STAFF SUMMARY FOR AUGUST 19-20, 2020

25. WESTERN JOSHUA TREE

Today's Item **Information ☐** **Action ☒**

Consider and potentially act on the petition, DFW's evaluation report, and comments received to determine whether listing western Joshua tree (*Yucca brevifolia*) as a threatened or endangered species under the California Endangered Species Act (CESA) may be warranted.

Summary of Previous/Future Actions

• Received petition	Oct 21, 2019
• Transmitted petition to DFW	Nov 1, 2019
• Published notice of receipt of petition	Nov 22, 2019
• Public received petition and FGC approved DFW's request for 30-day extension	Dec 11-12, 2019; Sacramento
• Received DFW's 90-day petition evaluation report	Apr 15-16, 2020; Teleconference
• Continued deliberations to Aug meeting	Jun 24-25, 2020; Webinar/Teleconference
• **Today determine if listing may be warranted**	**Aug 19-20, 2020; Webinar/Teleconference**

Background

On Oct 21, 2019, FGC received a petition from the Center for Biological Diversity to list the western Joshua tree as threatened under CESA (Exhibit 1). On Nov 1, 2019, FGC staff transmitted the petition to DFW for review. A notice of receipt of petition was published in the California Regulatory Notice Register on Nov 22, 2019.

California Fish and Game Code Section 2073.5 requires that DFW evaluate the petition and submit a written evaluation with a recommendation to FGC, which was received at FGC's Apr 2020 meeting (exhibits 2 and 3). The evaluation report delineates each of the categories of information required for a petition, evaluates the sufficiency of the available scientific information for each of the required components, and incorporates additional relevant information that DFW possessed or received during the review period. Based upon the information contained in the petition and other relevant information, DFW has determined that there is sufficient scientific information available to indicate that the petitioned action may be warranted.

FGC scheduled the public hearing on the petition for its Jun 2020 meeting following the public release and required minimum 30-day review period of the evaluation report, as required in Fish and Game Code sections 2074 and 2074.2. At the Jun meeting, FGC took public comment and continued the hearing to today's meeting. Today FGC will receive a presentation (Exhibit 4) on DFW's petition evaluation and continue the public hearing.

CESA and FGC's regulations require that the petition contain specific scientific information related to the status of the species. CESA, and case law interpreting it, make clear that FGC must accept a petition when the petition contains sufficient information to lead a reasonable person to conclude that there is a substantial possibility the requested listing could occur; FGC must accept a petition when the requested listing is tied to the species' status, that is, whether the species' continued existence is in serious danger or is threatened by a number of factors. FGC's decision in no way relates to economic consequences that might result from listing.

If FGC determines listing may be warranted pursuant to Section 2074.2 of the Fish and Game Code, western Joshua tree will become a candidate species and DFW will undertake a one-year status review before FGC can make a final decision on listing. Candidate species are protected under CESA pursuant to Section 2085 during the remainder of the CESA listing process.

Significant Public Comments

Through 5:00 p.m. on Aug 6 (first public comment deadline), FGC received over 5,000 comments regarding the potential listing of western Joshua tree as a threatened or endangered species; the majority of comments are in support of the petition, with approximately 200 opposed (recognizing that about 25 of the opposed comments are from associations or organizations representing dozens of members). Staff has reviewed the letters and provides a summary, with example public comments that are representative of the issues and concerns raised.

1. U.S. House of Representatives Republican Leader Kevin McCarthy and Congressional members Paul Cook, Tom McClintock, Doug LaMalfa, Ken Calvert, and Devin Nunes jointly oppose listing, stating the species is not at imminent risk of extinction and is adequately protected by existing law, and raising concerns that listing would have negative impacts on housing, energy diversification, and civil infrastructure. State Senator Scott Wilk, Assembly members Vince Fong, Tom Lackey, Chad Mays and Jay Obernolte, San Bernardino County Supervisor Dawn Rowe and Kern County Board of Supervisors Chair Leticia Perez, all representing areas of the state within the western Joshua tree range, oppose listing for reasons including redundancy of existing protections, failure to provide evidence of species decline, the recent U.S. Fish and Wildlife decision against listing the tree as an endangered species, and the immediate impacts candidate species protections would have on local governments. In addition, Assembly Member Fong expresses concern that the listing could potentially impede military readiness and national protection. See Exhibit 5 for representative examples.
2. The Town of Yucca Valley, mayor of Palmdale, Hi-Desert Water District, Victor Valley Transit Authority, High Desert Joint Powers Authority, San Bernardino County, Mohave Desert Air Quality Management District, and QuadState Local Governments Authority oppose the petition stating the tree is not currently imperiled, existing protections are adequate, and listing would hamper construction of infrastructure, affordable housing, and alternative energy projects. Additionally, the Town of Yucca Valley and the Hi-Desert Water District are concerned that listing could halt progress on the district's wastewater collection and treatment infrastructure required by the California Regional Water Quality Control Board, Colorado River Basin Region. See Exhibit 6 for representative examples.
3. To support positions of opposition, third-party analyses of the petition were submitted by the County of San Bernardino and the Town of Yucca Valley; the Solar Energy Industries Association, Large-scale Solar Association, California Wind Energy Association, and American Wind Energy Association of California; and the Cal

Portland Company on behalf of a coalition of construction materials, housing, energy and labor companies (Exhibit 7).

4. A broad coalition of industry associations and the California Construction and Industrial Materials Association oppose the petition, citing an absence of sufficient information, estimated abundance, or direct threat to the species in the "foreseeable future." Others state that DFW did not adequately analyze the petition and that the 90-day evaluation does not support a "may be warranted decision." A construction company requests that, in the event of a candidacy listing, facilities that have previously undergone a science-based impact analysis and will operate under CEQA-approved mitigation measures be exempt from the effects of a candidate listing. (Exhibit 8)

5. A coalition of chambers of commerce, individual chambers of commerce, and representatives of three real estate companies state that the tree is already adequately protected and describe the economic challenges and housing shortages they believe would be faced by underserved, rural communities. The California State Council of Laborers, Association of Western Employers, and members of the public oppose the listing citing similar concerns and a lack of current imperilment; approximately 150 form letters express the same. Additionally, a real estate firm describes an environmentally-sensitive, affordable housing project already underway that includes efforts to protect the tree, and expresses concerns that listing would make projects like this one much more expensive. See examples in Exhibit 9.

6. The National Parks Conservation Association, California Wilderness Coalition, the Antelope Valley Conservancy, Morongo Basin Conservation Association, Mohave Desert Land Trust, Transition Habitat Conservancy, and the Hispanic Access Foundation support listing the western Joshua tree for reasons including the threats of development, climate change, drought, wildfire, and non-invasive species; the tree's importance to the overall ecosystem; inadequate or unenforced current protections; and the tree's iconic beauty. Additionally, the Hispanic Access Foundation is concerned that the loss of western Joshua trees could do severe harm to the tourism industry that generates needed jobs and government revenue. (Exhibit 10)

7. A number of scientists, including biologists, ecologists and horticulturalists, write in support of the petition. Stated reasons include: the important services the tree provides to other species that rely on it for protection, food, and reproduction; the importance of maintaining habitat connectivity; the challenges of successfully germinating and transplanting western Joshua tree; the inadequacy of current protections, noting that 40% of Joshua tree habitat is on private land; and the tree's intrinsic value. (See examples in Exhibit 11)

8. Multiple individuals state that, even with current protections, local governments are not providing adequate oversight or enforcement to protect the trees, landowners are not held responsible when a tree is destroyed, some landowners are purposefully killing trees, and local communities are disincentivized to protect the tree as it can lead to decreased tax revenues (see Exhibit 12 for examples).

9. Many individuals support the petition and express concern that the tree is in danger due to climate change, construction, and fires. Many describe their personal experiences

with the trees. One commenter provided a link to a video showing the impact of development. See Exhibit 13 for examples.

10. Nearly 5000 form letters were received in support for multiple reasons (see Exhibit 14 for samples).

Recommendation

FGC staff: Determine that listing may be warranted and direct staff to issue a notice reflecting this finding and indicating that western Joshua tree is a candidate for threatened or endangered species status.

DFW: Accept the petition for further consideration under CESA.

Exhibits

1. Petition, received Oct 21, 2019
2. DFW memo, received Mar 16, 2020
3. DFW 90-day evaluation report, received Mar 16, 2020
4. DFW presentation
5. Letters of opposition from elected officials
6. Letters from local and regional government agencies
7. Letters of opposition from organizations submitting third-party analyses of the petition
8. Letters of opposition from industry associations and construction interests
9. Letters of opposition from real estate interests, chambers of commerce and the general public
10. Letters of support from conservation organizations
11. Letters of support from scientists
12. Letters of support from those concerned with the adequacy of current protections
13. Letters of support from general public or other organizations
14. Letters of support as form letters
15. Center for Biological Diversity presentation, received Aug 6, 2020

Motion/Direction

Moved by ____________ and seconded by ___________ that the Commission, pursuant to Section 2074.2 of the California Fish and Game Code, finds that the petition to list western Joshua tree as a threatened species **does** provide sufficient information to indicate that the petitioned action **may be** warranted based on the information in the record before the Commission, and directs staff to issue a notice reflecting this finding and indicating that western Joshua tree is a candidate for threatened or endangered species status.

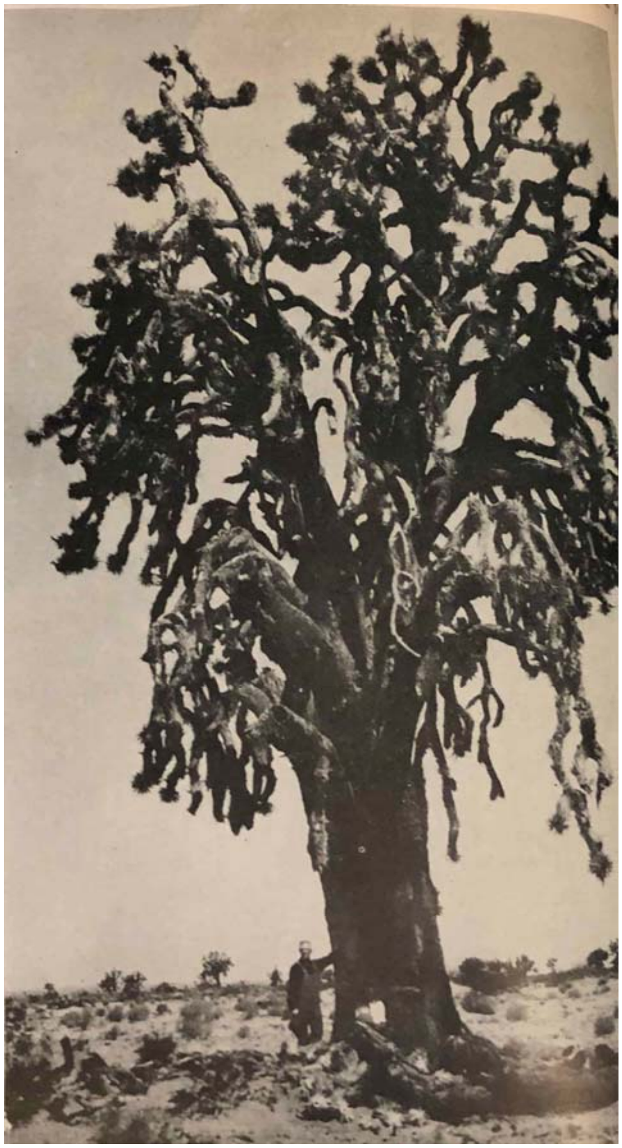
OR

Moved by ____________ and seconded by ____________ that the Commission, pursuant to Section 2074.2 of the Fish and Game Code, finds that the petition to list western Joshua tree as a threatened species **does not** provide sufficient information to indicate that the petitioned action may be warranted based on the information in the record before the Commission.

Received October 21, 2019.
Original date stamped copy on file.

BEFORE THE CALIFORNIA FISH AND GAME COMMISSION

A Petition to List the Western Joshua Tree (*Yucca brevifolia*) as Threatened under the California Endangered Species Act (CESA)



Center for Biological Diversity
October 15, 2019

CENTER for BIOLOGICAL DIVERSITY

Notice of Petition

For action pursuant to Section 670.1, Title 14, California Code of Regulations (CCR) and Division 3, Chapter 1.5, Article 2 of the California Fish and Game Code (Sections 2070 *et seq.*) relating to listing and delisting endangered and threatened species of plants and animals.

I. SPECIES BEING PETITIONED:

Species Name: Western Joshua tree (*Yucca brevifolia*) as either a full species, or as the subspecies *Yucca brevifolia brevifolia.*

II. RECOMMENDED ACTION: Listing as Threatened

The Center for Biological Diversity submits this petition to list the western Joshua tree (*Yucca brevifolia*) as Threatened pursuant to the California Endangered Species Act (California Fish and Game Code §§ 2050 et seq., "CESA"). The western Joshua tree (*Yucca brevifolia*), long recognized as a subspecies or variety (*Yucca brevifolia brevifolia*), has recently been recognized as a full species distinct from its close relative, the eastern Joshua tree (*Yucca jaegeriana*).

This petition demonstrates that the western Joshua tree is eligible for and warrants listing under CESA based on the factors specified in the statute and implementing regulations. Specifically, the western Joshua tree meets the definition of a "threatened species" since it is "a native species or subspecies of a … plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts . . . ." Cal. Fish & Game Code § 2067.

In the event the Commission determines that full-species taxonomy is not sufficiently established, petitioners request listing of the taxa as a subspecies/variety *Yucca brevifolia brevifolia*. Additionally, while petitioners believe that the western Joshua tree warrants protection under CESA throughout its range in California, in the event the Commission determines that it does not, the Commission must assess whether either of the two population clusters of the species (denoted as *Y. brevifolia* North [YUBR North] and *Y. brevifolia* South [YUBR South] in the petition) separately warrant listing as ecologically significant units (ESUs).

Cover photo of tallest (25 m) known *Yucca brevifolia* in western Antelope Valley in 1925 from Webber (1953). The tree was burned by vandals in 1930, generating outrage and sparking early desert protection efforts culminating in the 1936 creation of Joshua Tree National Monument.

III. AUTHOR OF PETITION:

Brendan Cummings
Center for Biological Diversity
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I hereby certify that, to the best of my knowledge, all statements made in this petition are true and complete.

Signature: ____________________________ Date: ____10/15/19___________

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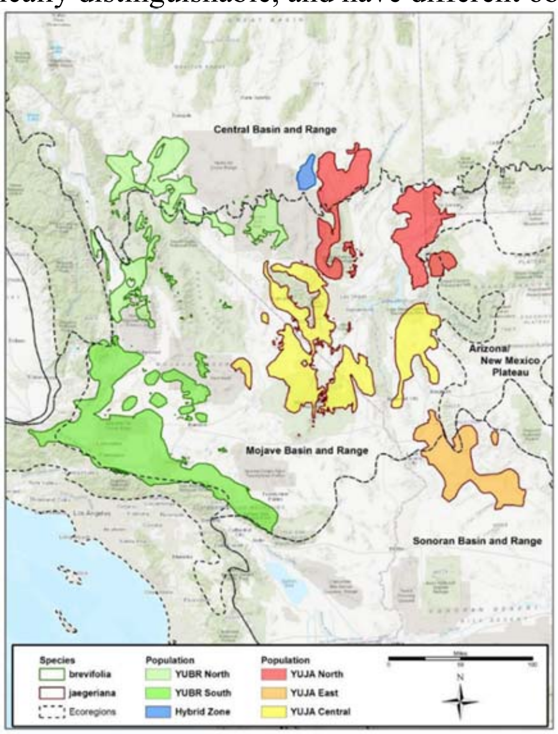
Executive Summary

The Center for Biological Diversity submits this petition to list the western Joshua tree (*Yucca brevifolia*) as Threatened pursuant to the California Endangered Species Act (CESA). This petition demonstrates that the western Joshua tree is eligible for and warrants listing under CESA based on the factors specified in the statute and implementing regulations.

Under CESA, a "threatened species" is "a native species or subspecies of a … plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts…" A plant is an "endangered species" when it is "in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease." While the western Joshua tree is not at imminent risk of extinction, it faces significant and growing threats, primarily from climate change, that ultimately threaten the viability of the species in all or a significant portion of its range in California; it consequently meets the definition of a "threatened species."

Long considered a single species with two subspecies or varieties, the Joshua tree has recently been recognized as comprised of two distinct species, the western Joshua tree (*Yucca brevifolia*) and the eastern Joshua tree (*Y. jaegeriana*). The two species are geographically separated, genetically and morphologically distinguishable, and have different obligate pollinators.



Both species occur in California, with the western Joshua tree having a boomerang-shaped range from Joshua Tree National Park, westward along the northern slopes of the San Bernardino and San Gabriel Mountains, through the Antelope Valley, northward along the eastern flanks of the southern Sierra Nevada and eastward to the edges of Death Valley National Park (green areas on map). The eastern Joshua tree's range in California is centered in the Mojave National Preserve (yellow areas on map).

While both the western and eastern species of Joshua tree are of conservation concern, the fate of the western Joshua tree in California is particularly alarming, as recent studies indicate that the species' range is contracting at lower elevations, recruitment is limited, and mortality is increasing, all of which would likely reflect a population already starting to decline due to recent warming. Even greater changes are projected to occur over the coming decades.

Climate change represents an existential threat to western Joshua trees. Even in the absence of climate change, the convergence of factors necessary for recruitment results in successful establishment of new seedlings only a few times in a century. Such recruitment has already largely stopped at the drier, lower limits of the species' range. Prolonged droughts, which are projected to occur with greater frequency and intensity over the coming decades, will not only preclude recruitment across ever-greater areas of the species' range, but will lead to higher adult mortality, either directly due to temperature and moisture stress or indirectly due to increased herbivory from hungry rodents lacking alternative forage. Whether or not the species' pollinating moth will be able to keep pace with a changing climate is highly questionable. The Joshua tree's ability to colonize new habitat at higher elevations or latitudes is extremely limited and no such range expansion is yet occurring, even as the lower elevation and southern edge of its range is already contracting. And there is no safe refuge, as the higher elevation areas in which Joshua trees are projected to best be able to survive increasing temperatures and drying conditions are at great risk of fire due to the prevalence of invasive non-native grasses. Absent rapid and substantial reductions in GHG emissions *and* protection of habitat, the species will likely be extirpated from all or most of California by the end of the century.

In addition to climate change and fire, the western Joshua tree is threatened by habitat loss and degradation from other human activities. The portion of the species' range where management is most protective—Joshua Tree National Park— is also the area where the early impacts of climate change are already being felt most severely. Other areas of federal land that are home to the species are subject to poorly-regulated activities including off-road vehicle use, cattle grazing, power and pipeline rights-of-way and large-scale energy projects that consume or degrade habitat. And while much of the western Joshua tree's range is on public lands, approximately 40% of its range in California is on private land, of which only a tiny fraction is protected from development. Under current growth projections, virtually all of this habitat will be lost in the coming decades absent strengthened protection under the law.

The Joshua tree has long been the most iconic species of the Mojave Desert. Given the well-publicized threats facing the species in the face of climate change, it has recently become an emblem of our society's failure to address the climate crisis. But the Joshua tree is also uniquely situated to become an example of successful action to save a species threatened by climate change. Action taken in and by California to save the species can serve as a model for proactive climate adaptation efforts not just in California but around the world. Listing the species under CESA is not just a symbolically important act of California recognizing the threats the species faces from climate change, but also can serve as the impetus for meaningful management actions that can help ensure the species remains a living icon in perpetuity.

The Western Joshua Tree Warrants Listing as Threatened under the California Endangered Species Act (CESA)

1 Introduction

This petition summarizes the available scientific information regarding the taxonomy and natural history of the western Joshua tree (*Yucca brevifolia*), its distribution and abundance in California, population trends and threats, and discusses the limitations of existing management measures in protecting the species. As demonstrated below, western Joshua trees meet the criteria for protection as "threatened" under the California Endangered Species Act (CESA) and would benefit greatly from such protection.

2 Life History

2.1 Taxonomy

Joshua tree taxonomy has long been subject to some dispute and confusion. Often referenced as being within the Families Liliaceae or Agavaceae, under the molecular-based taxonomic system developed by the Angiosperm Phylogeny Group, the species is now considered as being within the Asparagaceae (AGP IV 2016; ITIS 2019).

The Joshua tree has until recently been treated by most authorities as a single species, *Yucca brevifolia* Engelm., comprised of two varieties or subspecies, *Yucca brevifolia brevifolia* (western Joshua tree) and *Yucca brevifolia jaegeriana* (eastern Joshua tree) (ITIS 2019).[1] The two forms are for the most part geographically separated, genetically and morphologically distinguishable, and have different obligate pollinators. The two forms may be the result of allopatric speciation, though some gene flow between them has been documented in a small area in Nevada (Yoder et al. 2013; Royer et al. 2016). Lenz (2007) believed the differences in flower and fruit morphology between *Y. b. brevifolia* and *Y. b. jaegeriana* as well as each having different obligate pollinators were sufficient to recognize *Y. b. jaegeriana* as a full species, *Y. jaegeriana*.

More recent studies focused on pollinator interactions have confirmed significant morphological differences in the stylar canals of the flowers of the two forms, which correspond to differences in ovipositor length in their respective pollinators (Godsoe et al. 2008; Starr et al. 2013; Yoder et al. 2013). Smith et al. (2008) used genetic markers to determine that western and eastern Joshua trees likely diverged over 5 million years ago, which corresponds to the time when the Bouse Embayment, an extension of estuarine waters of the Gulf of California, extended into the Mojave, separating western and eastern areas (Pellmyr and Segraves 2003). Starr et al. (2013) and Yoder et al. (2013) also found genetic differentiation between the two forms but declined to recognize them as separate species.[2] Royer et al. (2016) expanded on these studies

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[1] Other previously described subspecies/varieties including *Y.b. herberti*, *Y.b. weberi* and *Y.b. wolfei* are considered synonyms of *Y. brevifolia* (ITIS 2019; Wallace 2017).

[2] Yoder et al. (2013) noted that whether *Y. b. brevifolia* and *Y. b. jaegeriana* represent full species "is heavily dependent on the species concept we use to make that judgment." Starr et al. (2013) noted that "[t]he validity of this

using molecular techniques and found "evidence for strong genome-wide patterns of divergence between the Joshua tree species" and noted their results "revealed extensive genetic differentiation between *Y. brevifolia* and *Y. jaegeriana*." Royer et al. (2016) followed Lenz (2007) and recognized *Y. brevifolia* and *Y. jaegeriana* as full species.

Most recently, in a broad review of the science regarding Joshua trees, the U.S. Fish and Wildlife Service treated *Y. brevifolia* and *Y. jaegeriana* as separate species for purposes of federal Endangered Species Act (ESA) consideration (Wallace 2017; USFWS 2018; USFWS 2019).[3] Petitioners follow Lenz (2007), Royer et al. (2016), Cole et al. (2017) and USFWS (2018) and treat *Y. brevifolia* and *Y. jaegeriana* as full species. However, since CESA provides for the protection of both species and subspecies, regardless of whether it is treated as a species (*Y. brevifolia*) or subspecies (*Y. b. brevifolia*), the western Joshua tree is eligible for and warrants listing under the statute.

2.2 Species Description[4]

The earliest known written description of the Joshua tree is an unflattering entry in the Fremont Report in which it was noted that "their stiff and ungraceful form makes them to the traveler the most repulsive tree in the vegetable kingdom . . .'' (Fremont 1845). Over time, Joshua trees became increasingly more appreciated, with Griffin (1930) referring to them as "one of the outstanding plants of the desert," Runyon (1930) characterizing them as "grotesque in the extreme…yet they are magnificent," Little (1950) somewhat undecidedly calling them "picturesque or grotesque," and Jaeger (1965) calling them "at once the most spectacular and most characteristic tree of the Mohave Desert."

More technically, the Jepson Flora describes Joshua trees as follows:

> *Habit*: Plant 1--15 m. *Stem*: erect, above ground, generally branched above, rosettes at tips, well above ground. *Leaf*: 15--35 cm, 0.7--1.5 cm wide, dark green, expanded base 2--4 cm, 4--5 cm wide, +- white, margins minute-serrate, yellow. *Inflorescence*: 3--5 dm, distal generally +- 1/2 exserted from rosettes. *Flower*: erect; perianth 4--7 cm, +- bell-shaped, parts lanceolate to oblong, +- fused at base, cream to +- green; filaments thick; pistil +- 3.5 cm. *Fruit*: capsule, spreading to erect in age, 6--8.5 cm, ellipsoid, dry, spongy, or leathery in youth. (Hess 2012).

Among the numerous natural history accounts of the Joshua tree, Gucker (2006), prepared for the U.S. Forest Service and readily available online,[5] is among the most comprehensive. The following is largely adapted from Gucker (2006).

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designation [two species] is not yet certain, and here, we conservatively refer to the two morphotypes as subspecies."

[3] As discussed *infra*, while the taxonomic and other life history discussions in USFWS (2018) represent a comprehensive summary of the available science, the threats analysis in the document is highly problematic and shows some evidence of political interference driving its ultimate conclusions.

[4] Because the bulk the scientific literature cited in this petition treats Joshua trees as a single species without distinction between *Y. brevifolia* and *Y. jaegeriana*, this petition generally refers just to the "Joshua tree," highlighting difference between the two taxa where appropriate.

The Joshua tree is a 5 to 20 meters tall, evergreen, tree-like plant. Trees exceeding 10 meters are rare. Tree size and growth form vary with site and climate conditions, as well as between the two species. *Y. brevifolia* typically have one main stout stem or trunk that measures 0.3 to 1 meter in diameter and have an expanded base. *Y. jaegeriana* typically have multiple stems. Trunks are fibrous, and the bark or periderm is soft and cork like. Bark plates measure 7.5 to 15 cm long and 2.5 to 5 cm in thickness. (Gucker 2006).

Figure 1. Western Joshua tree (*Yucca brevifolia*) and Easter Joshua tree (*Yucca jaegeriana*).

Older plants generally have extensive branching. Young trees typically lack branches and are covered with persistent reflexed leaves. Trees normally reach 1 to 3 meters tall before branching. Branches are 2 to 5 meters and fork at 0.5 to 1-meter intervals. Inner branches are typically erect, and outer branches can be horizontal or drooping. (Gucker 2006).

Leaves are clustered in rosettes at the branch ends. Clusters are commonly 0.3 to1.5 meters long and 0.3 to 0.5 meters in diameter. Leaves are linear, needle shaped and measure 15 to 35 cm long by 0.7 to 1.5 cm wide, with enlarged bases attaching them to the branch. Leaf shape is slightly triangular and leaf margins are lined with small teeth. Spines measuring 7 to 12 mm occur at the leaf tips. Leaf clusters are longer (1-1.5 meters) on juvenile plants than on mature plants (0.3-1 meters). Outer leaf layers are thick and waxy to reduce water loss. Dead leaves are persistent and fold down, covering the branches and coating the trunks of young trees. (Gucker 2006).

Joshua tree flowers occur in dense, heavy panicles that measure 20 to 40 cm long. Individual flowers are round to egg shaped and measure 2.5 to 5 cm wide. Flowers have a musky scent, with the early botanist Trelease (1893) describing the smell as “so oppressive as to render

[5] https://www.fs.fed.us/database/feis/plants/tree/yucbre/all.html

the flowers intolerable in a room." Fruits are indehiscent capsules, which become spongy and dry with age. Egg-shaped capsules are 6 to 10 cm long and approximately 5 cm in diameter. Fruits develop at the base of the inflorescence while the upper portion is still in flower. Mature fruits contain 30 to 50 black seeds, which are flat to thickened with smooth to undulate surfaces. Seeds are 7 to 11 mm long. (Gucker 2006).

Figure 2. *Yucca brevifolia* fruit and seeds.

The two species of Joshua trees are morphologically distinguishable. *Y. jaegeriana* is sometimes referred to as dwarf Joshua tree as it is often smaller (3-6 meters tall), with shorter leaves (<22 cm) and shorter branches (0.7-1 meter) compared to *Y. brevifolia*. *Y. brevifolia* is less stocky, often 5 to 12 meters tall, with longer leaves (19-37 cm) and higher branches (2-3 meters above ground) compared to *Y. jaegeriana*. *Y. jaegeriana* displays true dichotomous branching while *Y. brevifolia* is not truly dichotomous. (Gucker 2006).

Lenz (2007) described the vegetative differences between the two species as follows:

> *Yucca brevifolia* s.s. is arborescent with a distinct trunk and, usually, stout branches; *Y. jaegeriana* is generally smaller and branched from near the base, the branches somewhat slender. The two possess dissimilar patterns of branching, *Y. brevifolia* having pseudodichotomous (monopodial) branching; *Y. jaegeriana,* until flowering, has true dichotomous branching. The species differ in leaf length; *Y. brevifolia* having leaves 15–35 cm long, those of *Y. jaegeriana* 10–20 cm. Leaf length is variable, depending at least in part on environmental conditions. (internal citations omitted)

Additionally, Lenz (2007) noted the differences in flower morphology between *Y. brevifolia* and *Y. jaegeriana*:

> Flowers of *Y. brevifolia* are nearly globular or depressed globular, the broadly ovate, fleshy, cream-colored perianth segments are strongly incurved, and the flowers never fully expand. Flowers of *Y. jaegeriana* are narrowly campanulate, conspicuously swollen at the base, somewhat constricted above, and the narrowly oblong perianth

segments are usually greenish, and recurved at their tips. The ovaries of *Y. brevifolia* are conical and taper from the base; those of *Y. jaegeriana* are lance-ovoid. Fruits of *Y. brevifolia* are ovoid to broadly ovoid; those of *Y. jaegeriana* are ellipsoid.

Figure 3: Flowers of *Y. brevifolia* (L) and *Y. jaegeriana* (R) above a 6” ruler. Source: Lenz 2007.

Studies on flower morphology in the context of pollination have concluded that the statistically greatest discernable difference between *Y. brevifolia* and *Y. jaegeriana* is in the length of the stylar canal—the path through which the female yucca moth inserts her ovipositor when laying eggs (Godsoe et al. 2008; Starr et al. 2013).

According to Warren et al. (2016), flower panicles grow primarily at the tips of branches that are oriented to the south, and when on branches that are not oriented in a southerly direction, the flower panicles themselves tend to bend or tilt toward the south. Such orientation may provide energetic and/or pollinator benefits (Warren et al. 2016).

2.3 Reproduction and Growth

Joshua trees reproduce both sexually and asexually, although patterns of sexual and clonal reproduction have not been thoroughly investigated (Sweet et al. 2019).

2.3.1 Asexual reproduction

Asexual reproduction is by rhizomes, branch sprouts, and/or basal sprouts. Rhizome production and clonal growth can be triggered by stem damage as well as certain environmental conditions. Dormant buds beneath the periderm may grow when older stems are bent or injured. Joshua trees with extensive rhizome growth and clonal form are typically shorter and have less branching than single-stemmed trees. In some cases, basal buds do not develop into distinct rhizomes, and stems grow adjacent to the main stem as sprouts. (Gucker 2006).

Some Joshua tree populations are largely if not entirely clonal, including in the Liebre Mountains and along the southern and western slopes of the Tehachapi Mountains. In these areas Joshua trees can occur in clumps nearly 30 feet (8 m) in diameter, with 30 to 40 trunk-like stems. A single clone in Gorman Creek was determined to occupy approximately one acre (0.4 ha) and was comprised of several hundred stems (Gucker 2006). Joshua trees with this growth form were previously classified as *Y. b.* var. *herbertii* (Webber 1953)(Figure 4) but are now known to be a clonal form of *Y. brevifolia* (ITIS 2019).

Figure 4: Type specimen of *Y. b.* var. *herbertii* in western Antelope Valley in 1946. Source: Webber (1953)

The extent of cloning apparently increases with increased elevation, with Joshua trees in low-elevation dry areas rarely forming more than 1 or 2 stems, but 2 to 3 stems are common, and some clumps are found, in higher, moister areas. A mix of temperature, high winds and abundant snowfall, as well as fire, may be the causal mechanisms of higher levels of Joshua tree cloning. (Gucker 2006). In a study following a large fire in Joshua Tree National Park in 1999, DeFalco et al. (2010) found that 33% of plants that were censused in burned areas sprouted from the root crown or stem after the fire compared with 15% in unburned areas. Recently, Harrower and Gilbert (2018) found enhanced clonality and lack of seedling recruitment on the lower elevation margins of the Joshua tree range in addition to the previously reported prevalence of cloning at higher elevation sites.

2.3.2 Sexual reproduction

Sexual reproduction of Joshua trees is by seed production. As described above, bisexual flowers occur in dense, heavy panicles that measure 20 to 40 cm long. Individual flowers are round to egg shaped and measure 2.5 to 5 cm by 1to 2 cm wide.

Esque et al. (2015) noted that while flowering has been observed in Joshua trees as small as 1 meter in some areas, trees that were over 30-years old at their study site had yet to flower. Flowering is considered episodic and rare, generally occurring only in wetter years (Gucker 2006). Reports differ on timing of flowering, with, for instance, Hess (2012) indicating April and May, Waitman et al. (2012) stating February through March, and Harrower and Gilbert (2018) indicating between February and April. Recently, Cornett (2018) reported an apparently unprecedented flowering event in November, following heavy October rains and warmer than usual temperatures immediately thereafter.

Irrespective of timing, Joshua tree flowers require insect pollination to produce seeds.

Pollination and seed production

Joshua tree, as with almost all yuccas, have an obligate pollination mutualism with yucca moths (Lepidoptera, Prodoxidae). Female moths carry pollen to Joshua tree flowers in specialized mouthparts, inject eggs into the floral ovaries using a bladelike ovipositor, and then actively apply pollen to the stigmatic surface to fertilize the flower. As a Joshua tree flower develops into a fruit, the moth eggs hatch and the emerging larvae eat a portion of the developing seeds. The moths are the sole pollinators of Joshua trees, and in turn, the Joshua tree seeds are the only food source for the moths (Pellmyr and Segraves 2003; Yoder et al. 2013).

Joshua trees are now known to be pollinated by two species of moth, *Tegeticula synthetica* and *T. antithetica*, the latter only described in 2003 by Pellmyr and Seagraves. Outside of the narrow region in Nevada where *Y. brevifolia* and *Y. jaegeriana* are sympatric and hybridize, *T. synthetica* is the sole pollinator of *Y. brevifolia* and *T. antithetica* is the sole pollinator of *Y. jaegeriana*. While *T. synthetica* is about 30% larger than *T. antithetica*, the apparently more important difference in the two moths is the size of their ovipositors, with the difference in length of each matching the difference in the length of the stylar canal of their respective host plants, with the ovipositor of the western moth (*T. synthetica*) being about 50% larger than that of the eastern species (*T. antithetica*) (Pellmyr and Segraves 2003; Godsoe et al. 2008).[6]

The parallel differences between stylar canal length and ovipositor length between the two species of moths and two types of Joshua tree suggest that selection exerted by their pollinators is the best explanation for the morphological divergence of the trees. Since the female moth's ovipositor must be long enough to reach the ovules but not so long as to injure them, coevolution acting upon moth and tree should favor matching between the length of the moth's ovipositor and the flower's stylar canal (Godsoe et al. 2008; Yoder et al. 2013; Cole et al. 2017). Using molecular clock techniques, Pellmyr and Segraves (2003) concluded that the two moths diverged approximately 10 million years ago, while Smith et al. (2008) later determined that the split between the moth species likely occurred 1.14 million years ago.

[6] In addition to the pollinating *Tegeticula* moths, bogus yucca moths of the sister genus *Prodoxus* also lay their eggs in Joshua tree flowers. Adult Prodoxus lack the specialized mouthparts used for pollination and the larvae feed on plant tissues other than seeds (Althoff et al. 2004).

Studies in Tikaboo Valley in Nevada where both the two moth species and the two types of Joshua trees are sympatric demonstrate that *T. antithetica* can successfully fertilize *Y. brevifolia* and reproduce in their fruits, but *T. synthetica* do not successfully rear larvae on *Y. jaegeriana* (Smith et al. 2009; Starr et al. 2013; Yoder et al. 2013). Consequently, gene flow is largely unidirectional, with flow from *Y. jaegeriana* into *Y. brevifolia* but not from *Y. brevifolia* into *Y. jaegeriana* (Starr et al. 2013).

Once pollinated, fruits form in early summer and seeds are mature in mid-summer (Waitman et al. 2012). Fruits are indehiscent capsules, which become spongy and dry with age. Egg-shaped capsules are 6 to 10 cm long and approximately 5 cm in diameter. Fruits develop at the base of the inflorescence while the upper portion is still in flower. Mature fruits contain 30 to 50 black seeds, which are flat to thickened with smooth to undulate surfaces. Seeds are 7 to 11 mm long. (Gucker 2006).

<u>Seed predation and dispersal</u>

While *Tegeticula* moths are necessary for pollination, their larvae are the first predators that Joshua tree seeds experience. In one study, the range of larvae per fruit was 0 to 6, with an average of 1.4. These larvae consumed or damaged 7% of seeds (Keeley et al. 1985). Borchert and DeFalco (2016) found much higher levels of larvae predation, with 19.5% damaged in a year of widespread fruiting and 42.8% damaged in a subsequent year of reduced flowering and fruiting. Seed production was more than 100 times greater in the first year of the study, leading the authors to speculate that Joshua trees may be a masting species.

Just as a portion of a Joshua tree's seed production goes to its pollinator, a large percentage of its seed production goes to its primary dispersers, various scatter-hoarding rodents. Among the current consumers (and likely dispersers) of Joshua tree seeds in California are the white-tailed antelope squirrel (*Ammospermophilus leucurus*), Mojave ground squirrel (*Xerospermophilus mohavensis*) and California ground squirrel (*Otospermophilus beecheyi*), all of which are known to climb Joshua trees to remove the fruits for later consumption and/or to eat through the desiccated fruits in situ to reach the seeds (Lenz 2001). Once fruits are on the ground, numerous other species will dismantle the fruits and eat and/or cache the seeds, including the round-tailed ground squirrel (*Xerospermophilus tereticaudus*), rock squirrel (*Otospermophilus variegatus*), Merriam's kangaroo rats (*Dipodymus merriami*), canyon mice (*Peromyscus crinitus*) and woodrats (*Neotoma sp.*) (Lenz 2001; Vander Wall et al. 2006; Waitman et al. 2012; Borchert and DeFalco 2016). Among these species, the white-tailed antelope squirrel and Merriam's kangaroo rats have been identified as the most frequent agents of seed removal and caching (Waitman et al. 2012; Borchert and DeFalco 2016).

Studies by Vander Wall et al. (2006), Waitman et al. (2012) and Borchert and DeFalco (2016) have all highlighted the importance of seed dispersal by scatter-hoarding rodents. In the study by Vander Wall et al. (2006), more than 99% of tracked seeds were removed by rodents from placement below Joshua trees, with 84% found in rodent caches at a mean maximum distance of 30 meters. Subsequent surveys found 46% of caches intact, 51% of caches missing entirely, a handful of caches largely empty but with a few remnant seeds below ground and numerous new secondary caches established. Over the subsequent months, rodents ate most of the cached seeds. Ultimately, well under 1% of cached seeds were documented as eventually germinating from identified caches the following spring. Nevertheless, Vander Wall et al. (2006) concluded that "the dismantling of yucca pods by rodents is very important because there is no other known mechanism for Joshua tree seeds to exit the indehiscent seed pods," and "that seeds that are not harvested by seed-caching rodents probably have no chance of establishing a seedling."

While a rodent eats the vast majority of the seeds it removes from a Joshua tree fruit, it also acts as the primary seed disperser, moving seeds upwards of 50 meters from the source tree (Vander Wall et al. 2006; Waitman et al. 2012; Borchert and DeFalco 2016). Waitman et al. (2012) concluded that rodents not only disperse seeds, but also, via the act of caching them, increase the likelihood of germination as seeds that have been buried in soil have a much greater chance of establishing seedlings than those left on the soil surface. Consequently, the Joshua tree's relationship with the predating rodent, which liberates its seeds from an otherwise inescapable pod, disperses them, and caches many where they have a higher chance of germination, may, as with the pollinating moth, be one of obligate mutualism (Vander Wall et al. 2006; Waitman et al. 2012).[7]

Waitman et al. (2012) also noted the limitations of the mutualistic relationship between Joshua trees and rodents, as it requires sufficient seed production such that the caching rodent collects more seeds than it can eat: "Small seed crop size along with an overabundance of rodents may shift this interaction from mutualism toward seed predation by rodents." Given seed production is apparently greatest in wetter years, in drought years virtually all seeds may be consumed by rodents, resulting in no seedlings being produced that year.

While almost all authors recognize the current importance of rodent seed dispersal, several have hypothesized that the large effort in fruit production by Joshua trees without a specialized dispersal agent may indicate that current fruit production is an evolutionarily relict designed to attract a now extinct megaherbivore dispersal agent, with Cole et al. (2011) identifying ground sloths and Lenz (2001) suggesting Columbian mammoths. Cole et al. (2011) note that evidence supports "the concept that the species' current mobility is constrained by the earlier extinction of the Shasta ground sloth and other possible seed vector(s)." However, Waitman et al. (2012) discount the role of the sloths in seed dispersal and conclude that "seed-caching rodents are responsible for seed dispersal today, and we suspect that they were an important, if not the sole, means of dispersal in the past."

Additionally, several authors have identified wind as an important seed dispersal agent (*e.g.* Lenz 2001, citing earlier accounts), with Gucker (2006) noting that as fruits become overmature, skins crack and moisture is released, making fruits lighter and more easily wind dispersed, and that finding clumps of 2 or more seedlings is likely evidence that the dried fruits

[7] However, unlike the Joshua tree's relationship with *Tegeticula* moths, where both tree and moth absolutely need each other to successfully reproduce, the tree's relationship with the rodent is more one-sided; the Joshua tree may be dependent upon the rodent to disperse its seeds, but the rodent – while certainly benefiting from the tree's seeds – can generally subsist on other food sources in its absence.

were wind dispersed. The largest known modern dispersal distances for Joshua trees of 151 meters in the Antelope Valley and 251 meters in Lanfair Valley were recorded by Lenz (2001) and ascribed to wind. However, Waitman et al. (2012), based upon wind tunnel tests of fruits and seeds, discount wind dispersal of seeds as playing a significant role for Joshua tree reproduction.

As further discussed *infra*, whether by wind or rodents, seed dispersal of Joshua trees is generally considered quite limited, likely constraining the ability of the species to extend it range in response to changing conditions (Lenz 2001; Cole et al. 2011).

Germination and growth

In laboratory conditions, Joshua tree seeds germinate readily and do not require any pretreatment (Gucker 2006). Waitman et al. (2012) had germination rates of 99% on freshly harvested seeds, while other experiments had germination rates of 98% and 72% after 6 months and 1.5 years of storage, respectively (Gucker 2006).

Longevity of viable seeds in the soil seed bank is limited. Waitman et al. (2012) reported that "a small fraction of seeds" emerged the year following their experiment, indicating that in some circumstances viability is at least two years. Reynolds et al. (2012) observed that seeds in the ground "rapidly lost germinability through time. Longevity of seeds in the soil declined by about 50% per year, which indicates that *Y. brevifolia* has little capacity for seed dormancy." Borchert and DeFalco (2016) noted that in most years when fruit production is enough to satiate predation by larvae and rodents, uneaten fruits may remain on the tree and "may function as a viable aerial seed bank well after fruit maturation," since seed germinability is likely longer in an intact fruit than in the soil.

Notwithstanding very high laboratory germination rates, seedling production in the field is extremely low. Of the 1000 seeds tracked by Vander Wall et al. (2006), 836 were cached by rodents, but only three of these were documented to ultimately produce seedlings. Of seeds planted in artificial caches in enclosures that precluded rodent harvest, only 14.8% germinated (Vander Wall et al. 2006). In another enclosure study, Waitman et al. (2012) reported only 3.2% of cached seeds produced seedlings in the field, while 36% of pots in an artificial growing chamber produced seedlings. Buried seeds, both in the field and laboratory, were most likely to produce emergent seedlings when 1 to 3 cm deep, depths similar to the caches rodents were observed making (Waitman et al. 2012). Both Vander Wall et al. (2006) and Waitman et al. (2012) reported higher seedling emergence rates from caches under shrub cover. However, both studies also found that rodents cache seeds without regard to shrub cover.

Reynolds et al. (2012) described the climate conditions supporting emergence and postulated that "there are fewer opportunities of emergence in the far western Mojave Desert, and under the current climate regime *Y. brevifolia* in that area may be most vulnerable to demographic change resulting from low and infrequent recruitment and may already have occurred." Subsequent studies (*e.g*. Sweet et al. 2019) have demonstrated that this demographic change due to low recruitment is already underway.

Once a seedling emerges, it faces a long, arduous path to adulthood, with high mortality until it exceeds 25 cm in height (Esque et al. 2015). Survival of seedlings requires periods of cool temperatures, little to no herbivory, summer rain, and some amount of yearly precipitation over a period of several years (USFWS 2018).

Growth rates are dependent on factors ranging from age, precipitation, presence of nurse plants, temperature and (at least in labs) photoperiod (Gucker 2006). Over the years various studies have indicated differing rates of growth. In one study in Joshua Tree National Park, unbranched seedlings grew at an average rate of 7.6 cm/year for the first 10 years and an average of 3.8 cm/year thereafter, with other studies showing annual growth rates of was 5.9 cm/year and 11.7 cm/year (Gucker 2006). More recently, Esque et al. (2015) measured a long-term mean annual growth rate of 3.12 ± 1.96 cm over 22 years and noted that long-term growth rates in other contemporaneous studies elsewhere in the Mojave were comparable.

Lab studies suggest that cold periods are required for optimal seedling growth, as 3-year old seedlings kept at 4 °C for 2 months produced twice as many new leaves after the cold treatment as seedlings without the cold treatment. Other lab experiments suggest that day length affects the growth of seedlings, with seedlings exposed to 10 hours of daylight producing the longest and most leaves, while seedlings grown in 16 hours of daylight produced the shortest and fewest leaves (Gucker 2006).

Perhaps the most important factor in seedling survival and growth is the presence of nurse plants. Several studies have found successful seedling emergence tied to shrub cover (Bittingham and Walker 2000; Vander Wall et al. 2006; Waitman et al. 2012), with blackbrush (*Coleogyne ramississima*) generally noted as the most important nurse plant. The benefits of a shrub canopy for a young Joshua tree include increased soil moisture, decreased insolation, reduced soil temperatures, decreased evapotranspiration, increased nutrients, decreased herbivory, and/or lower wind desiccation (Bittingham and Walker 2000; Gucker 2006).

Figure 5: Young Joshua tree emerging from nurse plant.

Once established, a Joshua tree is relatively long-lived. However, aging a Joshua tree or determining maximum lifespan is difficult as the plants lack annual growth rings. While one early report of a 20-meter tall Joshua tree estimated the plant to be 1000 years old (Little 1950), most early studies postulated that large trees can be 300 years old with an average life span of 150 years (Gucker 2006). More recent studies based on growth rate and long-term monitoring have reached similar conclusions. Gilliland et al. (2006), based upon growth rates generated from a 14-year census of a Joshua tree woodland, estimated that the oldest tree was 321 years, with mean age of trees of 62.2 years. Estimates based on observed patterns of survivorship produced similar results, with a median life expectancy of 89 years, with 5% of the population projected to reach 383 years. Esque et al. (2015) estimated a generation time of 50-70 years based on data collected during a 22-year study.

Summing up reproduction and recruitment by Joshua trees, Esque et al. (2015) highlighted the challenges Joshua trees face:

> [R]ecruitment of *Y. brevifolia* requires a convergence of events, including fertilization by unique pollinators, seed dispersal and caching by rodents, and seedling emergence from a transient seed bank triggered by isolated late-summer rainfall. Alignment of these convergent events likely results in successful establishment of new seedlings only a few times in a century. (internal citations omitted)

As further discussed *infra*, the Joshua tree's recruitment challenges make the species particularly vulnerable to climate change.

2.4 Habitat Requirements

Joshua trees occur in desert grasslands and shrublands in hot, dry sites on flats, mesas, bajadas, and gentle slopes in the Mojave Desert (Gucker 2006). Soils in Joshua tree habitats are silts, loams, and/or sands and variously described as fine, loose, well drained, and/or gravelly, while the plants can reportedly tolerate alkaline and saline soils (Gucker 2006). Cole et al. (2011) characterizes populations as discontinuous and reaching their highest density on the well-drained sandy to gravelly alluvial fans adjacent to desert mountain ranges.

Lenz (2001) reports that plants tolerate temperatures of -25°C to 51°C and annual precipitation ranges of 98 to 268 mm. According to USFWS (2018), the temperature range for western Joshua trees ranges from a low of -8.1°C to a mean summer high of 37.2°C and the species occurs in areas averaging more than 82 mm of rainfall and less than 738 mm of rainfall per year. Went (1957), based on field observations and laboratory experiments, noted that non-juvenile Joshua trees required annual exposure to low temperatures for optimal growth. Turner (1982) postulated that such a need for cold winter temperatures may explain why Joshua trees are largely limited to the higher and cooler periphery of the Mojave.

Temperature and precipitation are likely the prime constraints on the species, with Cole et al. (2011) noting that "the northern portion of Joshua tree's range is spatially limited by extreme winter cold events, but at lower elevations it is limited by extreme high temperature events in summer or winter. Mean precipitation patterns primarily limit the range from the east and west, as well as above and below its elevational range during various portions of the year. Low late-spring (April and May) precipitation seems to prevent Joshua tree from growing in lower elevation portions of the Mojave Desert." Temperature and precipitation requirements are further discussed *infra* with regard to climate impacts on the species.

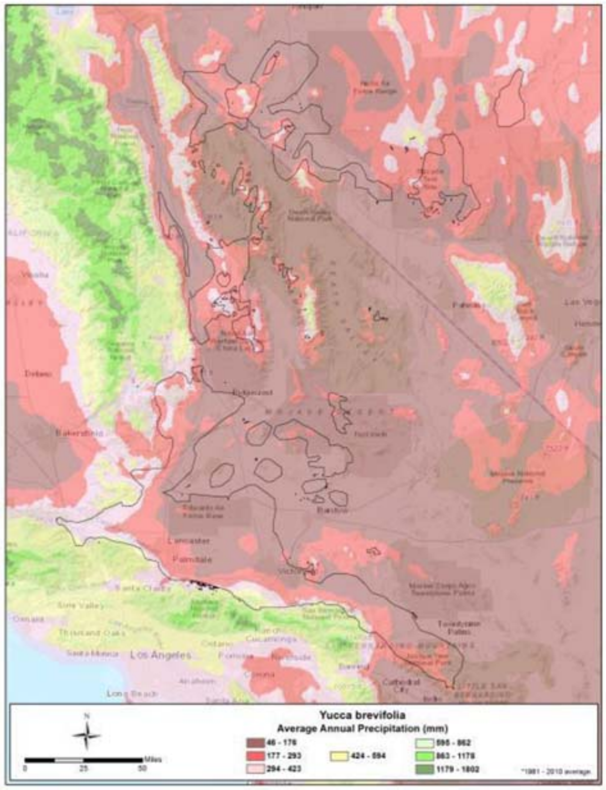

Figure 6. Average annual precipitation in range of *Y. brevifolia* (USFWS 2018).

The reported upper and lower elevation limits of Joshua trees vary significantly in the published literature (Gucker 2006). The recent Species Status Assessment by USFWS (2018) is based upon a comprehensive review of distribution records and describes the elevational range for *Y. brevifolia* as 750 meters (2461 ft) up to 2200 meters (7218 ft), and between 600 meters (1969 ft) and 2000 meters (6500 ft) for *Y. jaegeriana*.

Joshua trees are not restricted to any one desert scrub or xeric woodland community and can be found in many different plant alliances throughout their range (Turner 1982). For example, within Joshua Tree National Park, Harrower and Gilbert (2018) characterized their study area of Joshua trees as encompassing four broad eco-regional vegetation types: Sonoran–Colorado Desert scrub, Mojave–Sonoran creosote bush scrubland, Mojave mid-elevation desert, and pinyon–juniper woodland.

While Joshua tree habitat may not be limited by particular plant associations, as discussed *supra*, for successful reproduction and recruitment, Joshua trees require the presence of their obligate pollinator, rodents to disperse and cache seeds and nurse plants to shelter emerging seedlings.

3 Current and Historical Distribution

The current range of Joshua trees (both species)[8] extends from northwestern Arizona to southwestern Utah west to southern Nevada and southeastern California at elevations between 600 and 2200 meters of elevation and between 34° to 38° latitude (USFWS 2018). The current range of the Joshua tree is but a small fraction of its range during the late Pleistocene.

Plant material from Shasta ground sloth dung and packrat middens indicates that during the Pleistocene the Joshua tree had a much larger southern distribution extending well into the Sonoran Desert, where it range may have encompassed La Paz, Maricopa, Pinal, Yuma, and Pima counties in Arizona; Imperial and Riverside counties in California; mainland Mexico; and northern Baja California, Mexico (Cole et al. 2011) (Figure 7).

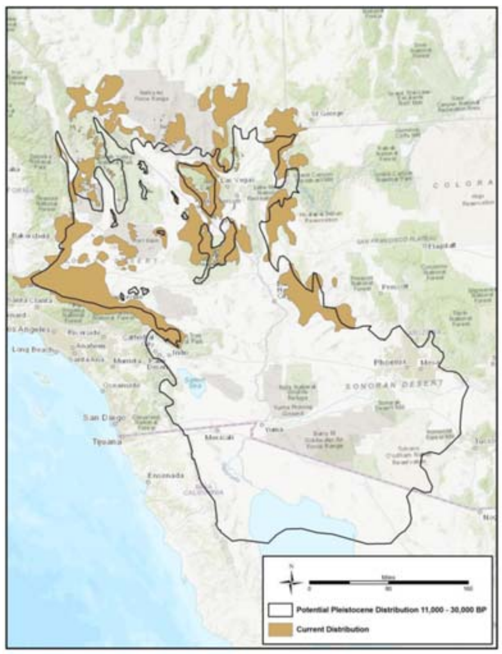

Figure 7: Current and Pleistocene range of the Joshua tree. Source: USFWS (2018), based on Cole et al. (2011).

The Joshua tree's historical range contracted northward along the southern edge of its range as climates warmed at the start of the Holocene. As noted by Cole et al. (2011), this contraction was not matched by northward expansion:

> Although the rapidly warming climate of the early Holocene would seem to have opened up vast new areas of potential range to the north, the fossil record does not record any significant northward expansion over the last 11,700 years.

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[8] Because the split of Joshua trees into two species has only recently been recognized, much of the literature describing their past and present range does not explicitly distinguish between the two. The current range of *Y. brevifolia* is readily discernable from that of *Y. jaegeriana* and is described *infra*. However, while the historic range of Joshua trees is broadly known from subfossil records, the portion of that range that is ascribable to each species has yet to be determined.

Cole et al. (2011) ascribed the lack of northward expansion to the Joshua tree's extremely limited dispersal ability, potentially a result of the extinction of the Shasta ground sloth which may have been a primary seed disperser for the species.

Since the end of the Pleistocene, the Joshua tree's distribution has been remarkably stable throughout the Holocene into the present day (Cole et al. 2011; Holmgren et al. 2010).

There are currently five regional populations of Joshua trees distributed across the Mojave, southern Great Basin, and western Sonoran Deserts, with the vast majority of trees occurring within the Mojave.[9] Of the five populations, two are of *Y. brevifolia* and three of *Y. jaegeriana*, with a sixth small hybrid population in Tikaboo Valley, Nevada. One of the *Y. brevifolia* populations is entirely in California (YUBR South in Figure 8), while the other is shared with Nevada (YUBR North in Figure 8). Only one of the three *Y. jaegeriana* populations occurs in California (primarily in the Mojave National Preserve), and this population is shared with Nevada and Arizona (YUJA Central in Figure 8) (USFWS 2018).

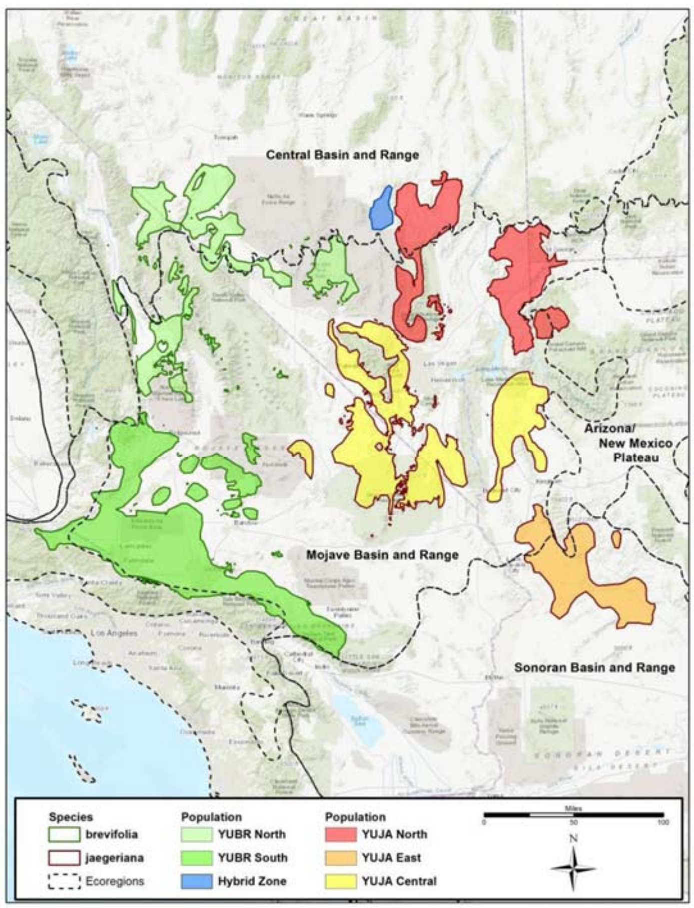

Figure 8. Current Joshua tree distribution. Source: USFWS 2018.

[9] While numerous published studies have characterized the range of Joshua trees, USFWS (2018) is the most complete synthesis of range data; consequently, petitioners cite primary to that document in this section.

Y. brevifolia occurs almost exclusively in the Mojave Desert in unevenly distributed populations. A small portion of its northern extent occurs within the Great Basin Desert (Figure 8). The primary distinguishing feature of these two desert regions is the presence of creosote bush in the Mojave Desert and Sagebrush steppe in the Great Basin. The southern extent of *Y. brevifolia's* range is in the Little San Bernardino Mountains of Joshua Tree National Park. The northern extent of its range is near Alkali, Nevada. The western extent is near the Hungry Valley State Vehicular Recreation Area near Gorman, California. The eastern extent of its range is in Tikaboo Valley, Nevada, where it co-occurs with *Y. jaegeriana* (USFWS 2018).

USFWS (2018), treats *Y. brevifolia* as comprised of two geographically separate populations, (YUBR) South and YUBR North.[10] YUBR South is entirely within California. This population occurs within the area stretching from Joshua Tree National Park, north to Ridgecrest and Red Mountain. This area is comprised of alluvial plains, fans, and bajadas of the major valleys lying between scattered mountain ranges. On the southern and western edge of the population boundary, *Y. brevifolia* occurs in transitional areas characterized by higher elevations and more rainfall with semi-desert montane chaparral to pinyon-California juniper woodlands. There is some variation in vegetation from north to south, but the basins typically are dominated by creosote bush (*Larrea tridentate*) and white bursage (*Ambrosia dumosa*) and the higher elevations are characterized by junipers and pinyons (USFWS 2018).

In the YUBR South range, average annual rainfall varies between 82.4 mm and 738.1 mm and minimum temperatures range from -5.7°C at the upper elevational limit (2200 meters) to 4.8°C at the lower elevational limit (750 meters). Mean summer high temperature are between 23.4–37.2°C. Less than 10 percent of annual precipitation occurs in summer in most areas occupied by *Yucca brevifolia* (USFWS 2018).

The geographic area in which YUBR South is situated is comprised of 3.7 million acres, with just over 50% in private ownership, 48% federally owned, and just under 2% state, county and local owned (USFWS 2018). USFWS (2018) estimates that 3,255,088 acres of this area was suitable for Joshua trees based on soils and other habitat factors.[11] However, Joshua tree do not occupy the entirety of this area, as they can have a patchy and disjunct distribution. Notably, the Bureau of Land Management's (BLM's) calculation of Joshua tree woodland on lands under its jurisdiction is substantially less than this larger area estimated by USFWS (2018). USFWS (2018) mapped 841,220 acres within the area of YUBR South as on BLM lands. BLM (2006) itself calculated that only 3275 acres of "Joshua tree woodland" occur on its lands in the West Mojave Plan (WEMO) area, which includes all of YUBR South. While this extreme difference between the two estimates is partly attributable to Joshua trees occurring in other plant community types that occupy much larger areas (e.g. "blackbrush scrub" and "creosote bush scrub"), it does highlight that areas of dense concentrations of Joshua trees occupy a relatively small fraction of the larger mapped areas.

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[10] As discussed *infra*, each of these populations may constitute an evolutionarily significant unit (ESU).

[11] A peer reviewer of USFWS (2018) pointed out that "the potential distribution of Joshua tree under current climate conditions is vastly overestimated" (Smith 2018). This is discussed in greater detail in the section of the federal ESA listing decision, *infra*.

Additionally, the cities of Palmdale, Lancaster, Hesperia, Victorville, and Yucca Valley, as well as numerous smaller communities are within the mapped YUBR South area. While *Y. brevifolia* currently persists in the less-developed areas of these communities, it is absent from the more developed areas as well as the agricultural lands in the region. The Antelope Valley, where the largest of these cities are situated, is the area where the greatest habitat loss of *Y. brevifolia* has already occurred.

The YUBR North population occurs in the area north of Inyokern, along the west and north margins of Death Valley, to Goldfield, Nevada, and east to the Nevada Test Site. In contrast to the mostly creosote bush shrubland of the lower elevations in YUBR South, the vegetation of this higher and cooler zone includes single-leaf pinyon, juniper, and sagebrush. The elevation range of the species in this population is between 1500 and 2200 meters. Average annual rainfall varies between 95.8 mm and 429 mm, minimum temperatures range from -8.1 to 3.6°C, mean summer temperatures range between 20.4 and 36.3°C, and summer precipitation comprises up to a quarter of the mean annual precipitation (USFWS 2018).

In contrast to the area of YUBR South, which is majority private land, the area of YUBR North is overwhelmingly (96%) federal land (USFWS 2018). The approximately 2 million acres comprising the YUBR North area is about evenly split between California and Nevada. USFWS (2018) estimates that almost all of this area (1,941,701 acres) is suitable for Joshua trees.

4 Abundance and Population Trends

Due to the species' patchy distribution within its range, highly variable population density (4 to 840 trees per acre) and lack of range-wide population surveys, a reliable estimate of Joshua tree population size is not available (USFWS 2018). Similarly, no range-wide population trends have been documented. However, recent studies carried out in portions of the species' range indicate that density is negatively correlated with increasing temperature, the species range is contracting at lower elevations, recruitment is limited, and mortality is increasing, all of which would likely reflect a population already starting to decline.

DeFalco et al. (2010), in a study in Joshua Tree National Park, found that recent drought and fire had resulted in significant mortality of *Y. brevifolia* in the park. Five years after a fire, 80% of burned trees in the study area had died, with smaller trees (<1 m tall) dying more rapidly. But perhaps more surprising, DeFalco et al. (2010) found that unburned trees also had high mortality rates during the same study period (1999-2004), with 26% of unburned trees also dying. As with post-fire mortality, smaller trees died in the initial years of the drought with mid-size and larger trees showing effects in later years. Mortality was ascribed both to water stress itself, as well as herbivory by pocket gophers (*Thomomys bottae*), which likely turned to Joshua tree stems, roots and periderm as alternative food sources due to reduced herbaceous cover during the drought (DeFalco et al. 2010).

In a recent study, Harrower and Gilbert (2018) investigated various life-history parameters of Joshua trees in Joshua Tree National Park and found the "ratio of dead to living trees was greater at the lower elevations where the sites are warmer and drier than sites at higher elevation." Their results "suggest that the range of Joshua trees is contracting at the lower elevations where there was no seedling recruitment and high tree mortality." Harrower and Gilbert (2018) also note that Joshua trees "do not seem to be moving successfully into higher elevations," potentially due to limitations on numbers of pollinating moths at these higher elevations. This finding is consistent with that of St. Clair and Hoines (2018) who found Joshua tree stand density negatively correlated with increasing temperature.

A series of small-scale studies in Joshua Tree National Park summarized in Cornett (2014) documented a 93% decline in Joshua tree abundance between 1990 and 2013 at one site, a 16% decline in Joshua tree numbers between 1988 and 2008 at second site, and a 73% decrease from 1990 through 2013 at a third site. Fire contributed to the decline at the third site, but even that site had declined by 18% prior to the fire. Cornett (2014) noted that declines at these three sites, which "represent a broad geographical sampling" of Joshua trees in the Park, and along with the documented mortality of some of the largest (and presumably oldest) trees in Park, "would seem to indicate *Yucca brevifolia* numbers are declining throughout the Park."

Regardless of whether Joshua tree abundance is already declining, it is virtually certain that abundance will decline in the foreseeable future. The impacts of climate change, fire, habitat loss and other sources of mortality are discussed further below.

5 Factors Affecting Ability to Survive and Reproduce

As discussed in the Life History sections *supra*, Joshua tree survival and reproductive success is tied to multiple factors, many of which are influenced by climate. Importantly, survival varies greatly by size class, with relatively high survival among adults, but very high mortality rates for seedlings and smaller individuals (DeFalco et al. 2010; Esque et al. 2015). As noted by Esque et al. (2015), because *Y. brevifolia* "is long lived the current distribution of reproductive adults may mask the effects of recent changes in climate on recruitment and survival of seedlings and juveniles, which are more sensitive to the vagaries of desert conditions." Consequently, while some impacts such as reduced recruitment may already be observable, impacts such as adult mortality and consequent population declines and range reductions may have a lag time before their presence is felt on the landscape (Svenning and Sandel 2013).

Among the factors affecting *Y. brevifolia's* ability to survive and reproduce are predation, invasive species, wildfire, drought, climate change and habitat loss due to development. These factors are often related, synergistic, and collectively threaten the continued viability of the species.

5.1 Predation

Predation plays an important role in Joshua tree survival at every life stage. Before a seed even leaves a fruit, *Tegeticula* moth larvae eat a portion of the seeds, with Keeley et al. (1985) observing 7% of seeds in a fruit consumed or damaged (Keeley et al. 1985). Borchert and DeFalco (2016) found much higher levels of larvae predation, with 19.5% damaged in a year of widespread fruiting and 42.8% damaged in a subsequent year of reduced flowering and fruiting. Rodents then cache and ultimately consume the vast majority of seeds, with fewer than 1% of seeds germinating (Vander Wall et al. 2006; Waitman et al. 2012; Borchert and DeFalco 2016). In drought years, virtually all seeds may be consumed by rodents, resulting in no seedlings being produced that year (Waitman et al. 2012).

Cattle have been documented grazing on the inflorescences of small Joshua trees. Lybbert and St. Clair (2017) documented floral herbivory by cows on *Yucca brevifolia* less than 2 m tall consumed 40% of inflorescences on their study plot. However, since the majority of Joshua trees flower above that 2 m threshold, only 6% of inflorescences overall were consumed by cattle. The fact that *Yucca brevifolia* evolved into a taller tree form than other yuccas might be a vestige of a growth-escape strategy to escape herbivory from a now extinct species, such as the Shasta ground sloth (Cole et al. 2011; Lybbert and St. Clair 2017).[12]

Drought years and fire also result in increased herbivory on seedlings and pre-reproductive Joshua trees (DeFalco et al. 2010; Esque et al. 2015), as the reduced availability of herbaceous forage forces small herbivores to use alternative food sources, including *Y. brevifolia* stems and leaves (DeFalco et al. 2010; Esque et al. 2015). DeFalco et al. (2010) found widespread evidence of tissue damage to Joshua trees in burned areas (28% of plants) from pocket gophers (*Thomomys bottae*), with lessor levels (16%) evident in unburned areas. Such damage occurred predominantly in lower elevation sites. In most areas Joshua tree survival rates dropped with evidence of rodent damage, with the effects most pronounced in burned areas.

In a separate study, Esque et al. (2015) found that herbivory by black-tailed jackrabbits (*L. californicus*) resulted in 55% mortality of pre-reproductive *Y. brevifolia* <25 cm tall on their study site in a single drought year. In addition to jackrabbits, Esque et al. (2015) documented damage to pre-reproductive plants from pocket gophers, white-tailed antelope squirrels (*Ammospermophilus leucurus*), and woodrats (*Neotoma sp*.).

While predation alone is likely not presently a threat to Joshua tree persistence, it can result in zero reproductive success in one or a sequence of dry years, as well as high mortality levels to seedlings and small plants (<25 cm tall), and even adults. This effect is magnified in areas that burn. Burned trees are likely physiologically more vulnerable to herbivore damage, while the lack of other herbaceous plants deprives young Joshua trees of nurse plants which shield them from herbivory. Moreover, jackrabbits, pocket gophers and other herbivores lack alternative food sources and turn to Joshua tree stems, roots and periderms for sustenance following such events (DeFalco et al. 2010; Esque et al. 2015). As discussed *infra*, both wildfire and droughts are predicted to increase in frequency and intensity in the coming decades, likely rendering the impacts of seed predation and herbivory on stressed and shrinking populations of Joshua trees more significant.

[12] Notably, cattle grazing can have significant impacts on other yuccas, with Lybbert and St. Clair (2017) documenting complete reproductive failure of *Y. baccata* and consequent apparent local extirpation of that species' pollinating moths on their study plot due to high levels of herbivory on the species' flowers by cows. *Y. baccata* is notably shorter than *Y. brevifolia* with its flowers within easy reach of cattle. The Joshua tree's evolutionary adaptation to survive sloth herbivory may have pre-adapted it to better survive cattle grazing.

5.2 Invasive species

Invasive plant species are widely established in the Mojave Desert throughout the range of *Yucca brevifolia*. And while invasive species represent a relatively small percentage of the flora, they represent a huge percentage of the biomass. Brooks and Berry (2006) found that in a high rainfall year (1995) nonnative annual species comprised 6% of the flora and 66% of the annual biomass, with those numbers increasing to 27% and 91% respectively in a low rainfall year (1999). The grasses red brome (*Bromus rubens*) and *Schismus* spp., along with the forb redstem fillaree/stork's bill (*Erodium cicutarium*) comprised 99% of the alien biomass. More recently, Sahara mustard (*Brassica tournefortii*) has spread into the Mojave, including into Joshua tree woodland (Frakes 2017; Brooks et al. 2018).

Figure 9: Carpet of desiccated invasive *Schismus* spp. between *Y. brevifolia*.

The abundance and diversity of alien species in the Mojave is positively correlated with disturbance, including livestock grazing, off-highway/off-road vehicle (OHV or ORV) use, fire, urbanization, roads, and agriculture. As summarized by Brooks and Berry (2006):

> Alien annuals had high density, biomass, or cover near roads, in an area of OHV use compared to an area where OHV use was lower, in an area where both OHV use and grazing were present compared to an area where both disturbances had been excluded for at least 10 years, in two grazed areas compared with ungrazed areas, and in areas near livestock watering sites…. These studies indicate that species richness and biomass of alien annual plants are positively correlated with disturbance (internal citations omitted).

Invasive species are also aided by nitrogen deposition as a result of air pollution (Brooks 2003). As noted by Allen et al. (2009), the "western Mojave Desert is affected by air pollution generated in the Los Angeles air basin that moves inland with the predominant westerly winds.

The pollution contains both oxidized and reduced forms of nitrogen (N), which are of concern because they are deposited on soil and plant surfaces and thus fertilize plants" (internal citations omitted). Fertilization disproportionally benefits nonnative species leading to increased abundance and biomass of invasive species such as *Bromus rubens* and *Schismus* spp. (Brooks 2003; Allen et al. 2009; Allen et al. 2011; Bytnerowicz et al. 2016).

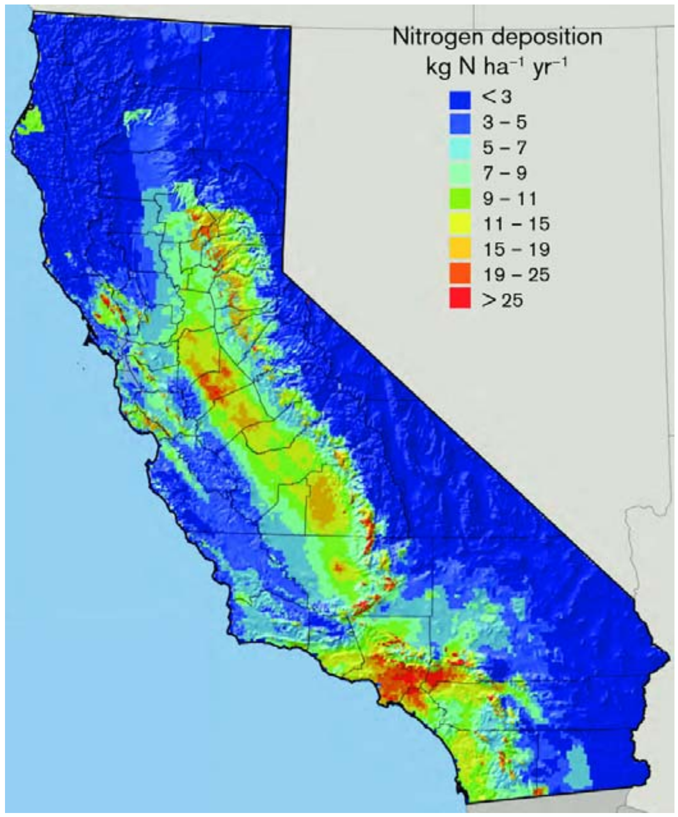

Figure 10: Map showing nitrogen deposition rates in California, with areas of high levels overlapping the range of YUBR South. Source: Bytnerowicz et al. 2016.

While the rapid spread of invasive species in the Mojave is resulting in competitive impacts on native annuals, and has also been demonstrated to have direct competitive impacts on native perennial species including creosote bush (*Larrea tridentata*) (DeFalco et al. 2007), direct competitive impacts of invasives on *Yucca brevifolia* have not been thoroughly studied. To the degree there is competition is would likely be most significant with emergent seedlings under nurse plants as this is the most vulnerable life stage of the Joshua tree (Reynolds et al. 2012).

The much bigger issue is that these invasive plants have altered fire dynamics, leading to larger and more frequent fires that are killing innumerable Joshua trees. As succinctly described by Barrows and Murphy-Mariscal (2012), "[m]ore frequent fires in the Mojave Desert are the result of the interaction of increased nitrogen deposition and the competitive advantage that nitrogen gives to invasive grasses such as red brome, *Bromus rubens*." Similarly, Pardo et al. (2011) highlighted the dire consequences for *Y. brevifolia*: "In Joshua Tree National Park in southern California, N deposition favors the production of sufficient invasive grass biomass to sustain fires that threaten the survival of the namesake species." As discussed below, the altered fire regimes in the Mojave represent a significant threat to the Joshua tree at the individual and population level.

Figure 11: Fire-killed *Y. brevifolia* in a carpet of *Bromus rubens*.

5.3 Wildfires

Wildfire is one of the greatest threats to the persistence of *Yucca brevifolia*, particularly as the species' range contracts in the face of climate change and the frequency and severity of fire in the species' range increases (DeFalco et al. 2010; Holmgren et al. 2010; Vamstad and Rotenberry 2010; Cole et al. 2011; Barrows & Murphy-Mariscal 2012; Sweet et al. 2019).

5.3.1 Joshua tree response to fire

Some early researchers suggested that Joshua trees are well-adapted to fire due to the fact that damaged trees can resprout after fire (Webber 1953). Older adult trees are more fire resistant than younger trees as the apical meristems grow above the level of most ground fires while the flammable dead leaves on the main truck that can facilitate fire spread into the crown are largely shed as the tree matures (Gunter 2006). And even if top-killed or damaged by fire, a Joshua tree can sprout from the root crown, rhizomes, and/or branches. Similarly, previous studies also found that Joshua trees can at least partially repopulate some burned areas via such sprouting (Loik et al. 2000a).

However, several longer-term studies have subsequently demonstrated that Joshua trees have relatively low post-fire survival, are slow to repopulate burned areas, and successful recruitment from resprouting requires sufficient precipitation in the years following fire (DeFalco et al. 2010; Vamstad and Rotenberry 2010; Abella et al. 2009).

As summarized by Brooks et al. (2018), "Yucca species such as Joshua tree and Mojave yucca (*Yucca schidigera*) often survive burning, but Joshua trees typically die within the first few years after fire due to drought and herbivory stress." Moreover, Joshua trees are particularly vulnerable to fires as the "relatively small size and dense packing ratio of dead Joshua tree leaves compared with dead Mojave or banana yucca leaves increase the frequency at which they are completely burned and may explain why Joshua trees are more frequently killed by fire" (Brooks et al. 2018). It can take several decades before a Joshua tree sheds the dead leaves on its trunk, leaving the adult tree more fire resistant.

DeFalco et al. (2010) carried out a detailed study of Joshua tree survival in both burned and unburned areas of Joshua Tree National Park that paints a grim picture for species' future in the face of increasing fire.

> Five years after the Juniper Fire Complex of May 1999, approximately 80% of burned *Y. brevifolia* died compared with 26% in adjacent unburned sites. This high postfire mortality of *Y. brevifolia* is consistent with other studies including 90% mortality six years after a 1978 fire in Lower Covington Flat at Joshua Tree National Park and 64 – 95% mortality at sites censused 1 to 47yr after fires in Mojave and Sonoran deserts of California. Declining survival during the first year is attributed to immediate losses of small *Y. brevifolia* (< 1 m tall) whose active meristems close to the ground are vulnerable to extreme fire temperatures and flames that consume whole plants. As they age and grow taller, *Y. brevifolia* shed leaves from the trunk and are less likely to burn, unlike younger plants whose aging leaves are still attached and provide ladder fuel. Thus, taller plants likely sustained less proportional burn injury to the outer periderm tissue during the fire, and steep declines in this size class occurred only after the consecutive dry periods that began in the autumn months during 1999 and 2000 (internal citations omitted).[13]

Post-fire mortality in this study was likely the result of the interplay of drought and herbivory with fire. During the dry years subsequent to the fire, herbaceous plants were scarce, and pocket gophers (*Thomomys bottae*) gnawed the periderm and hollowed stems of *Y. brevifolia* causing many of them to topple. Pocket gopher damage reduced plant survivorship at low-elevation, unburned sites and diminished survival of burned plants in all but the driest site, which already had low survival (DeFalco et al. 2010).

> The loss of *Y. brevifolia* was not only amplified by the lack of precipitation following the wildfire but also by herbivores that damaged burned plants. Herbaceous annual plants were scarce during the growing season following the 1999 fire, and many perennials were dormant due to low autumn through spring precipitation that triggers germination and breaks leaf dormancy. Widespread incidence of tissue damage by *T. bottae* in burned areas implies that the roots and periderm of *Y. brevifolia* that did not die immediately in the fire offered an

[13] Noteworthy in the DeFalco et al. (2010) study is the fact that mortality of even unburned trees was high (26%) over the five years of their study. This was ascribed to a combination of drought stress and herbivory by pocket gophers. As discussed *infra*, such prolonged droughts are likely to be more frequent in a changing climate.

alternative succulent food source in denuded areas where shrubs and grasses were incinerated (DeFalco et al. 2010) (internal citations omitted).

DeFalco et al. (2010) observed that 33% of censused Joshua trees in burned areas sprouted from the root crown or stem after the fire. These are in line with other studies that found 25% of Joshua trees sprouting from the root crown after a 1978 fire (but with only 10% surviving five years later) and 28% sprouting from the root crown (and 2% from the stem) one year after a 1995 fire (Loik et al. 2000a).

Postfire sprouting prolonged Joshua tree survival in the DeFalco et al. (2010) study, but only at the wetter, high-elevation sites. As noted by DeFalco et al. (2010), "sprouting can provide some advantage to survival only when precipitation is sufficient (e.g., at higher-elevation sites or during wet years). Thus, sprouting of *Y. brevifolia* in the Mojave Desert presents an uncertain recovery strategy in postfire landscapes, especially in the face of herbivory and recurring low-precipitation years."

One area where Joshua trees may be more adapted to fire is along the far western edge of their range. As observed by Brooks et al. (2018),

> Joshua tree populations along the extreme western edge of the desert bioregion near the Sierra Nevada and Transverse Ranges often resprout and survive more readily after fire than those further east. A cycle of relatively frequent fire and resprouting can result in short, dense clusters of Joshua tree clones, such as those found near Walker Pass, in the western end of the Antelope Valley, and in pinyon-juniper woodlands at ecotones with the Transverse Ranges such as Cajon Pass. High resprouting rates of Joshua trees in these areas may have evolved in local ecotypes that became adapted to shorter fire return intervals along the western desert ecotones than in other parts of the desert bioregion.[14]

Recruitment of new Joshua trees into burned areas is infrequent and slow. In one study no seedlings or saplings were observed in burned areas less than 10 years old, and fewer than 10 individuals per hectare were present on burned areas more than 40 years old in Joshua Tree National Park (Brooks et al. 2018). Another study found that Joshua trees were still rare on a site 65 years after a fire (Vamstad and Rotenberry 2010).

Among the factors inhibiting Joshua tree recolonization of burned sites are the lack of seeds due to mortality of seed-producing adults and the loss of suitable establishment sites due to the burning of nurse plants (DeFalco et al. 2010; Reynolds et al. 2012). Nurse plants in arid environments are known to moderate insolation, soil moisture, temperature, and humidity

[14] Notably, the distinguishable clonal form of Joshua trees in these areas was once recognized as its own subspecies or variety, *Y.b. herbertii*, which is now considered a synonym of *Y. brevifolia* (Wallace 2017). Regardless of taxonomy, Joshua trees in these areas warrant special monitoring and protection as they may hold adaptations that make them particularly resilient in the face of increasing fires and climate change.

beneath their canopies and improve conditions for seedling establishment (Reynolds et al. 2012). Nurse plants also shield seedlings from herbivory (Esque et al. 2015).

Blackbrush (*Coleogyne ramosissima*) is one of the most important nurse plants for Joshua tree seedlings (Brittingham and Walker 2000) but is also one of the most vulnerable shrubs to fire (Brooks et al. 2018). Blackbrush are highly flammable, and once ignited tend to completely combust and are killed. Blackbrush stands can take centuries to recover, with the fastest documented recovery being on the order of 50 to 75 years (Brooks et al. 2018). Because of their extreme flammability and slow recovery, the mid-elevation zone dominated by blackbrush and home to Joshua trees is likely the most susceptible area to type conversion via the grass/fire cycle as a result of the arrival of non-native grasses (Brooks et al. 2018).

In the Joshua Tree National Park fire studied by Loik et al. (2000a), blackbrush was eliminated from the burned area with no signs of recovery. Loik et al. (2000a) postulated that "the time required for Joshua trees to begin recruitment via seeds will be delayed until *C. ramosissima* becomes re-established."

As summarized by DeFalco et al. (2010), the "recruitment of *Y. brevifolia* is a slow process even without the impediments introduced by accelerated fire-return intervals." And with such accelerated return intervals it may be impossible: "The return of *Y. brevifolia* to prefire densities and demographic structure may take decades to centuries or be entirely unlikely, especially in light of potential changes to regional desert climate in combination with plant invasions and the potential for recurrence of subsequent fires" (Reynolds et al. 2012).

5.3.2 Increasing wildfire frequency and intensity in the Mojave

Large fires have been historically infrequent in Joshua tree woodlands, and the recent increase in fire size and frequency is partially due to invasion of exotic grasses, principally *Bromus* spp. and *Schismus* spp. (Brooks and Matchett, 2006; Vamstad and Rotenberry 2010; Klinger and Brooks 2017; Syphard et al. 2017; Brooks et al. 2018; Maloney et al. 2019).

Winters with relatively high amounts of precipitation produce an increase in biomass of native and especially non-native annual plants sufficient to carry fire in invaded habitats. The most dramatic changes have occurred in middle elevation shrublands dominated by creosote bush, blackbrush and Joshua trees. This zone is more susceptible than other areas of the Mojave Desert to increased fire size following years of high rainfall (Brooks and Matchett 2006).

The increase in fine, flashy fuel biomass from exotic plant species has increased the fire potential of these habitats sufficiently to allow for more frequent large fires than were carried by native vegetation alone (Brooks and Matchett 2006; Vamstad and Rotenberry 2010). The exotic grasses are of particular concern as they can form a continuous fuelbed for fire well into the hot, dry summer months and tend to not disarticulate as quickly as the native annual plants. While annuals, desiccated upright *Bromus* stems can be found on the landscape upwards of three years after senescence (Jurand and Abella 2013) and *Schismus* remnants can persist as fuel on the landscape for over a year (Brooks et al. 2018). Increased cover of invasive annual grass increases both the chance of a fire igniting and facilitates fire spread. This can both decrease the time interval between the previous and subsequent fire as well as the extent of burning (Klinger and Brooks 2017).

Several recent reviews have documented fire frequency and extent in the Mojave over the past century (Tagestad et al. 2016; Syphard et al. 2017; Brooks et al. 2018). Each of these studies recognized that precipitation was a primary driver of fire frequency and extent, with wetter periods fostering the growth of invasive grasses which carry fire, and drier periods leading to fewer and smaller fires. Tagestad el al. (2016) summarized both short and long-term impacts of precipitation variation.

> Long-term drought or above-average precipitation periods can have landscape-scale effects on the health and distribution of perennial plant species and the frequency and size of fires. Short-term increases in winter and summer precipitation can have an even greater effect on the likelihood of fire. High winter precipitation creates ephemeral flushes of herbaceous biomass resulting in continuous fuelbeds that promote the spread of fire. High summer precipitation brings thunderstorms with accompanying lightning and high winds which contribute to the ignition and spread of fires. Cumulative years of higher than normal precipitation also appear to have an effect on the potential for fire. This is especially a concern in areas invaded by annual grasses which exhibit a profound response to increased cool-season precipitation (internal citations omitted).

Particularly worrisome is that a sequence of wet years can lead to enormous fires, such as happened throughout the Mojave, including in the range of *Y. brevifolia* in 2005:

> The 2005 Mojave Desert fire season, which burned an area equal to 132% of the total area that burned during the previous 25 years, was preceded by three extremely high precipitation years, suggesting that multiple years of high precipitation can have a cumulative effect on the accumulation of fuels (Tagestad el al. 2016).

According to Brooks et al. (2018), accounts by agency fire mangers of the 2005 fires "indicate that these fires exhibited extreme fire behavior not previously observed in the Mojave Desert," and they attributed this largely to continuous cover of taller than average red brome in the burn areas.

One consistent finding of recent California Desert fire studies is that fires are not evenly distributed by ecological zone or area, but that mid-elevation areas (the zone predominately occupied by Joshua trees) are particularly susceptible. Brooks et al. (2018) found, based upon fire data from 1972 to 2007, that "although fire occurrence across large parts of the warm deserts may be relatively low, they can be much higher and pose significant land management challenges in localized areas. The majority of fire area in the Mojave section of California occurred in the middle-elevation zone." Brooks et al. (2018) also noted that in "the middle elevations of the Mojave Desert there was also evidence of a significant increase in annual fire area."

Tagestad et al. (2016) similarly observed that between "1976 and 2010 there were 227 fires in the Mojave Desert greater than 405 ha (1000 acres). These fires burned a total of 758,477 ha (1,874,230 acres) with most of the burned area occurring in the middle elevation zones receiving sufficient precipitation for growth of fuels." Notably, blackbrush, a critical nurse plant for Joshua tree seedlings, experienced exceptional rates of burning, as "areas identified as historical blackbrush communities have experienced more multiple fires than all the other communities combined."

Brooks et al. (2018) also found that fires in the California Desert "are clustered in regional hot spots where they are more frequent and burn more proportional area than desert-wide averages. These areas all occur in the Mojave ecological section, with one hot spot at the ecotone with the Colorado section in the vicinity of Joshua Tree National Park." A recent mapping effort by Syphard et al. (2017) clearly shows that a disproportionate number of fires, including large fires, occur in the western Mojave range of *Y. brevifolia* (Figure 12).

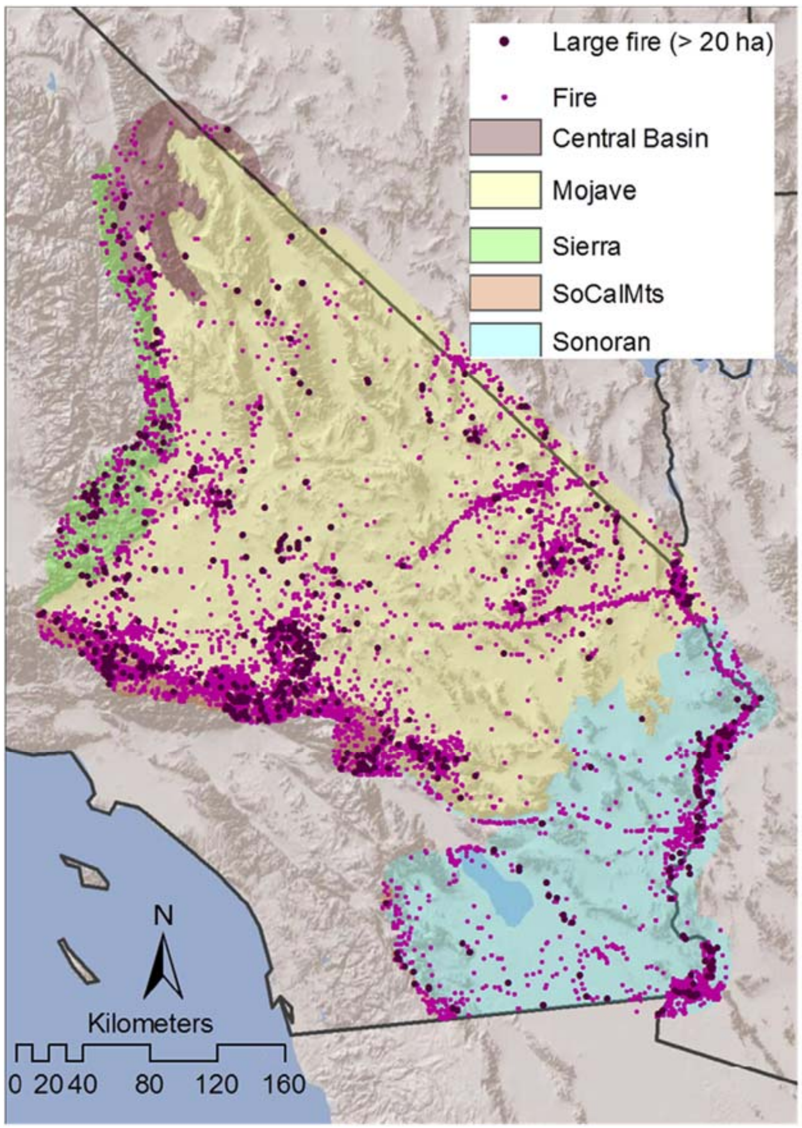

Figure 12. Fire occurrence between 1990-2010 in California Desert. Source: Syphard et al. (2019).

Fires in the Mojave are started by a mix of accidental and intentional human activities as well as lightening. Lightning frequency is higher in the desert than in any other California bioregion and is a significant source of fire (Brooks et al. 2018). Various studies have looked at the relationship of human caused versus lightening fires. One study found that the significant increase in fire frequency in the Mojave from 1980 to 1995 was associated with increased numbers of fires caused by humans, with the number of lightning-caused fires remaining constant. Although most human fires were small and started along roadsides, the less frequent large fires typically occurred in remote areas far from major roads and were started by lightning (Brooks et al. 2018). The influence of roads on fire ignitions is such that the outlines of Interstate Highways 5 and 40 can be discerned by the fire patterns reflected in the map in Figure 12.

Hopkins (2018), using data from Short (2017), tallied approximately 10,000 fires in the California desert from 1992 to 2015, and found that lighting accounted for only 10% of the fires, but 40% of the fires that burned more than 500 acres. Of the 90% that were human caused, equipment use was responsible for 22%, arson 8%, children 6%, smoking 5%, debris burning 5%, campfires 4%, and most of the remainder to unspecified miscellaneous causes.

A recent comprehensive analysis of fire records in the California Desert found that in "the Mojave, powerlines and other types of energy infrastructure (oil and gas wells, wind turbines, and power plants) were the most important anthropogenic land use contributors to large fires" (Syphard et al. 2017). The relationship between development and fire is also significant, with Syphard et al. (2019) warning that "[w]ith more fires occurring in close proximity to human infrastructure, there may also be devastating ecological impacts if development continues to grow farther into wildland vegetation."

Fire fueled by invasive grasses is already significantly affecting Joshua tree woodlands. As Holmgren et al. (2010) summarized regarding conditions in Joshua Tree National Park (JTNP),

> With each subsequent fire the native plants vanish but these invasive grasses thicken and expand, fuelling ever larger and more frequent wildfires, inducing what has been called the 'grass–fire cycle'. Prior to 1965, fire records at the park suggest that most lightning-caused fires, which happened in May through September, seldom spread more than a few tens of metres from the strike… [*B. rubens*] spread dramatically and began fuelling large fires in both the Mojave and Sonoran Deserts. At JTNP, fires measuring in the thousands of acres burned in 1979, 1995, 1999 and 2006. The increase in fire size and frequency could transform JTNP vegetation in a matter of decades.

The specific impacts of more frequent and intense fire on Joshua trees themselves are also significant. Esque et al. (2015) described these impacts:

> Recent increases in fire frequency caused by invasive species throughout the range of *Y. brevifolia* have also affected all life stages of the species, and survival from intense fires is low even among large individuals. The impact of fire on seedling and juvenile survival is particularly exacerbated because fires tend to track the same

heavy precipitation years that are most suitable for *Y. brevifolia* seedling emergence (internal citations omitted).

Perhaps most importantly, areas identified as potential late-century climate refugia for *Y. brevifolia* are particularly vulnerable to fire, with over a third of the area identified as refugia by Barrows and Murphy-Mariscal (2012) burned between 1967 and 2012, and half the refugia identified under a moderate warming scenario by Sweet et al. (2019) burned as of 2018 (Figure 13).

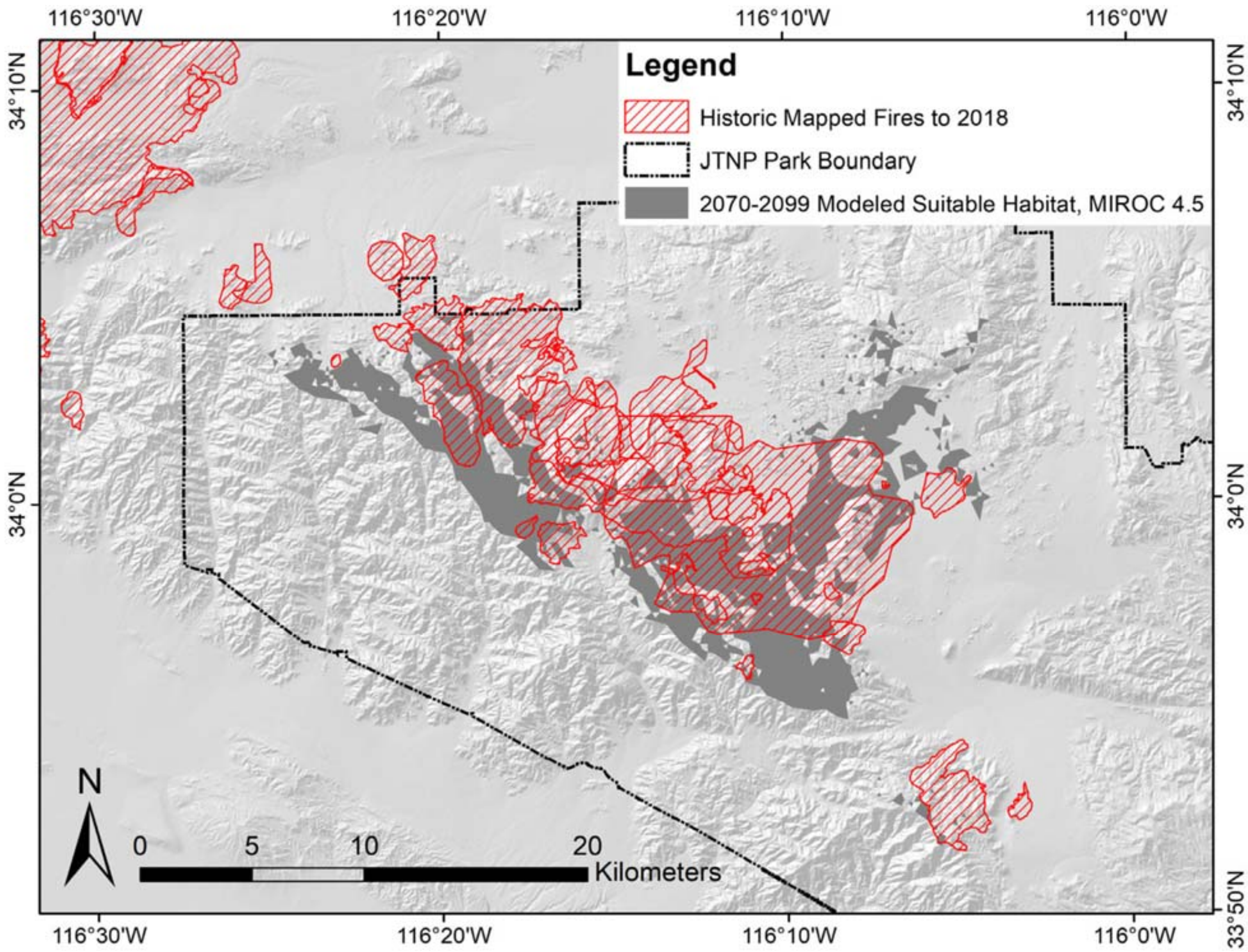

Figure 13. Historic fires in JTNP through 2018 in relation to modeled Joshua tree suitable habitat under a moderate warming scenario. Source: Sweet et al. (2019).

In sum, Joshua tree woodlands are generally not adapted to fire, and recover slowly, if at all (Abella et al. 2009; DeFalco et al. 2010; Vamstad and Rotenberry 2010; Brooks et al. 2018). Moreover, as noted by DeFalco et al. (2010), "the slower decline in survival for burned *Y. brevifolia* at the more mesic, high-elevation sites underscores the importance of postfire climate conditions on defining the demographic structure of recovering *Y. brevifolia* populations." As discussed *infra*, a rapidly changing climate with greater heat stress and more intense droughts will make postfire recovery increasing unlikely; and as fire increases in frequency and/or intensity, it will threaten the continued viability of ever-shrinking populations of *Y. brevifolia*.

5.4 Climate Change

Climate change represents the single greatest threat to the continued existence of *Yucca brevifoia*. Even under the most optimistic climate scenarios, western Joshua trees will be eliminated from significant portions of their range by the end of the century; under warming scenarios consistent with current domestic and global emissions trajectories, the species will likely be close to being functionally extinct in the wild in California by century's end (Dole et al. 2003; Cole et al. 2011; Sweet et al. 2019).

5.4.1 Current and projected climate change in the range of *Y. brevifolia*

A strong, international scientific consensus has established that human-caused climate change is causing widespread harms to human society and natural systems, and climate change threats are becoming increasingly dangerous. In a 2018 *Special Report on Global Warming of 1.5°C* from the Intergovernmental Panel on Climate Change (IPCC), the leading international scientific body for the assessment of climate change, describes the devastating harms that would occur at 2°C warming above pre-industrial levels, highlighting the necessity of limiting warming to 1.5°C to avoid catastrophic impacts to people and life on Earth (IPCC 2018). Average global temperature has already risen approximately 1°C (IPCC 2018).

In addition to warming, many other aspects of global climate are changing. Thousands of studies conducted by researchers around the world have documented changes in surface, atmospheric, and oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor (USGCRP 2017).

Climate change is increasing stress on species and ecosystems, causing changes in distribution, phenology, physiology, vital rates, genetics, ecosystem structure and processes, and increasing species extinction risk (Warren et al. 2011). A 2016 analysis found that climate-related local extinctions are already widespread and have occurred in hundreds of species, including almost half of the 976 species surveyed (Wiens 2016). A 2016 meta-analysis reported that climate change is already impacting 82% of key ecological processes that form the foundation of healthy ecosystems and on which humans depend for basic needs (Scheffers et al. 2016). The Mojave Desert in which the Joshua tree resides has already experienced many of these impacts, with, for example, bird occupancy and site-level species richness declining by about 50% over the past century (Iknayan and Beissinger 2018), and this decline linked to water stress related to increased cooling needs (Riddell et al. 2019).

Deserts have warmed and dried more rapidly over the last 50 years than other ecoregions, both globally and in the contiguous United States (USGCRP 2017). According to California's Fourth Climate Change Assessment: Inland Deserts Summary Report (Hopkins 2018), the California Desert has already experienced significant warming. Over the second half of the 20th century, daily maximum temperatures warmed by 0.4-0.7ºF [0.22-0.39ºC], comparing 1976-2005 with 1961-1990, and daily minimum temperatures warmed by 0.3-0.6 ºF [0.17-0.33ºC] over the same period.

Other studies have documented even greater warming in the range of the Joshua tree. The Washington Post, using NASA and NOAA county-level temperature datasets from 1895 to 2018, demonstrated that many areas of the United States have already had temperature increases well above the global average (Mufson et al. 2019).[15] The four California counties in which *Y. brevifolia* occurs — San Bernardino, Los Angeles, Kern and Inyo — have already experienced average annual temperature increases of 1.9, 2.3, 1.7 and 2.3ºC respectively.

Hopkins (2018) projects that daily maximum temperatures will increase by 5-6ºF [2.8-3.3ºC] for 2006-2039, by 6-10ºF [3.3-5.6ºC] for 2040-2069, and 8-14ºF [4.4-7.8ºC] for 2070-2100 on average for the region, with ranges depending on future greenhouse gas emissions (RCP 4.5 and RCP 8.5 scenarios). By the end of the century, the hottest day of the year is projected to rise by at least 6ºF [3.3ºC], and up to 9ºF [5ºC] on average. Extremely hot days, defined as temperatures >95ºF [35ºC], averaged 90 per year in the Mojave during the 1981-2000 period, and will increase to up to 141 days by the end of the century under RCP 8.5.

While temperature projections for the Mojave are unidirectional (it will be a lot hotter), precipitation projections are more complicated and divergent. For the suite of downscaled climate models used by Hopkins (2018), there is little projected change in average rainfall each year to the end of the century (<10%), even under different emissions scenarios. However, these projections show an increase in interannual variability, with reductions in minimum annual precipitation of up to 50% and increases in maximum annual precipitation of 40-65% by the end of the century, as well as an increase of winter precipitation (falling mainly in December, January, and February).

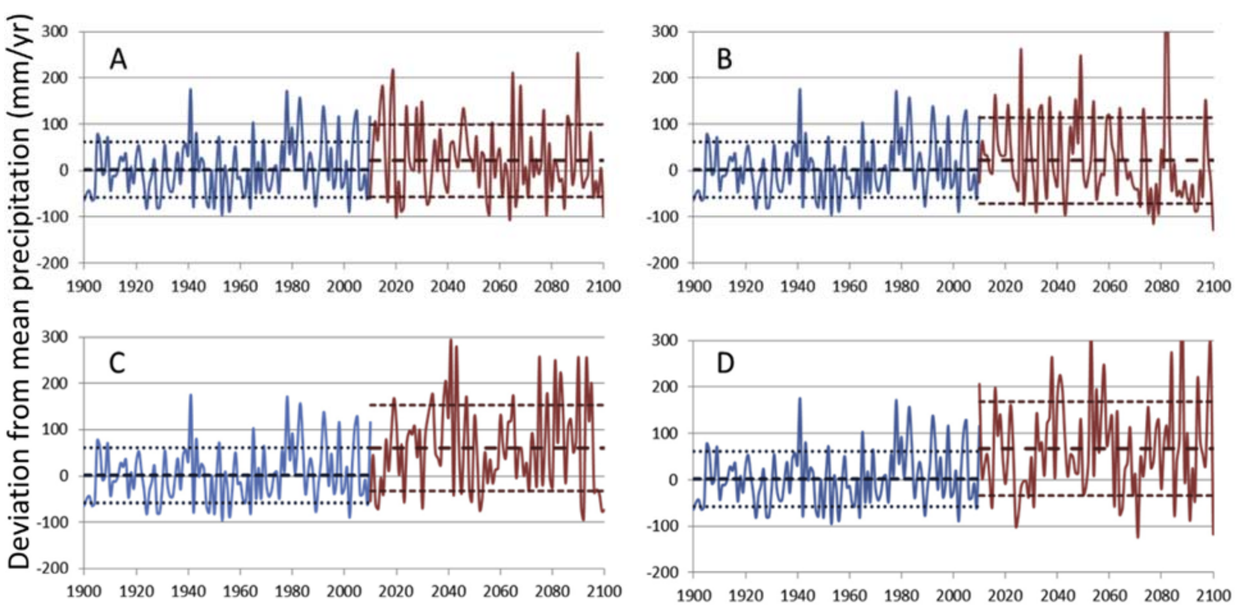

Figure 14: Plot of future modeled and historic precipitation in the Mojave Desert from global climate model/scenarios: A) GFDL/B1, B) GFDL/A2, C) IPSL/B1 and D) IPSL/A2. Source: Tagestad et al. (2016).

[15] Available at https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-america/

Tagestad et al. (2016) came to similar conclusions, noting that "recent analysis of regional climate models over southwest North America indicate increased winter precipitation in the future within the Mojave ecoregion." Tagestad et al. (2016), using climate models that best matched historic annual and seasonal precipitation records in the Mojave (GFDL_CM2.1 and IPSL_CM4), found that average annual precipitation is predicted to be higher than the historical average, although with greater annual and decadal variation, that there would be numerous, extended periods of high precipitation (Figure 14), and due to the invasive grass fueled link between winter precipitation and fire, concluded that "fire will be more prevalent in the Mojave Desert for many periods during the next century."

In sum, average annual temperatures in the range of *Y. brevifolia* have already increased well over 1.5°C (Mufson et al. 2019), and daily maximum temperatures over the remainder of the 21st century under current emissions trajectories will increase by over 7ºC (Hopkins 2018). Precipitation will increase in variability, with more extreme and prolonged droughts, while an overall increase in winter precipitation will foster more growth of invasive grasses, leading to more frequent and more intense fire (Hopkins 2018; Tagestad et al. 2016). Given Joshua trees are already suffering from the warming that has occurred to date, these additional changes pose a significant threat to the persistence of *Y. brevifolia* in California.

5.4.2 Climate change impacts on Joshua trees

Researchers have been raising the alarm about threats to the Joshua trees for decades. More than half a century ago, Webber (1953) stated of the species that "[r]egardless of the present wide distribution and large concentration of yuccas, its future appears very dim. This gloomy outlook is mainly due to the plant's failure to reproduce and its destruction by man." In 2000, Loik et al. (2000a) raised the specter of climate change, predicting that "[c]hanges in the local climate due to anthropogenic greenhouse gases may cause warming of the microclimate near the soil surface thereby precluding the future establishment of *Yucca brevifolia*." A year later, Lenz (2001) noted that "Joshua trees in many areas appear physically stressed in all probability due to less than optimum growing conditions," and speculated that "depending upon the intensity and duration of global warming its long-range survival may depend upon the availability of a refugium."

Over the past 20 years, modeling of Joshua tree future distribution in a warming climate has become more sophisticated, has used more accurate and comprehensive distribution data, has produced projections at ever-finer spatial scales and has increasingly used field data to validate model performance. And while model projections of potential range expansion have varied greatly and have not distinguished between *Y. brevifolia* and *Y. jaegeriana*, *every* published modeling effort has predicted range contractions along the western edge of the Joshua tree's range in California, which largely corresponds to the range of *Y. brevifolia* in the state. A review of these studies demonstrates that *Y. brevifolia* will face massive range contractions within the foreseeable future that threaten the continued viability of the species.

Thompson et al. (1998) published the first modeled projection of the future range of Joshua trees under changing climate conditions. Using data on temperatures and precipitation levels where the species is currently found, Thompson et al. (1998) calculated that Joshua tree potential future habitat under doubled CO_2 conditions was almost 8-fold greater than present habitat, extending as far north as Washington state, south into Mexico and east into Texas. The modeling effort predicted retraction of range along its western edge in California. This study, which dealt with 16 different tree species, did not analyze other habitat variables or dispersal ability and used a model that poorly matched the current distribution of the species (e.g. the model predicted presence in the Coast Ranges under then current climate conditions).

Shafer et al. (2001) carried out a similar modeling effort looking at the future range of Joshua trees, finding that "[u]nder each of the future climate scenarios, its simulated potential range is fragmented and displaced northward and eastward." The Shafer et al. (2001) study addressed 15 different species of trees, used three climate variables (mean temperature of the coldest month, growing degree days, and a moisture index) and a 25-km grid scale.[16] Consequently, the results are course, but still roughly consistent with later modeling efforts (e.g. Cole et al. 2011), and most notably show almost complete extirpation of the species from California (Figure 15). The projected potential expanded range extending into northern Nevada and Utah as well as Washington state does not account for how the species might disperse into these new areas of potential habitat.

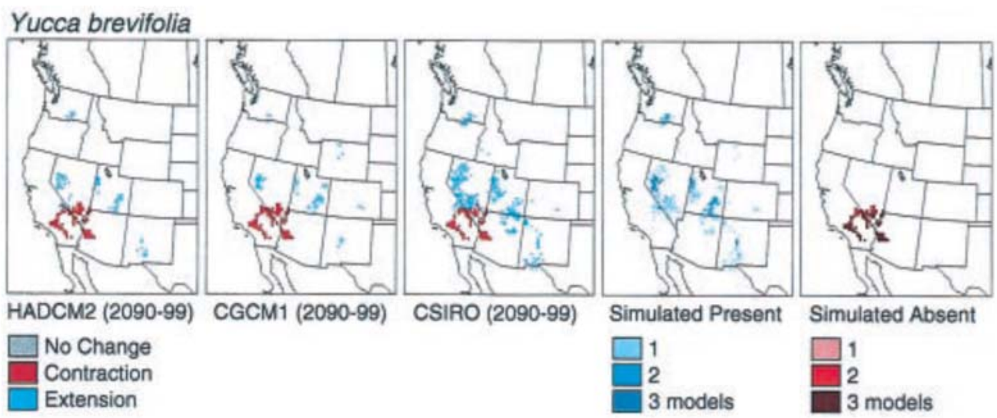

Figure 15: Modeled future range of Joshua Trees. Source: Shafer et al. (2001).

Dole et al. (2003) subsequently modeled future range for Joshua trees in a doubled CO_2 world, finding that "a considerable portion of the current range of *Y. brevifolia* will become climatically unfavorable for this species, but that significant amounts of new habitat may become available." While Dole et al. (2003) did not take dispersal into account in the modeling, they noted that it would be a factor in real-world application, and in "the worst-case scenario, *Y. brevifolia* will migrate too slowly to fill potential new habitat, while much of its current range will become climatically unfavorable."

Dole et al. (2003) also noted a further potential limitation in the model which assumed "the distribution of *Y. brevifolia* is in equilibrium with current climate." Significant subsequent research (e.g. Barrows and Murphy-Mariscal 2012; Harrower and Gilbert 2018; Sweet et al.

[16] The current distribution data used to develop the model in Shafer et al. (2001) is also questionable as the paper states "*Yucca brevifolia* (Joshua tree) is found in the deserts of the southwest US and northwest Mexico." The species has likely been absent from Mexico for thousands of years (Cole et al. 2011).

2019) has confirmed that at least in the southern part of its range, current climate conditions are already deleterious to Joshua tree survival and/or reproduction. Notwithstanding these model limitations, which almost certainly overestimate projected future habitat, modeled habitat loss is roughly congruent with the key results of Shafer et al. (2001) and Cole et al. (2011), with the species disappearing from 76% of its current range. Notably, much of the new area deemed climatically suitable for *Y. brevifolia* in California is developed agricultural land in the San Joaquin Valley and therefore highly unlikely to ever actually be occupied by the species.[17]

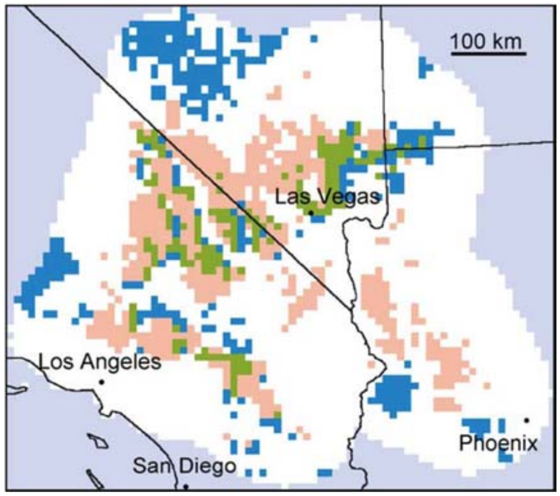

Figure 16: Modeled future range of Joshua Trees. Pink is lost range, green is maintained range and blue is expanded range. Source: Dole et al. (2003).

Cole et al. (2011) built a sophisticated species distribution model with climate and habitat variables derived from a comprehensive dataset of presence/absence data throughout the current range of the Joshua tree. Late Pleistocene and Holocene records were also compiled to generate a map of past distribution of the species. The study differed from previous models in its use of actual specific data points for presence and habitat variables for the species and the testing of the models to simulate the current range of the species.

> Construction of an independent test data set of Joshua tree current presence and absence allowed the evaluation of multiple suitable climate models for Joshua tree. Model concordance was found to increase with the inclusion of measures of monthly temperature variability (maximum and minimum rather than just mean), finer spatial scale (~1 km rather than ~4 km), and applying a 40-year mid-20th-century baseline (1930–1969) climate rather than a 30-year late-20th century baseline (1970–1999).[18]

[17] Dole et al. (2003) also modeled the impact of doubled CO_2 concentrations on the physiology of Joshua trees given there is some evidence that certain plant species are more resistant to freezing in high CO_2 conditions. Such modeling showed a 14% increase in projected new habitat and a slight increase (from 24% to 29%) of current habitat areas that would remain suitable. However, the authors recognized that the impacts of CO_2 induced warming were more significant than the physiological effects of CO_2 itself.

[18] Cole et al. (2011) selected 1930 to 1969 as their climatic baseline period "because evidence suggests that Joshua tree recruitment was greater during this interval than during the latter part of the 20th century. For instance, survey results show minimal to no recent Joshua tree recruitment within the southern Mojave Desert in recent years, and

The methodology of Cole et al. (2011) consequently address many of the shortcomings of climate niche models that have be raised by some (Pearson and Dawson 2003; Fitzpatrick and Hargrove 2009).

All of the individual climate models, as well as an ensemble of 22 global circulation models (GCMs) utilized by Cole et al. (2011), project a severe (~90%) decline in the area of suitable climates for Joshua trees by 2070 to 2099, as the southern parts of its range becomes climatically unsuitable.

Cole et al. (2011) also modeled areas where the species could potentially naturally expand its range in the future, as well as areas that might be suitable for relocation or assisted migration (Figure 17).

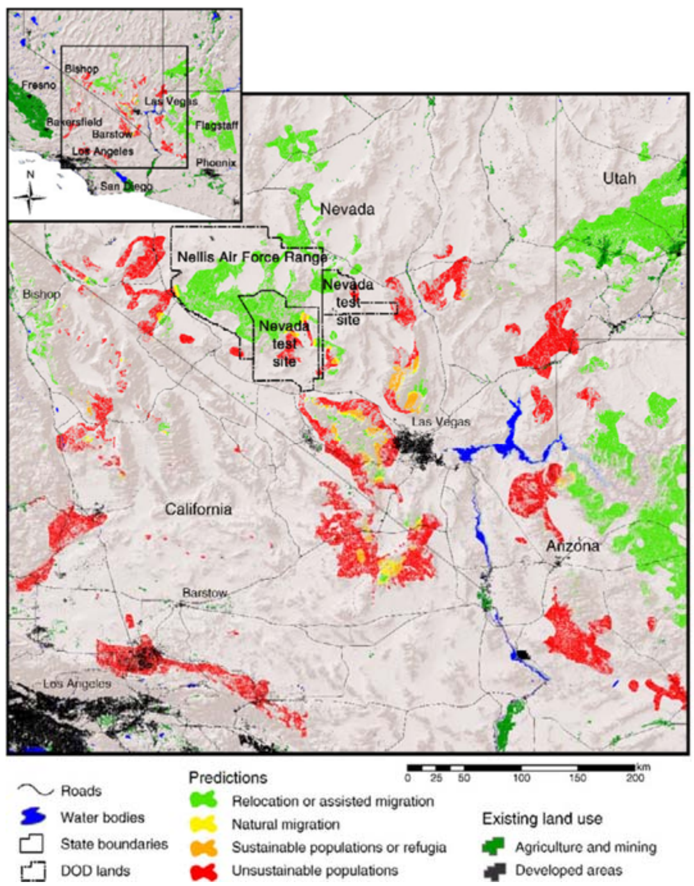

Figure 17. Areas with existing Joshua tree populations where a majority of the models used by Cole et al. (2011) predict future climates unsuitable for survival (red); current populations with future climates favorable for Joshua tree persistence (orange); areas within 2 km of current populations with future favorable climates and suitable substrates where natural migration could possibly occur (yellow); and protected areas with future favorable climates and suitable substrates where assisted migration might be possible (green). Source: Cole et al. (2011)

Joshua trees tall enough to be tallied in recent vegetation plots likely became established during this 1930–1969 interval or before."

In determining potential natural expansion areas, Cole et al. (2011) looked at rates of migration discernable from paleontological data as well as from modern studies of seed dispersal by rodents. Such data reveals minimal actual northward range shift over the Holocene, corresponding to a migration rate of 2 meters a year. Similar migration rates could be calculated based on studies of rodent seed caching activity and Joshua tree generation time. Cole et al. (2011) postulated that their results "suggest that the species migrational capacities have been ineffective following the extinction of Pleistocene megaherbivores that may have acted as seed vectors, especially the Shasta ground sloth." Given a 2-meters a year range expansion would total less than 200 meters by century's end and would be largely invisible in any mapping effort, Cole et al. (2011) used "a generous estimate of potential natural migration of 2 km over the next 60 to 90 years" to designate areas of potential natural migration. This suggests that the colonization of mapped areas of natural migration might in fact also require assisted migration to occur in a meaningful timeframe.

Cole et al. (2011) summed up the relationship between the Joshua tree's past, its present limited present dispersal abilities, and future projections to highlight the severe range contraction in will undergo in the coming decades.

> As climate rapidly warmed at the start of the Holocene, the widely dispersed range of Joshua tree severely contracted from the south, leaving only the populations near what had been its northernmost limit. The Holocene and recent history of Joshua tree suggests that its migrational capacity may be severely limited. Its ability to spread northward into new suitable habitats during the Holocene may have been inhibited by the somewhat earlier extinction of its primary megafaunal dispersers, especially the Shasta ground sloth. Because GCM models project a climate warming of a similar pace and magnitude to that of the early Holocene over the next 60 to 90 years, Joshua tree could undergo a similar decline in its southernmost populations to that of the early Holocene.

Cole et al. (2011) do not predict the complete extirpation of Joshua trees from their current range, noting that the "results predict the survival of some natural Joshua tree populations throughout the next century, but most will be greatly reduced in area." Importantly, because the authors modeled the Joshua tree present and future distribution as a single species, they did not distinguish between *Y. brevifolia* and *Y. jaegeriana*. From their mapping however, it appears that the majority of the areas for which Joshua trees are projected to persist are in the range of *Y. jaegeriana*. *Y. brevifolia* disappears almost entirely from its current range in California (Figure 17).[19]

[19] A subsequent study by Notaro et al. (2012) included Joshua trees among 170 tree and shrub species for which they modeled projected range shifts by the end of the century. They noted that the projected northward shift of the species and decline in its southern range in response to warming was consistent with that described by Cole et al. (2011). However, unlike Cole et al. (2011), they did not consider dispersal ability in projecting range expansion and consequently concluded that the species would experience a "robust range expansion" of 143%. Importantly, their analysis was limited to the "Southwest United States" which did not include California. Consequently, regardless of other limitations of their analysis that may render the results suspect, the results shed no light on the future status of *Y. brevifolia* in California.

While the Cole et al. (2011) study looked at the future of Joshua trees throughout their range, Barrows and Murphy-Mariscal (2012) examined the status and fate of *Y. brevifolia* in Joshua Tree National Park (JTNP). The approach Barrows and Murphy-Mariscal (2012) took was one of niche modeling:

> In lieu of local-scale predictions of how precipitation or temperature will shift, modeling the sensitivity of species to a gradient of climate change scenarios can provide insights as to potential effects of local-scale changes in temperature and precipitation. A useful tool in assessing species sensitivity to changing conditions is niche modeling which includes habitat variables, such as climate and terrain, in an attempt to assess the complex interaction of factors that constrain a species' distribution (internal citations omitted).

To assess the validity of the niche models, Barrows and Murphy-Mariscal (2012) used "citizen scientist" volunteers to collect Joshua tree recruitment data throughout their range in the park to determine whether modeled shifts in suitable habitat coupled with recent temperature increases approximate current demographic response patterns, specifically successful seedling recruitment. The key climate variable used was summer maximum temperature, which was changed incrementally by increasing mean maximum July temperature by 1ºC, 2ºC, and then 3ºC.

Since the niche models were developed based on data of existing adult Joshua trees, the model projects the distribution of suitable habitat for the species when those individuals were recruited into the population, conditions when summer temperatures may have been up to 1ºC cooler than current conditions. Shifting mean maximum summer temperatures upwards by 1ºC, 2ºC, and then 3ºC resulted in modeled reductions in the extent of suitable habitat for Joshua trees of 30-35%, 66-78% and 90-98% respectively, depending upon the precipitation variables used.

The niche model Barrows and Murphy-Mariscal (2012) developed for juvenile Joshua trees (individuals 30 cm or less in height) based on their current distribution, resulted in a total suitable habitat area about half of that for adult trees. The juvenile model was a near match for the boundaries of the +1ºC adult model. The match between the current juvenile model and the +1ºC adult model provides some level of model validation consistent with the hypothesis that early levels of climate change may have already had an impact on Joshua tree recruitment. Put another way, adult Joshua trees in JTNP were recruited into the population under climate conditions where summer maximum temperature was approximately 1ºC cooler than present; warming to date may not be fatal to established adult Joshua trees, but it has apparently already shrunk the area of suitable habitat for recruitment by half.[20]

Barrows and Murphy-Mariscal (2012) contrasted their results to those of Dole et al. (2003)

[20] Barrows and Murphy-Mariscal (2012) noted that "we searched for but did not find any areas of non-fire related mortality of Joshua trees within JTNP." This seems at odds with DeFalco et al. (2010) who reported 26% mortality of unburned Joshua trees following drought in their study area in JTNP. A subsequent study by Harrower and Gilbert (2018) also documented significant non-fire mortality in the park, indicating that the current climate, at least at lower elevations, is already deleterious to adult Joshua trees.

and Cole et al. (2011), both of which indicated that similar expected levels of climate change would result in no suitable habitat for Joshua trees within the central or southern portions of their current distribution. Barrows and Murphy-Mariscal (2012) ascribed the differences as being due to the scales of analyses rather than differences in models or model assumptions, since finer-scale analysis can incorporate local adaptations as well as topographic-climate complexities that may provide refugia.

Barrows and Murphy-Mariscal (2012) declared their analysis "represents a more optimistic scenario than previously published models of climate change impacts on Joshua trees." However, given their +3ºC model found that Joshua tree range in the park could be curtailed by 90 to 98% and noted that red brome fueled wildfires could burn any remaining refugia, it is somewhat difficult to share their optimism. Moreover, Barrows and Murphy-Mariscal (2012) used a +3ºC increase in summer maximum temperature as their "extreme" scenario, while Hopkins (2018) projects that summer maximum temperatures may hit that level before mid-century and may exceed +7ºC by century's end.

The most recent species distribution modeling effort for Joshua trees paints an even more concerning portrait of the species' future. Sweet et al. (2019) sought to identify the existence and extent of potential climate refugia for *Yucca brevifolia* within JTNP. Similar to Barrows and Murphy-Mariscal (2012), this study developed species distribution models (SDMs) validated with field data:

> By combining finer scale topographic and climate datasets, using more refined climate models and a more comprehensive set of Joshua tree location data, our objective was to construct SDMs to forecast this species' response to multiple future climate scenarios. Then, with the aid of volunteer community scientists, we collected Joshua tree demographic data across their range within the park. We aimed to identify the existence and extent of potential Joshua tree climate refugia and validate this prediction using empirical demographic data on Joshua tree recruitment along a gradient that falls within and outside modeled refugia.

Sweet et al. (2019) used the species distribution modeling platform Maxent to develop relationships between Joshua tree presence points and a database of nine environmental variables including minimum and maximum temperature, precipitation, climatic water deficit (CWD), topography, and soil characteristics. They used the end-of-century (2070–2099) CMIP5 MIROC RCP 4.5, 6.0, and 8.5 emissions scenarios, representing CO2 emissions under highly mitigated, moderately mitigated, and unmitigated scenarios, respectively. The results showed loss of the vast majority of *Y. brevifolia* suitable habitat under all scenarios. Under the RCP 4.5 and 6.0 scenarios, 18.6% and 13.9% of current occupied areas remained as refugia. However, under the RCP 8.5 scenario, which is closest to current emissions trajectories, suitable habitat was almost completely eliminated, with only 15 ha, or 0.02% remaining as refugia (Figure 18).

As with those identified by Barrows and Murphy-Mariscal (2012), the refugia identified by Sweet et al. (2019) are in areas of high fire risk, with the authors noting that the "areas mapped as Joshua tree refugia, which are found at higher elevation wetter areas, also tend to have the highest covers of invasive annual grasses." Approximately half of the refugia mapped under the

RCP 4.5 scenario have already experienced fire in recent decades. As discussed *supra*, fire fueled by invasive grasses is a significant source of Joshua tree mortality and creates conditions that delay or preclude recruitment, and therefore has the potential to diminish the effectiveness of any climate refugia for the species.

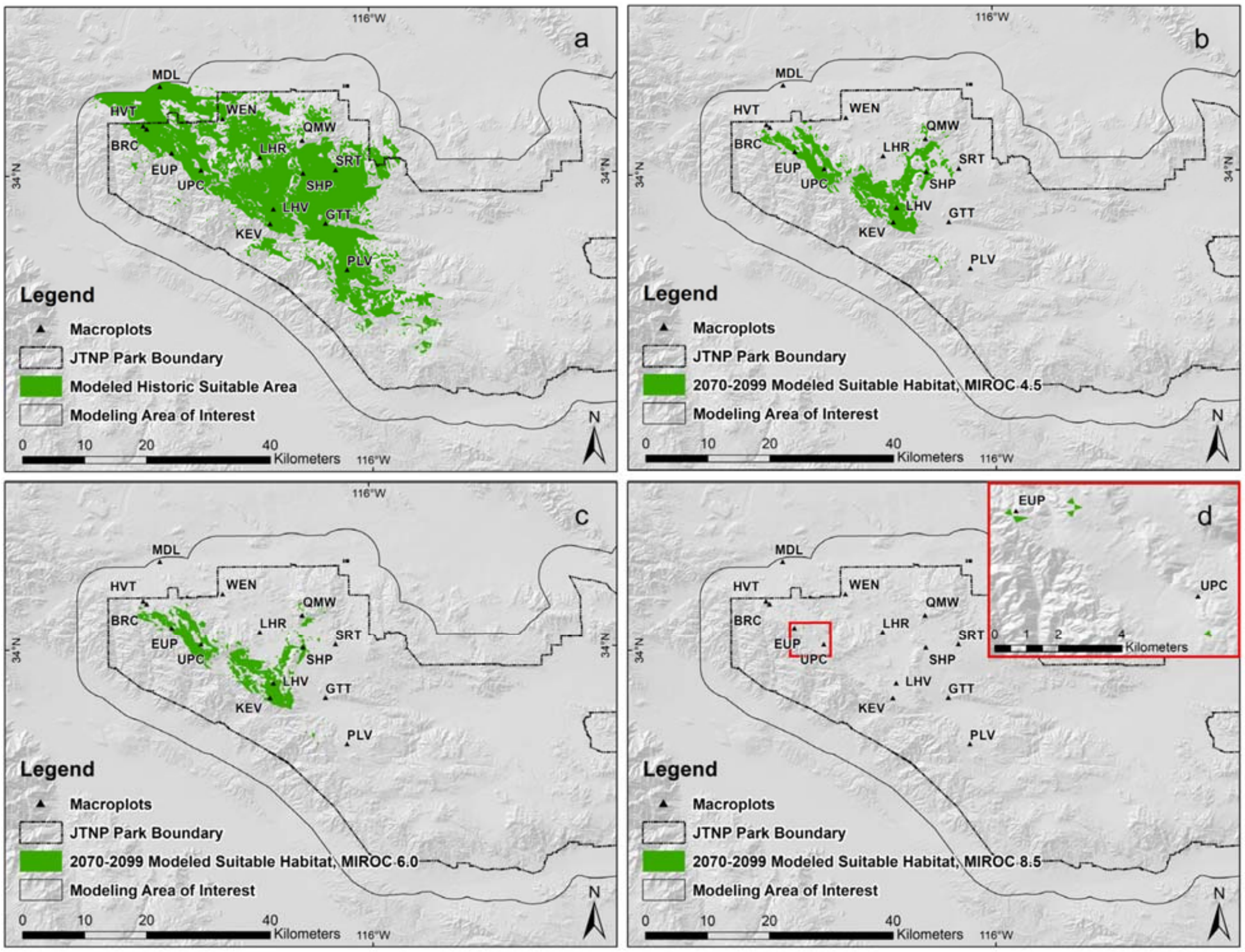

Figure 18: Map of historically suitable habitat (a) and end-of-century refugia for Joshua trees at JTNP. Modeled refugia are the area of overlap between current and future suitable habitat under 3 emission scenarios: RCP 4.5 (b), 6.0 (c), and 8.5 (d, with inset to display the modeled area). Source: Sweet et al. (2019).

The modeling results of Sweet et al. (2019) are similar to those of Barrows and Murphy-Mariscal (2012) in terms of overall trajectory and location of habitat loss in JTNP, but diverge in terms of how much area remains as refugia under their highest-warming scenarios. Barrows and Murphy-Mariscal (2012) projected between 2 and 10% of existing habitat would remain suitable in the park (916 to 4640 ha), while Sweet et al. (2019) projected only 0.02% would remain (15 ha). Sweet et al. (2019) ascribed the difference to finer scale habitat data, difference in climate scenarios used, and better and more dense information on Joshua tree presence. Put another way, the more detail we learn about the current status of Joshua trees, the bleaker their future appears.

Sweet et al. (2019) also used field data on distribution of juvenile trees (defined as smaller than 60 cm) to validate their modeling results.[21] They explained their rationale as follows:

> Large, long-lived species, such as Joshua trees, have an advantage over short-lived species, as they can weather year-to-year variation and short-term droughts. Still, long-term persistence, especially over the time reflected in climate change estimates, depends on where and when species reproduce, recruit, and establish on a landscape. Other studies have found differences between the adult distribution and the distribution of juveniles or seedlings on the landscape. Since the establishment stage of trees and other perennial species is a vulnerable and important stage, the density of seedlings in a given area can provide early indications of future distribution shifts.
>
> In order to study the future distribution of Joshua trees at JTNP, therefore, a field-based assessment of current recruitment patterns may be foretelling of changes in the population of Joshua trees on the landscape. Joshua tree annual survivorship is age- and precipitation-dependent; low precipitation levels have an inordinate negative impact on survivorship of smaller plants. With the levels of increased aridity that this region has already experienced, it follows that demographic shifts in Joshua trees should be apparent. The occurrence of young, healthy Joshua trees can therefore provide an empirical validation for modeled predictions of where climate refugia have already started to become established today (internal citations omitted).

Sweet et al. (2019) categorized 14 nine-hectare macroplots throughout the park that contained Joshua trees as high or low-recruiting depending on whether the density of documented juveniles was above or below the mean. They found that high-recruiting macroplots had significantly higher annual precipitation, and marginally significantly lower climatic water deficit and maximum summer temperature. Importantly, high-recruiting macroplots were geographically differentiated from low-recruiting macroplots in that they were located either within or significantly closer to predicted future refugia than low-recruiting macroplots. Moreover, when temperature and precipitation for refugia areas were plotted together with macroplots, there was considerable correspondence between the high-recruiting macroplots and the refugia. This result, which validated modeled predictions, was "not surprising—the factors that allow for recruitment (lower CWD, higher precipitation), especially in a desert environment, also differentiated, on a landscape scale, the areas supporting Joshua trees within the park."

Studying the density of tree recruitment, Sweet et al. (2019) found early indications of a shift in Joshua tree recruitment and noted that "[i]f recruitment patterns portend the future distribution of adults on the landscape, this type of analysis allows a glimpse into changes that may occur even before those outlined in the modeled future scenarios."

The Sweet et al. (2019) analysis was designed "to inform management with the most robust available predictions, focusing on areas where the species occurs already." These "occupied climate refugia are most relevant to the conservation of the species for the next 50 yr, and perhaps longer." Proper management and protection of these areas is critical the persistence

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[21] Barrows and Murphy-Mariscal (2012) also used juvenile distribution to validate their models but used a 30 cm rather than 60 cm cutoff to define "juveniles".

of *Y. brevifolia*: "Since these refugia are also subject to threats such as fire and invasive species, management efforts aimed at reducing these threats provide on-the-ground actions that increase the likelihood that these areas will sustain this iconic species." Management and recovery actions are further discussed *infra*.

The species distribution modeling studies discussed above individually and collectively lay out a compelling warning about the difficult future facing *Y. brevifolia* in California. Two of those studies also looked at field data and concluded that recruitment of Joshua trees was *already* being hampered by warming (Barrows and Murphy-Mariscal 2012; Sweet et al. 2019).

Additionally, multiple other field studies documenting the *current* impacts of warming, drought, invasive species, fire and other impacts on Joshua tree survival and recruitment reinforce the findings of these modeling efforts. The more recent of these studies have specifically looked at such impacts in the of context climate change (*e.g.* DeFalco et al. 2010 [fire, drought and herbivory]; Reynolds et al. 2012 [seed germination and recruitment]; Esque et al. 2015 [recruitment and juvenile growth]; Borchert and Defalco 2016 [reproduction, seed predation and dispersal]; Harrower and Gilbert 2018 [pollination]; St. Clair and Hoines 2018 [reproduction]). These studies and the documented impacts on *Y. brevifolia* are described in the sections on Reproduction, Abundance and Population Trends, and Factors Affecting Ability to Survive and Reproduce, *supra*.

Joshua tree persistence on the landscape is dependent not just on survival of Joshua trees themselves, but on successful recruitment, which is dependent upon their obligate pollinating moths, seed dispersing rodents and the presence of nurse plants. As summarized by Sweet et al. (2019), "[r]ecruitment, survival of populations, and certainly migration of the species will be affected by factors such as the availability of pollinators, dispersers, seed and seedling predators and other mutualisms on the landscape." Climate change threatens to disrupt these essential relationships.

While multiple species can serve as its nurse plants, and a variety of rodents can act as seed dispersers, only a single species, *Tegeticula synthetica*, pollinates *Yucca brevifolia* in its California range (Pellmyr and Segraves 2003; Godsoe et al. 2008). And while clonal reproduction can prolong survival in certain locations and circumstances (DeFalco et al. 2010), ultimately long-term survival as a species likely requires the genetic diversity that sexual reproduction fosters (Harrower and Gilbert 2018). Consequently, the long-term viability of *Y. brevifolia* depends on maintaining its obligate mutualism relationship with *T. synthetica*.

A recent study by Harrower and Gilbert (2018) in JTNP sheds significant insight into the apparent fragility of the relationship between *Y. brevifolia* and *T. synthetica*. The authors succinctly lay out the problem:

> Obligate mutualisms like the Joshua tree–yucca moth interaction are acutely sensitive to changes in climate. The interacting partners may respond differently, creating an asynchrony in species phenology that can lead to population decline and local extinction. Environmental changes that shift the outcome to fewer viable seeds or greater seed predation could be detrimental to both species. However, the climate

envelope within which this mutualism currently exists is narrow, and climate change effects in the Mojave Desert are expected to limit this envelope to only the highest elevations in Joshua Tree National Park (JTNP) within 90 yr, greatly reducing habitat with suitable climate and potentially extirpating the species from its namesake park (internal citations omitted).

Joshua trees are distributed across a 1200-m elevational range in JTNP from approximately 1000 m to 2200 m. Elevation gradients can serve as "natural experimental systems through systematic variation in abiotic and biotic factors," and average daily summer temperature per site in the Harrower and Gilbert (2018) study declined steadily along the elevation gradient with the warmest site at 30.2°C and the coolest at 19.9°C. Harrower and Gilbert (2018) examined how the abundance of *Y. brevifolia* and *T. synthetica* varies by elevation and quantified how the outcome of the Joshua tree–yucca moth interaction shifts depending on the context of where it occurs and the impacts that may have on Joshua tree fitness.

The authors found a sharp dichotomy between intermediate elevation sites versus the highest and lowest sites. Tree abundance was highest at intermediate elevations, with a "marked peak at around 1250 m where the trees were numerous and large and produced many flowers; this peak coincided with a high abundance of moths, as well as high production of pods, seeds, fertile seeds, and seedlings that grew from seeds." A positive relationship between moth abundance and successful sexual reproduction was found, with number of seedpods and fertile seeds per pod increasing with moth abundance. Moth abundance was significantly correlated with tree size, tree abundance, and number of flower panicles per tree, with larger trees having more panicles. These associations collectively indicate that reproductive success of both Joshua trees and yucca moths are greatest where the Joshua trees are abundant and vigorous, which currently is at intermediate elevations.

In stark contrast to intermediate elevation results, at the lowest and highest sites the number of dead Joshua trees peaked, while live trees were small and few and had few flowers, and no moths, seedpods, or seedlings were encountered. Reproduction was limited to clonal spread. Soil moisture was very low at the lower, warmer elevations and may have contributed to Joshua tree death. The authors noted that their observations were consistent with expectations from the models of Cole et al. (2011) and Barrows and Murphy-Mariscal (2012) and suggest that the range of Joshua trees is contracting at the lower elevations where there was no seedling recruitment and high tree mortality.

Harrower and Gilbert's (2018) finding that at elevation extremes Joshua tree reproduction is almost exclusively clonal is consistent with previous accounts finding that Joshua tree clonality increases with elevation, but the lack of seedling recruitment and enhanced clonality at low elevations had not been previously reported. Trees produced flowers at both of the extremes, but no moths, fruit development, or seed set were observed in these areas. Consequently, the lack of seedlings could be explained by the lack of pollinators.

The presence of only clonal populations at the low and high ends of *Y. brevifolia* distribution has several very significant potential repercussions:

> If trailing edge populations of (mostly clonal) Joshua trees are also those in the population that are best adapted to deal with the highest local temperatures, a lack of sexual outcrossing with populations at higher elevations could threaten overall species persistence due to reduced fitness of seedlings as the climate warms. Clones have reduced reproductive fitness, which could increase susceptibility to local extinction of the trees. The lack of pollinators, seed set, and seedlings at higher elevations suggests that Joshua trees are not currently expanding their range upslope (Harrower and Gilbert 2018) (internal citations omitted).

Harrower and Gilbert (2018) summarized the dilemma facing the *Y. brevifolia* and *T. synthetica* mutualism: "Joshua trees seem to be dying back at low elevations as predicted, but they do not seem to be moving successfully into higher elevations, where the mutualism is not successful." Moths are absent at these higher elevations and it "remains to be seen if Joshua tree performance can improve at higher elevations and if it will be able to attract enough moths to successfully reproduce, or if moths can migrate to and survive at those locations." Given "the survival of the species requires colonization of new habitats," the current lack of a functioning pollination mutualism at the high elevation margins of the Joshua tree's range raises serious doubts about the ability of the species to colonize new habitats, and ultimately to survive.[22]

In sum, climate change represents an existential threat to *Y. brevifolia* in its California range. Even in the absence of climate change, the convergence of biotic and abiotic factors necessary for recruitment "results in successful establishment of new seedlings only a few times in a century" (Esque et al. 2015). Such recruitment has already largely stopped at the drier, lower limits of the species' range (Barrows and Murphy-Mariscal 2012; Sweet et al. 2019). Prolonged droughts, which are projected to occur with greater frequency and intensity over the coming decades (Hopkins 2018), will not only preclude recruitment across ever-greater areas of the species' range, but will lead to higher adult mortality, either directly due to temperature and moisture stress or indirectly due to increased herbivory from hungry rodents lacking alternative forage (DeFalco et al. 2010; Harrower and Gilbert 2018). Whether or not the species' pollinating moth will be able to keep pace with a changing climate is highly-questionable (Harrower and Gilbert 2018). The Joshua tree's ability to colonize new habitat at higher elevations or latitudes is extremely limited and no such range expansion is yet occurring, even as the lower elevation and southern edge of its range is already contracting (Cole et al. 2011; Harrower and Gilbert 2018). And there is no safe refuge, as the higher elevation areas in which Joshua trees are projected to best be able to survive increasing temperatures and drying conditions are at great risk of fire due to the prevalence of invasive grasses (Barrows and Murphy-Mariscal 2012; Sweet et al. 2019). Absent rapid and substantial reductions in GHG emissions *and* protection of habitat, the species will likely be extirpated from all or most of California by the end of the century.

[22] Interestingly, certain higher elevation areas (but not the highest elevations) had the highest density of trees in the study, but very low moth abundance. These higher elevation sites were dominated by trees reproducing asexually. It is not clear whether moths are unable to thrive at these higher elevations or if the low numbers of flowers meant that location was unable to attract or support the moths. Harrower and Gilbert (2018) postulated that this elevation range, from 1500 to 1600 m, "where trees thrive but moths do not, may be an important transition zone for future work on the details of the Joshua tree–yucca moth climate mismatch."

5.5 Habitat Loss to Development

While the overall outlook for *Y. brevifolia* is grim, the species has an advantage over many other climate-threatened species in that much of its habitat is at least nominally protected from other impacts. Its southernmost population is within the national park that bears its name, while some of its northernmost populations are in Death Valley National Park. As described in the Distribution section *supra*, YUBR North is 96% federal land, while, YUBR South is 48% federal land. Nevertheless, development presents a substantial threat to the species in a significant portion of its range.

Of the two *Y. brevifolia* populations, YUBR South has been the most impacted by human development and faces the greatest threats in its future. Over 50% of the land area comprising the habitat for this population is privately owned (USFWS 2018). The cities and towns of Apple Valley, Hesperia, Lancaster, Palmdale, Ridgecrest, Victorville, and Yucca Valley, along with many other smaller communities have been built in Joshua tree habitat in the YUBR South area. In recent decades these areas have grown rapidly, with the populations of Lancaster, Palmdale and Apple Valley all growing by approximately 36% between 2000 and 2018, Yucca Valley growing by 29.5% and Victorville by a staggering 93% during that same time period (SCAG 2019).

Human population growth in these areas and consequent loss of Joshua tree woodlands is expected to continue in the coming decades. The USFWS (2018), using the EPA's Integrated Climate and Land-Use Scenarios (ICLUS) modeling tool to predict future housing density growth in the range of the Joshua Tree, estimated that 41.6% of suitable habitat for *Y. brevifolia* in the YUBR South area would be lost to housing development by 2095 (Figure 19).[23] When combined with YUBR North, about a third of Joshua tree habitat would be lost for the species in California. Importantly, the ICLUS modeling done by USFWS only looks at housing density, not industrial, military or other development so likely represents an underestimate of development impacts.

In addition to urban growth, various other forms of development threaten Joshua tree habitat in California, including roads, highways, transmission lines, industrial facilities and large and small-scale renewable energy projects. While many of these impacts have been poorly quantified to date, according to USFWS (2018), renewable energy development has already resulted in the loss of 1.2% of mapped *Y. brevifolia* habitat, equating to about 68,000 acres. However, given USFWS included Nevada habitat in this calculation, while virtually all of the large-scale renewable energy development in the range of the species is in the YUBR South area, the actual total in California is likely closer to 2% of habitat lost to date. Under the Desert Renewable Energy Conservation Plan (DRECP) amendments to the California Desert Conservation Area (CDCA) Plan, of the 388,000 acres of development focus areas on BLM land subject to a streamlined review process to facilitate renewable energy development, approximately 50,000 acres fall within the mapped distribution for *Y. brevifolia* (USFWS 2018),

[23] In using the ICLUS model, USFWS (2018) ran development scenarios consistent with IPCC B1 and A2 climate scenarios. The 41.6% projection is from the A2 scenario which most closely matches current emissions trajectories. Under the lower-growth B1 scenario, 21.7% of YUBR South suitable habitat would be lost to housing development.

equating to more than 1% of additional habitat at risk from this type of development on federal lands and an unknown but potentially larger amount on private lands (Figure 19).[24]

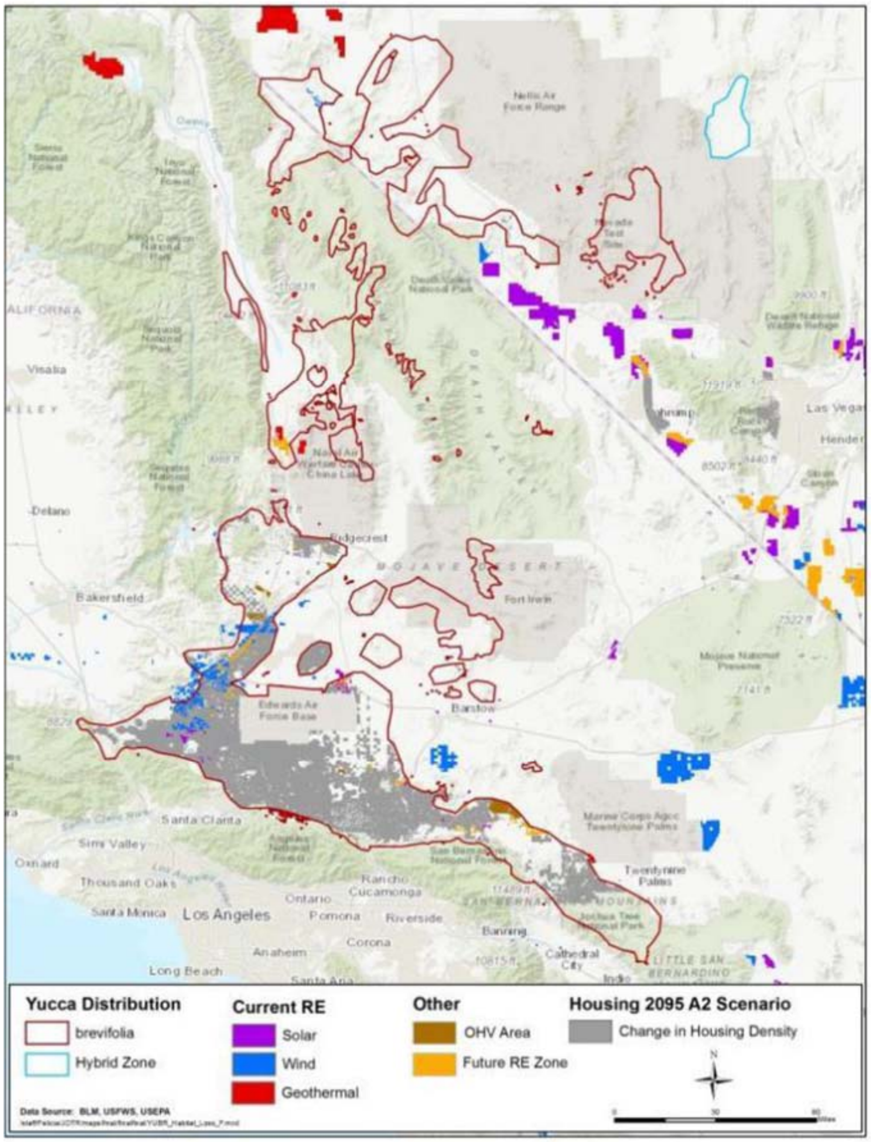

Figure 19: Map showing Joshua tree projected habitat loss due to urban grown, as well as current and projected habitat loss due to large-scale renewable energy projects. Source: USFWS (2018).

In sum, human development has already consumed hundreds of thousands of acres of habitat in the range of *Y. brevifolia*. Over the coming decades, over a million additional acres will be destroyed or degraded for housing, roads, energy projects and assorted other development (USFWS 2018). This large-scale loss or severe degradation of habitat is of conservation concern

[24] Notably, the Trump administration has initiated plans to roll back protections contained in the DRECP, which would likely subject additional areas of Joshua tree habitat to either renewable energy development or other forms of habitat degradation or destruction. https://www.blm.gov/california/BLM-to-consider-changes-desert-renewable-energy-conservation-plan.

for the species even absent the threats posed by climate change. However, given that *Y. brevifolia* in California will lose upwards of 90% of its range under likely climate scenarios, the added loss of habitat and the genetic resiliency and connectivity it provides will further push the species towards extirpation in California.

6 Degree and Immediacy of Threat

As demonstrated in the previous sections, the threats facing *Y. brevifolia* are severe and immediate. While extirpation is likely decades away, the species is already suffering the impacts of climate change, with recruitment failure and adult mortality at the hotter, lower elevation edges of its range (Barrows and Murphy-Mariscal 2012; Harrower and Gilbert 2018; Sweet et al. 2019). Moreover, the impacts of invasive grass fueled fire are already being felt, with approximately half of identified refugia areas in JTNP under moderate warming scenarios having burned in recent decades (Sweet et al. 2019). And perhaps most importantly, the impacts from current GHG emissions will continue to be felt for decades to come, with little time remaining to reduce such emissions before warming sufficient to drive *Y. brevifolia* to functional extinction becomes unavoidable. Consequently, while *Y. brevifolia* may not currently be "in serious danger of becoming extinct throughout all, or a significant portion, of its range," it is certainly likely to become so "in the foreseeable future." Cal. Fish & Game Code §§ 2062 & 2067.

7 Inadequacy of Existing Regulatory Mechanisms

No existing regulatory mechanism are currently in place at the international, national, state or local level that adequately address the threats facing *Y. brevifolia.*

7.1 Regulatory Mechanisms for Greenhouse Emissions Reductions

Given climate change is the greatest threat to the continued existence of the Joshua tree, ultimately the species cannot be saved absent global action to reduce such emissions. Unfortunately, such action is severely lacking in scale, speed and efficacy at all levels of government, both domestically and internationally.

The United States has contributed more to climate change than any other country. The U.S. is the world's biggest cumulative emitter of greenhouse gas pollution, responsible for 25 percent of cumulative global CO_2 emissions since 1850, and is currently the world's second highest emitter on an annual and per capita basis (Le Quéré et al. 2018). However, U.S. climate policy is wholly inadequate to meet the international Paris Agreement targets to avoid the worst dangers of climate change.

As summarized by the Fourth National Climate Assessment, efforts to mitigate greenhouse gas emissions do not approach the scale needed to avoid "substantial damages to the U.S. economy, environment, and human health and well-being over the coming decades":

> Climate-related risks will continue to grow without additional action. Decisions made today determine risk exposure for current and future generations and will either broaden or limit options to reduce the negative consequences of climate

> change. While Americans are responding in ways that can bolster resilience and improve livelihoods, neither global efforts to mitigate the causes of climate change nor regional efforts to adapt to the impacts currently approach the scales needed to avoid substantial damages to the U.S. economy, environment, and human health and well-being over the coming decades (USGCRP 2018).

In 2016, the U.S. committed to holding the long-term global average temperature to well below 2°C and "to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels" under the international Paris Agreement. Existing U.S. domestic laws including the Clean Air Act, Energy Policy and Conservation Act and others provide authority to executive branch agencies to require greenhouse gas emissions reductions from virtually all major sources in the U.S., sufficient to meet the Paris Agreement temperature commitment.

However, the Trump administration has focused on pushing through harmful rollbacks of federal climate policy, and federal agencies are either failing to implement or only partially implementing domestic law and policy mandating greenhouse gas reductions. Trump administration rollbacks of federal climate policy include rescinding the Climate Action Plan, repealing and replacing the Clean Power Plan, a plan to dramatically expand offshore oil drilling in all oceans along U.S. coast, an attempt to rescind the Obama-era withdrawal of offshore drilling in U.S. federal waters in most of the Arctic and parts of the Atlantic, lifting of the moratorium on new federal coal leases, weakening emissions standards for cars and light duty trucks, delaying the implementation of methane emissions standards for new and modified oil and gas facilities, and the intended withdrawal from the Paris Agreement.

As a result, current U.S. climate policy has been ranked as "critically insufficient" by an international team of climate policy experts and climate scientists who concluded in September 2019:

> The Trump Administration has continued with its campaign to systematically walk back US federal climate policy. If it successfully implements all the proposed actions, greenhouse gas emissions projections for the year 2030 could increase by up to 400 MtCO2e over what was projected when President Trump first took office. That's almost as much as the entire state of California emitted in 2016 (CAT 2019).

To meet the carbon budget for keeping temperature rise below 1.5°C, most U.S. and global fossil fuels must remain undeveloped and fossil fuel production must be phased out globally within the next several decades (Rogelj et al. 2015). However, the U.S. is now the world's largest oil and gas producer and third-largest coal producer (OCI 2019) due to U.S. policies that aggressively promote ever greater fossil fuel production. For example, in 2005, Congress exempted fracking from the Safe Drinking Water Act in legislation known as the "Halliburton Loophole." Thereafter, fracking spread rapidly and facilitated a dramatic increase in U.S. natural gas and crude oil production (USEIA 2016). After Congress lifted the 40-year old crude oil export ban in December 2015, crude oil exports have skyrocketed and now hover at nearly three million barrels per day—about a quarter of all U.S. production (DiChristopher 2019). U.S. subsidies are also spurring fossil fuel production. A recent study assessing the impact of major federal and state subsidies on oil production found that these subsidies push nearly half of new oil investments into profitability, potentially increasing U.S. oil production by 17 billion barrels over the next few decades (Erikson et al. 2017). In short, U.S. policy is incentivizing rather than reducing fossil fuel production.

And while U.S. policy and emissions are going in the wrong direction under the Trump administration, the rest of the world is doing little better. As summarized by CAT (2019), current polices, if actually implemented by all nations, will still result in over 3°C of warming, and even if all pledges and targets make pursuant to the Paris Agreement were met, warming would still be on the order of 2.6 to 2.9°C (Figure 20). This level is far above the 1.5°C threshold the world needs to stay below to avoid the worst impacts of climate change.

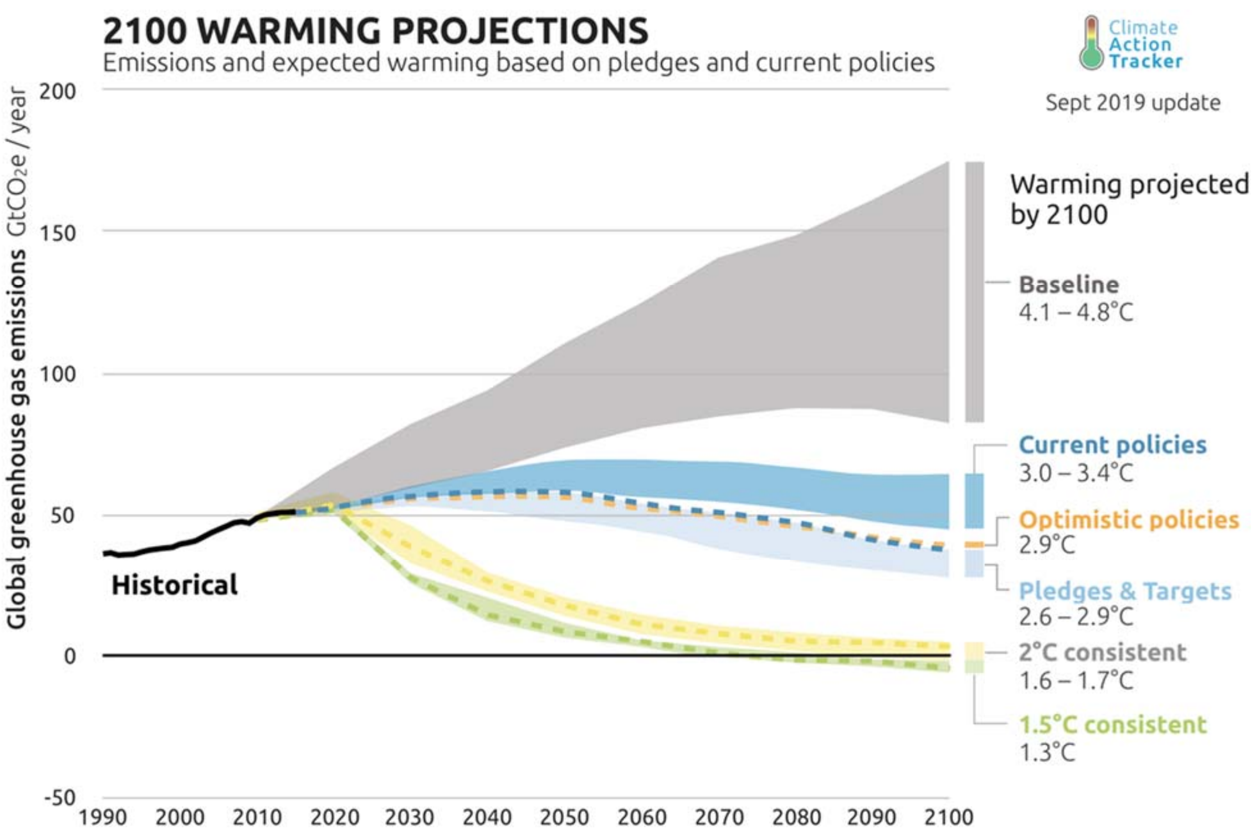

Figure 20: Graph showing mismatch between current emissions trajectories, international climate targets, and national policies and commitments. Source: CAT (2019).

In sum, both domestically and globally, government policies and commitments, not to mention actual actions, to avoid the worst impacts of climate change are woefully inadequate. These trends will lead to temperatures in the range of *Y. brevifolia* that are incompatible with reproduction and ultimately, survival of the species.

7.2 Mechanisms to protect habitat from fire, development and other threats

While the lack of effective regulatory mechanisms to address greenhouse pollution is largely determinative as to the question of whether *Y. brevifolia* qualifies for CESA protection, mechanisms to protect the species from other threats are also insufficient.

7.2.1 Invasive species and fire

To date no legal, regulatory or management efforts have demonstrative effectiveness at addressing the severe threat that invasive species and consequent altered fire regimes pose to Joshua trees. While the National Park Service (NPS) has updated it fire management plans to address the increased threat of fire to the species, large fires continue to be a significant threat in JTNP (Sweet et al. 2019). Other areas in the species' range lack species-specific fire management plans. And while immediate suppression of fires in *Y. brevifolia* habitat can limit the spread of fires, protection of the species from fire ultimately requires invasive species management to reduce the fuel load. Given invasive species spread and abundance is linked to both disturbance (e.g. roads, ORVs, cows, urbanization) (Brooks and Berry 2006) and nitrogen deposition (Allen et al. 2009; Allen et al. 2011), each of these contributing factors will need to be addressed.

Disturbance is somewhat limited in the portions of the range of *Y. brevifolia* within national parks, but these areas harbor only approximately 10% of the species' current suitable range in California. The vast majority of the species' range in the state is on BLM, military and private lands that are not managed primarily for species protection and include activities such as ORV use, cattle grazing, military training, urban sprawl and activities that foster the spread of invasive species and/or the ignition of fires (USFWS 2018).

Notably, BLM recently (10/3/19) approved a Record of Decision for a vehicle route network in the West Mojave Planning Area, which encompasses the entire range of YUBR South and a portion of YUBR North. About a quarter of mapped Joshua tree habitat in YUBR South is on BLM land, while over half of YUBR North habitat is on BLM land. BLM approved an expansive ORV route network of 6000 miles of open vehicle routes in the plan area, ensuring that any public lands outside of wilderness will be highly fragmented, directly degrading habitat, exacerbating the spread of invasive species and increasing the number of human-caused ignitions (BLM 2019).

Nitrogen deposition impacts both disturbed and relatively undisturbed areas, with JTNP being one of the areas in the range of *Y. brevifolia* worst impacted by nitrogen deposition (Allen et al. 2011; Figure 10). As summarized by, Pardo et al. (2011), the threat is dire: "In Joshua Tree National Park in southern California, N deposition favors the production of sufficient invasive grass biomass to sustain fires that threaten the survival of the namesake species."

It is unlikely that nitrogen deposition will be adequately reduced throughout the range of *Y. brevifolia* for at least several decades, if ever. In the western areas of JTNP, nitrogen deposition is largely derived from nitric oxides (HNO_3) coming from automobile and powerplant pollution blown in from the greater Los Angeles area (Allen et al. 2009). In the eastern part of the park, deposition is largely from ammonia (NH_3) from local agricultural sources in the Coachella and Imperial Valleys (Allen et al. 2009). High rate of nitrogen deposition in the far western Mojave likely originate from a mix of smokestack and tailpipe pollution and agricultural sources in the San Joaquin Valley (Bytnerowicz et al. 2016). Even if California successfully decarbonizes its vehicle fleet and power generation in the coming decades, nitrogen deposition from large-scale agriculture will likely continue to impact large areas of *Y. brevifolia* habitat for the foreseeable future.

Moreover, even if disturbance and nitrogen deposition are reduced and the further spread of invasive species can be curtailed, no fully-effective treatments currently exist to reduce or eliminate at a landscape scale the most pernicious invasive species (e.g. *Bromus* spp., *Schismus* spp., *Erodium cicutarium*), *Brassica tournefortii*) that have already become established in significant portions of the range of *Y. brevifolia* (Brooks et al. 2018).

7.2.2 Habitat loss and degradation

As discussed above, *Yucca brevifolia* stands to lose upwards of a third of its suitable habitat in California to development over the coming decades, including over 40% of its habitat in the YUBR South region. No existing state or federal regulatory mechanisms are currently operative in a manner that will meaningful reduce this threat.

<u>State and local mechanisms</u>

A relatively small portion of the range of *Yucca brevifolia* occurs within California State Parks, including Red Rock Canyon State Park and Eastern Kern County Onyx Ranch State Vehicular Recreation Area in Kern County and Saddleback Butte State Park, Arthur B. Ripley Desert Woodland State Park, and Antelope Valley California Poppy Reserve in Los Angeles County. Collectively these make up less than 1% of the species range in the state (USFWS 2018). While these areas are protected from urban development and are generally to be managed for the protection of park resources, they alone are unlikely to prevent the decline and eventual extirpation of Joshua trees from the region. Saddleback Butte and Arthur B. Ripley Desert Woodland State Parks are small and isolated islands of protected habitat, comprised of approximately 3000 and 500 acres respectively. Antelope Valley California Poppy Reserve is approximately 1800 acres but contains only a few isolated clusters of Joshua trees. Red Rock Canyon State Park at approximately 27,000 acres is much more substantial in size, but is faced with many management challenges similar to adjacent BLM lands, particularly a proposed increase in ORV use in the Park. Similarly, the newly-created Eastern Kern County Onyx Ranch State Vehicular Recreation Area contains some Joshua tree woodland but is managed primarily for ORV use.[25] In any event, even if all other threats to *Y. brevifolia* in these parks were effectively managed, climate change and fire still threatened to extirpate the species from these parks over the coming decades.

The California Desert Native Plants Act, Cal. Food & Agricultural Code §§ 80001 – 80201, was passed "to protect California desert native plants from unlawful harvesting on both public and privately owned lands." *Id*. at § 80002. Joshua trees are explicitly regulated under this provision. *Id*. at § 80073(a)("yuccas") & 80101(b)(1) (setting price for *Y. brevifolia* permits). The Act generally prohibits harvest of desert plants absent permits issued by the relevant county agricultural commissioner or sheriff. *Id*. at § 80073. Land clearing for agriculture and various

[25] Information on each of these parks is available at https://www.parks.ca.gov/.

other forms of development activities are generally exempted so long as the plants are not offered for sale and proper notice is given. *Id*. at § 80111. The statute also includes provisions designed to assure the survival and transplant of desert plants that are harvested pursuant to permits. *Id*. at § 80116. The Department of Fish and Wildlife is tasked with enforcing the statute. Cal. Fish & Game Code § 1925 ("The Department shall enforce the provisions of the California Desert Native Plants Act").[26]

Commercial collection was once seen as perhaps the greatest threat to the Joshua tree and other desert plants, As described in an early account about the threats commercial harvesters presented to the species in southern California, "As soon as they began to realize their beauty and unique character there began a wholesale foray into the desert to dig them up…At the present rate of destruction the cactus of the desert and the Joshua trees will be gone within two years" (Carr 1930). Various state and local laws and ordinances were ultimately passed to address this threat, including the California Desert Native Plants Act. While these measures have been largely effective at reducing the commercial harvest of Joshua trees, they have done little to slow the loss of habitat from agricultural conversation and development in the range of the species.

Among the local jurisdictions in the range of *Y. brevifolia* that currently have plant protection ordinances or other measures that nominally protect Joshua trees are Hesperia, Palmdale, Victorville, Yucca Valley, and Los Angeles and San Bernardino counties. While all of these provisions require consideration of Joshua tree retention in development plans, most exempt single-family homes and none act as an actual bar to tree removal, instead usually requiring transplantation, donation or making available for adoption trees removed from construction sites. *See, e.g*. Palmdale Municipal Code §§ 14.04.010 *et seq*. (requiring preservation of two Joshua trees per acre but allowing this metric to be met by donating removed trees to an offsite City-administered tree bank); Yucca Valley Ordinance 140 (allowing removal of Joshua trees for transplant if they interfere with "approved improvements or other ground disturbing activities" and "best efforts" are made to avoid the need to remove them).

The California Fish and Game Commission noted the inadequacy of these approaches when it adopted its California Policy for Native Plants in 2015:

> The State's policies and practices regarding native plants are in need of review and updating. More than 30 years ago state law focused on transplantation as a means of mitigating for listed plant species, however experience and numerous studies document that such practices are largely ineffectual over time and often damaging to species or population survival.[27]

In sum, the California Desert Native Plants Act and similar local ordinances are, as recognized by the Commission, "largely ineffectual" at protecting imperiled plant species from habitat loss. These provisions may result in the near-term preservation of individual adult Joshua

[26] A similar statute, the Native Plant Protection Act provides comparable protections for "endangered or rare" native plants. Cal. Fish & Game Code §§ 1900-1913. The Joshua tree is not among the species regulated by this statute.
[27] Available at https://fgc.ca.gov/About/Policies/Miscellaneous.

trees in urban and suburban neighborhoods, but these areas are less likely to remain habitat long-term. Successful recruitment in such areas is likely constrained by lack of nurse plants and it remains highly uncertain whether pollinating moths will be able to persist with the resultant low Joshua tree densities (Harrower and Gilbert 2018)("Having robust, dense, flowering trees is important to support and attract enough moths for successful seed set"). Consequently, these measures are inadequate to prevent extensive loss of Joshua tree habitat in the near-term and for the foreseeable future.

Other state statutes also are inadequate to protect Joshua trees from habitat loss. The California Environmental Quality Act (CEQA) is California's landmark environmental law and establishes a state policy to prevent the "elimination of fish or wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities...." Cal. Pub. Res. Code § 21001(c). Towards this end, state and local agencies are required to analyze and disclose the impacts of any discretionary decision or activity. CEQA contains a substantive mandate that agencies should not approve projects as proposed if there are feasible alternatives or mitigation measures which would substantially lessen the significant environmental effects of such projects. Cal. Pub. Res. Code § 21002.

CEQA requires a "mandatory finding of significance" if a project may "substantially reduce the number or restrict the range of an endangered, rare or threatened species." Cal. Code Regs., tit. 14, § 15065(a)(1). CDFW has interpreted this provision to apply to species of special concern, which are species that are "experiencing, or formerly experienced, serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for State threatened or endangered status."[28] CDFW further provides that species of special concern "should be considered during the environmental review process." *Id*.; Cal. Code Regs., tit. 14, § 15380. Thus, a potentially substantial impact on a species of special concern, threatened species, or endangered species could be construed as "per se" significant under CEQA. *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 449. And under CEQA, when an effect is "significant," the lead agency approving the project must make a finding that changes or alterations have been incorporated into the project to avoid or mitigate its significant impacts, or that such changes are within the responsibility of another agency, or that mitigation is infeasible. Cal. Pub. Res. Code § 21081(a). These provisions therefore provide some protections to species that are listed as species of special concern, threatened, or endangered.

However, Joshua trees are not listed as a species of special concern or as threatened or endangered, such that a project that has the potential to impact the species would not necessarily qualify as a "significant effect" under a lead agency's interpretation of CEQA. In such case, CEQA's substantive mandate to adopt all feasible alternatives or mitigation measures might not be triggered.

CEQA also requires a "mandatory finding of significance" if a project may "substantially

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[28] California Department of Fish and Wildlife, *Species of Special Concern*, available at https://www.wildlife.ca.gov/Conservation/SSC.

reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community." Cal. Code Regs., tit. 14, § 15065. Moreover, CEQA's "Environmental Checklist" in Appendix G of the CEQA Guidelines characterizes a project's effects as "significant" if the project would "[c]onflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance."

While these provisions might theoretically offer some protection for Joshua trees, in practice they have not provided sufficient protection. Under CEQA, lead agencies have discretion to develop their own thresholds of significance. *East Sacramento Partnerships for a Livable City v. City of Sacramento* (2016) 5 Cal.App.5th 281, 300; Cal. Code Regs., tit. 14, § 15064(d). This allows local agencies—who are often under pressure from developers to approve projects—to make significance determinations that are inconsistent with independent scientific analysis, including CDFW's analysis.

Even when a lead agency acknowledges that an effect is "significant," CEQA allows a lead agency to adopt a "statement of overriding considerations" and approve a project if the agency finds that other factors outweigh the environmental costs of the project or that further mitigation is infeasible. Cal. Code Regs., tit. 14, § 15093(b); Cal. Pub. Res. Code § 21081. This means that even if a project may have a significant effect on a Joshua tree population, an agency could interpret CEQA as still allowing approval of the project. CEQA in practice is therefore inadequate to protect Joshua trees.

The Natural Community Conservation Planning Act is a voluntary conservation planning mechanism for proposed development projects within a planning area to avoid or minimize impacts to wildlife. Cal. Fish & Game Code §§ 2800-2835. The Act is designed to promote coordination among agencies and landowners to conserve unfragmented habitat areas and multihabitat management. Cal. Fish & Game Code § 2801(d).[29] The Act can also serve as a mechanism to authorize take of CESA listed species. *Id*. at § 2835.

There are no finalized Natural Community Conservation Plans (NCCPs) that cover the Joshua tree. One approved NCCP, the Coachella Valley MSHCP approaches the southern edge of the range of *Y. brevifolia* but does not include the species as a covered species. An NCCP that does overlap the range of the Joshua tree is the proposed Town of Apple Valley MSHCP.[30] This NCCP has been under development for several years with a planning agreement signed in 2017. However, *Y. brevifolia* is not on the proposed list of covered species for the NCCP. Previously, both the West Mojave Plan and the DRECP were intended to be joint plans covering both federal BLM lands and private lands subject to development, but each was ultimately implemented as a federal-only plan, neither of which treat the Joshua tree as a covered species. These plans are further discussed below. In sum, NCCPs may in the future provide some conservation benefit for Joshua trees, but have not done so to date and consequently cannot be considered as providing adequate protection in lieu of CESA listing.

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[29] The NCCP Act is described on CDFW's website at https://www.wildlife.ca.gov/conservation/planning/NCCP.
[30] Documents available at https://www.wildlife.ca.gov/Conservation/Planning/NCCP/Plans/Apple-Valley-MSHCP

Federal mechanisms

The primary federal regulatory mechanism with the potential to protect Joshua trees are management laws and plans governing federal lands. Almost all of the suitable habitat in YUBR north and half within YUBR South is on federal land. Consequently, management of these lands has an important role to play in determining the continued viability of Joshua trees in the state. As discussed above, approximately 10% of *Y. brevifolia* habitat is on NPS lands that are generally well-managed and should prevent significant habitat loss or degradation from activities such as ORV use, cattle grazing, road building or other forms of development. However, even within Death Valley National Park, the 86,400-acre Hunter Mountain Allotment is still active and overlaps with the range of *Y. brevifolia* in the park (NPS 2012). Nevertheless, these lands represent the best opportunities for active management measures to reduce the risk of fire and otherwise attempt to maintain *Y. brevifolia* on the landscape in the face of projected warming.

About 12 percent of the mapped distribution of the YUBR South population falls within military installations and a roughly comparable amount of the YUBR North population falls within such lands (USFWS 2018). The four bases in California with Joshua tree habitat - Edwards Air Force Base, Fort Irwin National Training Center, China Lake Naval Weapons Station and Twentynine Palms Marine Corps Air Ground Combat Center - have each developed Integrated Natural Resource Management Plans (INRMPs) pursuant to the Sikes Act, 6 U.S.C. §§ 670a-670o, that incorporate some avoidance and minimization measures that could reduce impacts to Joshua trees. These measures are summarized in USFWS (2018) and largely consist of avoidance where feasible and transplantation when conflicts are unavoidable. These measures largely mirror those required for private lands under state and local ordinances, which as discussed *supra*, are in the Commissions own words, “largely ineffectual.”

The majority of Joshua tree habitat on federal lands is on BLM lands. These areas are governed by the agency’s California Desert Conservation Area (CDCA) Plan as amended. The Northern and Eastern Mojave Plan (NEMO) area overlaps with most of the California range of the YUBR North populations and the West Mojave Plan (WEMO) area covers all of YUBR South and the southwestern portion on YUBR North. The 2016 Desert Renewable Energy Conservation Plan (DRECP) amendments cover the entirety of the species’ range in California. None of these plans provide adequate protection for *Y. brevifolia*. area

BLM’s NEMO plan does virtually nothing to specifically protect Joshua trees. The species is not mentioned in the Record of Decision (ROD) at all, and the only specific protection afforded to it is a prohibition on collecting downed trees for firewood (BLM 2002). Notably, Joshua tree protection is explicitly excluded from the plan’s measure to limit surface disturbance below certain thresholds:

> It should be noted that some important plants, such as Joshua trees, which are important as an overstory plant but are not dominant, would not be a part of the evaluation trigger. Reestablishment of such plants could, of course, be a restoration requirement for a particular project, but they would not be used to trigger an evaluation for the purposes of reducing the cumulative disturbance total (BLM 2002).

In short, the NEMO plan was not designed with the intent of protecting Joshua trees, and the BLM apparently did not wish to have protection of the species act a barrier to any potential land-disturbing activities.

The WEMO plan is little better. As with NEMO, its ROD does not mention Joshua trees at all. The FEIS for the plan amendment was developed when the project was to also be a habitat conservation plan (HCP) covering private development in the plan area. In this context it discusses existing and proposed preservation of Joshua tree woodlands in the Antelope Valley by state and local entities, but the only specific conservation measure for Joshua trees that BLM itself takes is to prohibit harvesting of Joshua trees in designated conservation areas (BLM 2006). Given state law already prevents such harvest, this conservation measure is illusory. BLM approved the WEMO plan as a federal only plan with no HCP component. Under this alternative, BLM estimated that 54.1% of Joshua tree woodland habitat could be lost (BLM 2006).[31]

BLM recently completed an amendment to the WEMO plan dealing with vehicle routes (BLM 2019). Under this plan amendment, the route network is expanded to approximately 6000 miles of roads and trails open to ORVs. The ROD does not mention Joshua trees, the FSEIS does not meaningfully address impacts to Joshua trees, and the plan amendments do not add any specific measures to protect the species. Mentions of Joshua trees are cursory in the FSEIS, with for example, in a chart of subregions of the plan area, for one area BLM states that it "has an extensive Joshua Tree forest," and immediately thereafter notes that "Gently terrain and good soils make ideal provide ideal OHV touring opportunities" [typos in original].[32] In the ROD, BLM also reaffirms cattle grazing on all active allotments (BLM 2019). As discussed *supra*, invasive species and consequently fuel loads, and well as human-caused ignitions increase in areas subject to disturbance such as cattle grazing and ORV use (e.g. Brooks and Berry 2006). The recent plan amendment will both directly degrade Joshua tree habitat via increased vehicle use, while also indirectly exacerbating the conditions that lead to more frequent and more intense fires.

The more recent DRECP started as both a BLM plan and a state NCCP. Consequently, the environmental documents associated with it address the conservation of Joshua trees more directly than the overlapping BLM plans. However, the DRECP was ultimately adopted as a BLM-only plan, rendering much of the proposed broader conservation uncertain. Among the Joshua tree measures BLM adopted are an objective listed as "Conserve unique landscape features, important landforms, and rare or unique vegetation types identified within the BLM Decision Area, including…Areas of dense Joshua Tree woodland." To meet this objective, the DRECP requires that for new actions, Joshua tree impacts are to be assessed in planning

[31] As discussed in the Distribution section *supra*, "Joshua tree woodland" represents only a portion of the habitat types where the species occurs. However, it is the densest and highest quality habitat for the species.
[32] The only other "analysis" of impacts to Joshua trees in the FSEIS, is an assertion repeated verbatim multiple time in the document that attempts to minimize harm from vehicles: "In remote or mountainous areas, most travel is confined to roads, so that the woodland communities (Joshua tree woodland, scrub oak, pinyon pine woodland, juniper woodland) suffer relatively fewer direct vehicle impacts" (BLM 2019).

decisions and "impacts to Joshua tree woodlands will be avoided to the maximum extent practicable, except for minor incursions" (BLM 2016).[33] In addition to the specific measures for Joshua trees, their habitat would likely gain better protection from various land designations made under the DRECP. However, the benefits for the species derived from the DRECP amendments to the CDCA Plan are in doubt, as the BLM announced that is was planning to revisit the conservations measures of the plan. *See* Notice of Intent to Amend the California Desert Conservation Area, Bakersfield, and Bishop Resource Management Plans and Prepare Associated Environmental Impact Statements or Environmental Assessments, 83 Fed. Reg. 4921 (February 2, 2018). That amendment process is currently ongoing.

In sum, outside of national parks and areas of congressionally designated wilderness, federal land management plans in the range of *Y. brevifolia*, if they address the species at all, at best provide for avoidance of harm to the extent "practicable" or "feasible." Such protection is inadequate in the face of the difficulties the species will face in a rapidly changing climate.

8 USFWS's Flawed Endangered Species Act Determination.

The strongest federal regulatory mechanism that could protect *Y. brevifolia* is the federal Endangered Species Act (ESA). However, on August 15, 2019 the USFWS found that listing Joshua trees (*Y. brevifolia* and *Y. jaegeriana*) throughout their multistate range was not warranted. Endangered and Threatened Wildlife and Plants; 12-Month Findings on Petitions to List Eight Species as Endangered or Threatened Species, 84 Fed. Reg. 41694 (August 15, 2019) (USFWS 2019). The finding was made in response to a 2015 petition by WildEarth Guardians seeking such listing.

While the 2018 species status assessment prepared by USFWS and relied upon by the agency in its decision is informative as to many aspects of Joshua tree taxonomy, natural history, distribution and threats, its conclusions are not at all determinative to the question of whether *Y. brevifolia* warrants listing under CESA. Most importantly, USFWS (2018) assessed whether Joshua Trees in their four-state range were threatened or endangered. And to the degree that the agency considered *Y. brevifolia* separately from *Y. jaegeriana*, it never examined the species' status in just California, rather than California and Nevada combined. Under CESA, the only question is whether the species in imperiled in California. As both CDFW and the Commission have concluded—and appellate courts have upheld—the term "range" under CESA is construed to refer to the range of a species *within* California, not the worldwide range of the taxa. *California Forestry Assn. v. California Fish & Game Com.* (2007) 156 Cal.App.4th 1535, 1550-551.

Additionally, several of the analyses and conclusions contained in USFWS (2018) are flawed and served to downplay the threats and overstate the likely resilience of the species. For example, the agency used an upper "appropriate temperature range" for the species of 59ºC (138ºF). The same metric was used for all age classes, from seedlings to adults. This threshold

[33] DRECP documents are available at https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=95675

was based on a laboratory studies by Smith et al. (1983) in which detached leaves were placed in hot water for an hour and then examined for heat damage. The temperature at which a severed leaf demonstrates cell damage in a lab is a far different metric than the ambient temperature in which a Joshua tree can survive and successfully reproduce in the wild.[34] The temperature used by USFWS (2018) is higher than the hottest temperature (56.7°C; 134.1°F) ever measured on Earth. Notably, the highest lab air temperature that Smith et al. (1983) actually successfully reared Joshua trees was 45ºC (113ºF).[35]

USFWS (2018) also downplays the risks of fire to *Y. brevifolia*. Using modeling to estimate invasive grass cover and link high coverage ratios (15-45%) as a proxy for increased fire frequency and severity, the agency estimated that approximately 1.4 percent of the YUBR South and 8.8 percent of the YUBR North current mapped distribution would be at risk in the next several decades. In contrast, Sweet et al. (2019) documented that half of the area of Joshua tree habitat in JTNP identified as refugia for the species under an RCP 4.5 pathway had already burned in recent decades. The total recent burn area in the park represents well over 10% of the current range of the species in the park and such fires are likely to increase within JTNP and throughout the range of the species.

Another severe limitation of USFWS (2018) is the complete discounting of species distribution modeling, which currently represents the best available science on the future status of the western Joshua tree. The agency admits that it did not carry out any such modeling, claiming that having quantitative information is somehow at odds with its goals in carrying out a status assessment.

> We did not model future distribution based on predicted climate change scenarios. Instead, we used future scenarios to perform a qualitative evaluation of the impact of climate change on the current distribution. … Our goal was to present information related to future climate outcomes, not to evaluate quantitative assessments of climate change on future Joshua tree distribution, therefore we did not construct ecological niche models (e. g., species distribution models) (USFWS 2018).

What USFWS claims it did in lieu of deploying ecological niche modeling was scenario planning, citing to Star et al. (2016) for its rationale.

> Rather than focusing only on the most likely predictions, scenario planning identifies a range of possible future states. Scenarios are not predictions, and probabilities are not assigned to specific outcomes. By recognizing the limits of projections and acknowledging deep uncertainty, decision makers are not restricted to preparing for

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[34] By way of comparison, according to industrial safety standards, a human can safely touch items as hot a 140°F without burning their hand, but prolonged exposure to air temperature of 140°F would lead to heat stress and ultimately be fatal.

[35] Among the various temperature ranges listed for the species in the wild, the highest is reported by Lenz (2001) as 51°C (124°F), which presumably corresponds to a one-time daily maximum temperature recorded somewhere in the species' range; this temperature is well above the average summer maximum of the hottest place in the United States, Furnace Creek in Death Valley (July average of 47°C (116°F)).

> only one outcome, and can still act in the face of climate change while retaining flexibility.

USFWS (2018) also cites two older studies in an attempt to undermine the utility of such studies as well as the feasibility of doing them with regard to Joshua trees.[36]

> Furthermore, ecological niche models are often criticized for inaccurate projections of future occurrence (Fitzpatrick and Hargrove 2009, p. 2256). This is especially true for species where current distribution data are not extensive across the species range or information about physiological thresholds is lacking, such as Joshua tree (Pearson and Dawson 2003, p. 362). Given the absence of information about the adaptive capacity of Joshua tree, in combination with gaps in the occurrence data across the species' range, the probability of spurious conclusions seemed high.

The problems with USFWS's approach are many. First, USFWS did not *itself* need to model future distribution of Joshua trees, as this has already been done my multiple researchers, with Cole et al. (2011), Barrows and Murphy-Mariscal (2012) and Sweet et al. (2019) employing the most sophisticated of such efforts. Nowhere in USFWS (2018) is there even an acknowledgement that such modeling efforts have been undertaken and reported in these studies.[37]

Second, while scenario planning may be useful in recovery planning or otherwise preparing for management responses to climate change, it has little utility in determining whether a species is "likely" to become endangered in the foreseeable future, as required by the ESA and CESA. 16 U.S.C. § 1532(20); Cal. Fish & Game Code § 2067 (ESA and CESA definitions of threatened species). In effect, USFWS (2018) is acknowledging that "[r]ather than focusing only on the most likely predictions" it instead applied a more nebulous framework that allowed it to "retain flexibility" and disregard not just the best available science, but also the plain language of the ESA.

Third, USFWS's reliance upon Pearson and Dawson (2003) and Fitzpatrick and Hargrove (2009) for it critique of ecological niche models is misplaced. The concerns raised by Pearson and Dawson (2003) and Fitzpatrick and Hargrove (2009) about the limitations of certain niche modeling efforts may be valid, but Cole et al. (2011), Barrows and Murphy-Mariscal (2012) and Sweet et al. (2019) all employed the measures raised by these earlier authors to improve the accuracy of their modeling, including, most importantly, validating their models against the current distribution of the species. Pearson and Dawson (2003) also note that information on dispersal abilities should also be included in modeling where possible, a factor clearly addressed in Cole et al. (2011).

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[36]Neither of these studies, nor Star et al. (2016), appear in the references section of USFWS (2018), indicating that they may have been added at the last-minute in an attempt to justify a legally and scientifically dubious conclusion.

[37]Elsewhere in the document, USFWS (2018) cites to Cole et al. (2011) and Barrows and Murphy-Mariscal (2012) for other aspects of Joshua tree natural history or range. Sweet et al. (2019) had not been published at the time of USFWS (2018) but was released prior to the actual listing decision being published and should have factored into the final decision.

Additionally, the primary concern of Fitzpatrick and Hargrove (2009) is that climate change and future conditions will create novel environments with new species interactions, including many invasive species. This makes predictions about future species distribution less reliable, unless they account for such factors. But these concerns are addressed by Cole et al. (2011), Barrows and Murphy-Mariscal (2012) and Sweet et al. (2019) who examined the current and past status of *Y. brevifolia* across environmental gradients (elevation and latitude) and used increasingly finer-scale species distribution and climate data to refine their model outputs. Moreover, unlike USFWS who discarded such modeling entirely, Pearson and Dawson (2003) explicitly acknowledged the utility of such models: "In many cases, bioclimate envelope models provide perhaps the best available guide for policy making at the current time." In the decade and half since this statement was published, such models have improved greatly and are even more useful for informing policy decisions.

Finally, USFWS's failure to rely upon the published species distribution models was strongly criticized by one of the peer-reviewers of the status assessment.

> [T]he assessment has not completed, and does not incorporate, a species distribution model, and thus draws invalid conclusions about future distributions under various climate change scenarios. Unfortunately, the problems are significant enough that the assessment's conclusions are not scientifically sound, and should not be used for making a decision regarding whether to list Joshua trees under the ESA (Smith 2018).

Smith (2018) noted that species distribution models are the "accepted standard" for assessing future distribution of a species, described the finding of the various modeling efforts to date, compared these to the conclusions of the status assessment, and concluded that "[g]iven that the USFW assessment has not followed the conventional standards in the field for predicting future distributions, and makes predictions that are starkly different than those drawn by other workers making comparable model assumptions, I consider the assessment's conclusions to be highly dubious." Smith (2018) concluded with the recommendation that "[f]irst and foremost, the assessment simply MUST include a formal species distribution model." (emphasis in original).

Smith (2018) also pointed out that the estimation of "suitable habitat" for Joshua trees was overstated in the status assessment.

> [T]he way that 'suitable habitat' has been defined ignores important recent work on demographic trends in Joshua trees, with the result that the potential distribution of Joshua tree under current climate conditions is vastly overestimated.

Specifically, Smith (2018) pointed out USFWS (2018) had not taken into account climate change that has already occurred when it delineated such habitat.

> In identifying the climate requirements for Joshua tree, the assessment uses the current distribution to determine suitable habitat.… There are two significant, interrelated problems with these assumptions. First, the current distribution of Joshua

> tree includes individuals who are hundreds of years old, and that became established during pre-industrial climate conditions when global average temperatures were a full degree cooler than they are today, and about 0.75 degrees cooler than the 30-year average. Indeed, it is well established that long-lived trees can persist as relict stands of moribund adults that exist outsides the range of suitable habitats required for long term population persistence.
>
> In the case of Joshua trees in particular, we have very compelling evidence that the current distribution of mature trees does not reflect the climate requirements for successful germination and seedling establishment. For example, extensive mapping studies in Joshua Tree National Park found that seedlings occur only in a fraction of the area occupied by adults, and that this area corresponds to the predicted distribution under a 2-degree warming scenario (Barrows and Murphy-Mariscal, 2012). That is, the suitable habitat for seedlings is much smaller, includes a narrower range of climates, than would be predicted based adult presence data. Although the Barrows and Murphy-Mariscal study considered only a small portion of the geographic range of Joshua trees, other workers have found similar patterns across the Joshua trees range.

Smith (2018) concluded that these errors rendered the conclusions of the assessment unreliable: "I consider the current assessment to not be based on the best available science, and its conclusion have no valid scientific basis." USFWS did not address either of the primary problems identified by Smith (2018) when it finalized the status assessment.

In sum, USFWS's determination to not protect Joshua trees under the ESA should not, and legally cannot, be a basis to fail to protect *Y. brevifolia* under CESA.

9 The Western Joshua Tree Warrants Listing under CESA.

As detailed above, in conformance with the requirements of Cal. Code Regs., tit. 14, § 670.1, this petition presents scientific information regarding the western Joshua tree's life history, population trend, range, distribution, abundance, kind of habitat necessary for survival, factors affecting the ability to survive and reproduce, degree and immediacy of threat, impact of existing management efforts, suggestions for future management, availability of sources and information, and detailed distribution maps.[38]

That information clearly demonstrates that the western Joshua tree (*Yucca brevifolia*) is eligible for and warrants listing under CESA based on the factors specified in the statute and implementing regulations. While *Y. brevifolia* is not at imminent risk of extinction, it still faces significant and growing threats, primarily from climate change, that ultimately threaten the viability of the species in all or a significant portion of its range in California in the foreseeable future; it consequently meets the definition of a "threatened species."

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[38] Information on suggestions for future management and availability of sources and information are contained in the Management Recommendations and References sections *infra*.

Under CESA, a "threatened species" is "a native species or subspecies of a … plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts . . . ." Cal. Fish & Game Code § 2067. A plant is an "endangered species" when it is "in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease." Cal. Fish & Game § 2062.

Moreover, CDFW has concluded—and appellate courts have upheld—that when determining whether a species is threatened or endangered under CESA, the term "range" is construed to refer to the range of a species or subspecies *within* California, not the worldwide range of the species or subspecies. *California Forestry Assn. v. California Fish & Game Com.* (2007) 156 Cal.App.4th 1535, 1550-551. This means that regardless of how *Y. brevifolia* may fair in Nevada, the Commission and CDFW can only consider the status and fate of the species in California.

Additionally, in determining the foreseeable future in the context of climate change, CDFW has treated the rest of the century as foreseeable.

> In considering what the 'foreseeable' future is for climate change effects, the Department relied on climate change projections to the end of the 21st century, as described by the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007). The IPCC models and projections have been thoroughly vetted and validated in the series of Assessment Reports produced over the past 12 years. The Department considers the climate change projections to be the best available information on global climate change (Bonham 2013).

As discussed in the climate sections above, absent rapid and substantial reductions in greenhouse gas emissions, the best available science demonstrates that by the end of this century *Y. brevifolia* will be extirpated from, at a minimum, a significant portion of its range in California. Any places it remains will be in small, isolated refugia. These areas, if any, will likely be populated with low numbers of non-reproductive adult trees, themselves threatened by fire. At such point, if not already extirpated from the state, the species will certainly be "in serious danger of becoming extinct throughout all, or a significant portion, of its range" in California and be an "endangered species." Consequently, it is a "threatened species" today.

In the event the Commission determines that full-species taxonomy for the western Joshua tree is not sufficiently established, petitioners request listing of the taxa as a subspecies/variety *Yucca brevifolia brevifolia*. Additionally, while petitioners believe that the western Joshua tree warrants protection under CESA throughout its range in California, if the Commission determines that it does not warrant range-wide listing, the Commission must assess whether either of the two population clusters of the species, YUBR North and YUBR South separately warrant listing as ecologically significant units (ESUs).

The Commission and CDFW have long recognized that ESUs can be designated and listed under CESA, and this interpretation of CESA has been upheld by the courts. *See California*

Forestry Assn. v. California Fish & Game Com. (2007) 156 Cal.App.4th 1535, 1540 ("Consistent with the policy of the CESA, we will hold that the term 'species or subspecies' includes evolutionarily significant units"); *Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1197, fn. 4 ["*CCFA II*"] ("An ESU is included within the term 'species or subspecies' in sections 2062 and 2067."). While the ESU concept has primarily been applied to fish, the Commission recently listed an ESU of a mammal, the Pacific Fisher, as a "threatened species." *See* 14 C.C.R. 670.5(b)(6)(J) ("Fisher (*Pekania pennant*) Southern Sierra Nevada Evolutionarily Significant Unit"). Moreover, unlike the federal ESA, where listing of distinct populations segments (DPSs), of which ESUs are subcategory, is restricted to vertebrate species (16 U.S.C. § 1532(16) (definition of "species"), the ESU concept under CESA has no such limitation and applies to all listable taxa, including plants.

The populations currently delineated as YUBR North and YUBR South have been recognized for over 40 years and recently confirmed by USFWS (2018).

> Rowlands (1978, p. 72) subdivided the Joshua tree range into five regions based on differences in geographic distribution, varieties (i.e., species in this SSA), vegetation, and temperature and rainfall amounts. Based on these regions and more current distribution models (Cole *et al*. 2011, pp. 139–140), we delineated two populations of *Yucca brevifolia* [*Y. brevifolia* south (YUBR South) and *Y. brevifolia* north (YUBR North)], and three populations of *Y. jaegeriana* [*Y. jaegeriana* central (YUJA Central), *Y. jaegeriana* north (YUJA North), and *Y. jaegeriana* east (YUJA East)]. We added a sixth population, the Hybrid Zone in Tikaboo Valley, to distinguish the geographic area where both species, and their pollinators, come into contact between YUBR North and YUJA North.

The two *Y. brevifolia* populations are separated by a small gap in their range, with the northern edge of YUBR South reaching the southern parts of China Lake and the southern boundary of YUBR North reaching the northern edge of the base (Figure 8). USFWS (2018) characterizes YUBR North habitats as "somewhat drier and less diverse than YUBR South," with the lower elevations of YUBR South comprised of mostly creosote bush shrubland, while YUBR North associated vegetation including single-leaf pinyon, juniper, and sagebrush. At its simplest, YUBR South occurs mostly in the creosote dominated Western Mojave while YUBR North occurs in the area where the Northern Mojave transitions to the Great Basin and sagebrush becomes more dominant. This significant difference in habitat between the two population is sufficient to recognize them as ESUs for separate evaluation in the event full species listing is ultimately not deemed warranted by the Commission.

10 Recommended Management and Recovery Actions

For all species imperiled due to the impending loss of their suitable habitat as a result of climate change, the most important recovery actions are those that lead to rapid and steep greenhouse gas emissions reductions so as to minimize the additional warming that will occur in the climate system. However, given inertia in both the climate system and society, significant additional warming is unavoidable even under the most optimistic climate scenarios. Species that are already showing the effects of warming will continue to suffer and decline. For many narrowly-endemic species with limited dispersal capabilities we will soon reach a point where little else can be done other than ex situ conservation in captivity and/or via assisted migration. It is hard to be optimistic about the fate of such species, as they will likely be lost from the wild even under more moderate warming scenarios.

While the threats facing *Y. brevifolia* in the coming decades are dire, unlike more narrowly-endemic species, the species has the benefit of being long-lived, with a relatively large current distribution spread across elevational and latitudinal gradients, much of which is in protected areas. Consequently, if the species and its habitat are protected early from other threats, and with active management to enhance recruitment and survival, and potentially dispersal, the western Joshua tree has a realistic chance of persisting in the wild. In this context, recommendations for the management and recovery of the western Joshua tree are as follows:

1. The governor declares a climate emergency and takes all necessary action to set California on a path to full decarbonization of our economy by no later than 2045 (e.g. banning the sale of new fossil fuel vehicles by 2030 and requiring the generation of all electricity from carbon-free sources by 2030).
2. CDFW prepares a recovery plan for *Y. brevifolia* pursuant to Cal. Fish & Game Code § 2079.1.
3. CDFW works with local jurisdictions within the range of *Y. brevifolia* to develop NCCPs that protect from development all high-density Joshua tree habitat remaining on private lands.
4. The California Department of Parks and Recreation develops and implements management plans (including fire management plans) focused on Joshua tree protection for state park units within the range of *Y. brevifolia* (Red Rock Canyon State Park and Eastern Kern County Onyx Ranch State Vehicular Recreation Area in Kern County and Saddleback Butte State Park, Arthur B. Ripley Desert Woodland State Park and Antelope Valley California Poppy Reserve in Los Angeles County).
5. The California Department of Parks and Recreation seeks to acquire habitat to expand and connect existing state parks for protection and restoration of Joshua tree habitat.
6. CDFW expands its cooperative work with relevant federal agencies (NPS, DoD, BLM, USFWS) to better protect Joshua trees on federal land.
7. CDFW works with the University of California, California Invasive Plants Council and other institutions and agencies to develop effective measures to control the spread of invasive grasses in *Y. brevifolia* habitat.
8. CDFW works with CAL-FIRE to develop protocols for fire suppression activities within the range of *Y. brevifolia* that maximize protection of the species, while minimizing ground disturbance that may foster the spread of non-native grasses and other invasive species.
9. CDFW works with relevant entities to establish and maintain a seed bank of *Y. brevifolia* collected throughout the range of the species to ensure protection of its genetic diversity.
10. CDFW works with relevant entities to identify potential sites for assisted migration and develop protocols for carrying out such activities.

11 Conclusion

The Joshua tree has long been the most iconic species of the Mojave Desert. Given the well-publicized threats facing the species in the face of climate change, it has recently become an emblem of our society's failure to address the climate crisis. But the Joshua tree is also uniquely situated to become an example of successful action to save a species threatened by climate change. Action taken in and by California to save the species can serve as a model for proactive climate adaptation efforts not just in California but around the world. Listing the species under CESA is not just a symbolically important act of California recognizing the threats the species faces from climate change, but also can serve as the impetus for meaningful management actions that can help ensure the species remains a living icon in perpetuity.

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Copies of references cited in the petition are either linked to websites below or included as files on a disk accompanying a hard copy of the petition sent to the Commission.

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State of California
Department of Fish and Wildlife

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M e m o r a n d u m

Date: March 11, 2020

To: Melissa Miller-Henson
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: Initial Evaluation of the Petition to List Western Joshua Tree (*Yucca brevifolia*) as Threatened under the California Endangered Species Act

The Department of Fish and Wildlife (Department) has completed its initial evaluation of the Petition to list western Joshua tree (*Yucca brevifolia*) as a threatened species under the California Endangered Species Act, Fish and Game Code section 2050 et seq. The Fish and Game Commission (Commission) received the Petition from Brendan Cummings of the Center for Biological Diversity on October 21, 2019. Pursuant to Fish and Game Code section 2073, the Commission referred the Petition to the Department on November 1, 2019. On December 11, 2019, the Commission officially received the Petition and approved a Department request for a 30-day extension to further analyze the Petition and complete its evaluation report in accordance with Fish and Game Code section 2073.5, subdivision (b).

The Department completed the attached Petition evaluation report as required by Fish and Game Code section 2073.5. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).) The Department's evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the available scientific information regarding each of the Petition components, and incorporates additional relevant information that the Department possessed or received during the review period. Based upon the information contained in the Petition and other relevant information in the Department's possession, the Department has determined that there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted. The Department recommends that the Petition be accepted and considered.

If you have questions or need additional information, please contact Chad Dibble, Deputy Director, Ecosystem Conservation Division at (916) 653-6956 or by email at Chad.Dibble@wildlife.ca.gov.

Attachment

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State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF A PETITION FROM THE CENTER FOR BIOLOGICAL DIVERSITY TO LIST WESTERN JOSHUA TREE (*YUCCA BREVIFOLIA*) AS THREATENED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

Photo of *Yucca brevifolia* by Jeb McKay Bjerke

Prepared by
California Department of Fish and Wildlife

February 2020

I. EXECUTIVE SUMMARY

The Center for Biological Diversity (Petitioner) submitted a petition (Petition) to the Fish and Game Commission (Commission) to list the western Joshua tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act (CESA). The Commission referred the Petition to the Department of Fish and Wildlife (Department) and the Department prepared this evaluation report (Petition Evaluation) to assess the scientific information discussed and cited in the Petition in relation to other relevant and available scientific information possessed or received by the Department during the evaluation period.

Western Joshua trees are evergreen tree-like plants that occur on flats and slopes in the Mojave Desert. The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend; nevertheless, the Petition does provide information showing that some populations of western Joshua tree are declining, particularly within Joshua Tree National Park. Although a reliable estimate of western Joshua tree population size is not available, information available to the Department indicates that western Joshua tree is currently relatively abundant. Western Joshua tree likely relies on particular temperature and precipitation ranges, which in turn restricts the range of the species, and the habitat suitable for its survival. The Petition provides a significant amount of scientific information on factors affecting the ability of western Joshua tree to survive and reproduce. The Petition states that climate change is the greatest threat to the continued existence of western Joshua tree, with wildfires, invasive species, habitat loss due to human development, and predation as additional contributing factors that collectively threaten the continued viability of the species. Information in the Petition suggests that western Joshua tree is already being affected by threats, and these threats are likely to intensify significantly by the end of the century. The Petition describes the limitations of existing regulatory mechanisms as they relate to the factors affecting the ability of western Joshua tree to survive and reproduce.

After reviewing the Petition and other relevant information, the Department determined that the Petition contains sufficient information on population trend, range, distribution, abundance, life history, kind of habitat necessary for survival, factors affecting the ability to survive and reproduce, degree and immediacy of threat, impact of existing management efforts, suggestions for future management, and availability and sources of information, and also includes a detailed distribution map.

In completing its Petition Evaluation, the Department has determined the Petition provides sufficient scientific information to indicate that the petitioned action may be warranted for western Joshua tree. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

II. INTRODUCTION

A. Candidacy Evaluation

The Commission has the authority to list certain "species" or "subspecies" as threatened or endangered under CESA. (Fish & G. Code, §§ 2062, 2067, and 2070.) The listing process is the same for species and subspecies. (Fish & G. Code, §§ 2070-2079.1.)

CESA sets forth a two-step process for listing a species as threatened or endangered. First, the Commission determines whether to designate a species as a candidate for listing by evaluating whether the petition provides "sufficient information to indicate that the petitioned action may be warranted." (Fish & G. Code, § 2074.2, subd. (e)(2).) If the petition is accepted for consideration, the second step requires the Department to produce, within 12 months of the Commission's acceptance of the petition, a peer reviewed report based upon the best scientific information available that indicates whether the petitioned action is warranted. (Fish & G. Code, § 2074.6.) Finally, the Commission, based on that report and other information in the administrative record, determines whether the petitioned action to list the species as threatened or endangered is warranted. (Fish & G. Code, § 2075.5.)

A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant." (Fish & G. Code, § 2072.3; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1).) The range of a species for the Department's petition evaluation and recommendation is the species' California range. (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal.App.4th 1535, 1551.)

Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation. (Fish & G. Code, § 2073.) The Commission must also publish notice of receipt of the petition in the California Regulatory Notice Register. (Fish & G. Code, § 2073.3.) Within 90 days of receipt of the petition (or 120 days if the Commission grants an extension), the Department must evaluate the petition on its face and in relation to other relevant information and submit to the Commission a written evaluation report with one of the following recommendations:

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or

- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

(Fish & G. Code, § 2073.5, subds. (a)-(b).) The Department's candidacy recommendation to the Commission is based on an evaluation of whether the petition provides sufficient scientific information relevant to the petition components set forth in Fish and Game Code Section 2072.3 and the California Code of Regulations, Title 14, Section 670.1, subdivision (d)(1).

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission's determination of whether a petitioned action should be accepted for consideration pursuant to Fish and Game Code Section 2074.2, subdivision (e), resulting in the species being listed as a candidate species. The court began its discussion by describing the standard for accepting a petition for consideration previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104:

> As we explained in *Natural Resources Defense Council*, "the term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not.

(*Center for Biological Diversity*, *supra*, 166 Cal.App.4th at pp. 609-10 [internal citations omitted].) The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record." (*Id.* at p. 611.) However, the court clarified:

> [T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after

> the requisite review of the status of the species by the Department under [Fish and Game Code] section 2074.6.

(*Ibid*.)

CESA defines the “species” eligible for listing to include “species or subspecies” (Fish and G. Code, §§ 2062, 2067, and 2068), and courts have held that the term “species or subspecies” includes “evolutionarily significant units.” (*Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1236, *citing Cal. Forestry Assn.*, *supra*, 156 Cal.App.4th at pp. 1542 and 1549.)

B. Petition History

Recent studies separate Joshua tree into two groups: western Joshua tree (*Yucca brevifolia* or *Yucca brevifolia* var. *brevifolia*) and eastern Joshua tree (*Yucca jaegerana* or *Yucca brevifolia* var. *jaegerana*). Both western Joshua tree and eastern Joshua tree were considered for listing under the federal Endangered Species Act (ESA), but on August 15, 2019, the U.S. Fish and Wildlife Service (USFWS) found that listing of the Joshua tree as a threatened or endangered species was not warranted (USFWS 2019).

On October 21, 2019, the Commission received a Petition to list any of the following as threatened under CESA: (1) the western Joshua tree (*Yucca brevifolia*) throughout its California range; or, in the event the Commission determines that listing of *Yucca brevifolia* throughout its California range is not warranted, (2) the western Joshua tree population within the northern part of western Joshua tree’s California range (YUBR North), or (3) the western Joshua tree population within the southern part of western Joshua tree’s California range (YUBR South). On November 1, 2019, the Commission referred the Petition to the Department for evaluation. At its meeting on December 11, 2019, the Commission officially received the Petition and approved a request from the Department for a 30-day extension to further analyze the Petition and complete its Petition Evaluation pursuant to Fish and Game Code Section 2073.5, subdivision (b).

The Department evaluated the scientific information presented in the Petition as well as other relevant information the Department possessed at the time of review. The Department received information from two people during the petition evaluation period pursuant to Fish and Game Code Section 2073.4. This Petition Evaluation includes copies of this information as Appendix 1, pursuant to Fish and Game Code Section 2073.5, subdivision (c). Pursuant to Fish and Game Code Section 2072.3 and Section 670.1, subdivision (d)(1), of Title 14 of the California Code of Regulations, the Department evaluated whether the Petition included sufficient scientific information regarding each of the following petition components to indicate that the petitioned action may be warranted:

- Population trend;
- Range;
- Distribution;
- Abundance;
- Life history;
- Kind of habitat necessary for survival;
- Factors affecting the ability to survive and reproduce;
- Degree and immediacy of threat;
- Impact of existing management efforts;
- Suggestions for future management;
- Availability and sources of information; and
- A detailed distribution map.

C. Overview of Western Joshua Tree Ecology

Western Joshua trees are evergreen, tree-like plants that have recently been treated as members of the asparagus family (Asparagaceae) (APG 2016, ITIS 2019). Western Joshua trees typically have a 5 to 15 meter (m) (16 to 50 feet (ft)) main stem with extensive branching on older plants. The tallest known western Joshua tree was 25 m (82 ft) tall, although trees exceeding 10 m (33 ft) are rare (Gucker 2006, Cummings 2019). Western Joshua tree is found in many different plant communities occurring on flats and slopes in the Mojave Desert at elevations between 400 and 2200 m (1300 to 7200 ft) (Turner 1982, Hess 2012, USFWS 2018, CNPS 2019). Lenz (2001) reports that Joshua tree plants tolerate temperatures of -25°C to 51°C (-13°F to 124°F) and annual precipitation ranges of 98 to 268 mm (3.9 to 10.6 inches (in)).

Western Joshua trees are capable of both sexual reproduction, and asexual reproduction via growth of rhizomes, branch sprouts, and/or basal sprouts. Significant examples of western Joshua tree asexual reproduction have been observed, with some clumps of plants being entirely clonal (Gucker 2006, DeFalco et al. 2010, Harrower and Gilbert 2018).

Western Joshua trees can reproduce sexually resulting in seed production. Flowering of western Joshua trees is considered episodic and rare, generally only occurring in wetter years (Gucker 2006). Flowers of Joshua trees are exclusively pollinated by specialized yucca moths (Trelease 1893, Pellmyr 2003, Pellmyr and Segraves 2003, Godsoe et al. 2008). In California, western Joshua tree is pollinated by one species of moth, *Tegeticula synthetica*. Female moths transfer pollen between western Joshua tree flowers in specialized mouthparts, inject eggs into the floral ovaries using a bladelike ovipositor, and then actively apply pollen to the stigmatic surface to fertilize the flower (Trelease 1892, Pellmyr 2003). As a western Joshua tree flower develops into a fruit, the moth eggs hatch and emerging larvae eat a portion of the developing seeds. These moths are the sole pollinators of western Joshua trees in California, and in turn, Joshua tree seeds are the only food source for these moths (Pellmyr and Segraves 2003, Yoder et al. 2013). This relationship represents an obligate mutualism, where each species relies on the other for survival of its own species. Western Joshua tree relies on the yucca moth for pollination, but in turn has to sacrifice some seeds to the developing moth larvae.

Once pollinated, fruits form in early summer and seeds are mature in mid-summer (Waitman et al. 2012). Mature fruits contain 30 to 50 black seeds, which are flat to thickened with a smooth to shallowly bumpy surface.

Western Joshua tree seeds germinate readily in laboratory conditions and do not require any pretreatment (Wallace and Romney 1972, Alexander et al. 2008, Reynolds et al. 2012, Waitman et al. 2012). Seeds do not appear to be long-lived in the soil and are therefore unlikely to form a soil seed bank (Reynolds et al. 2012). Joshua tree seeds are harvested by rodents directly from fruits in the tree canopy and gathered quickly from the ground, and these seeds have been found in caches up to 57 m (190 ft) away from the source plant (Vander Wall et al. 2006, Waitman et al. 2012). Seeds that have been buried in soil have a much greater chance of establishing seedlings than those left on the soil surface, but seed caches are also consumed and moved to different caches by rodents; therefore Joshua tree and dispersing rodents may form a mutualism (Vander Wall et al. 2006, Reynolds et al. 2012, Waitman et al. 2012). Western Joshua tree seedling emergence was most successful for seeds planted one centimeter (cm) (0.4 in) deep (Waitman et al. 2012), and the greatest seedling emergence occurs during spring and summer, when increased soil moisture is accompanied by warm soil temperatures (Reynolds et al. 2012).

It can take many years for western Joshua tree seedlings to reach reproductive maturity. Esque et al. (2015) monitored a cohort of 53 western Joshua tree seedlings beginning in May of 1989, and found that ten of them (19 percent) were still living after 22 years, with an average height of 100 cm (39 in), but these ten plants had yet to reproduce. Growth rates appear to be dependent on factors including age, precipitation, presence of nearby plants that help seedlings establish, temperature and (at least in the laboratory) photoperiod (Gucker 2006).

III. SUFFICIENCY OF SCIENTIFIC INFORMATION TO INDICATE THE PETITIONED ACTION FOR WESTERN JOSHUA TREE MAY BE WARRANTED

The Petition components are evaluated below, pursuant to Fish and Game Code Section 2072.3 and Section 670.1, subdivision (d)(1), of Title 14 of the California Code of Regulations.

A. Population Trend

1. Scientific Information in the Petition

The Petition discusses population trends for western Joshua tree on pages 19 and 20 under the heading “Abundance and Population Trends”.

The Petition acknowledges that a reliable estimate of western Joshua tree population size is not available and that no range-wide population trends have been documented. The Petition therefore relies on studies indicating that western Joshua tree density is negatively correlated with increasing temperature, the species range is contracting at lower elevations, recruitment is limited, and plant mortality is increasing.

The Petition cites a study by DeFalco et al. (2010) that examined the mortality of western Joshua tree across several study sites five years after a fire in Joshua Tree National Park burned nearly 5700 hectares (22 square miles (mi^2)) in May 1999. The study found that approximately 80 percent of western Joshua trees that were burned by the fire died by 2004, and approximately 26 percent of the unburned trees died as well, with drought a likely contributing factor.

The Petition cites a study by Harrower and Gilbert (2018) that found strong positive relationships between western Joshua tree abundance, size, abundance of its pollinating moth, and reproductive success at Joshua Tree National Park. The study found that peak performance of both western Joshua tree and its pollinating moth occurs at intermediate elevations of approximately 1200 to 1400 m (4,000 to 4,600 ft). The study also found that the proportion of infertile western Joshua tree seeds increased at the margins of its range in Joshua Tree National Park, with the observation that Joshua trees appear to be dying back at low elevations, but do not appear to be expanding their range into higher elevations.

The Petition cites a study by St. Clair and Hoines (2018) that found a positive relationship between temperature and greater production of western Joshua tree flowers and seeds, but a negative relationship between temperature and western Joshua tree stand density, which suggests that there may be constraints of warmer temperatures on western Joshua tree establishment success.

The Petition also cites studies summarized by Cornett (2014) that describe declining western Joshua tree populations at three study sites in Joshua Tree National Park over an approximately 20-year period.

2. Other Relevant Scientific Information

The Department received additional information on western Joshua tree population trend during the Petition Evaluation period pursuant to Fish and Game Code Section

2073.4. The Department received two reports on western Joshua tree populations at Edwards Air Force Base. One of these reports describes a geographic information system (GIS) based analysis that was conducted to determine population trends for western Joshua tree at Edwards Air Force Base between 1992 and 2015 (USAF 2017a). The report suggests that western Joshua tree populations on the base were stable to increasing; however, the report describes several issues that increase the uncertainty of the results. The second report describes a GIS analysis, literature review, and field survey conducted of a 1999 fire area on Edwards Air Force Base to evaluate western Joshua tree survivorship and/or regeneration (USAF 2017a). The report used aerial photography taken in 1992 to count all identifiable western Joshua trees present in two areas prior to the 1999 fire and compared this information with the results of a 2017 field survey that identified all western Joshua trees in these same two areas. This report concludes that Joshua tree populations were stable in the sampled areas of the fire area from 1992 to 2017.

3. Conclusion

The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend; nevertheless, the Petition does provide information showing that some populations of western Joshua tree are declining, particularly within Joshua Tree National Park. The Petition provides sufficient information on the population trend of western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

B. Geographic Range

1. Scientific Information in the Petition

The Petition discusses the geographic range of western Joshua tree on pages 16 through 19, under the heading “Current and Historical Distribution”. The Petition extensively cites the range information summarized in the Joshua Tree Status Assessment prepared by the USFWS (2018).

As described in Section II(B) of this Petition Evaluation, recent studies separate Joshua tree into two groups: western Joshua tree (*Yucca brevifolia* or *Yucca brevifolia* var. *brevifolia*) and eastern Joshua tree (*Yucca jaegerana* or *Yucca brevifolia* var. *jaegerana*). Western Joshua tree and eastern Joshua tree are distinguished by genetic and morphological differences, and by different yucca moth pollinators. Considered collectively, the Petition describes the range of western Joshua tree and eastern Joshua tree as extending from northwestern Arizona to southwestern Utah, and west to southern Nevada and southeastern California at elevations between 600 and 2200 m (2000 to 7200 ft) and between 34° to 38° latitude. The ranges of both western Joshua tree, eastern Joshua tree, and populations of those two species are presented in the

Petition on page 17 as Figure 8. Western Joshua tree is described as comprising two geographically separate populations named YUBR South and YUBR North in the Petition, and the map showing these populations has been duplicated as Figure 1.

The Petition describes western Joshua tree as occurring almost exclusively in the Mojave Desert in unevenly distributed populations, with a small portion of its northern extent occurring within the Great Basin Desert. The southern extent of western Joshua tree's range is in the Little San Bernardino Mountains of Joshua Tree National Park, and the northern extent of its range is near Alkali, Nevada. The western extent is near the Hungry Valley State Vehicular Recreation Area near Gorman, California. The eastern extent of its range is in Tikaboo Valley, Nevada, where the species co-occurs with eastern Joshua tree (USFWS 2018).

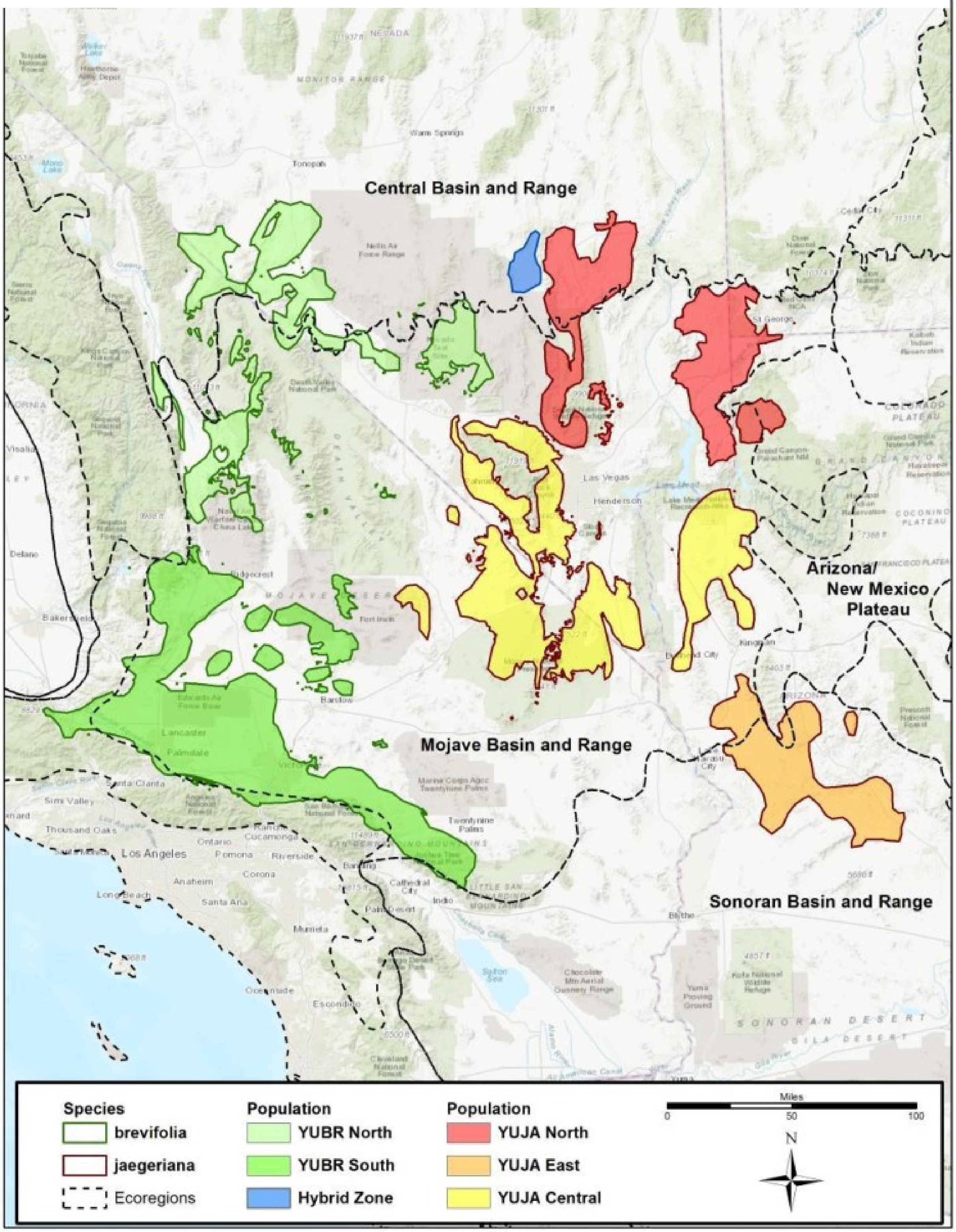
The Petition cites a study by Cole et al. (2011) that compiled locations and ages of late Pleistocene (22,000 to 13,000 years ago) Joshua trees from fossil packrat (*Neotoma* spp.) waste piles and Shasta ground sloth (*Nothrotheriops shastensis*) dung, and compared them with the current Joshua tree distribution. The study shows that as the climate rapidly warmed 11,700 years ago, the range of Joshua tree contracted, leaving only the populations near what had been its northernmost limit. Climate models for the next 60 to 90 years project a climate warming of a similar pace and magnitude to that which occurred in the early Holocene, approximately 11,700 years ago. The Cole et al. (2011) study includes models that project the future elimination of Joshua tree throughout most of the southern portions of its current range, with only a few populations within the current range predicted to be sustainable. Several models also project significant potential future expansion into new areas to the north and east of its current range and outside of California, but the species' historical and current rates of dispersal may conceivably prevent natural expansion into these new areas.

The Petition also cites a study by Holmgren et al. (2010) that examines the long-term vegetation history of Joshua Tree National Park via examination of fossil plants found in animal waste piles. Joshua tree is identified as a species that arrived fairly early in Joshua Tree National Park, about 13,880 years ago, and was stable in the Park throughout the Holocene (approximately 11,700 years ago to present).

2. Other Relevant Scientific Information

The Department possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree generally occurs (Thomas 2002, Agri Chemical and Supply Inc. 2008, CDFW and USGS 2014, CDFW and Chico State University 2015, CDFW et al. 2017, CDFW and AIS 2019a, 2019b, and 2019c, CDFW 2019, NPS 2019). The *Yucca brevifolia* vegetation alliance is mapped with an approximate accuracy of 95

Figure 1: Current Distribution of Western Joshua Tree (USFWS 2018)



percent in the vegetation maps related to the Desert Renewable Energy Conservation Plan, and these maps also denote the cover of Joshua tree canopy in all vegetation polygons by cover class (0, >0-1%, >1-5%, and >5%) (VegCAMP 2013). Vegetation maps in the Department's possession may contribute to a relatively high-resolution western Joshua tree distribution map in many areas of California. These vegetation maps are likely to improve the current understanding of western Joshua tree's range.

3. Conclusion

The Petition provides sufficient information on the geographic range of western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

C. Distribution

1. Scientific Information in the Petition

The Petition discusses the distribution of western Joshua tree on pages 16 through 19, under the heading "Current and Historical Distribution". The Petition primarily relies on distribution information summarized in the Joshua Tree Status Assessment prepared by the USFWS (2018). The Petition describes western Joshua tree as comprising two geographically separate populations named YUBR South and YUBR North.

YUBR South is described as being entirely within California, and extending from Joshua Tree National Park, north to near Ridgecrest in Kern County. YUBR South is located on alluvial plains, fans, and bajadas of the major valleys lying between scattered mountain ranges. The elevation range of the YUBA South population is between 750 and 2200 m (2500 to 7200 ft), with creosote bush (*Larrea tridentata*) shrubland as the primary vegetation type. USFWS (2018) estimates that 3,255,088 acres within the YUBR South population distribution area are suitable for Joshua trees based on soils and other habitat factors; however, western Joshua trees have a patchy and disjunct distribution and do not occupy this entire area. Just over 50 percent of the YUBR South population is on private land, 48 percent is on federal land, and just under 2 percent is under state, county, or local ownership.

The YUBR North population occurs in the area north of Inyokern in Kern County, along the west and north margins of Death Valley, to Goldfield, Nevada, and east to the Nevada National Security Site (formerly the Nevada Test Site). The elevation range of western Joshua tree in the YUBR North population is between 1500 and 2200 m (4900 to 7200 ft), and the vegetation occurring nearby this higher and cooler population often includes singleleaf pinyon pine (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), and big sagebrush (*Artemisia tridentata*) (USFWS 2018). The YUBR North population is about evenly split between California and Nevada. USFWS (2018) estimates that approximately 1,941,701 acres of the distribution area of the YUBR North population is suitable for western Joshua tree, and approximately 96 percent of the YUBR North population is on federal land (USFWS 2018).

2. Other Relevant Scientific Information

As described in Section III(B)(2) of this Petition Evaluation, the Department possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree occurs, and these maps may contribute to a relatively high-resolution western Joshua tree distribution map in many areas of California. These vegetation maps are likely to improve the current understanding of western Joshua tree's distribution.

3. Conclusion

The Petition provides sufficient information on the distribution of western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

D. Abundance

1. Scientific Information in the Petition

The Petition discusses the abundance of western Joshua tree on pages 19 and 20 under the heading "Abundance and Population Trends". The Petition states that western Joshua tree has a patchy distribution and a variable population density of 4 to 840 trees per acre (10 to 2,070 trees per hectare) and cites USFWS (2018). The discussion of western Joshua tree's "Current and Historical Distribution" on pages 16 through 19 of the Petition includes information demonstrating that western Joshua tree currently has a relatively widespread distribution in southern California. The Petition acknowledges that a reliable estimate of western Joshua tree population size is not available.

2. Other Relevant Scientific Information

As described in Section III(B)(2) of this Petition Evaluation, the Department possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree occurs. It may be possible to use cover estimates from these maps as a rough proxy for western Joshua tree abundance; however, the Department does not possess this information for the entire western Joshua tree distribution in California. The range, distribution, and density information available to the Department indicates that the abundance of western Joshua tree is currently relatively high.

3. Conclusion

The Petition acknowledges that a reliable estimate of western Joshua tree population size is not available; however, information available to the Department indicates that the abundance of western Joshua tree is currently relatively high. The Petition provides sufficient information on the abundance of western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

E. Life History

1. Scientific Information in the Petition

The Petition discusses the life history of western Joshua tree on pages 3 through 15 under the heading “Life History”. The Petition describes several aspects of western Joshua tree life history, including asexual reproduction, flowering, pollination, seed production, seed predation, seed dispersal, seed germination, and plant growth. In describing these aspects of western Joshua tree life history, the Petition cites several scientific studies and sources.

The Petition describes the ability of western Joshua tree to reproduce via asexual growth of rhizomes, branch sprouts, and/or basal sprouts. In discussing asexual reproduction, the Petition cites Webber (1953), Gucker (2006), DeFalco et al. (2010), and Harrower and Gilbert (2018).

The Petition describes the episodic and rare nature of western Joshua tree flowering events and the seasonal timing of flower production, and cites Gucker (2006), Hess (2012), Waitman et al. (2012), Esque et al. (2015), Cornett (2018), and Harrower and Gilbert (2018).

The Petition describes the obligate pollination mutualism between western Joshua tree and its specialized pollinating moth, *Tegeticula synthetica*, as well as the pollination mutualism between eastern Joshua tree and its pollinating moth, *Tegeticula antithetica*. The Petition also describes the narrow region in Nevada where western Joshua tree and eastern Joshua tree are sympatric and hybridize. The Petition describes the influence that two species of pollinating moth likely had on the morphological divergence of western Joshua tree and eastern Joshua tree. The Petition describes the formation and structure of western Joshua tree fruits. In discussing pollination and seed production, the Petition cites Pellmyr and Segraves (2003), Althoff et al. (2004), Gucker (2006), Godsoe et al. (2008), Smith et al. (2008a, 2008b), Smith et al. (2009), Waitman et al. (2012), Starr et al. (2013), Yoder et al. (2013), and Cole et al. (2017).

2. Conclusion

The Petition provides sufficient information on western Joshua tree life history for the Department to make the recommendation in Section IV of this Petition Evaluation.

F. Kind of Habitat Necessary for Survival

1. Scientific Information in the Petition

The Petition discusses the kind of habitat necessary for western Joshua tree survival on pages 14 and 15 under the heading "Habitat Requirements".

The Petition describes Joshua trees as occurring in desert grasslands and shrublands in hot, dry sites on flats, mesas, bajadas, and gentle slopes in the Mojave Desert. Soils in Joshua tree habitats are described as silts, loams, and/or sands, variously described as fine, loose, well drained, and/or gravelly. The Petition describes temperature and precipitation ranges that have been reported for western Joshua tree, and states that these attributes are likely prime constraints on suitable habitat for the species and the species' range. The Petition states that Joshua trees can be found in many different plant alliances throughout their range, and although they may not be limited by particular plant associations, Joshua trees require the presence of their obligate pollinator, rodents, to disperse and cache seeds, and nearby plants to shelter emerging seedlings for successful reproduction and recruitment.

In discussing the kind of habitat necessary for western Joshua tree survival, the Petition cites Went (1957), Turner (1982), Lenz (2001), Gucker (2006), Cole et al. (2011), Harrower and Gilbert (2018), and USFWS (2018).

2. Conclusion

The Petition provides sufficient information to support the conclusion that temperature and precipitation are likely critical for western Joshua tree survival and are likely prime constraints on suitable habitat for the species and the species' range. The Petition provides sufficient information on the kind of habitat necessary for western Joshua tree survival for the Department to make the recommendation in Section IV of this Petition Evaluation.

G. Factors Affecting the Ability to Survive and Reproduce

1. Scientific Information in the Petition

The Petition discusses factors affecting the ability of western Joshua tree to survive and reproduce on pages 20 through 48 under the heading "Factors Affecting Ability to Survive and Reproduce". The Petition identifies predation, invasive species, wildfires, climate change, and habitat loss to human development as the factors affecting the ability of western Joshua tree to survive and reproduce, stating that these factors are often related, synergistic, and collectively threaten the continued viability of the species. The information presented in the Petition for each of these factors is discussed separately below.

Predation

The Petition provides information on various impacts to western Joshua tree from predation and herbivory. Before dispersal, the larvae of the moth *Tegeticula synthetica* eat a portion of western Joshua tree's seeds. The Petition states that rodents cache and consume the vast majority of western Joshua tree seeds, with fewer than one percent of seeds germinating. Cattle have been observed grazing on the inflorescences of small western Joshua trees, and herbivory by black-tailed jackrabbits (*Lepus californicus*), pocket gophers (*Thomomys bottae*), white-tailed antelope squirrels (*Ammospermophilus leucurus*), and woodrats (*Neotoma* sp.) has been observed, which in some instances results in mortality of pre-reproductive plants. The Petition states that drought and fire result in increased herbivory on seedlings and pre-reproductive Joshua trees. The Petition acknowledges that predation alone is likely not presently a threat to western Joshua tree persistence, but the impact will be more significant as wildfire and drought frequency and intensity increase in the coming decades.

In discussing predation as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Keeley et al. (1985), Vander Wall et al. (2006), DeFalco et al. (2010), Cole et al. (2011), Waitman et al. (2012), Borchert and DeFalco (2016), Esque et al. (2015), and Lybbert and St. Clair (2017).

Invasive Species

The Petition provides information on impacts to western Joshua tree from invasive species. Invasive plant species are widely established in the Mojave Desert throughout the range of western Joshua tree, and represent a large percentage of the biomass on the landscape. The abundance of invasive plant species in the Mojave Desert is positively correlated with disturbances such as livestock grazing, off-road vehicle use, fire, urbanization, roads, and agriculture. These invasive species are also aided by nitrogen deposition as a result of air pollution. Although it is possible that invasive plant species may compete with emergent western Joshua tree seedlings, the biggest impact to western Joshua tree from invasive plant species is through altered fire dynamics. Invasive plant species in the Mojave Desert have resulted in larger and more frequent fires that are killing a large number of western Joshua trees. The Petition describes this as a significant threat to western Joshua tree at the individual and population level.

In discussing invasive species as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Brooks (2003), Brooks and Berry (2006), DeFalco et al. (2007), Allen et al. (2009), Allen and Geiser (2011), Pardo et al. (2011), Barrows and Murphy-Mariscal (2012), Reynolds et al. (2012), Bytnerowicz et al. (2016), Frakes (2017), and Brooks et al. (2018).

Wildfires

The Petition provides information on impacts to western Joshua tree from wildfire, and states that wildfire is one of the greatest threats to the persistence of the species, particularly as the species' range contracts in the face of climate change and as the frequency and severity of fire in the species' range increases.

Under the Wildfires section, the Petition first discusses western Joshua tree's response to fire. Although some early researchers suggested that western Joshua tree was well adapted to fire due to the ability of fire-damaged trees to resprout, longer-term studies have demonstrated that Joshua trees have relatively low post-fire survival rates, are slow to repopulate burned areas, and require sufficient precipitation in the years following fire for successful resprouting. Older and taller western Joshua trees are less affected by fire than younger, shorter trees. Post-fire mortality of western Joshua tree can be high due to drought and increased herbivory, particularly in areas that have been denuded of other vegetation that could serve as an herbivore food source. Post-fire sprouting of burned trees has been observed to prolong Joshua tree survival at high-elevation sites, when precipitation is sufficient. Joshua tree populations along the extreme western edge of the desert bioregion, near the Sierra Nevada and Transverse Ranges, appear to survive more readily after fire than those further east, resulting in dense unique clumps of clonal plants. Recruitment of new western Joshua trees into burned areas is infrequent and slow. The Petition states that blackbrush (*Coleogyne ramosissima*) is one of the most important plants for aiding western Joshua tree seedling establishment, but it is also one of the most vulnerable shrubs to fire and can take centuries to fully recover. The Petition states that due to western Joshua tree's inherently slow recruitment process, accelerated fire return intervals, and climate change, a return to pre-fire western Joshua tree density and abundance in burned areas may take centuries or may never occur.

In discussing western Joshua tree's response to fire as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Webber (1953), Brittingham and Walker (2000), Loik et al. (2000), Gunter (2006), Abella et al. (2009), DeFalco et al. (2010), Vamstad and Rotenberry (2010), Reynolds et al. (2012), Esque et al. (2015), Wallace (2017), and Brooks et al. (2018).

Under the Wildfires section, the Petition also discusses the increasing wildfire frequency and intensity in the Mojave Desert. The Petition states that large fires have been historically infrequent in Joshua tree woodlands, and recent increases in fire size and frequency are partially due to invasion of non-native annual grasses. Winters with relatively high amounts of precipitation produce an increase in biomass of native and especially non-native annual plants that carry fire in invaded habitats, dramatically changing middle elevation shrublands dominated by creosote bush, blackbrush, and western Joshua trees. Precipitation has been recognized as a primary driver of fire frequency and extent in the Mojave Desert, with wetter periods fostering the growth of invasive grasses which carry fire, and drier periods leading to fewer and smaller fires. Fires in the Mojave Desert are started by a mix of accidental and intentional human activities, as well as lightning. Most wildfires are human-caused and start along roadsides. Less frequent large fires typically start by lightning and occur in remote areas far from major roads. The Petition also notes the impact of fire on western Joshua tree seedling and juvenile survival is particularly exacerbated because fires tend to track the same heavy precipitation years that are most suitable for western Joshua tree seedling emergence.

In discussing the increasing wildfire frequency and intensity in the Mojave Desert as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Brooks and Matchett (2006), Holmgren et al. (2010), Vamstad and Rotenberry (2010), Barrows and Murphy-Mariscal (2012), Jurand and Abella (2013), Esque et al. (2015), Tagestad et al. (2016), Klinger and Brooks (2017), Short (2017), Syphard et al. (2017), Brooks et al. (2018), Hopkins (2018), Maloney et al. (2019), Sweet et al. (2019), and Syphard et al. (2019).

Climate Change

The Petition provides information on impacts to western Joshua tree from climate change, and states that climate change represents the single greatest threat to the continued existence of the species. The Petition states that even under the most optimistic reduced-emission climate scenarios, western Joshua trees will be eliminated from significant portions of their range by the end of the century, and under warming scenarios consistent with current domestic and global emissions trajectories, the species will likely be close to being functionally extinct in the wild in California by the century's end.

Under the Climate Change section, the Petition has a subsection that discusses current and projected climate change in the range of western Joshua tree. A strong, international scientific consensus has established that human-caused climate change is causing widespread harm to human society and natural systems, and climate change threats are becoming increasingly dangerous. Climate change is causing increasing stress on species and ecosystems, and deserts have warmed and dried more rapidly over the last 50 years than other ecoregions, both globally and in the contiguous United States. Since 1895, the counties supporting western Joshua tree have already experienced annual temperature increases of 1.7 - 2.3°C (3.1 - 4.1°F). In addition, the Mojave Desert has experienced impacts to species and ecosystems, with bird occupancy and site-level species richness declining by about fifty percent over the past century, with this decline linked to increased cooling needs, necessitating more water intake for survival. While all temperature projections predict that the Mojave Desert will become much hotter in the future, projections for future precipitation are less clear. Average annual rainfall is expected to be about the same, but interannual precipitation variability is expected to increase, as is the amount of winter precipitation.

In discussing current and projected climate change in the range of western Joshua tree as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Warren et al. (2011), Scheffers et al. (2016), Tagestad et al. (2016), Wiens (2016), USGCRP (2017), Hopkins (2018), Iknayan and Beissinger (2018), IPCC (2018), Mufson et al. (2019), and Riddell et al. (2019).

Under the Climate Change section, the Petition has an additional subsection that discusses climate change impacts on western Joshua trees. Under this subsection, the Petition discusses six published models of future Joshua tree distribution: Thompson et al. (1998), Shafer et al. (2001), Dole et al. (2003), Cole et al. (2011), Barrows and Murphy-Mariscal (2012), and Sweet et al. (2019). Each of these models predict contractions of western Joshua tree at the western edge of its range. These six models are discussed separately in the following paragraphs.

Thompson et al. (1998) used temperature and precipitation data from the existing range of western and eastern Joshua tree to calculate potential future habitat under doubled carbon dioxide conditions. The Thompson et al. (1998) model predicted a retraction of Joshua tree range along its western edge in California, and predicted significant expansion of possible Joshua tree habitat extending as far north as Washington state, south into Mexico, and east into Texas; however this modeled projection of the future range of Joshua trees under changing climate conditions did not analyze other habitat variables or dispersal ability and used a model that poorly matched the current distribution of Joshua tree.

Shafer et al. (2001) carried out a similar modeling effort using three climate variables (mean temperature of the coldest month, a temperature index called growing degree days, and a moisture index) and a course grid scale. The results of this study were roughly consistent with the Thompson et al. (1998) model, but notably show an almost complete extirpation of western Joshua tree from California by 2090-2099 under several future climate scenarios.

Dole et al. (2003) also modeled the future range for Joshua trees under doubled carbon dioxide conditions, finding similarly to Thompson et al. (1998) models that a considerable portion of the current range of western Joshua tree will become climatically unfavorable for the species, although significant amounts of new habitat may become available. Like previous models, Dole et al. (2003) did not take dispersal ability into consideration and only focused on suitable habitat variables. This study also noted that current climate conditions may already be detrimental to Joshua tree survival and/or reproduction, which was later confirmed by other subsequent research in the southern part of western Joshua tree's range.

Cole et al. (2011) built a sophisticated species distribution model with climate and habitat variables derived from a comprehensive dataset of presence/absence data throughout the current range of western and eastern Joshua tree. Late Pleistocene and Holocene (22,000 to years ago to present) records were also compiled to generate a map of past Joshua tree distribution. The study differed from previous models in its use of specific data points for presence and habitat variables for the species and the testing of models to simulate the current range of the species. All of the individual climate models, as well as an ensemble of 22 global circulation models (GCMs) utilized by Cole et al. (2011), project a severe (~90%) decline in the area of suitable climates for Joshua trees by 2070 to 2099, as the southern parts of its range become climatically unsuitable. Cole et al. (2011) also modeled areas where the species could potentially expand its range naturally in the future, as well as areas that might be suitable for relocation or assisted migration. The Cole et al. (2011) study considered the ability of Joshua tree to colonize new areas of potentially suitable habitat, which appears to be very limited.

Barrows and Murphy-Mariscal (2012) constructed a finer-scale model of western Joshua tree's current distribution within and surrounding Joshua Tree National Park, and then assessed the sensitivity of western Joshua tree to a gradient of climate change scenarios. Under the most severe climate scenario modeled (3°C increase in mean July maximum temperature), there was a 90 percent reduction in the current distribution of western Joshua tree in Joshua Tree National Park, but refugium of suitable western Joshua tree habitat still remained. A niche model for juvenile Joshua trees also provides support for the hypothesis that climate change has already had an impact on western Joshua tree recruitment within Joshua Tree National Park.

Similar to Barrows and Murphy-Mariscal (2012), Sweet et al. (2019) sought to identify the existence and extent of potential climate refugia for western Joshua tree within Joshua Tree National Park via species distribution models validated with field data. Sweet et al. (2019) used Joshua tree presence points, a database of nine environmental variables, and end-of-century (2070–2099) greenhouse gas emissions under highly mitigated, moderately mitigated, and unmitigated scenarios. Under highly mitigated and moderately mitigated greenhouse gas emissions scenarios, 18.6 percent and 13.9 percent, respectively, of current occupied western Joshua tree habitat remained as refugia. However, under the unmitigated greenhouse gas emissions scenario, which is closest to current emissions trajectories, suitable habitat for western Joshua tree was almost completely eliminated from Joshua Tree National Park, with only 15 hectares (37 acres), or 0.02 percent of western Joshua tree habitat remaining as refugia. Sweet et al. (2019) also used field data on distribution of juvenile western

Joshua trees (defined as smaller than 60 cm tall) to validate their modeling results as the current recruitment patterns may be foretelling of future changes in the population of western Joshua trees on the landscape.

In addition to the findings of the modeling efforts described above, the Petition presents information from other field studies that document the current impacts of warming, drought, invasive species, fire and other impacts on western Joshua tree survival and recruitment. The convergence of biotic and abiotic factors necessary for western Joshua tree recruitment results in successful establishment of new seedlings just a few times in a century, and the Petition reports that such recruitment has already largely stopped at the drier, lower elevational limits of western Joshua tree's range. Prolonged droughts are projected to occur with greater frequency and intensity over the coming decades and are likely to preclude recruitment across large areas of western Joshua tree's range. The droughts will also likely lead to higher adult mortality, either directly due to temperature and moisture stress or indirectly due to increased herbivory from rodents lacking alternative forage. Western Joshua trees also do not appear to be moving successfully into higher elevations. Where yucca moth population density is low, plants appear to only be reproducing via clonal growth. The areas where western Joshua trees are projected to be most likely to survive increasing temperatures and drying conditions are also at great risk of fire due to the prevalence of invasive grasses that increase the size and severity of fires. The Petition claims that absent protection of habitat and rapid and substantial reductions in greenhouse gas emissions, western Joshua tree will likely be extirpated from all or most of California within 80 years.

In discussing climate change impacts on western Joshua tree as a factor affecting the ability of western Joshua tree to survive and reproduce, the Petition cites Webber (1953), Thompson et al. (1998), Loik et al. (2000), Lenz (2001), Shafer et al. (2001), Pearson and Dawson (2003), Pellmyr and Segraves (2003), Cole et al. (2011), Dole et al. (2003), Godsoe et al. (2008), Fitzpatrick and Hargrove (2009), DeFalco et al. (2010), Barrows and Murphy-Mariscal (2012), Notaro et al. (2012), Reynolds et al. (2012), Esque et al. (2015), Borchert and Defalco (2016), Harrower and Gilbert (2018), Hopkins (2018), St. Clair and Hoines (2018), Sweet et al. (2019).

Habitat Loss to Development

The Petition provides information on impacts to western Joshua tree from habitat loss due to human development, and states that development presents a substantial threat to the species in a significant portion of its range.

The Petition acknowledges that much of western Joshua tree's distribution is on federal land and is therefore protected to some degree from development impacts. 96 percent of the geographic area in which the YUBR North population is located is federal land. 48

percent of the YUBR South population is located on federal land, but over 50 percent of the YUBR South population is on private land (see Figure 1). Western Joshua trees on private land have been the most impacted by human development and face the greatest threats from human development in the future. The cities and towns of Apple Valley, Hesperia, Lancaster, Palmdale, Ridgecrest, Victorville, and Yucca Valley, along with many other smaller communities have been built in western Joshua tree habitat in the YUBR South area, and these areas have grown rapidly in the past decades. Human population growth in these areas and consequent loss of Joshua tree woodlands is expected to continue in the coming decades.

In addition to urban growth, the Petition states that various other forms of human development threaten western Joshua tree habitat in California, including roads, highways, transmission lines, industrial facilities and large and small-scale renewable energy projects, and these developments have resulted in significant western Joshua tree habitat loss.

A possible scenario for western Joshua tree habitat loss due to human development by the year 2095 is presented in the Petition on page 47 as Figure 19. The Petition states that human development has already consumed hundreds of thousands of acres of habitat in the range of western Joshua tree, and that over the coming decades, more than a million additional acres will be destroyed or degraded for housing, roads, energy projects and assorted other development projects. Combined with threats to western Joshua tree under likely climate scenarios, the Petition states that the added loss of habitat and the genetic resiliency and connectivity that habitat provides will further push the species towards extirpation in California.

In discussing habitat loss due to human development and its effects on western Joshua tree survival and reproduction, the Petition cites USFWS (2018) and SCAG (2019).

2. Other Relevant Scientific Information

The Department received additional information on wildfires as a factor affecting the ability of western Joshua tree to survive and reproduce during the Petition Evaluation period pursuant to Fish and Game Code Section 2073.4. The Department received a report that describes a GIS analysis, literature review, and field survey of a 1999 fire area on Edwards Air Force Base to evaluate western Joshua tree survivorship and/or regeneration (USAF 2017a). The report used aerial photography taken in 1992 to count all identifiable western Joshua trees present in two areas prior to the 1999 fire and compared this information with the results of a 2017 field survey that identified all western Joshua trees in these same two areas. This report concludes that Joshua tree populations were stable in the sampled areas of the fire area from 1992 to 2017.

3. Conclusion

The Petition provides a significant amount of scientific information on factors affecting the ability of western Joshua tree to survive and reproduce. The Petition states that climate change is the greatest threat to the continued existence of western Joshua tree, with wildfires, invasive species, habitat loss from human development, and predation as additional contributing factors that collectively threaten the continued viability of the species. The Petition provides sufficient information on factors affecting the ability of western Joshua tree to survive and reproduce for the Department to make the recommendation in Section IV of this Petition Evaluation.

H. Degree and Immediacy of Threat

1. Scientific Information in the Petition

The Petition discusses the degree and immediacy of threats to western Joshua tree on page 48, under the heading “Degree and Immediacy of Threat”. The Petition states that while extirpation is likely decades away, the species is already suffering the impacts of climate change, with recruitment failure and adult mortality at the hotter, lower elevation edges of its range. The Petition states that invasive grass-fueled fires are already impacting populations of western Joshua tree, and half of the habitat refugia area in Joshua Tree National Park (modeled under a moderate global warming scenario) have already burned in recent decades. The Petition claims that impacts from current greenhouse gas emissions will continue for decades to come, with little time remaining to reduce emissions before climate warming drives western Joshua tree to unavoidable functional extinction.

In discussing the degree and immediacy of threats to western Joshua tree, the Petition cites Barrows and Murphy-Mariscal (2012), Harrower and Gilbert (2018), and Sweet et al. (2019). The Petition also references the preceding section of the Petition on pages 20 through 48 under the heading “Factors Affecting Ability to Survive and Reproduce”.

2. Conclusion

Information provided in the Petition suggests that western Joshua tree is already being affected by threats described in the Petition, and these threats are likely to intensify significantly by the end of the century. The Petition provides sufficient information on the degree and immediacy of threat to western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

I. Impact of Existing Management Efforts

1. Scientific Information in the Petition

The Petition discusses the impact of existing management efforts for western Joshua tree on pages 48 through 58, under the heading “Inadequacy of Existing Regulatory Mechanisms”, and also discusses the USFWS decision to not list Joshua tree under the federal Endangered Species Act on pages 58 through 62 under the heading “USFWS’s Flawed Endangered Species Act Determination”. The discussion of existing management efforts in the Petition is focused on regulatory mechanisms of government agencies. The Petition states that no existing regulatory mechanisms are currently in place at the international, national, state or local level that adequately address the threats facing western Joshua tree. The Petition goes on to discuss (1) regulatory mechanisms for greenhouse emissions reductions, (2) regulatory mechanisms to protect habitat from invasive species and fire, (3) state and local mechanisms to protect habitat from loss and degradation, and (4) federal mechanisms to protect habitat from loss and degradation. Information presented in the Petition for each of these will be discussed separately below.

Regulatory Mechanisms for Greenhouse Emissions Reductions

The Petition states that climate change is the greatest threat to the continued existence of western Joshua tree, and that the species cannot be saved absent global action to reduce greenhouse gas emissions. The Petition states that the United States has contributed more to climate change than any other country, and highlights recent rollbacks of federal climate policy. The Petition states that both domestically and globally, government policies, commitments and actions to avoid the worst impacts of climate change are inadequate, and that trends will lead to temperatures that are incompatible with reproduction and survival of western Joshua tree in its current range.

In discussing regulatory mechanisms for greenhouse emissions reductions, the Petition cites Rogelj et al. (2015), USEIA (2016a, 2016b), Erikson et al. (2017), Le Quéré et al. (2018), USGCRP (2018), CAT (2019), DiChristopher (2019), and OCI (2019).

Regulatory Mechanisms to Protect Habitat from Invasive Species and Fire

The Petition states that, to date, no legal, regulatory or management efforts have demonstrated effectiveness at addressing the severe threat that invasive plant species and consequent altered fire regimes pose to western Joshua trees. Immediate suppression of fires in western Joshua tree habitat can limit the spread of fires, but protection of the species from fire ultimately requires invasive plant species management to reduce fuel load. The Petition states that the spread and abundance of invasive plant species are linked to both disturbance (e.g. roads, off road vehicles, cows, and urbanization) and nitrogen deposition, and therefore each of these contributing factors needs to be addressed. Although disturbance is limited in national parks, U.S. Bureau of Land Management (BLM), military, and private lands that compose the majority of western Joshua tree's range are often disturbed by projects and activities. It is also unlikely that nitrogen deposition will be adequately reduced throughout the range of western Joshua tree for at least several decades, if ever. The Petition states that even if disturbance and nitrogen deposition are reduced and the further spread of invasive species can be curtailed, no fully-effective treatments currently exist to reduce or eliminate the most harmful invasive plant species (e.g. *Bromus* spp., *Schismus* spp., *Erodium cicutarium*, *Brassica tournefortii*) that have already become established at a landscape scale in the range of western Joshua tree.

In discussing regulatory mechanisms to protect habitat from invasive species and fire, the Petition cites Brooks and Berry (2006), Allen et al. (2009), Allen et al. (2011), Pardo et al. (2011), Bytnerowicz et al. (2016), Brooks et al. (2018), USFWS (2018), BLM (2019), Sweet et al. (2019).

State and Local Mechanisms to Protect Habitat from Loss and Degradation

The Petition states that western Joshua tree stands to lose more than a third of its suitable habitat in California due to development over the coming decades, including over 40 percent of its habitat in the YUBR South region. Lands owned by the State of California make up less than one percent of western Joshua tree's range in the state, and the Petition states that protection of these lands alone is unlikely to prevent the decline and eventual extirpation of western Joshua tree.

The Petition discusses provisions of the California Desert Native Plants Act, which regulates commercial harvest of western Joshua tree. Commercial harvest was once considered a great threat to western Joshua tree and other desert plants. The Petition states that the California Desert Native Plants Act and various local laws and ordinances were ultimately passed to address this threat. These measures have been largely effective at reducing the commercial harvest of western Joshua tree, but have done little to slow the loss of western Joshua tree habitat from agricultural conversation and other human development. The Petition cites the California Fish and Game Commission's 2015 California Policy for Native Plants.

The Petition discusses the California Environmental Quality Act (CEQA). The Petition states that western Joshua tree is not a species of special concern or a candidate, threatened, or endangered species under CEQA, and therefore a project that has the potential to impact the species would not necessarily qualify as having a "significant effect" under a lead agency's interpretation of CEQA. The Petition identifies other limitations in the ability of CEQA to protect western Joshua tree habitat from loss and degradation and concludes that CEQA, in practice, is inadequate to protect western Joshua tree.

The Petition discusses the Natural Community Conservation Planning Act but states that there are no finalized Natural Community Conservation Plans (NCCPs) that cover western Joshua tree. The Petition states that NCCPs may in the future provide some conservation benefit for western Joshua tree, but have not done so to date and consequently cannot be considered as providing adequate protection in lieu of CESA listing.

In discussing state and local mechanisms to protect western Joshua tree habitat from loss and degradation, the Petition cites Harrower and Gilbert 2018, USFWS 2018, and several state and local laws and regulations.

Federal Mechanisms to Protect Habitat from Loss and Degradation

The Petition states that management laws and plans governing federal lands are the primary federal regulatory mechanism with the potential to protect western Joshua trees. Almost all suitable habitat for YUBR North and about half of suitable habitat for YUBR South is on federal land. Consequently, management of these lands has an important role in determining the continued viability of western Joshua trees in California.

The Petition states that approximately ten percent of western Joshua tree habitat is on National Park Service lands that are generally well-managed, which should prevent significant habitat loss or degradation from activities such as off-road vehicle use, cattle grazing, road building or other forms of development. Approximately 12 percent of the mapped distribution of the YUBR South population falls within military installations and a roughly comparable amount of the YUBR North population falls within such lands. The Petition states that Integrated Natural Resource Management Plans for military installations incorporate some avoidance and minimization measures that could reduce impacts to western Joshua tree, but these measures largely consist of avoidance where feasible and transplantation when conflicts are unavoidable.

The majority of western Joshua tree habitat on federal lands is on BLM land, which is governed by BLM's California Desert Conservation Area (CDCA) Plan. The Northern and Eastern Mojave Plan and West Mojave Plan are amendments to the CDCA Plan that cover the California range of western Joshua tree. The 2016 Desert Renewable Energy Conservation Plan (DRECP) amendments also cover the entirety of western Joshua tree's range in California. The Petition states that these plans do not provide adequate protection for western Joshua tree because the species is not addressed in the plans, the plans include weak or nonexistent avoidance and conservation measures, and/or the plans include activities that will actively degrade western Joshua tree habitat.

In discussing federal mechanisms to protect western Joshua tree habitat from loss and degradation the Petition cites BLM (2002, 2006, 2016, 2019), NPS (2012), USFWS (2018), and additional federal laws, regulations, and reports.

2. Conclusion

The Petition describes the limitations of existing regulatory mechanisms as they relate to the factors affecting the ability of western Joshua tree to survive and reproduce. The Petition provides sufficient information on the impact of existing management efforts on western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

J. Suggestions for Future Management

1. Scientific Information in the Petition

The Petition provides suggestions for future management of western Joshua tree on pages 64 through 65, under the heading “Recommended Management and Recovery Actions”. The Petition states that the most important recovery actions for western Joshua tree are those that lead to rapid and steep greenhouse gas emission reductions to minimize the additional warming that will occur in the climate system. The Petition also provides a list of ten additional recommendations for management and recovery of western Joshua tree. These additional recommendations include (1) declaration of a climate emergency and full decarbonization of California’s economy by 2045, (2) preparation of a state recovery plan for the species, (3) development of NCCPs, (4) management plans for western Joshua tree on California Department of Parks and Recreation land, (5) expansion and connection of existing state parks for protection and restoration of Joshua tree habitat, (6) expansion of cooperative work with federal agencies, (7) development of effective measures to control the spread of invasive grasses, (8) development of protocols for fire suppression activities that minimize ground disturbance and spread of invasive species, (9) establishment and maintenance of a western Joshua tree seed bank, and (10) assisted migration activities.

2. Conclusion

The Petition provides several suggestions for future management of western Joshua tree, although some of the suggestions are not within the Department’s jurisdiction. The Petition provides sufficient suggestions for future management of western Joshua tree for the Department to make the recommendation in Section IV of this Petition Evaluation.

K. Detailed Distribution Map

1. Scientific Information in the Petition

A distribution map is provided as Figure 8 on page 17 of the Petition. This distribution map was prepared by USFWS (2018) and includes a representation of the distribution of both western Joshua tree and eastern Joshua tree. This map has been duplicated as Figure 1 in this Petition Evaluation.

2. Other Relevant Scientific Information

As described in Section III(B)(2) of this Petition Evaluation, the Department possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree occurs, and these maps may contribute to a relatively high-resolution western Joshua tree distribution map in many areas of California. These vegetation maps are likely to improve the current understanding of western Joshua tree's distribution.

3. Conclusion

The Petition provides a western Joshua tree distribution map that is sufficient for the Department to make the recommendation in Section IV of this Petition Evaluation.

L. Sources and Availability of Information

1. Scientific Information in the Petition

The Petition cites 114 scientific and administrative documents on pages 66 through 75, under the heading "References Cited". The Petitioner provided digital copies of these documents to the Commission, and they have been made available to the Department.

2. Other Relevant Scientific Information

The Department used additional sources of scientific information cited in this Petition Evaluation. The Department also received additional comments and information on the petitioned action from Mr. Robert R. Brown, Jr. and Mr. Larry Zimmerman, and these additional comments and information have been included as Attachment 1 to this Petition Evaluation.

3. Conclusion

The Petition provides sufficient information on the sources and availability of information used in the Petition for the Department to make the recommendation in Section IV of this Petition Evaluation.

IV. RECOMMENDATION TO THE COMMISSION

Pursuant to Section 2073.5 of the Fish and Game Code, the Department has evaluated the Petition on its face and in relation to other relevant information the Department possesses or received. In completing its Petition Evaluation, the Department has determined there is sufficient scientific information to indicate that the petitioned action for western Joshua tree may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

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APPENDIX 1: INFORMATION SUBMITTED TO THE DEPARTMENT

Western Joshua Tree

(*Yucca brevifolia*)

Fish and Game Commission Meeting
August 19-20, 2020
Jeb McKay Bjerke
Native Plant Program

1

Presentation Overview

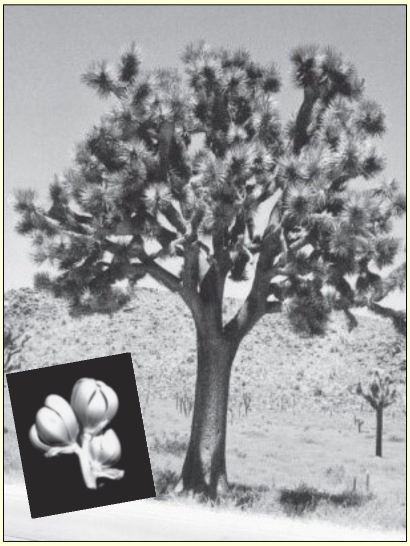
Purpose: Summarize Western Joshua Tree Petition Evaluation Report

1. Brief Species Overview
2. Information in the Petition and in the Department's Possession
3. Department Recommendation

2

2

Western Joshua Tree
Yucca brevifolia or
Yucca brevifolia var. *brevifolia*



Eastern Joshua Tree
Yucca jaegerana or
Yucca brevifolia var. *jaegerana*

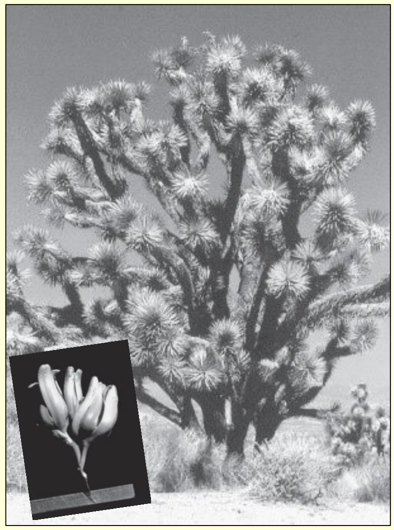


Photo Source: Lenz, L.W. 2007. Reassessment of *Yucca brevifolia* and recognition of *Y. jaegeriana* as a distinct species. Aliso: A Journal of Systematic and Evolutionary Botany 24(1):97–104. (cited in petition)

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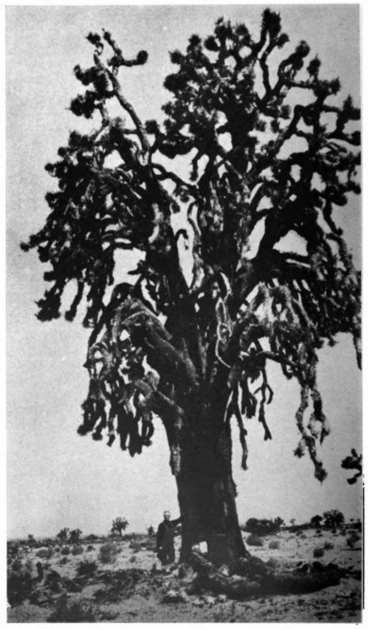
Agriculture Monograph 17, U. S. Department of Agriculture PLATE 15



Yucca brevifolia Engelm.: 15 miles east of Lancaster, Calif. An exceptionally fine plant. Photographed by Ernest Braunton, July 9, 1925.

5

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6

Information In Petition

- ✓ Population Trend
- ✓ Geographic Range
- ✓ Distribution
- ✓ Abundance
- ✓ Life History
- ✓ Habitat Necessary for Survival
- ✓ Factors Affecting Survival & Reproduction
- ✓ Degree and Immediacy of Threat
- ✓ Impact of Existing Management Efforts
- ✓ Suggestions for Future Management
- ✓ Detailed Distribution Map
- ✓ Sources & Availability of Information

7

7

Other Relevant Information the Department Possessed or Received

Vegetation maps possessed by the Department

Reports from Edwards Air Force Base:

- population trend from 1992-2015
- survivorship and/or regeneration within a fire area

Comments and information from a landowner

8

8

Abundance and Population Trend

(Information from Petition)

- No population size estimates
- No evidence of a range-wide population trend
- Some populations declining, particularly within Joshua Tree National Park

9

9

Abundance and Population Trend

(Additional Information in Department Possession)

- Currently relatively abundant
- Populations at Edwards Air Force Base appeared stable to increasing from 1992 to 2015

Source: U.S. Air Force. 2017. Joshua Tree Historical Status on Edwards AFB. 412th Civil Engineering Group. Environmental Management Division. Edwards Air Force Base

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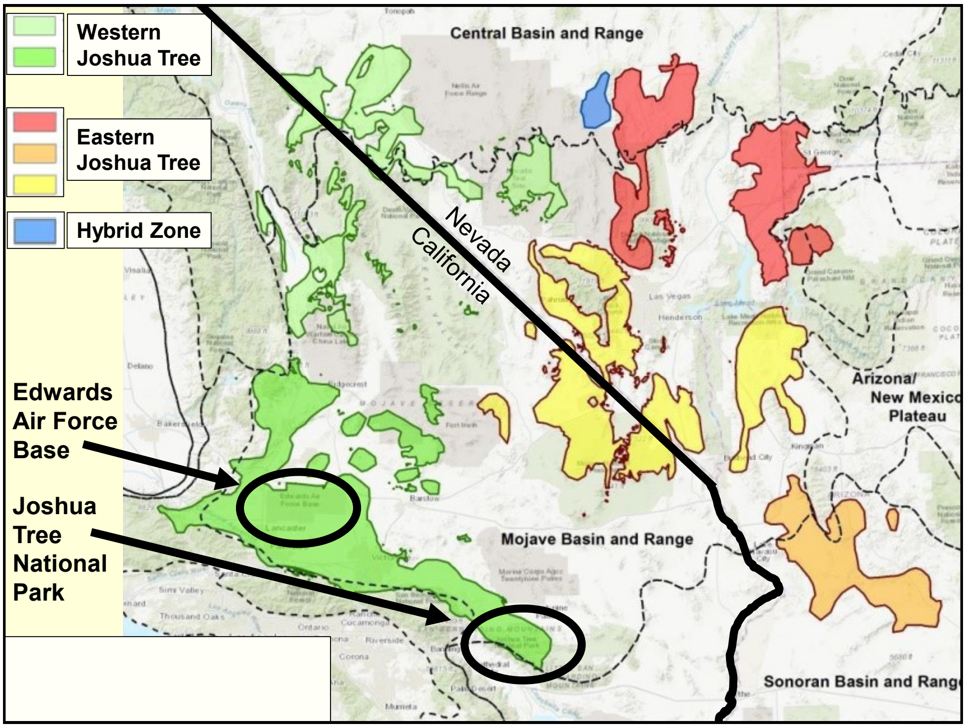


11

Life History

(Information from Petition)

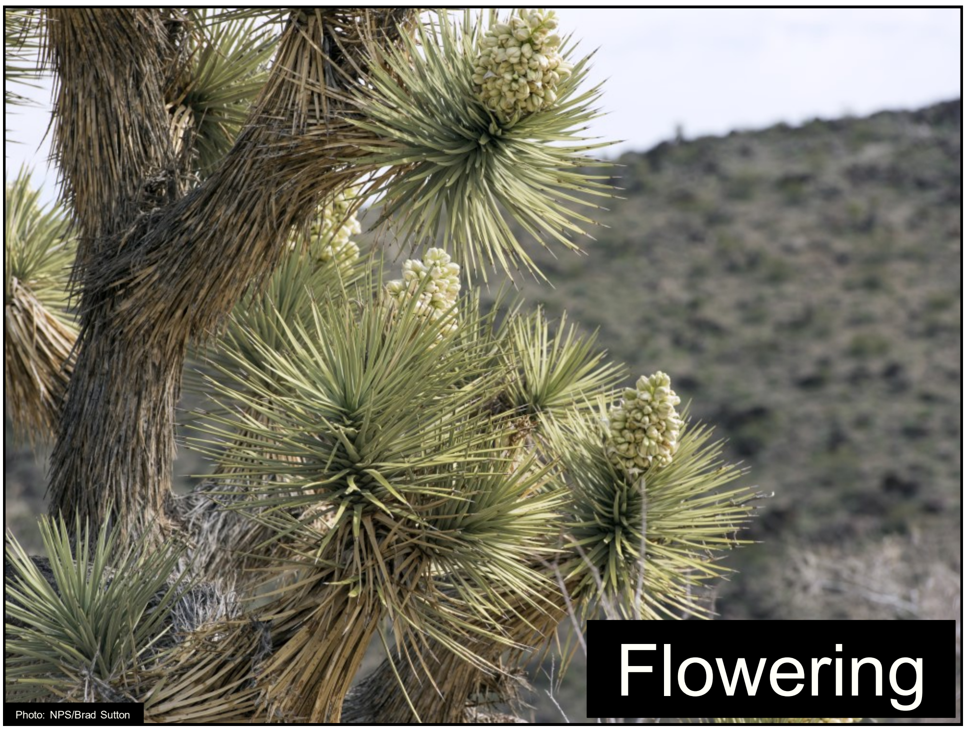
- Sexual or asexual reproduction
- Episodic and rare flowering
- Obligate pollination mutualism
- Seed production
- Germination and growth

12

12


Asexual Reproduction
Photo: Jeb Bjerke

13


Flowering
Photo: NPS/Brad Sutton

14


Photo: NPS/Robb Hannawacker

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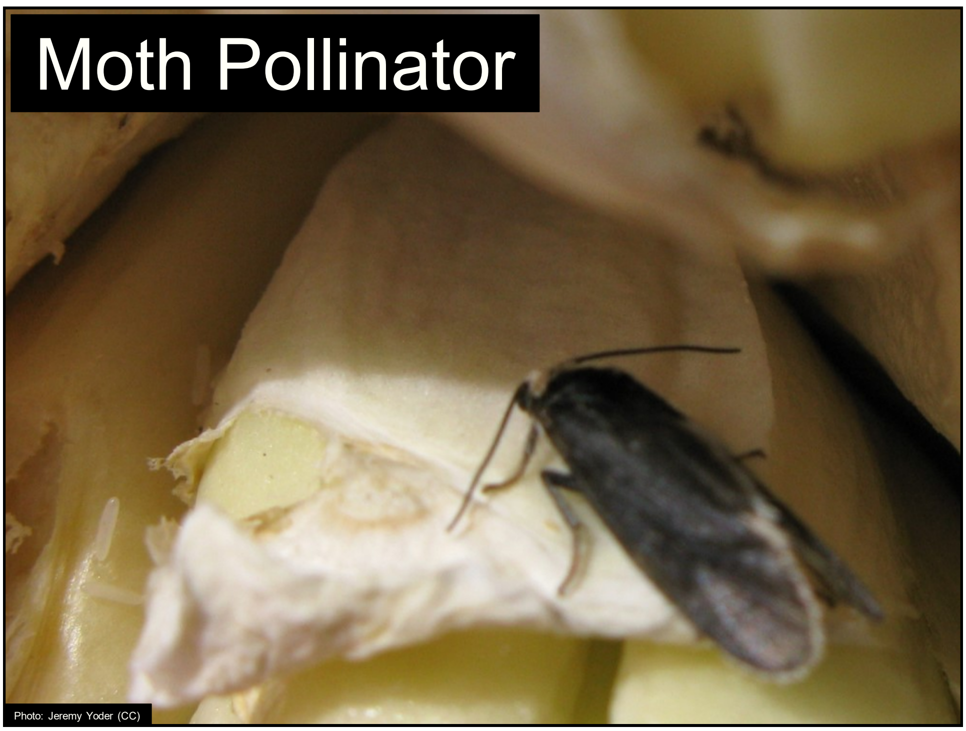
Moth Pollinator
Photo: Jeremy Yoder (CC)

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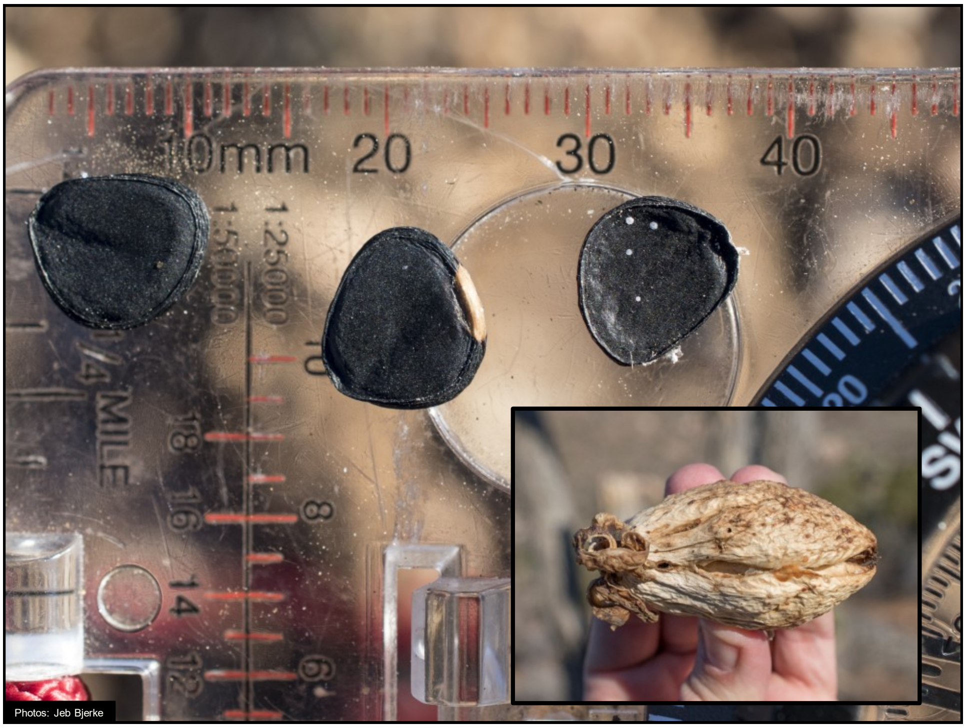

Photos: Jeb Bjerke

17

Photo: NPS/Brad Sutton

18

Habitat

(Information from Petition)

- Hot, dry sites on flats, mesas, bajadas, and gentle slopes
- Various soils
- Temperature and precipitation important
- Needs obligate pollinators, rodents, and plants to shelter emerging seedlings

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Factors Affecting Survival & Reproduction

(Information from Petition)

- climate change
- habitat loss to human development
- invasive species
- wildfires
- predation

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Factors Affecting Survival & Reproduction

(Information from Petition)

- Climate change represents the single greatest threat
- Six published models predict contractions at the western edge of its range
- Climate change contributes to other threats.

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Models of Future Joshua Tree Distribution

Author (year)	Modeled Area	Data/Methods	Scenario	Results
Thompson et al. (1998)	Rangewide	15 km grid, temperature & precipitation, Little (1971,1976) range map	Doubled CO_2	**8-fold increase in range to north and east, range retraction in California**
Shafer et al. (2001)	Rangewide	25 km grid, 3 climate variables, Little (1971,1976) range map	2090-2099	**Increase in range to north and east, severe range retraction in California**
Dole et al. (2003)	Rangewide	10 km grid, temperature & precipitation data, Benson and Darrow (1981) range map	Doubled CO_2	**Increase in range to north and east, both contraction and expansion of range in California**
Cole et al. (2011)	Rangewide	Sophisticated model using presence/absence points from several sources, with statistical testing of the model, migration rates included, range retraction ~11,700 years ago examined	2070-2099	**Increase in range to north and east, very severe range retraction in California**
Barrows and Murphy-Mariscal (2012)	Joshua Tree National Park	Sophisticated fine-scale model using adult and juvenile presence points, adults and juveniles mapped separately to check for warming that has already occurred	+1°, +2° and +3° C warming	**Decrease but not elimination from Joshua Tree National Park (<10% remains under +3° C warming). Juvenile range already reduced ~75% from adult range**
Sweet et al. (2019)	Joshua Tree National Park	Sophisticated fine-scale model, Maxent, expanded presence point data from Barrows and Murphy-Mariscal (2012), field verification of model results at 14 macroplots	2070-2099	**Very severe range retraction in Joshua Tree National Park: almost complete elimination under current CO_2 trajectory**

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Development

Source: Google Streetview

24

24


Invasive Grasses
Photo: NPS/Robb Hannawacker

25


Fire
Photo: NPS

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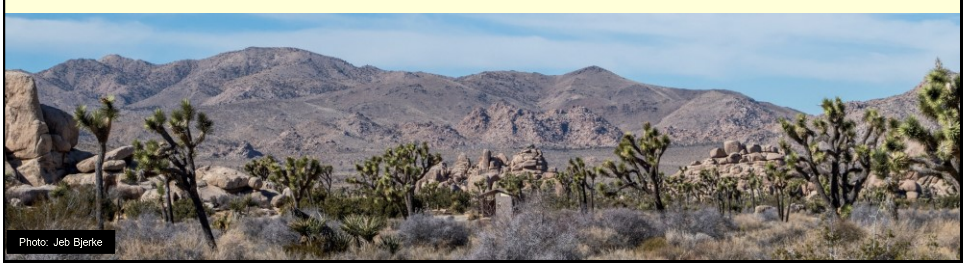
Impact of Existing Management

(Information from Petition)

- Inadequate regulatory mechanisms for:
    - CO_2 emissions
    - invasive species and fire
    - habitat loss and degradation



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Sources & Availability of Information

(Information from Petition)

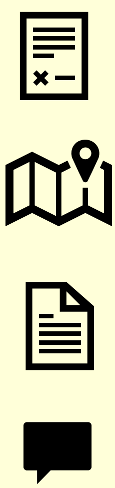
100+ scientific papers and other sources

Photo: NPS/Brad Sutton

29

29

Information In Petition



- ✓ Population Trend
- ✓ Geographic Range
- ✓ Distribution
- ✓ Abundance
- ✓ Life History
- ✓ Habitat Necessary for Survival
- ✓ Factors Affecting Survival & Reproduction
- ✓ Degree and Immediacy of Threat
- ✓ Impact of Existing Management Efforts
- ✓ Suggestions for Future Management
- ✓ Detailed Distribution Map
- ✓ Sources & Availability of Information

Other Relevant Information the Department Possessed or Received

30

30

Department Recommendation

The Department recommends that the Commission find there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

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SUMMARY

- Information from Petition and other sources
- Climate change listed as greatest threat: 6 models project California range reduction
- Human development, invasive species and altered fire regime are additional threats

- Petition states existing regulatory mechanisms are inadequate
- Recommendation: there is sufficient information to indicate that the petitioned action may be warranted

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Questions ◈ Thank You

Jeb McKay Bjerke
Senior Environmental Scientist (Specialist)
(916) 651-6594
Jeb.Bjerke@wildlife.ca.gov

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33

Congress of the United States
Washington, DC 20515

Original on file,
received June 10, 2020

June 10, 2020

Mr. Eric Sklar
President
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

We write in strong opposition to the petition, submitted by the Center for Biological Diversity, to list the western Joshua tree as a threatened species under the California Endangered Species Act (CESA). Approving this petition would create an unprecedented expansion of CESA by using subjective models of hypothetical future circumstances, instead of objective evidence of declines in habitat and population, to justify listing of a species. Additionally, it would place unworkable burdens on private landowners and local governments.

The petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the western Joshua tree population. Instead they seek threatened status for the western Joshua tree based on their prediction of a future decline due to global climate change. Such a justification is unprecedented and would open a Pandora's box to allow nearly any species of flora or fauna in California to be listed via CESA.

The petition itself acknowledges the western Joshua Tree is "not at imminent risk of extinction."[1] Yet, the petition cites California Fish & Game Code § 2067, which defines a "threatened" species as "a native species … although not presently threatened with extinction, [that] is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts." In fact, the Joshua tree has benefited from extensive conservation efforts and widely expanded habitat protections, many recent, which obviate the need for threatened status.

The overwhelming majority of Joshua tree habitat is located on federal lands, with millions of acres designated for various conservation purposes. Outside federal lands, the Joshua tree is protected under state law through the California Desert Native Plants Act, which requires permitting for removal. With these robust existing protections and population numbers

[1] Center for Biological Diversity, "Petition to List the Western Joshua Tree (Yucca brevifolia) as Threatened under the California Endangered Species Act (CESA)", exec. summary, p. 1, Oct. 15, 2019, *available at* https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=175218&inline.

unchanged, the US Department of the Interior last year rejected a nearly identical petition to list the Joshua tree as a threatened species.

Accepting this petition would be disastrous for housing needs and undermine California's own energy diversification goals, all while shuttering aggregate materials sites necessary to rebuild our civil infrastructure efficiently and responsibly.

We urge you to consider the dangerous new precedent that would be set should this petition succeed and ask respectfully that you deny this petition.

Thank you,

Paul Cook Member of Congress	Kevin McCarthy House Republican Leader
Tom McClintock Member of Congress	Doug LaMalfa Member of Congress
Ken Calvert Member of Congress	Devin Nunes Member of Congress

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California State Senate

SENATOR
SCOTT WILK
TWENTY-FIRST SENATE DISTRICT

COMMITTEES
AGRICULTURE
VICE CHAIR
EDUCATION
VICE CHAIR
GOVERNMENTAL ORGANIZATION
VICE CHAIR
RULES
VICE CHAIR
BUSINESS, PROFESSIONS & ECONOMIC DEVELOPMENT
VETERANS AFFAIRS

May 12, 2020

Original on file,
received May 12, 2020

Mr. Eric Sklar, President
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Dear Commissioners,

I understand the Commission is considering listing the Western Joshua Tree under the California Endangered Species Act. My district covers much of the high desert ecosystem where the Western Joshua Tree is found, it is important to our community identity, our ecosystem and the natural beauty of our desert. However, it is not necessary or prudent to list the Western Joshua Tree under the Act.

The Joshua tree is well protected in its natural habitat in California. There are millions of acres set aside to preserve the Western Joshua Tree including the Mojave National Preserve, the Joshua Tree National Park, the Mojave Trails National Monument, the Sand to Snow National Monument, Castle Mountains National Monument and other protected areas at the local, state and federal levels.

By comparison, the areas of the high desert in Los Angeles and San Bernardino County are vital to the state's commitment to develop more housing and in areas that would not impact current and future efforts to continue to protect the Western Joshua Tree. This action would jeopardize housing commitments unnecessarily.

Not long ago, the federal government wisely rejected this proposal, and the Commission will be doing the right thing reject it as well.

Sincerely,

Scott Wilk

SCOTT WILK
Senator, 21st District

SW: dm

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Assembly
California Legislature

VINCE FONG
ASSEMBLYMEMBER, THIRTY-FOURTH DISTRICT

COMMITTEES
VICE CHAIR: TRANSPORTATION
APPROPRIATIONS
BUDGET
BUSINESS AND PROFESSIONS
PUBLIC EMPLOYMENT AND RETIREMENT

SUBCOMMITTEES
BUDGET SUBCOMMITTEE NO. 3 ON RESOURCES AND TRANSPORTATION
BUDGET SUBCOMMITTEE NO. 6 ON BUDGET PROCESS OVERSITE AND PROGRAM EVALUATION

June 11, 2020

Original on file, received June 11, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

I write in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act (CESA). The Joshua tree currently receives protections at the federal, state, and local levels. Listing the tree under CESA would add redundant protections that place a significant financial burden on private land owners while doing little to address the long term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas throughout our state. Listing the Joshua tree would effectively halt future development of these communities at a time when they are grappling with housing shortages, rising homelessness, and widespread unemployment.

Though it is important to protect our native species, the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to demonstrate a decline of the Joshua tree population. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

Furthermore, western Joshua trees are scattered throughout eastern Kern County near the Naval Air Weapons Station at China Lake. Listing the tree could potentially impede the ability of this military installation to carry out its intended purpose in helping ensure the military readiness and national protection of the United States. Restricting our national defense for a petition based upon unproven assertions is not only misguided, it’s dangerous.

I urge you to consider the significant impacts this will have on the development of rural desert communities and our national defense. I respectfully ask that you deny this petition.

Thank you,

Vince Fong
California State Assemblyman
34th District

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Assembly
California Legislature

TOM LACKEY
ASSEMBLYMAN, THIRTY-SIXTH DISTRICT

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VICE CHAIR: PUBLIC SAFETY
ACCOUNTABILITY AND ADMINISTRATIVE REVIEW
AGING AND LONG-TERM CARE
BUDGET
GOVERNMENTAL ORGANIZATION
JOINT LEGISLATIVE COMMITTEE ON EMERGENCY MANAGEMENT

Original on file, received June 10, 2020

June 10, 2020

The Honorable Eric Sklar, President
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

As an elected official representing the Antelope Valley, I write in strong opposition to the Petition submitted by the Center for Biological Diversity (Petition) to list the western Joshua tree as a threatened species under the California Endangered Species Act (CESA) and appreciate the opportunity to provide public comment. The western Joshua tree presently receives extensive protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private land owners while doing little to address the alleged long term threat to the species upon which the Petition is based.

The Petition fails to provide scientific evidence to substantiate a decline of the western Joshua tree population. Instead, the Petition predicts a future decline due to global climate change. It is worth noting that a substantial portion of the western Joshua tree population resides on federal, state, and locally protected lands across multiple jurisdictions in the south western United States, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal. Counties and municipalities within the desert areas have also imposed development regulations to protect the species.

In August of 2019 the United States Department of Fish and Wildlife rejected a substantially similar petition to list both species of the Joshua tree on the federal Endangered Species Act. Citing the best available scientific evidence, their work resulted in the following statement:

> Adapted to harsh desert conditions, the trees can tolerate extreme temperatures, ranging from 4 to 120 degrees Fahrenheit and elevations between 1,900 to 7,200 feet….
>
> …The Service reviewed the status of both species and assessed the potential impact on their populations of stressors such as wildfire, drought, plant-eating animals, and climate change. The Service's analysis determined that neither taxa currently requires protection under the ESA. Most habitat occupied by the two species is federally-managed by agencies including the National Park Service, Bureau of Land Management, U.S. Forest Service and Department of Defense. A much smaller portion of habitat is managed by state or local governments or is privately owned. Species distribution mapping shows there has been no major reduction or contraction in Joshua tree populations during the last 40 years. Additionally, several federal agencies, the states of

1) https://www.fws.gov/carlsbad/NR/JTree_12M_Finding_NR_final_20190814.pdf

California and Arizona and several local jurisdictions have adopted and implemented policies that provide some protections to Joshua trees from harvesting and removal. (1)

Adding CESA protections will make it nearly impossible to construct vital public infrastructure projects and will increase the cost of housing in an economically depressed region. For example, between the cities of Palmdale and Lancaster there are at least 24 projects that would be affected due to this classification. These projects include mixed use development with apartments, townhomes, a hotel, commercial/retail, and almost a dozen tentative tract map (TTM) developments. If the western Joshua tree receives CESA protections, these projects will be significantly delayed or prohibited.

To make matters worse, CESA protections take effect immediately if the western Joshua tree is listed as a candidate species. This process leaves local governments without adequate time to plan contingencies for infrastructure projects that are under construction or close to breaking ground. The specific impacts this potential listing may have on state-mandated projects and affordable housing development remain largely unknown, and I therefore request additional time to realize the full impact this study will have on our communities. Due to the immediate and significant impacts this decision will have and the communication challenges faced, particularly due to the complications resulting from the COVID-19 pandemic and related public health State of Emergency, I respectfully ask that the Commission delay consideration of this matter to a meeting date after June 25, 2020. I acknowledge the Commission's currently posted agenda and staff's recommendation to continue the hearing to August 19-20, 2020, and strongly encourage the Commission to approve this continuance.

The western Joshua tree is an iconic species that defines the Antelope Valley community, and I and my predecessors have worked diligently to ensure that existing federal, state, and local protections for this plant species are observed at all times. I would welcome the opportunity to discuss local protection measures with the petitioners if they deem them insufficient. I oppose this Petition request because it creates new, sweeping state protections across immense geographical locations of our state that do not address the specifically alleged long-term threat to the species. Rather, these CESA protections will impose significant challenges to critical infrastructure development and drastically increase the cost of living in an already disadvantaged region. I remain committed to working with stakeholders on a strategic, targeted solution that balances conservation and preservation of this species with sustainable economic prosperity.

Thank you,

Thomas Lackey

Tom Lackey
California State Assemblyman
36th District

1) https://www.fws.gov/carlsbad/NR/JTree_12M_Finding_NR_final_20190814.pdf

Assembly
California Legislature

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CHAD MAYES
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June 10, 2020

Original on file, received June 10, 2020

The Honorable Eric Sklar, President
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

As elected officials representing the Morongo Basin, we write in strong opposition to the Petition submitted by the Center for Biological Diversity (Petition) to list the western Joshua tree as a threatened species under the California Endangered Species Act (CESA) and appreciate the opportunity to provide public comment. The western Joshua tree presently receives extensive protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private land owners while doing little to address the alleged long term threat to the species upon which the Petition is based.

The Petition fails to provide scientific evidence to substantiate a decline of the western Joshua tree population. Instead, the Petition predicts a future decline due to global climate change. It is worth noting that a substantial portion of the western Joshua tree population resides on federal, state, and locally protected lands across multiple jurisdictions in the south western United States, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal. Counties and municipalities within the desert areas have also imposed development regulations to protect the species.

In August of 2019 the United States Department of Fish and Wildlife rejected a substantially similar petition to list both species of the Joshua tree on the federal Endangered Species Act. Citing the best available scientific evidence, their work resulted in the following statement:

> Adapted to harsh desert conditions, the trees can tolerate extreme temperatures, ranging from 4 to 120 degrees Fahrenheit and elevations between 1,900 to 7,200 feet….
>
> …The Service reviewed the status of both species and assessed the potential impact on their populations of stressors such as wildfire, drought, plant-eating animals, and climate change. The Service's analysis determined that neither taxa currently requires protection under the ESA. Most habitat occupied by the two species is federally-managed by agencies including the National Park Service, Bureau of Land Management, U.S. Forest Service and Department of Defense. A much smaller portion of habitat is managed by state or local governments or is privately owned. Species distribution mapping shows there has been no major reduction or contraction in Joshua tree populations during the last 40 years. Additionally, several federal agencies, the states of California and Arizona and several local jurisdictions have adopted and implemented policies that provide some protections to Joshua trees from harvesting and removal. (1)

(1) https://www.fws.gov/carlsbad/NR/JTree_12M_Finding_NR_final_20190814.pdf

Adding CESA protections will make it nearly impossible to construct vital public infrastructure projects and will increase the cost of housing in an economically depressed region. For example, the Town of Yucca Valley (Town) is currently in the first stage of a wastewater reclamation project, which is a state-mandated phased project to connect the entire town to a newly constructed treatment facility. To finance the project, 4,500 properties were assessed $18,000 each, but there are still 3,000 connections remaining to be completed. If the western Joshua tree receives CESA protections, these remaining connections will be significantly delayed or prohibited, and the original assessment amount will not cover connection costs.

To make matters worse, CESA protections take effect immediately if the western Joshua tree is listed as a candidate species. This process leaves local governments without adequate time to plan contingencies for infrastructure projects that are under construction or close to breaking ground. We very much appreciate the multiple conversations we have had with yourself, Fish and Game Commission (Commission) staff, and officials from the California Department of Fish and Wildlife (Department). The specific impacts this potential listing may have on state-mandated projects and affordable housing development remain largely unknown, and we therefore request additional time to realize the full impact this study will have on our communities. Due to the immediate and significant impacts this decision will have and the communication challenges we faced, particularly due to the complications resulting from the COVID-19 pandemic and related public health State of Emergency, we respectfully ask that the Commission delay consideration of this matter to a meeting date after June 25, 2020. We acknowledge the Commission's currently posted agenda and staff's recommendation to continue the hearing to August 19-20, 2020, and strongly encourage the Commission to approve this continuance.

The western Joshua tree is an iconic species that defines our Morongo Basin community, and we and our respective predecessors have worked diligently to ensure that existing federal, state, and local protections for this plant species are observed at all times. We would welcome the opportunity to discuss our local protection measures with the petitioners if they deem them insufficient. We oppose this Petition request because it creates new, sweeping state protections across immense geographical locations of our state that do not address the specifically alleged long-term threat to the species. Rather, these CESA protections will impose significant challenges to critical infrastructure development and drastically increase the cost of living in an already disadvantaged region. We remain committed to working with stakeholders on a strategic, targeted solution that balances conservation and preservation of this species with sustainable economic prosperity.

Thank you,

Chad Mayes
California State Assemblyman
42nd District

Dawn Rowe
Third District Supervisor
County of San Bernardino

Dawn
ROWE
THIRD DISTRICT SUPERVISOR

Original on file,
received June 16, 2020

BOARD OF SUPERVISORS
COUNTY OF KERN

SUPERVISORS

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ZACK SCRIVNER District 2
MIKE MAGGARD District 3
DAVID COUCH District 4
LETICIA PEREZ District 5

KATHLEEN KRAUSE
CLERK OF THE BOARD OF SUPERVISORS
Kern County Administrative Center
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June 16, 2020

California Fish and Game Commission
Mr. Eric Sklar, President
P.O. Box 944209
Sacramento, CA 94244-2090

Emailed - fqc@fqc.ca.gov

RE: Opposition to Listing of Western Joshua Tree Item
June 24-25 California Fish and Game Commission

Dear President Sklar and Members of the Commission,

The Joshua Tree is well known in Kern County throughout our eastern Kern desert areas which contain the Mojave Air and Space Port, the cities of California City and Ridgecrest and thousands of acres of wind and solar projects. It occurs on both Bureau of Land Management (BLM) lands as well as private lands. In addition, there are protected areas within Red Rock State Park and on federal lands such as wilderness designations and BLM Areas of Critical Environmental Concern (ACEC) within Kern County. The Kern County Board of Supervisors believes that listing the Western Joshua Tree as a candidate for threatened status is unnecessary and will impede the implementation of climate goals that the State has created.

Through our Environmental Impact Report preparation on thousands of MWs of wind and solar as well as battery storage, the staff of our Planning and Natural Resources Department has carefully evaluated and protected the Western Joshua Tree when it occurs on projects. Since 2004, a policy of the Kern County General Plan has required Joshua Tree Woodlands be preserved onsite from development proposals or compensation land be provided. Extensive stands of Joshua Tree woodlands have been preserved in Kern's Tehachapi Wind area in between the turbine placement and will not be developed over the next 30-40 years of the wind farm operation. Repowering of those projects at the end of that 40 years will have a smaller footprint and those woodlands will still be there. In the cases where woodland must be disturbed our Board, on the recommendation of staff, has required that mitigation cover the loss of those important natural community through payment to the City of Lancaster for additions to their Prime Desert Woodland Preserve at 35th Street West in Lancaster which includes extensive Joshua Tree Woodlands.

The representations of the petition that Joshua Trees on private lands are threatened due to development is not applicable to Kern County. The majority of trees removed were done in the 1970s and 1980s for farming and cannot be reestablished. The current private lands with Joshua Trees are in the Antelope Valley adjudicated water basin and other water limited areas where residential and commercial development will not occur. While the petition you reviewed asserts that energy projects are a threat, in fact, commercial scale solar developers avoid properties with Joshua Trees whenever possible. If a significant older Joshua Tree occurs on the site, since they can live from 150 to 300 years, they have been avoided in the project design and in one case smaller trees were relocated to create desert landscaping along the outside of the project. Those relocated trees are thriving and continuing their slow growth. We note that if climate change is a threat to Joshua Trees it is a threat to all species and humans and increasing the burden of environmental regulation on this desert plant will only interfere with the ability of solar and wind projects to be financed and built. These are the exact projects the environmental groups claim is needed to address their climate change concerns and the State is encouraging for energy for our population. In addition, Kern County is a center of oil development in our valley portion and groups, as well as the State of California wants diversification of energy. Kern County has significant desert areas and transmission that will continue to be appropriate, and already disturbed for commercial scale solar and wind including the new over 3000 MW of battery storage planned. All projects in Kern County require an Environmental Impact Report and appropriate siting and evaluation of the impacts on Joshua Trees and Joshua Tree Woodlands are done. Listing could and will add a complicated layer of regulation that will delay and even prevent such projects with the related loss of jobs, tax revenue and progress on energy diversification that is so important to achieving the State goals. Kern County already provides over 15,900 MW of renewable energy for cities, counties and utilities in the State and this one listing could stop that progress.

The Kern County Board of Supervisors requests you vote no on designating the Western Joshua Tree as a candidate species for listing as inconsistent with the important goals of green energy job creation and encourage the department staff to continue their good work on reviewing projects to implement best practices for supporting the survival and expansion of the Western Joshua Tree.

Sincerely,

Leticia Perez, Chairman
Kern County Board of Supervisors

Cc: San Bernardino County Board
Senator Grove
Senator Hurtado
Assemblyman Salas
Assemblyman Fong

VICTOR VALLEY TRANSIT

May 19, 2020

Mr. Eric Sklar, President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

RE: PETITION TO LIST THE WESTERN JOSHUA TREE

Dear President Sklar:

Victor Valley Transit Authority values our desert environment, of which the native Joshua Tree is an important element.

After careful consideration however, the Victor Valley Transit Authority Board of Directors is in ***strong opposition*** to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act.

As noted in the Petition, the Western Joshua tree is not presently threatened with extinction. As such, the petition predicts a future decline due to global climate change. The proposed listing is based upon theory and modeling efforts, not current scientific facts as they exist today.

It is well known that much of the Western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal. In addition, the state of California has the opportunity to collaborate with the federal government on conservation efforts designed to protect the western Joshua tree and its surrounding habitat. To place the conservation requirements onto private property owners prior to governmental agencies attempting to collaborate and cooperate in implementing effective conservation efforts is neither good public policy nor good governance. Placing significant financial burdens on private landowners will not address the hypothetical decline in the species as outlined in the Petition.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state.

It is incongruous that the state of California on the one hand acknowledges the significant state-wide housing shortage, the lack of affordable housing, and the homeless population crisis, which all exist at the current time, yet on the other is prepared to impose some of the most stringent impediments to construction of housing by implementing this the State Endangered Species Act. Conflicting public policies need to be addressed prior to imposing additional constraints and costs upon private property owners and upon the delivery of critical public infrastructure which is so lacking in the Victor Valley and indeed the entire desert area.

Imposition of the State Endangered Species Act will create unnecessary impediments, as well as greatly increased costs, to the delivery of these much-needed infrastructure systems throughout the Victor Valley. In many cases, these limitations upon infrastructure development will prevent local agencies from delivering much needed housing development, transportation network capacity enhancements and job creation through commercial development opportunities. Placing significant constrains and financial burdens on infrastructure development in this region's desert communities will not address the theoretical decline in the species as outlined in the Petition.

While we appreciate the Commission's role in administering the California Endangered Species Act, it is equally important to recognize when conflicting state public policies create an untenable framework within which federally funded public agencies such as the VVTA must navigate. VVTA urges you to consider the significant impacts your decision will have on our beautiful desert communities, and respectfully ask that you deny this petition.

Thank you for your time and consideration.

Curt Emick
Board Chair, Board of Directors
Victor Valley Transit Authority

Cc: Board of Directors

May 19, 2020

Mr. Eric Sklar, President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

RE: PETITION TO LIST THE WESTERN JOSHUA TREE

Dear President Sklar,

The Town of Yucca Valley, possibly more than any other community in the state, values the integration of the desert environment, including the Joshua Tree and other unique desert plants, into our continued development as a community. As evidenced by our Town logo, as well as our General Plan Vision and Values, the desert environment is woven into the fabric of this community.

After careful consideration however, the Yucca Valley Town Council is in ***strong opposition*** to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act.

As noted in the Petition, the western Joshua tree is not presently threatened with extinction. As such, the petition predicts a future decline due to global climate change. The proposed listing is based upon theory and modeling efforts, not current scientific facts as they exist today.

The Petition clearly identifies that significant western Joshua tree habitat is located on federal lands. As such, the state of California has the opportunity to collaborate with the federal government on conservation efforts designed to protect the western Joshua tree and its surrounding habitat. To place the conservation requirements onto private property owners prior to governmental agencies attempting to collaborate and cooperate in implementing effective conservation efforts is neither good public policy nor good governance. Placing significant financial burdens on private landowners will not address the theoretical decline in the species as outlined in the Petition.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. While the Petition identifies significant growth rates in several communities, the details in the Petition are misleading. For example, over the Town of Yucca Valley's 28 years of incorporation, the growth rate in housing units is less than one (1%) percent annually. Since 2010, a total of 194 single family residential construction permits have been issued. Growth in Yucca Valley has been anything but substantial or significant over the past 28 years.

TOWN OF YUCCA VALLEY, CALIFORNIA • INC. NOV. 27, 1991
The Town of Yucca Valley
57090 Twentynine Palms Highway • Yucca Valley, California 92284
760/369-7207 • FAX 760/369-0626

Simultaneously, the state of California acknowledges the significant state-wide housing shortage, the lack of affordable housing, and the homeless population crisis, which all exist at the current time. But the state of California is prepared to impose some of the most stringent impediments to construction of housing through implementation of the State Endangered Species Act. Conflicting public policies need to be addressed prior to imposing additional constraints and costs upon private property owners and upon the delivery of critical public infrastructure which is so lacking in Yucca Valley and the surrounding Morongo Basin.

The Town of Yucca Valley, through The Hi-Desert Water District, and as ordered by the California Regional Water Quality Control Board, is implementing wastewater collection and treatment infrastructure. Property owners in Phase I of the project agreed to tax themselves approximately $19,000 per single family residential unit to deliver this critical infrastructure to the community. Phase I was completed in approximately December 2019. Preliminary estimates for Phase II of the wastewater project place single family residential units' costs at approximately $28,000. For numerous property owners, it will not be possible to connect to the State mandated wastewater collection system without removal of Joshua trees. Therefore, policies created by two separate State agencies have created the inability of property owners to comply with both State regulations. Again, conflicting public policies need to be addressed prior to imposing additional constraints and costs upon private property owners.

The Town of Yucca Valley is part of the Morongo Basin. The Morongo Basin, including the Town of Yucca Valley, the City of 29 Palms, and the surrounding unincorporated San Bernardino County areas of Morongo Valley, Joshua Tree, as well as other small communities, is infrastructure deficient. These deficiencies cover the transportation network, including State Routes 62 and 247, flood control systems, as well as water and wastewater systems.

Imposition of the State Endangered Species Act will create unnecessary impediments, as well as greatly increased costs, to the delivery of these much-needed infrastructure systems throughout the Morongo Basin. In many cases, these limitations upon infrastructure development will prevent the agencies from delivering much needed housing development, transportation network capacity enhancements and job creation through commercial development opportunities. Placing significant constrains and financial burdens on infrastructure development in the Morongo Basin will not address the theoretical decline in the species as outlined in the Petition.

While we appreciate the Commission's role in administering the California Endangered Species Act, it is equally important to recognize when conflicting state public policies create an untenable framework within which the Town must navigate. I urge you to consider the significant impacts this will have on rural desert communities including the Town of Yucca Valley, and respectfully ask that you deny this petition.

Thank you for your time and consideration.

TOWN OF YUCCA VALLEY
Jeff Drozd
Mayor

385 North Arrowhead Avenue, 5th Floor, San Bernardino, CA 92415-0120 | Phone: 909.387.4821 Fax: 909.387.5430

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SAN BERNARDINO COUNTY

County Administrative Office
Governmental & Legislative Affairs

Josh Candelaria
Director

Original on file, received August 6, 2020

August 6, 2020

Erick Sklar
President, California Fish and Game Commission
P.O. 944209
Sacramento, CA 94244-2090

RE: Item No. 25 – Western Joshua Tree

Dear President Sklar:

On behalf of the County of San Bernardino, thank you for taking into consideration our concerns regarding listing the western Joshua tree as a threatened species under the California Endangered Species Act (CESA). We appreciate the efforts the Commission and the California Department of Fish and Wildlife have taken to listen to our unique issues. Due to measures we have adopted on the local level to protect the Western Joshua tree and the clear absence of sufficient evidence to justify the petitioner's request, we are opposed to listing the Western Joshua tree under CESA.

With more than 80% of the county in federal ownership, public land is a major asset in San Bernardino County. Our diverse public lands support a range of environmental, economic, and quality of life benefits. The County is committed to balancing conservation with continuing public access for sustainable multiple uses.

As a regional conveyor, the County has worked with multiple stakeholders, including conservation organizations, outdoor recreationists, ranchers, industry officials, tribal leaders, and state and local officials, to ensure our natural resources are managed appropriately.

With the recent designation of three national monuments, numerous military installations located throughout the County, and 81% of the 20,000 square miles outside of local government's jurisdictions, listing the Joshua tree as a threatened species has the potential to adversely impact the limited development that can occur in rural parts of the County.

It is also important to note, communities take pride in the Joshua tree and have enacted additional protective measures through local ordinances. Moreover, the tree is considered an iconic species that generally adds property value. In fact, many builders go out of their way to plan developments around existing trees. Listing the Joshua tree

BOARD OF SUPERVISORS

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Chairman, Fourth District

JOSIE GONZALES
Vice Chair, Fifth District

Gary McBride
Chief Executive Officer

on the CESA list will put unnecessary financial burdens on land owners, adversely impact local economies, and do little to address the alleged long-term threat to the species suggested by the petition.

Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, as well as through local governments regulations, which requires permitting for removal.

Furthermore, as explained in the County's legal and technical comments concurrently submitted with this letter, the County is concerned by the clear absence of sufficient information in the Petition, as prescribed in Fish and Game Code section 2072.3, regarding the "abundance" and population trend of the western Joshua tree to indicate that listing the species may be warranted. Should the Commission determine that the petition action may be warranted, a precedent may be set for future petitioners to disregard the requirement to include sufficient scientific evidence for justification of the request.

The County is supportive of additional measures on the local level, such as regional planning efforts to further enhance both population data and protections for the Joshua tree, in lieu of the petition.

For the above reasons, the County of San Bernardino respectfully requests you deny the petitioner's request. If you have any questions regarding the County's position, please do not hesitate to contact Josh Candelaria, Director of Governmental and Legislative Affairs at (909) 387-4821 or jcandelaria@sbcounty.gov.

Sincerely,

Curt Hagman
Board of Supervisors Chairman
Fourth District Supervisor
County of San Bernardino

Dawn Rowe
Board of Supervisors
Third District Supervisors
County of San Bernardino

Original on file,
received August 6, 2020

August 6, 2020

Erick Sklar
President, California Fish and Game Commission
P.O. 944209
Sacramento, CA 94244-2090

RE: Item No. 25 – Western Joshua Tree

Dear President Sklar:

On behalf of the High Desert Corridor (HDC) Joint Powers Authority, I am writing you to express our opposition to the petition to list the Western Joshua tree as a threatened species under the California Endangered Species Act (CESA).

The purpose of the HDC is to improve east-west mobility within the High Desert region of Southern California by addressing present and future travel demands and mobility needs. The HDC also aims to improve travel safety and reliability, while connecting residential, commercial and industrial areas in the Antelope and Victor Valleys, including the cities of Palmdale, Lancaster, Adelanto, Victorville and the Town of Apple Valley.

Many of our communities take pride in the Joshua tree and have enacted additional protective measures through local ordinances. Moreover, the tree is considered an iconic species that generally adds property value. In fact, many builders go out of their way to plan developments around existing trees. Listing the Joshua tree as a threatened species has the potential to adversely impact the limited development that can occur in rural parts of San Bernardino and Los Angeles Counties. Critical public infrastructure projects, including road, sewer, and water would require additional environmental review, potentially increasing the cost of projects and delaying completion.

For the above reasons, I respectfully request you deny the petitioner's request. If you have any questions, please do not hesitate to contact Josh Candelaria, staff coordinator for the HDC, at (909) 387-4821 or jcandelaria@sbcounty.gov.

Sincerely,

ROBERT A. LOVINGOOD
Chairman, High Desert Corridor Joint Powers Authority

NOSSAMAN LLP

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Refer To File # 501803-0004

VIA EMAIL

Original on file,
received June 10, 2020

June 10, 2020

Erik Sklar, President
California Fish and Game Commission
1416 9th Street, Suite 1320
Sacramento, CA 95814
fgc@fgc.ca.gov

Re: Petition to list the western Joshua tree as threatened or endangered under the California Endangered Species Act

Dear President Sklar:

This letter is prepared and submitted on behalf of QuadState Local Governments Authority ("QuadState").[1] We are writing to oppose a petition ("Petition") submitted by the Center for Biological Diversity ("Petitioner") to list the western Joshua tree (*Yucca brevifolia*)[2] as threatened as either a full species or as the subspecies (*Yucca brevifolia brevifolia*) under the California Endangered Species Act ("CESA"), Fish & G. Code ("Code"), § 2050 *et seq*. We understand that at its June 24-25, 2020 meeting, the California Fish and Game Commission ("Commission") will consider whether listing the western Joshua tree under CESA, as requested by the Petition, may be warranted. We request the Commission reject the Petition.

While QuadState is confident that CESA and its implementing regulations require rejection of the Petition, QuadState supports the Commission deferring any decision until the next Commission meeting in order to provide our County members and their constituents with a meaningful ~~opportunity to participate in t~~he listing process. We understand that Commission staff have also recommended the decision be deferred until the August 19-20, 2020 Commission meeting.[3] As you

[1] QuadState is a joint exercise of powers authority established between eight counties and one city in four Western states. QuadState membership includes three desert counties in California—Imperial County, Inyo County, and San Bernadino County—in which the western Joshua tree may be found.

[2] Due to the species' treatment in the majority of existing scientific literature, the Petition primarily refers to Joshua tree as a single species rather than distinguishing between *Y. brevifolia* (the western Joshua tree) and *Y. jaegeriana* (the eastern Joshua tree); however, the Petition adopts the recent view that *Y. brevifolia* is distinct from *Y. jaegeriana* and requests listing of only *Y. brevifolia*. *See* Petition at 1, 4. In this letter, QuadState refers to the petitioned species as the western Joshua tree.

[3] *See* June 24-25, 2020 Commission Agenda *available* at:

https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=180395&inline.

57498505.v1

are well aware, governments and their citizens are facing a raft of challenges at this moment in time largely as a consequence of the COVID-19 pandemic and its devastating societal impacts. These circumstances have made it difficult for our members to give the Petition and the Department of Fish and Wildlife's ("Department") March 11, 2020 Initial Evaluation of the Petition ("Department Evaluation") appropriate attention.

Deferral will also allow the County members and their constituents with an opportunity to confer with Commission staff and Department personnel regarding the potential to adopt a 2084 regulation in the event that the Commission determines, over our objections, that listing the western Joshua tree under CESA may be warranted. As we are in the midst of a recession of uncertain depth and length, and because all agree that the threat to the species is not by any stretch a near-term threat, a 2084 regulation could be invaluable as a tool to limit the economic consequences of candidacy while ensuring adequate protection for the species, should the Commission pursue that route.

As set forth in greater detail below, QuadState does not believe that the Petition demonstrates that the western Joshua tree meets the definition of a threatened species under CESA. Rather, the Petition relies substantially on effects to the species that may be caused by climate change that Petitioner admits may not be evident for 50 or more years into the future. Such a request is unprecedented. Neither CESA nor its implementing regulations contemplate listing species where the data do not indicate existing and demonstrable threats. To date, the Commission has not listed a species primarily on the basis of potential, future adverse effects of climate change and doing so would establish a precedent not rooted in principles of sound science.

QuadState urges the Commission not to simply accept Petitioner's assertions regarding threats to the western Joshua tree and its habitats; rather, QuadState requests the Commission fulfill its legal obligation to evaluate the information in the Petition and other available information and determine whether the Petition's claims are credible and provide a lawful basis for a candidacy determination.

1. LEGAL BACKGROUND

Section 2070 of the Code provides that the Commission "shall establish a list of endangered species and a list of threatened species." CESA defines a threatened species as:

> a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter.

Fish & G. Code § 2067. The statute defines endangered species as a species:

> which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease.

Id. at § 2062.

A. Petition requirements

Any person can submit a petition to list a species under CESA. In order for a petition to be accepted by the Commission, the Code requires the petition include sufficient scientific information that the petitioned action may be warranted. Fish & G. Code, § 2072.3. Specifically, the CESA requires that a petition include information regarding the "population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information," as well as the "kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant." *Id*.

Caselaw clarifies that a species does not qualify as a candidate for "endangered" or "threatened" classification if the petition does not provide sufficient information that would lead a reasonable person to conclude the petitioned action may be warranted. *Natural Resources Defense Council v. Fish & Game Com*., 28 Cal. App. 4th 1104, 1119 (1994) (citing Fish & G. Code, § 2074.2).

B. Obligations of California Department of Fish and Wildlife in evaluating petitions

Pursuant to section 2073.5 of the Code and Title 14 of the California Code of Regulations, the Department must address each of the following petition components when evaluating whether the petitioned action (here, listing the western Joshua tree as threatened) may be warranted:

1. Population trend;
2. Range;
3. Distribution;
4. Abundance;
5. Life history;
6. Kind of habitat necessary for survival;
7. Factors affecting the ability to survive and reproduce;
8. Degree and immediacy of threat;
9. Impact of existing management efforts;
10. Suggestions for future management;
11. Availability and sources of information; and
12. A detailed distribution map.

Cal. Code Regs., tit. 14, § 670.1(d)(1). As set forth below, QuadState believes neither the information presented by the Petition nor the information contained in the Department Evaluation are sufficient to indicate that listing the western Joshua tree may, in fact, be warranted.

2. NEITHER THE PETITION NOR THE DEPARTMENT EVALUATION ESTABLISH SUBSTANTIAL POSSIBILITY THAT LISTING THE WESTERN JOSHUA TREE MAY BE WARRANTED

As noted above, a threatened species under CESA is one that is not presently threatened with extinction, but is "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter." Fish & G. Code § 2067. The Petition requests the western Joshua tree be listed as threatened under CESA. Thus, the question for the Commission is whether the species is likely to become in danger of extinction in the *foreseeable future* without *special protection and management* afforded by the Code. Below, we provide information establishing that the western Joshua tree does not meet the criteria for listing under the Code.

A. Western Joshua tree unlikely to become an endangered species in the foreseeable future

The Petition is clear that the western Joshua tree is not faced with "imminent risk of extinction," and, admits that "extirpation [of the species] is likely decades away[.]" Petition at 1, 48. While the Petition predicts that western Joshua trees will be "close to being functionally extinct" in California by "century's end" (that is, 80 years from now), the Petition also explains that "researchers have been raising the alarm about threats to Joshua trees for decades." *Id*. at 32. For example, a study cited by Petitioner from 1953 stated that "regardless of the present wide distribution and large concentration of yuccas, [the Joshua tree's] future appears very dim." *Id*. at 34. And yet, more than 70 years after that grim assessment, there has been no observable downward trend in the population of the Joshua tree, as stated in the Petition and reiterated in the Department Evaluation. *See* Petition at 19 ("no range-wide population trends have been documented"), at 20 ("Regardless of whether Joshua tree abundance is already declining, it is virtually certain that abundance will decline in the foreseeable future"), and at 9 ("The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend…"); *see also* Department Evaluation at 2 ("Although a reliable estimate of western Joshua tree population size is not available, information available to the Department indicates that the Joshua tree is currently relatively abundant"). Indeed, the Petition itself notes that "while the threats facing *Y. brevifolia* in the coming decades are dire, unlike more narrowly-endemic species, the species has the benefit of being long-lived, with a relatively large current distribution, spread across the elevational and latitudinal gradients, much of which is in protected areas." Petition at 65.

Neither CESA nor its implementing regulations provide guidance on how the Commission should apply the "foreseeable future." Nevertheless, the Petition cites to a 2013 memorandum from the Director of the Department to the Executive Director of the Commission ("2013 Memorandum") concerning a petition to list the American pika on the basis of climate change-induced threats as precedent for the theory that the end of the 21st century may be an appropriate measure. Petition at 63; Memorandum from Charlton H. Bonham, Director of California Dep't of Fish and Wildlife to Sonke Mastrup, Exec. Director of Fish and Game Comm'n, (May 5, 2013) at 1 (emphasis added).

Petitioners fail to mention, however, that the Department ultimately recommended in the 2013 Memorandum that the Commission not list the American pika as a result of the potential threat of climate change. Instead, the Department noted in the 2013 Memorandum that "the best scientific information currently available indicates [the American pika] is not in serious danger in the ***next few decades*** of becoming extinct throughout all or a significant portion of the species' range in the state, nor by the end of the century should the existing climate change models and predicted trajectory of suitable pika habitat come to fruition." 2013 Memorandum at 1 (emphasis added).

Given that supposed extirpation of the Joshua tree is likely "decades" in the future and that there currently is no demonstrable downward trend in the species' abundance or range, QuadState fails to see how the Petition provides the best scientific evidence that the species is in danger of extinction in the foreseeable future.

B. Climate change modeling and relevant studies diverge on the effects of climate change on the Joshua tree

The Petition relies heavily on certain select studies to support the contention that extirpation of the western Joshua tree in California is a foregone conclusion due to the predicted effects of climate change. But multiple studies predict growth and expansion of the range of the tree as a result of a warming climate, while others predict a modest contraction of the tree's range, and still others predict total extirpation. This range of outcomes indicates uncertainty that increases as one looks further into the future.

For example, and as mentioned by Petitioners in a footnote, Notaro et al. (2012) predicted a "robust range expansion" of the species of nearly 150 percent as a result of climate change. Petition at 38, n. 38. Petitioners discount Notaro et al. because that study did not examine the species' response to climate change in California, but fail to mention other studies that also predict potential expansion of the species' range in California.

Archer et al. (2008) notes that "limited available data suggest increases in atmospheric [carbon dioxide] concentrations could promote Joshua Tree seedling survival, and could result in an increase of this native species' range." Steven R. Archer and Katharine I. Predick, *Climate Change and Ecosystems of the Southwestern United States*, Rangelands 30(3): 23-38 (June 2008). The same study further provides that:

> Although the deserts of southwestern North America have been the sites of many important ecological studies, there have been relatively few long-term monitoring studies that provide the opportunity to observe changes in ecosystem structure and function in response to climate change per se… Current observation systems are inadequate to separate the effects of changes in climate from the effects of other drivers…
>
> …

> In climate simulations for the Intergovernmental Panel on Climate Change emission scenarios, novel climates arise by 2100 AD. These future novel climates (warmer than any present climates, with spatially variable shifts in precipitation) increase the likelihood of species reshuffling into novel communities and other ecological surprises… Most ecological models are based upon modern observations, and so might fail to accurately predict ecological responses to future climates occurring in conjunction with elevated atmospheric CO2, nitrogen deposition, and nonnative species introductions.

Id. at 27-28.

Likewise, a study published in 2012 demonstrated that where there was a 3 degree Celsius increase in mean July maximum temperature, Joshua tree distribution within the Joshua Tree National Park ("JTNP") declined by a predicted 90 percent, but a suitable Joshua tree refugium remained in the park. Cameron W. Barrows, Michelle L. Murphy-Mariscal, *Modeling impacts of climate change on Joshua trees at their southern boundary: How scale impacts predictions*, Biological Conservation 152: 29-36 (2012). The study's authors noted that statistical analyses used in previous larger-scale climate modeling homogenized different local conditions and adaptations and, as a result, failed to accurately characterize "the unique niches of statistical outliers, individual populations at the periphery of a species' distribution." *Id*. at 30. To better understand Joshua trees' response to changing climactic conditions, the study's authors employed niche modeling, which considers habitat variables (e.g., climate and terrain) to assess the "complex interaction of factors" constraining species distribution. *Id*. Using this niche modeling, Barrows and Murphy-Mariscal explained that their results contrasted with those of two studies cited heavily by Petitioner: Dole e al. (2003) and Cole et al. (2011) (collectively "Dole and Cole"). While Dole and Cole constructed models wherein similar levels of climate change resulted in no suitable habitat for Joshua trees within the central or southern portions of their current distribution, Barrows and Murphy-Mariscal's results indicated suitable habitat would, indeed, remain. *Id*. at 34. Barrow and Murphy-Mariscal opined that the differences were due to scales of analyses used by Cole and Dole rather than differences in modeling or model assumptions. *Id*. Put simply, Barrows and Murphy-Marsical "were able to incorporate local adaptations as well as topographic-climate complexities, a perspective that would almost certainly be lost with the homogenizing of climate adaptations and landscape features inherent with larger scale analyses." *Id*. (citing Pennington et al. 2010). Importantly, and unlike Cole et al. (2011), Barrows and Murphy-Mariscal found no evidence of Joshua tree mortality within JTNP that was unrelated to fires, despite specifically searching for such causes. *Id*.

Finally, QuadState wishes to bring to the Commission's attention a paper presented at the 2018 Desert Symposium demonstrating that young *Y. jaegeriana* within the Cima Dome in the Mojave National Preserve (located in San Bernadino County, California) appear to survive and grow even through periods of long-term drought. *See* James W. Cornett, *Eastern Joshua tree (Yucca jaegeriana) growth rates and survivability on Cima Dome, Mojave National Preserve*, 2018 Desert Symposium (2018) ("The… study indicates young Joshua trees established near the species' elevational limit have the capacity to survive and continue to grow despite the long-term drought experienced during the… study"). While this paper was written based on a study of *Y. jaegeriana*, one could reasonably postulate that *Y. brevifolia* occurring at similar elevations elsewhere in California would respond in much the same fashion in response to climate change-induced drought and temperature increases as their eastern counterpart. At a minimum, this paper provides further support for QuadState's position that the potential impacts to Joshua tree as a result of climate change do not form a reasonable basis on which to list the Joshua tree or place the species on the list of CESA candidates.

The varying results of studies and models demonstrate that specific effects of climate change on the western Joshua tree are uncertain, and, therefore, the Commission should decline to find the species may warrant listing under CESA at this time.

C. Special protection and management unlikely to address primary alleged threat of climate change

Even assuming that the species is, in fact, in danger of extinction in the foreseeable future, the Petition still fails to meet the test for listing the western Joshua tree as threatened under CESA. As is described in greater detail below, because the primary threat identified by the Petition is that of climate change, there would not appear to be relevant special protection or management efforts that the Commission could put into place that would reverse the supposed trajectory of the species.

The Petition acknowledges its position that "[c]limate change represents the single greatest threat to the continued existence of the *Yucca brevifolia*." Petition at 31. Indeed, the Petition states that "***[e]ven under the most optimistic climate scenarios, western Joshua trees will be eliminated from significant portions of their range by the end of the century***…" *Id*. (emphasis added).

Consequently, the Petition explains that the "lack of effective regulatory mechanisms to address greenhouse pollution is largely determinative as to the question of whether *Y. brevifolia* qualifies for CESA protection." Petition at 50-51. And the first remedy suggested in the Petition for ameliorating threats to the species and to manage and recover the species is for the governor of the State of California to declare a "climate emergency and take[] all necessary action to set California on a path to full decarbonization of [the state's] economy by no later than 2045 (e.g., banning the sale of new fossil fuel vehicles by 2030 and requiring the generation of all electricity from carbon-free sources 2030)." *Id*. at 65. The Department Evaluation also acknowledges that the most important recovery actions for the species are those leading to rapid and steep greenhouse gas emission reductions to minimize climate change. Department Evaluation at 27.

QuadState notes that the Petition neither explains nor substantiates how state-level action to address climate change would lead to a reduction in greenhouse gas emissions at a level necessary to ameliorate threats of climate change on western Joshua trees located in the State of California. Moreover, the Code explicitly states that the relevant management actions and protections must be available under Chapter 1.5 of the Code itself.[4] Fish & G. Code at § 2067. These provisions relate

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[4] As noted above, the definition of a "threatened" species under CESA is a "native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that…is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [Chapter 1.5 of the Code]." Fish & G. Code

to regulation of "take" of CESA-listed species and not to broad orders by the governor regulating GHG emissions.

Other protective or special management measures recommended by Petitioner include preparation of recovery plans, development of Natural Community Conservation Plans, acquisition of habitat to expand and connect existing state parks to protect Joshua trees, and development of fire protocols within the species range, among others. While these measures may be beneficial to the Joshua tree, the Petition states – and the Department Evaluation recognized – that threats to the Joshua tree due to habitat destruction, fire, and invasive species merely exacerbate the larger threat caused by climate change. *See* Department Evaluation at 2. As such, the measures recommended by Petitioner would not, without a reversal of the climate change trajectory, provide sufficient benefit to counter the purported threat to the species. If the climate change predictions espoused by the Petition prove true, the presence or absence of any protective measures would make no difference to the species' status. As noted above, the Petition admits that even under the best climate change scenario, the species will become close to functionally extinct. Petition at 32.

D. Joshua tree is adequately protected in the State of California

QuadState notes that the western Joshua tree already benefits from substantial on-the-ground conservation pursuant to federal, state, and local law, regulation, and policy, and believes that the Petition's claim that the western Joshua Tree is inadequately protected is wholly without merit. Petition at 48, 58.

For example, under the California Desert Protection Act of 1994 ("CDPA"), Congress expanded environmental protections to millions of acres of desert "wilderness" by establishing the Death Valley and Joshua Tree National Parks, and the Mojave National Preserve. Pub. L. No. 103-433, 108 Stat. 4471 (1994). Through the CDPA, Congress declared its policy that public lands in the California desert be included in the national park and national wilderness preservation systems in order to perpetuate the diverse ecosystems of the California desert in its natural state. *Id*. The CDPA withdrew designated areas from "all forms of entry, appropriation, or disposal under the public land laws" and effectively functions to preserve and protect the very habitat necessary for the Joshua tree's survival. *Id.;* 16 U.S.C. §§ 410aaa–42, 410aaa–47.

The Petition acknowledges that 96 percent of the western Joshua Tree population in the northern part of its range occurs on federal lands protected under the CDPA and other mechanisms and that ten percent of the species occurring in the northern part of its range occurs on National Park Service land which is "generally well-managed and should prevent significant habitat loss or degradation from activities such as [off-road vehicle] use, cattle grazing, road building, or other forms of development." Petition at 55. Nevertheless, Petitioners attempt to minimize the significance of this protection by noting without additional commentary the existence of a single grazing allotment (the 86,400-acre Hunter Mountain Allotment) within Death Valley National Park that supposedly

§ 2067. The term "special protection and management efforts" is not further defined by the Code. Chapter 1.5 of the Code does not set forth any required special protection and management obligations relating to state-listed species outside of the application of prohibitions on import, export, and take established in § 2080 and activities relating thereto.

overlaps with the "range of *Y. breviolia*". *Id*. Petitioners cite the National Park Service's Death Valley National Park Wilderness and Backcountry Stewardship Plan and Environmental Assessment (2012) ("Park Service EA"). The Park Service EA, however, does not address whether the western Joshua tree occurs within the Hunter Mountain Allotment, and the Petition does not explore whether the current grazing allotment (which permits grazing of no more than 150 head of cattle between November 20 to June 30 of each year), in fact, negatively affects the species. *See* Park Service EA at 122.

At the state and local level, numerous laws and ordinances serve to provide significant additional protection for the western Joshua tree. For example, under the California Desert Native Plants Act, the western Joshua tree may not be harvested without a permit in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego Counties. Food & Agr. Code, §§ 80073(a), 80003. Local jurisdictions have adopted measures similar to those set forth in the California Desert Native Plants Act, including specific prohibitions on harvesting or removing Joshua trees. *See* San Bernadino County Code 88.01.060(c)(4). Chapter 14 of the City of Palmdale Municipal Code declares as its policy that "appropriate action must be taken in order to protect and preserve desert vegetation, ***and particularly Joshua trees***, so as to retain the unique natural desert aesthetics on some areas of this City[.]" Palmdale, Cal., Ordinance Ch. 14.04, § 14.04.010 (1992) (emphasis added).

QuadState fails to see how preservation and protection of such significant portions of a species' current habitat in addition to strong state and local laws and ordinances prohibiting removal of the species could lead a reasonable person to conclude such species is inadequately protected under existing regulatory mechanisms.

3. DEPARTMENT EVALUATION FAILS TO NOTE THE FACT THAT THE PETITION IS INCOMPLETE

QuadState notes that the Department appears to have completely ignored the requirement of the California Code of Regulations that a petition to list a species under CESA provide information concerning the species population trends and abundance. Despite acknowledging that the "Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a rangewide population trend," the Department nevertheless found that the Petition presented sufficient information on population trend and range. Department Evaluation at 2, 9.

Indeed, the Petition explicitly states that "[d]ue to the [Joshua tree's] patchy distribution within its range, highly variable population density…and lack of range-wide population surveys, a reliable estimate of Joshua tree population size is not available." Petition at 19. Moreover, the Petition notes that "impacts such as adult mortality and consequent population declines and range reductions may have a lag time before the presence is felt on the landscape." *Id*. at 20.

QuadState fails to understand how a Petition's provision of no data can result in a Department finding that sufficient data was provided.

4. STANDARD FOR LISTING UNDER CESA CANNOT BE BASED ON FUTURE DECLINE ALONE

The Petition includes dire warnings concerning the threat climate change poses to the western Joshua tree; however, the Petition also acknowledges that "[s]ince the end of the Pleistocene, the Joshua tree's distribution has been remarkably stable throughout the Holocene into the present day." Petition at 16-17. Despite the continued persistence of the species for tens of thousands of years, the Petition nevertheless predicts that the species will be extirpated at least from the JTNP by 2071 to 2099. *Id.* at 37. Among the studies relied upon by the Petition for this prediction is Cole et al. 2011. *Id.* at 68. However, it is notable that Cole et al. 2011 explains that the warming climate that occurred at the end of the Pleistocene and marking the beginning of the Holocene was the "most recent warming event of similar magnitude to that predicted for the near future." Cole et al. 2011 at 139. While that study indicated the species did not migrate as one might have expected, the species nevertheless has continued to persist, demonstrating its remarkable resilience.

Common logic would tell us that a species should not be listed on the sole basis that it may experience a future decline in range or distribution, particularly where no studies have demonstrated a downward population trend or reduction in abundance at a population level. Indeed, to date, the Commission has declined to list any species solely (or primarily) on the basis of future threats due to climate change. Doing so would open Pandora's box, allowing for the listing of innumerable plants and animal species that are not currently in danger of extinction nor likely to become so in the coming decades. QuadState believes a listing – or even a placement of a species – based on supposed future threats would be inconsistent with the Code.

QuadState suggests that the approach the Department adopted with respect to the American pika, mentioned briefly above and cited by the Petition, was precisely right. There, the Department did not recommend listing the species under CESA on the basis of future threats caused by climate change. Instead, the Department noted its belief that continued study and monitoring of the American pika would be "imperative" for the agency over the "next few decades" in order to "better assess the foreseeable future and the need for protections under CESA." 2013 Memorandum at 2.

This wait and watch closely approach suggested by the Department in connection with the status of the American pika under state law was prudent, thoughtful, and warranted. The Commission should decline to find the Petition warranted at this time and should, instead, adopt an approach wherein the species' trends and trajectory are closely monitored. The Commission may elect to initiate the CESA listing process at a later date due to the provision of new information and, of course, interested persons may submit new petitions to list at any time, which would trigger the petition review process.

5. CONCLUSION

In light of the foregoing, QuadState urges the Commission not to simply accept Petitioner's assertions regarding threats to the western Joshua tree and its habitats; rather, QuadState requests the Commission fulfill its legal obligation to evaluate the information in the Petition and other available information and determine whether the Petition's claims are accurate and credible.

Natural Resources Defense Council v. Fish & Game Com., 28 Cal. App. 4th 1104, 1119, 1125. The "may be warranted" finding described in Fish & Game Code § 2074.2 requires a determination that there is a "substantial possibility" that the petitioned action is warranted. *Id*. Based on the information provided in the Petition, there can be no rational determination of a substantial possibility that listing the western Joshua tree would be warranted at this time.

Very truly yours,

Paul S. Weiland
Nossaman LLP

cc: Charlton Bonham, Director, California Department of Fish and Wildlife
Gerald Hillier, Executive Director, QuadState Local Governments Authority

From: Deanna Hernandez <dhernandez@mdaqmd.ca.gov>
Sent: Tuesday, June 23, 2020 2:28 PM
To: FGC <FGC@fgc.ca.gov>
Cc: Brad Poiriez <bradp@mdaqmd.ca.gov>
Subject: Public Comment - Fish & Game Commission Meeting June 24-25, 2020

Dear Commissioners,

The attached is being presented as public comment for Agenda Item #27, Western Joshua Tree by the Mojave Desert Air Quality Management District's Governing Board and the Executive Director, Air Pollution Control Officer. The District location is 14306 Park Avenue, Victorville, CA 92392, 760.245.1661.

Please feel free to contact me if you have any questions.

Sincerely,

Deanna Hernandez
Senior Executive Analyst - Confidential
760.245.1661, ext. 6244 *Office*
760.241.3942 *Fax*
MDAQMD.ca.gov
@MDAQMD on Facebook, Twitter and Instagram

MINUTES OF THE GOVERNING BOARD
OF THE MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT
VICTORVILLE, CALIFORNIA

AGENDA ITEM #13

DATE: June 22, 2020

RECOMMENDATION: Adopt a Resolution to oppose a petition to the California Fish and Game Commission to list the Joshua Tree as threatened under the California Endangered Species Act and direct staff action.

SUMMARY: This action adopts a resolution urging against listing the Joshua Tree as threatened under the California Endangered Species Act.

BACKGROUND: The California Fish and Game Commission will consider a petition to list the western Joshua Tree as threatened under the California Endangered Species Act. Such an action has the potential to harm the opportunities to advance renewable energy projects. Renewable energy projects are important contributors to reducing carbon-based fuel emissions, and improving air quality throughout the Mojave Desert Air Basin and Palo Verde Valley. The Resolution seeks to avoid a permanent prohibition on alternative energy projects from sources such as solar and wind.

REASON FOR RECOMMENDATION: Governing Board is required to adopt resolutions.

REVIEW BY OTHERS: This item was reviewed by Karen Nowak, District Counsel as to legal form and by Brad Poiriez, Executive Director on or about June 9, 2020.

FINANCIAL DATA: No increase in appropriation is anticipated.

PRESENTER: Robert Lovingood, Governing Board Member.

MINUTES OF THE GOVERNING BOARD
OF THE MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT
VICTORVILLE, CALIFORNIA

ACTION OF THE GOVERNING BOARD

APPROVED

Upon Motion by **ROBERT LOVINGOOD,** seconded by **BARBARA RIORDAN,** as approved by the following roll call vote:

Ayes:	*11*	**ABEL, BENNINGTON, COX, DECONINCK, HERNANDEZ, LEON, LOVINGOOD, MINTZ, PEREZ, RIORDAN, ROWE**
Noes:		
Absent:	*2*	**CAMARGO, WILLIAMS**
Abstain:		

DEANNA HERNANDEZ, SENIOR EXECUTIVE ANALYST
BY Deanna Hernandez
Dated: June 22, 2020

Ref. Resolution 20-11, "A RESOLUTION OF THE GOVERNING BOARD OF THE MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT (MDAQMD) OPPOSING A PETITION TO THE CALIFORNIA FISH AND GAME COMMISSION TO LIST THE JOSHUA TREE AS THREATENED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT."

RESOLUTION 20-11

A RESOLUTION OF THE GOVERNING BOARD OF THE MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT (MDAQMD) OPPOSING A PETITION TO THE CALIFORNIA FISH AND GAME COMMISSION TO LIST THE JOSHUA TREE AS THREATENED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT.

On June 22, 2020, on motion by Member **ROBERT LOVINGOOD** seconded by Member **BARBARA RIORDAN**, and carried, the following resolution is adopted:

WHEREAS, the California Fish and Game Commission will consider a petition to list the western Joshua tree as Threatened under the California Endangered Species Act; and

WHEREAS, the jurisdiction of the MDAQMD is home to dense stands of Joshua trees, with only five percent of the land area dedicated to housing, industrial, utilities, agriculture, transportation and parks; and

WHEREAS, the MDAQMD's jurisdiction, including the Joshua trees, is impacted by air pollution from tradition electricity generation; and

WHEREAS, renewable energy projects are important contributors to reducing carbon-based fuel emissions and improving air quality throughout the jurisdiction of the MDAQMD; and

WHEREAS, the MDAQMD seeks to avoid prohibitions on opportunities for alternative energy projects from sources; and

WHEREAS, a candidate listing would run counter to the State's housing and renewable energy goals; and

WHEREAS, a candidate listing would reduce well-paying jobs for local workers and harm the continued work of the local mining industry, which supplies vital materials to the housing, renewable energy, high-tech and many other industries; and

WHEREAS, the Joshua tree is already well protected through the 1.5 million-acre Mojave National Preserve, the 800,000-acre Joshua Tree National Park, the Mojave Trails National Monument, the Sand to Snow National Monument, Castle Mountains National Monument and other protected areas.

NOW, THEREFORE BE IT RESOLVED, that the MDAQMD Board respectfully urges the California Fish and Game Commission to decline the petition to list the western

Joshua tree as Threatened under the California Endangered Species Act.

BE IT FURTHER RESOLVED, that this Resolution shall take effect immediately upon adoption.

PASSED, APPROVED AND ADOPTED by the Governing Board of the Mojave Desert Air Quality Management District by the following vote:

AYES:	11	MEMBER: ABEL, BENNINGTON, COX, DECONINCK, HERNANDEZ, LEON, LOVINGOOD, MINTZ, PEREZ, RIORDAN, ROWE
NOES:		MEMBER:
ABSENT:	2	MEMBER: CAMARGO, WILLIAMS
ABSTAIN:		MEMBER:

STATE OF CALIFORNIA)
)
) ss:
COUNTY OF SAN BERNARDINO)

I, Deanna Hernandez, Senior Executive Analyst – Confidential, of the Mojave Desert Air Quality Management District, hereby certify the foregoing to be a full, true and correct copy of the record of the action as the same appears in the Official Minutes of said Governing Board at its meeting of June 22, 2020.

Deanna Hernandez,
Senior Executive Analyst – Confidential
Mojave Desert Air Quality Management District.

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August 6, 2020

Christopher J. Carr
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Chris.Carr@BakerBotts.com

VIA E-MAIL: fgc@fgc.ca.gov

California Fish and Game Commission
P. O. Box 944209
Sacramento, CA 94244-2090

Re: Renewables Comments on August 20, 2020 Meeting Agenda's Item 25 re Petition of Center for Biological Diversity to List the Western Joshua Tree as a Threatened Species

Dear President, Vice President and Members of the Commission:

I submit these comments on behalf of the Solar Energy Industries Association (SEIA), the Large-scale Solar Association (LSA), the California Wind Energy Association (CalWEA) and the American Wind Energy Association California (AWEA-CA). As explained more fully below, these solar and wind energy industry associations urge the Commission to deny the Petition of the Center for Biological Diversity (CBD) to list the Western Joshua Tree (Joshua Tree) as a threatened species under the California Endangered Species Act (CESA) at this time.

The Petition should be denied for three principal reasons:

1. Insufficient population data for the Joshua Tree exists to support advancing it to candidacy at this time.[1]
2. Federal, state, and local regulations currently provide protections for the Joshua Tree covering over 76 percent of its range. See TetraTech Report submitted with this letter. Much of this area has been placed entirely off-limits to renewable energy development.
3. Finally, the solar and wind energy associations and their members will be participating in a regional conservation planning effort for Joshua Tree that will include enhancing both Joshua Tree population data and conservation measures required by local governments.

---

[1] The letter submitted to the Commission by the California Building Industry Association et al. ably explains the lack of Joshua Tree population data.

> That process should be given an opportunity to succeed, because only through such planning can the threats to the Joshua Tree be effectively addressed.

Under current protections, solar and wind projects are developed without any significant impact on the Joshua Tree population. Moreover, accepting the Petition would impede development of wind and solar projects currently under development, and frustrate the achievement of California's goals to entirely eliminate greenhouse gases from its electricity supply. California's success in weaning itself from fossil fuels is the only way to effectively address the threat that climate change poses to the Joshua Tree -- the concern that is at the heart of CBD's Petition.

These issues are addressed below.

The Data-Deficient Petition Underscores the Need for a More Thorough Review
CBD's Petition as well as the Department's Evaluation Report lack basic population abundance and trend data that is needed before the Commission can make an informed decision as to whether to advance the Joshua Tree to candidacy. Additionally, the institutional and personal constraints imposed by the COVID-19 crisis have resulted in a process for considering the Petition that has provided insufficient time for stakeholder engagement including, critically, assessing the current state of the Joshua tree based on data. Apart from the process fairness (and quality of decision-making) concerns this presents, it will result in significant obstacles on Day 1 should the Joshua Tree be advanced to candidacy. It would seem to be difficult for CDFW to develop and implement 2081/ITPs without such data to inform the requirements of the permit, to say nothing of doing so in a timely manner. Advancing the Joshua Tree to candidacy without this information could effectively place a moratorium on development of any property containing a Joshua Tree. Given that Joshua Trees are not immediately threatened (as conceded by the Petition) there is no reason that more time should not be taken to acquire the necessary data to support a decision to advance the Joshua Tree to candidacy.

Existing Joshua Tree Protections are Widespread
A review of federal, state, and local regulations that protect the Joshua Tree was commissioned by the solar and wind energy associations. See TetraTech Report.[2] The review shows that there are many layers of existing protections that must be analyzed for any decision on candidacy to be properly informed. The area and proportion of the species range protected by a given policy were quantified specific to its jurisdiction using GIS spatial analyses. In total, the review found that 76.3 percent of the Joshua Tree range in California is subject to protective regulations. The review also found that many feasible mitigation measures are currently available or required under the California Environmental Quality Act (CEQA) to protect the Joshua Tree, and that compensatory mitigation for unavoidable habitat impacts at a 1:1 ratio is typical.

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[2] This review represents a high-level survey and summary that was necessarily limited by budget and time constraints.

Impacts on California Renewables and Climate Change Mandates
As the Commission is aware, the renewables industry has long been at the tip of the spear in California's nation-leading battle to address climate change. The contributions of solar and wind energy to meeting California's clean energy mandates, and the impacts on those efforts of advancing the Joshua Tree to candidacy, are detailed in my letter to the Commission of June 11, 2020 (which is attached hereto for the convenience of the Commission and incorporated herein by reference).

While CBD's Petition "states that climate change is the greatest threat to the continued existence of western Joshua tree" (Evaluation Report at 23), advancing the Joshua Tree to candidacy would hamper renewables development at precisely the moment renewables must start to scale dramatically if California is to meet SB 100's mandates of 60% renewable electricity by 2030 and a fully decarbonized grid by 2045.

Land use in California is often a zero-sum proposition, and with California in need of at least 100 gigawatts (GW) of new renewable energy in the next two decades, considerable thought must be given to where new renewable energy projects can be located in relation to the myriad other land needs, including conservation, agriculture, housing, recreation and the like. Renewable energy already faces a dearth of land on which to construct solar and wind projects. See Figure 1 at the end of this letter. It is not as a matter of choice that solar and wind projects are geographically concentrated.

As part of the state-federal Desert Renewable Energy Conservation Plan (DRECP), the Bureau of Land Management (BLM) adopted a Land Use Plan Amendment (LUPA) covering approximately 10 million acres of land. Of this area, the LUPA set aside 4,926,000 acres for permanent conservation while identifying just 388,000 acres for potential renewable energy development in Development Focus Areas (DFAs).[3] As shown in Figure 1, below, the LUPA, in combination with other protected federal land and military lands, leaves a tiny fraction of federal land available to renewable energy development. Of this area, much is unsuitable for renewable energy development.

With regard to wind energy, approximately 96 percent of the high-quality wind resources previously available for development on BLM land were permanently put off limits to development as a result of the new land designations made for conservation. With regard to solar energy, some 384 Conservation and Management Actions required under the LUPA when developing projects in DFAs have proven too onerous to enable development. As a result, approximately a dozen wind project applications were abandoned during the DRECP process and no new applications have been filed. Solar applications have also declined under the DRECP.

[3] In addition, 3.6 million acres (about 36% of BLM DRECP land) was designated for recreational activities – of which approximately 1.5 million acres are accessible to off-highway vehicles. Solar and wind development is precluded in these areas, as well as in conservation areas.

As a result of these federal land restrictions, solar and wind projects must be sited primarily on private lands. These areas have also been severely restricted for development. For example, Los Angeles County adopted a Renewable Energy Ordinance in 2016 that prohibits ground-mounted utility-scale solar facilities in a large portion of the County and utility-scale wind facilities are prohibited in all zones and areas within the unincorporated County.[4] Similarly, San Bernardino County, in 2017, adopted the Renewable Energy and Conservation Element of its General Plan that prohibits utility-scale renewable energy development in a large percentage of the county.[5]

As a consequence of these federal and local restrictions, the majority of solar and wind development in Southern California is now concentrated in areas of Los Angeles and Kern Counties, as shown in Figure 2 at the end of this letter. See also TetraTech Report. These areas are within the Joshua Tree distribution range where renewable energy is not prohibited, but where protective local regulations exist, as described in the TetraTech Report. According the Joshua Tree protected species status under CESA would, as a practical matter, further restrict, and potentially make these areas unavailable for, renewable energy development. Southern California is particularly important to achieving California's clean-energy goals due to the greater quality and/or quantity of solar and wind resources, compared to Northern California, as well as transmission constraints limiting access to Northern California resources from which to supply Southern California electricity load. Therefore, it is no exaggeration to state that further limitations on the ability to develop solar and wind projects in the southern region will risk the achievement of California's climate change goals.

As explained above, according the Joshua Tree protected species status under CESA would, as a practical matter, only make more land unavailable to renewables development. Standing up the regional planning effort described below will involve the active participation of CDFW and provide the Department much needed runway to develop a consistent process and requirements for issuing 2081/Incidental Take Permits for Joshua Tree, should the species ultimately be advanced to candidacy.

Advancing the Joshua Tree to Candidacy Will Jeopardize Clean Energy Projects

A number of renewable energy projects are already contracted for 2021 and 2022 commercial operations dates (CODs). These projects have already prepared or are preparing Environmental Impact Reports in compliance with CEQA that address Joshua Trees among other biological resources. They also must conform to other relevant local and state laws and regulations that protect sensitive biological species. In order to achieve their contracted dates, projects with 2021 CODs must begin construction in mid- to late-2020, and projects with 2022 CODs must begin construction in mid- to late-2021. If the Joshua Tree advances to candidacy and a 2084 Rule is

[4] See http://planning.lacounty.gov/energy.

[5] See http://www.sbcounty.gov/uploads/LUS/Renewable/2019_WEBSITE/REC%20Element.pdf and http://www.sbcounty.gov/uploads/LUS/Renewable/2019_WEBSITE/MIN-LUS-2-28-19-RECE_SIGNED.pdf. In 2019, amendments were made that allow some flexibility to the blanket prohibition of utility-scale projects in rural areas on an individual-project basis, subject to approval by the Board of Supervisors.

not established (as discussed below), the resulting need for 2081/Incidental Take Permits would delay the construction start dates of these projects and potentially make their CODs unachievable. In those cases, the developers would need to revisit the viability of their projects in consideration of liquidated damages and other penalties, and the off-takers would potentially be out of compliance for their renewable energy sourcing or reliability requirements. In addition, the much-needed jobs that come with those projects would be delayed or potentially lost altogether.

The Regional Planning Effort for Joshua Tree Should Be Given a Chance

Kern and San Bernardino Counties, along with renewable energy and other regulated industries, have committed themselves to initiate in short order a regional planning effort to address the long-term threats to the Joshua Tree. That planning effort, which was called for by CDFW Director Bonham in his statement to the Commission at its June 25 meeting, will build on the long-standing efforts of local governments to regulate and limit destruction of Joshua Trees through their local planning and permitting processes. See TetraTech Report (cataloguing actions taken by local governments). This planning effort will endeavor to enhance both Joshua Tree population data and the conservation actions of local governments to protect Joshua Trees. The Counties and project developers anticipate that CDFW will provide technical assistance in the planning effort, and will concurrently take steps to implement (and assist in the implementation of) most all of the management actions called for by CBD in the Petition. Advancing the Joshua Tree to candidacy on top of this would only complicate and divert resources from this planning effort.

2084 Rule

If the Commission decides to accept the Petition and makes the Joshua Tree a candidate species, the renewables industry respectfully requests that the Commission immediately thereafter adopt a regulation pursuant to its authority under Section 2084 of the Fish and Game Code to provide incidental take authorization during the Joshua Tree's candidacy. The solar and wind industries are aware of the Commission's desire to ensure its compliance with CEQA in adopting a 2084 Rule. For that reason, they will work closely with the Commission and CDFW to craft a regulation that authorizes incidental take for those projects subjected to appropriate CEQA review for impacts to the Joshua Tree. Both the solar and wind industries believe a 2084 Rule will be needed if the Joshua Tree is advanced to candidacy, because of the time it would take to secure 2081/Incidental Take Permit authorization of incidental take for projects that cannot be delayed if developers are to meet their commercial obligations.

Conclusion

Given California's urgent climate imperatives, and the extent to which California relies on both solar and wind projects to meet grid needs and climate targets, the solar and wind industries cannot emphasize strongly enough the negative impact that advancing the Joshua Tree to candidacy will have on clean energy development in California. Rejecting CBD's Petition at this time would afford local governments and these industries an opportunity to develop the necessary (and currently lacking) Joshua Tree population data while allowing Counties and project developers -- working closely with CDFW -- an opportunity to stand up a regional planning effort to responsibly and effectively address the long-term threats to the Joshua Tree.

Respectfully,

Christopher J. Carr

cc: Charlton Bonham
Director, California Department of Fish and Wildlife

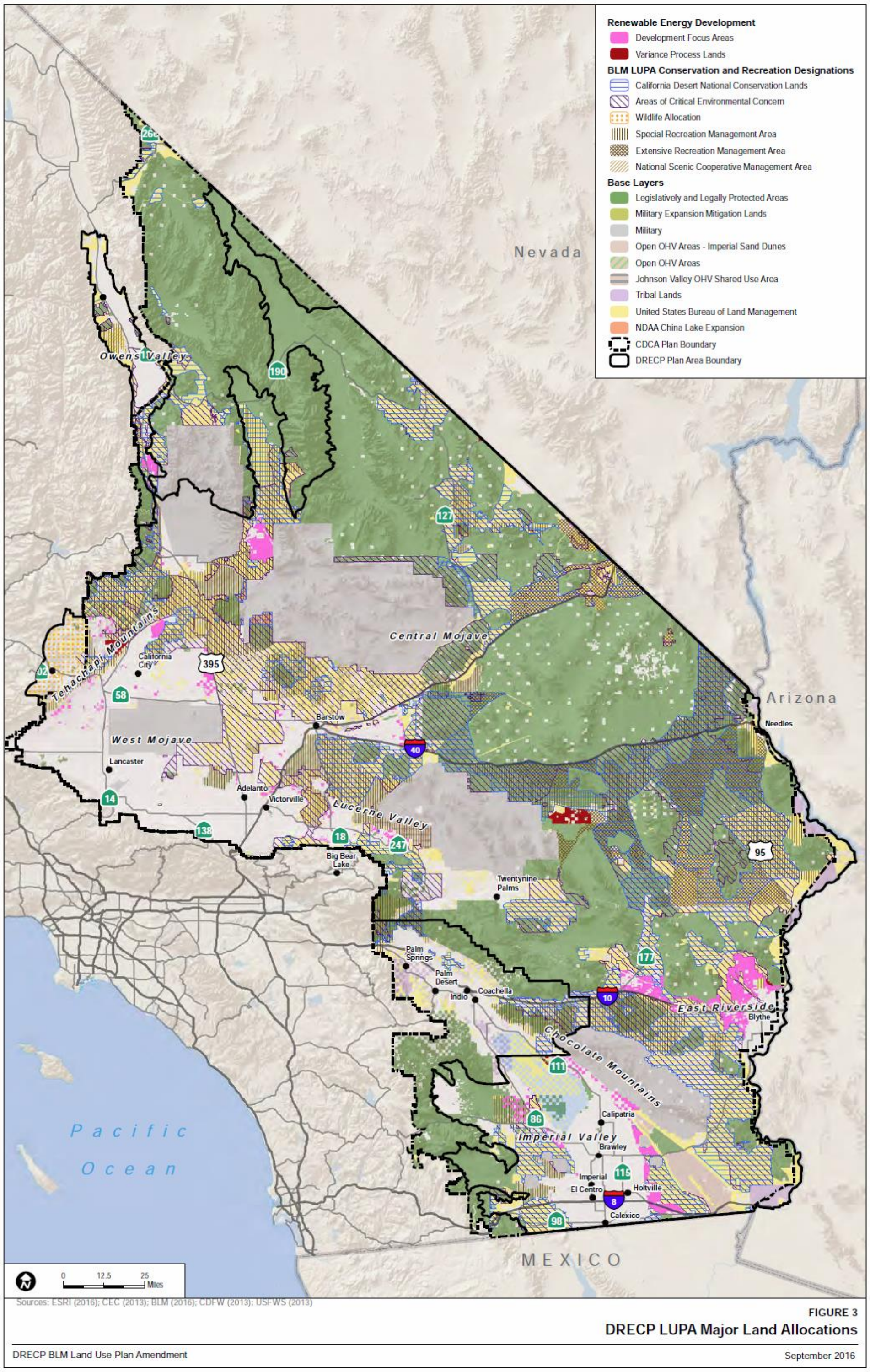
Shannon Eddy
Executive Director, LSA

Rick Umoff
Senior Director & Counsel, California, SEIA

Nancy Rader
Executive Director, CalWEA

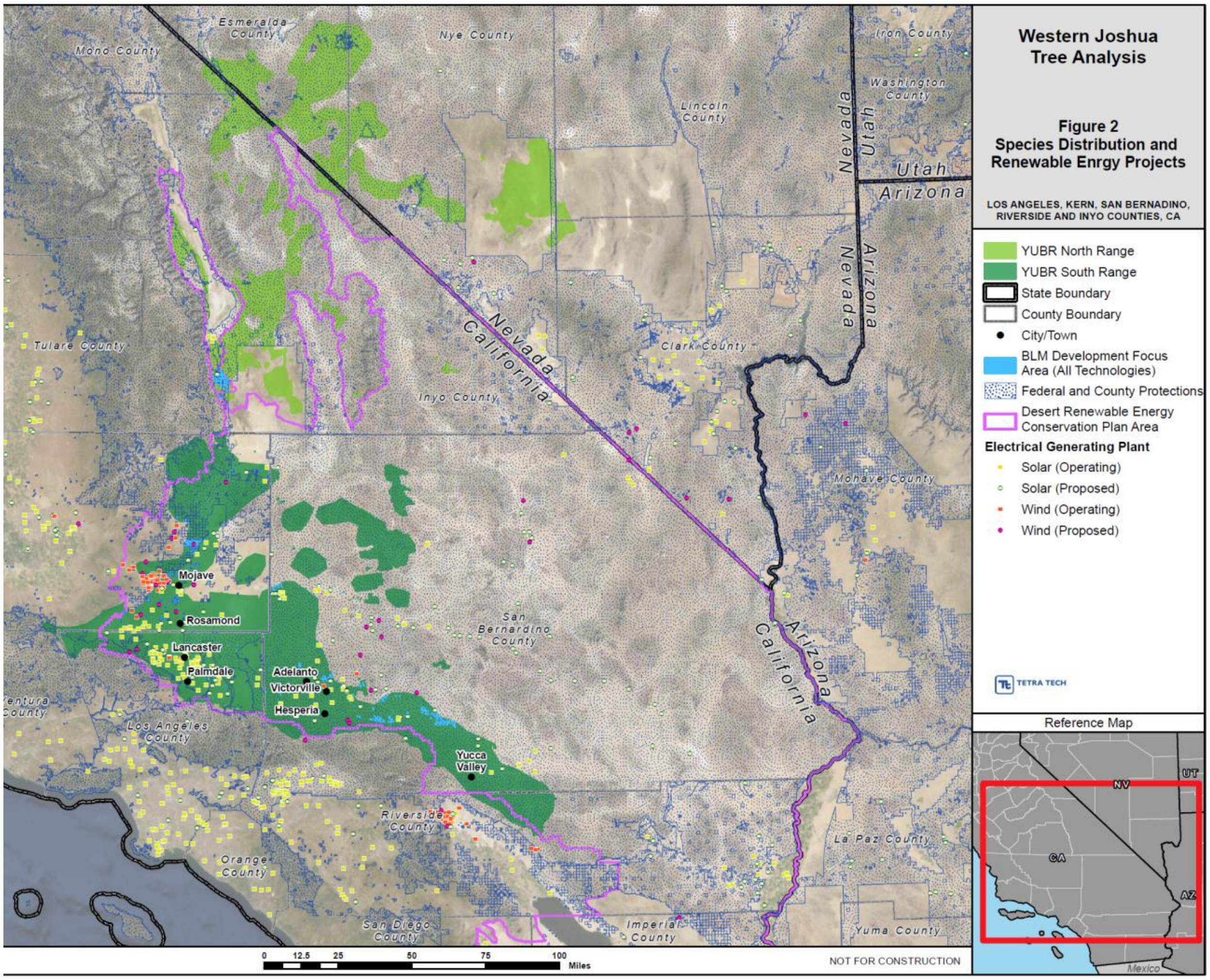
Danielle Mills
Director, AWEA-CA

Figure 1. Federal Land Wind and Solar Energy Development Areas and Exclusion Areas



Source: DataBasin

Figure 2. Joshua Tree Distribution and Solar and Wind Energy Projects



Source: TetraTech Report

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June 11, 2020

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California Fish and Game Commission
P. O. Box 944209
Sacramento, CA 94244-2090

Re: Solar Energy Industries Association and Large-scale Solar Association Comments on June 24-25, 2020 Meeting Agenda's Item 27 re Petition of Center for Biological Diversity to List the Joshua Tree as a Threatened Species

Dear President, Vice President and Members of the Commission:

These comments are submitted on behalf of the Solar Energy Industries Association ("SEIA") and the Large-scale Solar Association ("LSA"), to express their members' concerns about the potential implications of CBD's Petition to List the Joshua Tree as a threatened species under the California Endangered Species Act ("CESA").

The current agenda ("Agenda") for the Commission's June 24-25, 2020 meeting includes, as Item 27, consideration of whether listing the Joshua Tree "may be warranted." An affirmative determination by the Commission will result in "candidate" status for the Joshua Tree while the Commission considers whether listing the species as threatened "is warranted." Agenda at page 7. The Agenda includes a note explaining that: "Staff will recommend this item be continued to the August 19-20, 2020 meeting based on conversations with the petitioner, other stakeholders, and the Department." Id. SEIA and LSA urge the Commission to follow this staff recommendation. The Commission's continuing the item to its August meeting will allow workers, businesses, local governments and other interested parties that would be adversely impacted if the Joshua Tree is advanced to candidacy more time to analyze those impacts and present them to the Commission. It would also allow more time to gather information regarding the significant Joshua Tree protections already in place under existing laws. Moreover, the continuance would allow interested parties the time needed to work with the Commission and CDFW to develop a reasonable 2084 Rule under CESA to authorize incidental take of the Joshua Tree, so that one could be quickly promulgated by the Commission if the species is advanced to candidacy. California Fish and Game Code section 2084. SEIA's and LSA's members are such parties.

SEIA's and LSA's members include companies leading the nation in developing solar energy generation to address climate change and help states meet their ambitious goals for obtaining electricity from renewable sources. Collectively, the solar industry has developed some 12 GW of utility scale solar generation capacity in California, playing a critical, indeed indispensable, role in helping the State meet and exceed its RPS targets. A substantial percentage of the State's solar generating capacity is located within the area CBD's Petition identifies as the range of the Joshua Tree. In this area there are many more solar projects that have been permitted (and will soon commence construction), are in the permitting process, or are being planned. Simply put, by adding significant uncertainty, risk and delay to solar projects in the various planning, permitting and pre-construction stages, the listing of the Joshua Tree as a threatened species under CESA could hamper California's ability to meet its RPS requirement of 60% by 2030. It could also drive the development of solar projects to neighboring states, undermining economic and employment benefits that would otherwise accrue to Californians.

The solar industry has long been committed to conserving the earth's resources and protecting its biodiversity; fighting climate change is at the core of that commitment. In fact, the rasion d'tre of those companies is the development of renewable energy sources to combat climate change. CBD's Petition identifies climate change as a threat to the Joshua Tree. Nowhere is the nexus between climate action and conservation more complex than in the California desert – home to both rare desert habitat and species, and to some of the highest solar radiance in the world. What is most unique about this region is its proximity to major load centers – making it the ideal area for siting solar projects. California electricity planners project that the State must *at least* double its utility-scale solar capacity by 2020 in order to meet our climate targets – this is in addition to increasing rooftop solar installations. Smart siting of these projects in the desert must be part of this crucial effort if we are to succeed in meeting our goals.

Given California's urgent climate imperatives, we ask the Commission to expand its immediate species perspective to consider the myriad ways advancing the Joshua Tree to candidacy could undermine the State's efforts to address climate change. Slowing and substantially increasing the costs of solar development in California – which is what advancing the species to candidacy would do (even if only while the Commission considers whether listing in warranted) – would not help address, let alone arrest, any threat that climate change may pose to the Joshua Tree. Even the risk that the species will be advanced to candidacy will make financing and developing solar projects in California more difficult and expensive. Fortunately, it need not come to a choice between climate change solutions and the Joshua Tree. In fact, existing management efforts, some of which are identified below, are robust and sufficient to address the potential threats to the species asserted in the Petition.

In addition to being indispensable to advancing California's climate initiatives and meeting its renewable generation goals, the solar industry has been declared "essential critical infrastructure" under Governor Newsom's "Shelter-in-Place Order" in response to COVID-19. Executive Order N-33-20 (Mar. 19, 2020). What is more, not only does the industry employ essential workers developing critical energy infrastructure, but the construction jobs provided by solar project development are high-paying jobs that workers in the construction sector need now more than ever, given the impacts of the State and County shelter-in-place restrictions on the availability of work and the associated economic slowdown. It is estimated that utility scale solar contributes tens of thousands of jobs to California. Similarly, with the drop in local government tax revenues resulting from the economic slowdown, the sales tax revenues that solar development projects have long provided to counties and cities (which developers have taken pains to designate the points of sale for solar panels) are needed now more than ever by those local governments.

These combined adverse impacts on the solar industry, workers, and local governments can be responsibly avoided. Contrary to the dire claims of CBD's Petition, existing management efforts are more than adequate to protect the Joshua Tree from any risk of becoming, in the foreseeable future, "in serious danger of becoming extinct throughout all, or a significant portion, of its range." Cal. Fish and Game Code sections 2062 and 2067. A great deal of Joshua Tree habitat is protected in federal and California parks, on State lands, and on other public lands where use is restricted (e.g., BLM lands subject to the DRECP). Many of the Counties where the Joshua Tree is present have their own ordinances and programs that conserve sensitive biological resources. A number of cities also have ordinances that help conserve the Joshua Tree. In addition, solar projects are subject to specific discretionary land use permit restrictions, with impacts to Joshua Trees mitigated as specified in the permit and associated environmental analysis. The California Desert Native Plants Act – California Food and Agriculture Code sections 80001 et seq. – already places restrictions on the removal of Joshua Trees, which the California Department of Fish and Wildlife is charged with enforcing. Fish and Game Code section 1925.

SEIA and LSA cannot emphasize strongly enough the negative impact that advancing the Joshua Tree to candidacy will have on solar development in California. Solar projects scheduled to receive permits, permitted projects expected to start construction later this year, as well as those already being built, will be brought to a standstill. These are projects that have already completed or soon will be completing CEQA, have mitigated or will be mitigating their environmental impacts, and have obtained or soon will obtain all necessary local, state, and federal permits and authorizations to comply with environmental laws and regulations. Even further consideration of the Petition to list the Joshua Tree will introduce uncertainty in the financing of upcoming solar projects. Any delays in these projects will put them at risk in their entireties because they often have both Investment Tax Credit deadlines as well as power purchase agreement (PPA) guaranteed in-service dates. The loss of jobs and impacts on local economies as a result of this listing effort are real and tangible; they cannot be overstated. Local tax revenues will take another hit, on top of the loss of revenues caused by the economic slowdown. And California's progress on advancing its climate initiatives and meeting its renewable sourcing goals will be unnecessarily hampered. California has been the nation's leader in addressing climate change – that role should not be undermined, particularly when there are many existing and successful programs in place to protect the Joshua Tree in California.

Continuing the Joshua Tree agenda item to the Commission's August meeting will allow SEIA and LSA to address in detail the threats to the Joshua Tree asserted in CBD's Petition, and enable them to update and provide additional information on the impacts that advancing the species candidacy would have on the solar industry in California. We understand the many complex issues the Commission must weigh in this process, and respectfully request that you continue the Joshua Tree agenda item to the Commission's August 2020 meeting.

Respectfully,

Christopher J. Carr

cc: Charlton Bonham
Director, California Department of Fish and Wildlife

Shannon Eddy
Executive Director, LSA

Rick Umoff
Senior Director & Counsel, California, SEIA

Western Joshua Tree State Listing Petition Analysis

Prepared for:

American Wind Energy Association California

California Wind Energy Association

Large-scale Solar Association

Solar Energy Industries Association

Prepared by:

TETRA TECH

Tetra Tech, Inc.

1750 S. Harbor Way, Suite 400

Portland, Oregon 97201

August 2020

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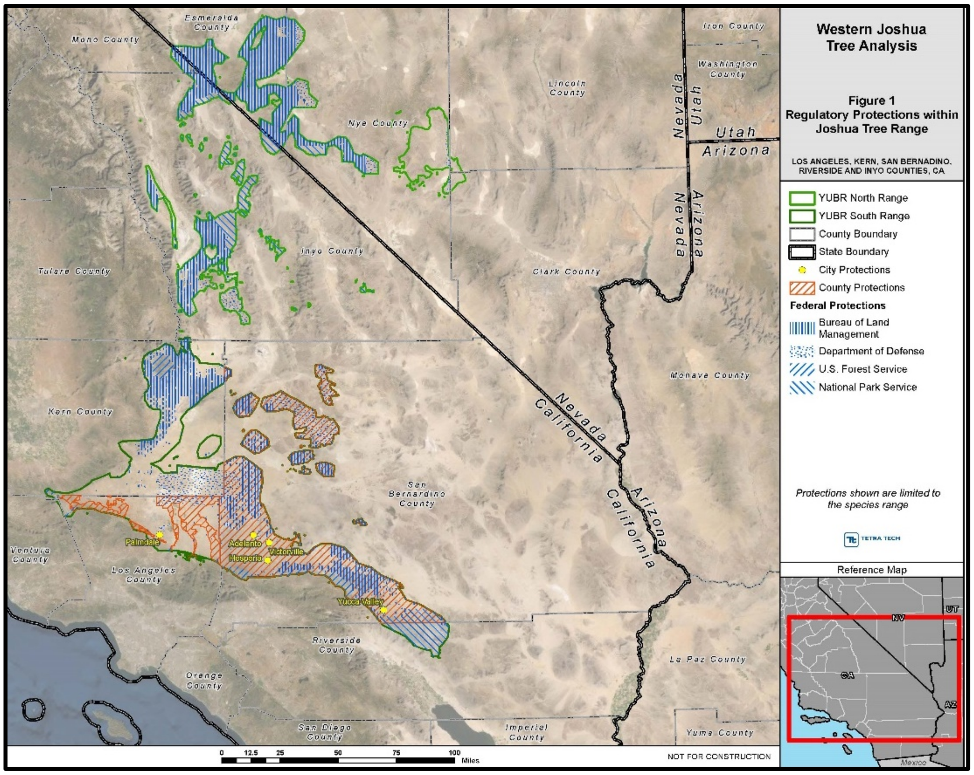
Executive Summary

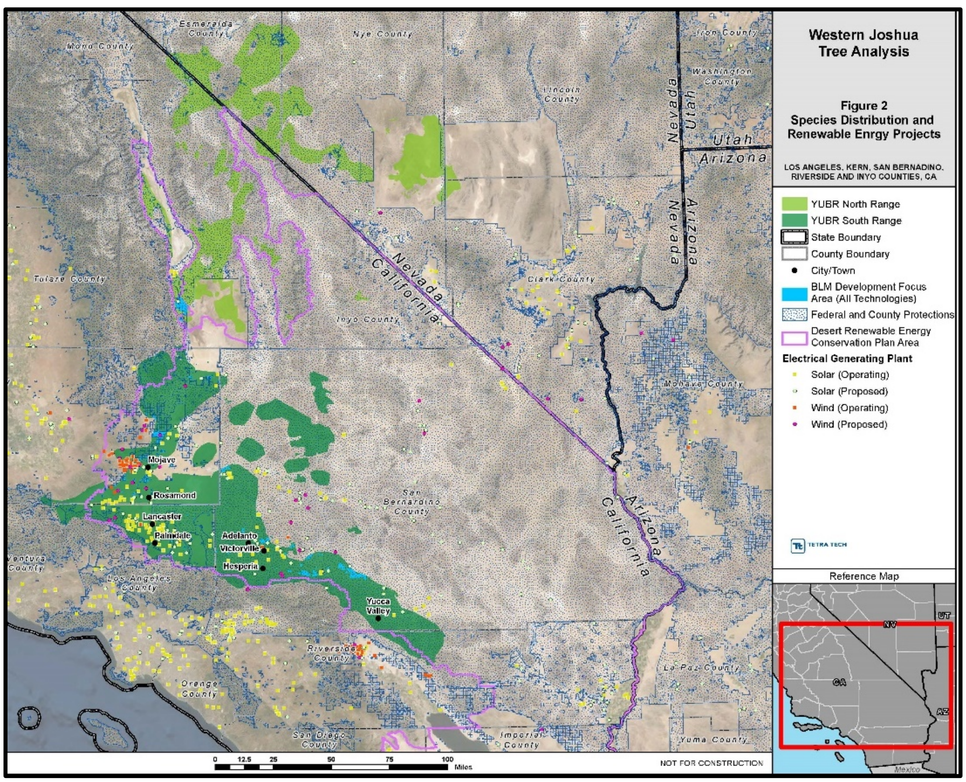
The Center for Biological Diversity submitted a petition to the California Fish and Game Commission to list the Western Joshua Tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act (CESA). Several renewable energy trade associations contracted Tetra Tech to review and summarize existing land protections and protective policies within the current distribution of the Western Joshua Tree (Figure 1). An evaluation prepared by the California Department of Fish and Wildlife (Department) found the species to be warranted for listing, but did not provide sufficient detail in its evaluation regarding protections for the species and its habitat, as written.

Tetra Tech reviewed publicly available data to identify protections of the Western Joshua Tree at the federal, state, and local level. Given the expanse of the Western Joshua Tree range across multiple states and numerous jurisdictions, an exhaustive review of all protective policies was not feasible within the limited window of the public comment period extension. The review encompassed those information sources for which data were publicly available and accessible via online resources; it does not constitute a comprehensive catalog of all protective policies. The area and proportion of the species ranges protected by a given policy was quantified specific to its jurisdiction using GIS spatial analyses. Coverage was calculated specific to the northern and the southern ranges of the Western Joshua Tree as well as the combined range. To provide context as to the implications of species listing, current or planned renewable energy development projects that overlap with the species' range were also reviewed and mapped (Figure 2).

Federal, state, and local regulations currently provide a variety of protections to this species, including specific protections related to the threats of invasive species, fire, and land development. In total 76.3 percent of the Western Joshua Tree range benefits from protective regulations (Figure 1). There are multiple feasible mitigation measures that are currently available or are required under CEQA to protect the Western Joshua Tree, and that typically require compensatory mitigation for unavoidable habitat impacts at a 1:1 ratio.

Research and species management strategies offer potentially the best opportunities for conserving Joshua trees. If Joshua trees are listed as a proposed candidate species, an Incidental Take Permit would be required prior to any project impacting Joshua trees. The Incidental Take Permit would require additional administrative steps that would otherwise not be required and any requirement imposed by the ITP conditions can be required by existing regulations. Agency and jurisdictional conflicts may also arise with existing regulations and policies.


Western Joshua Tree Analysis
Figure 1
Regulatory Protections within Joshua Tree Range
LOS ANGELES, KERN, SAN BERNADINO, RIVERSIDE AND INYO COUNTIES, CA
YUBR North Range
YUBR South Range
County Boundary
State Boundary
City Protections
County Protections
Federal Protections
Bureau of Land Management
Department of Defense
U.S. Forest Service
National Park Service
Protections shown are limited to the species range
Reference Map
NOT FOR CONSTRUCTION
Miles


Western Joshua Tree Analysis
Figure 2
Species Distribution and Renewable Enrgy Projects
LOS ANGELES, KERN, SAN BERNADINO, RIVERSIDE AND INYO COUNTIES, CA
YUBR North Range
YUBR South Range
State Boundary
County Boundary
City/Town
BLM Development Focus Area (All Technologies)
Federal and County Protections
Desert Renewable Energy Conservation Plan Area
Electrical Generating Plant
Solar (Operating)
Solar (Proposed)
Wind (Operating)
Wind (Proposed)
Reference Map
NOT FOR CONSTRUCTION
Miles

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1.0 Introduction

The Center for Biological Diversity (CBD) submitted a petition (Petition) to the California Fish and Game Commission (Commission) to list the Western Joshua Tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act (CESA). CBD identified climate change as the single greatest threat to the continued existence of Western Joshua Tree, with habitat loss due to development (in addition to other threats) further contributing to the likelihood of extirpation. The petition summarized existing federal, state, and local regulatory mechanisms to protect Western Joshua Tree habitat from loss and degradation and concluded they were insufficient. At the request of the Commission, the California Department of Fish and Wildlife (Department) prepared an evaluation (Evaluation) of the Petition and concluded that the species may be warranted for listing (CDFW 2020). However, neither the Petition nor the Evaluation provided sufficient detail regarding existing protections for the Western Joshua Tree and its habitat. As a result, several renewable energy trade associations contracted Tetra Tech to review and summarize existing land protections and protective policies within the current distribution of the Western Joshua Tree as delineated by the U.S. Fish and Wildlife Service (USFWS; USFWS 2018).

2.0 Methods

Tetra Tech reviewed publicly available data to identify existing protections and policies at the federal, state, and local levels. Data reviewed included:

- Petition
- Evaluation
- Spatial data (e.g., DataBasin, USFWS shapefiles)
- Conservation plans
- Land use plans
- Species status assessments
- Federal and state listing petitions and decisions for the Western Joshua Tree
- Municipal codes
- Acts of Congress

Given the expanse of the Western Joshua Tree range across multiple states and numerous jurisdictions, an exhaustive review of all protective policies was not feasible within the limited window of the public comment period extension. The review encompasses those information sources for which data were publicly available and accessible via online resources; it does not constitute a comprehensive catalog of all protective policies.

Spatial analyses were performed in a geographic information system (GIS) using ESRI ArcGIS software. The entire range of the Western Joshua Tree was analyzed, as well as the northern region (YUBR North) and southern region (YUBR South) using spatial layers generated by USFWS in the species status assessment (USFWS 2018; Figure 1). The area and proportion of the species (entire range as well as subregions) protected by a given protection or policy was quantified specific to its jurisdiction (e.g., plan area, county or city). Additionally, to provide context as to the implications of species listing, current and planned renewable energy development projects (i.e., wind and solar) were reviewed and mapped relative to the species range.

3.0 Results

3.1 Protections and Policies for Western Joshua Tree

The below narrative provides details of protective policies pertaining to the Western Joshua Tree organized by jurisdiction (federal, state, county, city). A tabular summary of the regulations by jurisdiction and regulatory agency is included in Appendix A and provides the degree of protection, spatial extent, and proportion of the Western Joshua Tree range that is covered (YUBR North, YUBR South, and Total). As mentioned above, these results do not constitute a comprehensive catalog of all protective policies pertaining to the Western Joshua Tree.

3.1.1 Federal

3.1.1.1 Bureau of Land Management - DRECP

The Desert Renewable Energy Conservation Plan (DRECP) Bureau of Land Management (BLM) Land Use Plan Amendment (LUPA) represents the public-lands component of the DRECP, permanently restricting areas where renewable energy development is permitted (Figure 2), and permanently protecting areas deemed important for biological, environmental, cultural, recreation, social, and scenic conservation, consistent with the Federal Land Policy and Management Act of 1976 as Amended (FLPMA) multiple use and sustained yield requirements. The DRECP boundary covers 61.3 percent of the range of Western Joshua Tree within the state of California (Figure 2).

The BLM LUPA is a comprehensive land use plan amendment that applies to specified activities on public land administered by BLM within the Decision Area. It addresses a full range of impacts, including, but not limited to, impacts to plant, wildlife, vegetation types, recreation, and cultural resources. Under federal law, BLM is solely responsible for implementation of the LUPA, and all activities that take place on BLM-administered public lands will ultimately require BLM authorization. BLM's ongoing responsibilities regarding land use plan implementation include implementation of the California Desert Advisory Committee chartered under the Federal Advisory Committee Act.

The BLM LUPA, which covers approximately 10 million acres of land, set aside 4,926,000 acres for permanent conservation while identifying 388,000 acres for potential renewable energy development in Development Focus Areas (DFAs; Figure 2). Joshua Tree Woodlands are called out specifically, with 3,000 acres identified within National Conservation Lands designated under the LUPA that did not already receive legislative or legal protection. Lands designated for conservation are closed to renewable energy. Renewable energy and transmission development activities are required to implement Conservation and Management Actions (CMAs)- of which there are 384 - to avoid and minimize impacts inside and outside the DFAs as well as CMAs to compensate for the impacts. Specific CMAs related to the Western Joshua Tree include:

- CMA “LUPA-BIO-1” requires conducting a habitat assessment of Focus and BLM Special Status Species’ suitable habitat, subsequent presence-absence surveys and identification and/or delineation of DRECP vegetation types, rare alliances, and special features, including the Joshua Tree.
- CMA “LUPA-BIO-SVF-1” requires a map delineating potential sites and a habitat assessment of special vegetation features including Joshua Tree Woodlands (for activity-specific NEPA analysis).
- CMA “LUPA-BIO-SVF-5" requires avoidance of impacts to Joshua Tree Woodland (*Yucca brevifolia* Woodland Alliance) to the maximum extent practicable, except for minor incursions.

3.1.1.2 Department of Defense

The Sykes Act (16 U.S.C. 670g-670l, 670o) directs the Secretary of Agriculture to plan, develop, maintain, coordinate, and implement programs for the conservation and rehabilitation of wildlife, fish and game species, including habitat improvement projects on public lands under their jurisdiction. This pertains to native habitats such as Joshua Tree Woodlands on military lands. Military lands contain 10.5 percent of the YUBR North region and 15.3 percent of the YUBR South region (Figure 1).

3.1.1.3 National Park Service

Joshua Tree National Park, Death Valley National Park and Mojave National Preserve are part of the California Desert Protection Act of 1994. Lands in Joshua Tree National Park have been withdrawn for mineral and geothermal leasing, but rights-of-way issued to the Metropolitan Water District remain intact.

Allowed activities in the Mojave National Preserve are limited to the following.

- Hunting, fishing, trapping in accordance with applicable federal and state laws.
- Mining claims that are subject to applicable laws and regulations related to mining.
- Grazing.

Existing rights-of-way for the Southern California Edison Company and the Southern California Gas Company remain intact. Land development is prohibited within National Parks, with the exception of necessary facilities related to Park maintenance and management. Thus, Western Joshua Tree habitat is in effect protected from anthropogenic habitat loss. National Parks contain 14.0 percent of the YUBR North region and 5.8 percent of the YUBR South region (Figure 1; Appendix A).

3.1.1.4 United States Forest Service

The Wilderness Act prohibits certain uses including commercial enterprises and no permanent roads within any wilderness area designated by the Wilderness Act except as necessary to meet minimum requirements for the administration of the area for the purposes of the Wilderness Act. The Act does not limit the following.

- Prospecting for the purposes of gathering information about mineral or other resources as long as the prospecting is conducted in a manner that preserves the wilderness environment and mineral drilling, production, mining and processing for leases in existence prior to midnight, December 31, 1983.
- Water reservoirs, water conservation works, power projects, transmission lines, road construction and maintenance.
- Grazing of livestock.
- Commercial services for realizing the recreational or other wilderness purposes.

The Forest Service Manual (USFS 2008) 2000, chapter 2070 related to vegetative ecology provides a detailed list of legal authority for management of National Forest System (NFS) lands that includes the promotion of the use of native plants (such as Western Joshua Tree) for revegetation and restoration/rehabilitation of NFS lands.

3.1.2 State

3.1.2.1 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires public agencies to analyze and disclose the impacts of any discretionary activity they approve and to adopt realistic measures to mitigate for any significant impacts identified. The law includes a mandate requiring agencies to not approve discretionary projects or activities as proposed if there is a feasible alternative(s) or measures that would substantially minimize significant environmental impacts. CEQA also provides a process for public engagement so interested private entities have the ability to be involved in the decision process. The Department advises public agencies during the CEQA process to ensure that any action approved does not significantly impact endangered, threatened, candidate for listing, rare, or species of special concern.

During CEQA review, public agencies must address impacts to plant species protected under the CESA and the Native Plants Protection Act (NPPA), in which most cases require mitigation of all significant impacts to these species to a level of less than significant. In addition, public agencies must also address plant species that may not be listed under CESA or the NPPA but may nevertheless meet the definition of rare or endangered provided in CEQA, or are otherwise protected under local regulations or policies. As required by CEQA, the analysis of impacts from a project must determine if the project would cause direct or indirect impacts that would have a substantial adverse effect on a sensitive natural community identified in local or regional plans, policies or regulations or by the Department or USFWS (OPR 2019). Joshua Tree Woodland is designated as a sensitive plant community by the Department. Further, CEQA also requires that project impacts be evaluated that would conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. If the project would cause impacts to Joshua tree woodlands or conflict with local policy or ordinance for Joshua trees, but can be fully mitigated a less than significant impact would occur. If the project would cause an impact that cannot be fully mitigated, a significant impact would occur and the CEQA lead agency would be required to provide a Statement of Overriding Considerations for why the project should be implemented despite the unmitigated impact to Joshua Trees.

3.1.2.2 California Desert Native Plants Act (CDNPA)

The California Desert Native Plants Act (CDNPA) prohibits the unlawful harvest of California desert native plants on both public and privately-owned lands without a relevant county-issued permit. The CDNPA encompasses Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego Counties, in which the harvest, transport, sale, or possession of specific native desert plants is prohibited unless a person has a valid permit or wood receipt, and the required tags/seals. The appropriate permits, tags and seals must be obtained from the sheriff or commissioner of the county where the collection will occur. All species of the family Agavaceae (century plants, nolinsa, and yuccas), including the Western Joshua Tree are protected under this law.

3.1.3 County

Note: all counties must comply with CEQA in addition to any county-specific ordinances or plans.

3.1.3.1 Kern County

As part of the Environmental Impact Reporting under CEQA, Kern County has frequently included requirements for development of a Joshua Tree Impact Plan or Joshua Tree Preservation Plan for those developments which may impact the Joshua Tree Woodlands. Plans are expected to include surveys and delineations of habitat, and may include measures such as avoidance of trees, minimization of impacts, and compensatory mitigation for impacted habitat at a 1:1 ratio, and/or such measures would be included in adopted mitigation measures. Kern County may also require a Transportation Plan if relocation is proposed. Construction setbacks are also enforced by Kern County for Joshua Tree Woodlands that are adjacent to developments. These measures are required prior to the issuance of any permits.

Willow Springs Specific Plan

The Willow Springs Specific Plan developed by Kern County in 1992 for the development of 50,560 acres identified a series of conservation measures for Western Joshua Trees and is summarized as follows. Where possible, project development within the Specific Plan would be designed to avoid displacement or destruction of Joshua Tree habitat, to the satisfaction of the Kern County Agricultural Commissioner's Office. Areas adjacent to Joshua Tree Woodland would have a 50-foot setback from the Joshua Tree plants. Within that setback, a native plant cover should be restored to natural habitat values to serve as a buffer, if such plant cover is not present. Finally, a Joshua Tree

Preservation and Transportation Plan shall be developed by the applicant for each parcel where Joshua Trees are located within the Specific Plan area. The plan would be submitted to the Kern County Agricultural Commissioner's Office for review and approval prior to grading permit issuance.

3.1.3.2 Los Angeles County

Some unincorporated portions of Los Angeles County are within Los Angeles County Significant Ecological Area (SEA) general plan designations, which indicate the presence of sensitive resources and require county environmental review (Los Angeles County 2020a). The Los Angeles County General Plan has analyzed Joshua tree habitats throughout the Antelope Valley. Areas with significant concentrations of Joshua trees are placed in SEA #60, "Joshua Tree Woodland Habitat" (Kern County 2011). Joshua Tree Woodlands are located and protected within the Antelope Valley, Joshua Tree, and San Andreas SEAs.

The SEA Program objective is to conserve genetic and physical diversity with Los Angeles County by designating biological resource areas that are capable of sustaining themselves into the future. The SEA ordinance establishes the permitting, design standards and review process for developing within SEAs to balance preservation of the County's natural biodiversity with private property rights.

The SEA program was originally adopted in the 1970s, and currently the County of Los Angeles is reviewing the SEA program as part of the General Plan Update. The intent of the proposed SEA regulations is to allow limited, controlled development that does not jeopardize the unique biotic diversity within the County. The SEA conditional use permit requires development activities be reviewed by the Significant Ecological Area Technical Advisory Committee (SEATAC). The SEATAC may provide recommendations to avoid development in sensitive resource area present on a site. The SEA does not change the land use designation or the zoning of a property; however, a conditional use permit is required for development activities within a SEA, unless the activity is exempt from the ordinance.

The Western Joshua Tree also receives protection from energy development as a result of Los Angeles County adopting a Renewable Energy Ordinance in 2016 that prohibits ground-mounted utility-scale solar facilities in the SEAs (Los Angeles County 2020a). Development of utility-scale wind facilities is prohibited in all zones and areas within the unincorporated County (Los Angeles County 2020b), providing protection to the Western Joshua Tree from wind energy development in these areas.

3.1.3.3 Riverside County/Coachella Valley Multiple Species Habitat Conservation Plan (MSHCP)/Natural Community Conservation Plan (NCCP)

The overall goal of the MSHCP is to enhance and maintain biological diversity and ecosystem processes while allowing future economic growth. This goal would allow preservation of a quality of life characterized by well-managed and well-planned growth integrated with an associated open-space system. The MSHCP/NCCP allows take of sensitive species and includes measures to restore, enhance and manage habitat that includes Joshua tree habitat. The Department determined that approval of the MSHCP/NCCP could result in potentially significant adverse impacts to the following plant species covered by the plan: Coachella Valley milk vetch (*Astragalus lentiginousus* var. *coachellae*), tripled-ribbed milkvetch (*Astragalus tricarinatus*), little San Bernardino linanthus (*Linanthus maculates*) and Orocopia sage (*Salvia greatae*). The NCCP Permit (2835-2008-001-06) for the MSHCP plan area of the Coachella Valley was issued in August 2008. An ESA Section 10(a)(1)(B) Incidental Take Permit for the Coachella Valley Association of Governments MSHCP was issued on October 1, 2008. The MSHCP establishes a simple and uniform mechanism for mitigating the effects of development through the payment of a Local Development Mitigation Fee ("Fee"). The Fee applies to all projects within the Plan's jurisdiction. The amount of the Fee will vary based on the type and size of the project. Certain areas have been identified in the Plan as Conservation Areas and are generally hillsides and open desert. Development in Conservation Areas is subject to additional review, and certain limits on the amount and location of development can apply.

3.1.3.4 San Bernardino County

County of San Bernardino Development Code, Chapter 88.01 Plant Protection and Management.

San Bernardino County Code Title 8, Chapter 88.01 of the County of San Bernardino code provides regulations and guidelines for the management of plant resources in the unincorporated areas of the County on property or combinations of property under private or public ownership. The intent of this development code is to provide the following standards related to native trees and plants including Joshua trees.

- Promote and sustain the health, vigor and productivity of plant life and aesthetic values within the County through appropriate management techniques.
- Conserve the native plant life heritage for the benefit of all, including future generations.
- Protect native trees and plants from indiscriminate removal and to regulate removal activity.
- Provide a uniform standard for appropriate removal of native trees and plants in public and private places and streets to promote conservation of these valuable natural resources.
- Protect and maintain water productivity and quality in local watersheds.
- Preserve habitats for rare, endangered, or threatened plants and to protect animals with limited or specialized habitat.

Hacienda at Fairview Valley Specific Plan.

The Hacienda at Fairview Valley project is located in San Bernardino County, California approximately two miles east of the Town of Apple Valley and within the Town of Apple Valley's sphere of influence. Hacienda at Fairview Valley Specific Plan provides a mixed-use community with a wide variety of housing opportunities that supports active adult and equestrian-friendly, clustered around recreational and open space areas located in San Bernardino County. As part of the approval of this Specific Plan, the Hacienda at Fairview Valley Joshua Tree Management Program was prepared and adopted. This Program is consistent with County of San Bernardino Development Code Chapter 88.01, Plant Protection and Management, and provides additional provisions and guidelines relating to grading parameters, construction activities and conservation areas within the Hacienda at Fairview Valley Specific Plan. A Multi-Species Habitat Conservation Plan/Natural Community Conservation Planning Plan for the Town of Apple Valley is currently in preparation.

Joshua Tree Community Plan.

The Joshua Tree Community Plan identifies a goal to retain the existing rural desert character of the community. Policies toward that goal include the requirement that development shall be required to maintain, conserve and be complementary to environmentally sensitive areas and elements, including but not limited to Joshua trees, Mojave yuccas, creosote rings and other protected plants, protected fauna, hillsides, scenic vistas, drainage areas, habitat, and unique geological features.

Lucerne Valley Community Plan and Homestead Valley Community Plan.

Both the Lucerne Valley Community Plan and the Homestead Valley Community Plan to the County of San Bernardino General plan are in areas of the county that includes the following general habitat types:

- Sage scrub;
- Joshua Tree Woodland;
- Mojave Desert scrub;
- Saltbush scrub;
- Alkali sinks; and
- Sand dunes.

Both the Lucerne Valley Community Plan and Homestead Valley Community Plan identifies as a policy a goal to conserve and protect unique environmental features including the protection of native vegetation.

Morongo Valley Community Plan.

The Morongo Valley Community Plan also encourages conservation and protection of native wildlife and habitat but identifies more restrictive regulations requiring greater retention of existing vegetation with an emphasis for the retention of Joshua trees.

Conservation of Joshua tree and other native plants within the Morongo Valley Community Plan includes the following steps for project development that are also found in the County of San Bernardino General Plan (2007).

- Requiring an approved landscape plan as part of the development plan review and approval process for all new development projects.

- Requiring the Building Official to make a finding that no other reasonable siting alternatives exist for development of the land prior to removal of a Joshua tree.
- Encourage on-site relocation of Joshua trees. However, if on-site relocation is not feasible, encourage residents to consult a list that will be established and maintained in the County of San Bernardino Building and Safety Office of residents willing to adopt and care for relocated trees.
- The developer/home builder would bear the cost of tree relocation.
- Retention and transplantation standards will follow best nursery practices.

Oak Hills Community Plan.

The Oak Hills Community Plan identifies as a policy a goal to conserve and protect unique environmental features including the protection of native vegetation. The Oak Hills Community Plan encourage the retention of specimen sized Joshua Trees by requiring the building official to make a finding that no other reasonable siting alternative exists for the development of the land. Specimen size trees are defined in Section 88.01.050 of the County of San Bernardino Development Code.

Phelan/Piñon Hills Community Plan.

The Phelan/ Piñon Hills Community Plan Lucerne Valley Community Plan is in an area of the county that includes the following general habitat types:

- White fir woodland;
- Piñon/juniper woodland;
- Sage scrub;
- Joshua Tree Woodland;
- Mojave Desert scrub;
- Salt brush scrub;
- Conifer forest;
- Alkali sinks; and
- Sand dunes.

The Phelan/Piñon Hills Community Plan identifies as a policy a goal to conserve and protect unique environmental features including the protection of native vegetation.

3.1.4 City

All cities and towns must comply with CEQA in addition to any local ordinances or plans.

3.1.4.1 Adelanto (San Bernardino County)

The City of Adelanto has identified an ordinance for the relocation of Joshua trees. City of Adelanto Municipal Code Chapter 17.57.040 identifies that development projects must comply with requirements of the County of San Bernardino for relocation of Joshua trees. The permit required by the City of Adelanto specifies adherence to Title 8, Division 9 of the County of San Bernardino Code with regards to Joshua trees. Title 8, Division 9 of the County of San Bernardino refers to public facilities financing. County of San Bernardino Code Title 8, Division 8 refers to Resource Management and Conservation and specifically to the requirements for conserving Joshua trees. The City of Adelanto requires that a project applicant apply for a permit to conduct a Joshua tree survey and removal.

3.1.4.2 Lancaster (Los Angeles County)

The City of Lancaster has identified an ordinance to preserve the habitat of Joshua Trees. Per Lancaster City Ordinance 848, Chapter 15.66 of the Municipal Code, a biological impact fee ($770/acre) is required for any new land subdivision, development, or previously approved subdivision/development requesting a time extension. The biological impacts fees are then used for the acquisition of mitigation land, restoration of habitat, environmental education, and other uses approved by the City Council. Therefore, replacement lands can be purchased to preserve Joshua Tree habitat.

3.1.4.3 Hesperia (San Bernardino County)

The City of Hesperia has identified an ordinance to manage protected plants that include Joshua trees. City of Hesperia Municipal Code Chapter 16.24 applies to private and public lands within the city. The City of Hesperia requires a removal permit prior to the removal of native trees or plants. Joshua trees that are proposed to be removed must be transplanted or stockpiled for future transplanting. The applicant is required to post a bond to ensure that stockpiled Joshua trees are transplanted appropriately. Prior to issuance of a native tree/plant removal permit, the applicant must provide a plan that shows exactly where the plants will be transplanted to. Penalties are specified for violation of the ordinance. The ordinance also identifies the prohibition of commercial harvesting of desert native plants that includes all Joshua trees.

3.1.4.4 Palmdale (Los Angeles County)

The City of Palmdale has identified an ordinance that directs protection and preservation measures for desert vegetation and particularly Joshua trees. Palmdale Municipal Code Chapter 14.04 for Joshua tree and native desert vegetation preservation specifies that all development applications of lands with native desert vegetation shall include a desert preservation plan that includes preservation criteria for Joshua trees, California juniper and other desert vegetation. The City of Palmdale also identifies maintenance requirements for transplanted Joshua trees or other desert vegetation. Additionally, the code requires reservation of two Joshua trees per acre but this metric can also be met by donating removed trees to an offsite City-administered tree bank (Palmdale Municipal Code §§ 14.04.010).

3.1.4.5 Victorville (San Bernardino County)

The City of Victorville has identified an ordinance for the preservation and removal of Joshua trees. City of Victorville Municipal Code Chapter 13.33 specifies that it is unlawful for any person to cut, damage, destroy, dig up, or harvest any Joshua tree without the prior written consent of the director of parks and recreation or his designee. A violation of this section of the municipal code is a misdemeanor punishable by up to six months in jail and/or a five-hundred-dollar fine.

3.1.5 Cumulative Protected Area

When the spatial extent of the protective policies described above were totaled (not counting overlap; Appendix A), they represented a minimum of 80.5 percent of the YUBR North region and a minimum of 74.1 percent of the YUBR South region (Figure 1). Combined, 76.3 percent of the Western Joshua Tree range benefits from protective regulations (Figure 1).

3.2 Review of Existing Threats to the Species

Tetra Tech reviewed several sources to identify existing threats to the Western Joshua Tree, including the USFWS Species Status Assessment (USFWS 2018), the Petition, the Evaluation, as well as other literature and reports as cited below. Analyses performed by USFWS suggest that threats to individual trees such as wildlife, increasing temperatures, drought, and habitat loss may affect the resiliency of the species; however, they concluded that these threats are not likely having population-level impacts (USFWS 2018). Introduction of invasive annual grasses was also noted as a threat by the Department in the Evaluation (CDFW 2020). Note that these threats are interrelated and altered fire regimes and invasive annual grasses in particular may be exacerbated by climate change.

Fire regimes across the range of *Yucca brevifolia* have likely increased in frequency over recent decades in certain parts of the range, and this broader altered fire regime has been largely driven by the proliferation of invasive annual grasses which act as fine fuels and connect vegetation previously less connected (USFWS 2018). However, the impact of fire on the Western Joshua Tree is not clear. As summarized in the Evaluation, two GIS-based analyses conducted by the U.S. Air Force on Western Joshua Tree populations at Edwards Air Force Base showed that the population on the Base was “stable to increasing” (USAF 2017a) and the other that the population in the study area of an earlier fire was “stable” (USAF 2017b).

Climate change is anticipated to result in increased temperatures and an increase in interannual variability of precipitation in the Mojave Desert. A variety of climate change models and research studies were summarized in the Petition and Evaluation, including two specific to the effects of climate change on Western Joshua Tree (i.e., Barrows and Murphy-Mariscal 2012, and Sweet et al. 2019). Modeled effects of climate change included constriction or shifting of the current range and potentially reduced juvenile recruitment. USFWS concluded that climate change and the interactions with fire and habitat loss were unlikely to prevent the species from persisting across the landscape through the end of the century (USFWS 2018).

4.0 Discussion and Conclusions

4.1 Effectiveness of Existing Protections Against Threats

As described above and shown in Figure 1 and Appendix A, existing federal, state, and local regulations currently provide widespread protections to this species, including protections that target select threats to this species. Federal agencies, the State of California, and several communities have adopted and implemented laws and ordinances that protect *Yucca brevifolia* from harvesting and removal to some degree (USFWS 2018; Appendix A), which limits potential habitat loss from urban development and military activities. Additionally, the DRECP contains measures to avoid removing individual plants by avoiding areas classified as Joshua Tree Woodland (Section 3.1.1.1), which would reduce the number of individual trees and habitat potentially lost to renewable energy development (USFWS 2018). Current protections on federal land (e.g., BLM- and DOD-managed land) include management actions to remove invasive plants and monitor Joshua Tree Woodland population trends, and perform habitat improvements (Appendix A), which reduces the threat of invasive species and the associated effects of wildfire on *Yucca brevifolia*.

4.2 Implications of Listing

Given that there are numerous existing ordinances/policies providing protection for Joshua Trees, listing the species under the CESA will lead to additional agencies having jurisdiction, requiring additional review and coordination. Furthermore, listing would likely cause project delays as counties and local agencies incorporate the change in status into their ordinances. Programs such as the CVMSHCP may require updating to include the Western Joshua Tree. This could cause regional delays for projects with sites that have Joshua trees. Once the change in status has been incorporated, the process for negotiating full mitigation for take could proceed using the approach under CESA. However, these additional review and permitting requirements could place at risk renewable energy project developments with near-term commercial online delivery obligations.

4.3 Mitigation Requirements and Limitations

Multiple mitigation measures are available and sometimes required to protect the Western Joshua Tree within the 76 percent (minimum) of the species distribution area where regulations are present. Typical mitigation requirements for the Western Joshua Tree include onsite or offsite preservation of Joshua Tree Woodland habitat or conservation easements and compensatory mitigation, with avoidance and minimization measures being the first preferences. If relocation is included as a mitigation option, the mitigation measure would typically require, per CEQA, a period of monitoring post-relocation, the required success rates for relocation, contingency measures should relocation prove unsuccessful, and that a certified botanist oversee the relocation, planting, and monitoring. Impact plans or preservation plans (or documentation of a similar variety) are usually required and typically include requirements to set back from Joshua tree habitat so as to avoid impacts, and a delineation of habitat and description of the total area of impact.

Measures such as avoidance of impacts to Joshua Tree Woodland, minimization of impacts, and compensatory mitigation, typically through provision and protection of in-lieu habitat at a 1:1 ratio, are typically required by Kern County as part of mitigation for projects with impacts to Joshua Tree Woodland.

Examples of avoidance, minimization, and compensatory mitigation measures required include:

First Solar's Windhub B Solar Project (Kern County 2018)

- Prior to any ground disturbing activities, a Joshua Tree Preservation Plan shall be submitted for review and approval by the appropriate agencies. Upon approval of the Plan, and prior to initiating project construction, the project proponent/operator shall have a qualified biologist document the location and acreage of Joshua tree woodland that would be subject to permanent disturbance.
- The Joshua Tree Preservation Plan shall describe field methods used to delineate acreage of Joshua tree woodland and shall provide a detailed compensatory mitigation strategy, based on one or both of the following options:
  - Preservation of Joshua tree woodland habitat shall occur on parcels within the project site. The project proponent/operator may mitigate all or part of the project's impacts to Joshua trees, as follows: Delineate and designate one or more parcels for dedication for permanent conservation management. The mitigation lands shall provide habitat at a 1:1 ratio for impacted lands, comparable to habitat to be impacted by the project (i.e., similar abundance and size of Joshua trees, similar dominant vegetation community, similar levels of disturbance or habitat degradation). Suitable mitigation lands provided for other species may be used for Joshua tree woodland mitigation, at a 1:1 ratio.
  - In lieu monetary funding. For any Joshua tree woodlands not part of relocation efforts, the project proponent/operator shall submit funding for the acquisition and management in perpetuity of Joshua tree woodland habitat or habitats similar to those that contain impacted Joshua trees on site. Funding and management shall be provided through conservation plan approved by the appropriate agencies, either through an existing mitigation bank (e.g., as managed by the City of Lancaster Parks, Recreation and Arts Department) or through a third-party entity such as the Wildlife Conservation Board or a regional Land Trust. The in-lieu fee shall provide sufficient funds to acquire appropriate lands to provide habitats containing Joshua tree woodland at a 1:1 ratio for impacted lands, comparable to habitat to be impacted by the project (i.e., similar abundance and size of Joshua trees, similar dominant vegetation community, similar levels of disturbance or habitat degradation). Suitable mitigation lands provided for other species may be used for Joshua tree woodland mitigation, at a 1:1 ratio.

Daggett Solar Power Facility Project (San Bernardino County 2019)

- A Joshua Tree Relocation Plan is included as a standard condition for all projects requiring a Conditional Use Permit, even if Joshua trees are not onsite. The developer is required to submit an approved relocation plan for Joshua trees within the developed site area, if present. The relocation plan requires a certification from an appropriate arborist, registered professional forester or a Desert Native Plant Expert that the proposed tree removal, replacement, or revegetation activities are appropriate, supportive of a healthy environment, and are in compliance with Chapter 88.01 of the San Bernardino County Development Code. The certification will include the information in compliance with Department procedures. Transplantation onsite will be the primary method of addressing a Joshua tree removal from the subject property.

Gaskell West Solar Project (Kern County 2016)

- Compensatory mitigation is required to mitigate impacts to Joshua tree woodlands whereby equivalent Joshua tree woodland (or habitats similar to those that contain impacted Joshua trees on site that are located within the same bioregion and/or watershed) on another site is protected in perpetuity. This is performed in-lieu of fee for loss of Joshua tree woodland. This mitigation must be approved by the Kern County Planning and Natural Resources Department and funding/management will be provided by a Kern County approved Conservation Plan, either through an existing mitigation bank or a third-party entity. The in-lieu fee will provide sufficient funds to acquire appropriate lands to provide habitats containing Joshua trees at a 1:1 ratio, comparable to the habitat to be impacted by the project (similar abundance/size, codominant vegetation, suitable soils and hydrology, and levels of disturbance or habitat degradation). The County-approved biologist will submit confirmation of the total area of Joshua tree woodland and an estimate of the number of individual Joshua trees that will be removed.

Joshua trees are found in the Mojave Desert at elevations between 400 and 1,800 meters (1,300 to 5,900 feet) above sea level. Suitable habitat based on soils, weather conditions and rainfall for the Western Joshua Tree is limited to areas within the Mojave, Sonoran and Colorado Deserts. Opportunities for in-kind compensatory mitigation in the form of land conservation will likely be very limited and best focused on areas with suitable microclimates such as identified by Sweet et al. 2019. Mitigation strategies that involve research and species management within the national parks and publicly owned lands may present opportunities for conserving Joshua trees.

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Figures

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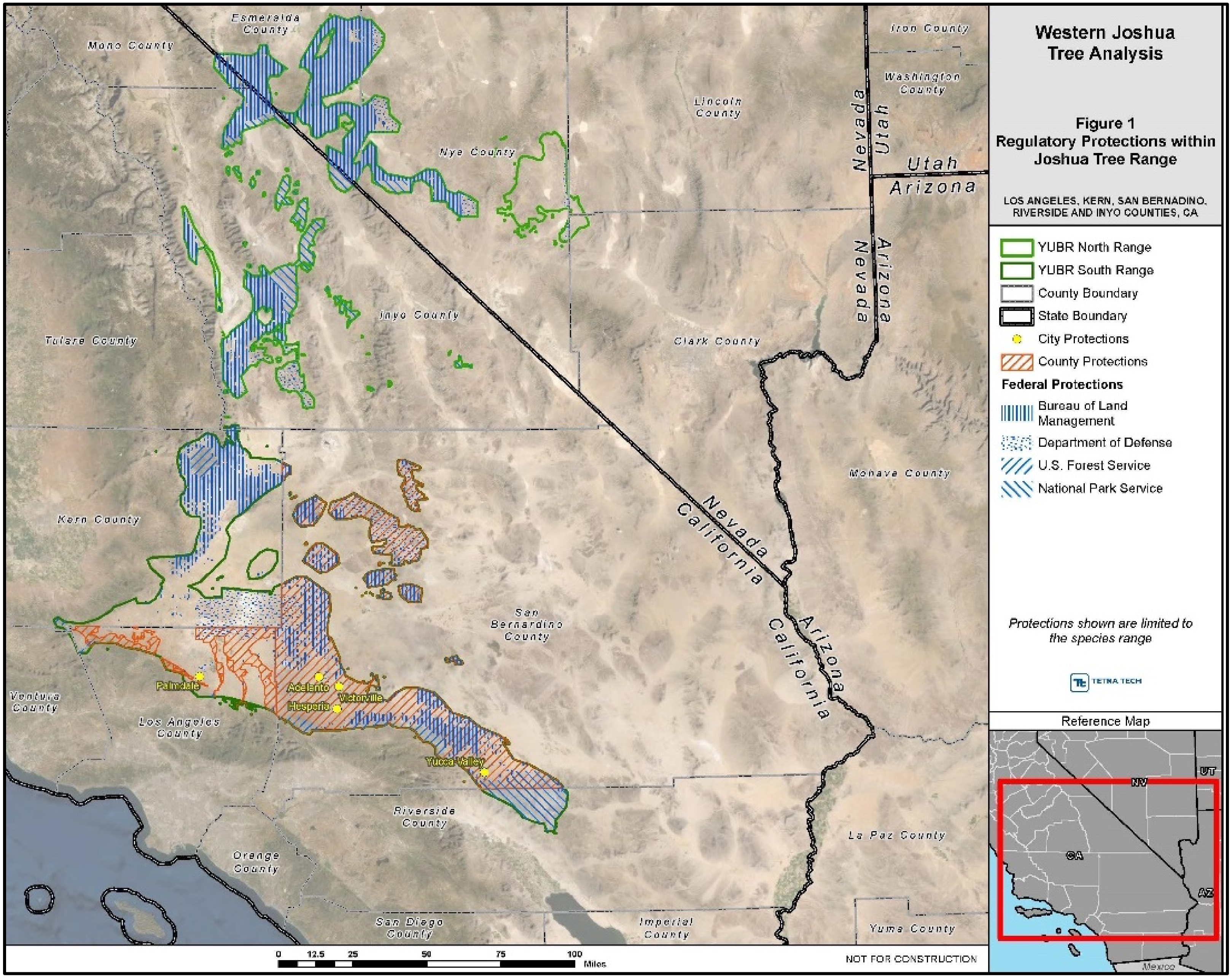
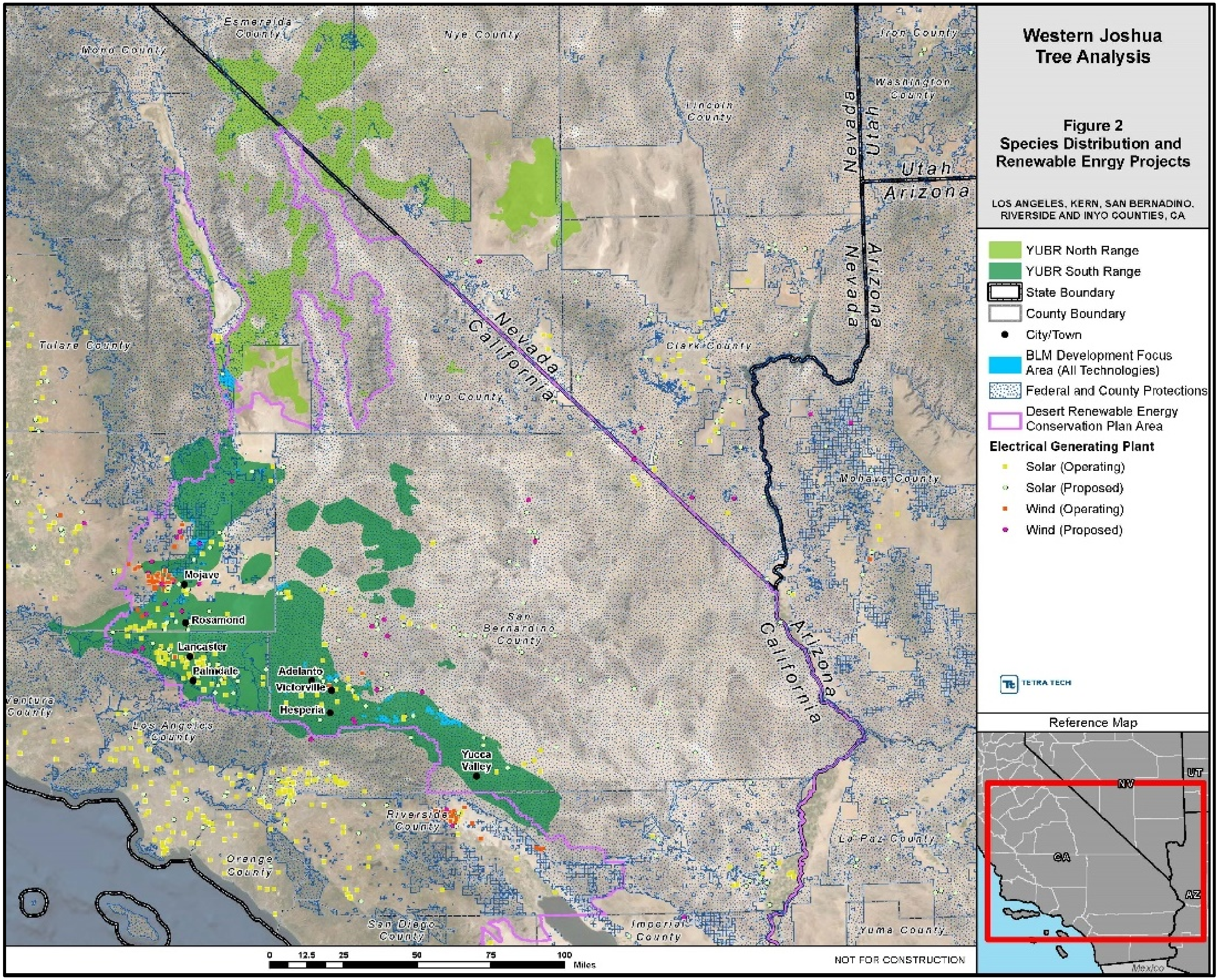

Western Joshua Tree Analysis
Figure 1
Regulatory Protections within Joshua Tree Range
LOS ANGELES, KERN, SAN BERNARDINO, RIVERSIDE AND INYO COUNTIES, CA
YUBR North Range
YUBR South Range
County Boundary
State Boundary
City Protections
County Protections
Federal Protections
Bureau of Land Management
Department of Defense
U.S. Forest Service
National Park Service
Protections shown are limited to the species range
TETRA TECH
Reference Map
NOT FOR CONSTRUCTION
0 12.5 25 50 75 100 Miles
Mono County
Esmeralda County
Lincoln County
Nye County
Inyo County
Tulare County
Clark County
Kern County
San Bernardino County
Ventura County
Los Angeles County
Riverside County
Orange County
San Diego County
Imperial County
Mohave County
La Paz County
Yuma County
Iron County
Washington County
Nevada
Utah
Arizona
California
Palmdale
Adelanto
Victorville
Hesperia
Yucca Valley


Western Joshua Tree Analysis
Figure 2
Species Distribution and Renewable Enrgy Projects
LOS ANGELES, KERN, SAN BERNADINO, RIVERSIDE AND INYO COUNTIES, CA
YUBR North Range
YUBR South Range
State Boundary
County Boundary
City/Town
BLM Development Focus Area (All Technologies)
Federal and County Protections
Desert Renewable Energy Conservation Plan Area
Electrical Generating Plant
Solar (Operating)
Solar (Proposed)
Wind (Operating)
Wind (Proposed)
TETRA TECH
Reference Map
NV
UT
CA
AZ
Mexico
0 12.5 25 50 75 100 Miles
NOT FOR CONSTRUCTION
Esmeralda County
Nye County
Mono County
Iron County
Washington County
Lincoln County
Nevada
Utah
Arizona
California
Tulare County
Clark County
Inyo County
Mohave County
Mojave
Rosamond
Lancaster
Palmdale
Adelanto
Victorville
Hesperia
Yucca Valley
San Bernardino County
Ventura County
Los Angeles County
Riverside County
Orange County
San Diego County
Imperial County
La Paz County
Yuma County

Appendix A. Existing Regulations Pertaining to the Current Distribution of Western Joshua Tree (*Yucca brevifolia)*

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Appendix A. Western Joshua Tree – Existing Regulations Pertaining to Current Distribution (North, South)

Regulatory Agency	Name of Regulation and/or Policy Instrument	Description of Existing Regulation	Degree of Protection (Required vs Voluntary)	Extent of Area Protected by Regulation	Protected Area	
					Percentage of YUBR Range Covered by Regulation	YUBR Range within Jurisdiction (Acres/Sq. Mi)
FEDERAL						
Bureau of Land Management (BLM)	California Desert Protection Act; Code of Federal Regulations	Designated 69 wilderness areas as additions to the National Wilderness Preservation System within the California Desert Conservation Area (CDCA). Joshua trees are protected in these areas. No surveys required.	Required	CDCA Plan Boundary	Not calculated, see DRECP	Not calculated, see DRECP
Bureau of Land Management (BLM)	Desert Renewable Energy Conservation Plan, Land Use Plan Amendment	Conserve unique landscape features, important landforms, and rare or unique vegetation types identified within BLM land (NLCS, ACEC, etc.), including areas of dense Joshua Tree Woodland. Management actions include removal of invasive plants, rehabilitating disturbed areas, protecting populations of special status plants, and monitoring Joshua Tree Woodland population trends, removing threats, and taking remedial actions when impacts occur. Impacts to Joshua Tree Woodlands will be avoided to the maximum extent practicable, except for minor incursions. Suitable habitat may require surveys.	Required	DRECP Plan Area Boundary	Total: 34.1 (BLM lands only) North: 55.7 (BLM lands only) South: 22.7 (BLM lands only)	North:1,104,262/1,725 (BLM lands only) South: 843,999/1,319 (BLM lands only)
Department of Defense (DOD)	Sykes Act	Requirement of Integrated Natural Resources Management Plans (INRMP) for military installations. Plan, develop, maintain, coordinate, and implement programs for the conservation and rehabilitation of wildlife, fish and game species, including specific habitat improvement projects, on public land.	Required	INRMP Plan Boundary	Total: 13.6 North: 10.5 South: 15.3	North: 209,102/327 South: 569,566/890
National Park Service (NPS)	Enabling legislation for National Park; California Desert Protection Act, Code of Federal Regulations	Established Death Valley and Joshua Tree National Parks and Mojave National Preserve; Joshua trees are protected in these areas. Minimize human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them within these parks. Withdraws all Federal lands within the Park from the same forms of appropriation or entry under public land, mining, and mineral and geothermal leasing laws as are applicable to lands within Death Valley National Park. No surveys required.	Required	All National Park Lands	Total: 8.7 North: 14.0 South: 5.8	North: 278,934/436 South: 216,284/338
STATE						
California Department of Fish and Wildlife (CDFW)	California Desert Native Plants Act	California law that prohibits unlawful harvesting of desert plants on both public and privately-owned lands, without a permit, in all California deserts. Specifically prohibits commercial harvesting of Joshua trees.	Required	Boundaries of Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties	Total: 74.9 North: 39.8 South: 100.0	North: 789,089/1,233 South: 3,721,813/5,815
Multiple (state and county)	California Environmental Quality Act (CEQA)	The California Environmental Quality Act (CEQA) generally requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of proposed projects, and to reduce those environmental impacts to the extent feasible. Impacts are reviewed for those species which are endangered, threatened, candidate for listing, rare, or considered by CDFW to be a species of special concern. Joshua Tree Woodland is designated as a sensitive plant community by CDFW.	Required	Statewide	Total: 79.1 North: 39.8 South: 100.0	North: 789,095/1,233 South: 3,724,081/5,818
LOCAL						

Regulatory Agency	Name of Regulation and/or Policy Instrument	Description of Existing Regulation	Degree of Protection (Required vs Voluntary)	Extent of Area Protected by Regulation	Protected Area	
					Percentage of YUBR Range Covered by Regulation	YUBR Range within Jurisdiction (Acres/Sq. Mi)
Kern County	California Environmental Quality Act (CEQA)	Kern County typically requires development of a Joshua Tree Preservation Plan for those developments which may impact the Western Joshua Tree. For those trees which cannot be avoided and require removal, removal is limited to those trees within ground-disturbance areas. Mitigation of project impacts to the species requires dedicating an equal area of comparable habitat as a conservation easement (or in lieu fee) at a 1:1 ratio for impacted trees. Surveys required.	Required	Countywide	Total: 20.4 North: 0 South: 31.3	North: 0 South: 1,166,353/1,822
Los Angeles County	General Plan – Significant Ecological Areas (SEA)	Joshua Tree Woodlands are located and protected within the Antelope Valley, Joshua Tree, and San Andreas SEAs. This protection applies to all Joshua trees (*Yucca brevifolia*) regardless of size. Joshua trees must be 20' tall to be considered a heritage tree, which would require a Conditional Use Permit (CUP) to remove or relocate for development. Removal of two or more Joshua trees (non-heritage) would also require a CUP. A survey would likely be required to determine the plant locations which are required for inclusion with the CUP. A Protected Tree Permit would also be required for removal of up to two Joshua trees. Failure to apply could result in a 5-year ban to apply for new permits. Some developments are exempt from the SEA policies (see Section 22.102.040).	Required	Antelope Valley, Joshua Tree, and San Andreas SEAs	Total: 4.0 North: 0 South: 7.0	North: 0 South: 253,611/396
San Bernardino County	General Plan, Section F, Goal D/CO, Policies 1.3 and 1.11	Require retention of existing native vegetation for new development projects, particularly Joshua trees (including specimen sized Joshua trees). May require a landscape plan, determination that no other siting alternative exists, on-site relocation of the tree(s). Specimen size trees are defined in Section 88.01.050 of the Development Code. No surveys required.	Required	Countywide	Total: 13.3 North:0 South:46.0	North: 0 South: 1,711,907/2,675
San Bernardino County	Development Code – Title 8 – Development Code, Section V, 83.10.080(c)(1) Section 88.01.050(f)(3)(A), (B), and (C) Section 88.01.060(c)(4)	Any existing native desert plant material, or any part thereof, except the fruit, shall not be removed without the issuance of a tree removal permit (including all plants in the Agavaceae family and Joshua trees). If Joshua trees exist on-site and are proposed to be relocated, they shall be relocated on-site in the landscaped areas; unless, the Director of the Land Use Services Department specifically allows another option. Joshua trees that are proposed to be removed will be transplanted or stockpiled. Transplanting shall comply with the Desert Native Plants Act provisions. No surveys required.	Required	Countywide	Total: 13.3 North: 0 South: 46.0	North: 0 South: 1,711,907/2,675
San Bernardino County	Hacienda Fairview Valley Specific Plan	Re-establish natural desert landscape – use open space areas for transplanting of candidate Joshua trees. Requires preservation in place and/or relocation of existing on-site Joshua Trees per a Joshua Tree Management Program. This Program is consistent with County Development Code Chapter 88.01, Plant Protection and Management, and provides additional provisions and guidelines relating to grading parameters, construction activities and conservation areas within the Hacienda at Fairview Valley Specific Plan. The Environmental Impact Report shall establish appropriate mitigation measures and monitoring requirements for any potentially significant impacts. Encourage the retention of specimen sized Joshua Trees (as defined below) by requiring the building official to make a finding that no other reasonable siting alternative exists for the development of the land. No surveys required.	Required	Plan Area	Total: <0.1 North: 0 South: <0.1	North: 0 South: 1,557/2

Regulatory Agency	Name of Regulation and/or Policy Instrument	Description of Existing Regulation	Degree of Protection (Required vs Voluntary)	Extent of Area Protected by Regulation	Protected Area	
					Percentage of YUBR Range Covered by Regulation	YUBR Range within Jurisdiction (Acres/Sq. Mi)
San Bernardino County	Homestead Valley Community Plan Phelan/Pinon Hills Community Plan Oak Hills Community Plan Lucerne Valley Community Plan Morongo Valley Community Plan Joshua Tree Community Plan	Preserve the unique environmental features, including native wildlife, vegetation, and scenic vistas (including the Joshua Tree Woodland). Encourage the retention of specimen sized Joshua Trees (as defined below) by requiring the building official to make a finding that no other reasonable siting alternative exists for the development of the land. Establish more restrictive regulations requiring greater retention of existing native vegetation for new development projects, particular attention shall be given to the retention of Joshua trees. This can be accomplished by adhering to provisions outlined in the General Plan, Section F, Goal D/CO, Policies 1.3 and 1.11. No surveys required.	Required	Plan Area	Not calculated	Not calculated
Riverside County / Coachella Valley	Coachella Valley Multiple Species Habitat Conservation Plan	Conserve and protects portion of Joshua Tree National Park and Indio Hills/Joshua Tree National Park linkage habitat that is within Coachella Valley. No surveys required.	Required	Plan Area	Not calculated	Not calculated
City of Adelanto	Native Vegetation Removal Permit and Joshua Tree Survey	Permit that allows for the removal and transport of native vegetation. Joshua trees and other vegetation requiring transportation must be supervised by a City-approved arborist while adhering to a City-approved Transplantation Plan. Per Title 8, Division 9 of San Bernardino County Code, every Joshua Tree Proposed for Removal is required to be inspected by the Local Jurisdiction to assure the Joshua tree is not a "specimen" class tree requiring preservation and transplantation. No surveys required or exemptions.	Required	Citywide	Total: <0.1 North: 0 South: <0.1	North: 0 South: 29/<0.1
City of Hesperia	PL-16, Protected Native Vegetation and PL-17, Protected Plant Policy	Joshua trees on single-family residential tract, multiple-family residential, commercial, and industrial developments are identified and avoided, if possible. If not possible, transplanting or adoption is an alternative. Must be transplanted or stockpiled for future use whenever possible. Shall not be harvested or removed except use a permit. No surveys required.	Required	Citywide	Total: <0.1 North: 0 South: <0.1	North: 0 South: 8/<0.1
City of Palmdale	Joshua Tree and Native Desert Preservation	City ordinance that protects and preserves desert vegetation, and in particular *Yucca brevifolia.* Joshua tree shall not be removed, nor caused to be removed, on or from any parcel of land, without a native desert vegetation removal permit. Permit package requires site plan which may require surveys to determine exact locations of plants. Violators will be penalized. Exemptions include routine maintenance of a Joshua tree or desert vegetation to ensure its continued health or trees that have been planted, grown and/or held for sale by a licensed nursery (Section 14.04.090 for full list of exemptions). No surveys required.	Required	Citywide	Total: <0.1 North: 0 South: <0.1	North: 0 South: 730/1
City of Victorville	City Ordinance No. 1224, Joshua Tree Inspection Program, Chapter 13.3 Preservation and Removal of Joshua Trees	Under this ordinance, *Yucca brevifolia* on undeveloped lands are protected. Grading a site, removing or damaging plants prior to completing the inspection procedures may result in fines and/or penalties for the property owner/ developer. No surveys required.	Required	Citywide	Total: <0.1 North: 0 South: <0.1	North: 0 South: 169/<0.1

Regulatory Agency	Name of Regulation and/or Policy Instrument	Description of Existing Regulation	Degree of Protection (Required vs Voluntary)	Extent of Area Protected by Regulation	Protected Area	
					Percentage of YUBR Range Covered by Regulation	YUBR Range within Jurisdiction (Acres/Sq. Mi)
Town of Yucca Valley	City Ordinance 140, Desert Native Plant Protection, Section 9.10.040 Native Landscape Documentation Package	A Native Plant Permit issued by the Community Development Director is required to remove *Yucca brevifolia,* with the exception of the fruit. Applies on all private lands within the town of Yucca Valley and public lands owned by Yucca Valley. Native landscape documentation shall be submitted to the division at the time of filing land use applications, which could require surveys.	Required	Entire range within Yucca Valley	Total: <0.1 North: 0 South: <0.1	North: 0 South: 192/0.3

KERN, INYO AND MONO COUNTIES BUILDING TRADES COUNCIL

Tehachapi Wind Wall, LLC

Lebata, Inc.

August 6, 2020

Mr. Eric Sklar, President and
Members of the Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

[*VIA EMAIL TO FGC@FGC.CA.GOV*]

RE: August 19-20 Meeting Agenda Item 25: Western Joshua tree listing petition

Dear President Sklar and Members of the Fish and Game Commission:

CalPortland Company ("CalPortland") submits this letter on its behalf and on behalf of a coalition of construction materials, housing, energy, and labor companies (for purposes of this letter, the "Coalition") and organizations concerning the pending petition to list the Western Joshua Tree (*Y. brevifolia* or "Joshua tree") as threatened under the California Endangered Species Act (Fish & G. Code § 2050 *et seq.* ["CESA"].)[1] For the reasons set out below, the Coalition urges the Commission to reject the Petition.

In order to be accepted by the Commission, CESA requires a listing petition to include certain scientific information, which when taken as a whole, must show that the "petitioned action may be warranted". (Fish & G. Code § 2072.3.) The Petition now before the Commission does not satisfy this standard. The Petition fails to include any scientific information at all regarding *Y. brevifolia*'s abundance and population trend, and other scientific information wholly undercuts the Petition's cited evidence regarding threats to the species and the degree and

[1] The Petition, which can be found online at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=175218&inline, is hereby incorporated by reference.

immediacy of those threats. Taken as a whole, the Petition does not establish that listing of Joshua trees may be warranted.

Beside the Petition's failure to satisfy CESA's requirements for acceptance by the Commission, the Commission's consideration of the Petition at all during the continuing and intensifying COVID-19 pandemic is problematic from public access and procedural due process standpoints. The Commission's acceptance of the Petition would immediately affect land use decisions across millions of acres, an area larger than some states. Impaired access to the Commission as a result of the pandemic means that stakeholders and the public will not be able to fully participate in a decision that could profoundly impair housing construction and economic development in communities where both are most needed. At the same time, the Petition acknowledges that immediate protection of *Y. brevifolia* is unnecessary – the species is "not currently" "in serious danger of becoming extinct throughout all, or a significant portion, of its range". (Petition, p. 48.) Such a danger "is likely decades away." (*Ibid*.)

The Coalition urges the Commission to reject the Petition for its failure to meet CESA's basic informational requirements. Alternatively, CalPortland asks the Commission to postpone its consideration of the Petition until such time that the public can fully participate in the Commission's decision.

This letter proceeds in four parts: Part 1 establishes the Coalition's vested interest in the Commission's action on this matter. Part 2 addresses serious procedural and due process problems in the Commission's consideration of this matter during the ongoing COVID-19 pandemic. Part 3 outlines CESA's criteria and evidentiary standards governing the Commission's consideration of a listing petition. Part 4 outlines the patent defects in the Petition that require the Commission, as a matter of law, to find "the petition does not provide sufficient information to indicate that the petitioned action may be warranted[.]" (Fish and G. Code § 2072.4(e)(1).)

Finally, this letter encloses and incorporates by reference WestLand Resources, Inc.'s *Assessment Of Petition To List The Western Joshua Tree (Yucca Brevifolia) As Threatened Under The California Endangered Species Act* (August 2020) ("WestLand Assessment"). The WestLand Assessment provides an expert critical analysis of evidence and arguments offered in the Petition, and identifies the Petition's critical scientific and evidentiary shortcomings.

1. <u>Coalition Members' Beneficial Interest</u>

Coalition members, which include those companies and organizations identified at the top of this letter, as well as other entities with similar interests, are landowners, essential businesses, employers, and community leaders within the Mojave Desert region and surrounding areas that would be impacted by the Commission's acceptance of the Petition. Coalition members provide essential construction materials, public infrastructure, housing, energy, and skilled labor, and their ability to carry out these critical functions would be impaired by acceptance of the Petition.

2. Procedural and Due Process Problems

The Commission Should Exercise Its "Sound Discretion" To Postpone Its Hearing On The Petition. Governor Newsom's Executive Order N-29-20 (March 17, 2020) imposes a temporary partial exception to Bagley-Keene Act requirements that "would prevent, hinder, or delay appropriate actions to *prevent and mitigate the effects of the COVID-19 pandemic*." (Executive Order N-25-20 [emphasis added].) Executive Order N-29-20 waives aspects of the Bagley-Keene Act that require state agencies to be physically present during a meeting or to make physical facilities available to members of the public for meetings addressing "actions to prevent and mitigate the effects of the COVID-19 pandemic."

The Executive Order makes these same partial waivers applicable to state agency meetings for all other purposes, subject, however, to the following mandate:

> All state and local bodies are urged to use *sound discretion* and to make reasonable efforts to *adhere as closely as reasonably possible to the provisions of the Bagley-Keene Act* and the Brown Act, and other applicable laws regulating the conduct of public meetings, *in order to maximize transparency and provide the public access to their meetings*.

(Executive Order N-29-20, ¶ 3 [emphasis added].) In other words, while agencies may proceed under the modified access rules established by the Executive Order, agencies are encouraged to exercise their "sound discretion" to do more than the minimum to "maximize transparency and provide the public access to their meetings." Compliance with this direction is not a "one size fits all" proposition. Some routine matters may be appropriate for consideration by electronic means, while other matters, including non-urgent matters and matters with significant geographic, social, and economic impacts, should be postponed to such a time that the public can be afforded full access to the Commission's meetings.

The Commission's consideration of the Petition is not an "appropriate action to prevent and mitigate the effects of the COVID-19 pandemic"; it is business as usual. The Commission's decision to consider the Petition by exclusively electronic means even while the current pandemic intensifies in California evidences no effort by the Commission to exercise "sound discretion" to "adhere as closely as reasonably possible to the provisions of the Bagley-Keene Act". Nor does the Commission's action show any effort to "maximize transparency and provide the public access to their meetings" as directed by Executive Order N-29-20 and consistent with the Commission's own Core Value of Transparency.

Virtual meeting technologies do not provide fair and equal access to all members of the public, but rather impose new challenges to public participation for those that do not have access to required technologies. Members of the public that wish to participate must do so by electronic or telephonic devices that they purchase or otherwise obtain themselves, which imposes a barrier to participation that has a known negative effect on participation by members of the public living in rural and low income areas, as are many of the communities that would impacted by the Commission's acceptance of the Petition. (See, e.g., Goss, Justin et al, Public Policy Institute of California, *California's Digital Divide* (March 2019) available at: https://www.ppic.org/publication/californias-digital-divide/.)

These electronic challenges are compounded by poor accessibility to key Department staff members, as detailed in CalPortland's June 11, 2020 letter to the Commission, as well as by staff's inability to timely respond to Public Records Act ("PRA") requests for documents relevant to this matter. Attorneys on behalf of CalPortland submitted two Public Records Act requests each to the Department and to the Commission on June 8. The requested records relate narrowly to documents concerning the Commission's Joshua tree listing process and the Department's evaluation of the Joshua tree listing process, among other documents.

Despite multiple follow-up communications with the Department and Commission's PRA coordinator and reviewing staff since June 8, the Department provided the required 10-day response indicating that it would provide certain records for only one of the two requests submitted on June 8. The Department failed to comply with the PRA's 10-day response requirement for the second records request. On July 22, accompanying a limited production of responsive documents, the Department transmitted a letter to CalPortland's attorneys stating as follows, in relevant part:

> Due to the COVID-19 emergency, most Department staff are working remotely and do not have access to all Department records. For this reason, our search for responsive records has been limited to those records Department staff can access remotely.

(Department Response to Public Records Act Request No. 20-06-212, July 22, 2020.)

The Commission, by comparison, failed to respond to both records requests within the 10-day initial response period, and did not respond in any fashion until July 21, when a Commission staff person communicated the following by email:

> We will be happy to complete the Public Records Request (PRA) for the Letters received for the Western Joshua tree petition. Please be aware that due to the volume of comments received (over 5,000), it will take several months to complete this project.

(Email from J. Greaves to M. Harrison, July 21, 2020.)

Apart from the Department's and Commission's violation of basic PRA response requirements, these communications show that the pandemic is impeding state government's ability to carry out normal operations, even those as fundamental as responding to requests for public records. The practical consequence of the Department and Commission's failure to respond and timely produce requested records is that CalPortland and other stakeholders are unable to review the complete administrative record before the Commission as is necessary to fully comment on the Petition.

Rather than proceed with consideration of the Petition while COVID-19 social distancing orders remain in effect, we urge the Commission to use its "sound discretion" to postpone consideration of the Petition until social distancing is no longer required in order to "maximize transparency and provide the public access to their meetings". (See Executive Order N-29-20, ¶ 3.) The Petition makes clear that such a delay will result in no harm to *Y. brevifolia*. As noted above, danger, if any, to Joshua trees "is likely decades away." (Petition, p. 48.)

The Fish and Game Code's timeframe for the Commission to hold a public hearing on a Petition is directory, not mandatory. Prevailing California law allows the Commission to postpone its consideration of the Petition without consequence. Fish and Game Code section 2074 provides that the Commission shall consider a petition "at its next available meeting" after the Department completes is evaluation of the petition, while section 2074.2(d) allows the Commission to continue the public hearing on a petition for an additional 90 days.

As a general rule, "requirements relating to the time within which an act must be done are directory rather than mandatory or jurisdictional, unless a contrary intent is clearly expressed." (*Edwards v. Steele* (1979) 25 Cal. 3d 406, 410 ["*Edwards*"]; *Briggs v. Brown* (2017) 3 Cal. 5th 808, 877.) In the absence of statutory provisions clearly expressing that intent, courts have routinely found deadlines or time limitations directory where no "consequence or penalty is provided for failure to do the act within the time commanded." (*Edwards*, at p. 410; *Kabran v. Sharpe Memorial Hospital* (2017) 2 Cal. 5th 330, 340.) Here, the Fish and Game Code intent that the timeframes set out in sections 2074 and 2074.2 are mandatory rather than directory. The Commission can postpone consideration of the Petition without consequence.

Finally, even if the Commission's timeframe to consider the Petition were mandatory, such deadlines never supersede the people's right to constitutional due process, and such deadlines may be adjusted as necessary to avoid infringement of constitutional protections, such as the right to due process. (See *Ursino v. Superior Court* (1974) 39 Cal.App.3d 611, 621-622.)

As stated above, the Petition makes clear that a delay – even a delay as long as may be necessary for the COVID-19 pandemic to subside – will result in no immediate harm to *Y. brevifolia*. The species is not in serious danger of becoming extinct; rather, such a danger "is likely decades away." (Petition, p. 48.) The Petition further acknowledges that *Y. brevifolia* has been remarkably stable for the past 11,000 years or more. (*Id.*, at p. 17.) The circumstances do not demand immediate action by the Commission; to the contrary, the Executive Order, the continuing pandemic, "sound discretion," and basic principles of due process and public participation all militate toward postponement of this matter until the public can fully participate in the Commission's process.

3. CESA Criteria and Evidentiary Standard

Fish and Game Code section 2072.3 establishes the criteria a listing petition must meet in order "to be accepted" by the Commission. Specifically, a petition "shall" include "sufficient scientific information that a petitioned action may be warranted", as well as sufficient scientific information for each of the following categories:

(A) Population trend;
(B) Range;
(C) Distribution;
(D) Abundance;
(E) Life history;
(F) Kind of habitat necessary for survival;
(G) Factors affecting the ability to survive and reproduce;
(H) Degree and immediacy of threat;
(I) Impact of existing management efforts;
(J) Suggestions for future management;
(K) Availability and sources of information;
(L) A Detailed distribution map.

These criteria are mandatory (i.e., a petition "shall include"), not directory. (Fish & G. Code § 2072.3; Cal. Code Regs., tit. 14, § 670.1(d) [emphasis added].) "A petition will be rejected by the commission if it fails to include sufficient scientific information under the categories of Section 2072.3 of Fish and Game Code (subsections d(1)(A) through (L) above) that the petitioned action may be warranted." (Cal. Code Regs., tit. 14, § 670.1(e)(1) [emphasis added].)

In other words, CESA and implementing regulations bar the Commission from accepting a petition that (1) fails to include any information at all concerning any one of the above categories; or (2) fails to include "sufficient scientific information" concerning any one of the above categories. (Cal. Code Regs., tit. 14, § 670.1(e)(1).)

"Sufficient scientific information" is undefined in CESA, but the phrase "sufficient information" in the CESA listing context has been interpreted to mean "that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." (*Center for Biological Diversity v. Fish & Game Com.* (2008) 166 Cal.App.4th 597, 609-610 ["*Center for Biological Diversity*"].) Evidence proffered with a petition is sufficient to meet the "may be warranted" standard "only if it is material to the criteria at issue, is credible, supports the petition, and, when weighed against the department's written report and any comments received, is strong enough to indicate" that the requested action may be justified. (*Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1204 ["*Central Coast Forest Assn.*"].)

Even where a petition includes otherwise "sufficient scientific information", that information may be rendered insufficient where "countervailing information and logic persuasively, wholly undercut some important component of that prima facie showing." (*Center for Biological Diversity v. Fish & Game Com*. (2008) 166 Cal.App.4th 597, 612.)

The Petition falls short of the above standards in the following ways:

- The Petition fails to provide any evidence whatsoever that the northern or southern populations of *Y. brevifolia* meet the Department's own definition of an Evolutionary Significant Unit ("ESU"). As a result, evidence offered by the Petition concerning factors affecting the species' ability to survive and reproduce (criterion "G" above) and concerning the degree and immediacy of the threat to the species (criterion "H" above) is scientifically insufficient when viewed range-wide.

- The Petition fails to provide any evidence whatsoever regarding *Y. brevifolia's* abundance and population trend (criteria "D" and "A" above), and fails to address evidence that wholly undercuts the Petition's claim that the species' population is declining range-wide;

- The Petition mischaracterizes the evidence regarding factors affecting *Y. brevifolia*'s ability to survive and reproduce (criterion "G" above);

- The Petition provides no evidence that either fire or climate change present an immediate range-wide threat to *Y. brevifolia* (criterion "H" above), and fails to address other evidence that wholly undercuts the Petition's claim that these factors are in fact a threat to the species.

- The Petition's primary suggestion for future management is infeasible and exceeds the Commission's and Department's authority under CESA (criterion "J" above).

Taken as a whole, the Petition fails to provide scientific information sufficient to "lead a reasonable person to conclude the petitioned action may be warranted." (*Center for Biological Diversity, supra,* 166 Cal.App.4th at pp. 609-610; *Central Coast Forest Assn., supra,* 18 Cal.App.5th at p. 1204.) We discuss these defects in detail below.

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4. The Petition Does Not Satisfy CESA Criteria For Acceptance By The Commission

The Petition Provides No Evidence That Northern or Southern *Y. Brevifolia* Populations Qualify As ESUs. The Petition asks the Commission to list the Joshua tree as a "species" or a "subspecies or variety" across the species' entire range, or as various, distinct ESUs. (Petition, pp. ii, 16, fn. 8.) The Petition, however, fails to provide any evidence whatsoever supporting its argument for recognizing *Y. brevifolia* ESUs.

By the Department's own adopted definition, a population may qualify as an ESU where it meets two criteria: (1) it must be reproductively isolated from other conspecific (i.e., same species) population units, and (2) it must represent an important component of the evolutionary legacy of the species. (See WestLand Assessment, p. 3.) The Petition provides no such evidence. To the contrary, studies cited for other purposes in the Petition show that it is likely that the Joshua tree northern and southern populations are not reproductively isolated, and that there is gene flow between the two populations. (*Id*., at pp. 3-5.)

The consequence of this is that the Petition presents "(1) a biased discussion of the population status and dynamics of Joshua trees across their range and (2) a biased conclusion of threats to Joshua trees." (WestLand Assessment, p. 5.) In other words, because the Joshua tree northern and southern populations are not ESUs, the Petition must address the species across the entire range, rather than one population or the other, in order to show that listing "may be warranted." (Fish & G. Code § 2072.3.)

The Petition wholly fails in this regard. Rather, the Petition supports its assertions by improperly extrapolating findings from a limited dataset developed from within a geographical fraction of *Y. brevifolia*'s range. As explained in the WestLand Assessment:

> While ecologists often extrapolate population dynamics by subsampling populations of the organism of interest, the statistical reliability of this subsampling depends on multiple procedural and ecological factors. . . . Critically, a failure to account for these factors when sampling or extrapolating data can lead to spurious conclusions that do not reflect the biological processes that are occurring.

(WestLand Assessment, p. 6.) The Petition fails to follow standard scientific practices necessary to properly extrapolate data. As a consequence, the studies cited in the Petition concerning factors affecting survival and reproduction, and degree and immediacy of the threat cannot and do not constitute scientifically sufficient evidence supporting the Petition's range-wide assertions regarding *Y. brevifolia*.

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The Petition Provides No Evidence Regarding *Y. Brevifolia's* Abundance or Population Trend. "Abundance" in the CESA context refers to the number of individuals of a taxon in a given area. "Population trend" relates to the directional change in abundance of a specific taxon in a given area through time. Data on abundance and population trend is essential to adjudging whether a particular species is "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts" required by CESA. (Fish & G. Code § 2067.) On both required components, the Petition includes no information, much less scientifically sufficient information.

The Department's *Evaluation of a Petition from the Center for Biological Diversity to List Western Joshua Tree (Yucca Brevifolia) as Threatened Under the California Endangered Species Act* (February 2020) ("Department Evaluation") openly acknowledges these two deficiencies: "[T]he Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend . . .." (Department Evaluation, p. 9 [emphasis added].) Instead, "the Petition includes information demonstrating that western Joshua tree currently has a relatively widespread distribution in southern California," and that "the abundance of western Joshua tree is currently relatively high." (Department Evaluation, p. 13.) The Petition also cites to studies indicating that Joshua trees have been stable in at least Joshua Tree National Park for more than 11,000 years. (Petition, p. 17; Department Evaluation, p. 10.) According to the Department, the only information presented in the Petition regarding abundance and population trend show that the petitioned action is not warranted. (See Fish & G. Code § 2072.3.)

The Department Evaluation, however, concludes without support that because "the Petition does provide information showing that some populations of western Joshua tree are declining, particularly within Joshua Tree National Park . . ., sufficient information on population trend, range . . . distribution was shown." (Department Evaluation, p. 2.) With all due respect to the Department, the identified *lack* of information does not transform into "sufficient information" because studies may have indicated a potential decline in Joshua Tree National Park—a tiny fraction of the "range and population" for which the Petition seeks listing.

Further, the Petition's "information showing that some populations of western Joshua tree are declining" does not constitute "sufficient scientific information." Studies cited in the Petition to support its argument that the Joshua tree population is declining (e.g., DeFalco et al. (2010), Harrower and Gilbert (2018)) are based on a few, discrete study plots within Joshua Tree National Park, which lies at the extreme southern end of the species' range. This evidence is not scientifically sufficient for two reasons: first, the Petition improperly extrapolates the data across the Joshua tree's entire range without satisfying any of the scientific and statistical criteria to do so. (WestLand Assessment, pp. 5-7.) In other words, study data from, as in one case, as little as a single hectare within Joshua Tree National Park do not accurately represent conditions across the Joshua tree's more than six million-acre range.

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Second, the Petition fails to address other studies that wholly contradict its cited studies. For example, USAF 2017a (cited in the Department Evaluation) shows that Joshua tree populations on Edwards Air Force Base are stable to increasing. (WestLand Assessment, p. 7.) The Edwards Air Force Base data, like the data presented in the Petition, are both part of the body of data regarding the Joshua tree species, but neither dataset by itself describes the entire species. (*Ibid*.)

At the same time, accurate information concerning *Y. brevifolia*'s abundance and population trend can be ascertained. *Y. brevifolia* is not like the elusive California Tiger Salamander, which lives most of its life underground. Instead, abundance and population trend data on *Y. brevifolia* could be gathered through straightforward and common scientific means that include representative sampling and statistically-valid data extrapolation.

The Department Evaluation, as noted, acknowledges that the Petition contains no information concerning *Y. brevifolia*'s abundance and population trend. The Petition is accordingly incomplete as a matter of law, and incomplete as a practical matter as well – without this data, it is impossible for the Commission to determine whether *Y. brevifolia* is "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts" required by CESA. (Fish & G. Code § 2067.) The Commission must decline to accept the Petition without this data.

The Petition Contains Insufficient Scientific Information On Factors Affecting The Ability to Survive and Reproduce. The Petition relies heavily on a few studies to support its argument that threat factors are impeding recruitment, leading toward population decline and range reduction. (See Petition, p. 20.) The Petition's evidence offered in this regard does not constitute "sufficient scientific evidence" for two reasons.

First, the Petition again improperly extrapolates studies on recruitment at specific sites within Joshua Tree National Park across the species' entire six million-acre range. (WestLand Assessment, p. 9.) The consequences of improper data extrapolation are evident even among the studies cited by the Petition. While the Petition cites certain studies (Barrows and Murphy-Mariscal 2012, Sweet et al. 2019) for the proposition that recruitment "has already largely stopped" within Joshua Tree National Park, these same studies note continued recruitment elsewhere in Joshua Tree National Park. (*Ibid*.) Other long-term data from northern portions of the Joshua tree range show evidence of new plants between 1963 and 2001, which wholly undercuts the Petition's assertion that recruitment is declining range-wide. (*Ibid*.)

"Evidence" cited in the Petition drawn from limited study areas and improperly extrapolated across the entire *Y. brevifolia* range is simply not "sufficient scientific information." Recruitment may indeed be declining in the specific, limited geographic areas discussed in the Petition, but the Petition provides no evidence that such information accurately describes conditions anywhere else within the species' range. The Petition's claims in this regard are pure conjecture.

Second, the studies cited by the Petition to support its arguments concerning recruitment address only sexual reproduction, despite the fact that *Y. brevifolia* recruitment can occur through both sexual and asexual reproduction. (See Petition, p. 8; WestLand Assessment, pp. 9-10.) Thus, according to WestLand, "studies cited by the Petition may be systematically underestimating total recruitment (sexual and asexual) at the locations where asexual reproduction is more likely to occur – namely, lower elevations and post-fire habitat." (*Ibid*.) In other words, the evidence provided by the Petition concerning recruitment is fundamentally incomplete, and cannot constitute "sufficient scientific information."

The Petition's reliance on incomplete, geographically-limited data means that the Petition fails to provide "sufficient scientific information" regarding *Y. brevifolia*'s ability to survive and recruitment capacity. These failings also mean that the Petition provides no evidentiary basis for the Commission to conclude that *Y. brevifolia* recruitment is declining range-wide. To the contrary, as the U.S. Fish & Wildlife Service ("USFWS") recently found following extensive scientific review: "Threats to individual trees are not likely influencing population resiliency on a population or species scale since there is no evidence to indicate any recent population size reductions or range contractions and limited demographic studies indicate recruitment is occurring." (*Endangered and Threatened Wildlife and Plants; 12-Month Findings on Petitions to List Eight Species as Endangered or Threatened Species*, 84 Fed. Reg. 41694 (August 15, 2019) ["USFWS Findings"], p. 41697.)

The Petition Provides No Evidence To Support Its Claim That Climate Change And Fire Immediately Threaten *Y. Brevifolia* Range-Wide. The Petition claims that wildfire and climate change are the two most significant threats to *Y. brevifolia*'s continued viability. (Petition, p. 24 ["Wildfire is one of the greatest threats to the persistence of *Yucca brevifolia*"]; p. 32 ["Climate change represents the single greatest threat to the continued existence of *Yucca brevifolia*"].) A petition must provide sufficient scientific information concerning the degree and immediacy of threat to a species so that the Commission may evaluate whether the species "is likely to become an endangered species in the foreseeable future" and thus appropriate for listing. (Fish & G. Code § 2067.) The Petition, however, provides no evidence showing that either factor threatens *Y. brevifolia* range-wide, now or in the foreseeable future. Further, the Petition fails to address other evidence, particularly concerning fire, that appears to wholly undercut the evidence cited by the Petition.

With respect to wildfire, the Petition relies primarily on a single study, DeFalco et al. (2010), for the assertion that wildfire threatens individuals and recruitment throughout *Y. brevifolia*'s range. (WestLand Assessment, p. 10.) As with its arguments concerning abundance, population trend and recruitment, the Petition again improperly extracts data from a limited geographic area within Joshua Tree National Park to the entire Joshua tree range. The fundamental scientific and statistical defects in this approach are set out above. (*Id*., at p. 11.)

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The Petition further compounds its evidentiary missteps by mischaracterizing the findings of certain studies. As stated in the WestLand Assessment:

> The Petition cites scientific papers that undermine the Petition's argument that increasing wildfire frequency and intensity have considerable effects on the continued existence of Joshua trees. For example, the Petition cites Brooks and Matchett (2006) as evidence that an increase in fire size and frequency in the Mojave Desert will impact the ability of Joshua trees to survive and reproduce. However, Brooks and Matchett (2006) actually concluded the opposite: for the 15 years of data analyzed, there was a *decrease* in the observed frequency of fires and no clear trend in the amount of area burned.

(WestLand Assessment, p. 11 [emphasis in original].) The Petition cites other studies, including Esque et al. (2015) (Petition, p. 30) and Abella et al. (2009) (Petition, p. 31), as evidence that wildfire negatively impacts Joshua trees individuals and recruitment when, in fact, neither study analyzed fire impacts on Joshua trees. (*Ibid*.)

Finally, the Petition ignores other evidence, including USAF 2017b, as cited in the Department Evaluation, showing that the number of individual Joshua trees had actually increased post-fire. (See WestLand Assessment, p. 11.) While this data may be no more appropriate for range-wide extrapolation than the data cited in the Petition, this evidence wholly undercuts the Petition's claim that fire is unequivocally a significant threat to the species.

The Petition's analysis of climate change as a threat to *Y. brevifolia* is equally troubled. As stated in the WestLand Assessment:

> The Petition relies largely on three sources to argue that climate change constitutes a significant and immediate threat to the species: Cole et al. (2011), Barrows and Murphy-Mariscal (2012), and Sweet et al. (2019). The latter two studies are limited to modeling efforts in Joshua Tree National Park. The results of Cole et al. (2011) have been explicitly refuted by other researchers.

(WestLand Assessment, p. 12.) Data improperly extrapolated is scientifically invalid, as explained above. Studies of certain areas of Joshua Tree National Park cannot be extrapolated range wide because, among other reasons, fine scale topographic and climactic data are necessary to understand how a particular species will react to climate change, as acknowledged by Sweet et al. (2019), one of the studies cited by the Petition. (Id., at p. 13.) In other words, the effects of climate change do not present in the same way across the entire Joshua tree range, which varies widely in topography, elevation, temperature, and in other important metrics.

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As respects Cole et al. (2011), which the Petition cites extensively at pages 36-40, the study's models based on assumptions of climate predictions and other factors "have been explicitly rejected by recent genetic and distribution modeling efforts that were not cited by the Petition." (WestLand Assessment, p. 12.) In particular, Smith et al. (2011) documents evidence of population growth historically and argues that previous periods of climate change do not explain historical changes to Joshua tree population size, in conflict with Cole et al. (2011). (*Ibid*.)

The Petition does not address these evidentiary challenges directly, other than to acknowledge, as noted, that "extirpation is likely decades away." Even this prediction, however, rings hollow. As the Petition notes, the Joshua tree's imminent demise has been predicted since at least 1953. (See Petition, p. 24, citing to Webber (1953).) While the body of data regarding the species may have grown since that time, the data does not support a conclusion that the species is in decline, or, more specifically, climate change threatens *Y. brevifolia* range-wide.

The Commission has previously confronted and rejected listing in a similar context. Specifically, the Commission declined to list the American pika for the following reasons:

> Based on the criteria described above, the best scientific information currently available to the Department indicates the American pika is not in serious danger in the next few decades of becoming extinct throughout all or a significant portion of the species' range in California, nor by the end of the century should the existing climate change models and predicted trajectory of suitable pika habitat come to fruition. At the present time, the species is widespread through its known range in California and the scientific uncertainty associated with current modeling efforts do not establish with scientific certainty or otherwise provide a sufficient scientific basis for the Department to know categorically or to state the actual threat climate change ultimately poses to the species at this time or through the end of this century. Even the models currently available predict a reduction in pika habitat and therefore populations, distribution, and abundance, but not extinction.

(Department of Fish & Wildlife, *Report to the Fish and Game Commission, Status Review of the American Pika (Ochotona pinceps) In California*, February 25, 2013, pp. 55-56 ("Pika Status Review").)

This same rationale applies to *Yucca brevifolia*: the species is not in serious danger of extirpation in the next few decades; the species is widespread through its known range in California; and current climate models do not provide a sufficient scientific basis to know categorically or to state the actual threat climate change ultimately poses to the species at this time or through the end of this century.

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The Petition's Primary "Suggestion For Future Management" Is Infeasible. CESA requires a petition to include "suggestions for future management." (Fish & G. Code § 2072.3; Cal. Code Regs., tit. 14, § 670.1(d)(1)(J).) This phrase is not elsewhere defined in CESA, but a closely-related term, "special protection and management efforts", appears in CESA's definition of "threatened species", as follows:

> "Threatened species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future *in the absence of the special protection and management efforts required by this chapter*. Any animal determined by the commission as "rare" on or before January 1, 1985, is a "threatened species."

(Fish & G. Code § 2067 [emphasis added].) Given that a petition filed pursuant to section 2072.3 seeks to list a species as "threatened", it stands to reason that section 2072.3's requirement that such a petition include "suggestions for future management" is intended to facilitate the Commission's identification of "special protection and management efforts." Importantly, however, such "management efforts" must be those that are "required by this chapter", i.e., CESA. (*Ibid*.) Thus, any "suggestions for future management" identified in a petition must also fall within the requirements and authority of CESA. It stands equally to reason that any suggested measures must actually be feasible, or in other words, bear some possibility of occurring.

The Petition states that climate change "represents the single greatest threat to the continued existence of the *Yucca brevifolia*", and that "the lack of effective regulatory mechanisms to address greenhouse pollution is largely determinative as to the question of whether *Y. brevifolia* qualifies for CESA protection. (Petition, pp. 32, 50-51.) Because the Petition contends that climate change is the primary threat to the species, only actions that can reduce or eliminate the effects of climate change would be effective in preventing the asserted threat. (See Department Evaluation, p. 27 ["The Petition states that the most important recovery actions for western Joshua tree are those that lead to rapid and steep greenhouse gas emission reductions to minimize the additional warming that will occur in the climate system"].)

In this regard, the Petition offers the following management action:

> The governor declares a climate emergency and takes all necessary action to set California on a path to full decarbonization of our economy by no later than 2045 (e.g. banning the sale of new fossil fuel vehicles by 2030 and requiring the generation of all electricity from carbon-free sources by 2030).

(Petition, p. 65.) Even casual observers of California's long and difficult process toward regulating greenhouse gas emissions will understand that such a "declaration" by the governor is itself unlikely, but that the probability of such drastic regulatory measures being implemented by declaration is even less likely. This measure is infeasible on its face.

More fundamentally, however, this suggested measure lies well outside the Commission's and the Department's purview under CESA. The Department obliquely acknowledges this: "some of the [management] suggestions are not within the Department's jurisdiction." (Department Evaluation, p. 27.) The Petition's central management suggestion, in fact the only management suggestion oriented toward minimizing additional climate warming, is consequently neither feasible nor actionable or enforceable by the Commission or the Department. None of the Petition's other nine management suggestions entail measures to counteract climate change, and so the Petition functionally fails to satisfy CESA's requirement in this regard.

Conclusion and Recommendations

The Petition, as shown above, fails to provide any information whatsoever concerning *Y. brevifolia*'s abundance and population trend, even though such data is ascertainable. The Petition also fails to provide sufficient scientific information concerning factors affecting the species' ability to thrive and reproduce, and the degree and immediacy of the threat to the species. Finally, the Petition's management suggestion for the primary threat factor to the species is infeasible and unenforceable. Subsection (e)(1) of section 670.1 of Title 14 of the California Code of Regulations mandates that the Commission decline to accept the Petition.

As the Commission is well aware, a decision to not accept a petition is not a pronouncement that the species does not or will not require protection. To the contrary, a model for appropriate action can be found in the Commission's Pika Status Review, which states, in relevant part:

> It will be imperative for the Department and for the scientific community to study and monitor the distribution and abundance of the American pika over the next few decades, and as climate change models become more data driven, to be able to better assess the foreseeable future. Such monitoring will ultimately inform scientific understanding as to whether the American pika is trending toward serious danger of extinction or not.

(Pika Status Review, pp. 55-56.)

The Petition fails to show that the Joshua tree is likely to become "extinct" throughout its range in the "foreseeable future." Joshua trees have a life span of approximately 200 years. They are admittedly abundant. There is no evidence presented that their extinction in the foreseeable future is likely. It is clear from the data gaps in the Petition that the species merits further study. But the wisdom of further study is not the same as possessing sufficient scientific information currently to warrant listing.

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The Commission should also pay special attention to the vast geographic area that would be impacted by acceptance of the Petition, and the particularly challenging economic and social issues within these areas that would be compounded by the Commission's action. As other commenters will no doubt explain, acceptance of the Petition would result in real hardship to already-challenged communities. This fact provides all the more reason for the Commission to postpone consideration of the Petition until these communities can be fully heard.

For the reasons set out above, CalPortland respectfully requests that the Commission decline to accept the Petition at this time, and to instead encourage the scientific community to study and monitor *Yucca brevifolia* over the next few decades.

* * *

Very truly yours,

By

Robert M. Binam
Senior Vice President and General Counsel
CalPortland Company

cc: Building Industry Association of Southern California
California Building Industry Association
Coast Aggregates
Golden Queen Mining Company, LLC
Holliday Rock
Lebata, Inc.
State Building and Construction Trades Council of California
Tehachapi Wind Wall, LLC
Vulcan Materials Company
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Encl: WestLand Resources, Inc., *Assessment Of Petition To List The Western Joshua Tree (Yucca Brevifolia) As Threatened Under The California Endangered Species Act* (August 2020)

ASSESSMENT OF PETITION TO LIST THE WESTERN JOSHUA TREE (*YUCCA BREVIFOLIA*) AS THREATENED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

Prepared for: CalPortland, Inc.

Prepared by: WestLand Resources, Inc.

Date: August 4, 2020

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APPENDICES

1. EXECUTIVE SUMMARY

On October 15, 2019, the Center for Biological Diversity (CBD or Petitioner) submitted a petition (the Petition) to the California Department of Fish and Wildlife Service (CDFW) to list the purported Western Joshua Tree (*Yucca brevifolia* or Joshua tree) as threatened under the California Endangered Species Act (CESA). WestLand Resources, Inc. (WestLand) has reviewed the Petition and available scientific information on *Y. brevifolia*. Our review of the Petition indicates that the evidence provided in the Petition is limited in its scope and does not meet the standards required by CESA. The evidence provided in the Petition is based primarily on studies conducted in Joshua Tree National Park, and these findings are improperly extrapolated to represent dynamics of *Y. brevifolia* across its range, including population trends, threat factors, and immediacy and degree of threats. The Petition, however, does not address this lack of evidence or provide a reasoned argument to justify that studies conducted in Joshua Tree National Park can properly be extrapolated to represent dynamics of Joshua tree across its range. Critically, the Petition does not appropriately address this lack of evidence or provide sufficient scientific information to inform the decision of whether the species warrants listing under CESA. Collectively, these issues demonstrate that the Petition does not provide sufficient scientific information to indicate that the listing of this species is warranted under CESA.

Specifically, the fundamental issues we identify in the Petition and discuss in greater detail below are:

- The Petition lacks sufficient scientific information to justify the conclusion that Joshua tree populations should be considered Evolutionary Significant Units (ESUs).
- The Petitioners extrapolate range-wide patterns from a small subset of the Joshua tree's range to support their conclusion regarding population trends, threat factors, and degree and immediacy of threats, without providing scientific evidence to justify that their extrapolation is statistically and biologically appropriate.
- The Petition does not contain sufficient scientific information on the population status of Joshua trees to support the Petitioner's claims.
- The Petition misinterprets the available data of potential threats to Joshua trees, and does not survey scientific evidence providing alternate findings regarding potential threats to Joshua trees.

In our discussion below we first address the Petitioner's arguments that there are two Joshua tree ESUs in California. We then discuss limitations of the available scientific data regarding the population dynamics of Joshua tree and the Petitioner's inappropriate extrapolation of those data from studies of limited geographic extent to the population of Joshua tree throughout its range in California. Understanding these fundamental questions is essential to the critical evaluation of the rest of the Petitioner's arguments regarding population trends and the potential threats to this species.

2. Petition Does not Provide Sufficient Scientific Information to Support Designation of an Evolutionarily Significant Unit(s) for Joshua Tree

The Petition argues that *Y. brevifolia* is a listable taxonomic entity under CESA and should be considered for listing as threatened. The Petition also states that Joshua trees in the western Mojave Desert are subdivided into two populations, North and South, and declares that these populations can be considered ESUs for the purposes of listing under CESA (Petition, pg. 64). The CDFW's definition of an ESU requires sufficient scientific evidence to support listing under CESA. Specifically, to conclude that a species or subspecies includes ESUs, CDFW has adopted the definition proposed by the National Marine Fisheries Service for an ESU that a population must meet two criteria (CDFW 2015): (1) it must be reproductively isolated from other conspecific (i.e., same species) population units, and (2) it must represent an important component of the evolutionary legacy of the species (Waples 1991). However, scientific evidence supporting the Petitioner's argument that these two populations should collectively, or individually, be considered ESUs consistent with CDFW's adopted definition has not been provided. Rather, the Petitioners support their position with a simple declarative statement, relying upon USFWS' (2018) delineation of populations of *Y. brevifolia*, a small gap between the putative north and south populations of this taxon, and differences in the associated vegetation between populations as the sole evidence to conclude that CDFW should recognize these populations as ESUs.

Waples (1991) stresses the importance of genetic information, stating that "population characteristics that are important in an evolutionary sense must have a genetic basis." For example, in CDFW's status review of the fisher (*Pekania pennanti*) in California (CDFW 2015), CDFW relied upon mitochondrial genetic data and explicit empirical evidence and modeling of dispersal as justification to conclude that fishers in northern and southern California are "genetically distinct and were effectively isolated from each other." Yet, the Petition contains no genetic, dispersal, or other data to establish that the northern and southern populations are reproductively isolated or represent an important component in the evolutionary legacy of the species. Indeed, while the Petition relies upon USFWS' (2018) delineation of northern and southern population, USFWS makes no conclusion that these populations are ESUs. In fact, USFWS (2018) acknowledges that the structure of Joshua tree populations is unknown and that "more research is needed to better inform our understanding of where local populations occur on the landscape, how the local populations interact, and how this structure influence regional population demographics…" (pp. 18).

Critically, genetic studies cited in the Petition (that were not discussed in the context of ESU designation), show that it is likely that the purported northern and southern populations are not reproductively isolated. Per the map provided in the Petition (Petition, pp. 1), the proposed northern and southern populations of *Y. brevifolia* are separated by a "small gap" (Petition, pp. 64) measuring less than 10 miles (**Figure 1**; calculated from maps provided by Petition, pp. 1, and USFWS 2018). While the arguments made in the Petition focus on the dispersal rate of *Y. brevifolia* seeds transported by rodent species within their relatively small home ranges (Petition, pp. 11; Vander Wall et al. 2006, Waitman et al. 2012), USFWS (2018) documents *Y. brevifolia* fruits being consumed by cattle, mule deer, horses and burros (pp. 24; internal citations omitted). Ungulates have much larger range sizes than rodents and an ~10-mile gap would not be as great an impediment to seed dispersal for such species. Moreover, *Y. brevifolia* is pollinated by the yucca moth *Tegeticula antithetica* (Yoder et al. 2013), which may be capable of transporting pollen between populations. Thus, the scale of dispersal of both *Y. brevifolia*, its seed dispersers, and its pollinator *T. antithetica* must be understood to determine the realized spatial separation between populations and potential for reproductive isolation. An analysis cited in the Petition regarding *T. antithetica* genetic population structure across the range of *Y. brevifolia* suggests that its pollinator "disperses widely" (Yoder et al. 2013, pp. 1231), although the distance over which *T. antithetica* may transport pollen is not well-understood. Importantly, despite extensive sampling across the north and south populations of *Y. brevifolia,* Yoder et al. (2013) found little evidence for population genetic structure within the "pure" *Y. brevifolia* populations across its range. This suggests that there is gene flow between the north and south populations and thus that there is little evidence to support reproductive isolation. While Yoder et al. (2013) did find some evidence for greater genetic differences the farther away *Y. brevifolia* populations were from each other, this occurred at a far greater scale than the ~10-mile gap between the proposed northern and southern ESUs (Yoder et al. 2013). Indeed, disjunct populations *within* the proposed ESUs are separated by a greater spatial distance (e.g., ~11.4 miles; **Appendix A**) than the gap *between* the proposed North and South ESUs (~9 miles)[1], yet the Petitioner's do not acknowledge this discrepancy. Together, these data do not support the idea that the north and south populations of *Y. brevifolia* are reproductively isolated from one another, nor that the gap constitutes a major barrier to dispersal that could produce geographic isolation.

The arguments made in the Petition also rely upon purported differences in associated vegetation between the northern and southern populations to conclude they should be recognized as ESUs. Waples (1991) states that populations that occupy unique habitats may be an ESU. However, for this designation to be supported, there needs to be evidence that occupancy of different, unique habitat types is an indication of ecological and genetic differences between those populations. The Petition contains no evidence that the habitats occupied by the Petition's proposed northern and southern ESUs are unique to either region. To the contrary, the USFWS' Species Status Assessment for Joshua tree (USFWS 2018) shows that there is substantial overlap in the ecoregions present in the northern

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[1] To calculate distances between populations within and between the proposed North and South ESUs, WestLand used the Generate Near Table (https://pro.arcgis.com/en/pro-app/tool-reference/analysis/generate-near-table.htm) in ArcgIS Pro 2.6. The 35 polygons of both the north and south populations (data from Cole et al. 2011, USFWS 2018) were digitized the analysis ran to generate a stand-alone table with the closest distance (meters) to the other 34 polygons (**Appendix A**). The distance from boundary to boundary, was used to derive measures of the maximum dispersal distance between adjacent populations.

and southern populations of *Y. brevifolia* (**Figure 1, Table 1**)[2]. Specifically, the proposed southern and northern ESUs overlap in the ecoregions present for approximately 75% of the range of *Y. brevifolia* (**Table 1**), indicating that the ecoregions within each proposed ESU are not unique to either. Considering (1) the generally similar habitats occupied by the northern and southern populations of *Y. brevifolia*, (2) an apparent lack of genetic differences between the two populations (described above), and (3) a lack of evidence to support isolation, the Petitioners have provided no compelling evidence that the north and south populations of *Y. brevifolia* occupy unique habitats that would confer some ecological or genetic distinctness on one population over the other that would warrant designation of an ESU.

The consequences of the Petition's unsupported conclusion that northern and southern populations of *Y. brevifolia* should be recognized as ESUs are (1) a biased discussion of the population status and dynamics of Joshua trees across their range and (2) a biased conclusion of threats to Joshua trees. Specifically, the lack of evidence supporting the conclusion that the north and south populations are ESUs makes the extrapolation of data from a small subset to the range of the species statistically and biologically inappropriate (see below). Illustration of the biases that resulted from the limited data presented in the petition are provided in the sections that follow.

3. THE PETITION PROVIDES NO INFORMATION ON THE RANGE-WIDE POPULATION STATUS OF JOSHUA TREES

A fundamental flaw in the Petition, that is particularly evident in the Petitioner's conclusions regarding the population status of Joshua trees, is the misapplication and inappropriate extrapolation of findings from a small portion of the range of *Y. brevifolia* to the species as a whole. Extrapolating range-wide population dynamics from a subset of non-random data can produce erroneous and biased conclusions. While ecologists often extrapolate population dynamics by subsampling populations of the organism of interest, the statistical reliability of this subsampling depends on multiple procedural

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[2] *Y. brevifolia* is located almost exclusively in the Mojave Desert with a small portion of its northern population extending into the Great Basin Desert. Near the northeastern extent of the range of *Y. brevifolia* there is a hybrid zone where *Y. brevifolia* and *Y. jaegeriana* overlap and hybrids occur (USFWS 2018). The USFWS (2018) describes the ecoregion of the northern and southern populations where *Y. brevifolia* (see Figure 1). According to the EPA, ecoregions are identified by analyzing the biotic and abiotic composition of the area, including geology, landforms, soils, vegetation, climate, wildlife, and hydrology (epa.gov).

The southern population occurs mostly within the Western Mojave Basin ecoregion from Joshua Tree National Park north to Ridgecrest and Red Mountain. Level-four ecoregions common in the southern population area that support *Y. brevifolia* include Eastern Mojave Basin, Eastern Mojave Mountain Woodland and Shrubland, Western Mojave Basin, Western Mojave Low Ranges and Arid Footslopes and Western Mojave Mountain Woodland and Shrublands. Occupied habitats in this portion of *Y. brevifolia*'s range extend from approximately 750 to 2,200 meters in elevation (ca 2,400 to 7,200 feet) and rainfall ranges from 82.4mm (3.24in) to 738.1 mm (29.06in). Temperatures through the year in this area are also variable with mean winter minimum temperatures ranging from -5.7°C (22°F) to 4.8°C(41°F) to summer mean high temperatures of 23.4°C (74°F) to 37.2°C (99°F) (USFWS 2018).

The northern population of *Y. brevifolia* in California includes northern Mojave Desert, southern Great Basin Desert and transitional vegetation types between the Great Basin and Mojave Desert. Common level-four ecoregions in the northern part of the species range include, but are not limited to, Western Mojave Basin, Western Mojave Low Ranges and Arid Footslopes, Western Mojave Mountain Woodland and Shrublands, and Eastern Mojave Low Ranges and Arid Footslopes. Occupied habitats in this portion of *Y. brevifolia*'s range extend from approximately 1,500 to 2,200 meters in elevation (ca 4,900 to 7,200 feet) and rainfall ranges from 95.8mm (3.77in) to 429mm (16.89in). Temperatures through the year in this area are also variable with mean winter minimum temperatures ranging from -8.1°C (17°F) to 3.6°C(38°F) to summer mean high temperatures of 20.4°C (69°F) to 36.3°C (97°F) (USFWS 2018).

and ecological factors. As described by (Conn et al. 2015), these factors include how intensive the sampling effort is, the spatial proximity of the sampling area to the areas the data are extrapolated to, variability of the ecological process in question, and the similarity of explanatory covariates in the sampled area to the explanatory covariates across range of the organism of interest. Critically, a failure to account for these factors when sampling or extrapolating data can lead to spurious conclusions that do not reflect the biological processes that are occurring. Yet, the Petition does just that and does not take these considerations into account when extrapolating data from Joshua Tree National Park to infer the range-wide population status of Joshua trees.

First, Joshua Tree National Park is located at the extreme southern edge of the species' range and constitutes less than 5% of the total area known to be currently inhabited by *Y. brevifolia* (311,961 acres in Joshua Tree National Park, out of total 6,463,397 acres of Y. brevifolia range, calculated from data included in Cole et al. 2011, USFWS 2018). Therefore, sampling solely within Joshua Tree National Park does not represent intensive random sampling that can be reasonably expected to accurately reflect population trends, nor is it in close proximity to the rest of the range.

Second, the range of *Y. brevifolia* encompasses a wide diversity of habitat types, such that Joshua trees experience spatiotemporal variation in the conditions that promote reproduction, recruitment and survival. Thus, subsampling one region does not accurately represent conditions in other parts of the range, because this sampling does not capture the variation in Joshua tree density, climactic conditions, soil and vegetation characteristics that are known to occur throughout the range of the species (**Figure 1**; USFWS 2018, pp. 57-58; Esque et al. 2010) and are discussed throughout the Petition (e.g., the highly variable population density (pg. 19) and climactic conditions (pg. 18)). Joshua trees occupy a wide elevational (750 to 2220 meters) and geographical range extending from southeastern California to Nevada (Petition, pg. 16), encompassing a broad diversity of habitats with varying ecological communities (Turner and Brown 1982, USFWS 2018). Indeed, *Y. brevifolia* in Joshua Tree National Park are found in only two out of the 24 Level IV-ecoregions inhabited by *Y. brevifolia* across its range (**Figure 1**, **Table 1**). According to the EPA, ecoregions are identified by analyzing the biotic and abiotic composition of the area, including geology, landforms, soils, vegetation, climate, wildlife, and hydrology (epa.gov). For this reason, it is unlikely that Joshua Tree National Park is representative of the broad range of variation experienced by Joshua trees (see below). Moreover, *Y. brevifolia* demonstrate irregular sexual reproduction that is highly dependent on local conditions and asexual reproduction that can result from local factors that vary across the landscape (see below). Together, the statistical reliability for extrapolating data from a small, non-random subset of the *Y. brevifolia* range is poor and will likely fail to reflect population dynamics and status across the range of Joshua tree.

Despite the flaws inherent in extrapolating from a small, biased subset of data, the Petition does not provide scientific evidence or justification to support the extrapolation of data from Joshua Tree National Park across the range of *Y. brevifolia*. Indeed, both the Petition and CDFW's evaluation of the Petition acknowledge that there are no reliable estimates of species population size or documented range-wide population trends for *Y. brevifolia* (Petition, pp. 19). In fact, based on the best data available, CDFW has determined that Joshua trees are relatively abundant (CDFW 2020b). Yet, based on data from a few, discrete study plots on the extreme southern edge of the species boundary, the Petition concludes that, for the species as a whole, "recruitment is limited, and mortality is increasing, all of which would likely reflect a population already starting to decline" (Petition, pp. 19). This extrapolation from a limited study area at the edge of the species range to conclude that *Y. brevifolia* is experiencing a range-wide population decline, when other studies, e.g., USAF 2017a (cited in CDFW 2020), show that Joshua tree populations on Edwards AFB were stable to increasing, is a striking example of how insufficient scientific information can potentially lead to inappropriate conclusions. Moreover, the Petition misinterprets the available scientific data and does not include key data in its analysis of the population status of Joshua trees. We discuss these issues in the sections below.

3.1 The Information Provided by the Petition Regarding the Abundance and Population Trends of Joshua Trees is Misleading

In the discussion of abundance and population trends, the Petition cites three studies to support its contention that Joshua tree populations are declining: DeFalco et al. (2010), Harrower and Gilbert (2018), and Cornett (2014)[3]. All three studies were limited to Joshua Tree National Park. Critically, the Petition's extrapolation of data from these three studies across the species' entire range is scientifically inappropriate for the reasons set out above. As survival and reproduction of *Y. brevifolia* varies based on local conditions (e.g., due to elevation and temperature; Harrower and Gilbert 2018, St. Clair and Hoines 2018), Joshua Tree National Park is unlikely to be representative of range-wide patterns in Joshua tree abundance and population trends due to variation in elevation, climactic, soil type, temperature ranges, rainfall amounts, and vegetation characteristics. This point is highlighted by the fact that Joshua Tree National Park only contains a small subset of the Level IV ecoregions that are encompassed by the range of *Y. brevifolia* (USFWS 2018, pp. 19). Specifically, the ecoregions present in Joshua Tree National Park only account for approximately 12% of the land occupied by *Y. brevifolia* (**Table 1**), and the ecoregions present in Joshua Tree National Park are not the dominant ecoregion types found throughout the range of Joshua trees (**Figure 1**). Thus, population trends documented solely within Joshua Tree National Park are unlikely to provide an accurate representation of the abundance and population trends of *Y. brevifolia* across their range.

The Petition cites three studies conducted within Joshua Tree National Park to support the conclusion that Joshua tree populations are declining. To understand how fire influenced Joshua tree populations, DeFalco et al. (2010) selected 10 study sites, five each in burned and unburned areas of Joshua Tree National Park sampled from 1999-2005. Within each burned and unburned area, DeFalco et al. (2010) randomly selected four to five 300-600 meter transects for a total of 46 transects within Joshua Tree

[3] The Petition also cites St. Clair and Hoines (2018) as evidence that Joshua tree density is negatively correlated with increasing temperature, but this study was performed across Joshua tree species, such that the relevance of any findings to *Y. brevifolia* is limited and there appears to have been no attempt to randomly sample locations. No information was provided about how sites were selected except "site selection in our study maximized coverage across Joshua tree's range…" (St. Clair and Hoines 2018, pp. 3).

National Park. Harrower and Gilbert (2018) evaluated Joshua tree demographic parameters at 11 sites across the 1,200 meter elevational distribution of the species in Joshua Tree National Park (two sites were included just outside of the park's boundaries) in 2016 and 2017. Finally, Cornett (2014) studied Joshua trees at a single one-hectare study plot in Joshua Tree National Park from 1990-2013 and discusses studies conducted at two additional one-hectare study plots within Joshua Tree National Park.

The findings of these studies are limited in their explanatory power for range-wide population dynamics of *Y. brevifolia*, as the results do not appear to capture the environmental variation of occupied habitat throughout the range of the species (see above; **Figure 1**). For example, the single, one-hectare study site investigated by Cornett (2014) renders it impossible for researchers to understand how representative these results are for Joshua trees outside of the single study site. Harrower and Gilbert (2018), Cornett (2014) and DeFalco et al. (2010) are case studies, that, if combined with other studies conducted throughout the range of the species, would contribute to a range-wide understanding of *Y. brevifolia* population dynamics. Alone however, these studies do not and cannot provide evidence of a range-wide population decline, as claimed in the Petition. Indeed, a cursory review of the available scientific literature cited by USFWS (2018) indicates that the densities of Joshua trees are increasing in other portions of its range (e.g., Webb et al. 2003; USAF 2017a as Cited in CDFW 2020). In short, the Petition cites as evidence studies conducted only in a small portion of the species range, the results of which cannot provide inference beyond the specific sites sampled. As such, rather than providing sufficient evidence documenting population declines, the Petition bases its conclusions on data that is insufficient to inform species-wide inferences of population status.[4]

[4] For species such as the Joshua tree that occur across broad geographic distributions, study designs should include several elements to make reliable inference about population abundance, trends, and other population parameters such as recruitment. We suggest several possible actions by which strong inference into Joshua tree population abundance and trends can be gained. First, range-wide stratified random samples are required to be certain that the population estimate is "weighted" based on relevant ecological factors that influence the species' distribution (Edwards 1998, Thompson 2012). Range-wide stratification of the occupied habitat should be based on important ecological features, including soil type, lithology, vegetation type, and climactic zone (Vojta et al. 2013). This measure is particularly necessary, as Joshua Tree National Park only contains two of the ecoregions inhabited by Joshua trees, and these two ecoregions do not represent the dominant type found throughout their range. Due to this variation in ecoregions across the range of *Y. brevifolia*, stratified samples throughout the range are required to gain strong inference into population trends. Second, the spatial extent of sampling (e.g., the number of study sites where individuals are sampled) should be sufficient to estimate summaries (abundance or density) of interest and measures of uncertainty (e.g., 95% confidence intervals) and to examine how covariates of interest may be associated with these summaries (Williams et al. 2002). Multiple plots should be sampled (sub-samples) in order to characterize variation within and across study sites (Hurlbert 1984). Finally, given the broad spatial distribution of the Joshua tree, and the longevity of individuals, a power analysis should be conducted to estimate the spatial extent and temporal duration of the sampling period required to estimate parameters of interest at desired levels of confidence (Steidl et al. 1997).

3.2 THE INFORMATION PROVIDED IN THE PETITION REGARDING THE RECRUITMENT OF JOSHUA TREES IS MISLEADING

Joshua tree recruitment is one of the key population parameters that the Petition focuses on in its discussion of the factors affecting the ability for Joshua trees to survive and reproduce. The Petition contends that recruitment is currently being substantially impacted by threats to Joshua trees and that this lack of recruitment will lead toward population declines and range reductions (Petition, pp. 20).

The Petition, however, inappropriately extrapolates patterns of recruitment occurring at specific sites within Joshua Tree National Park to represent recruitment rates across the range of *Y. brevifolia*. This extrapolation is inappropriate for two reasons. First, reproduction and recruitment of juveniles into the population is contingent on local microhabitat and ecological contexts (Reynolds et al. 2012) that can be highly variable both within and across habitat types (e.g., Borchert and DeFalco 2016, pp. 833, Webb et al. 2003). Even within Joshua Tree National Park, which according to the Petition has "limited" recruitment that has "largely stopped", studies cited by the Petition noted recruitment across the park (Barrows and Murphy-Mariscal 2012, pp. 34, Sweet et al. 2019, pp. 7). Long-term data from the northern portions of the *Y. brevifolia* range show evidence of new plants between 1963 - 2001, which does not support range-wide reductions in recruitment (Webb et al. 2003).

Second, the Petition cites studies that do not comprehensively measure recruitment. As discussed by the Petition (pp. 8), recruitment can occur into *Y. brevifolia* populations through both sexual and asexual reproduction (Gucker 2006), such that some populations are "largely if not entirely clonal" (Petition, pp. 8). However, the studies cited by the Petition do not inventory asexual reproduction (Barrows and Murphy-Mariscal 2012, pp. 31, Harrower and Gilbert 2018, pp. 4, Sweet et al. 2019, pp. 4). This bias limits the predictive power of data from Joshua Tree National Park to infer recruitment in other parts of the range, as patterns of sexual and asexual reproduction will differ across habitats occupied by *Y. brevifolia* due to variation in the conditions that promote each type of reproduction.[5]

Specifically, there is some evidence that asexual reproduction is more common at elevational extremes (Harrower and Gilbert 2018, pp. 7,12), that it may occur in response to fire (DeFalco et al. 2010, pp. 244, Loik et al.2000, pp. 82, Webber 1953) and, in some cases, herbivory (Esque et al. 2015, pp. 87). Thus, the studies cited by the Petition may be systematically underestimating total recruitment (sexual and asexual) at the locations where asexual reproduction is more likely to occur – namely, lower elevations and post-fire habitat. In the absence of a comprehensive investigation of sexual and asexual recruitment, it is not possible to state whether recruitment is limited at lower elevations, or whether that result follows from a selective appraisal of only one of the reproductive strategies available to *Y.*

[5] To better understand recruitment across the range of *Y. brevifolia*, we propose several actions. Joshua trees are long-lived species with irregular sexual reproduction. Population age-structures can be elucidated by measuring the height of Joshua trees (a common means by which to estimate age) within random stratified plots across the range of *Y. brevifolia*. Sensitivity and power analyses can be used to determine how large a sample, and how many years of sampling, are required to estimate population trends with a sufficient level of confidence. Moreover, a life stage analysis can provide inference into the mortality of each life stage of *Y. brevifolia*, how these patterns vary across the range, and how mortality of different life stages may impact population dynamics in the future.

brevifolia. Indeed, asexual reproduction is critical to population dynamics in other clonal tree species like quaking aspen, where asexual reproduction is common following fire and herbivory (Kulakowski et al. 2013, Mock et al. 2008). Mock et al. (2008) states that "the relative frequency of sexual vs. asexual reproduction determines long-term dominance and persistence of clonal plants at the landscape scale" (pp. 4827) and notes that "the proportion of these reproductive strategies varies across the species' range" (pp. 4828; internal citation omitted). Thus, it is inappropriate to exclude measures of asexual reproduction, as it may systemically bias measures of recruitment in particular kinds of habitats and for those long-lived species that are subject to "irregular" sexual reproduction, such as *Y. brevifolia* (Esque et al. 2010, pp. 11).

4. The Petition Misinterprets the Available Scientific Data Regarding the Degree and Immediacy of Potential Threats to Joshua Trees

The Petitioner's inappropriate extrapolation of data from a non-random subset to the entire *Y. brevifolia* range is also pervasive in the Petitioner's conclusions regarding the potential threats to Joshua trees. The Petition concludes that the degree and immediacy of threats to the species is such that immediate listing under CESA is required. The Petition attempts to justify this conclusion by relying heavily on the putative impacts from fire and climate change. However, the spatial bias and inappropriate extrapolation that is prevalent throughout the Petition results in a misinterpretation of the available data. Moreover, the Petition incorrectly cites numerous studies that do not support the conclusion that fire and climate change are significant threats to Joshua trees.

4.1 The Petition Provides No Evidence that Fire Is A Range-Wide Threat to Joshua Trees

The Petition cites various studies to show that fire represents a considerable threat to Joshua trees. However, several of these citations are either misinterpreted by the Petition or do not support the Petition's claims.

The Petition relies heavily on DeFalco et al. (2010) to assert that fires have had a demonstrative effect on Joshua trees and threatens individuals throughout the species' range. DeFalco et al. (2010), however, provides data from a single fire complex in Joshua Tree National Park with apparently limited variability in fire intensity (i.e., "all burned sites were nearly denuded of shrub and perennial grass cover, and…lacked the safe sites beneath nurse plants"). As such, the results of DeFalco et al. (2010) have limited utility for predicting how fire will affect Joshua trees across its range; the results of a fire at a single location cannot be extrapolated across highly variable vegetative, soil, and climactic conditions such as those experienced by *Y. brevifolia* across its range. Sweet et al. (2019), another study upon which the Petition relies, provides caution against oversimplification of the effects of fire on Joshua trees noting that burn area polygons do not reflect the variability in fire dynamics. Despite several sample sites within burn area polygons, Sweet et al. (2019) did not observe evidence of fire on sample sites in Joshua Tree National Park (with a single exception where a light burn occurred within a sample site). Consequently, taking into account fire intensity is particularly important when drawing conclusions on the effects of fire on Joshua trees at Joshua Tree National Park or predicted refugia within the park, and even more so when extrapolating results to the range of the species. In point of fact, second-hand review of research cited by USFWS (2018) conducted in other parts of the *Y. brevifolia* range provide contrary results, showing that the number of individual *Y. brevifolia* plants had increased post-fire (USAF 2017b, pp. 1-3 as cited in CDFW 2020). The Petition fails to acknowledge this direct evidence of the importance of capturing the variation in conditions when drawing broad conclusions about the effects of fire on Joshua trees.

The Petition cites scientific papers that undermine the Petition's argument that increasing wildfire frequency and intensity have considerable effects on the continued existence of Joshua trees. For example, the Petition cites Brooks and Matchett (2006) as evidence that an increase in fire size and frequency in the Mojave Desert will impact the ability of Joshua trees to survive and reproduce. However, Brooks and Matchett (2006) actually concluded the opposite: for the 15 years of data analyzed, there was a *decrease* in the observed frequency of fires and no clear trend in the amount of area burned.

The Petition also cites scientific studies as evidence of the effects of fire on Joshua trees that do not measure or report results regarding the effects of fire on *Y. brevifolia*. For example, the Petition cites Esque et al. (2015) and implies that they provide evidence of significant impacts of fire frequency and intensity on Joshua trees (Petition, pg. 30). Esque et al. (2015) does not report or analyze impacts of fire on Joshua trees, instead, this study tracks the survival of a cohort of young plants with a focus on herbivory. The potential effects of fire are briefly mentioned in the discussion, but this study does not include any data on fire. The Petition cites Abella et al. (2009) as evidence that Joshua tree woodlands are not adapted to fire and recover slowly (Petition, pg. 31) and that "Joshua trees have low post-fire survival, are slow to repopulate burned areas, and successful recruitment from resprouting requires sufficient precipitation in the years following fire (Petition, pg. 24). Yet, Abella et al. (2009) neither measures the effects of fire on Joshua trees nor reports any data whatsoever on Joshua trees. Instead, Abella et al. (2009) examined plant communities, soils and seed banks several years after a fire had taken place in the Mojave Desert, with no mention of *Y. brevifolia* outside of a brief statement in the introduction.

4.2 The Petition does not Provide a Comprehensive Review of the Threats of Climate Change to Joshua Trees

The issues of inappropriate extrapolation of results to the species as a whole and the general lack of critical review of the available scientific literature are also prevalent in the Petition's analysis of the threats of climate change on Joshua trees. The Petition relies largely on three sources to argue that climate change constitutes a significant and immediate threat to the species: Cole et al. (2011), Barrows and Murphy-Mariscal (2012), and Sweet et al. (2019). The latter two studies are limited to modeling efforts in Joshua Tree National Park. The results of Cole et al. (2011) have been explicitly refuted by other researchers. We discuss each of these below.

The Petition relies heavily on Cole et al. (2011) to conclude that no suitable habitat for Joshua trees will exist by the end of the century. Cole et al. (2011) models predicted Joshua tree habitat into the future by combining assumptions of climate predictions, the current distribution of the species, the assumed response of Joshua trees to climate warming in the paleontological past, and the extinction of mega-faunal seed dispersers that limit dispersal. In particular, the predictions of Cole et al. (2011) assume that Joshua trees underwent a range contraction in response to warming conditions in the past and that future expansions in their range will be extremely limited due to reduced dispersal capability, as the megafauna that once acted as seed dispersers are now extinct. These assumptions have been explicitly rejected by recent genetic and distribution modeling efforts that were not cited by the Petition. Specifically, Smith et al. (2011) did not find evidence that Joshua trees have undergone substantial declines in its historical range based on genetic data and distribution modeling. They also found no evidence that dispersal rates have changed dramatically due to extinction of megafauna. In fact, Smith et al. (2011) found evidence of population growth historically in Joshua trees, although not in the recent past, and argues that previous climate change does not explain historical changes to population size. Regardless, Smith et al. (2011) explicitly question the assumptions of Cole et al. (2011) and cast doubt upon the assumptions and predictions of Cole et al. (2011) relied upon so heavily by the Petition. Yet, the Petition does not acknowledge or discuss the findings of Smith et al. (2011).

The Petition relies upon other modeling efforts that predict the locations of future suitable habitat conditions for Joshua tree within Joshua Tree National Park: Barrows and Murphy-Mariscal (2012) and Sweet et al. (2019). Both reports predict reductions in suitable habitat across the park. To project population changes that could result from climate change, baseline distributions and trends of *Y. brevifolia* must be generated and then these baseline measures are used to project into the future, based on the assumptions incorporated into climate models. The lack of data that initially used to calibrate such climate models are critically important, because a lack of representative data will bias the conclusions of the projections. Sweet et al. (2019) and Barrows and Murphy-Mariscal (2012), however, are limited to Joshua Tree National Park, and cannot be appropriately extrapolated past the boundaries of the park for two main reasons. First, there is insufficient range-wide distribution data for *Y. brevifolia*. The outcomes of predictive models depend on the parameters and assumptions they are founded on. By supplying such models with a non-random subset of data that does not represent the overall population, the likelihood that model parameters will not reflect current reality of range-wide *Y. brevifolia* distribution is high and makes it very probable that future distribution projections will be skewed. Indeed, there is some evidence that pairing an underestimate of current distributions with a climate scenario that predicts conditions will be less favorable to Joshua trees, as was done by Sweet et al. (2019), will likely lead to a drastic underestimate of future Joshua tree distributions at the landscape scale (Smith et al. 2011).

Second, where species are distributed on the landscape depends on a complex suite of factors, including factors external to the organism - such as abiotic and biotic conditions - and factors internal to the individual – such as physiological tolerance. As explicitly recognized and discussed by Sweet et al. (2019), fine scale topographic and climactic data are necessary to understand how a particular species will react to climate change. The studies cited by the petition use a correlative approach that links *Y. brevifolia* distribution data to climactic and soil characteristics, and use these to project how *Y. brevifolia* will respond to future conditions (Barrows and Murphy-Mariscal 2012, Cole et al. 2011, Sweet et al. 2019). While this correlative approach can provide meaningful insight, it does not consider the physiological tolerances of *Y. brevifolia*, nor how changes in biotic communities may influence *Y. brevifolia* populations. This is an important distinction, as Pearson and Dawson (2003) state, "the species distributions as they appear today may not be in equilibrium with the current climate, nor indeed are they necessarily determined primarily by climate." Moreover, the reality of how climate change will affect ecological systems is complex and the reliability of models to estimate these effects depend on how representative the population data are over time and space. If non-random samples are taken, and if the number of samples and years of observation are limited in scope and duration, then resulting estimates are likely to be biased. Importantly, the direction of potential bias is also unknown. As such, the extrapolation of results from a limited area to the entire range of *Y. brevifolia* is biologically and statistically inappropriate for determining the range-wide effects of climate change.

5. CONCLUSION

A critical review of the Petition indicates that there is not sufficient scientific evidence to provide strong inference into either range-wide population trends or the threats that may be affecting Joshua trees. Critically, the Petition does not appropriately address this lack of evidence or provide sufficient scientific information to inform the decision of whether the species warrants listing under CESA. First, the Petition suggests that North and South *Y. brevifolia* populations are ESUs but provides no supporting evidence under the criteria required by CFDW. Second, the Petition improperly extrapolates data from Joshua Tree National Park, comprising less than 5% of the total population range, as representative of range-wide processes. This extrapolation is likely to produce spurious conclusions, as Joshua trees occur in many different habitat types across their range that may influence local survival and reproduction. For example, contrary to the overarching claim made in the Petition that populations are declining based upon patterns observed in Joshua Tree National Park, the Petition does not review the evidence that Joshua tree populations are increasing in other parts of their range. Third, the potential threats to the species are mischaracterized in the Petition and are not supported by the references cited by the Petition. The Petition also does not fully survey the literature on potential threats to *Y. brevifolia*, as studies not cited by the Petition directly contradict the conclusions therein (e.g., the potential effects of climate change based on models). Together, these issues demonstrate that the Petition does not provide sufficient scientific information to indicate that the listing of this species under CESA is warranted.

Table 1. Ecoregions occupied by Joshua tree (*Yucca brevifolia*) across range

Ecoregions shared between YUBR North and South	YUBR North	YUBR South	YUBR within JTNP	Total of Each Ecoregion Type	Percentage of YUBR Total Range
14a Eastern Mojave Basins	177,486	161,793	49,799	339,279	6.02%
14b Eastern Mojave Low Ranges and Arid Footslopes	243,139	91,484	163,617	334,623	5.93%
14f Mojave Playas	315	61,428		61,743	1.09%
14j Western Mojave Basins	120,368	2,045,394		2,165,762	38.40%
14k Western Mojave Low Ranges and Arid Footslopes	434,802	557,426		992,227	17.59%
5i Eastern Sierra Great Basin Slopes	1,912	97,773		99,685	1.77%
5j Eastern Sierra Mojavean Slopes	9,851	202,977		212,829	3.77%
Total shared Ecoregions between YUBR North and South (acres)	**987,874**	**3,218,275**		**4,206,149**	**74.57%**

Ecoregions unique to YUBR North or South	YUBR North	YUBR South	YUBR within JTNP	Total of Each Ecoregion Type	Percentage of YUBR Total Range
13ac Upper Owens Valley	46,631			46,631	0.83%
13h Lahontan and Tonopah Playas	2,439			2,439	0.04%
13u Tonopah Basin	598,194			598,194	10.61%
13v Tonopah Sagebrush Foothills	304,124			304,124	5.39%
13w Tonopah Uplands	47,055			47,055	0.83%
13x Sierra Nevada-Influenced Ranges	23,934			23,934	0.42%
13y Sierra Nevada-Influenced High Elevation Mountains	127			127	0.00%
14g Amargosa Desert	37,168			37,168	0.66%
14h Death Valley/Mojave Central Trough	2,608			2,608	0.05%
14l Western Mojave Mountain Woodland and Shrubland	40,766			40,766	0.72%
14o Mojave Sand Dunes	22			22	0.00%
14n Mojave Lava Fields		806		806	0.01%
5o Tehachapi Mountains		59,118		59,118	1.05%
8c Arid Montane Slopes		199,157		199,157	3.53%
8e Southern California Lower Montane Shrub and Woodland		8,320		8,320	0.15%
8f Southern California Montane Conifer Forest		6,094		6,094	0.11%
8g Northern Transverse Range		57,716		57,716	1.02%
Total Ecoregions unique to YUBR North or South (acres)	**1,103,069**	**331,211**	**0**	**1,434,280**	**25.43%**
Grand Total (acres)	**2,090,943**	**3,549,487**	**213,416**	**5,640,429**	

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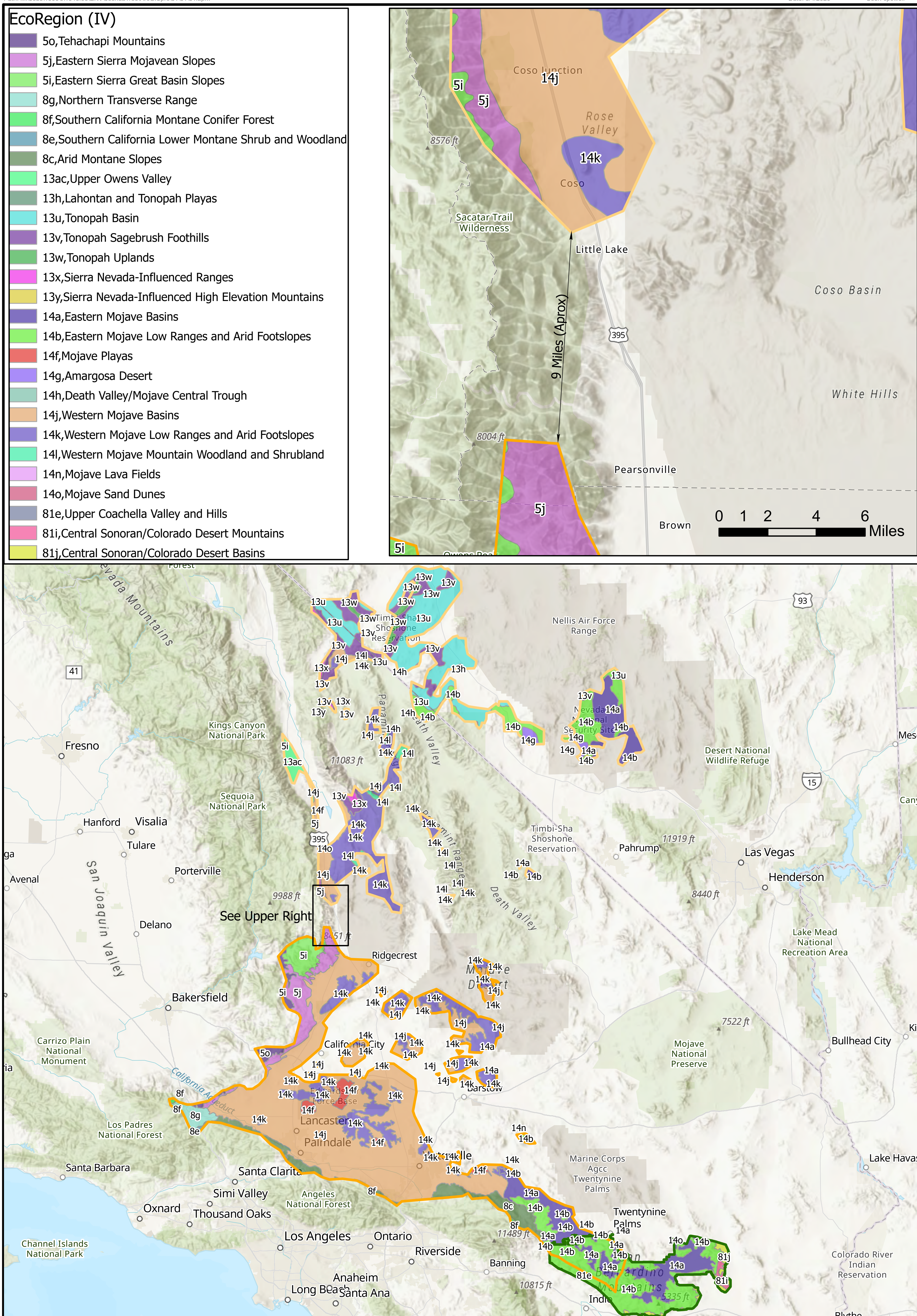
FIGURES



Data Sources: EPA (http://www.epa.gov/wed/pages/ecoregions.htm)
NPS (https://services1.arcgis.com/fBc8EJBxQRMcHlei/arcgis/rest/services/NPS_Park_Boundaries/FeatureServer)
UFWS (Digitized from PDF Report Sirchia et al 2018)
Image Source: ArcGIS Online World Topographic Map

WestLand Resources

N

0 15 30 Miles

0 30 60 Kilometers

Legend

Joshua Tree National Park

Population

YUBR North

YUBR South

Assessment of Petition to List the Western Joshua Tree as Threatened under the California Endangered Species Act

Joshua tree (*Yucca brevifolia* or YUBR) range and ecoregions

Figure 1

APPENDIX A

Population polygons of Joshua tree (*Yucca brevifolia*) across range


Population
YUBrR South
YUBR North
Data Source: UFWS (Digitized from PDF Report Sirchia et al 2018)
Image Source: ArcGIS Online World Topographic Map
Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
6 3 0 6 12 18 24
Miles

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June 11, 2020

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Re: Petition to List the Western Joshua Tree (*Yucca brevifolia*) as Threatened Under the California Endangered Species Act

Dear President Sklar and Commission Members:

The County of San Bernardino (County) and Town of Yucca Valley (Town) jointly submit this letter in response to the Center for Biological Diversity's Petition (Petition) for the listing of the western Joshua tree (*Yucca brevifolia*) as a threatened or endangered species under the California Endangered Species Act (CESA). The County and Town strongly oppose the Petition and the listing of the western Joshua tree under CESA.

The Fish and Game Commission (Commission) is scheduled to consider as Item 27 at its June 24-25, 2020, meeting (1) the Petition; (2) the Department of Fish and Wildlife's (Department) "Report to the Fish and Game Commission: Evaluation of a Petition from the Center for Biological Diversity to List Western Joshua Tree (*Yucca brevifolia*) as Threatened Under the California Endangered Species Act" (Report); and (3) public comments. The posted agenda indicates that staff has recommended the Commission's consideration of the Petition be continued to the August 19-20, 2020 meeting based on input from stakeholders, among others. As key stakeholders, the County and Town are grateful for the additional time to address the important issues raised by the Petition and to work with the Department with respect to the proposed listing.

The County and Town submit these joint comments now to further the anticipated dialogue and to highlight three vital concerns to the Commission that justify denial of the Petition. First, the California Desert Native Plants Act, the California Environmental Quality Act (CEQA) and numerous local ordinances already provide strong and comprehensive protections to preserve western Joshua tree populations and their habitat. Indeed, the County and Town both have specific provisions preventing improper removal of the western Joshua tree and actively enforce these measures to ensure the protection of this iconic species. Second, the Petition fails to provide sufficient data of actual impacts to the western Joshua tree to warrant listing at this time.

Existing management efforts have been successful, as demonstrated by the current population trend, range, distribution and abundance of the western Joshua tree. Although climate change may pose certain threats to this species (along with nearly every other species), at present nearly all of the threats identified in the Petition are based on widely variable modeling assumptions. Third, granting candidate status to the western Joshua tree would interfere with existing regulations and thwart critically needed housing, infrastructure and other projects. This is a huge and undue burden on the desert communities, particularly given the speculative grounds for the Petition.

For these reasons, as discussed in more detail below and in the enclosed Technical Memorandum from Heritage Environmental Consultants, the Petition does not meet the criteria for listing the western Joshua tree as a threatened species pursuant to Fish and Game Code section 2072.3 and California Code of Regulations, Title 14, section 670.1. These concerns are not exclusive, and the County and Town will be supplementing this letter with additional comments and supporting materials in advance of the August meeting.

Current Law Already Provides Strong and Comprehensive Protections for the Western Joshua Tree and Grounds for Denying the Petition

The western Joshua tree is an iconic species of the California desert and deserving of strong regulation to protect its continued survival. These protections are already in place and, contrary to the assertions in the Petition, these protections are effective in reducing impacts to western Joshua trees throughout their range in California. Thus, these protections serve as grounds for denying the Petition.

Federal

At the federal level, the California Desert Protection Act (16 U.S.C. § 410) established the Death Valley and Joshua Tree National Parks and the Mojave National Preserve in the California desert, protecting a vast range of western Joshua tree. In addition, there are approximately 69 wilderness areas within the U.S. Bureau of Land Management lands in the California Desert Conservation Area. The federal government recognized the protections these vast areas afford the species when it declined to list the western Joshua tree under the federal Endangered Species Act last year (a proceeding more fully discussed below).

State

The California Desert Native Plants Act (Cal. Food & Agric. Code, § 80001 *et seq*.) (DNP Act) was enacted in 1981 expressly to protect California desert native plants, including the western Joshua tree, in the Counties of Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego, from unlawful harvesting on both public and privately owned lands. Under the DNP Act, the harvest, transport, sale, or possession of western the Joshua tree is prohibited unless a person has a valid permit that strictly regulates the grounds and procedures for any removal. The DNP Act has been enforced for nearly 40 years to ensure that no western Joshua trees are removed or damaged unless as permitted by the applicable county.

County

The County's Desert Native Plant Protection Ordinance (San Bernardino County Code (County Code) § 88.01.050) (Ordinance) implements the DNP Act. The Ordinance provides regulations for the removal or harvesting of specified desert native plants in order to preserve and protect the plants and to provide for the conservation and wise use of desert resources. The Ordinance requires a permit for the removal of all Joshua trees, regardless of trunk or stem size. In addition, permit conditions for Joshua trees must include provisions for transplanting wherever feasible. (County Code § 88.01.050(f)(3)(A).) Additional protections are in place to require transplanting for specimen trees, which have a circumference greater than 50 inches or height taller than 15 feet. Violation of this section constitutes a misdemeanor punishable by a fine of up to $1,000, up to six months of jail time, and a replacement program for disturbed Joshua trees that were illegally removed. (County Code § 88.01.050(j).) The provisions are intended to augment and coordinate with the DNP Act and the efforts of the State Department of Food and Agriculture to implement and enforce the DNP Act.

Town and Other Municipalities

The western Joshua tree also already enjoys substantial protection within the Town of Yucca Valley. Under section 9.10.040 of the Town's Municipal Code, the Joshua tree is listed as a "regulated desert native plant." For all commercial development projects within the Town, an applicant must submit a native landscaping documentation package that identifies the regulated native plants within the development area, documents their size, height, health, and proposed placement or disposition of the plant. "All regulated desert native plants identified … as likely to survive transplanting shall be made available for adoption or shall be transplanted on site as part of the project's landscaping plan. All native plant permit applications shall illustrate <u>maximum utilization of regulated desert native plants in the project's landscaping plan</u>." (Municipal Code section 9.10.040 [emphasis added].) Moreover, the Town's Municipal Code requires that all Joshua trees that are likely to survive transplanting procedures, and which are not incorporated into the project's landscaping plan, must be made available for adoption. (Id.) Therefore, the Town already endeavors to ensure that the Joshua tree is protected during commercial development.

The Town regulation is just one of the many local protections for the western Joshua tree. For example, the Cities of Hesperia (Hesperia Municipal Code Ch. 16.24 "Protected Plants"), Palmdale (Palmdale Municipal Code Ch. 14.04 "Joshua Tree and Native Desert Vegetation Preservation"), and Victorville (Victorville Municipal Code Ch. 13.33 "Preservation and Removal of Joshua Trees") all have similar ordinances intended to protect or avoid impacts to western Joshua trees. The County and Town will endeavor to provide a more comprehensive survey of local regulations for the August 19-20, 2020, meeting.

For Projects By or Under Permit at All Governmental Agencies within the State – CEQA

Because of the heightened protection of western Joshua trees by local ordinance, projects that may affect the western Joshua tree are also scrutinized under the California Environmental Quality Act (Public Resources Code § 21000 et seq.) (CEQA) and its implementing guidelines to ensure mitigation for any impacts. In addition, the Petition omits that Joshua trees are listed as a "sensitive natural community" within the California Natural Diversity Database (CNDDB). As a result, projects under CEQA are often required to inventory all accessible Joshua trees within the proposed project disturbance areas and have a qualified botanist identify those likely to survive transplantation. Suitable trees are relocated prior to grading to off-site reclamation or restoration areas, and maintained to ensure successful transplantation. Alternatively, project applicants are often required to permanently conserve land (on or off the project site) that comprises suitable Joshua tree habitat as mitigation for the clearance of any Joshua trees on their site.

In addition, the Petition falsely states that local agencies can circumvent impacts to Joshua trees merely by adopting a statement of overriding considerations. One of the most well-settled principles of CEQA is that all feasible mitigation measures must be implemented. Measures to avoid impacts to biological resources, such as transplanting, permanently conserving habitat, or replanting fresh saplings, are all measures that have been deemed feasible under California law and therefore must be incorporated into environmental analysis, when applicable under CEQA.

In sum, the State, the County, the Town and other local jurisdictions have adopted policies that protect Joshua trees from unregulated removal and habitat loss in the urbanizing areas within the species' current habitat range. The existence of these policies, and the listing of Joshua trees within the CNDDB, both trigger substantive requirements under CEQA to conserve habitat and otherwise mitigate impacts to Joshua trees by new development. The County and Town intend to submit additional information prior to the August meeting to demonstrate that these robust protections fully enforce and provide the necessary protections to the western Joshua tree, so that listing under the CESA is not warranted.

The Petition's Claims that the Western Joshua Tree's Survival is Uniquely Threatened and Can Be Preserved by the Listing Under CESA Are Unsupported

The County and Town further want to direct the Commission's attention to the unsupported nature of the Petition. Under CESA, the decision to list a species as threatened or endangered must be based upon the best available scientific information. (Fish & Game Code § 2070.) A petition for listing a species as threatened must provide sufficient scientific information under CESA regulations regarding the population trend, abundance, degree and immediacy of the threat, impact of existing management efforts, and suggestions for future management. (Fish and Game Code, § 2072.3; 14 Cal. Code Reg. § 670.1(d)(1).)

The best available scientific information does not warrant a finding that the survival of the western Joshua tree is threatened at this time. The Petition cites several studies that model the future impact of global climate change on the western Joshua tree. The County and Town have serious concerns, however, that the Petition relies too heavily on the modeling of future climate change impacts as a basis for listing the western Joshua tree as threatened, given that the U.S. Fish & Wildlife Service (USFWS) concluded that there has been no major reduction in Joshua tree populations during the last 40 years, and the existing potential habitat for the western Joshua tree currently exceeds 5 million acres.[1] The Petition also fails to adequately and accurately account for the strong protections already in place (as discussed above) to relocate, replant or replace any trees impacted by new development, therefore these local programs will assist in ensuring the survival of western Joshua trees in lower elevations.

The enclosed Technical Memorandum on Scientific basis for listing the western Joshua tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act, dated June 10, 2020, from Heritage Environmental Consultants (Technical Memo) raises significant questions regarding the Petition's overall premise that climate change will cause extirpation of the species. The Technical Memo notes that all of the major studies cited by the Petition were based on data from Joshua Tree National Park, which the Petition acknowledges to be the southernmost range of the species. The Technical Memo further notes that results from Joshua Tree National Park may not accurately represent population trends farther north in the species' range. The report specifically questions whether the Petition's conclusions regarding impacts from greater wildfires, climate change, and encroaching development hold true in its northern range. More data is therefore needed to confirm whether northern populations will be affected by predation, invasive grasses and other species, wildfires and climate change in the same manner as those populations located within Joshua Tree National Park.

The Petition argues that modeling of future climate change scenarios indicates that the western Joshua tree will face more difficult challenges to its survival than other species. At this time, however, it is wholly premature to list the Western Joshua tree as threatened where the rationale for listing is based entirely on future modeling (not present activity), and where measures are in place to protect the western Joshua tree in areas where the hypothetical threats identified in the future modeling, i.e., lower elevations and urbanizing areas, are the greatest.

Furthermore, the long-range modeling of potential impacts from climate change do not provide a reasonable basis for listing the western Joshua tree as threatened because current populations have remained stable and recruitment continues throughout most of its habitat. The Petition noted that a 2018 study published by the USFWS[2] provides "the most complete synthesis of range data" for the western Joshua tree. By the Petition's own admission, the USFWS Assessment therefore provides the best available science on the western Joshua tree's population trend and abundance. The Petition and USFWS Assessment noted, however, that "a reliable estimate of Joshua tree population size is not available," due largely to patchy distribution of the species within its range, highly variable population density (4 to 840 trees per acre) and a lack of

[1]Summary of Findings https://www.regulations.gov/document?D=FWS-R8-ES-2016-0088-0028

[2] U.S. Fish and Wildlife Service. 2018. Joshua Tree Species Status Assessment. Dated July 20, 2018. 113 pp. + Appendices A–C (USFWS Assessment).

range-wide population surveys. (Petition, p. 19.) Nevertheless, the Petition and the USFWS Assessment found more than 3.2 million acres of potential habitat in the area identified as YUBR South, and almost 2 million acres of potential habitat in the area identified as YUBR North, for a total of more than 5 million acres of potential habitat for the western Joshua tree. (Petition, pp. 18-19.)

Despite its reliance on the USFWS Assessment, the Petition fails to mention the key finding in that report: threats to individual Joshua trees are not likely influencing population resiliency on a population or species scale since there is no evidence to indicate any recent population size reductions or range contractions over the past 40 years, based on distribution mapping and limited demographic studies that indicate recruitment is occurring. (USFWS Assessment, pp. 1-2, 61, 65.) Rather, the Petition seeks to distinguish the threats analysis in the USFWS Assessment by asserting, without any justification or support, that "political influence" factored into its ultimate conclusions. (Petition, p. 4, fn. 3.)

The underlying premise of the Petition is that: "Regardless of whether Joshua tree abundance is already declining, it is virtually certain that abundance will decline in the foreseeable future… [due to] the impacts of climate change, fire, habitat loss and other sources of mortality." (Petition, p. 18.) This is akin to saying that there is no evidence today, but someday there will be proof. Spokespersons for the Center for Biological Diversity also admitted as much when they stated to news outlets that "the idea is to get ahead of the curve…. The Joshua tree, because it has protected public land and a whole lot of other private land, it provides an opportunity to collectively figure out how to get adaptation right… as our climate warms."[3] The USFWS Assessment, however, contradicts the Petition's first assumption that western Joshua tree populations are currently in decline. The Petition's remaining rationale for listing the western Joshua tree relies on modeling of future climate change scenarios through the end of the 21st century. This is not the standard under CESA, which requires a documented immediacy of the threat to the species. Although the County appreciates the significant work that the academic community has produced to evaluate the viability of the western Joshua tree, such work at this time remains highly speculative given the massive complexities in the intersection of climate change, species migration and other interrelationships, such as the western Joshua tree's symbiotic relationship with its pollinating moth.

The County and Town do not dispute that climate change may affect the ability of many plant species, including California desert species like the western Joshua tree, to adapt and survive. However, as explained in the enclosed Technical Memo, the Petition does not provide adequate analysis of how this global concern would be unique to the western Joshua tree, would directly affect the tree's migration and other resiliency factors, and would be redressed through management and listing as threatened under CESA. For similar reasons, the Commission denied

[3] Brendan Cummings, senior counsel and conservation director for the Center for Biological Diversity https://www.desertsun.com/story/news/environment/2019/10/15/conservationists-seek-protect-california-joshua-trees-climate-change/3990631002/

listing the American pika as a threatened species, a decision that was upheld by the courts despite several lawsuits by the Center for Biological Diversity.[4]

Based on its current population and range, the local measures to protect, relocate and replant the western Joshua tree, and its wide range of habitat zones, additional studies are needed to validate the accuracy of models that are predicting significant habitat loss for the western Joshua tree. That the models run for 80 years through 2100 further suggests that additional studies can be reasonably performed without any immediate threat to the survival of the species. These additional studies may ultimately show that the modeling is correct, however, the County and Town will bear a heavy burden if western Joshua tree is regulated under CESA, and such burden is not appropriate if it is not actually needed to protect the western Joshua tree's survival. These factors make it too speculative to warrant consideration of the western Joshua tree as a candidate at this time.

The Commission Should Ensure that any Action on the Proposed Listing Does Not Interfere with the Existing Regulatory Regime for Protection of the Western Joshua Tree

The County and Town again express appreciation for the staff's recommendation that the consideration of the Petition be continued to the August meeting. In addition to facilitating a complete substantive analysis, this continuance is critical to ensure that if the Commission considers granting candidate status to the western Joshua tree, measures can be put into place to avoid interference with the existing regulation protecting the species and confirm that essential infrastructure, affordable housing and other important development projects can proceed.

It cannot be overstated how listing the western Joshua tree under CESA would have drastic and detrimental effect on the County, Town and other desert communities. As has been expressed by numerous letters already submitted to the Commission, the western Joshua tree is widespread and its presence is addressed in nearly every development project in the area. Usurping the long-standing protections in place under the California Desert Protection Act and the local ordinances by granting candidate status to the western Joshua tree would cause havoc to the existing regulatory regime and prevent the development of critically needed projects.

For example, the Town is presently in the middle of a two-phase waste water treatment plant project that involves the construction of a treatment plant, infrastructure throughout the Town, and individual connections to approximately 6,000 homes and businesses. This significant project is in response to a related discharge prohibition imposed upon the Town by other state agencies. In some instances, Joshua trees must be removed in order to install the collection systems and related private property connections. The placement of added restrictions on the

[4] See _Ctr. for Biological Diversity v. California Fish & Game Comm_ (2011) 195 Cal. App. 4th 128, 124 Cal. Rptr. 3d 467; CDFW denied petition for listing American pika; court rejected attorneys' fee claim where petition was again denied after court ordered reconsideration.

removal of the Joshua Tree would hinder this project by causing delays and increasing costs to the Town and individual residents and business owners who are responsible for constructing the new connections to their homes and businesses. In this time of economic hardship and uncertainty, these additional costs could significantly affect residents and businesses within the Town. Listing the Joshua Tree as a candidate species would also impact development projects that have already been approved by the Town, including Yucca Plaza (a 23,056 square foot multi-tenant commercial shopping center) and Princeton Equine (an equine veterinary clinic).

Additionally, listing the western Joshua tree as a candidate species could severely hinder future development. The County's rural desert areas have many small projects that would have incidental *de minimis* impacts on the western Joshua tree's survival; imposing the incidental take process on such projects would seriously deter and likely stop many of these small projects, typically single homes or home additions. For the Town, various developers are in development review for the construction of affordable housing. Placing additional hurdles on development, where the margins for a developer are already razor thin, could force these developers to look elsewhere and deprive the Town of much needed affordable housing, as identified in the Town's Regional Housing Needs Assessment. Similarly, other projects, including a campground that would service the Joshua Tree National Park, a housing subdivision, and a carwash, are in the pre-application phase. Listing the western Joshua tree as a candidate species could result in many of these projects being postponed or abandoned entirely.

These projects (and others like it) need to be allowed to proceed without additional requirements that may be imposed if the western Joshua tree is granted candidate status, and the County and Town intend to propose regulations to ensure those protections under California Fish and Game Code section 2084. The regulatory burden for local agencies to comply with the CESA is especially unjustified given that the potential threats to the western Joshua tree from global climate change or other factors are unsupported or, at most, not imminent.

* * * * * *

The County and Town thanks the Commission for considering these preliminary comments and look forward to working with the Department on these issues over the next several months.

Sincerely,

Meyers Nave Riback Silver & Wilson	Burke, Williams & Sorensen, LLP
Shaye Diveley Special Counsel County of San Bernardino	Thomas D. Jex Town Attorney Town of Yucca Valley

Enclosures: Heritage Environmental Consultants, Technical Memorandum on Scientific basis for listing the western Joshua tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act, June 10, 20203537965.6

Technical Memorandum

Prepared For: County of San Bernardino

Prepared By: Heritage Environmental Consultants

Subject: Scientific basis for listing the western Joshua tree (*Yucca brevifolia*) as threatened under the California Endangered Species Act

Date: June 10, 2020

Background

On October 15, 2019, the Center for Biological Diversity (CBD) submitted a petition to the California Fish and Game Commission to list the western Joshua tree (*Yucca brevifolia* [YUBR]) as threatened under the California Endangered Species Act (CESA) (CBD 2019). In February 2020, the California Department of Fish and Wildlife (CDFW) completed a review of the petition, as well as other scientific information available to CDFW. In its review, CDFW determined that "the petition provides sufficient scientific information to indicate that the petitioned action may be warranted" and recommended that the commission "accept the petition for further consideration under CESA" (CDFW 2020a). In the event that the commission accepts the petition, YUBR would become a candidate for listing as threatened under CESA.

Petition Review

Heritage Environmental Consultants was asked to review existing information and provide expert opinion regarding the scientific basis for listing YUBR as threatened under the CESA. The following review is based primarily on the petition itself (CBD 2019) and CDFW's subsequent review of the petition (CDFW 2020a) because of the limited time available for a more in-depth review of the supporting literature for these two documents. As such, this review accepts in a general sense that both CBD and CDFW have reviewed the existing literature and represent it accurately in their respective documents. The following sections provide review comments following the same outline as CBD's petition.

Life History

Most aspects of the life history of YUBR have been well-researched and are generally accepted. The current taxonomy of *Y. brevifolia* as a distinct species from *Y. jaegeriana* has been accepted. The previous taxonomy, with two subspecies (*Y. brevifolia brevifolia*) and (*Y. brevifolia jaegeriana*), would also provide a suitable basis for listing of either one or both subspecies under the CESA, if the current taxonomy were to be rejected.

Flowering, seed production, dispersal, predation, germination, and growth are generally understood, although several points are worth noting, as follows.

Seed production is an episodic event, correlated with increased precipitation. Sufficient moisture is also required for survival of young YUBR. In a desert environment, conditions for recruitment of YUBR seedlings may only occur "a few times in a century" (Esque and others 2015, in CBD 2019) and no seed production or seedling survival can be expected in drought years.

Individual YUBR cannot be aged in the same way as true trees because they lack annual growth rings. In previous studies, growth (size) has been used as a surrogate for age, on the assumption that larger trees must be older. At the level of this review, it is unclear how well previous studies have been able to correlate size with age, or if any studies have been conducted for sufficient time to even demonstrate a statistically significant correlation.

Considering that seedling recruitment is a rare event, and that age structure in the existing population is uncertain, it is questionable whether a demographic shift (reduced frequency of younger YUBR) has actually occurred, or if the observed reduction of younger plants is an artifact of the infrequent nature of recruitment events. That is, has it just been a long time since the last recruitment event, such that no younger plants are present? In asking this question, it is important to acknowledge the role of climate change, which may have reduced the probability of recruitment events by increasing temperature and the incidence of drought.

Current and Historical Distribution

The current range of YUBR is essentially the same as its historical distribution (post-European contact), demonstrating that human actions have not affected its distribution at present. Some studies (for example, Cole et al. 2011, in CBD 2019) reported model results that indicate future reductions in the southern portion of the range. This same model showed a substantial northward expansion of suitable habitat, albeit without consideration of the dispersal ability of YUBR, which appears to be relatively slow.

It has been suggested that the species is divided into two populations; however, the separation between these populations is a relatively short distance ("a small gap", CBD 2019, page 64) that appears similar to within-population gaps. Habitat differences have been suggested between the two populations, with more creosote bush in the south, and more pinyon pine, juniper, and sagebrush in the north. No evidence was provided to show that this gradient causes any sort of separation between the two purported populations, other than being a convenient correlation. Other differences between populations, in terms of temperature and precipitation, show substantial overlap and are not likely to be statistically valid.

Abundance and Population Trends

The petition stated that "a reliable estimate of Joshua tree population size is not available" and that "no range-wide population trends have been documented" (CBD 2019, page 19). In the absence of any estimate of population size or trend, and for a species that is relatively abundant and widespread, it is not clear how it is "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts" (California Fish and Game Code Section 2067, in part).

Nevertheless, the petition provided information from several studies at Joshua Tree National Park (JTNP) that showed recruitment is limited and mortality is increasing, as well as a correlation between higher temperatures and lower density, and contraction of the species' range at lower elevations. CBD (2019) asserted that these results all point to a population in decline. It is important to note that the studies referenced by CBD were all conducted at JTNP, which is located at the extreme southern edge of the species current and historical range, at the transition between the Mojave Desert to the north and the hotter Sonoran Desert to the south. It seems possible that study results from JTNP may not accurately represent population trends farther north in the species' range.

CDFW (2020a) cited two studies at Edwards Air Force Base, near the center of the range of YUBR, that appeared to show stable or increasing populations, although at least one of these studies was not without some uncertainty. CDFW (2020a, page 13) stated that "the range, distribution, and density information available to the Department indicates that the abundance of western Joshua tree is currently relatively high". In the absence of robust range-wide abundance and population trend data, or at least additional samples from other locations within the species' range, it is uncertain what the actual abundance and population trends are for YUBR.

Factors Affecting Ability to Survive and Reproduce

The petition suggested that factors including predation, invasive species, wildfires, climate change, and habitat loss to development "collectively threaten the continued viability of the species" (CBD 2019, page 20). This is a bold statement considering the lack of population abundance and trend data, much less the level of demographic data needed to truly assess long-term viability. Regardless, the threats listed in the petition were generally reasonable, with a few exceptions noted here.

JTNP has hosted several large wildfires in recent years. The petition used this fact to suggest that fire risk has increased across the range of YUBR; however, it is not clear that this is the case, or if the recent large fires at JTNP represent a more local anomaly. Recent studies (for example, Brooks and others 2018, in CBD 2019, page 28) found that "although fire occurrence across large parts of the warm deserts may be relatively low, they can be much higher and pose significant land management challenges in localized areas."

It appears that most of the recent studies on the effects of fire on YUBR were carried out at JTNP and showed a significant reduction in the local population in burned areas (CBD 2019). However, CDFW (2020a) cited a study at Edwards Air Force Base (located in the center of the species range) that showed a stable long-term local population following wildfire. This result reinforces the idea that studies in a small area on the edge of the species' range (JTNP) may not be applicable across its entire range.

There is no doubt that human-caused climate change is an ongoing process that may increase temperatures within the range of YUBR. Existing studies suggest that precipitation may increase in the area, but that it will also become more variable, meaning long periods of drought can be expected. "Climate change represents the single greatest threat to the continued existence of *Yucca brevifolia*" (CBD 2019, page 32). The question is, how will YUBR as a species be affected, given the uncertainty among different climate model scenarios? And perhaps more importantly, how does listing YUBR as threatened under the CESA improve the situation, given that climate change is best addressed at the regional and global levels?

In answer to the first question, the petition (CBD 2019, pages 34 to 45) reviewed a number of studies that examined the effects of climate change on YUBR at several scales. The most detailed of these studies, and the ones most relied on by the petition to demonstrate ongoing and future effects of climate change on the species, were focused on JTNP. As noted above, it is unclear if results obtained at JTNP are applicable across the range of the species.

Habitat loss to development is another likely threat to YUBR; however, the extent of this threat is uncertain. The petition stated (CBD 2019, page 46) that an estimated 41.6% of suitable habitat for YUBR in the south population area would be lost to development by 2095, based on an Environmental Protection Agency model (cited to USFWS 2018 in CBD 2019, page 46). The parameters and assumptions of this model were not examined, but this result seems speculative. It appears that the model predicted that almost all private lands in the western Mojave Desert would be developed. Given the desert climate, lack of water, distance from the greater Los Angeles area (as a source of jobs), and perhaps other factors, this projection needs to be strongly questioned.

Inadequacy of Existing Regulatory Mechanisms

While existing regulatory mechanisms that protect YUBR as a species may be limited at the state and federal levels, it is unclear how a CESA listing would lead to substantial changes in the current situation. For example, the petition acknowledged climate change as the greatest risk and that "ultimately the species cannot be saved absent global action to reduce such emissions" (CBD 2019, page 48). A CESA listing of YUBR would have little or no bearing on efforts to reduce carbon emissions at a global scale. Similarly, the CESA has no legal standing on federal lands, which make up 48% of the south population area and 96% of the north population area. In practice, state-listed species are sometimes considered during project analysis under the National Environmental Policy Act (NEPA); however, there is no requirement for such consideration.

The petition suggested that CESA listing would bring focus to preservation of YUBR and its habitat for projects analyzed pursuant to the California Environmental Quality Act (CEQA). While listing may increase findings of significance on the basis of effects to YUBR, this may not necessarily equate to a reduction of effects to YUBR because agencies can still approve projects that may have a significant effect, as acknowledged in the petition (CBD 2019, page 55).

The petition gives relatively little space to local ordinances, although it does list Hesperia, Palmdale, Victorville, Yucca Valley, and Los Angeles and San Bernardino Counties as local jurisdictions that have plant protection ordinances or similar measures (CBD 2019, page 53). At the level of this review, these ordinances were not reviewed to determine if they "nominally protect" YUBR, or if in fact they provide substantial protections within the limits of local control over private land use.

Recommended Management and Recovery Actions

The list of recommended management and recovery actions (CBD 2019, page 65), while ambitious, is notable in that only one (a recovery plan) is directly related to CESA listing. The remainder could easily be enacted independently, although a CESA listing may provide focus for YUBR and spur such actions. CDFW (2020a, page 27) noted that "some of the suggestions are not within the Department's jurisdiction."

Conclusions

The ultimate question to be answered by this review is whether the existing scientific information in CBD's petition and the CDFW's review of that petition demonstrates that the YUBR, "…although not presently threatened with extinction, is <u>likely</u> to become an endangered species in the <u>foreseeable future</u> in the absence of the <u>special protection and management efforts</u>…" (California Fish and Game Code Section 2067, in part, emphasis added).

It appears that CDFW has previously defined "foreseeable future" to include the contemplated timeline in the petition, which examines climate change modeling through the end of the 21st century (CBD 2019, page 63). In this case, the prolonged timeline further complicates some of the questionable assumptions raised above, which further increases the substantial uncertainty as to the actual effects of some threats to YUBR, including wildfire, climate change, and human development, particularly at the farther reaches of the foreseeable future. It may be that these threats, while seemingly real at present, would not reach the level of actually threatening YUBR for an uncertain and perhaps lengthy period of time, if at all.

Other entities have examined the rarity and threats to YUBR and found that it is not at sufficiently high risk at this time to warrant special status. At the federal level, the U. S. Fish and Wildlife Service (USFWS) determined that listing the Joshua tree as threatened or endangered under the federal Endangered Species Act (ESA) was not warranted on August 15, 2019. The California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California, which is considered a definitive source on the rarity of plants in the state, lists the Joshua tree as "Considered But Rejected" because it is "too common" (CNPS 2020).

The conclusion to the petition makes sweeping statements about the listing of YUBR as a symbolic action, as "an emblem of our society's failure to address the climate crisis" (CBD 2019, page 66). It should be noted that symbolism is not one of the criteria used to consider listings under the CESA. Nor is symbolism a noteworthy scientific principle. A symbolic listing of YUBR would likely divert staff time and funding to special protection and management actions. There are 286 taxa of federally- and/or state-listed plants in the state of California, including 100 taxa that are only listed by the state (CDFW 2020b). In addition, there are 168 taxa of federally- and/or state-listed wildlife in the state of California, including 39 taxa that are only listed by the state (CDFW 2019). The great majority of these taxa are rarer, and more likely to be threatened with extinction, than YUBR. Yet, a listing of YUBR would likely draw some staff resources and funding away from these other species, increasing their risk of extinction. While admittedly the CESA contains no provision for weighing risk of extinction of other species in a listing decision, it is worth asking if a symbolic listing is worth that risk.

References

California Department of Fish and Wildlife. 2020a. Evaluation of a Petition from the Center for Biological Diversity to List the Western Joshua Tree (*Yucca brevifolia*) as Threatened under the California Endangered Species Act. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=178625&inline. Accessed June 9, 2020.

California Department of Fish and Wildlife. 2020b. State and Federally Listed Endangered, Threatened, and Rare Plants of California. January 2, 2020.

California Department of Fish and Wildlife. 2019. State and Federally Listed Endangered, Threatened Animals of California. August 7, 2019.

California Native Plant Society. 2020. Inventory of Rare and Endangered Plants of California. Available online at: http://www.rareplants.cnps.org. Accessed June 9, 2020.

Center for Biological Diversity. 2019. A Petition to list the Western Joshua Tree (*Yucca brevifolia*) as Threatened under the California Endangered Species Act. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=175218&inline. Accessed June 3, 2020.

GRANITE™

June 11, 2020

Original on file,
received June 11, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
1416 Ninth Street, Suite 1320
Sacramento, CA 94244-2090

Also emailed to fgc@fgc.ca.gov

Re: Petition to List the Western Joshua Tree; June 24-25 Hearing; Agenda item #27

Dear President Sklar,

Granite Construction Company is writing in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private landowners while doing little to address the long-term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua tree would effectively halt future development at a time when California is grappling with housing shortages and rising homelessness.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. As an example, Joshua Tree National Park's contains 792,623 acres (over 1,200 sq. miles) of habitat for the Joshua tree where it already has the ultimate protection. The Mojave National Monument is over 1.6 million acres and the National Park Service describes the desert solitude there as containing a "large Joshua tree forest". Outside of those jurisdictions, they are also already protected under state law through the California Desert Native Plants Act, which requires permitting for removal or transplant.

Granite Construction Co is the largest transportation infrastructure contractor in California with more than 2,800 employees in the state. Based in Watsonville, California and founded in 1922, the work that Granite performs is considered an essential public service, from making aggregate (sand and gravel), to producing asphalt and concrete paving materials, to rebuilding our roads, streets and bridges for state and local entities. The production of aggregate, asphalt and concrete requires years of planning, engineering, environmental review and permitting – all an expensive and risky venture process for private companies that invest in this state. Active aggregate production facilities that have been permitted under environmental review and mitigation under the authority of the California Endangered Species Act (CEQA) result in appropriate mitigation measures arising from guidelines such as the California Desert Native Plants Act. For operational aggregate and production facilities in the California desert, changing the mitigation measures for previously approved facilities will result in increased costs, uncertainty, and a reduction in the ability to produce and utilize such aggregate reserves. This means lower employment, more costly public and private construction, and less efficiency in spending the valuable SB1funding approved by the legislature and Governor, and subsequently upheld by an overwhelming margin by the voters. Given that these active facilities are operational, have previously undergone science-based impact analysis, and are operating under CEQA-approved mitigation measures for many species including the western Joshua tree, Granite urges the Commission to recognize these types of facilities and exempt or grandfather them from the effects of a candidate listing review that is not science-based.

I urge you to consider the significant impacts this potential listing will have on the employees and businesses in the rural desert communities and respectfully ask that you deny this petition.

Thank you,

Jim Radich
Senior Vice President
California Operating Group

MONTEREY BAY AREA OFFICE
580 West Beach Street, Watsonville CA 95076 ▪ Phone (831) 763-6100 ▪ Fax (831) 763-6121

Original on file,
received August 5, 2020

August 5, 2020

Mr. Eric Sklar
President
California Fish and Game Commission
1416 9th Street, Suite 1320
Sacramento, CA 95814

Re: California Fish and Game Commission Meeting - August 19-20, 2020
Agenda Item 25: Petition to list the Western Joshua Tree as Threatened pursuant to the California Endangered Species Act

Dear President Sklar:

Our organizations endorse the attached comments from Briscoe, Ivester & Bazel on behalf of the California Building Industry Association, California Alliance for Jobs, California Business Properties Association, California Farm Bureau Federation, California Construction and Industrial Materials Association, California Manufacturers and Technology Association, California Cattlemen's Association, Joshua Tree Gateway Association of Realtors, and Southwest Riverside County Association of Realtors regarding Item #25 on the August 19-20, 2020, California Fish and Game Commission meeting agenda – Western Joshua Tree. As noticed on the Commission's August 19-20, 2020 agenda, the Commission will consider and potentially act on the Petition to determine whether the petitioned action may be warranted.

As discussed in the attached document, our organizations are concerned by the clear absence of "sufficient information" in the Petition, as prescribed in Fish and Game Code section 2072.3, regarding the "abundance" and "population trend" of the western Joshua tree to indicate that listing the species may be warranted. For example, the Petition fails to offer any estimate of the abundance of the western Joshua tree, so there is no showing for the Department or Commission to even evaluate with respect to this statutorily required factor.

We are concerned that should the Commission determine that the petitioned action may be warranted – even in light of the fact that there is zero information in the petition regarding "abundance" and "population trend" – that it will provide a justification for future petitioners to dispense with any pretense of addressing the abundance and population trend of a species (or, indeed, any other statutorily required factor impacting species survival). This is not a question regarding whether the petitioned action may be warranted, but rather whether there is sufficient information regarding each of the statutorily required categories upon which the Commission can base its findings.

Based on the issues raised in the attached document as well as other concerns raised by other commenters objecting to the Petition, we urge the Commission to find that the Petition does not contain sufficient information regarding abundance and population trend to indicate that listing the western Joshua tree may be warranted, and reject the Petition.

Sincerely,

Tyler Munzing
American Council of Engineering Companies, California

Peter Tateishi
Associated General Contractors of California

Michael Quigley
California Alliance for Jobs

Michael Miiller
California Association of Winegrape Growers

Nick Cammarota
California Building Industry Association

Rex S. Hime
California Business Properties Association

Kirk Wilbur
California Cattlemen's Association

Frank T. Sheets, III
California Cement Manufacturers Environmental Coalition

Valerie Nera
California Chamber of Commerce

Sunshine Saldivar
California Farm Bureau Federation

Rich Gordon
California Forestry Association

Lance Hastings
California Manufacturers and Technology Association

Adam Harper
California Construction and Industrial Materials Association

Dan Macon
California Wool Growers Association

Jody Rich-Ramirez
Joshua Tree Gateway Association of REALTORS®

James Camp
National Association of Industrial and Office Properties – California Chapters

Gene Wunderlich
Southwest Riverside County Association of Realtors®

Gail Delihant
Western Growers Association

cc: Commission Vice President Samantha Murray
Commissioner Jacque Hostler-Carmesin
Commissioner Russell Burns
Commissioner Peter S. Silva
Executive Director Melissa Miller-Henson, California Fish and Game Commission
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August 5, 2020

By Email
California Fish and Game Commission
1416 Ninth Street, Suite 1320
Sacramento, CA 95814

Re: Petition to List Western Joshua Tree

Dear Members of the Commission:

Introduction

I write on behalf of the California Building Industry Association, California Alliance for Jobs, California Business Properties Association, California Farm Bureau Federation, California Construction and Industrial Materials Association, California Manufacturers and Technology Association, California Cattlemen's Association, Joshua Tree Gateway Association of Realtors, and Southwest Riverside County Association of Realtors to call to the Commission's attention deficiencies in the Petition, dated October 15, 2019, by the Center for Biological Diversity (CBD) to list the western Joshua tree as threatened under the California Endangered Species Act (CESA). The Petition plainly fails to provide "sufficient information," as prescribed in Fish and Game Code section 2072.3, regarding the "abundance" and "population trend" of the western Joshua tree to indicate that listing the species may be warranted. Abundance and population trend, naturally, are two of the most obvious and important factors in determining whether a species warrants listing, yet CBD acknowledges that its Petition does not provide either an estimate of western Joshua tree abundance or evidence of a rangewide population trend. Nor does CBD explain why it failed to obtain or provide any such information. If a petition as deficient as this one is deemed acceptable, one is hard put to imagine why the Legislature bothered to require petitions to include such information or direct the Commission to assess the "abundance" and "population trend" of a species when deciding whether to accept a petition for further consideration. (Fish & Game Code §§ 2072.3, 2074.2.) The Commission should reject the Petition in keeping with section 2074.2.

Legal Background

The Commission is authorized to list certain species as threatened or endangered under CESA. The Act allows an interested person to petition the Commission to list a species (Fish & Game Code § 2071) and establishes a process for the Commission's consideration of such a petition. After referring a petition to the Department of Fish and Wildlife to evaluate whether the petition contains sufficient information to indicate that the petitioned action may be warranted and receiving the Department's evaluation report and recommendations, the Commission must hold a public hearing and then determine whether the petition contains "sufficient information" to indicate that the petitioned action "may be warranted." (Fish & Game Code §§ 2073, 2073.5, 2074.2.) If the Commission determines that the petition does not provide sufficient information, it must reject the petition (*Id.* § 2074.2(e)(1)), and that ends the process. If the Commission determines that the petition does provide sufficient information, it must accept it for consideration. (*Id.* § 2074.2(e)(2).) If the petition is accepted, the species becomes a "candidate" for listing (*id.*) and is treated under CESA much the same as a listed species (*id.* § 2085). The Department must then review the status of the species and, within 12 months, submit to the Commission a report indicating whether the listing is warranted. (*Id.* § 2074.6.) After receiving the Department's report, the Commission must hold a public hearing and then determine whether the petitioned action "is warranted." (*Id.* § 2075.)

The Legislature prescribed the necessary contents of a petition:

> To be accepted, a petition shall, at a minimum, include sufficient scientific information that a petitioned action may be warranted. Petitions shall include information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant.

(*Id.* § 2072.3.)

The California Court of Appeal has elaborated on the standard to be applied by the Commission in finding facts and exercising its discretion regarding accepting or rejecting a petition:

> "[T]he term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" (*Natural Resources Defense Council, supra*, at p. 1125.) "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report [under the California Environmental Quality Act] but does not require that listing be more likely than not [akin to the "reasonably probable" standard required for preliminary injunctions].

(*Center for Biological Diversity v. Fish & Game Com.* (2008) 166 Cal.App.4th 597, 609-610.)

Petition

As noted above, section 2072.3 provides that to be accepted, a petition to list a species must, at a minimum, include sufficient scientific information that the listing may be warranted and must include information regarding, among other things, the "population trend" and "abundance" of the species.

CBD's discussion of both population trend and abundance, comprising but one page of its petition, may readily be summarized. CBD first admits:

> Due to the species' patchy distribution within its range, highly variable population density (4 to 840 trees per acre) and lack of range-wide population surveys, a reliable estimate of Joshua tree population size is not available (USFWS 2018). Similarly, no range-wide population trends have been documented.

(Petition, p. 19.) It then points to some recent studies and speculates about population decline:

> However, recent studies carried out in portions of the species' range indicate that density is negatively correlated with increasing temperature, the species range is contracting at lower elevations, recruitment is limited, and mortality is increasing, all of which would likely reflect a population already starting to decline.

(*Id.*) After briefly describing four studies, none of which speak of the rangewide abundance or population trend of the western Joshua tree, CBD concludes:

> Regardless of whether Joshua tree abundance is already declining, it is virtually certain that abundance will decline in the foreseeable future. The impacts of climate change, fire, habitat loss and other sources of mortality are discussed further [elsewhere in the Petition].

(*Id.*, p. 20.)

Department's Evaluation Report

The Department's discussion of both population trend and abundance in its Evaluation Report, dated February 2020, is similarly brief.

With respect to population trend, the Department observes:

> The Petition acknowledges that a reliable estimate of western Joshua tree population size is not available and that no range-wide population trends have been documented. The Petition therefore relies on studies indicating that western Joshua tree density is negatively correlated with increasing temperature, the species range is contracting at lower elevations, recruitment is limited, and plant mortality is increasing.

(Evaluation Report, p. 8.) It then summarizes the four studies in a brief paragraph devoted to each. The Department also states that it received two other reports on western Joshua tree populations at Edwards Air Force Base:

> One of these reports describes a geographic information system (GIS) based analysis that was conducted to determine population trends for western Joshua tree at Edwards Air Force Base between 1992 and 2015 (USAF 2017a). The report suggests that western Joshua tree populations on the base were stable to increasing; however, the report describes several issues that increase the uncertainty of the results. The second report describes a GIS analysis, literature review, and field survey conducted of a 1999 fire area on Edwards Air Force Base to evaluate western Joshua tree survivorship and/or regeneration (USAF 2017a). The report used aerial photography taken in 1992 to count all identifiable western Joshua trees present in two areas prior to the 1999 fire and compared this information with the results of a 2017 field survey that identified all western Joshua trees in these same two areas. This report concludes that Joshua tree populations were stable in the sampled areas of the fire area from 1992 to 2017.

(*Id.*, p. 9.)

The Department concludes:

> The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend; nevertheless, the Petition does provide information showing that some populations of western Joshua tree are declining, particularly within Joshua Tree National Park. The Petition provides sufficient information on the population trend of western Joshua tree for the Department to make the recommendation [that the Commission accept the Petition for further consideration].

(*Id.*)

With respect to abundance, the Department observes that "[t]he Petition acknowledges that a reliable estimate of western Joshua tree population size is not available." (*Id.*, p. 13.) The Department notes that the Petition states that "the western Joshua tree has a patchy distribution and a variable population density of 4 to 840 trees per acre" and "includes information demonstrating that western Joshua tree currently has a relatively widespread distribution in southern California." (*Id.*)

The Department describes, apart from the Petition, other relevant scientific information that it has indicating the relatively high abundance of western Joshua trees:

> [T]he Department possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree occurs. It may be possible to use cover estimates from these maps as a rough proxy for western Joshua tree abundance;

> however, the Department does not possess this information for the entire western Joshua tree distribution in California. The range, distribution, and density information available to the Department indicates that the abundance of western Joshua tree is currently relatively high.

(*Id.*)

The Department concludes:

> The Petition acknowledges that a reliable estimate of western Joshua tree population size is not available; however, information available to the Department indicates that the abundance of western Joshua tree is currently relatively high. The Petition provides sufficient information on the abundance of western Joshua tree for the Department to make the recommendation [that the Commission accept the Petition for further consideration].

(*Id.*, pp. 13-14.)

Discussion

The Petition Does Not Contain Sufficient Information Regarding The Abundance Of Western Joshua Tree To Indicate That Its Listing May Be Warranted

For many reasons, the Petition falls far short of providing sufficient information regarding the abundance of the western Joshua tree to indicate that listing of the species may be warranted.

First and most obvious, the Petition does not provide an estimate of the abundance of the western Joshua tree. Indeed, CBD acknowledges as much. (Petition, p. 19.)

Second, while the Petition points to four studies of certain characteristics of the western Joshua tree, it does not even venture to assert what, if anything, these studies may reveal about the abundance of the western Joshua tree. Put bluntly, the Petition says nothing to indicate the current abundance of the western Joshua tree.

Third, the Department in any event observes that available evidence belies any implicit suggestion that the abundance of the western Joshua tree is anything but robust. Noting that it "possesses vegetation maps that cover a large portion of the California deserts where western Joshua tree occurs," the Department confirms that "[t]he range, distribution, and density information available to the Department indicates that the abundance of western Joshua tree is currently relatively high." (Evaluation Report, p. 13.)[1]

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[1] After acknowledging that the Petition does not estimate western Joshua tree abundance and offering its own assessment that its abundance is "relatively high," the Department nonetheless concludes that "[t]he Petition provides sufficient information on the abundance of western Joshua tree" for the Department to recommend accepting it. (Evaluation Report, pp. 13-14.) One might be forgiven for wondering how the Department could reach such a conclusion, since it appears contrary to the cited facts and the Department offers no explanation of how or

Fourth, while the Commission and the Court of Appeal have, *in appropriate circumstances*, allowed petitioners to get by without providing reliable information about a species' abundance and instead resort to reasonable inferences about abundance drawn from incomplete evidence, no such alternative approach is warranted here, nor is any such inference justified by the information in the petition. In *Center for Biological Diversity v. Fish & Game Com.* (2008) 166 Cal.App.4th 597, the court considered whether a petition to list the California tiger salamander (CTS) contained sufficient information to indicate its listing may be warranted. As the court observed, CTS spend most of their adult lives out of sight in underground burrows, and individual CTS emerge only infrequently, sporadically, and briefly to breed. (*Id.*, pp. 601-603.) In that case too limited scientific data was available on the abundance of the species, and there was no comprehensive, rangewide population estimate. (*Id.*, p. 602.) Owing to the difficulty of estimating total population size, the Department concluded that "absent long-term monitoring data produced by a scientifically designed study, attempting to estimate the total population size rangewide is not appropriate." (*Id.*, pp. 602-603.) CBD offered instead an estimate of the number of breeding females, 4,479, derived from statistical analysis (comprised largely of assumptions) regarding known breeding ponds. (*Id.*, p. 603.) Noting again the characteristics of CTS complicating estimating abundance, the court found CBD's estimate of breeding female salamanders plausible and found that it supported a prima facie showing that CTS may be threatened or endangered. (*Id.*, p. 611.)

Here, circumstances are anything but appropriate to accept the paltry information in the Petition. As noted above, CBD fails to offer *any* estimate of the abundance of the western Joshua tree, so there is no showing even to evaluate with respect to this statutorily required factor.

Even if CBD had ventured an estimate of abundance, there is no reason for it to suggest it could do so by resorting to some less reliable, indirect approach. Unlike the CTS, the western Joshua tree does not move and does not hide. Rather, it stands still and stands out prominently on the desert landscape, 24/7/365—just waiting to be observed and counted. CBD offers no excuse for its failure simply to look and count. Given the relative ease with which a reliable estimate of western Joshua tree abundance may be obtained, this is not an appropriate circumstance for a petition to fail to provide such an estimate.

Similarly, even if CBD had asserted that inferences might be drawn from the studies it cited to derive an estimate of western Joshua tree abundance, no such inference is appropriate here. As the court explained in *Center for Biological Diversity v. Fish & Game Com.* (2008) 166 Cal.App.4th 597, when presented with information supporting a prima facie showing, a reasonable person would conclude there is a substantial possibility that listing could occur, "unless the countervailing information and logic, persuasively, wholly undercut some important component of that prima facie showing." (*Id.*, p. 612.) The court then considered the absence of an estimate of CTS abundance

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why it concluded otherwise. California courts have long called on agencies to "set forth findings to bridge the analytic gap between the raw evidence and ultimate decision or order." (*Topanga Assn. for a Scenic Community v. County of Los Angeles* (1974) 11 Cal.3d 506, 515.) The Department has failed to do so here. With apologies to Ricky Ricardo, "Lucy, you got some 'splainin' to do."

and concluded "[t]he absence of historic population counts of the species, *given its reclusive characteristics*, does not greatly diminish the strength of the inferences of threat or endangerment that arise from the showing of habitat loss." (*Id.*, emphasis added.) Noting that the strength of inferences from circumstantial evidence varies, the court added:

> Pointing to an absence of evidence that could provide a stronger inference of population decline, alone, does nothing to diminish the evidence that was provided. That would only undermine the existing showing if the absent evidence was available but was suppressed because it was unfavorable.

(*Id.*, fn. 15.)

Here, unlike the CTS, the western Joshua tree is not reclusive nor hard to find; one need only look and count. CBD though averted its eyes from such evidence, failed to provide it to the Commission, and failed to provide any estimate of western Joshua tree abundance. Moreover, the Department independently concluded from information apart from the Petition that western Joshua tree abundance is "relatively high"—not a finding that, in and of itself, would suggest the species is threatened or endangered. Under these circumstances, any contrary inference CBD may wish to draw from its cited studies is wholly undercut.

The Petition Does Not Contain Sufficient Information Regarding The Population Trend Of Western Joshua Tree To Indicate That Its Listing May Be Warranted

CBD does not offer a separate discussion of population trend, and instead collapses its discussion of both abundance and population trend into a single page in the Petition. Glossing over these fundamental factors suggests that information regarding them would not advance a finding that listing the western Joshua tree may be warranted. Because CBD treated abundance and population trend together in its Petition, the reasons the Petition is deficient with respect to population trend track in many respects those discussed above with respect to abundance.

First, the Petition does not provide information of a rangewide population trend of the western Joshua tree. CBD acknowledges as much. (Petition, p. 19.)

Second, rather than attempt to demonstrate what, if anything, the four studies it cites may reveal about a rangewide population trend of the western Joshua tree, CBD punts. It instead asserts that "[r]egardless of whether Joshua tree abundance is already declining," it will decline in the future and impacts of climate change, fire, and habitat loss are discussed elsewhere in the Petition. (Petition, p. 20.)

Third, much as explained above with respect to abundance, while the Commission and the Court of Appeal have, in appropriate circumstances, allowed petitioners to get by without providing reliable information about a species' population trend and instead resort to reasonable inferences drawn from incomplete evidence, this is not such a circumstance. Even if CBD had ventured to assert a rangewide population trend, there is no reason for it to suggest it could do so by resorting to some less reliable, indirect approach like resorting to studies, such as it cites, regarding other aspects of the species.[2] The western Joshua tree does not move and does not hide. Moreover, it stands prominently on the desert landscape. One need only look to observe them on the landscape or on current and historical aerial photographs. CBD offers no excuse for its failure simply to look and count to ascertain a population trend. Given the relative ease with which a reliable population trend of the western Joshua tree could be derived, this is not an appropriate circumstance for a petition to fail to provide such fundamental, important information.

Moreover, even if one deemed resort to some alternative approach otherwise reasonable, no inference about population trend that might conceivably be drawn from the studies CBD cited is appropriate here, since CBD failed even to try to obtain the most obvious, definitive, and readily available evidence simply by looking and counting. Blinding itself to such evidence does not lend credence to whatever inference CBD might posit from the paltry information it offered.

Indeed, the U.S. Air Force provided two reports on western Joshua tree populations at Edwards Air Force Base to the Department that showed how such a direct assessment of population trend can and should be done. As described by the Department, two geographic information system (GIS) based analyses were conducted, drawing on aerial photography, literature review, and field surveys, to determine population trends, one from 1992 to 2015 and the other from 1992 to 2017. One concluded that the western Joshua tree population on the Base was "stable to increasing," and the other that the population in the study area of an earlier fire was "stable." (Evaluation Report, p. 7.)

Any inference about population trend that might be drawn from CBD's cited studies would be wholly undercut by CBD's failure to seek and obtain the best evidence readily available to it and by the forthright observe-and-count studies that show populations in sampled areas to be stable and even increasing.

Conclusion

CBD's Petition fails to provide even the most basic information about two critical factors in determining whether a species' listing may be warranted: information about its "abundance" and "population trend." CBD indeed seems to dismiss these statutory requirements of a petition as all but unnecessary. It describes a few studies of various aspects of the western Joshua tree apparently as eyewash, but fails even to assert, much less explain, what, if anything, these studies might show about the species' rangewide abundance or population trend. Rather, CBD summarily dispenses with these statutory requirements by turning instead to argue only that "[r]egardless of whether Joshua tree abundance is already declining," it will decline in the future. (Petition, p. 20.)

The Legislature though presumably included "abundance" and "population trend" among the factors that must be addressed in petitions for good reason. It presumably had good reason as

[2] The Department inexplicably seems to give more credence to the studies CBD cites than CBD even asserts, and concludes that the Petition provides sufficient information on population trend for it to recommend acceptance of the Petition. (Evaluation Report, p. 9.)

well to call on the Commission to consider these two factors in deciding whether a petition provides sufficient information to indicate a species' listing may be warranted.

Were CBD's Petition to be deemed adequate, and accepted for further consideration, the Legislature's requirements would be rendered a dead letter. Future petitioners may well dispense with any pretense of addressing the abundance and population trend of a species (and, indeed, perhaps other factors prescribed in section 2072.3), and instead hire experts simply to opine what the future may bring with climate change, fires, and all.

The Commission should adhere to the Legislature's requirements, find that the Petition does not contain sufficient information regarding abundance and population trend to indicate that listing the western Joshua tree may be warranted, and reject the Petition.

Very truly yours,

BRISCOE IVESTER & BAZEL LLP

David Ivester

DMI/mh

CALCIMA

California Construction and Industrial Materials Association

August 6, 2020

Original on file,
received August 6, 2020

Eric Sklar
President
California Fish and Game Commission
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Re: Comments – Petition to list western Joshua tree (*Yucca brevifolia*) as a threatened species under the California Endangered Species Act

Dear Mr. Sklar,

California Construction and Industrial Materials Association ("CalCIMA") submits this letter opposing further action on the petition ("Petition") submitted by the Center for Biological Diversity ("CBD") to list the western Joshua tree as a threatened species under the California Endangered Species Act ("CESA") Fish & Game Code §§ 2050 *et seq.*. We respectfully request the California Fish and Game Commission ("Commission") reject the Petition for the enumerated reasons expressed in this letter, including: (i) the Petition's failure to include statutorily required scientific information regarding western Joshua tree population trends and abundance; (ii) the Petition's failure to demonstrate that neither threats such as climate change and habitat loss, nor the western Joshua tree's response to those threats, will occur within the "foreseeable future;" and (iii) the Petition's failure to include sufficient information regarding existing regulations.[1]

CalCIMA is a statewide trade association representing construction and industrial material producers operating in California. Our members supply the materials that build our state's infrastructure, including public roads, rail, and water projects; help build our homes, schools and hospitals; assist in growing crops and feeding livestock; and play a key role in manufacturing wallboard, roofing shingles, paint, low-energy light bulbs, and battery technology for electric cars and windmills. The continued availability of our members' materials are critical to ensuring California meets its renewable energy, affordable housing, and infrastructure goals. CalCIMA represents its member-producers on a statewide level on issues involving regulation, land use, and environmental protections, among other things. Because the proposed listing of the western Joshua tree fails to meet the basic listing criteria under the California Endangered Species Act ("CESA") and will have drastic impacts on CalCIMA's members, CalCIMA urges the listing be rejected from further consideration.

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[1] CalCIMA requests this letter be included in the administrative record for this Petition. Additionally, CalCIMA incorporates by reference herein the arguments and factual assertions contained in the various letters submitted to the Commission by individual members of CalCIMA opposing further action on the Petition, as well as the prior letter submitted by the California Cement Manufacturers Environmental Coalition (CCMEC) that includes CalCIMA, dated June 11, 2020.

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On November 12, 2019, the California Fish and Game Commission ("Commission") provided public notice that it received, on October 21, 2019, a petition ("Petition") from the Center for Biological Diversity ("CBD") to list the western Joshua tree (*Yucca brevifolia*) as threatened under CESA. Also in November 2019, the Commission provided the Petition to the California Department of Fish and Wildlife ("CDFW") for further evaluation. In February 2020, CDFW provided the 90-day "Evaluation of a Petition from the Center for Biological Diversity to List the Western Joshua Tree (*Yucca Brevifolia*) as Threatened Under the California Endangered Species Act" ("90-Day Evaluation"). CDFW's 90-Day Evaluation recommended "the Commission accept the Petition for further consideration under CESA" because the Petition contains sufficient scientific information indicating further listing of the western Joshua tree "may be warranted." (90-Day Evaluation at p. 29.)

EXECUTIVE SUMMARY

Neither CDFW's 90-Day Evaluation nor the Petition itself contain sufficient scientific information to support further consideration of the proposed listing, and no reasonable person could find the western Joshua tree should be listed as threatened. Accordingly, and as discussed in greater detail below, **CalCIMA urges the Commission to reject the Petition and not declare the western Joshua tree as a candidate species for the following reasons:**

1. The Petition does not include the statutorily required scientific information regarding western Joshua tree population trends and abundance;
2. The Petition does not demonstrate that either threats such as climate change and habitat loss, or the western Joshua tree's response to those threats, will occur within the "foreseeable future;" and
3. The Petition fails to include sufficient scientific information that demonstrates existing regulations are insufficient.

CalCIMA sincerely appreciates both the opportunity to provide comments to the Commission regarding the Petition and the Commission's careful consideration of the Petition's failure to meet the basic statutory requirements, especially given the unnecessary and substantial impacts accepting the Petition would have on CalCIMA and its members.

DISCUSSION

1. The Petition Fails to Include Sufficient Scientific Information Regarding Western Joshua Tree Population Trends and Abundance

The Commission must follow specific CESA statutory requirements and regulatory guidance when determining whether a petition is complete. Specifically,

> *[a]n incomplete petition shall be returned to the petitioner by the commission staff within 10 days of receipt. A petition shall be deemed incomplete if it is not submitted on [Form] FGC-670.1 (3/94) or fails to contain information in each of the required categories set forth in subsection (d)(1).*

(14 CCR § 670.1(b).)[2]

Furthermore, CDFW must independently assess whether the information contained in the petition is accurate and credible and cannot simply accept the petitioner's claims as sufficient to support further action. (*Natural Resources Defense Council v. Fish & Game Com.* (1994) 28 Cal.App.4th 1104, 1125.) Thus, regulations require *both* the Commission and CDFW to review the Petition for completeness and determine that the Petition contains information in each of the required categories set forth in statute and regulation, including population trends and abundance. (Fish & G. Code §§ 2072.3, 2073.5; 14 CCR §670.1(d).) The petitioned action may be warranted *only if* the Petition contains the required information.[3]

CDFW acknowledges in the 90-Day Evaluation that "The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend" and that "a reliable estimate of western Joshua tree population size is not available." (90-Day Evaluation at p. 2.) CDFW further admits "Although a reliable estimate of western Joshua tree population size is not available, information available to the Department indicates that western Joshua tree is currently relatively abundant" (*Ibid.*)

The Petition acknowledges its own insufficiencies, stating,

> *"Due to the species' patchy distribution within its range, highly variable population density (4 to 840 trees per acre) and lack of range-wide population surveys, a reliable estimate of Joshua tree population size is not available (USFWS 2018). Similarly, no range-wide population trends have been documented."*

(Petition at p. 19.)

The Petition relies solely on "[a] series of small-scale studies in Joshua Tree National Park, at the *very edge of the species' range*, summarized in Cornett (2014)." (Petition at 20.) The Petition fails to demonstrate that these small-scale studies support a reasonable conclusion that western Joshua tree abundance is declining; that the studies are somehow more valid than other population studies that show stable western Joshua tree populations; or that decline is occurring uniformly across the species' range. Additionally, the Petition fails to discuss significantly larger and more recent studies undertaken at Edwards Air Force Base, located within the middle of the species' range, that describe *increasing*

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[2] Petition requirements are enumerated in California Fish & Game Code sections 2072.3, 2073.5, and regulations governing the administration of the requirements for listing, uplisting, downlisting, and delisting species are found in Title 14 of the California Code of Regulations section 670.1.

[3] The 90-Day Evaluation must evaluate whether a petition contains sufficient information on: (i) population trend; (ii) range; (iii) distribution; (iv) abundance; (v) life history; (vi) kind of habitat necessary for survival; (vii) factors affecting the ability to survive and reproduce; (viii) degree and immediacy of threat; (ix) impact of existing management efforts; (x) suggestions for future management; (xi) availability and sources of information; and (xii) a detailed distribution map. (Fish & G. Code §§ 2072.3, 2073.5; 14 CCR § 670.1(d).)

western Joshua tree populations.[4] Ignoring these less favorable (to its argument) and even contradictory studies, the Petition instead relies on conjecture and conclusory language and asserts, "[r]egardless of whether Joshua tree abundance is already declining, it is virtually certain that abundance will decline in the foreseeable future." (Petition at p.20). The term 'virtually' indicates a lack of evidence to support CBD's dire predictions and CBD's attempts to mischaracterize the state of scientific information and otherwise ignore required legal standards.

Despite CDFW's and CBD's recognition that the scientific evidence is lacking, and the Petition's failure to provide a balanced discussion of the science that is available, CDFW's 90-Day Evaluation concludes that the Petition is sufficient, *in violation of regulatory requirements*. In short, there is no legally supportable basis that allows CDFW to determine that the Petition contains sufficient information on either population trends or abundance.

CDFW and the Commission cannot disregard regulatory requirements and cannot lawfully allow, let alone recommend further consideration of the Petition. The Petition does not include sufficient scientific information regarding western Joshua tree population trends or abundance, and further action under CESA is not warranted.

2. The Petition Does Not Provide Sufficient Scientific Information to Demonstrate that the Western Joshua Tree is Likely to Become Endangered in the "Foreseeable Future" Due to Climate Change or Habitat Loss

A species may be listed as "threatened" only if it "is likely to become an endangered species in foreseeable future." (Cal Fish & G. Code § 2067.) As it relates to endangered species, "foreseeable future" is generally defined as the time period in which one "can reasonably determine *both* the future threats and the species' response to those threats are likely." (50 C.F.R. § 424.11(d); *see also Natural Resources Defense Council*, *supra*, 28 Cal.App.4th at 1124 (by definition, a species to be listed as threatened is "on the brink of survival" not simply subject to possible threats).) Thus, the western Joshua tree can only be listed as threatened if the Petition provides sufficient information regarding *both* threats *and* the species' response to such threats. Here, the Petition fails to demonstrate the western Joshua tree will likely become endangered in the "foreseeable future" and CBD does not provide sufficient information regarding *either* the future threats of climate change or habitat loss or the western Joshua tree's response to those threats.

First, the Petition fails to reconcile multiple, divergent climate models. The Petition admits that "While temperature projections for the Mojave are unidirectional . . . precipitation projections are complicated and divergent." (Petition at p. 33.) Furthermore, when describing the anticipated impacts of climate change on the western Joshua tree, the Petition describes a laundry-list of climate models

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[4] See U.S. Air Force, Joshua Tree Historical Status on Edwards AFB. 412th Civil Engineering Group. Environmental Management Division. Edwards Air Force Base (2017a); U.S. Air Force, Joshua Tree Survivorship and/or Regeneration in Fire Area on Edwards Air Force Base. 412th Civil Engineering Group. Environmental Management Division. Edwards Air Force Base (2017b).

(primarily conducted between 1998 and 2003) but does not address those models' scattershot findings. For example, the Petition describes one 2003 model and acknowledges that while "a considerable portion of the current range of *Y. brevifolia* will become climatically unfavorable . . . significant amounts of new habitat may become available." (Petition at p. 35.) Despite the models indicating that the models themselves and climate change impacts are unknown and may vary significantly, the Petition presents only the worst-case scenarios. Simply stating the worst case scenario is not sufficient to demonstrate that climate change presents a foreseeable threat to the western Joshua tree or that the species' response to climate change will result in a change in the species' status in the foreseeable future. The models CBD presents simply provide too many different potential outcomes, making it impossible to understand both the scope of potential future threats *and* the species' response thereto.

There have been nearly 40 years of dire predictions regarding the health of western Joshua tree populations; which have thus far been inaccurate. Nevertheless, the Petition requests the Commission look 80 years in the future without sufficient data. Simply put, the Petition offers conjecture regarding a hypothetical future fate of the western Joshua tree but does not sufficiently demonstrate that the western Joshua tree is likely to become endangered in the foreseeable future.

Second, the Petition argues the western Joshua tree is facing significant habitat loss due to urban development and infrastructure development (roads, highways, transmission lines, industrial facilities, and renewable energy projects). (Petition at pp. 46-47.) The Petition also argues that existing local and state regulations are insufficient to protect against habitat loss. The Petition insinuates that California state parks are the only adequate existing protection for western Joshua tree habitat and that state statutes, including the California Environmental Quality Act ("CEQA") and Desert Native Plant Act ("DNPA"), and local tree protection ordinances are insufficient because the regulations do not outright prohibit western Joshua tree removal or may be amended or rescinded. (Petition at pp. 52-53, 57-58.)

Despite the Petition's ready dismissal of existing regulatory mechanisms, the western Joshua tree is sufficiently protected by state and local regulations, as further discussed below. Removal of a western Joshua tree generally requires a permit from the local authority and requires the removed western Joshua tree to be replanted, rather than destroyed. (*See, e.g.,* San Bernardino County Code § 88.01.50; .Hesperia Municipal Code § 16.24; *see also* Appendix A for a list of existing regulatory programs and policies.) Additionally, a significant portion of the species' habitat is already subject to a level of protection by virtue of being located on Federally owned lands.[5] (Felicia Sirchia, Scott Hoffman, and Jennifer Wilkening, "Joshua Tree Species Status Assessment," U.S. Fish and Wildlife Service (July 20, 2018) at 2.)

The Petition's predictions of climate change and habitat loss, and its presumption that existing regulatory mechanisms are insufficient to prevent negative impacts to the western Joshua tree, do not demonstrate that the western Joshua tree is likely to become endangered in the foreseeable future, as

[5] There are two regions populated by western Joshua tree. The *Yucca brevifolia* ("YUBR") South population region is comprised of approximately 3,661,960 acres, of which 47 percent is federally owned. The North population region is comprised of approximately 1,977,837 acres, of which 96 percent is federally owned.

is required to list a species as threatened under CESA (Cal Fish & G. Code § 2067.) The Petition instead presents hypothetical threats – of inconsistent statutory application – and panders to misplaced fear of political discretion rather than demonstrating sufficient scientific information of actual threats to the species.

3. The Petition Does Not Include Sufficient Scientific Information Discussing Existing Management Efforts and Does Not Acknowledge that CESA Protections are Duplicative of Existing Management Efforts

The Petition misleadingly states, "No existing regulatory mechanism are [sic] currently in place at the international, national, state or local level that adequately address the threats facing *Y.* brevifolia" (Petition, p. 48). This statement is wholly inaccurate. Land throughout the YUBR South region is subject to a vast number of existing regulations and policies that protect western Joshua trees. The Petition does not meaningfully address these regulatory protections. Rather, the Petition's arguments reflect mere disagreement with how existing statutes are implemented. The Petition insinuates that the only effective species' protections are absolute prohibitions on "take." (Petition at p. 53.) However, even CESA does not prohibit take; it simply requires a permit to engage in take – a limitation similar to existing regulations.

The Petition's 'Inadequacy of Existing Regulatory Mechanisms' section also focuses on CBD's political convictions that the current Presidential administration's "harmful rollbacks of federal climate policy" (Petition, p. 49) should be redressed on the state level. The Petition provides no meaningful discussion of California's multiple existing climate change policies that protect our State's communities and natural environments. The Petition also fails to discuss the multiple local regulations that directly protect western Joshua trees. These regulations include:

- Eight municipalities, including towns, cities, and counties which protect western Joshua trees and require permits prior to disturbance or removal;
- Multiple designations of western Joshua trees as "ecologically significant" or requiring additional environmental review of impacts to western Joshua trees;
- State-level environmental review laws, including the California Environmental Quality Act ("CEQA") and Desert Native Plant Act ("DNPA"), which require environmental review and mitigation; and
- Multiple local "Climate Action Plans" that address climate change impacts on desert ecosystems.[6]

Taken together, these local and state regulatory requirements adequately protect the western Joshua tree and CESA's protection provisions will therefore be redundant. That is, "take" of western Joshua tree is already prohibited or otherwise regulated at the local and county level and projects that impact

[6] A table summarizing local and state regulations that protect the western Joshua tree is attached as Appendix A to this letter.

western Joshua trees are required to obtain permits and mitigate for those impacts to western Joshua trees. CESA protections will not add a meaningful additional layer of protection, and, instead, will simply shift permitting requirements from the desert to Sacramento.

The volume and breadth of existing regulations adequately protect the western Joshua tree. Additional protection under CESA will be redundant and will not provide any additional protection. Imposing these duplicative and unnecessary restrictions would be especially inappropriate given the extensive and harmful impacts the listing process would have on numerous operations and projects of CalCIMA's members. CBD's failure to address existing protections is yet another example of how the Petition mischaracterizes the status of the western Joshua tree in order to try and force a listing decision lacking scientific merit.

CONCLUSION

CalCIMA thanks the Commission for considering these comments. We respectfully ask the Commission to reject the Petition and not declare the western Joshua tree to be a candidate species pursuant to being listed as threatened under CESA. Please contact Suzanne Seivright-Sutherland with any questions or concerns at (951) 941-7981 or at sseivright@calcima.org.

Sincerely,

Robert Dugan
President & CEO

cc: Charlton Bonham, Director, California Department of Fish and Wildlife
Kerry Shapiro, Esq., Jeffer Mangels Butler & Mitchell LLP
Dan L. Quinley, Esq., Jeffer Mangels Butler & Mitchell LLP

APPENDIX A: CHART OF EXISTING STATE AND LOCAL WESTERN JOSHUA TREE REGULATIONS

Authority	Description of management effort	Code/General Plan/Policy Links
	Local Management Efforts	
City of Adelanto	Permit required for removal - code requires compliance with requirements of San Bernardino for relocation of western Joshua trees.	Permit Application and Plant Protection Management Code
Town of Apple Valley	No existing western Joshua tree shall be disturbed, moved (transplanted or otherwise), removed or destroyed unless such disturbance, move, removal or destruction is first reviewed and approved by the Town of Apple Valley. Sets specific findings which need to be made in order to authorize removal.	Apple Valley Code 9.76.040 Joshua Trees
Town of Apple Valley	Climate Action Plan	https://www.applevalley.org/services/planning-division/climate-action-plan
City of Hesperia	Arborist/botanist developed plan and relocation / adoption program - includes single family residence provisions protecting healthy trees.	Protected Plant Policy
City of Hesperia	Climate Action Plan	http://www.cityofhesperia.us/DocumentCenter/View/1587/Climate-Action-Plan-7210?bidId=
City of Lancaster	Objective with six supporting policies to maintain important biologic systems specifically including western Joshua trees. Also required CEQA monitoring plan (BR-8) requires planning department in Grading Plans to provide protection for special status plants in western Joshua tree woodlands including translocation, weed control BMPs.	Link to General Plan(pg. 2-25) and CEQA Mitigation Monitoring Plan (pg. 12-10)
City of Palmdale	Requires site plans permits avoidance transplanting and as a last resort if other actions infeasible, mitigation required.	City code
City of Victorville	Makes it a misdemeanor to cut, damage, destroy, dig up, or harvest any western Joshua tree without the prior written consent of the director of parks and recreation or his designee	Victorville Code
City of Victorville	Climate Action Plan	https://www.victorvilleca.gov/government/city-departments/development/planning/land-use-plans
City of Yucca Valley	Requires Native Plant Permit for Removal - Includes relocation and transplanting options and adoption provision.	Native Plant Permit Policy
	County Management Efforts	
County of Los Angeles	Joshua Tree Woodlands Significant Ecological Area (SEA) Included on SEA protected tree list across multiple SEA's.	County Ordinance and SEA Planning Guide
County of Los Angeles	Community Climate Action Plan	http://planning.lacounty.gov/ccap/background
County of San Bernardino	Tree removal permit and plot plan map - approval by authority - extra protections for specimen tree's as defined and allows enforcement by CA department of forestry as applicable.	Title 8 Division 8 (88.01) County Ordinance
County of San Bernardino	83.10.080(c)(1) Regional Landscaping Standards - The County of San Bernardino's 'San Bernardino County Development Code (Development Code)' details policy regarding the protection of western Joshua trees inclusive of 'Regional Landscape Standards' that applies to all new and rehabilitated landscapes associated	

	with homeowner installed residential uses, and rehabilitated landscapes associated with any develop-installed residential uses. One of the aims of the 'Regional Landscape Standards' is to preserve existing natural vegetation. Specifically, section 83.10.080(c)(1) of the 'Regional Landscaping Standards' addresses western Joshua trees in the desert region prohibiting removal of western Joshua trees without a tree removal permit, and requires the western Joshua tree to be relocated on-site unless specific permission from the County of San Bernardino Land Use Services Department is obtained as detailed below.	
County of San Bernardino	88.01.050 Tree or Plant Removal Permits - Additionally, the County of San Bernardino addresses western Joshua trees via a 'Plant Protection and Management' policy within the Development Code to manage plant resources under private or public ownership inclusive of conserving the native plant life heritage for the benefit of all, including future generations. Section 88.01.050 'Tree or Plant Removal Permits' requires a permit to be required for the removal of a regulated tree or plant that is inclusive of western Joshua trees. The County of San Bernardino provides limited justification for removal of regulated plants in Section 88.01.050(f), and administers supplemental guidance specific to western Joshua trees in Section 88.01.050(f)(3) as detailed below.	
County of San Bernardino	88.01.060 Desert Native Plant Protection - Section 88.01.060 'Desert Native Plant Protection' regulates the removal or harvesting of specified desert native plants in order to preserve and protect the plants and to provide for the conservation and wise use of desert resources. This section is intended to augment and coordinate with the Desert Native Plants Act (Food and Agricultural Code Section 80001 et seq.) and the efforts of the State Department of Food and Agriculture to implement and enforce the Act.	
County of San Bernardino	County of San Bernardino Mining Permits / Reclamation Plans - The County of San Bernardino implements policies within their mining permit and reclamation plan procedures to protect western Joshua trees by providing that mineral extraction does not result in significant adverse environmental effects. Mining can be meet present needs without compromising needs of future generations with minimized environmental impacts associated with minerals extraction activities. The County of San Bernardino is focused on reducing environmental impacts and implements strategies for assessing the sustainability of mining operations inclusive of measuring, monitoring, and working to improve various performance metrics to minimize land disturbance, pollution reduction, and efficient reclamation activities. Posted below are example strategies that the County of San Bernardino implements within their 'Mine Permit Conditions'.	
County of San Bernardino	Greenhouse Gas Emissions Reduction Plan	http://www.sbcounty.gov/Uploads/lus/GreenhouseGas/FinalGHGFull.pdf
	State Management Efforts	
	California Environmental Quality Act ("CEQA") – Projects that face CEQA approvals must take special account of western Joshua trees because the species is listed as a "sensitive natural community" within the California Natural Diversity Database.	
	Surface Mining And Reclamation Act ("SMARA")	

	California Desert Native Plants Act (Cal. Food & Agric. Code § 80001 *et seq.*) Prohibits harvest, transport, sale, or possession absent of a permit.	
	Climate change initiatives...	
Federal Management Efforts		
	Desert Renewable Energy Conservation Plan ("DRECP")	
	California Desert Protection Act (16 U.S.C. § 410)	

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August 6, 2020

Eric Sklar, President
California Fish and Game Commission
1416 9th Street, 12th Floor
Sacramento, CA 95814
fgc@fgc.ca.gov

VIA EMAIL ONLY

Re: Petition to list western Joshua tree as threatened under California Endangered Species Act and 90-day evaluation

Dear President Sklar,

This letter is submitted on behalf of CEMEX Construction Materials Pacific, LLC ("CEMEX") in opposition to the petition ("Petition") submitted by the Center for Biological Diversity ("CBD") to list the western Joshua tree (*Yucca brevifolia*) as a threatened species under the California Endangered Species Act ("CESA"), Fish & Game Code §§ 2050 *et seq*. We request the California Fish and Game Commission ("Commission") reject the Petition.

The Petition is unwarranted and unprecedented in that:

(1) the Petition fails to demonstrate that the western Joshua tree meets the statutory definition of a "threatened" species;

(2) the Petition mischaracterizes existing regulatory programs to improperly suggest that CESA is the sole viable method of protecting western Joshua trees;

(3) the California Department of Fish and Wildlife ("Department") failed to independently analyze the Petition for adequacy; and

(4) the Department's recommendation to the Commission is wholly unsupported by the 90-day evaluation ("Evaluation").

Further, if the Petition were granted and the western Joshua tree were listed, it could significantly affect CEMEX's future operating plans at its existing mining and production sites, and potentially impose dramatically higher mitigation costs. The imposition of additional, Department-administered processes will be redundant of CEMEX's existing management obligations under local and state regulations, including (1) the California Native Plant Protection

Act ("CNPPA") (Fish and Game Code §§ 1900-1913), (2) the Desert Native Plant Act ("DNPA") (Food and Agriculture Code § 80001 *et seq*.), and (3) local ordinances implementing and supplementing the CNPPA and DNPA.

Yet these potential consequences are unnecessary. The Department should not have overlooked its legal duty to analyze the Petition and should not have arbitrarily accepted the claims made in the Petition. Although the standard for finding that listing "may be warranted" is not as stringent as the standard for listing a species following the Department's full status review, there must nevertheless be sufficient information in the Petition such that a reasonable person would conclude that listing may be warranted. As demonstrated below, the Petition does not contain sufficient information, and no reasonable person could find additional action on the Petition warranted.

I. Background on CEMEX's Operations Affected by Western Joshua Tree Listing

CEMEX is a construction materials manufacturing company specializing in the production of cement, aggregates, and ready-mixed concrete, employing nearly 2,000 people in California. With operations throughout California, CEMEX serves both public and private construction projects with the much-needed supply of these construction materials necessary to support essential infrastructure like roads, bridges, water conveyance and flood protection, housing, hospitals, and schools.

Further, the California Department of Conservation has identified substantial areas potentially impacted by this Petition as important sources of natural resources necessary to produce construction aggregates. For example, according to the Department of Conservation's 2017 Report,[1] the San Bernardino-Riverside Production-Consumption Region will need approximately 993 million tons of aggregate construction materials over the next 50 years. Moreover, the demand for cement has already outstripped the state's supply and must be regularly supplemented by imports year after year.

CEMEX owns, occupies, or has mineral rights to thousands of acres in the region potentially affected by the Petition and operates a cement manufacturing plant as well as various mining operations in that region. These facilities produce (1) limestone, the main constituent in cement and a critical input for the supply of cement from CEMEX's plant, (2) construction aggregate materials necessary for producing local and regional building materials such as concrete and asphalt, and (3) silica and alumina, required additives for the production of cement. These facilities have western Joshua trees on-site, although not within the footprint of existing operations.

Should the western Joshua tree be listed under CESA, the potentially duplicative mitigation requirements resulting therefrom could substantially impact project implementation and increase costs for CEMEX's ongoing mining operations. These increased costs will be borne by

[1] State Mineral and Geology Board Updated Designation Report No. 14 (March 2017).

CEMEX's customers, whether public or private, and thus ultimately borne by consumers and taxpayers. Importantly, CESA's duplicative mitigation measures and costs would not directly correlate to increased conservation benefits for the western Joshua tree because CEMEX is already required under existing management and protection mechanisms to relocate and re-establish any removed western Joshua trees.

II. <u>The Commission Should Reject CBD's Petition</u>

CESA defines a "threatened" species as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to be become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter." (Fish & G. Code § 2067.) And while anyone may submit a petition to list a species under CESA, to be accepted, a petition must include sufficient scientific information to indicate that the petitioned action may be warranted. (Fish & G. Code § 2072.3.)[2] A species will not qualify for candidate status if there is not sufficient information to lead a reasonable person to conclude that the petitioned action may be warranted. (*Nat. Resources Defense Council v. Fish & Game Com.* (1994) 28 Cal.App.4th 1104, 1119.)

In light of the foregoing, the Department and the Commission cannot arbitrarily and carelessly accept assertions regarding the status of the species and its habitat(s) in a listing petition. Both agencies have a legal duty to evaluate the information in the petition – and other readily available information – to determine whether a petition's claims are accurate and credible. (*Id.* at pp. 1119, 1125.) Further consideration of the petition "may be warranted" only if there is a "substantial possibility" that the petitioned-for action is warranted. (*Id.*)

Here, the Petition fails this test, and the Commission should reject it from further consideration. Specifically, no reasonable person could find that the petitioned-for action is warranted because:

> (i) the Petition fails to demonstrate the western Joshua tree could be a "threatened" species, as defined by CESA;
>
> (ii) the Petition fails to demonstrate CESA is the only existing management tool that can adequately protect the species;
>
> (iii) the Department's Evaluation is significantly deficient because it failed to independently analyze the content of the Petition; and

---

[2] A petition must contain sufficient information on: (i) population trend; (ii) range; (iii) distribution; (iv) abundance; (v) life history; (vi) kind of habitat necessary for survival; (vii) factors affecting the ability to survive and reproduce; (viii) degree and immediacy of threat; (ix) impact of existing management efforts; (x) suggestions for future management; (xi) availability and sources of information; and (xii) a detailed distribution map. (Fish & G. Code §§ 2072.3, 2073.5; 14 CCR § 670.1(d).)

(iv) the Department's recommendation is unsupported by the information and conclusions in the Evaluation.

These shortcomings are discussed in more detail below.

A. CBD's Petition Fails to Demonstrate the Western Joshua Tree Meets the Statutory Criteria to be Listed as "Threatened"

A "threatened" species is one which is likely to become endangered in the "foreseeable future." "Foreseeable future" is undefined by CESA and traditionally interpreted by the Department to align with the term's application under the Federal Endangered Species Act ("ESA").[3] In September 2019, the United States Fish and Wildlife Service ("USFWS") and National Marine Fisheries Service ("NMFS") promulgated regulations and defined "foreseeable future" as being only so far in the future as when the appropriate wildlife service can reasonably determine *both* future threats and a species' *likely* (*i.e.*, more likely than not) response to those threats. (50 CFR § 424.11(d) ("2019 Regulations").) Case law is also clear that the "foreseeable future" *must* be based on facts found within the administrative record. For example, prior to the 2019 Regulations, USFWS determined foreseeable future based on a "timeframe over which the best available scientific data allow[s] [USFWS] to reliably assess the effects of threats" on the species. (*In re Polar Bear Endangered Species Act Listing* 794 F.Supp.2d 65, 93 (D.D.C. 2011).) When analyzing whether it was appropriate to list the polar bear as threatened, USFWS found that the foreseeable future extended only so far as 45 years, during which time multiple factors – including biological and habitat factors – could be "confidently predict[ed]."[4] (*Id.*)

Here, the Petition urges the Commission to list the western Joshua tree as "threatened" because CBD "is virtually certain that abundance will decline in the foreseeable future," based on asserted threats of (1) climate change, (2) fire, (3) habitat loss, and (4) unspecified "other" threats. (Petition at p. 20.) Yet, CBD's assertions do not demonstrate that the western Joshua tree could meet the statutory definition of "threatened." There is no evidence that the western Joshua tree is racing toward the precipice of extinction. Rather, the Petition requests that the Commission look nearly <u>80 years</u> into the future based on wholly speculative threats. Such long range forecasting into the distant future would, if accepted, obliterate the concept of "foreseeable" future, and is not consistent with *either* existing regulatory requirements or the body of case law that require *both* impacts and responses to be reasonably predictable.

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[3] *See* Tara L. Mueller, Guide to Federal and California Endangered Species Law 90 (1994); *see also* Brad D. Kern, "Permitting the Take: An Analysis of Section 2081 of the California Endangered Species Act" 102 N.Y.U. Law Journal 74, 75-76.

[4] CBD was also a proponent of the polar bear listing and argued that USFWS should have considered the "foreseeable" future to extend to 2100 – approximately 90 years. The court was "perplexed" by CBD's argument for extending USFWS's "foreseeable future" analysis. (*In re Polar Bear Endangered Species Act Listing*, 794 F.Supp.2d at 93, fn. 34.)

Indeed, CBD asserts that the western Joshua tree has been under threat since the middle of the 20th century, claiming that researchers have been "raising the alarm" that "regardless of the present wide distribution and large concentration of yuccas, [the Joshua tree's] future appears dim." (Petition at p. 34.) 70 years later, the western Joshua tree's "wide distribution and large concentration" has not changed and there has been no observable downward trend in population; but CBD continues to paint an alarmist picture of the western Joshua tree.

To support its specious arguments, CBD relies on a limited number of studies that are generally confined to western Joshua tree's extreme southern range, and then extrapolates select findings from those limited studies to support alleged range-wide assumptions. For example, the Petition relies on a single 2010 study for the proposition that wildfire poses a significant threat to western Joshua trees based on post-fire survival rates. (Petition at p. 25.) However, that study was limited to a small portion of the species' range located in Joshua Tree National Park. CBD improperly infers, generalizes, and applies the study's conclusions to the entire range of the western Joshua tree, when in fact, multiple other studies provide contradictory evidence regarding fire risk. Indeed, studies from *other* areas of the western Joshua tree's range indicate (1) decreased fire frequency and (2) increased western Joshua tree recruitment *after* fires.[5]

The misapplication of limited data to support CBD's general conclusions is foundational to the Petition and thus fatally undermines the Petition. Simply, CBD relies on insufficient data and urges the Commission to rely on faulty future assumptions, ignore applicable legal standards, and list a species that does not – and could not – meet the legal definition of "threatened."

B. CBD's Petition Mischaracterizes Existing Regulatory Mechanisms and Improperly Suggests CESA Listing is the Sole Method of Adequately Protecting the Western Joshua Tree

Section 2072.3 of the Fish and Game Code[6] requires a petition to include specific information, including, "the impact of existing management efforts." CBD states, "No existing regulatory mechanism are [sic] currently in place at the international, national, state, or local level that adequately address the threats facing *Y. brevifolia*." (Petition at p. 48.) Although the Petition briefly discusses local plant protection ordinances in, "Hesperia, Palmdale, Victorville, Yucca Valley, and Los Angeles and San Bernardino counties" it dismisses these existing management mechanisms, stating that "none act as an actual bar to tree removal." (Petition at p. 53.)

This discussion fatally misconstrues both the existing local regulatory landscape *and* CESA's scope. The Petition's discussion presupposes that local regulatory mechanisms *must* bar any

[5] M.L. Brooks & J.R. Matchett (2006) "Spatial and Temporal Patterns of Wildfire in the Mojave Desert, 1980-2004," 64 JOURNAL OF ARID ENVIRONMENTS 148 (concluding that observed wildfire frequency in the Mojave Desert decreased without demonstrated change in the amount of impacted area); U.S. Air Force, Joshua Tree Survivorship and/or Regeneration in Fire Area on Edwards Air Force Base." 412th Civil Engineering Group. Environmental Management Division. Edwards Air Force Base (2017) (concluding there was increased recruitment of western Joshua trees after fires).

[6] Hereinafter, all references to "Section" shall refer to the California Fish and Game Code.

removal of the western Joshua tree for such protections to be of any consequence. However, even CESA is not an absolute bar on Joshua tree removal – it prohibits "take" of a listed species absent an incidental take permit. (Cal. Fish & G. Code § 2081.) This exemption is similar to existing management mechanisms, which often require a permit prior to removing a western Joshua tree and mandates removed trees be "transplanted or stockpiled for future transplanting wherever possible." (*See e.g.*, Palmdale Municipal Code §§ 14.04.010-14.04-120; San Bernardino County Dev. Code § 88.01.050.)

This mischaracterization of existing local regulatory protections is fatal to the Petition. A CESA threatened listing is warranted when, among other things, it demonstrates that a species "is likely to become an endangered species . . . *in the absence of the special protection and management efforts* required by [CESA]." (Cal. Fish & G. Code § 2067.) Here, CESA's "special protection and management efforts" are duplicative of multiple existing regulations that already prohibit Joshua tree removal and require "removed" Joshua trees to be relocated. Thus, CESA will provide little, if any, additional protections to the western Joshua tree.

Presently, if CEMEX were to remove a western Joshua tree, it would be required to comply with existing regulations in place to protect the western Joshua tree.[7] For example, under certain county or municipal tree protection ordinances, CEMEX would be required to obtain tree removal permits, demonstrate such removal is necessary, and do everything it can to offset the tree removal, including replanting the trees. Accordingly, CESA protections would require CEMEX to undertake similar and potentially duplicative permitting and minimization measures, but with the Department acting as the overseeing body rather than the local county or municipal authority. Although the Petition fails to adequately discuss existing protections, an impartial review of those existing protections demonstrates that no further action on the Petition is warranted.

C. The Department Failed to Independently Analyze the Petition for Adequacy

Section 2073.5 requires the Department to "evaluate the petition on its face *and* in relation to other relevant information the department possesses or receives." (Cal. Fish & G. Code § 2073.5 (emphasis added).) Indeed, courts have reiterated the requirement that the Department's Evaluation adhere to a "sufficient information" standard – *i.e.*, is the information contained in the petition *actually* sufficient. (*Nat. Resources Defense Council v. Cal. Fish & Game Com.* (1994) 28 Cal.App.4th 1104, 1122 (emphasis added).)

First, in analyzing the information available to it, the Department actively ignores USFWS's 12-Month Evaluation of the Joshua tree and determination to *not* list the species under the Federal ESA. (*See* 84 FR 41694 (Aug. 15, 2019.) In that evaluation, USFWS determined, among other reasons, that the Joshua tree did not merit federal protection because (1) there was no significant population decline over the past 40 years and recruitment continues to occur across the species'

[7] *See* Appendix A of the August 6, 2020 letter submitted by CalCIMA for a detailed summary of existing regulations.

range; (2) despite threats, including wildfire, invasive plants, effects of climate change, there was not a threat "of population-or-species level decline in the foreseeable future," and (3) significant portions of the species' habitat is protected lands that require additional environmental review and/or permitting before impacting the species. (*Ibid.*) The Department's failure to identify, acknowledge, or otherwise engage with the significant work of a fellow wildlife service is indicative of the Evaluation's deficiencies and a troubling sign of the Department's failure to undertake its legal duty to evaluate the Petition.

Second, despite the requirement to evaluate the Petition's information, the Department's Evaluation does not actually *analyze* the Petition so much as it simply re-states the information contained within the Petition absent any critical assessment. Indeed, multiple sections of the Department's Evaluation simply say, "The Petition cites" a chosen study, followed by a summary of said study that emulates the Petition's phrasing. More is needed from the Department than a recitation of the Petition. The table below demonstrates just how closely the Department's Evaluation mirrors the Petition when discussing invasive species:

Petition	**The Department's Evaluation**
"Invasive plant species are widely established in the Mojave Desert throughout the range of the *Yucca brevifolia*. And while invasive species represent a relatively small percentage of the flora, they represent a huge percentage of the biomass." (Petition at page 22.)	"Invasive plant species are widely established in the Mojave Desert throughout the range of the western Joshua tree, and represent a large percentage of biomass on the landscape." (Evaluation at page 16.)
"The abundance of diversity of alien species in the Mojave is positively correlated with disturbance, including livestock grazing, off-highway/off-road vehicle (OHV or ORV) use, fire, urbanization, roads, and agriculture." (*Ibid.*)	"The abundance of invasive plant species in the Mojave Desert is positively correlated with disturbances such as livestock grazing, off-road vehicle use, fire, urbanization, roads, and agriculture." (*Ibid.*)
"Invasive species are also aided by nitrogen deposition as a result of air pollution." (*Ibid.*)	"These invasive species are also aided by nitrogen deposition as a result of air pollution." (*Ibid.*)

Petition	The Department's Evaluation
"To the degree there is competition is [sic] would likely be most significant with emergent seedlings under nurse plants as this is the most vulnerable life stage of the Joshua tree. The much bigger issue is that these invasive plants have altered fire dynamics, leading to more frequent fires that are killing innumerable Joshua trees." (*Id.* at p. 23.)	"Although it is possible that invasive species may compete with emergent western Joshua tree seedlings, the biggest impact to the western Joshua tree from invasive plant species is through altered fire dynamics. Invasive plant species in the Mojave Desert have resulted in larger and more frequent fires that are killing a large number of western Joshua trees." (*Ibid.*)
"As discussed below, the altered fire regimes in the Mojave represent a significant threat to the Joshua tree at the individual and population level." (*Id.* at pp. 23-24.)	"The Petition describes this as a significant threat to western Joshua tree at the individual and population level." (*Ibid.*)

The Department's cursory analysis and summary of the Petition is inadequate to satisfy the requirements of Section 2073.5. Statutory language and case law plainly state that the Department is required to *analyze* the information in the Petition, not *summarize* the information in the Petition. The Department's failure to adequately analyze the Petition renders the Evaluation as nothing more than a governmental rubber stamp instead of a critical analysis – and the Commission cannot rely on it when determining the sufficiency of the Petition.

D. The Department's Recommendation that the Commission Accept the Petition is Inconsistent With and Unsupported by Its Own Purported Evaluation

The Department's Evaluation recommends to the Commission that it accept the Petition for further consideration. The Department makes this recommendation despite multiple conclusions throughout the Evaluation to the opposite effect that demonstrate there is insufficient evidence to support a listing.

The Department's conclusion, in whole, states,

> Pursuant to Section 2073.5 of the Fish and Game Code, the Department has evaluated the Petition on its face and in relation to other relevant information the Department possesses or received. In completing its Petition Evaluation, the Department has determined there is sufficient scientific information to indicate that the petitioned action for western Joshua tree may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA."

(Evaluation at 29.) The Department's conclusion offers no summation and no details as to why it recommends further consideration of the Petition. This omission is striking given the sheer number of times in the Evaluation that the Department offered unsupported and contradictory conclusions, including:

- Population Trend

  "The petition **does not** present an estimate of western Joshua, nor does it provide evidence of a range-wide population trend; nevertheless the Petition does provide information showing that some populations of western Joshua tree are declining [at the extreme southern end of the species' range] . . . [t]he Petition provides sufficient information on the population trend . . . to make the recommendation in … this Petition Evaluation." (Evaluation at 9 (emphasis added).)

- Abundance

  "The Petition acknowledges that a reliable estimate of western Joshua tree **is not available**; however, information available to the Department indicates that the abundance of western Joshua tree is currently **relatively high**. The Petition provides sufficient information on the abundance of western Joshua tree for the Department to make the recommendation in … this Petition Evaluation." (Evaluation at 13-14 (emphasis added).)

- Degree and Immediacy of Threat

  "[T]he Petition **suggests** that western Joshua tree is already being affected by threats described in the Petition, and these threats are likely to intensify significantly by the end of the century. The Petition provides sufficient information on the degree and immediacy of threat to western Joshua tree for the Department to make the recommendation in … this Petition Evaluation." (Evaluation at 23 (emphasis added).)

- Suggestions for Future Management

  "The Petition provides several suggestions for future management of western Joshua tree, although some of the suggestions are **not within the Department's jurisdiction**. The Petition provides sufficient suggestions for future management of western Joshua tree for the Department to make the recommendation in … this Petition Evaluation." (Evaluation at 27 (emphasis added).)

The Department's conclusion that the Petition warrants further consideration, despite multiple admissions of the Petition's inadequacies and the Department's analysis of contradictory information, strains credulity to put it mildly. The Department's recommendation is wholly unsupported by information within the Department's own conclusions throughout the Evaluation.

III. Conclusion

Neither listing nor candidacy for the western Joshua tree is appropriate at this time. The species does not – and cannot – meet the definition of "threatened" under CESA. Furthermore, there are fatal deficiencies in *both* the Petition and the Evaluation that preclude further action. Should the Commission decide to accept the Petition for further consideration, its decision would violate the minimal standards CESA requires because the Petition is deficient on multiple fronts, including, most importantly, the failure to include sufficient scientific information. The Department's blind acceptance of the Petition, absent any independent review, undermines its recommendation to accept the Petition. Furthermore, the increased cost of anticipated mitigation were the species to be listed under CESA is expected to be significant – with little-to-no additional conservation benefits beyond those required by existing regulations.

Based on these factors, no reasonable person could find the western Joshua tree is likely to be listed. CEMEX thus urges the Commission to reject the Petition. Thank you.

Very truly yours,

KERRY SHAPIRO of
Jeffer Mangels Butler & Mitchell LLP

cc: Chuck Bonham, Director
Debbie Haldeman, CEMEX
Daniel Quinley, Esq.

July 23, 2020

Original on file,
received July 23, 2020

California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244

Re: Petition to List the Western Joshua Tree as a Threatened Species – OPPOSE

Dear President Sklar and Commission Members:

On behalf of the above business organizations in the Inland Empire, we write in opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as threatened under the California Endangered Species Act (CESA). If this proposal is approved, it would set a dangerous precedent that would subject any tree or animal that is not endangered to protection under CESA because they could be impacted by climate change.

Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal. The Center for Biological Diversity filed a petition with the California Department of Fish and Wildlife to increase existing protections by listing the tree as threatened despite their own acknowledgment that the species is currently not in decline. Rather, the petition argues that the species may be threatened in the future by global climate change, a threat that will not be mitigated through increased regulations on local property owners. Additionally, the Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend. Despite all of this information staff from the Department of Fish and Wildlife determined the Petition provides sufficient scientific information to indicate that the petitioned action may be warranted for western Joshua tree.

The state of California has never protected a species primarily on the threat of climate change. The imposition of the CESA will create unnecessary impediments, as well as greatly increased costs, to the delivery of much-needed infrastructure improvements throughout the Inland Empire region. In many cases, these limitations upon infrastructure development will prevent the agencies from delivering much needed housing development, transportation network capacity enhancements and job creation through commercial development opportunities. Placing significant constrains and financial burdens on infrastructure development will not address the theoretical decline in the species as outlined in the Petition. The Commission must recognize when conflicting state public policies create an untenable framework for communities and local governments to navigate.

For the reasons stated above and others, we urge you to reject the Petition. If you have any questions or would like to discuss our position in greater detail, please contact Luis Portillo at 909-944-2201 or by email at lportillo@ieep.com. Thank you.

Sincerely,

Janice Moore
Apple Valley Chamber of Commerce

Bette Rader
Beaumont Chamber of Commerce

Zeb Welborn
Chino Valley Chamber of Commerce

Bobby Spiegel
Corona Chamber of Commerce

Gloria Martinez
Fontana Chamber of Commerce

Joshua Bonner
Greater Coachella Valley Chamber of Commerce

Peggi Hazlett
Greater Ontario Business Council

Cyndi Lemke
Hemet San Jacinto Chamber of Commerce

Shannon Shannon
Hesperia Chamber of Commerce

Andrea De Leon
Highland Chamber of Commerce

Paul Granillo
Inland Empire Economic Partnership

Oscar Valdepeña
Moreno Valley Chamber of Commerce

Patrick Ellis
Murrieta/Wildomar Chamber of Commerce

Jennifer Walker
Perris Valley Chamber of Commerce

Monique Manzanares
Pomona Chamber of Commerce

Robert Hufnagel
Rancho Cucamonga Chamber of Commerce

John Mills
Redlands Chamber of Commerce

Emily Falappino
Temecula Valley Chamber of Commerce

Peggy Robertson
Upland Chamber of Commerce

Mark Creffield
Victor Valley Chamber of Commerce

ANTELOPE VALLEY HISPANIC CHAMBER OF COMMERCE

FOUNDED 1997

819 EAST AVENUE Q 9 PALMDALE CA, 93550 • 661-538-0607

WWW.AVHISPANICCHAMBER.ORG / AVHISPANICCHAMBER@GMAIL.COM

Original on file,
received August 6, 2020

August 6, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

I write in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private landowners while doing little to address the long-term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua tree would effectively halt future development at a time when California is grappling with housing shortages and rising homelessness.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

I urge you to consider the significant impacts this will have on rural desert communities and respectfully ask that you deny this petition.

Sincerely,

Sylvia S. Duarte
President, AV Hispanic Chamber of Commerce

c: Palmdale City Council
J.J. Murphy, Palmdale City Manager

Original on file,
received June 19, 2020

Buchalter

18400 Von Karman Avenue
Suite 800
Irvine, CA 92612
949.760.1121 Phone
949.720.0182 Fax

File Number: H5318-0002
949.224.6439 Direct
dwance@buchalter.com

June 19, 2020

VIA U.S. MAIL AND VIA E-MAIL (FGC@FGC.CA.GOV)

Eric Sklar, President
California Fish and Game Commission
PO Box 944209
Sacramento, CA 94244-2090

Re: Petition to list the western Joshua tree as threatened or endangered under the California Endangered Species Act

Dear President Sklar:

This letter is prepared and submitted on behalf of Hesperia Venture I, LLC and Terra Verde Group, LLC ("HVI/TVG") to respond to the Petition submitted, under the California Endangered Species Act (California Fish & Game Code ("Code") § 2050 et seq.) ("CESA"), by the Center for Biological Diversity ("Petitioner") requesting the California Fish and Game Commission ("Commission") to take any one of three actions: (1) list the western Joshua tree (Yucca brevifolia) as threatened; (2) list a subspecies of the western Joshua tree (Yucca brevifolia brevifolia) as threatened; or (3) list as ecologically significant units ("ESUs") either or both the North or South population clusters of the western Joshua tree (Yucca brevifolia) species.

We understand that the Commission's staff will recommend at the June 24-25, 2020 meeting that the Commission continue review of the Petition until the August 19-20, 2020 Commission meeting. We support this recommendation for the reasons stated by staff as well as the challenges created by the COVID-19 pandemic, which is affecting the public's thorough review and analysis of the Petition and the Petition evaluation report ("Report") to the Commission by the Department of Fish and Wildlife ("Department"), as well as the public's participation in the hearing process.

If the Commission chooses to proceed with the hearing on the Petition, we request the Commission reject the Petition. Under CESA and its implementing regulations, the Petition is inadequate to warrant listing of the western Joshua tree or the other actions requested by Petitioner. Various stakeholders in their submitted comments to the Commission have outlined many of the Petition's deficiencies. In addition, we have concerns that granting the Petition will also have a detrimental impact on the availability of affordable housing needed within southern California. These concerns derive from the potential financial consequences of listing the western Joshua tree to a recently approved Tapestry project of HVI/TVG's in the City of Hesperia. The Tapestry project is intended to address the significant housing shortage that currently exists in California by providing an affordable option for homebuyers that is not available in the Southern California market. The Tapestry project, from the beginning, was designed to bring essential affordable housing stock to market while addressing the local environmental concerns.

Unlike most new housing projects, Tapestry was designed from the outset to be the most environmentally sensitive project in the state. All homes and commercial buildings will be required to use solar energy to the maximum extent possible. Even public buildings, such as schools, will be required to implement the solar energy directive. Tapestry is also making the most efficient use of our precious water resources. All homes and commercial buildings will have dual plumbing so that all irrigation needs can be met with non-potable water. Parks, schools, parkways, etc. will all use non-potable water for irrigation purposes. Tapestry will require building to CalGreen standards and will implement recycling to the maximum extent possible.

All environmental and conservation measures for Tapestry will be implemented to address important issues affecting the quality of life in California, including measures to protect Joshua trees. The City of Hesperia required several mitigation measures to protect Joshua trees for Tapestry, including protocols for transplanting, incorporating or managing Joshua trees as part of the project. In accordance with the City of Hesperia's Protected Plant Policy (City of Hesperia 2009), Tapestry will prepare a transplant plan, which will describe the salvage procedures for Joshua trees prior to construction. It is anticipated that a portion of the salvaged Joshua trees will be incorporated into Tapestry's landscaping. The remaining Joshua trees will be available for public adoption. Further, Tapestry is creating a Habitat Management Plan for the conservation easement and open space portions of the project. Joshua trees are present in the northern and central portions of Tapestry's conservation easement and open space areas that altogether encompass 3,533 acres of the project, which will be managed in perpetuity.

The listing of western Joshua trees would significantly increase costs to develop any housing within southern California, thereby decreasing the availability of affordable housing. These costs and impacts are unwarranted at this time based on the evidence presented by Petitioners for a possible impact to the western Joshua tree, which is based on possible detrimental impacts to the western Joshua tree. The plain rationale of Petitioner for the listing boils down to the contention that climate change will occur and detrimental impacts will likely occur to the western Joshua tree. Petitioner presents no concrete evidence of the extent of the detrimental impacts to the western Joshua tree, its habitat, or its range. In fact, the Petition at page 19 states that "no range-wide population trends have been documented." The simplicity of Petitioner's contention would justify listing almost all plants and animals within California as threatened, even if those plants and animals, like the western Joshua tree, are currently abundant and range stable.

The stability and abundance of the western Joshua tree is noted within several sources before the Commission. First, the Department states in its Report on the Petition that "information available to the Department indicates that the abundance of western Joshua tree is currently relatively high" (CDFW 2020, page 2). Second, USFWS compiled a Joshua Tree Species Status Assessment (USFWS 2018), which on page 2 states :

> "Currently, populations of both Joshua tree species have large distributions, ecological diversity, and a large amount of intact habitat. Therefore, we consider that Joshua tree populations now have: (1) a high capacity to withstand or recover from stochastic disturbance events (resilience); and (2) both species likely can recover from catastrophic events (redundancy) and (3) adapt to changing conditions (representation)."

Third, Petitioner's own reference materials, regarding the current distribution of Joshua tree, Sweet et. al 2019, page 2, states that:

> "Joshua Tree National Park straddles the lower elevation Colorado and higher elevation Mojave Deserts in southern California. Evidence from paleo-biological records indicates that Joshua trees, among many species, have shifted their distribution since the Pleistocene, when they were more broadly distributed in the southwestern United States (Smith et al. 2011). Today, Joshua trees occur in a jagged continuous band across the western Mojave Desert and in fragmented populations to the north and east (Cole et al. 2011); the occurrence of Joshua trees within JTNP defines the current southern extent of the Mojave Desert before it transitions into the Colorado Desert within the park. While the ecotone between these deserts has shifted during glacial and inter-glacial cycles, as a whole, it is believed to have been quite stable since the end of the Pleistocene (Holmgren et al. 2010)."

Regardless of the conclusions of abundance of trees and range, Petitioner maintains that the Commission must take one or more of the actions noted above for the western Joshua tree. The

Commission has a duty to follow the CESA and its implementing regulations and deny all of Petitioner's requested actions, since none are warranted based upon the current Petition and its wholly lacking evidence. For the Commission to do otherwise would cause great harm to the rule of law at the expense of affordable housing desperately needed for Californians.

Very truly yours,

BUCHALTER
A Professional Corporation

Douglas E. Wance

DEW:gt

COMMERCIAL REAL ESTATE SERVICES

Mark McGaughey
First Vice President
Broker Lic. 00418549

CBRE, Inc.
Brokerage Services
Broker Lic. 00409987

Original on file, received August 6, 2020

CBRE

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August 6, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

I write in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private landowners while doing little to address the long-term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua tree would effectively halt future development at a time when California is grappling with housing shortages and rising homelessness.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

I urge you to consider the significant impacts this will have on rural desert communities and respectfully ask that you deny this petition.

Sincerely,

Mark McGaughey
First Vice President

c: Palmdale City Council
J.J. Murphy, Palmdale City Manager

Original on file,
received August 6, 2020

Vincent M. Roche
Executive Director/Principal
Lic. #01155079
5060 California Avenue, Suite 1000
Bakersfield, CA 93309
Direct +1 661 633 3817
Fax +1 661 633 3801
Vincent.Roche@paccra.com
www.paccra.com

August 6, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

I write in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels. Listing the tree would add redundant protections that place a significant financial burden on private landowners while doing little to address the long-term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua tree would effectively halt future development at a time when California is grappling with housing shortages and rising homelessness.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

I urge you to consider the significant impacts this will have on rural desert communities and respectfully ask that you deny this petition.

Sincerely,

Vincent M. Roche
Executive Director/Principal

c: Palmdale City Council
J.J. Murphy, Palmdale City Manager

California State Council of Laborers

Laborers' International Union of North America

LiUNA!
Feel the Power

May 8, 2020

Original on file,
received May 8, 2020

1121 L Street, Suite 502
Sacramento, CA 95814

Phone: (916) 447-7018
Fax: (916) 447-4048
Email: cscl@calaborers.org

Jose Mejia
Director

Oscar De La Torre
LiUNA Vice President at Large
Business Manager
Northern California District Council of Laborers

Jon P. Preciado
Business Manager
Southern California District Council of Laborers

Rocco Davis
LiUNA Vice President at Large
Regional Manager
Pacific Southwest Region
Special Assistant to the General President

Eric Sklar
President
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244

RE: Proposed Listing of the Joshua Tree Under the California Endangered Species Act—OPPOSITION

Dear President Sklar:

On behalf of the California State Council of Laborers, I write in strong **OPPOSITION** to the petition submitted by the Center for Biological Diversity to list the western Joshua Tree as a threatened species under the California Endangered Species Act. The Joshua Tree already receives protections at the federal, state, and local levels. This would add redundant protections that would place a significant financial burden on private landowners, while doing little to address the long-term threat to the species. We too live in these communities and are families that seek to protect our environment just like anybody else but feel this proposal is completely unnecessary!

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua Tree would effectively halt future development, which would impact not only the jobs of our members but the potential jobs and tax revenues to local governments providing essential services.

The petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua Tree population, instead predicting a future decline due to global climate change. Additionally, much of the western Joshua Tree population is on federally protected lands and state preserves, giving them the highest level of protection. Outside of those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

For these reasons, we respectfully ask that you deny this petition. Should you have any questions, please contact Katie Donahue-Duran or myself at (916) 447-7018.

Sincerely,

Jose Mejia
Director

cc: Secretary Wade Crowfoot, CA Natural Resources Agency

URGENT: PROPOSED LISTING OF THE JOSHUA TREE UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

A proposal to list the western Joshua tree as a threatened species is under consideration by the California Fish and Game Commission. If this proposal is approved, the Joshua tree would be protected under the California Endangered Species Act, a move that would effectively halt the development of private property within large swaths of the California desert and bring the state government into the backyards of desert residents uninvited.

How will this impact me?

A threatened species designation requires private property owners to obtain California Environmental Quality Act (CEQA) compliance for any activity that may disturb a threatened species, including homebuilding. If the Joshua tree is listed, activities that may remove any amount of Joshua trees will require a CEQA compliance document, thereby forcing the property owner to employ biologists and specialists to prepare the environmental documents. This requirement would apply to ***any*** construction, or even yard work, that would not normally require a permit, adding tens of thousands of dollars to the cost of development. Complicating matters further is the need for mitigation, which may include financial contributions to various conservation funds or the mandated purchase of undisturbed land that is restricted from development in perpetuity. Once the environmental review is complete, property owners will be required to obtain an incidental take permit, again subjecting the project to additional state scrutiny and costs.

Background information

Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal. The Center for Biological Diversity recently filed a petition with the California Department of Fish and Wildlife to increase existing protections by listing the tree as threatened despite their own acknowledgment that the species is currently not in decline. Rather, the petition argues that the species may be threatened in the future by global climate change, a threat that will not be mitigated through increased regulations on local property owners.

Local communities take pride in the Joshua tree and have enacted additional protective measures through local ordinances. Moreover, the tree is considered an iconic species that generally adds property value. In fact, many builders go out of their way to plan developments around existing trees. Listing the Joshua tree on the California Endangered Species list will put unnecessary burdens on land owners, significantly limits development, and adversely impacts local economies.

What can you to do stop this shortsighted proposal?

The public is encouraged to send letters of opposition (sample letter attached) to the California Fish and Game Commission. Letters may be submitted by mail or email before **Wednesday, May 20, 2020**. Here is where to send your correspondence:

Mailing Address: California Fish and Game Commission, P.O. Box 944209, Sacramento, CA 94244
Email Address: fgc@fgc.ca.gov (Include "Petition to List the Western Joshua Tree" in the Subject Line)

ASSOCIATION OF WESTERN EMPLOYERS

Original on file, received June 11, 2020

June 11, 2020

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Re: Petition to List the Western Joshua Tree

Dear President Sklar,

I write in strong opposition to the petition submitted to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels and is prized locally and throughout the country for its beauty and as a symbol of a healthy desert. Adding redundant protections will place significant financial burden on private land owners, in the development of public facilities, affordable housing, and career building jobs all of which have been planned while successfully protecting the Joshua tree already.

Contributing to the very real and often severe challenges of lack of housing, homelessness, and real economic progress in the California desert's many rural, underserved communities serves no useful public policy goal and runs counter to many well established goals put forth with wide agreement from multiple Legislatures and Administrations.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. The proposed listing is nothing more than a solution in search of a problem. Much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.

On behalf of the thousands of career building jobs relying on the work of our Association and others, I urge you to not follow through on this listing request.

Thank you for your consideration.

Sincerely,

Jeff Miller

Assembly member Jeff Miller, retired (Riverside County)
Chair, Association of Western Employers

30211 Avenida Banderas #200 Rancho Santa Margarita, CA 92688
(949) 438-0448

Steve Harris
[redacted]

June 12, 2020

Mr. Eric Sklar, President
California Fish and Game Commission
P.O. Box 944209
1416 Ninth Street, Ste. 1320
Sacramento, CA 94244-2090

Sent via U. S. Mail
And by Email to Melissa Miller-Henson@fgc.ca.gov

Re: Opposition to Petition of Center for Biological Diversity to declare Western Joshua Tree an Endangered Species; Report to Fish and Game Commission "*Evaluation of a Petition from The Center for Biological Diversity to List Western Joshua Tree as Threatened Under the Endangered Species Act" - February 2020*
278 Acres in Kern County, California; Parcel No. 244-040-14 and Parcel No. 244-040-15; Boron, California; Britton Associates, LLC

Dear Mr. Sklar:

I am writing to you on behalf of my family members who, together with me, form Britton Associates, LLC, the owner of 278 acres in Boron, California. We are writing to strongly protest and oppose the Petition submitted by the Center for Biological Diversity to list the Western Joshua Tree as a threatened species under the California Endangered Species Act. I have had the opportunity to review the above-listed 41-page Report and I would like to make you aware of several things in it that I think are weaknesses and probably militate against using it as a basis to institute such a sweeping action.

Probably the first and best place to start is the report's executive summary. On its Page 2, it states this:

"The Petition does not present an estimate of western Joshua tree population size, nor does it provide evidence of a range-wide population trend; nevertheless, the Petition does provide information showing that some populations of western Joshua tree[s] are declining, particularly within Joshua Tree National Park. Although a reliable estimate of western Joshua tree population size is not available, information available to the Department indicates that western Joshua tree is currently relatively abundant."

(Report to the Fish and Game Commission of February 2020, Page 2, Paragraph 2)

While we know and understand the emotional importance of the Joshua Tree to the identity of the State of California, this statement alone makes it clear that this isn't a species that is dying out and it's not one that really is threatened, whether in the colloquial sense or in the scientific or legal sense, either.

Much is made in Pages 2 through 7 of the Report to indicate that a very low threshold or standard is required for the Commission to entertain a Petition. Rather than go through each of the precedents, I can properly conclude that the Commission is clearly invested with discretion and authority to look at common sense facts and trends rather than simply adopt wholesale the report's findings; they are based on the opinions and conclusions of an entity of an entity whose mission, as it puts it, is "saving life on earth". (Biological Diversity.org; home page)

The Report continues on its Page 8 reflecting that the deterioration of the current Western Joshua Tree population trend is primarily the result of a massive fire:

"The Petition cites a study by DeFalco et al. (2010) that examined the mortality of western Joshua tree[s] across several study sites five years after a fire in Joshua Tree National Park burned nearly 5700 hectares (22 square miles (mi2)) in May 1999. The study found that approximately 80 percent of western Joshua trees that were burned by the fire died by 2004, and approximately 26 percent of the unburned trees died as well, with drought a likely contributing factor."

This passage alone introduces a factor that clearly had little to do with a declining population for environmental reasons. A massive wild fire, whether the cause of climate change, arson or other reasons, is an unforeseen circumstance that cannot be planned for in the context of insulating any species from extinction, threatened or otherwise. It is a catastrophic event.

Interestingly, the Report reaches a conclusion on its Page 13 as to abundance:

"The discussion of western Joshua tree's "Current and Historical Distribution" on pages 16 through 19 of the Petition includes information demonstrating that western Joshua tree[s] currently has a relatively widespread distribution in southern California. The Petition

acknowledges that a reliable estimate of western Joshua tree population size is not available."

Notwithstanding that factual statement, the Report indicates that:

"...information available to the Department indicates that the abundance of western Joshua tree[s] is currently relatively high*. The Petition provides sufficient information on the abundance of western Joshua tree[s] for the Department to make the recommendation in Section IV of this Petition Evaluation."*

(Report, Pages 13 and 14)

Findings that Joshua trees are abundant, that a fire geographically wiped out a number of them in a relatively small and narrow region and that there is no reliable information as to their total population seems antithetical to a decision that the Joshua tree is an endangered species. Certainly, given these weaknesses, along with the admission that the pollination of the Joshua tree through asexual reproduction, flowering, pollination, seed production and other methods are not deteriorating or apparently reduced to a level that the existence of the tree as a species is now threatened.

I don't want this entire letter to simply be a critique and analysis of the Report; I bring it up only because it seems weak on its face even to me, a lay person. If you look at the entire Report, in essence, its sole reason for existence is the threat of climate change. The body of law that the Petitioners are relying on, the California Endangered Species Act (CESA) most likely never contemplated its own expansion to take in the prediction of a future decline due to global climate change. Certainly, this would open a Pandora's box for species protections and most likely would do hard and serious damage to local governments and economies. Our land is in a rural and underserved community with little housing and proximity to the main east-west highway (CA 58) connecting US 395 (north-south) and CA 14, the Palmdale Freeway. The Mojave Air and Space Port is located in this region as is Edwards Air Force Base. Other uses, such as vehicle testing and proving grounds, exist here as well. In point of fact, we store over 100,000 tons of mined clay on our property, too.

Our family has owned this property since the 1930s and operated a clay mine on it until the 1960s.

With the Mojave Space Port, Edwards AFB and other federal lands (including one directly adjacent to us) there is little opportunity for new housing or economic development if this petition were granted. California is grappling with housing shortages and rising homelessness, caused in part by a lack of necessary housing in more populated areas.

In just my doing some basic research, I have learned that just last year, the John D. Dingell, Jr. Conservation, Management and Recreation Act placed into protected status hundreds of thousands of acres of federal lands on which Joshua trees grow. Three years prior to that, nearly two million acres of desert lands containing Joshua tree habitat were placed into protection through the use of the Antiquities Act. It would be hard to find a single species benefitting more from these land preservation efforts than the Joshua tree. The Joshua tree is also protected under State law through the California Desert Native Plants Act, which requires permitting for removal. Clearly, the overwhelming majority of Joshua trees exist on land already protected by the State and federal governments.

Our family has significant longevity in owning and maintaining this property. For us, such a decision would not only render it valueless but essentially useless, too. To take such a drastic and massive decision based solely upon climate change without any objective evidence (I have looked at the Report and I just don't see any), wanders quite closely to a taking without compensation. That isn't good for us and it isn't good for the State, either. There needs to be a common sense fact-based process and findings that in fact show that the species is very nearly extinct. The Report hasn't presented that and, since the Report relies on the Petition, it must not have, either.

For all of these reasons, my family and I urge you to deny the Petition in its entirety. Rural desert communities will suffer enormous impacts if it is granted and I just do not see a logical basis for that.

Yours truly,

Steve Harris

Steve Harris
For Britton Associates, LLC, Owners

tc

From: Daniela Bellissimo
Sent: Friday, May 29, 2020 12:03 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Petition to List the Western Joshua Tree

May 30 2020
Mr. Eric Sklar
President
California Fish and Wildlife Commission P.O. Box 944209
Sacramento, CA 94244-2090

Dear President Sklar,
I write in strong opposition to the petition submitted by the Center for Biological Diversity to list the western Joshua tree as a threatened species under the California Endangered Species Act. The Joshua tree already receives protections at the federal, state, and local levels.

Listing the tree would add redundant protections that place a significant financial burden on private land owners while doing little to address the long-term threat to the species.

The California desert is comprised of rural, underserved communities that face economic challenges unlike other areas of our state. Listing the Joshua tree would effectively halt future development at a time when California is grappling with housing shortages and rising homelessness.

Even more troubling is the fact that the petition submitted by the Center for Biological Diversity fails to provide scientific evidence to substantiate a decline of the Joshua tree population. Instead, the petition predicts a future decline due to global climate change. Further, the proposed action conflicts with other public policy directives such as affordable housing mandates and wastewater discharge prohibitions. As you know, much of the western Joshua tree population resides on federally protected lands and state preserves, giving them the highest level of protection. Outside those jurisdictions, they are protected under state law through the California Desert Native Plants Act, which requires permitting for removal.
I urge you to consider the significant impacts this will have on rural desert communities and respectfully ask that you deny this petition.

Thank you,

Daniela Bellissimo

Original on file,
received April 13, 2020

Submitted via email to fgc@fgc.ca.gov

April 10, 2020

Eric Sklar, President
California Fish and Game Commission
1416 Ninth Street, Suite 1320
Sacramento, CA 95814

Subject: Support for the petition to list the western Joshua tree (Yucca brevifolia) as a Threatened species under the California Endangered Species Act (CESA)

Dear President Sklar and Members of the Fish and Game Commission:

Since our founding in 1976, the California Wilderness Coalition (CalWild) has been promoting conservation on the federal public lands in the California desert. As you know, the Joshua tree is a true icon of the Mojave Desert ecosystem.

We are increasingly concerned that this iconic species is threatened by development, climate change, the invasion of non-native species (especially grasses that increase the frequency and severity of fire), and other factors. This is especially true in the western portion of the species' range.

We therefore support the petition to consider listing the western Joshua tree as Threatened under the CESA. We urge the Commission to carefully consider the science applicable in this case to determine whether listing is warranted. Regardless of the ultimate determination, we urge the Commission to institute protections and recovery measures that can prevent the downgrading of the species to Sensitive or Endangered status.

Thank you for considering our input. Please keep us abreast of your conservation efforts in regards to the western Joshua tree and other key species of plants and wildlife.

Sincerely,

Ryan Henson

Ryan Henson
Senior Conservation Director
3313 Nathan Drive
Anderson, CA 96007
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Original on file,
received June 11, 2020

Antelope Valley Conservancy
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June 11, 2020

Eric Sklar, President
California Fish and Game Commission
via electronic communication to fgc@fgc.ca.gov

Dear President Sklar and Members of the Commission,

Thank you for this opportunity to submit comment regarding the Mojave Desert's iconic western Joshua tree. As a conservancy founded in the Mojave Desert in 2005 and authorized by the California Department of Fish and Wildlife to hold conservation lands, Antelope Valley Conservancy writes to you in **strong support** of the petition submitted by the Center for Biological Diversity, requesting the formal listing of the western Joshua tree (yucca brevifolia) as a threatened species under the California Endangered Species Act..

As desert stewards and Antelope Valley residents, the board members of the Antelope Valley Conservancy recognize the value and uniqueness of Joshua tree habitats and the importance of protecting them for future generations. Joshua tree woodlands face an uncertain future, threatened by invasive species, drought, wildfires, grazing, off-roading, and development. Climate change may leave Joshua Tree National Park without its namesake Joshua trees by the end of the century. With approximately 40% of the western Joshua tree's range on private land, projections indicate all of this habitat could be lost in the coming years without CESA protection.

Clearly, the Mojave Desert's iconic western Joshua trees need protection.

We request your support for the designation of western Joshua trees as a formal candidate for protection under CESA.

Thank you for your consideration,

Antelope Valley Conservancy

C. Andrews

By Christina Andrews
Corporate Secretary

Original on file,
received June 11, 2020

MBCA
morongo basin conservation association

June 11, 2020

Mr. Eric Sklar
President
California Fish and Game Commission
P.O. Box 944209
Sacramento, California 94244-2090
Via email: fgc@fgc.ca.gov

Re: Strong Support for Candidacy of Western Joshua Tree as Threatened

Dear President Sklar,

Founded in 1969, over 50 years ago, the Morongo Basin Conservation Association is pleased, honored, and continues to present our voice to support our mission:

to advocate for a healthy desert environment that nurtures the region's rural character, cultural wealth and economic well-being.

We believe that a healthy desert is essential for the well-being of desert residents and for the health of our local economy. These are the three pillars of sustainability: environment, society, and the economy.

As the effects of climate change become ever more apparent, the recognition and listing of the western Joshua tree as threatened will help preserve and protect our Joshua tree woodlands. Unique and beautiful, the stands of Joshua trees provide an irreplaceable link in the desert ecosystem. The Western Joshua tree is suffering and withering under the impact of climate change with reduced precipitation, increased heat, reduced recruitment, and wildfires due to the spread of invasive plants. The loss of these woodlands due to climate change and poorly planned ongoing development undermines the foundations on which our thriving desert communities have been built.

Combatting and adapting to climate change must be the driver in making appropriate land use and planning decisions. The Mojave Desert is the largest intact ecosystem in the contiguous 48 states and includes the habitat of the western Joshua tree. This special habitat is a global biological ‘hot-spot,’ home to a large number of unique and diverse species. As extinction rates continue to grow worldwide, it is imperative we embrace biological diversity as an asset to the health of the entire planet.

We recognize that classifying *Yucca brevifolia* as a threatened species under the California Endangered Species Act (CESA) has significant ramifications both for planned development and for developments now underway. However these represent only a small fraction of the anticipated impacts coming to our world due to the effects of climate change.

Vulnerability of the Joshua tree has long been recognized; we see it singled out for protected status in development code plant ordinances in Apple Valley, Yucca Valley, Palmdale and other municipalities; however, existing local and State regulations are often inadequate, and too often un-enforced. To pin survival of the iconic Joshua tree on the existing patchwork of regulations will almost certainly lead to the erosion of these woodlands and the natural communities that have grown up around them.

Given the scale, rate of change, and magnitude of the climate crisis, a landscape-level planning framework is essential to guide development within the range of the Joshua tree. An opportunity is now presented for the creation of a Natural Community Conservation Plan (NCCP) that covers the range of the western Joshua tree which would provide such a framework and allow for continued smart, and appropriate development while incorporating protection and mitigation measures. Creation of an NCCP would streamline processing of development entitlements and spare individual property owners from having to apply for incidental take permits for small projects or improvements.

There are many examples of the successful implementation of a regional planning process. Claims that the listing will halt or forestall development, are hyperbolic. One need only look at other examples where a regional planning process has been implemented to see that this listing will not inevitably halt development. The Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) provides evidence of how a region can utilize landscape level planning practices without adversely affecting development. These NCCP frameworks provide for a rational science-based framework and certainties for land use proposals for decision makers, developers, and homeowners while protecting our ecosystems.

This listing will create an opportunity from which to build the broad scale landscape planning that is desperately needed if we are to nurture preservation of this slow-growing species and the desert ecosystem to which it is linked. Taking the proactive step of protecting the western Joshua tree offers an opportunity to get out ahead of the massive adaptations climate change will necessitate. We must seize this opportunity to define a purpose and need in the creation of a NCCP that would include not just the Joshua tree, but a range of issues integral to our continued existence in our ever-warming environment.

Decisive action offers the prospect of a future where the desert is appropriately valued not only for its beauty, but also for the role it plays in the sequestration of large amounts of CO^2 and its ability to ensure healthy air quality across vast stretches of land. Recognition of existing land use patterns within the range of the Joshua tree have the potential to accommodate additional housing, either through in-fill housing or by construction of Accessory Dwelling Units (ADUs) and 'tiny' houses as are now being encouraged by State legislation.

Will sparing the requirements of managed development be worth the gamble if the Western Joshua tree disappears from the desert landscape in the near future? To relinquish the opportunity to keep the Mojave Desert ecosystem intact through prudent, managed care in order to avoid inconvenient but proven best management practices is to risk a loss that may not be possible to recover. It is our hope that the Commission will grant the listing for the Joshua tree under CESA so that we protect the legacy of this desert icon for future generations.

At its very best, protection of the Joshua tree could be the first step in laying a foundation for a future where fossil fuels have been traded for renewables; where policies and practices provide for social and environmental justice for all; where maintaining a diversity of species in the natural desert environment is given priority; and where prudent use of water resources is recognized as being essential. It is for the reasons above that we urge you to give the strongest possible consideration to listing the western Joshua tree.

Thank you for your consideration and attention.

Steve Bardwell

Steve Bardwell, president
Morongo Basin Conservation Association

MBCA Board members:

David Fick, vice president
Meg Foley, director
Janet Johnston, director
Mike Lipsitz, director
Ruth Rieman, director
Marina West, treasurer
Pat Flanagan, director
Brian Hammer, director
Sarah Kennington, past president
Arch McCulloch, director
Laraine Turk, secretary

Original on file,
received April 16, 2020

California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Thursday, April 16, 2020

President Sklar, esteemed Commissioners;

The National Parks Conservation Association is the nation's only independent, nonpartisan membership organization devoted exclusively to advocacy on behalf of the National Parks System. Our mission is to protect and enhance America's National Park System for present and future generations. We have worked to establish and protect national parks and monuments in the California desert for more than two decades. We also take a strong interest in preserving the ecological integrity of lands surrounding the California desert's parks and monuments.

Our support of the petition to list the western Joshua tree as Threatened under CESA derives in part from the tree's importance to the landscape integrity of several national parks and monuments in the California desert. Besides the National Park that bears the name of this iconic species, Joshua Tree National Park, the western Joshua tree is an important member of vegetative communities in the northern and western reaches of Death Valley National Park, and plays a similar role in the Mojave Desert portion of Sand to Snow National Monument.

Further, the trees are an important visual resource associated with the Old Spanish National Historic Trail in that trail's stretch between Barstow and Cajon Pass, where they preserve a few remaining vestiges of the landscape that greeted 19th century travelers along that forbidding trail route.

Our interest in the species, however, is not limited to those western Joshua trees that are part of a national park setting. The southernmost population of western Joshua trees, referred to by petitioner as "YUBR South," constitutes the largest assemblage of continuous Joshua tree habitats to be found in the Mojave Desert. This assemblage runs for hundreds of miles westward from Joshua Tree National Park to the vicinity of Tejon Pass and then northeastward along the eastern foothills of the Tehachapi Mountains to Ridgecrest. While the individual forests may not be contiguous, their proximity along this wide swath of California provides for a significant measure of habitat connectivity for animals that depend on Joshua trees, and for the trees' genetic diversity as well. Outlier populations in the central Western Mojave between Boron and Barstow only augment the diversity to be found in this population.

Throughout the expansive range of YUBR South, only in the eastern and northern extremes are Joshua trees protected, and even there only stemming from their location in a park or wilderness area. In the east, a cluster of protective designations including Joshua Tree NP, Sand to Snow NM, and the Bighorn Mountains Wilderness protects important populations of the tree. Near Ridgecrest and Walker Pass, the Kiavah, Owens Peak, and El Paso Mountains Wildernesses offer protection to a few more critical Joshua tree forests. Throughout all the rest of the range of YUBR South, aside from a handful of acres in the extreme north sections of San Gabriel Mountains National Monument, federal protection of the trees is nonexistent. The state of California fills a few of these gaps, with protected groups of Joshua trees in Saddleback Butte, Ripley Desert Woodland, and Red Rock Canyon state parks. Elsewhere, the trees are covered by an inconsistent mosaic of differing and even conflicting county and municipal codes, with enforcement of applicable municipal native plant ordinances sporadic at best.

Conservation of a single species – or population within a species – is ill-served by such a patchwork of policies. Add to this the reality that this broad swath of unprotected Joshua trees is the same group of trees most vulnerable to development pressure, as communities develop open land between Apple Valley, Lancaster, and Ridgecrest, and it becomes clear that more stringent and consistent protections for the western Joshua tree are in order as development proceeds.

Petitioner has done a thorough job of documenting the threats the trees face. For the sake of brevity, we will only resummarize here:

1) The trees face an existential threat from the prospect of climate change, including reproductive failure, failure of the trees' obligate pollinator *Tegeticula synthetica* to contend with changing temperatures and precipitation, disruption of nurse plant vegetative regimes, and the strong likelihood that even established trees may be damaged as herbivores desperate for moisture girdle the trunks.
2) Wildland fire, on the increase due to introductions of exotic grasses and other weeds, is likely to permanently convert thousands of acres of Joshua tree habitat to a periodically burning annual grassland.
3) Physical damage to the trees, through either deliberate vandalism or negligence, is likely to increase as the population of the trees' range increases.
4) Physical removal of the trees, usually fatal in the medium term even if efforts to transplant the trees are made, will increase as demand for residences, commercial development, and renewable energy facilities also increase in the West Mojave.
5) The development described in point 4 substantially augments the threats in points 1 through 3.

NPCA suggests that the cause of protecting Joshua trees in Joshua Tree National Park and other protected areas is best served by ensuring those protected areas do not become isolated from other populations of the tree. As a keystone species in much of its range, Joshua trees provide important services to species ranging from the yucca moths that rely on the tree for reproduction and the yucca giant-skipper moths whose larvae feed on Joshua tree branch tissue, to antelope ground squirrels who rely on Joshua tree seeds in mast years for food caches, to species such as desert night lizards and ladderback woodpeckers to whom the trees offer shelter. To protect Joshua trees throughout their range is to protect these species as well.

Again, we thank you for the opportunity to comment on this pivotal moment in the future of the Mojave Desert's signature species. We urge you to protect the western Joshua tree under the California Endangered Species Act.

Chris Clarke

Chris Clarke
Associate Director, California Desert Program
National Parks Conservation Association
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Joshua Tree, CA 92252
cclarke@npca.org | (760) 600-0038

California Fish and Game Commission
1416 Ninth Street, Room 1320
Sacramento, CA 95814

June 10, 2020

Dear Commissioners,

We are writing in support of the designation of the western Joshua Tree as a candidate for listing under the California Endangered Species Act.

The Mojave Desert Land Trust is dedicated to the protection and conservation of the Mojave and Colorado Desert ecosystems and their scenic, natural, and cultural resources. Since our formation in 2006, we have protected more than 84,000 acres of desert lands. Our acquisitions have increased the size and integrity of existing protected lands such as wilderness, parks, and monuments, and permanently protected the wildlife corridors linking them. While much of the land we acquire is conveyed to the Bureau of Land Management and the National Park Service, we are also permanent stakeholders -- owning, monitoring, and managing thousands of acres of desert lands.

Among the lands we own are Joshua tree woodlands in a wildlife corridor connecting Joshua Tree National Park to lands managed for conservation on the 29 Palms Marine Corps base. As land managers and participants in studies of Joshua trees, we have witnessed first-hand the decline in their reproduction due to climate change and other factors such as the proliferation of non-native plants. Recently, we witnessed the effects of another threat -- wildfire -- when approximately 150 acres of our land within the wildlife corridor burned killing and damaging western Joshua trees, Mojave yuccas and other native vegetation. With warming temperatures and the spread of exotic species, fires are becoming more frequent and more intense and the fire season is becoming longer.

Climate change and wildfire are not the only threats to the western Joshua tree. Many thousands of acres have been lost due to residential and commercial development, and more recently from large scale renewable energy projects. The loss of desert lands also contributes to climate change: Mojave Desert plant communities are excellent carbon sinks.

Due to the combination of threats facing the western Joshua Tree, it is at risk of extinction. The protections provided by state listing are needed to help ensure its survival and recovery. Its conservation cannot be achieved solely on public lands because much of the species' habitat is on private land. Current protections afforded in some areas, while of some value in preventing direct mortality, are not adequate to meet the species' conservation needs.

MOJAVE DESERT LAND TRUST
P.O. Box 1544
60124 29 Palms Highway
Joshua Tree, California 92252
760.366.5440 • www.mdlt.org

MOJAVE DESERT LAND TRUST

We acknowledge that in addition to the pressing need to address threats to the western Joshua tree, there is also a need for affordable housing and renewable energy. However, these goals are not mutually exclusive. As a retired senior Fish and Wildlife Biologist with the federal government, I've seen how regional Habitat Conservation Plans and Natural Community Conservation Plans can achieve the conservation and recovery of species while also providing for smart growth (i.e. infill versus sprawl) including creating a streamlined development and permitting process.

The western Joshua Tree is a beautiful and iconic species. The very identities of our Joshua Tree community and the community of Yucca Valley are tied to this signature tree. The western Joshua tree and the unique and spectacular desert lands it occupies attracts visitors from around the world, underpinning many of our high desert economies. Doing what we can to help the western Joshua tree survive and recover is our moral responsibility. Its conservation is not only achievable, but it can be done while still maintaining a robust economy and meeting climate change goals. In fact, it is integral to it.

Sincerely,

GW Hund

Geary W. Hund
Executive Director

MOJAVE DESERT LAND TRUST
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Transition Habitat Conservancy
PO Box 720026
Pinon Hills, CA 92372-0026
760 868 5136
Tax ID # 74-3146328

fgc@fgc.ca.gov

To the California Fish and Game Commission

August 4, 2020

We are writing to you in full support of listing the western Joshua Tree as Threatened or Endangered. Transition Habitat Conservancy is a 501 (c) (3) land trust operating in the West Mojave Desert. We purchase private land and provide perpetual stewardship on these habitat lands. We have raised and spent $24 million to date and own about 8,000 acres of important West Mojave desert habitat. Of that, about 1000 acres are Joshua Tree woodlands. Joshua Trees woodlands are being replaced by wind and solar farms in the west Antelope Valley at an alarming rate. We are saving what we can. Without listing this iconic species there are no requirements for protection of Joshua trees that exist on private lands in the unincorporated County lands. Further, if lands are zones agricultural the owners are free to bulldoze Joshua trees at will. If mitigation is required, then at least some of the remaining Joshua Trees will be saved.

Images of Joshua Trees and Poppies have become icons of the Antelope Valley- which is known around the world for the incredible and unique poppy and Joshua tree images that are in every coffee table book that show California's beauty. They are valuable symbols--parts of our valley's own group of "flagship species" identifying our high desert cities, rural communities, and open spaces that contribute to the economic vitality and attractions of suburban and rural living. If listed, the State together with the renewable energy project proponents could mitigation some of the loss of our Joshua Trees. Through improved conservation together we could balance renewable energy development with healthier communities, economic benefits, and preservation of the valuable open-space qualities that draw people to our area.

Please list the Western Joshua tree so we can save some of what once was covering the Antelpe Valley and much of the west Mojave desert.

Sincerely Yours,
Jill Bays
President
Transition Habitat Conservancy

Original on file,
received August 6, 2020

Hispanic Access Foundation

August 6, 2020

California Fish and Game Commission
Sacramento, CA

RE: Western Joshua Tree Listing – Please List as Threatened

Dear Members of the Commission,

I am writing on behalf of Hispanic Access Foundation to support a YES vote for advancement of the Western Joshua Tree to candidacy status under CESA as a threatened species. The Western Joshua Tree is not only unique and endemic, but also iconic to the California desert. Losing it would be a blow to our identity as California residents, and also do severe harm to the tourism industry that generates tens of thousands of jobs as well as hundreds of millions of government revenue. If we were to let that happen, it would disproportionately affect Latino communities in the region, who are already facing the harmful impacts of the climate crisis as frontline communities, along with the current economic crisis and coronavirus crisis afflicting us today. But with a CESA "threatened" status, this harm could be prevented.

The Western Joshua Tree has ample reason to be listed as threatened, as increased temperatures from climate change would make what was once its habitat largely uninhabitable. In addition, wildfires are projected to increase in area and intensity in the Western Joshua Tree habitat, with young trees particularly vulnerable. Private lands and local jurisdictions in the range of the Western Joshua Tree have minimal protections that allow bulldozing of trees for energy and other large development projects. CESA listing would provide stronger protection measures, while still allowing development projects that minimize and mitigate impacts to this amazing species.

When we bring under-privileged students to Joshua Tree National Park for the first time, they go from complaining about the lack of cell service on the bus ride to being breathless and altogether forgetting about their screens while inside the park. Losing a tree as special and iconic as the Western Joshua Tree would remove one of the reasons for feeling wonder and connection to California's incredible natural heritage. For all of these reasons, we urge a YES vote for advancement of the Western Joshua Tree to candidacy status under CESA as a threatened species.

Sincerely,

Shanna Edberg

Director of Conservation Programs
Hispanic Access Foundation
(818) 640 2936
https://hispanicaccess.org

Original on file,
received June 1, 2020

6/1/20

California Department of Fish and Game,

It has come to my attention that you are considering listing the Joshua tree as an endangered species in the state of California. It is critically important that the Joshua tree be listed.

We need to protect wildlife linkages connecting larger protected areas. Part of this protection is Joshua trees. It is crucial that their genetic material is able to transfer among multiple plants in order to prevent genetic bottlenecking and weakening of the species. Protecting this iconic species also protects other species - in particular the yucca moth that only reproduces in yucca flowers. If moths can't move pollen around from plant to plant, then the plants can't reproduce. No flowers, no moths. That impacts other species that use the moths for food. If we create disparate "islands" to which Joshua trees are restricted, then we resign ourselves to their extinction. Just as wild animals need variation in population, and the ability to reproduce with wide ranging individuals, plants need the same. The idea that they are protected within Joshua Tree National Park and the Mojave Preserve means nothing when it comes to long term viability of the species - especially when they aren't reproducing any longer in areas outside high elevation, north facing, ravines called “refugia”. This has the same effect as isolation on an island - lack of genetic variation and ability to mix up genes through combination of different individuals each time – for example: genetic recombination, crossing over, and independent assortment during meiosis. This is a complex ecosystem wide subject - one that I've studied for decades, have a degree in, and have taught for nearly 30 years. We need all the trees BETWEEN protected areas to be protected for movement of genes between populations.

As a biologist and ecologist, I support this action. Years of research have shown habitat availability for Joshua trees is declining at a significant rate. Overdevelopment, lack of adherence to the state native plant code, and climate change all contribute to the loss of mature plants. Additionally, climate change is causing mortality of baby trees before they have an opportunity to establish themselves. Dr. Cameron Barrows and Dr. Lynn Sweet, research ecologists for the Center for Conservation Biology at the University of California, Riverside, have done considerable field research, and published papers in the journals Ecosphere and Biological Conservation outlining current climate threats to these trees (Congruence between future distribution models and empirical data for an iconic species at Joshua Tree National Park, June 2019). Seedlings are establishing themselves successfully in exceedingly few microclimates, called refugia. As adult trees die, they are not being replaced. It is imperative everything possible is done to protect this species for the future.

I have dealt with this issue, in one capacity or another, for nearly 25 years. My introduction to the disregard for our desert environment by the town of Yucca Valley started with one event about 23 years ago. There was a majestic Joshua tree on the border of my property and the property next door. My yard was nearly all intact habitat except the house envelope; the property next door was completely intact desert habitat. A developer bought the property and decided to develop it. The tree was nowhere near the building envelope, nor the driveway, nor anything else. I came home from errands to find most of the huge tree knocked down and the bulldozer pushing the rest aside. The dozer operator told me he was told by the developer to knock it down. The other contractor told him to shut up. I took pictures. I made a formal complaint to code enforcement. The officer I spoke with said he knew the exact tree, as it was one of the most magnificent in the area. The code enforcement officer later told me there was nothing they could do with my complaint since the developer said the tree was "diseased" so he had to knock it down. However, the tree was in perfect health; my daughter and I had watched that tree and the birds nesting in it for years. It was a magnificent tree.

This sort of behavior has been going on for decades in Yucca Valley and surrounding areas, leading to the destruction of tens of thousands Joshua trees, yuccas, and creosote that are all on the protected species list for the state of California. However, San Bernardino County and its developers have demonstrated they cannot be trusted to adhere to the requirements for protection of trees in place whenever possible. When not possible, Joshua trees and yuccas are required to be transplanted on site. When that isn't possible, they are required to be transplanted off site. These actions are not enforced and are used as a loophole to avoid the cost of adhering to the laws regarding protected native species.

Recently, we even have our San Bernardino County supervisor, Dawn Rowe, writing to the Yucca Valley Town Council asking them to oppose the listing. She is an ELECTED official, using her position to force a specific action by a town council. Further, the town council, made op of developers and realtors, has posted on the government website – and included in the government newsletter – inflammatory fear speech coercing community members to write letters opposing the listing. This is at best unethical and at worst illegal as it is a tremendous conflict of interest.

Please use your position to protect our beautiful and threatened Joshua trees from those who want only to monetarily profit from their demise.

Sincerely,

Cindy Zacks
2017 JTNPA Minerva Hoyt Honoree
Field Ecology/Conservation of Natural Resources Instructor
Yucca Valley High School

Barrows, C. W., and M. L. Murphy-Mariscal. 2012. Modeling impacts of climate change on Joshua trees at their southern boundary: How scale impacts predictions. Biological Conservation 152:29–36.Bell, D. M., J. B. Bradford, and W. K. Lauenroth. 2014.

Sweet, et al. 2019. Congruence between future distribution models and empirical data for an iconic species at Joshua Tree National Park. Ecosphere, Volume 10(6), Article e02763.

July 19, 2020

Mr. Eric Sklar, President and Melissa Miler-Hensen
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090
Sent electronically to: fgc@fgc.ca.gov

Richard Macedo
Habitat Conservation Planning Branch Chief
California Department of Fish and Wildlife
P.O. Box 944209
Sacramento, CA 94244-2090
Sent electronically to: Richard.Macedo@wildlife.ca.gov

Support for Petition to List the Joshua Tree, Yucca brevifolia as threatented under the California Endangered Species Act

Dear Mr. Sklar, Ms Miller-Hensen and Mr. Macedo:

I appreciate the opportunity to provide comments on the Brendan Cummings/Center for Biodiversity, petition to list the Joshua Tree*, Yucca brevifolia*, as threatened under the California Endangered Species Act (Cummings 2019). The Joshua tree has long been the most iconic species of the Mojave Desert and can be considered a keystone species as it provides special habitat for the moths that pollinate it but also structural habitat for wildlife and for other plant species regeneration. Indeed, the Mohave Desert is often defined by the range of the Joshua Tree.

I am an ecologist, botanist and forester who spent nearly 10 years working on the Sequoia National Forest as an Environmental Scientist and project planner. The Sequoia National Forest and adjacent federal and non-federal lands include Joshua trees and habitat. I am familiar both with the Joshua tree, its habitat and threats to habitat and its continuing existence.

Brendan Cummings/Center for Biodiversity (Cummings 2019) submitted a petition to list the western Joshua tree (*Yucca brevifolia*) as Threatened pursuant to the California Endangered Species Act (California Fish and Game Code §§ 2050 et seq., CESA). The western Joshua tree (*Yucca brevifolia*), long recognized as a subspecies or variety (*Yucca brevifolia brevifolia*), has recently (Lenz 2007) been recognized as a full species distinct from its close relative, the eastern Joshua tree (*Yucca jaegeriana*) based on a different pollinator.

Yucca brevifolia exists in a precarious equilibrium. It has evolved an obligate mutualistic relationship with the yucca moth, *Tegeticula synthetica,* on which it depends for pollination. While *Yucca jaergeriana* has a different pollinator *Tegeticula antithetica (*Pellmyr and Segraves 2003). *Tegeticula synthetica* is a moth of the family Prodoxidae. It is found in the United States in the Mojave Desert in southern Nevada, south-eastern California and from south-western Utah to north-western Arizona. The habitat for *Tegeticula synthetica* consists of desert areas with *Yucca brevifolia* (Pellmyr and Segraves 2003). The adult *Tegeticula synthetica* do not feed but lay eggs in the developing seed pods of *Yucca brevifolia*. The larvae feed on the developing seeds of *Yucca brevifolia*. There is a balance between the seeds consumed by the larvae and the seeds remaining to be dispersed for reproduction. Larvae leave the mature *Yucca brevifolia* in a few weeks after eggs are laid and pupation of *Tegeticula synthetica* takes place in a cocoon in the soil (Davis 1967, Moisset 2020). The pupa will stay underground until the next spring. However, some pupae remain dormant for more than a year. If the yucca fails to bloom one year because of weather conditions, there will still be yucca moths around (Moisset 2020) barring disturbance.

Yucca brevifolia depends on the vagaries of rodent caching for seed dispersal. Only those seeds dispersed without consumption to sites within a narrow climate window and soil conditions will thrive. Lastly, Joshua trees are slow-growing, slow-reproducing plants and therefore respond very slowly to changes in their environment (Esque et al. 2015). *Yucca brevifolia* spends an extended period of time in a juvenile growth phase before it begins to bloom (Esque et al. 2015). *Yucca brevifolia* does not provide habitat for *Tegeticula synthetica* until it starts to bloom. *Yucca brevifolia* are long-lived; one population near St. George, Utah, had an estimated median age of 89 years, and five percent of that population are expected to reach 383 years of age (Gilliland et al. 2006). They have been described as "probably the oldest living things in the American southwest desert," with large trees estimated to be up to 300 years old (Johnson 1970). Some *Yucca brevifolia* are documented to be over 1,000 years old (Little 1950).

The Brendan Cummings/Center for Biodiversity petition (Cummings 2019) demonstrates that the western Joshua tree (*Yucca brevifolia*) is eligible for and warrants listing under CESA based on the factors specified in the statute and implementing regulations. Specifically, the western Joshua tree meets the definition of a "threatened species" since it is "a native species or subspecies of a ⋯ plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts (Cal. Fish & Game Code §2067).

While the Brendan Cummings/Center for Biodiversity petition (Cummings 2019) indicates that *Yucca brevifolia* is not at imminent risk of extinction, it still faces significant and growing threats, primarily from climate change, that ultimately threaten the viability of the species in all or a significant portion of its range in California in the foreseeable future; it consequently meets the definition of a "threatened species." Under CESA, a "threatened species" is "a native species or subspecies of a…plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts (Cal. Fish & Game Code §2067)". A plant is an "endangered species" when it is "in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Cal. Fish & Game §2062). Moreover, CDFW has concluded–and appellate courts have upheld–that when determining whether a species is threatened or endangered under CESA, the term "range" is construed to refer to the range of a species or subspecies *within* California, not the worldwide range of the species or subspecies (*California Forestry Assn. v. California Fish & Game Com.)* (2007) 156 Cal.App.4th

1535, 1550-551. This means that regardless of how *Y. brevifolia* may fair in Nevada, the Commission and CDFW can only consider the status and fate of the species in California.

The petition (Cummings 2019) details the current and foreseeable threats to the continued existence of the Joshua Tree. From further investigation on my part, neither the Bureau of Land Management (BLM) nor the any of the adjacent National Forests (Sequoia, Inyo, San Bernadino) have recognized the Joshua Tree as a sensitive species nor a species of conservation concern.

Jones and Goldrick (2015) summarize threats as: climate change is first among them; climate models indicate that by 2100, as much as 90% of Joshua tree habitat may disappear. Secondary and interacting threats include drought, pollution, invasive plants, and changing fire regimes.

Sirichia et al. (2018) writing for the US Fish and Wildlife Service discuss major threats as: clearing large swaths of the desert of vegetation is on-going for solar energy projects and for housing and other industrial development, increasing (OHV) recreation vehicle use and other recreational uses. (Sirichia et al. 2018) also include threats such as wildfire, increasing temperatures (both minimum and maximum), drought, and habitat loss that may affect the resiliency of each species. Available data indicate these threats can lead to individual mortality, especially to small-size plants less than 25 centimeters (10 inches) tall. In evaluating the petition from Wild Earth Guardians, (Jones and Goldrick 2015) they note that “these threats to individual trees are not likely influencing population resiliency on a population or species scale since there is no evidence to indicate any recent population size reductions or range contractions and limited demographic studies indicate recruitment is occurring. (Below I present data to the contrary.)

Cole et al. (2011) modeled predicted climate change within the range of *Yucca brevifolia* by combining a geostatistical analysis of 20th-century climates over its current range, future modeled climates, and paleoecological data showing its response to a past similar climate change. As climate rapidly warmed 11,700 years ago, the range of Joshua tree contracted, leaving only the populations near what had been its northernmost limit. Its ability to spread northward into new suitable habitats after this time may have been inhibited by the somewhat earlier extinction of megafaunal dispersers, especially the Shasta ground sloth. They applied a model of climate suitability for the Joshua tree, developed from its 20th-century range and climates, to future climates modeled through a set of six individual general circulation models (GCM) and one suite of 22 models for the late 21st century. All distribution data, observed climate data, and future GCM results were scaled to spatial grids of ;1 km and ;4 km in order to facilitate application within this topographically complex region. All of the models project the future elimination of Joshua tree throughout most of the southern portions of its current range. **This represents the potential for a major range reduction in the future.**

During the Pleistocene, *Yucca brevifolia* had a more expansive distribution, occurring in middens as far south as Organ Pipe National Monument, as far north as the Amargosa Desert and Sheep Range of southern Nevada and as far east as the Waterman Mountains of southern Arizona, whereas its subsequent Holocene history has been one of contraction from the southern and eastern limits of its Pleistocene range (Holmgren et al. 2009). **This represents a major range reduction in the past.**

While almost all authors recognize the current importance of rodent seed dispersal, several have hypothesized that the large effort in fruit production by Joshua trees without a specialized dispersal agent may indicate that current fruit production is an evolutionarily relict designed to attract a now extinct megaherbivore dispersal agent, with Cole et al. (2011) identifying ground sloths and Lenz (2007) suggesting Columbian mammoths. Cole et al. (2011) note that evidence supports “the concept that the species’ current mobility is constrained by the earlier extinction of the Shasta ground sloth and other possible seed vector(s).” **This lack of a dispersal agent that would expand the current range is evident in the current distribution of *Yucca brevifolia and contributes to the range reduction discussed above*.**

Yucca brevifolia has been recognized as separate from *Yucca jaegeriana* (Lenz 2007). Sirichia et al. (2018) indicate that: *Yucca brevifolia* currently occurs in two regional populations across 5 million acres of habitat supporting resource needs in the western Mojave and southern Great Basin Deserts. *Yucca jaegeriana* currently occurs in three regional populations across 6.3 million acres of habitat supporting resource needs in the eastern Mojave, southern Great Basin, and western Sonoran Deserts. They also identified a Hybrid Zone (131,107 acres) to designate the area where both species occur together on the landscape, along with their obligate pollinating moths, and where hybrid trees occur. So rather than seeing *Yucca brevifolia* as occupying 11.3-11.4 million acres, *Yucca brevifolia* is now known to only occupy at most 5 million acres with much of that habitat unoccupied by individuals as *Yucca brevifolia* is known to occur widely spaced. **This represents an additional range reduction for *Yucca brevifolia*.**

Wildfire poses several threats to *Yucca brevifolia*. *Yucca brevifolia* burns readily as do the nurse plants that facilitate seedling development (Cummings 2019). Wildfire can result in the rapid recruitment of invasive vegetative species particularly grasses that burn easily. This can start a cycle of frequent wildfires that prevents the re-establishment of nurse plants and *Yucca brevifolia*. Brittingham and Walker (2000) investigated regeneration of *Yucca brevifolia* and found that a large majority of seedlings were found growing under the canopy of other woody shrubs. Local presence of specific perennial shrubs resulted in higher levels of recruitment. Brooks et al. (2018) indicate that *Yucca brevifolia* populations along the extreme western edge of the desert bioregion near the Sierra Nevada and Transverse Ranges often re-sprout and survive more readily after fire than populations further east. A cycle of relatively frequent fire and re-sprouting can result in short, dense clusters of Joshua tree clones, such as those found near Walker Pass, in the western end of the Antelope Valley, and in pinyon-juniper woodlands at ecotones with the Transverse Ranges such as Cajon Pass. High re-sprouting rates of Joshua trees in these areas may have evolved in local ecotypes that became adapted to shorter fire return intervals along the western desert ecotones than in other parts of the desert bioregion. Recruitment of new Joshua trees into burned areas is infrequent and slow. In one study, no seedlings or saplings were observed in burned areas less than 10 years old, and fewer than 10 individuals per hectare were present on burned areas more than 40 years old in Joshua Tree National Park (Brooks et al. 2018). Another study found that Joshua trees were still rare on a site 65 years after a fire (Vamstad and Rotenberry 2010). **Any long or continued absence of regeneration can represent an additional, on-going reduction in range.**

The amount and extent of cloning appears to be increasing and accompanies the trend toward absence of successful regeneration at the lower elevation margins of the current range of *Yucca brevifolia.* The extent of cloning apparently increases with increased elevation, with *Yucca brevifolia* in low-elevation dry areas rarely forming more than 1 or 2 stems, but 2 to 3 stems are common, and some clumps are found, in higher, moister areas. A mix of temperature, high winds and abundant snowfall, as well as fire, may be the causal mechanisms of higher levels of Joshua tree cloning (Gucker 2006). In a study following a large fire in Joshua Tree National Park in 1999, DeFalco et al. (2010) found that 33% of plants that were censused in burned areas sprouted from the root crown or stem after the fire compared with 15% in unburned areas. Recently, Harrower and Gilbert (2018) found enhanced clonality and lack of seedling recruitment on the lower elevation margins of the Joshua tree range in addition to the previously reported prevalence of cloning at higher elevation sites. **This represents an additional, on-going range reduction.**

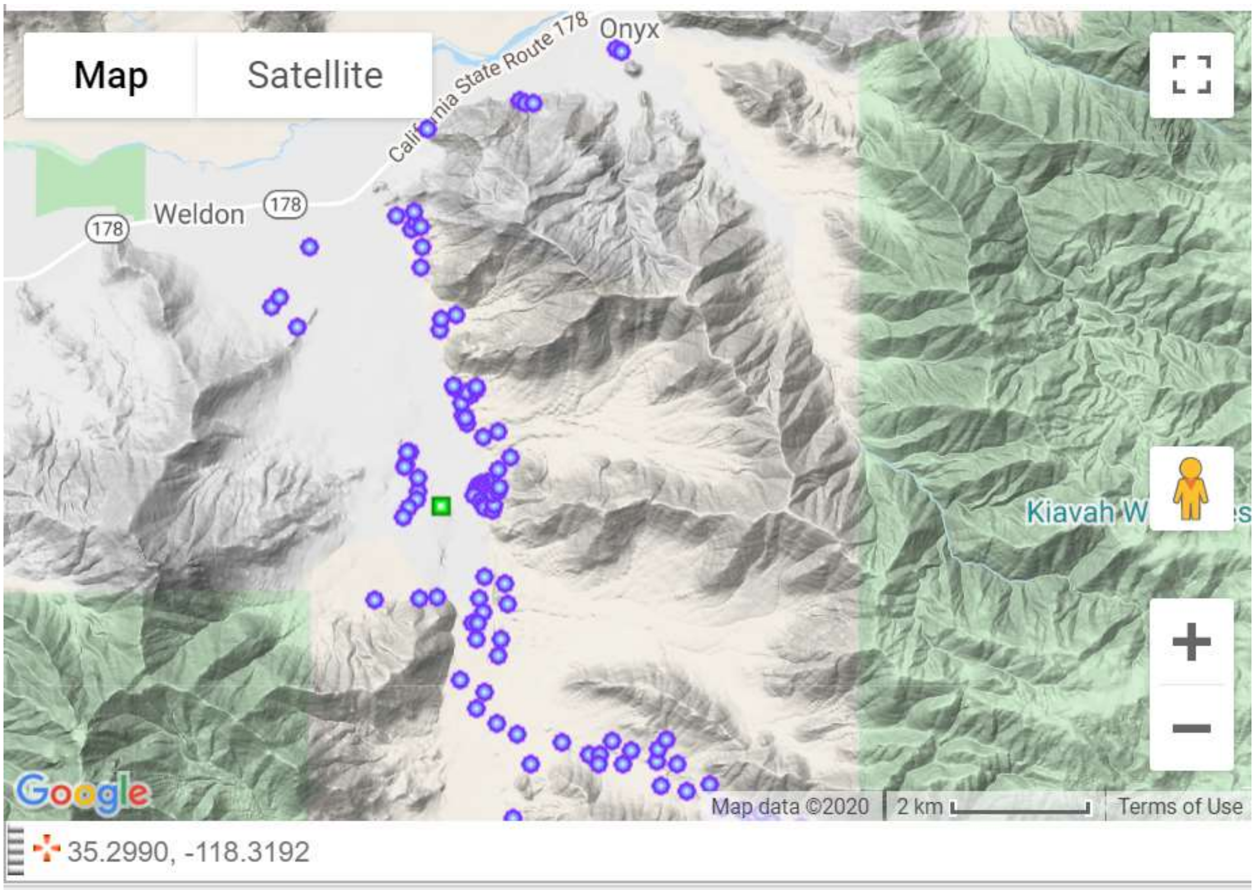
While few studies have discussed threats to its pollinator and its life cycle, many of the threats to *Yucca brevifolia* apply to also to *Tegeticula synthetica.* The moth would seem to be particularly to sensitive to influences to the soil including disturbance from development, recreation, wildfire, invasive vegetation species, air pollution and climate change. COSEWIC (2013) evaluated threats to Yucca moths associated with soapweed *Yucca glauca* and which have a similar life cycle to *Tegeticual synthetica.* They identified threats as dispersal ability, maintaining population size if *Yucca glauca* populations decrease in size, repeated reproductive failure of the Yucca plant over a 25-30 year period, ants, competing Yucca moths such as *Prodoxus quinquepunctellus,* the Five-spotted Bogus Yucca Moth, competing grasses, herbivory of Yucca plants and blossoms, development, OHV and other recreational use. **Any reduction in the moth would result in a reduction in *Yucca brevifolia* reproduction which would represent a reduction/contraction of its range. Other seemingly abundant insects have suddenly gone extinct from soil disturbance e.g. the Rocky Mountain Locust (Lockwood and DeBrey 1990).**

There is a lack of complete inventory data for *Yucca brevifolia*. Occurrence data in CalFlora (2020) shows occurrences mainly by roadsides in valley bottoms, while aerial photos as displayed in Goggle-Earth show *Yucca brevifolia* plants on midslopes as well.

Figure1. Probable *Yucca brevifolia* on uplands south of Weldon, California.

Source: Kathleen S. Roche 2020a. Prepared from Google Earth Image 07/18/2020.

Calflora data for *Yucca brevifolia* south of Weldon, CA.



Source: Kathleen S. Roche 2020b. Prepared from Calflora 07/18/2020.

However, a better inventory is unlikely to expand the known range of *Yucca brevifolia*.

The threats and trends discussed amply support the listing of *Yucca brevifolia* as endangered under the California Endangered Species Act.

Thank you for this opportunity to show support for listing the Joshua Tree, *Yucca brevifolia*, as threatened under the California Endangered Species Act.

Kathleen S Roche

Kathleen S. Roche

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Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244

In support of the CESA Candidacy for Western Joshua Tree
Submitted via email June 9, 2020

Dear President Sklar,

As a landscape designer and horticulturalist, I would like to emphasize the recruitment and survival challenges facing the western Joshua tree (Yucca brevifolia ssp. brevifolia). During my research in Joshua Tree National Park and other field studies in Morongo Valley from 2014 – 2019, I have observed limited survival of young species in the wild in this region. In cultivation, container stock of seed grown species tends to survive well if the plants are caged and regularly irrigated and monitored. In general, germination in greenhouse conditions and in the wild can be high, but survival following germination is low due to a wide range of factors including climatic factors, soil conditions, and herbivory. Transplanting of moderately sized individuals tends to be variable, but possible. Transplanting of large mature species and pups is significantly less successful.

Esque and other researchers have observed challenges over time for the survival of seedlings. In a field study conducted over several decades, researchers observed that when precipitation was low, almost half of the Joshua Tree seedlings within the field site were consumed by the Black-tailed Jackrabbit (Esque et al., 2015). After twenty years, only 1/5 of the plants remained and those that remained were the ones that grew more than nine inches in height as seedlings (Esque et al., 2015, 87). These researchers also observed the role of nurse plants in the survival of Joshua tree seedlings. In specific, after the first year only 1/3 of the plants at the edge of the perennials survived whereas ¾ of the plants under perennials were still alive (Esque et al., 2015, 87). Similarly, in a different study by Reynolds and others (2012) that compared uncaged to caged species, researchers found that the impact of rodents on seedlings was incredibly significant, thus limiting seedling survival overall.

Fire may potentially be one of the most significant negative effects of climate change throughout California and it is particularly detrimental for desert regions where plants have not evolved to resprout. A study in 2010 by Defalco and others (2010) of the Juniper Fire Complex, researchers observed that the burned species at the lower elevation test sites declined faster than burned species at higher elevations. After five years, amongst the test sites, 80% of the burned Joshua Trees died and only 26% of the unburned species died due to other conditions like drought or consumption (Defalco et al., 2010). The small Joshua Trees (up to 1 meter) experienced the greatest amount of loss during fire because they are more vulnerable to the intense heat close to the ground (Esque 2004). In addition, fire dramatically reduces the storage of seeds in the ground and the understory plant canopies, thus making it more difficult for species to reproduce and survive (Esque, Young, & Tracy 2010). All these factors contribute to the slow recovery rate of the Joshua Tree following disturbance.

These added challenges combined with the negative effects resulting from climate change, which have been acknowledged in the petition, such as fire, drought, and temperature increases prose difficulty for the survival of the species at its southern border (Barrows and Murphy-Mariscal 2012). An elevated state of protection for the species, may be remarkably successful in encouraging more cautious and thoughtful planning when it comes to site design and layout. I would like to emphasize the benefits of careful site planning that strives to integrate development into the landscape while preserving as much of the terrain, understory plants, and Joshua trees as possible because this unique landscape has significant ecological and aesthetic value.

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Thank you!

Sincerely,
Marinna Wagner
[redacted]

From: Alec Goodman
Sent: Thursday, June 11, 2020 3:40 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Western Joshua tree protection

California Fish and Game Commission,

My name is Alec Goodman. I am a wildlife biologist working with sensitive species in the vast Mojave desert. I am writing this email to urge you to support the recommendations of the California Department of Fish and Wildlife and vote YES for the advancement to candidacy status for the western Joshua tree under the California Endangered Species act. This iconic plant is beneficial not only to the ecosystem it resides in but also economically, attracting thousands of visitors and stimulating local communities. There are many threats facing this species, and I have personally seen huge areas of Joshua tree woodlands - which can support a number of other sensitive species - bulldozed for development projects. But there are also a number of other threats that we are still grasping their full effects such as climate change and a changing fire regime due to non native grasses in the desert. Listing this species would lend it protection and give it a fighting chance at a time when the species population is predicted to decline throughout most of its range. Protection of this species protects the desert as a whole, providing habitat for other species including the desert tortoise and Mojave ground squirrel among many others, conserving scenic desert vistas, battling urban sprawl, and preserving the economic benefits of ecotourism associated with Joshua trees and desert wild lands.
I hope that you see the importance of protecting this special desert resident and vote for its increased level of protection.

Thank you.

Alec Goodman

From: MARIJA MINIC
Sent: Tuesday, August 4, 2020 12:20 PM**To:** FGC <FGC@fgc.ca.gov>
Subject: Consideration of Western Joshua Tree as a "Threatened Species" pursuant to the California Endangered Species Act (C.E.S.A.).

Hello,

My name is Marija Minić and I currently work as an Authorized Mojave Desert Tortoise (Gophurus agassizii) biologist here in Needles, California. I wanted to comment on the consideration of the Western Joshua Tree (Yucca brevifolia) being listed as "Threatened" pursuant to the California Endangered Species Act (C.E.S.A.). This important species is under a barrage of threats, including climate change impacts, wildfire risk, and large-scale development projects. Four published studies have concluded that without intervention, climate change alone creates a high risk of losing western Joshua tree habitat almost entirely.

The presence of the Western Joshua Tree benefits our economy. Its iconic presence attracts people to visit, live and work in the high desert. Its protection will encourage responsible development, preventing urban sprawl and overcrowding, increase property values, and preserve the rural quality of life which attracts people to our area.

While some protection is provided by local ordinances, these are inadequate to respond to the multitude of threats that could lead to its disappearance. Not all Joshua Trees are within National Park and National Monument boundaries. In fact, 40% of Joshua Tree habitat is on private land, where it has only modest protection at best. We are at a critical juncture for the Western Joshua Tree. A collection of scientific studies predict the widespread decline of this iconic endemic species.

Joshua Trees don't grow anywhere else on Earth. They attract visitors and new residents which, in turn, support our economy. In 2018, visitors to the National Park created an economic benefit of nearly $196 million both within the Park and its vicinity — that's almost double the expenditure in 2014. For the local communities adjacent to the Park, 1,823 jobs were related to visitation.

Attracted by the area's scenic beauty and Joshua Trees, the real estate market in the Joshua Tree/Yucca Valley region has steadily increased. New residents generally are not seeking a home in densely developed areas such as a subdivision, but instead are looking for a more rural lifestyle, ideally with proximity to the National Park, and Joshua Trees are a very desirable feature.

We recognize that the rapid growth of our communities and the dramatic increase in visitation at the National Park has resulted in its own issues such as traffic. These issues need to be addressed, but protection of the Joshua Tree will help, not hurt those communities. Its listing will encourage local governments to develop a regional approach to conservation through a Natural Communities Conservation Plan. These plans focus on the conservation of large undeveloped areas, while encouraging new development on vacant land in already developed areas. This helps prevent sprawl and overdevelopment.

Thank you for taking the time to read my letter!

Sincerely yours,

Marija Minić

REED COLLEGE

BIOLOGY DEPARTMENT
3203 SE Woodstock Boulevard, Portland, Oregon 97202-8199
phone: 503-777-7239 fax: 503-777-7239

August 5, 2020

Eric Sklar
President of California Fish and Wildlife

Dear Mr. Sklar:

Why protect the Western Joshua Tree (*Yucca brevifolia*?)

Joshua Trees may appear to be quite abundant and widespread if you live in the Mojave Desert, so why put burdens on land developers? In fact they are rare when seen through a wider lens. They only live in the Mojave Desert, giving the desert it's unique value in terms of tourism and recreation let alone quality of life for those who are fortunate enough to live there. Their inherent value as a keystone for plants and animals in the Mojave is well documented and beyond question. Once a tree is gone there is one less tree. The incremental loss is unidirectional especially in light of uncertainties concerning the tree's ability to reproduce and adapt in a changing world. I urge you to approve protecting the Western Joshua Tree and take a stand that makes sense both economically and scientifically.

Thank you.

Sincerely,

Robert Kaplan

Robert H. Kaplan, Ph. D.
Professor of Biology Emeritus
[redacted]
Joshua Tree, CA [redacted]
[redacted]

REED COLLEGE CENTENNIAL 100 1911–2011

Ernesto Nevarez
[redacted]
Morongo Valley, [redacted]

Original on file,
received August 5, 2020

To: Eric Sklar
President of California Fish and Wildlife
fgc@fgc.ca.gov

Before the California Fish and Game Commission
Re: Petition to List the Western Joshua Tree (Yucca brevifolia) as Threatened under the California Endangered Species Act (CESA)

I support the listing of the Western Joshua Tree as Threatened under CESA. Even those that are against the listing, such as the Town of Yucca Valley mean well for the tree but have a position that the tree can best be protected by having it done at a local level. It is the intent of my written testimony to objectively present the recent practices of the Town of Yucca Valley and their failure to protect any trees at all. My presentation will be based on the copies of the permit applications for this calendar year which the Town of Yucca Valley provided to me under a Freedom of Information Act request. The files as given to me have been attached for your reference.

The application (Native Plant Permit Application) is a one page document which lists the number of Joshua Trees to be destroyed, relocated or trimmed. It also lists other endangered plants not an issue in this proceeding. A simple signature by the alleged property owner is all that is required. There is no certification of any sort that the information is correct or that the relocation would be done. Also, there is no verification done by the town to confirm that the applicant is the property owner, no inspection of the conditions of the trees and no documentation that the trees had been relocated or where they were relocated. I have attached a list of the dates the permits were submitted and when they were approved or denied. None of the 147 permits applied for this year were denied and all were approved upon filing without any changes, all having the same date for the filing date and the approval date. I have attached a list of dates on the 147 permit applications submitted/approved this year. See PDF file Processing Dates.

The staff that “reviewed” these permit applications were a handful of office clerks and a supervisor that had no credentials to make decisions on which trees were to live or die. The only skill exercised was to rubber stamp all applications without any question nor changes. The staff lacked proper supervision and there was no accountability for the quality of their work. Of the 147 permits issued this year, 68 of the permits were based on photos in the file according to the staff notes on the permits. Only 24 of the files include any photos at all, a discrepancy of 44 cases with missing photos. Either the staff fabricated the information in order to approve the permit on the spot or they were incompetent in documenting their decisions by saving the alleged exhibits. I would hate to allege any fabrication and would only suggest incompetence.

This inability to professionally process the permit applications, both by staff and the Town Council itself, has come at a great price to the Western Joshua Tree population. From January 1, 2020 through July 22, 2020 here are the statistics:

Destroyed (killed)	213	
Relocated on-site	122	less than 10% survival rate
Relocated off-site	47	less than 10% survival rate
Doomed trees	382	

Again, these statistics come from the actual permits issued this year. Not a single permit was denied in whole nor in part. This was a rubberstamp operation with no regards for saving any of the trees.

I ask the Commission to take caution on any testimony by the Town of Yucca Valley. The attached reports come from the actual permits which are also attached. Quite possibly you will hear as to how the town has specific regulations in place to protect the tree but what good are they if they are not enforced? If it is true that there are such rules in place and they are not enforced it says a lot as to the intent of the town not to protect the trees. None of the permit requests make any references to any of the rules, especially not since there were no permits denied or altered. The Town of Yucca Valley is not capable of enforcing its' own rules. The Town Clerk confirms the Town's inability and lack of interest in protecting the trees;

> *Further, the Town has searched for potentially responsive records concerning service requests and reports of potential violations, service requests, and reports of tree removals, citations, fines, and prosecutions for violating the Town's ordinances concerning the removal of Joshua Trees during the last three years; however, no such records were found.*
> (From the file Town Clerk)

Please do not allow the Town of Yucca Valley to continue the slaughter of OUR trees.

Respectfully,

Ernesto Jesus Nevarez
August 4, 2020

Chad Dibble
Deputy Director Ecosystem Conservation Division
chad.dibble@wildlife.ca.gov

Stafford Lehr
Deputy Director Wildlife and Fisheries Division
stafford.lehr@wildlife.ca.gov

Wendy Bogdan
General Counsel Office of the General Counsel
wendy.bogdan@wildlife.ca.gov

Joshua Tree Permits

				Relocated			
Case #	Received	Address	Killed	On-site	Off-site	Protected	Trimmed
20-001	1/2/2020	[redacted] Tr	1				1
20-002	1/2/2020	[redacted] ave					3
20-003	1/2/2020	[redacted] hwy					1
20-004	1/2/2020	[redacted] hwy	1				
20-005	1/2/2020	[redacted] ave	1				
20-006	1/6/2020	[redacted] ave	1				
20-007	1/6/2020	[redacted] ave	1		1		
20-008	1/6/2020	[redacted] ave	2				
20-009	1/9/2020	[redacted] Rd	2				
20-010	1/9/2020	[redacted] Trail	1				
20-011	1/9/2020	[redacted] Dr	1				
20-012	1/13/2020	[redacted] dr					3
20-013	1/13/2020	[redacted] Dr.	1				
20-014	1/13/2020	[redacted]					1
20-015	1/15/2020	[redacted] ave	1				
20-016	1/20/2020	Same as above					3
20-017	1/23/2020	[redacted]					1
20-019	1/28/2020	[redacted] Dr	3				
20-020	1/28/2020	[redacted]	1				
20-021	1/28/2020	[redacted]	1				
20-022	1/28/2020	[redacted]	9			10	
20-023	2/4/2020	[redacted]	2		2		
20-024	2/5/2020	[redacted] [redacted] ave					1
20-025	2/10/2020	[redacted] Rd	1				
20-026	2/10/2020	[redacted] dr	1				
20-027	2/11/2020	[redacted] Trail					5
20-028	2/12/2020	[redacted] Trail					1
20-029	2/19/2020	[redacted] ave					1
20-030	2/24/2020	[redacted] Drive	1				
20-031	2/24/2020	[redacted] Lane		3			1
20-032	2/25/2020	[redacted] ave	1				
20-033	2/25/2020	[redacted] Trail	1		1		1
20-034	2/25/2020	On Pueblo, between Hopi and Bannock	12				
20-035	2/24/2020	[redacted] Lane					2
20-036	2/25/2020	[redacted]a[redacted] Way					3
20-037	3/3/2020		4				
20-038	2/27/2020	[redacted]					2
20-039	3/2/2020	[redacted] ave	2				
20-040	3/2/2020	[redacted] dr	2	2			
20-041	3/4/2020	[redacted]rail	2				
20-042	3/3/2020	[redacted]ve	3				
20-043	3/4/2020	[redacted] Trail		6	2		
20-044	3/11/2020	[redacted] Lane					3
20-045	3/11/2020						
20-046	3/12/2020	[redacted] ave	6		6		
20-047	3/17/2020	[redacted] Rod	1		1		
20-048	3/17/2020	[redacted] Dr	2				
20-049							
20-050	3/18/[redacted]	[redacted] dr					1
20-051		Burrtec	37	96			
20-052		[redacted] Dr					
20-053	3/26/2020	[redacted] Drive	1		1		
20-054	3/30/2020	[redacted] Trail				4	
20-055	4/13/2020	[redacted] ave	1				
20-056	4/14/2020	[redacted] Dr	13			15	
20-057	4/15/2020	[redacted] ave	4				
20-058	4/16/2020	[redacted] Ave	1				
20-059	4/28/2020	[redacted]	1				
20-060	5/4/2020	[redacted]					1
20-061	5/4/2020	[redacted] ave					2
20-062	5/5/2020	[redacted]	1				4
20-063	5/11/2020	[redacted]	2				1

Joshua Tree Permits

Case #	Received	Address	Killed	Relocated		Protected	Trimmed
				On-site	Off-site		
20-064	5/12/2020	[redacted] Tr					3
20-065	5/14/2020	[redacted]			5		
20-066	5/18/2020	[redacted]	4	5			
20-067	5/20/2020	[redacted]					2
20-068	5/21/2020	[redacted]	2				
20-069	6/28/2020	[redacted] Drive	1				
20-070	5/28/2020	[redacted] hwy	2				
20-071	5/28/2020	[redacted] hwy	2				
20-072	6/1/2020	southeast corner of Pueblo trail and ballock trail	1				
20-075	6/1/2020	Northeast corner of Pueblo trail and Geronimo Tr	1				
20-076	6/1/2020	North side of Pueblo tr 100 ft east of Geronomo	1				
20-077	6/1/2020	North side of Pueblo Tr, 100 ft east of Deer Trail					1
20-078	6/1/2020	north side of Pueblo tr 100 ft east of Cervec Trai	1				
20-079	6/1/2020	[redacted] hwy			1		
20-080	6/1/2020	[redacted] ave			1		1
20-081	6/1/2020	south side of Alley Way Rabbit Trail, Palm ave	1				
20-082	6/1/2020	[redacted] Radbit Trail	3				
20-083	6/1/2020	North side of Alleyway Rabbit trail	1				
20-084	6/2/2020	[redacted] Dr		3			
20-085	6/2/2020	[redacted] ave	2				1
20-086	6/5/2020	south side of Yucca Trail, west of Warren Vista	1				
20-087	6/8/2020	North side Yucca Trail at Alaba ave	1				
20-088	6/3/2020	[redacted] Trail	1				
20-089	6/3/2020	[redacted] Trail	1				
20-090	6/3/2020	[redacted] Way					1
20-091	6/3/2020	[redacted] dr	1				
20-092	6/3/2020	north side of Pueblo Trail, west of Geronimo Trail	1				
20-093	6/3/2020	[redacted] ave	1				
20-094	6/4/2020	[redacted]	2				
20-095	6/8/2020	[redacted] way	5				
20-096	6/8/2020	[redacted] ave					4
20-097	6/8/2020	[redacted]	1				
20-098	6/8/2020	[redacted] Drive	2				
20-099	6/8/2020	Little League dr and Grand avenue	1				
20-100	6/8/2020	Little League and Grand ave	1				
20-101	6/8/2020	Little league and Grand	1				
20-102	6/8/2020	Little League and Grand	1				
20-103	6/9/2020	[redacted] ave	2				
20-104	6/10/2020	[redacted] Dri					
20-105	6/15/2020	[redacted] dr					2
20-106	6/16/2020	[redacted] trail	1				
20-107	6/18/2020	[redacted] Dr	4	1		2	
20-108	6/18/2020	[redacted] ave	3	6		6	
20-109	6/18/2020	[redacted] Dr	1				
20-110	6/18/2020	[redacted] Tr					1
20-111	6/23/2020	Onaga and Palm			3		
20-112	6/23/2020	Onaga Trail and Palm			1		
20-113	6/23/2020	Onaga and Palm			1		
20-114	6/23/2020	Yucca Trail and Palm			1		
20-115	6/23/2020	Onaga and Palm			2		
20-116	6/23/2020	Onaga Trail and Palm	3				
20-117	6/23/2020	Onaga and Palm			2		
20-118	6/28/2020	Onaga trail and Palm			1		
20-119	6/23/2020	Onaga trail and Palm	6				

Joshua Tree Permits

Case #	Received	Address	Killed	Relocated On-site	Relocated Off-site	Protected	Trimmed
20-120	6/23/2020	Onaga Trail and Palm			1		
20-121	6/23/2020	Onaga trail and Palm	10				
20-122	6/23/2020	Onaga Trail and Palm			2		
20-124	6/23/2020	Onaga Trail and Palm	1				
20-125	6/23/2020	Onaga Trail and Palm			1		
20-126	6/23/2020	Onaga Trail and Palm			1		
20-127	6/23/2020	Onaga Trail and Palm			1		
20-128	6/23/2020	Onaga trail and Palm			1		
20-129	6/23/2020	Onaga Trail and Palm			1		
20-130	6/23/2020	[redacted] tr			1		
20-131	6/24/2020	[redacted]					
20-132	6/29/2020	[redacted] Ct					1
20-133	6/29/2020	[redacted] Dr	1				
20-134	6/29/2020	[redacted] Dr	1				
20-135	7/2/2020	[redacted] trail	1				
20-136	7/6/2020	[redacted]	1				
20-137	7/6/2020	[redacted] trail	1		1		
20-138	7/6/2020	[redacted] Trail					14
20-139	7/7/2020	[redacted] ave					
20-140	7/7/2020	[redacted]rail	1				
20-141	7/7/2020	[redacted] rd	1				
20-142	7/7/2020	[redacted] Dr	1				
20-143	7/8/2020	[redacted]rail	1				
20-144	7/13/2020	[redacted] Tr					4
20-145	7/16/2020	[redacted] ave					2
20-146	7/21/2020	[redacted] hwy	1				
20-147	7/22/2020	[redacted] tr			5		
		Total:	**213**	**122**	**47**	**37**	**79**

August 6, 2020

Mr. Eric Sklar
President
California Fish and Game Commission
P.O. Box 944209
Sacramento, California 94244-2090
Via email: fgc@fgc.ca.gov

Re: Strong Support for Candidacy for Western Joshua Tree as Threatened under the CESA

Dear Mr. Sklar:
I am a retired biologist educator living in Twentynine Palms in the Mojave Desert. To reach my home I drive east through the Morongo Basin and the Joshua tree studded town of Yucca Valley and the unincorporated community of Joshua Tree before losing the elevation which supports their namesake. We are all gateway to Joshua Tree National Park with economies that thrive because of the tree and the Park which protects them. In 2019 over 3 million visitors from countries around the world came to gaze at this tree in its natural woodland environment. They provided $201 million to the gateway economies.

You would think that Yucca Valley, the western most portal to this wonderland would do everything possible to protect this cash cow. Not so. Faced with development they rely on the California Native Plants Act and local ordinances. None act as a bar to tree removal only requiring transplantation, donation or making available for adoption trees removed from construction sites. The requirements are not enforced.

The local Hi-Desert Water District prepared a Mitigated Negative Declaration (MND) for their 10-year construction project to install 64 miles of sewer pipeline with 1,300 manholes and 3 lift stations within roadways and easements outside the core contiguous area of Yucca Valley, i.e. in Joshua tree woodland. An unknown number of Joshua trees would be sacrificed.

The CDFW provided the following comments in response to the MND.

> CDFW would like to note the Fish and Game Commission has received a petition to list Western Joshua Tree (*Yucca brevifolia*) as a threatened species under CESA. A decision will be made in June 2020. CDFW recommends Hi-Desert Water District reviews the listing status prior to finalizing the MND as it may affect the legality of BIO-6.
> If the Project, including the Project construction or any Project-related activity during the life of the Project, results in take of CESA-listed species, CDFW recommends that the Project proponent seek appropriate authorization prior to Project implementation through an ITP.

Local activists, such as myself, request strongly that the Western Joshua tree be listed as threatened under CESA. Current regulatory mechanisms are not adequate. We need the listing to effectively use CEQA to protect the survival and reproduction of the western Joshua Tree under siege from climate change.

Thank you for your consideration of these comments.

Pat Flanagan

Pat Flanagan
[redacted]
Twentynine Palms, [redacted]

Sent: Thursday, June 4, 2020 12:29 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Save the Joshua Trees.

To Whom It May Concern,

We are writing this letter to support listing Joshua Trees on the California Endangered Species List.

Being tax paying residents of Yucca Valley, what drew us to this high desert region (and literally millions of visitors who come yearly to the Joshua Tree National Park and to Yucca Valley as well) was and still it the beautiful and unique Joshua Trees. Never would we have thought that a group of 5 misguided city council members, who do not represent the greater community, oppose having the very trees which benefits and brings tourism to their city be opposed to the protection of these trees. However we are fully aware that their decision in this matter has to do with catering to developers who have long opposed the protection of these unique trees for their own greed. If you visit our city you will see empty lots of scaped land where once stood Joshua Trees illegally removed, many empty half developed projects all along the main road that never finished, and unfortunately present more blight then progress to our city. Unfortunately Yucca Valley City Council is known to it's residents as not representing its people but only their own personal interests which are shortsighted. The Joshua Trees are perhaps the only things that brings this community a sense of awe and beauty to this otherwise non descript desert region.

Being independent hospitality business owners in Yucca Valley, 100% of our guests come from all over this country and the world to the high desert specifically to see and be around these beautiful trees. They take years to mature, are fragile, and contribute to our ecosystems. Without their protection the town of Yucca Valley and neighboring towns would have nothing much to offer. We say with certainty that tourism would ebb and the effects of not protecting these trees would lead to their demise (which only purpose is to serve developers who most do not even reside in our communities) and would drastically change the entire landscape of our desert.

Please we implore you to support the listing of the Joshua Tree and oppose the City Council of Yucca Valley myopic and immediate for profit mind set to not list them. We hope that in good conscious in your decision making as protectors of the environment and this planet, you will not allow the greed of the Yucca Valley 5 City Council members to determine the faith and future of these magnificent and unique trees for the millions others who travel the world to experience them and for future generations.

With warm Regards,

Shirley Perl
Billy Shire

Subject: Western Joshua Tree Listing

7/30/2020

From: M Sims

CC: FGC <FGC@fgc.ca.gov>; Dibble, Chad@Wildlife <Chad.Dibble@wildlife.ca.gov>; Lehr, Stafford@Wildlife <Stafford.Lehr@wildlife.ca.gov>; Bogdan, Wendy@Wildlife <Wendy.Bogdan@wildlife.ca.gov>; Isabal.Baer@wildlife.ca.gov

I am writing to you to change the listing for the Western Joshua Tree to endangered. I support CESA protection.

If something isn't done soon future generations may not be able to enjoy a truly unique desert landscape that includes Joshua trees.

I live in Yucca Valley California and even though the city has restrictions and many rules in place to keep Joshua tree destruction from development to a minimum, the rules are rarely followed and even more rarely, enforced.

What typically happens is the land is clear cut of all desert vegetation with few exceptions.

Mike Sims
Yucca Valley, California

Who is Protecting the Joshua Trees?

6/24/20

From: Casey Kiernan

To: Dibble, Chad@Wildlife <Chad.Dibble@wildlife.ca.gov>; FGC <FGC@fgc.ca.gov>; Bogdan, Wendy@Wildlife <Wendy.Bogdan@wildlife.ca.gov>; Lehr, Stafford@Wildlife Stafford.Lehr@wildlife.ca.gov

Hello;

The Joshua Tree habitat is threatened by climate change, urban development and wildfires - but no one is charged with protecting them against these threats.

Those who opposed doing a study are clearly NOT interested in protecting the Joshua Trees. In fact, local communities are disincentivized to protecting the Joshua Trees - because they are driven by tax revenue.

It's shocking to see such opposition!!

Please help protect the Joshua Trees!

https://youtu.be/sSxBRvpAd9A

Thank you!

Casey Kiernan

I was born in California. I have lived in Joshua Tree for 5 years - and I have been coming to the park since the 1970's. I am a landscape photographer - I teach workshops in Joshua Tree and Death Valley National Parks.

From: Hyeonjin Park
Sent: Thursday, August 6, 2020 4:58 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Re: Public Comment for 19-20 August CA FGC Meeting

To Whom It May Concern:

I am writing to you today to ask that you please vote **YES** to designate the western Joshua Tree as a candidate for formal protection under the California Endangered Species Act.

40 percent of this endemic species' habitat is on private land, has no other habitat on earth, and the area has an economic dependence on its scenic attributes that attract tourism as well as buyers to regional real estate markets. With this widespread decline, the *Yucca brevifolia*, otherwise known as the Joshua Tree, is in desperate need of added protection more than ever.

While I recently moved to Southern California for my graduate studies, I have visited Joshua Tree National Park (JTNP) on multiple occasions. Every visit, JTNP never failed to take my breath away. During the period of the federal government shutdown from December 2018 to January 2019, I was heartbroken and enraged to find out that the National Park was desecrated, with burn markings on and near historic petroglyphs and timeless rock formations; trash and litter scattered to the wind; and, worst of all, damaged and destroyed Joshua Trees. As it is, the park superintendent, Curt Sauer, has been quoted that it could take up to **300 years** for wildlife to recover from the damages done in the span of a month. However, we must consider all of the existing threats that our world is currently facing, both natural and manmade: natural disasters such as wildfires and earthquakes; climate change; large-scale developments, and human traffic through this park— In far less than 300 years—perhaps even less than 50 years—the Joshua Tree could easily be extinct without protections under the California Endangered Species Act.

It is our responsibility—especially as main contributors to their endangerment—that we protect the Joshua Tree and, ultimately, the environment that depends on this species. They are vital to the lives of the yucca moth (*Tegeticula synthetica*), which are the only species of moth that can pollinate it. They are a vital part of the ecosystem to dozens of species including but not limited to rodents, birds of prey, reptiles, arachnids, and insects. From a human's perspective, we lose a cultural landmark; a valuable resource that was treasured by the Cahuilla and call it *hunuvat chiy'a* or *humwichawa*; and the opportunity for future generations to see an incredibly unique species to this region.

We must do everything we can to protect the Joshua Tree. I once again urge you to vote **YES** to advance the candidacy of this species as endangered and, ultimately, fall under the protection of the California Endangered Species Act.

Best wishes,

Hyeonjin Park, M.A.
Ph.D. Student, Musicology
UCLA Herb Alpert School of Music
Pronouns: they/them

President Eric Sklar
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Submitted via email August 6, 2020
Letter supplementing comments of June 10, 2020

Re: Support for Western Joshua tree petition

Dear President Sklar,

Thank you for entertaining my perspectives in support of this petition. I'd also like to express my appreciation to Director Bonham for his June 25 invitation, urging primary stakeholders to explore existing pathways. Hopefully, the value of working in conjunction with the Department was recognized and meaningful long term policies are in the process of being formed. In a previous letter, I asserted that much of the controversy surrounding this petition might have been avoided through reasonable public education by local officials, and I continue to maintain this position. Protections do exist as claimed, but opaquely and only on paper. In daily practice, this confusion manifests as permission to disregard protections entirely.

I commented at the last meeting regarding the contractor who suggested killing a few trees with gasoline to insure land use entitlements. Reactions were strong, and included a call from the Third District office to name the individual. I declined. From this experience, I learned that people are generally unaware of the widespread nature of this mindset, and the role that do-or-die messaging plays in promoting extreme behavior. My spa vendor was asked by a customer if chlorine would work. Personally I find such techniques amoral. But the point of these anecdotes is not to vilify isolated individuals, who cannot be blamed for taking their cues from sanctioned activities. In a strictly collateral sense, the use chemicals to expedite the removal of individual specimens is less detrimental than the unchecked practice of scraping entire parcels as condoned under permits.

Local lack of a state supported conservation plan leaves room for the creation of a policy that centers around a reward system for voluntary conservation. This is far more manageable than the norm of inconsistently enforced, punitive ordinances. Using round numbers for simplicity, imagine that a parcel has ten Joshua trees, and the tree-related fees are determined to be $10,000. Fees could be held in escrow until project completion. Based on ten trees, for each of the reproduction age trees left undisturbed, an 6-8% credit is applied. For smaller, unbranched trees translocated under proper conditions through an adoption program, a 3% credit is applied (lower percentage since survival rates of transplanted trees are low: administer translocations through a state endorsed non-profit as is done in Arizona with Saguaro). Simple pre construction adjustments, such as driveway or septic placements, could positively impact species conservation while benefitting the developer's bottom line. I recently test drove the approach for a local development group (combined assets in excess of 50 income properties). Within our ranks, it was greeted as a win-win. There must be numerous incentivizing options that would support the legal intention of authorized take as truly incidental. Leadership that drafts a workable compromise policy would be held in esteem across their constituencies.

Messaging the loss of personal property rights predictably triggers hostility within rural communities. Exacerbating this atmosphere of conflict is AB235, deemed by the author as urgent for public peace: ironically, it inflames the very anxiety that it's proposing to quell, which was set in motion by the tone of jurisdictional messaging in the first place.

Clearly, this petition and the ambitions of AB235 are closely linked. As law, AB235 would force the Commission away from its role as a discrete wildlife and science based agency and transform it into an ineffectual Everything Burger Commission. The bill is fiscally irresponsible, proposing to flush away the spent resources of numerous candidacy processes by introducing irrelevant new considerations. But most tragic of all, as law AB235 would codify shoot-shovel practices. Driven by uncertainty over listing determinations, some will feel panicked or resentful, and be compelled to obliterate any evidence of imperiled species irregardless of need, thinking a candidacy year to be a last chance.

A several year long public process led up to Yucca Valley's Native Plant Ordinance, which was abruptly amended in a closed door town council session shortly before a large residential project broke ground and hundreds of mature trees were removed. In 2007, I signed onto an illusive San Bernadino County Joshua tree plant adoption list. Since I have ongoing habitat restorations at several properties and the adoption system does not seem to be functional, I've taken up a practice that I call "drive by gardening", which involves pulling over at the sight of a bulldozer. Translocations are an unsatisfactory last resort, but superior to the alternative of seeing trees disposed. Where my triage falls along the spectrum of legality is as unclear to me as the removals are to those clearing lots. Displacing natives solely for cosmetic landscaping purposes cannot be allowed, but these drive bys have resulted in rescuing *Y. brevifolia* from dump piles, dump trailers, and from the dump itself. Because trees must be moved quickly, there is never enough time to react properly with a hired tree spade: meanwhile, the only spade in the area has not been called upon to move a Joshua Tree in over two years. Of the more than two dozen *Y. brevifolias* that I've moved by different methods at different times, some trees have prevailed, but many have succumbed. These translocations have produced an incomplete but empirical understanding of likely conditions for success and failure, and I would welcome the opportunity to volunteer my field knowledge for incorporation into sensible ordinance guidelines.

Furthermore, I've scattered thousands of seeds into the nurse plants that make natural recruitment even the remotest of possibilities. I've installed seed in man made catchments that are tended and caged. Consistent with scientific studies, germination rates are high but only a handful persist to yearlings, and to date a mere four or five seed raised individuals show any assurances of maybe reaching reproduction age - and if they do, their flowering is a condition that I will not witness in my lifetime. First hand observation of low recruitment rates underlines the fact that every Joshua tree is the most unlikely of miracles, and the protection of existing trees is a serious affair. As a keystone species, they must be retained if we hold any desire to preserve an entire ecosystem on landscape scale.

And so I dumpster dive or scatter seeds, hoping that maybe *this one* survives past its first, third, fourth year, and improbably even persist to maturity. Gambling against unfavorable stochastic events and the whims of future land owners, I call representatives, read legal documents, and write letters to this Commission. At times it feels like the futile acts of a crazy person, knowing that somewhere nearby there's a decent probability that an entire tract of *Y. brevifolia,* representing thousands of years of collective growth, is being churned under on any given day.

Respectfully,

Miriam Seger
[redacted].
Joshua Tree, [redacted]

-seed collected in parking lots, trees found discarded, removed or in process of removal
-these photos are a sampling from 14 years of personal rescue and restoration efforts

Mr. Eric Sklar
President
California Fish and Wildlife Commission
P.O. Box 944209
Sacramento, CA 94244-2090

RE: Strong Support of CESA Candidacy for Western Joshua Tree

Submitted via email June 10, 2020

Dear President Sklar,

As a developer and conservationist with seven figure capital assets in California's high desert, my holdings consist of commercial, residential, and open land properties. I specifically chose to invest in the Morongo Basin for the "intangible asset value" of its landscape and natural processes, and the erosion of these attributes negatively affects the worth of my portfolio. To describe my business model in biological terms, investments coupled with conservation are a lucrative form of obligate mutualism, and I'm part of a community of local businesspeople who benefit from this strategy.

SUPPORT FOR PETITION

Climate change abatement, conservation, and economic health are imperative partners for continued residency in desert extremes. Near term projections (decades not centuries) demand wildlife strategies that straddle the precariousness of such communities, the preservation of ecosystems that mitigate increased human presence, and the pressures on keystone species for ongoing habitation in an increasingly hot environment.

Representatives of my area have equated this listing petition with a mandated cessation of growth, and melodramatically as a trigger for economic devastation. Please note that we have had decades of business-as-usual development in spite of Agassiz's desert tortoise listings (CESA 1989/ESA 1990). To use the desert tortoise as an example, defined pathways for construction have long been approached as just one procedural step among many. Since tortoise and western Joshua tree habitat overlap, there is no reason to believe that listing would bring unfamiliar or insurmountable burdens to builders. Pathways allowing development will follow a new listing, and the process can be smooth so long as there is a will on the part of local representatives to balance the varied economic interests of their entire constituencies.

In a highly optimistic scenario, isolated individuals of *Yucca brevifolia* would develop adaptations that express some degree of resiliency to climate and precipitation changes. Since the necessity of gene flow is a common denominator for the persistence of all species, genetic exchange is critical to the survival of *Yucca brevifolia*. With 40% of the population on private land, a critical but reasonable constraint should require that some trees remain in order to allow sufficient connectivity for the obligate pollinator to distribute adaptive traits. A degree of understory vegetation should also remain for the possibility of recruitment. But here in the Morongo Basin, "scrape first, plan later" blading is par for the course and removing all vegetation from entire tracts will have the eventual effect of fragmenting homogeneous populations, making recruitment and adaptation in these disturbed areas unlikely. It's understood by conservationists that trees will be removed for development regardless of listing status, but mitigation could conceptually boil down to three simple words: leave something behind.

SAN BERNADINO COUNTY SUPERVISORS

Since it has come to my attention that San Bernardino County Supervisors have been, to borrow the adjective from a staffer, “aggressively” lobbying the Commission against this petition, I’m compelled to provide my constituent perspective on their actions. Protections have fallen short of legal intent due to either jurisdictional indifference or avoidance and now officials are appealing to the Commission with cries of foul. This petition has been called redundant because “protections already exist“ yet this conveniently ignores the fact that lack of adherence (by way of inaction) to legislation, ordinance, regulation, or Act represents non-compliance. While protections may be practiced in other *Yucca brevifolia* habitat areas, there is little evidence of recognition within the Morongo Basin with the exception of the very largest of projects that necessitate CEQA review.

Inflated and wildly speculative estimates of listing related costs are being broadcast to the public, creating irrational fear. Constituents have been told that constraints will add $50,000 or more to the construction of a modest single family home (this has blown up by Facebook citizenry to $100,000). Individuals are down-streaming this with assertions that a homeowner’s right to trim a dangerous branch will require $10,000 and become a protracted bureaucratic affair. In talking points, using the provocative rallying cry of keeping the government “out of your backyards” at least one official is acting as public agitator - inherently contradictory to their role.

In reality, mechanisms for take of *Yucca brevifolia* are clearly offered within the petition, with latitude for local interpretation. Disregard for this is evidenced by a Supervisor quoted in print media as incorrectly saying, “Private and commercial property owners would be forbidden to remove any trees from their land.” Lastly, I must speak for the multitudes of constituents who do not accept that climate change is merely a futuristic apparition in a gazing ball, as one county Supervisor so nostalgically suggests in calling it a “prediction”.

STREAMLINING THE PROCESS: PROTECTIONS PLUS FEE REDUCTION

Regardless of spin doctoring by elected officials, dealing with listing has the potential to become straightforward by removing conjecture via reasonable definitions of constraints and fees under an area-specific and overdue Natural Community Conservation Plan (NCCP), and Habitat Conservation Plan (HCP). To return to earth and replace hyperbole with two actual numbers: tag costs for Joshua trees, as mandated by the Desert Native Plants Act, “must be a minimum of two dollars” and the development fee to cover all listed plant and animal species combined (specifically per a region-wide Coachella Valley Conservation Plan, where property values are higher and therefore presumably fees) is about one thousand dollars/acre per single unit with numerous exemptions (as opposed to current local $6,000 and up fees for trees alone). Under an NCCP/HCP, further reductions in cost per parcel and expedited time frames can be attained by towns or counties seeking permits on behalf of individuals and landowners. Although this requires a bit of retooling for local jurisdictions, nearby communities offer examples of templates. Doing the right thing initially requires a bit more thought than doing your own thing, until in short order it becomes just the way that things are done better.

AFFORDABLE HOUSING

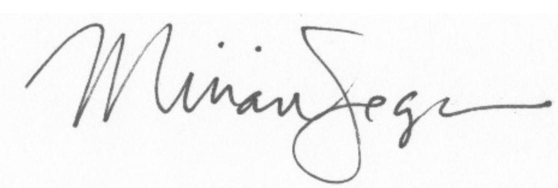
Some argue that encumbering Joshua tree removal denies a segment of the population from accessing housing. This fails on multiple social justice levels. If housing the disadvantaged is a genuine concern, it is absurd to think that a wildlife management agency could ever enact policies impactful as those which municipalities have left unexplored. The current developer norm of scraped dirt construction for affordable housing presumes a chauvinistic attitude that only the affluent can benefit from from green spaces, relegating those in need to unaesthetic and dusty habitation. Actually, in situ natives do not require removal/disposal expenses, subsequent replacement with nursery cultivars, irrigation hardware, and costly use of precious water resources. Selective grading minimizes dust and invasive plant potential, and desert plants are among the most extremely efficient organisms of carbon sequestration. Because they are so long lived, the removal of individual mature plants could represent the release of over a century of stored carbon - further contributing to a damaging feedback loop. Increased constraints will serve to reinforce state action plans that recognize the poor as disproportionally affected by climate change and air quality. Furthermore, California's Accessory Dwelling Unit encouragements are a new tool for exploring affordable, small footprint homes, harmoniously sited in Joshua tree woodland with minimal disturbance.

<u>OTHER COMMENTS</u>
In reference to the document submitted by Concerned Citizen: since the Commission is previously aware of the differences between foraging patterns and seed dispersals of native herbivores vs. domestic livestock, the difficult issues surrounding grazing, wild burro removal, complex debates over supplemental water for bighorns etc., I'm trusting that these and other simplified arguments will be dismissed without need for rebuttal.

<u>CONCLUSION</u>
Yearly, millions of domestic and international visitors are drawn to experience the Mojave Desert, and *Yucca brevifolia* is the identifying symbol for the specificity of that beauty. From a marketing viewpoint, *Yucca brevifolia* is the preeminent icon of our landscape. From a scientific view, its role as a vulnerable keystone species makes the importance of CESA candidacy even more broadly significant.

I have faith that the Commission will support this consequential petition. I also look forward to working with local agencies on the implementation of a sensible plan to ensure the viability of our prize natural resource, and continuing to expand my livelihood as provided by the stunning Mojave Desert.

Respectfully,



Miriam Seger
[redacted]
Joshua Tree, CA., [redacted]
[redacted]

Sent: Monday, June 1, 2020 12:44 PM
To: FGC <FGC@fgc.ca.gov>
Cc: Tom O'Key
Subject: Petition to List the Western Joshua Tree

Dear Commissioners, and Department,

Please accept this email as my comment regarding the listing of the Western Joshua Tree for protection under the guidance of intelligent California Law.

Joshua Trees. We must protect them.

There's a special and unique kind of shadow that's cast by Joshua Trees. Most of them aren't known for having great robustness as provider's of shady repose. Rather, at a distance, some dozen or more, yards away, the tree poses as it presents its photogenic prowess; displaying an image that stirs desert magic into a city dwellers gaze. They are "art in abstraction", if nothing, else.

Once endeared, a Joshua Tree forest presses primordial juices forward. A Pavlovian response yields to innate reflexes of appreciation and attraction. The eyer sees incongruent forms, that lure and beckon investigation. The effervescent reaction of Mojave flora and landforms meet in harmony as they meld with the repertoire of desert voices, only heard as whispers in the hot, crisp, and arid Mojave breezes. This, reflecting only a hint of the majesty found in such forests.

Beyond human assertions, recognizing the spiritual and aesthetic merits of a pristine Joshua Tree forest, it's far more important to assess them as commodities unto themselves as habitat providers within their unique environment.

Here, in the Mojave, they stand as fragile hallmarks of ecological well-being. The trees are sentinels from an ancient past and seers of current conditions within changing climatic margins. They're thermometers that indicate states of wellness as measured in diversion from normal climatic conditions. Joshua Trees are alpha class representatives in crucial desert habitats.

They are extremely sensitive to climate conditions that trigger chain reactions that reverberate throughout their ecosystems.

The climate anomaly that occurred in the Morongo Basin, over the last two years, has upset normal routines with the local forest. Early Springtime weather sparked a record bloom within the forest at a time when the sole symbiotic partner to the trees was unprepared to meet in regular association, as anticipated.

The Yucca Moth, a species exclusively paired as the pollinator of the flowers of Yucca Brevifolia, Yucca Shidigra, and Yucca Brevifolia Jaegeriana, was not to be found. It was much too early in the season for the moths to respond as normal.

As the flowers presented an astounding sight, they soon wilted and shriveled to small, brown, benign seedpods; absent of fertilized seeds.

Months later, the moths hatched and came forth to find that they had no host and as such, no sustenance. In short order, they starved to death, missing the annual rendezvous nature had perpetuated over many thousands of years. The viable seed count in the bloom was devastated. The perpetuated successors for the next generation of moths was decimated, as well.

The extinction of the moth is inevitable if synchronization between the seasonally tied association is disturbed beyond balance. Without the moths there can be no seeds and without seeds, the climate will have claimed the destruction of two critical species, one plant and one animal.

This event is anecdotally obvious to a casual observer. Looking for the moths during the early bloom showed no moths to be available to pollinate the trees and follow up examination showed barren seed pods missing evidence of the moth's larval activity. This observation was visible throughout the forest in the Morongo Valley region, including the remnants of the ancient forest remaining in the Town of Yucca Valley where Minerva Hamilton Hoyt first saw and knew the intrinsic merits of defending the Joshua Trees. This, culminating in success as she influenced President Roosevelt in designating the National Monument named to honor this unique tree in the most ecologically diverse desert habitat on Earth.

I write this response and as a call for protection for the Joshua Trees. Ruthless acts of mass grading and commercial exploitation of Desert environments can be seen as, mostly, unnecessary. More so, the destruction of these forests is an act of poor planning where rubber stamped projects solely reflect a satellite view of the lazy land use planning, where an environmental landscape view is required.

My past efforts include nearly two decades of pursuing activities aimed to preserve desert environments.

I am known to many of you, who work for the Department, as well as to The Commission, as I spoke out in defense of Bobcats against commercial exploitation by the archaic practice of fur trapping. This, of course, all behind us in California, now. A very thankful and responsibly good mark on the scoresheet of great leadership!

Looking to the future and responding correctly to the need for sustainability, a work plan that follows a sensible direction is crucial. All steps forward must apply resolve for preservation and conservation. Repair and reconstruction must lead where waste is minimized and productivity is durable without negative impacts to the living environment.

At the end, I tried to save nearly five hundred Joshua Trees by relocating them before being destroyed in commercial development projects where the trees received no protection from the Town of Yucca Valley.

First, I relocated eighty trees from a bladed construction site for Copper Hills residential development. Then, I moved twenty eight trees from the local veterinary clinic expansion. Then, the biggest move came when I moved over three hundred trees from a bladed pristine desert plot of about a hundred acres where a new and unnecessary car dealership was built. Two years later, the dealer went bankrupt, took whatever could be taken, and left an abandoned facility. This, in view of previously available, disturbed, land at another abandoned car lot area only a couple of miles away. All, within the city limits of Yucca Valley.

Now, six years later, only eight of the trees I moved remain standing. The other four hundred plus trees have fallen and only provide a token habitat zone for night lizards and kangaroo mice. So, not a total loss. But, sad, all the same.

The trees don't transplant successfully often enough to simply apply the method as a solution. This is important as the idea that a relocation service won't know if a tree will survive until at least five years after replanting.

Trees have been seen to remain green and heathy looking for years, only to see it suddenly take a turn for the worse, seeing no root development had ever happened. The trees didn't know that they were already dead, from the start.

Even the required replanting of trees relocated around the project sites by the developers have a survival rate of less than fifty percent. Most have perished and non native, deciduous trees now spread falling leaves into an unfamiliar environment.

My efforts cost me somewhere around $40,000 that I paid in casual labor to dig and move the trees, including equipment rentals and supplies required to accomplish the task. At times, I had four helpers working hard for months, trying to outrun the bulldozers.

Besides the Joshua Trees, all of the flora and fauna were destroyed by the mass grading, which exceeded the necessary footprint of the various projects. Collateral destruction extended well beyond the limits of the development sites, showing me a general disregard on the part of those in charge of city oversight.

Now, the City of Yucca Valley espouses their virility as defender's of their namesake flora, but this is not true. A careful examination will prove blatent disregard for the mantra written by Minerva Hoyt. Her legacy is merely a logo and mascot without due respect for what that means. She would be first to condemn the actions of the past leadership of the Morongo Basin communities, as sad decisions can be found to be the model of business as usual, thanks to subversive planning by brutal self serving interests.

As renewable energy projects come to exploit desert resources, land use must reflect collateral costs when choice and cost benefit comparisons are considered. Destroyed Joshua Tree forests supplanted by temporary solar energy projects, as similar to Ivanpah and others, where examples currently show the waste and technical bungling of shortsighted debacles.

We cannot save our Planet by simply replacing Joshua Trees with solar farms. The California Desert cannot save the World from itself!

Real science will need immediate attention to set a course towards the most expedient solutions for climate management. The climate crisis demands focus and dedication to seeking and administrating only the best and most sustainable ideas.

Destruction of Joshua Trees without serious oversight will lend to further degradation of an already struggling variety of species associated intimately with Yucca. Brevifolia, and related kin. Joshua Trees are the hallmarks of healthy desert habitats.

Protecting Joshua Trees will force better technology to step forward. We must follow the best roads in building the future, not the least obstructive or most economical.

There's no time to follow bad ideas that can't solve our real problems. Destroying natural habitat is a waste when economics is the only measure assessing merit and value. We can't let the future down. We must protect and defend as much as we can.

Protect Our Joshua Trees! Please!

Thank you.

Sincerely,

Tom O'Key

-----Original Message-----
From: Mark Simmons
Sent: Saturday, May 30, 2020 12:08 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Petition to List the Western Joshua Tree

Warning: This email originated from outside of CDFW and should be treated with extra caution.

To whom this may concern:

I'm a 34-year resident in The Town of Yucca Valley. I'm reaching out to the Department of Fish and Game to support putting the Joshua Tree, a native plant for centuries to this area, to be placed on the endangered species list.

For far too long now, builders, developers and realtors in this area to overlook the beauty and majesty of the Joshua Tree and have allowed the "clear cutting" of these trees all in the name of GREED! I'm aware that the town council has sent the DFG a letter stating that there are provisions in place that protect this species. However, they do not go far enough to fully protect them. Among the Joshua Trees that had to be removed in my neighborhood due to the sewer project, those trees which were replanted, have all died. The 200-year old Joshua Tree that was an iconic figure on my road was killed due to Sukit Construction's negligence, as they constantly sprayed water on it to keep our dirt road wet during the sewer line construction.

I respectfully ask the DFG to intercede and protect the existing Joshua Trees on its list of protective species before it's too late!

Thank you!

Sincerely,
Mark Simmons
[redacted]
Yucca Valley, [redacted]

From: Jiyeon Kim <
Sent: Wednesday, August 5, 2020 01:50 PM
To: FGC <FGC@fgc.ca.gov>
Subject: The Western Joshua Tree

To the members of the CA Fish and Game Commission:

I fully support the recommendations of the CA Department of Fish and Wildlife and would like to see a YES vote for the western Joshua tree to advance to candidacy status under the CESA.

Without the Joshua tree, this region will lose a defining aspect of its culture and history. Joshua trees do not grow anywhere else on Earth. It is unique to the Mojave Desert. As a longtime resident, I have noticed the steady decline of Joshua trees in my town and around the region. It has been disheartening to see a ubiquitous symbol of this region slowly die out the past decade. To CA, America, and the world, the Joshua tree is a living and present image of many organizations and businesses in the region. Without it, the Joshua tree will become a part of the past.

In addition to its cultural and historical significance, it requires state protection because it is under a barrage of threats, including climate change impacts (e.g. wildfire risk) and large-scale development projects. Not all Joshua trees are within National Park and National Monument boundaries. In fact, 40% of Joshua tree habitat is on private land, where it has only modest protection at best. While some protection is provided by local ordinances, these are inadequate to respond to the multitude of threats that could lead to its disappearance—not to mention the disappearance of animals that rely on the tree for protection and food.

The iconic presence of the Joshua Tree attracts people to visit, live, and work in the high desert. In 2019 alone, visitors to the National Park created an economic benefit of nearly $196 million both within the Park and its vicinity—that is almost double the expenditure in 2014. Furthermore, for the local communities adjacent to the Park, 1,823 jobs were related to visitation. Attracted by the area's scenic beauty and Joshua trees, the real estate market in the Joshua Tree region has steadily increased along with job opportunities. This is because incoming residents generally are not seeking a home in densely developed areas such as subdivision, but instead are looking for a more rural lifestyle, ideally in proximity to the National Park. It is important to emphasize that the presence of Joshua trees is an underlying factor in this growing attraction. Its protection will encourage responsible development, preventing urban sprawl and overcrowding, increase property values, and preserve the rural quality of life which attracts people to our area.

With the rapid growth of our communities and the dramatic increase in visitation at the National Park, new issues have come up as a byproduct (e.g. traffic). Of course these unintended consequences must be addressed over time along with the decline of Joshua trees. **We must start addressing these issues by listing the Joshua tree as a threatened or endangered species. Doing so will push local governments to develop a regional approach to conservation through a Natural Communities Conservation Plan. This plan will effectively help prevent sprawl and overdevelopment by focusing on the conversation of large undeveloped areas, while encouraging new development on vacant land in already developed areas.**

I hope you will take this into consideration. Thank you for your time.

Sincerely,
Jiyeon Kim

From: Ty Fredericks
Sent: Wednesday, August 5, 2020 06:10 PM
To: FGC <FGC@fgc.ca.gov>
Subject: Protect California's Western Joshua Trees

Warning: This email originated from outside of CDFW and should be treated with extra caution.

Dear California Fish and Game Commission,

I'm writing to urge you to protect western Joshua trees under the California Endangered Species Act.

As you know, they face multiple threats to their survival, including climate change, wildfire, drought, invasive species and habitat loss. Outside the national park, other federal lands that are home to Joshua trees are subject to poorly regulated activities that consume or degrade habitat, including offroad-vehicle use, cattle grazing, and large-scale energy projects/rights-of-way. While much of the western Joshua tree's range is on public lands, about 40% of its California range is still on private land, of which only a tiny fraction is protected from development. All this spells disaster if we don't act now.

We're in the middle of a climate and extinction crisis, and we simply can't afford to wait to protect species such as the western Joshua tree. Under current climate projections, they're likely to decline by upwards of 90% in the coming decades, while much of their habitat will be lost to development, absent strengthened protection under law. A California Endangered Species Act listing would support existing western Joshua tree populations, protect habitat, and mandate recovery actions for their survival.

I strongly urge the California Fish and Game Commission to accept the California Department of Fish and Wildlife's recommendation for advancing western Joshua trees to candidacy as a threatened species.

Please move forward quickly to protect western Joshua trees knowing you have my full support.

Sincerely,
Ty Fredericks
Glendale, CA 91201

From: Sarah Agnew <
Sent: Thursday, August 6, 2020 02:30 PM
To: FGC <FGC@fgc.ca.gov>
Subject: YES vote for advancement to candidacy status under CESA

Hello,

I am emailing to inform you that I support the recommendations of the California Department of Fish and Wildlife and would like to see a YES vote for advancement to candidacy status under CESA.
Here are is why…

- This important species is under a barrage of threats, including climate change impacts, wildfire risk, and large-scale development projects. Four published studies have concluded that without intervention, climate change alone creates a high risk of losing western Joshua tree habitat almost entirely.
- The presence of the western Joshua tree benefits our economy. Its iconic presence attracts people to visit, live and work in the high desert. Its protection will encourage responsible development, preventing urban sprawl and overcrowding, increase property values, and preserve the rural quality of life which attracts people to our area.
- While some protection is provided by local ordinances, these are inadequate to respond to the multitude of threats that could lead to its disappearance. Not all Joshua trees are within National Park and National Monument boundaries. In fact, 40% of Joshua tree habitat is on private land, where it has only modest protection at best.
- We are at a critical juncture for the western Joshua tree. A collection of scientific studies predict the widespread decline of this iconic endemic species.
- Joshua trees don't grow anywhere else on Earth. They attract visitors and new residents which, in turn, support our economy. In 2018, visitors to the National Park created an economic benefit of nearly $196 million both within the Park and its vicinity — that's almost double the expenditure in 2014. For the local communities adjacent to the Park, 1,823 jobs were related to visitation.
- Attracted by the area's scenic beauty and Joshua trees, the real estate market in the Joshua Tree region has steadily increased. New residents generally are not seeking a home in densely developed areas such as a subdivision, but instead are looking for a more rural lifestyle, ideally with proximity to the National Park, and Joshua trees are a very desirable feature.
- We recognize that the rapid growth of our communities and the dramatic increase in visitation at the National Park has resulted in its own issues such as traffic. These issues need to be addressed, but protection of the Joshua tree will help, not hurt our communities. Its listing will encourage local governments to develop a regional approach to conservation through a Natural Communities Conservation Plan. These plans focus on the conservation of large undeveloped areas, while encouraging new development on vacant land in already developed areas. This helps prevent sprawl and overdevelopment.

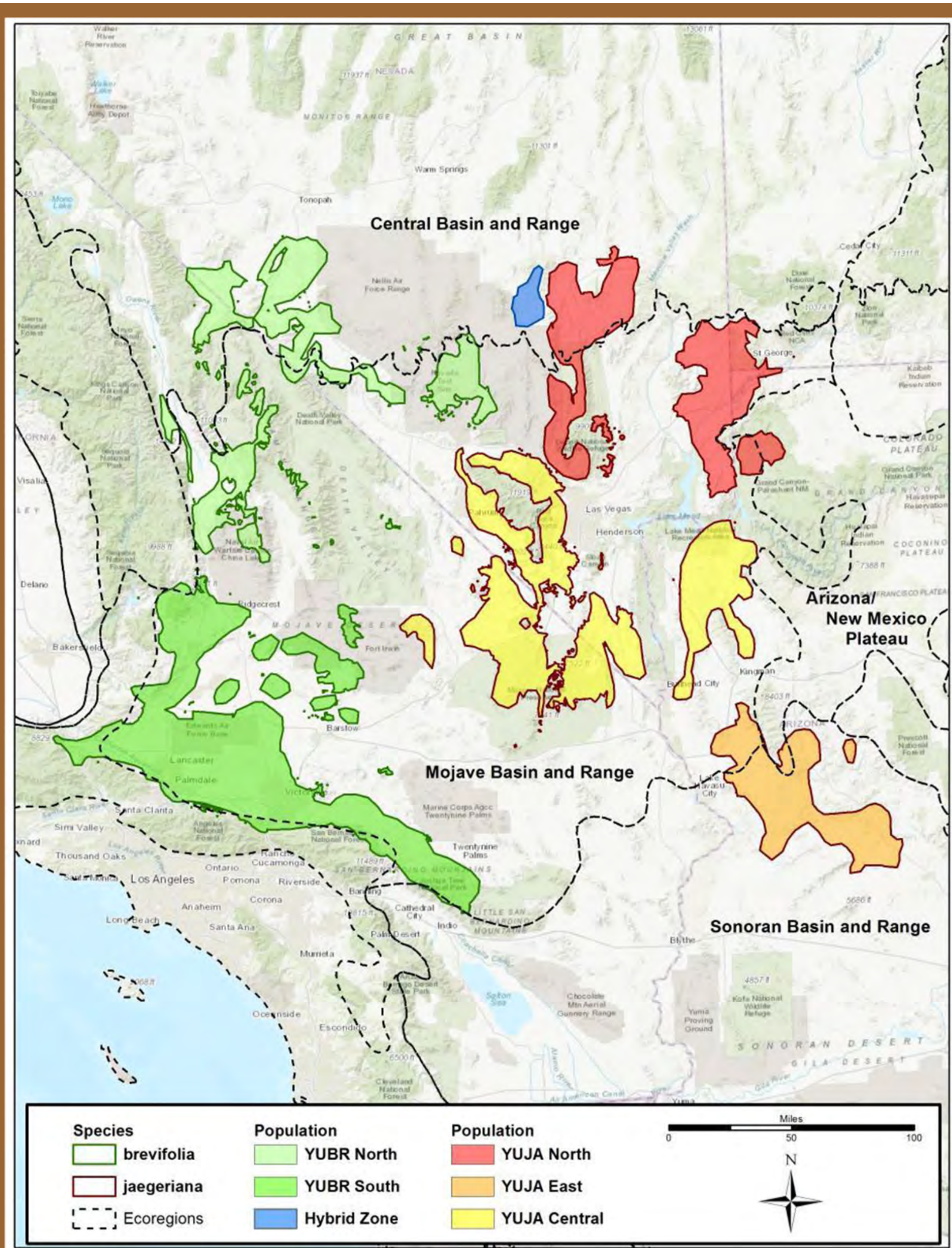
Thank you for taking the time to read

Best wishes,
Sarah Agnew

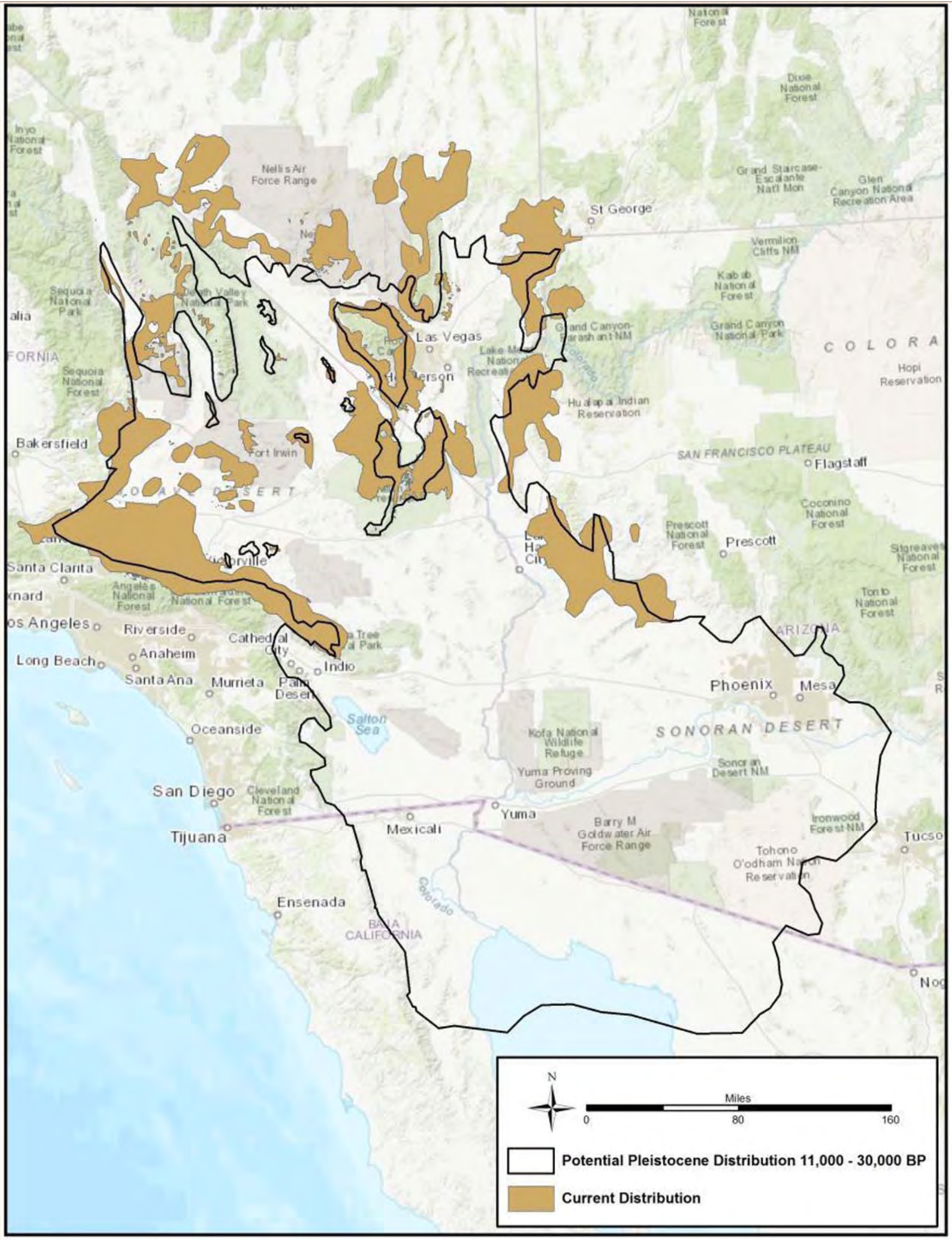
Western Joshua Trees and the California Endangered Species Act

Brendan Cummings
Center for Biological Diversity

August 2020


Central Basin and Range
Mojave Basin and Range
Arizona/
New Mexico
Plateau
Sonoran Basin and Range
Las Vegas
Henderson
Los Angeles
Species
brevifolia
jaegeriana
Ecoregions
Population
YUBR North
YUBR South
Hybrid Zone
Population
YUJA North
YUJA East
YUJA Central
Miles
0
50
100
N

USFWS (2018)



Cole et al. (2011)

Threats to the Western Joshua Tree

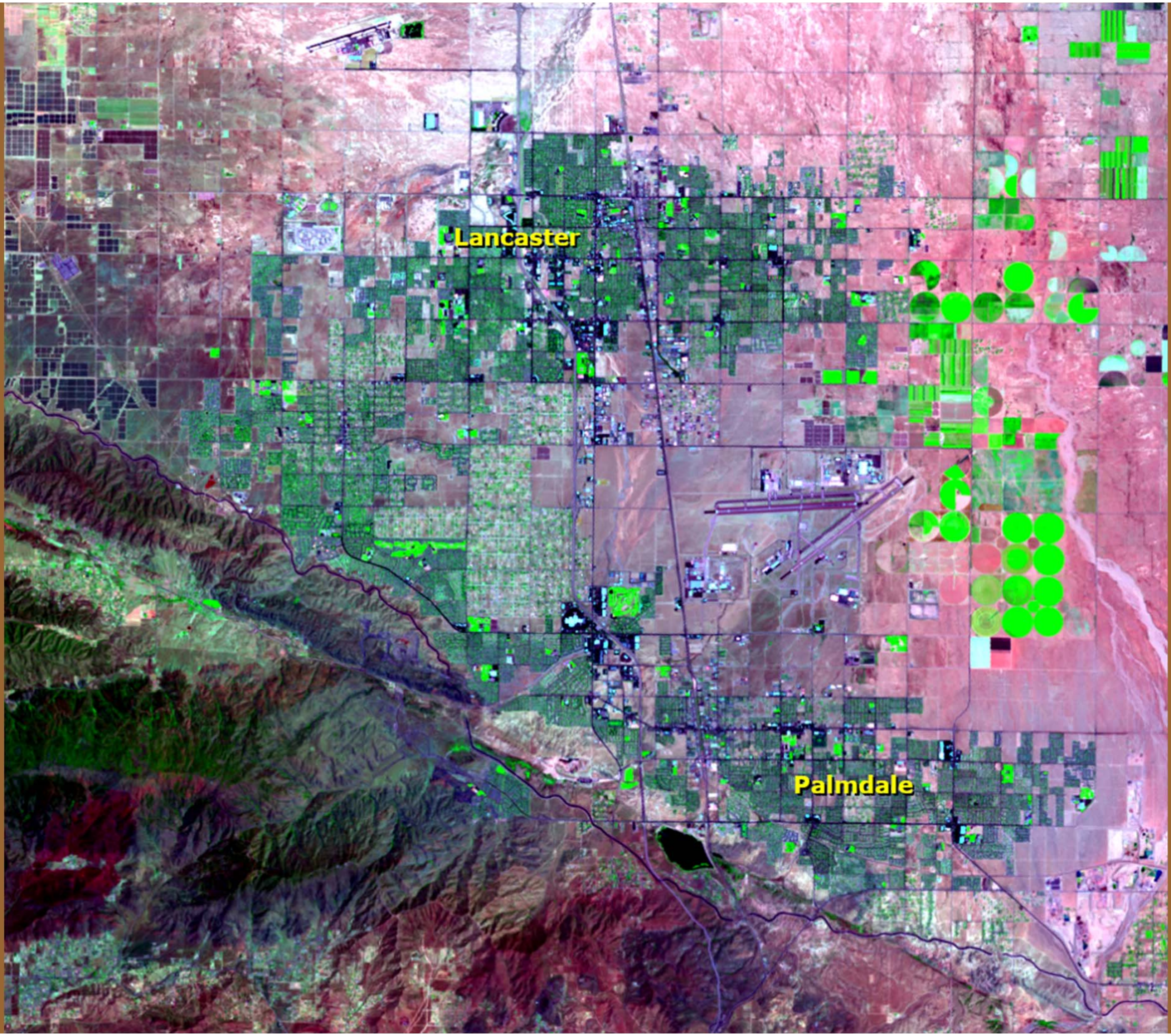
- Climate Change
- Fire/Invasive Grasses
- Development
- Vulnerable life history traits

Life History of the Western Joshua Tree

- Can live upwards of 300 years, but average life expectancy about 90 years
- Grows about 3cm a year on average, but highly variable
- At least 1m tall and 30+ years old before flowering (usually not till 2-3m tall)
- Flowers only in certain years
- Requires pollination by moths and seed dispersal by rodents
- Fewer than 1% of seeds produce seedlings
- Seedlings require shelter of host plant
- Juvenile mortality of over 80% over 22 years

“Recruitment of *Y. brevifolia* requires a convergence of events, including fertilization by unique pollinators, seed dispersal and caching by rodents, and seedling emergence from a transient seed bank triggered by isolated late-summer rainfall. Alignment of these convergent events likely results in successful establishment of new seedlings only a few times in a century.”

Esque et al. (2015)


Lancaster
Palmdale

Current “Protections” for the Western Joshua Tree

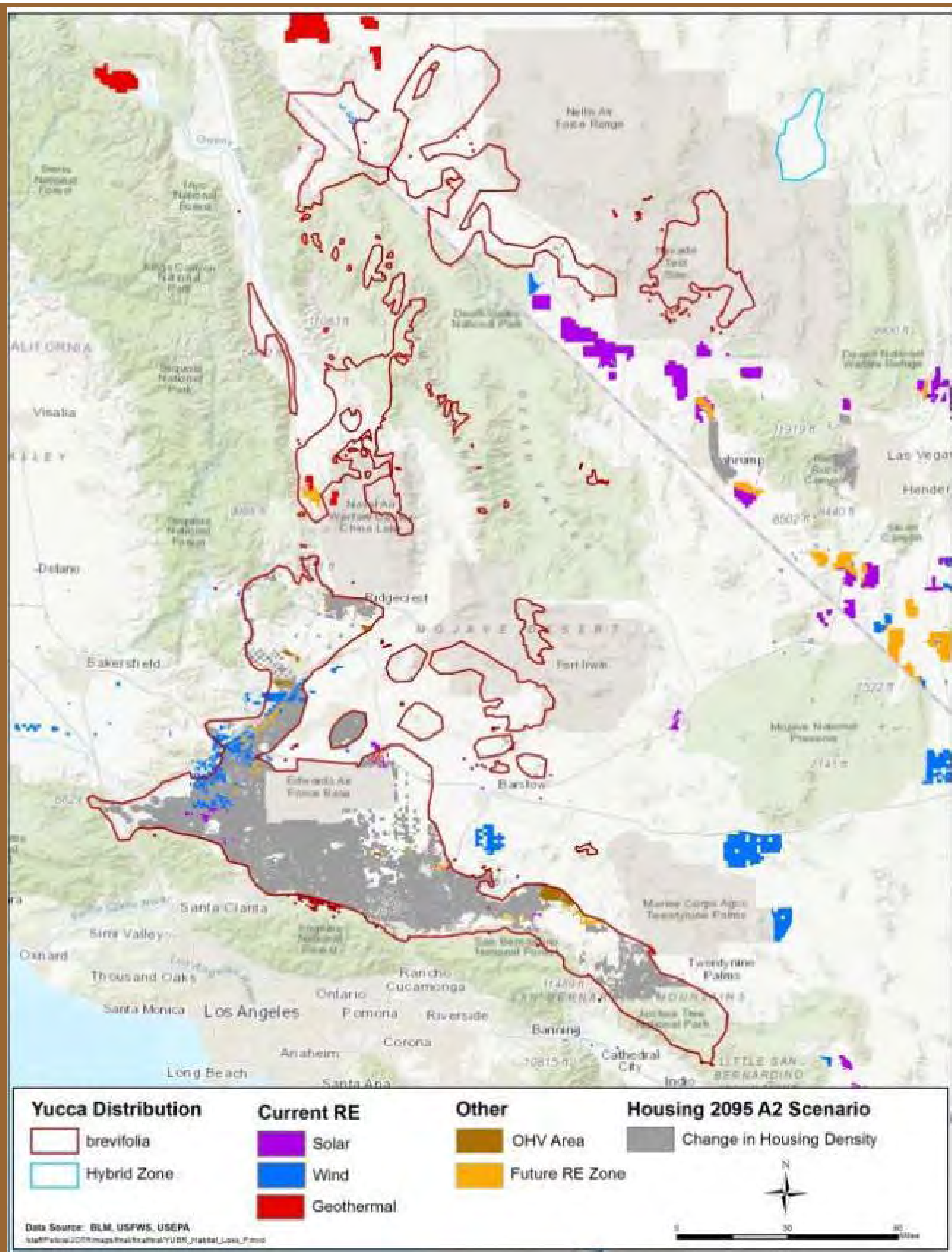
- About 40% of range on private land
- California Desert Native Plants Act
- Local Ordinances

California Fish and Game Commission
California Policy for Native Plants (Adopted 2015)

“The State’s policies and practices regarding native plants are in need of review and updating. More than 30 years ago state law focused on transplantation as a means of mitigating for listed plant species, however experience and numerous studies document that such practices are largely ineffectual over time and often damaging to species or population survival.”

Yucca Valley: A Typical Project

- 108 Joshua trees on project site
- 2 avoided
- 42 deemed transplantable
- Permit issued to transplant 23 to casino
- Remainder bulldozed or chainsawed


Yucca Distribution
brevifolia
Hybrid Zone
Current RE
Solar
Wind
Geothermal
Other
OHV Area
Future RE Zone
Housing 2095 A2 Scenario
Change in Housing Density
Data Source: BLM, USFWS, USEPA
Visalia
Delano
Bakersfield
Ridgecrest
MOJAVE DESERT
Fort Irwin
Barstow
Las Vegas
Santa Clarita
Simi Valley
Oxnard
Thousand Oaks
Santa Monica
Los Angeles
Ontario
Pomona
Rancho Cucamonga
Riverside
Banning
Anaheim
Corona
Long Beach
Santa Ana
Cathedral City
Indio
Twentynine Palms

USFWS (2018)

Journal of Arid Environments 67 (2006) 148–164

Journal of Arid Environments

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Spatial and temporal patterns of wildfires in the Mojave Desert, 1980–2004

M.L. Brooks*, J.R. Matchett

United States Department of the Interior, United States Geological Survey, Western Ecological Research Center, Las Vegas Field Station, 160 N. Stephanie, Henderson, NV 89074, USA

Received 28 June 2006; received in revised form 6 August 2006; accepted 30 August 2006

Abstract

Fire has been historically infrequent in the M
the invasion of non-native annual grasses is a
dramatic changes have occurred in middle elev
tridentata), Joshua tree (*Yucca brevifolia*), and/
of the fires occurred between 1980 and 2004. T
Mojave Desert to increased fire size following
related to the flush of non-native annual gr
continuous fuelbeds following years of high rai
at lower elevations, but the background cover
muting the effects of the ephemeral fuels. At el
size does not vary with rainfall, indicating that
suggest that an invasive plant/fire regime cycle i
low elevation shrublands of the Mojave Desert
Published by Elsevier Ltd.

Keywords: *Bromus*; Disturbance; Fire history; Grass/

1. Introduction

Deserts worldwide tend to experience les
productivity and limited production of fue

*Corresponding author. Tel.: +1 702 5644615; fax
E-mail address: matt_brooks@usgs.gov (M.L. Br

0140-1963/$ - see front matter Published by Elsevier
doi:10.1016/j.jaridenv.2006.09.027

Journal of Arid Environments 67 (2006) 100–124

Journal of Arid Environments

www.elsevier.com/locate/jaridenv

Dominance and environmental correlates of alien annual plants in the Mojave Desert, USA

M.L. Brooks[a,*], K.H. Berry[b]

[a]*United States Department of the Interior, United States Geological Survey, Western Ecological Research Center, Las Vegas Field Station, 160 N. Stephanie, Henderson, Nevada 89074, USA*
[b]*Box Springs Field Station, 22835 Calle San Juan de Los Lagos, Moreno Valley, CA 92553, USA*

Received 13 November 2003; received in revised form 15 January 2004; accepted 20 July 2004
Available online 7 November 2006

Abstract

Land managers are concerned about the negative effects of alien annual plants on native plants, threatened and endangered species such as the desert tortoise (*Gopherus agassizii*), and ecosystem integrity in the Mojave Desert. Management of alien plants is hampered by a lack of information regarding the dominance and environmental correlates of these species. The results of this study indicate that alien plant species comprised a small fraction of the total annual plant flora, but most of the annual plant community biomass. When rainfall was high in 1995, aliens comprised 6% of the flora and 66% of the biomass. When rainfall was low in 1999, aliens comprised 27% of the flora and 91% of the biomass. *Bromus rubens*, *Schismus* spp. (*S. arabicus* and *S. barbatus*), and *Erodium*

Journal of Applied Ecology 2003
40, 344–353

Effects of increased soil nitrogen on the dominance of alien annual plants in the Mojave Desert

MATTHEW L. BROOKS

United States Geological Survey, Western Ecological Research Center, Las Vegas Field Station, 160 N. Stephanie St., Henderson, NV 89074, USA

Summary

1. Deserts are one of the least invaded ecosystems by plants, possibly due to naturally low levels of soil nitrogen. Increased levels of soil nitrogen caused by atmospheric nitrogen deposition may increase the dominance of invasive alien plants and decrease the diversity of plant communities in desert regions, as it has in other ecosystems. Deserts
mall increases in soil nitrogen levels because
iomass is higher compared with most other

rogen will lead to increased dominance by
diversity was tested in field experiments
the in the Mojave Desert of western North

nts to soil nitrogen additions were measured
richness. Effects of nitrogen additions were
afall and annual plant productivity. The rate
ed rates of atmospheric nitrogen deposition
Desert ($3 \cdot 2$ g N m^{-2} $year^{-1}$). The dominant
madritensis ssp. *rubens* and *Schismus* spp.
Erodium cicutarium.
ensity and biomass of alien annual plants
iomass and species richness of native species
productivity. The negative response of natives
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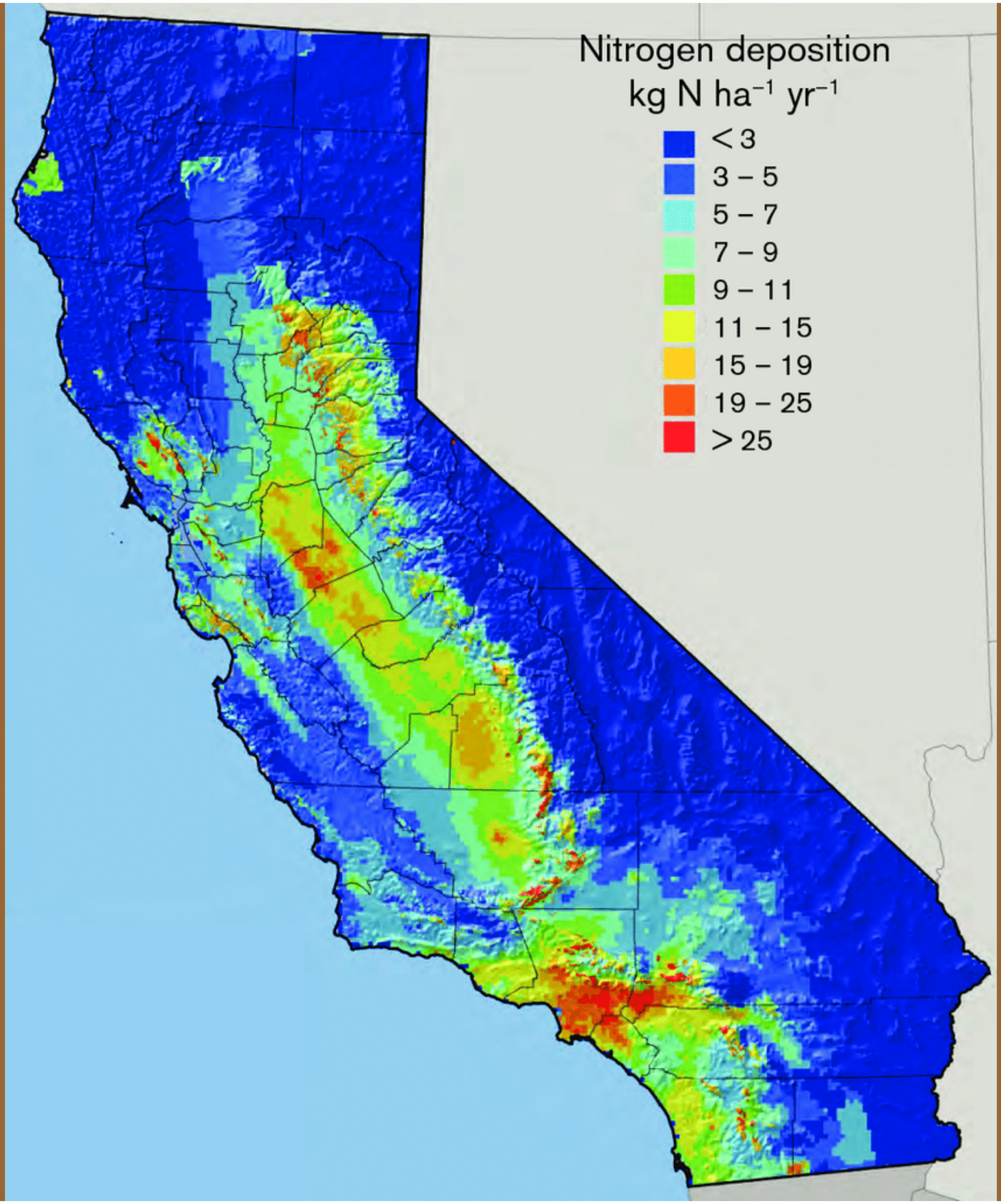
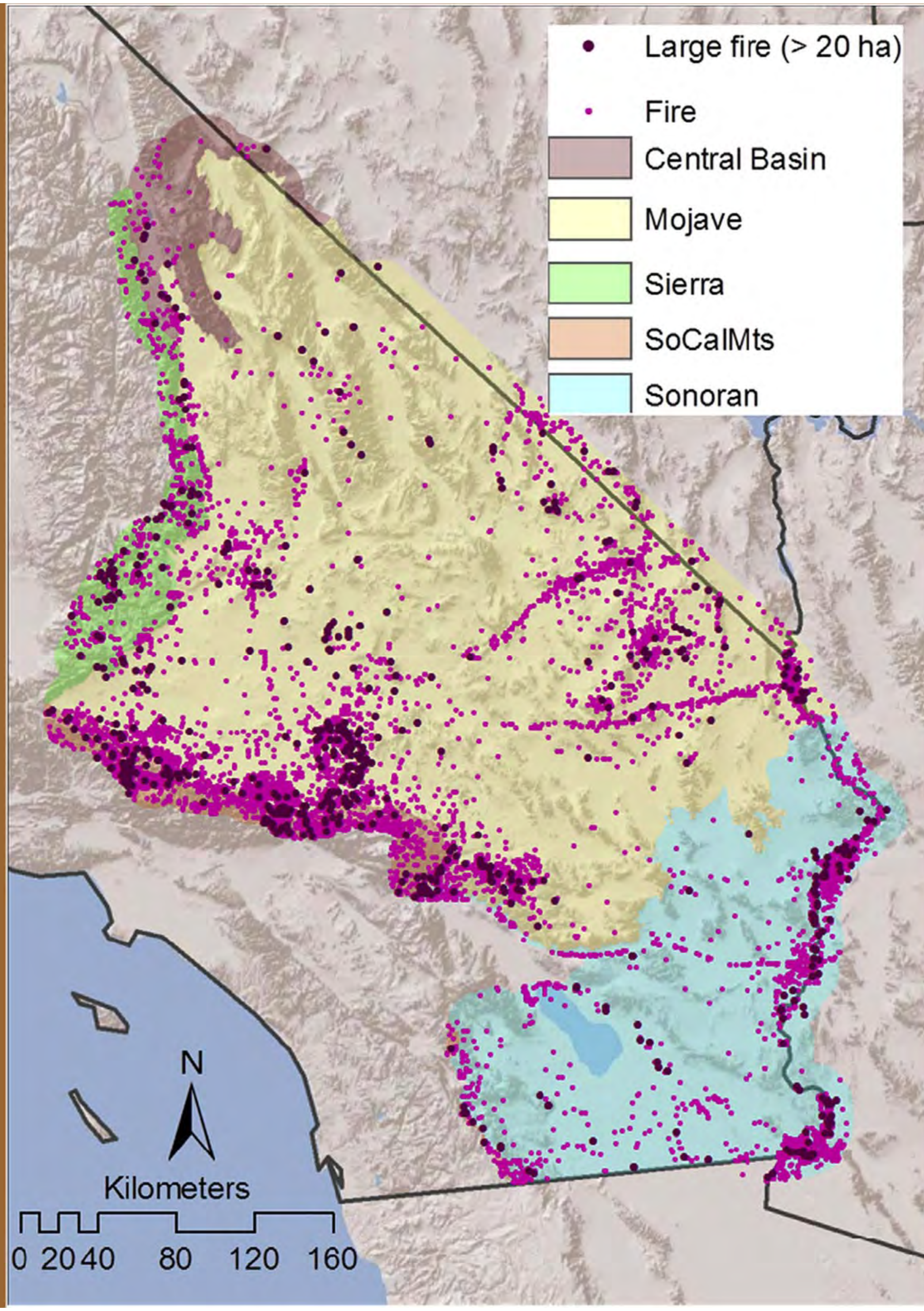
significant at both ends of a natural nutrient
tridentata canopies and in the interspaces
among individual alien species. The positive
in the beneath-canopy for *B. rubens* and in
arium.
ls of soil nitrogen from atmospheric nitrogen
crease the dominance of alien annual plants
species in desert regions. Increased domina-
ersity of native annual plants, and increased
increase the frequency of fire.
be controlled by local land managers, the
effects on plant communities and ecosystem
may interact with land-use activities that can
ctions are currently unknown, and hinder the
and-use decisions related to nitrogen deposi-

f nitrogen deposition on invasive alien plants
re to locate new conservation areas, and in
ffects of new projects that would increase



Bytnerowicz et al. (2016)



Syphard et al. (2019)

Joshua Trees and Fire

"Yucca species such as Joshua tree and Mojave yucca (*Yucca schidigera*) often survive burning, but Joshua trees typically die within the first few years after fire due to drought and herbivory stress."

Brooks et al. (2018)

Joshua Trees and Fire

"Five years after the Juniper Fire Complex of May 1999, approximately 80% of burned *Y. brevifolia* died compared with 26% in adjacent unburned sites. This high postfire mortality of *Y. brevifolia* is consistent with other studies including 90% mortality six years after a 1978 fire in Lower Covington Flat at Joshua Tree National Park and **64 – 95% mortality** at sites censused 1 to 47yr after fires in Mojave and Sonoran deserts of California."

DeFalco et al. (2010)

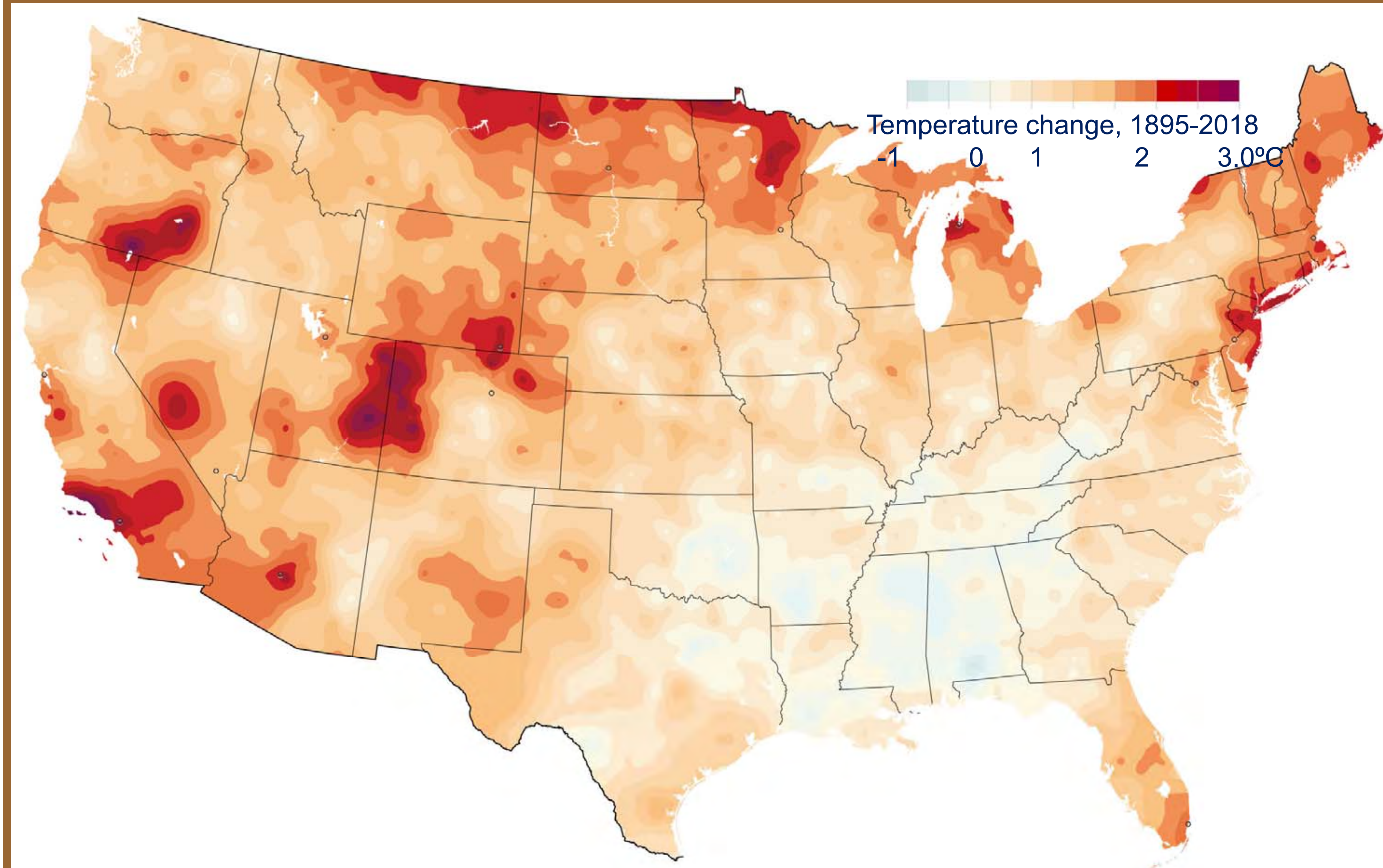
Joshua Trees and Fire

"The return of *Y. brevifolia* to prefire densities and demographic structure may take decades to centuries or be entirely unlikely, especially in light of potential changes to regional desert climate in combination with plant invasions and the potential for recurrence of subsequent fires."

Reynolds et al. (2012)

Climate Change in the Range of the Western Joshua Tree

- Average global temperature has already risen approximately 1°C over pre-industrial levels
- Counties with western Joshua trees have already experienced greater temperature increases than global average
  - Riverside: 1.8°C
  - San Bernardino: 1.9°C
  - Los Angeles: 2.3°C
  - Kern: 1.7°C
  - Inyo: 2.3°C



Mufson et al. 2019

Climate Change in the Mojave

- Daily maximum temperatures will increase by 5-6ºF [2.8-3.3ºC] by 2039, by 6-10ºF [3.3-5.6ºC] for 2040-2069, and 8-14ºF [4.4-7.8ºC] for 2070-2100
- By the end of the century, the hottest day of the year is projected to rise by at least 6ºF [3.3ºC], and up to 9ºF [5ºC]
- Extremely hot days, defined as temperatures >95ºF, averaged 90 per year in the Mojave during the 1981-2000 period, and will increase to up to 141 days by the end of the century

Hopkins (2018)

Climate Change in the Range of the Western Joshua Tree

- Precipitation will increase in interannual variability, with reductions in minimum annual precipitation of up to 50% and increases in maximum annual precipitation of 40-65% by the end of the century
- There will be more extreme and prolonged droughts
- An overall increase in winter precipitation will foster more growth of invasive grasses, leading to more frequent and more intense fire

Ecological Applications, 21(1), 2011, pp. 137–149

Past and ongoing shifts in Joshua tree distribution support future modeled range contraction

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[3]*NOAA Earth Systems Research Laboratory, 325 Broadway, Boulder, Colorado 80305 USA*
[4]*Institute of the Environment, University of Arizona, Tucson, Arizona 85719 USA*
[5]*Lawrence Livermore National Laboratory and University of California, Merced, California 94550 USA*
[6]*USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana 59808 USA*

Abstract. The future distribution of the Joshua tree (*Yucca brevifolia*) is projected by combining a geostatistical analysis of 20th-century climates over its current range, future modeled climates, and paleoecological data showing its response to a past similar climate change. As climate rapidly warmed ~11 700 years ago, the range of Joshua tree contracted, leaving only the populations near what had been its northernmost limit. Its ability to spread northward into new suitable habitats after this time may have been inhibited by the somewhat

esa **ECOSPHERE**

Context-dependent mutualisms in the Joshua tree–yucca moth system shift along a climate gradient

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Citation: Harrower, J. and G. S. Gilbert. 2018. Context-dependent mutualisms in the Joshua tree–yucca moth system shift along a climate gradient. Ecosphere 9(9):e02439. 10.1002/ecs2.2439

Abstract. Changing climate patterns can affect the geographic distribution of species through effects on species interactions. Iconic Joshua trees are limited to a narrow range of climate conditions, and climate
pected to shift suitable habitat to higher elevations and latitudes than their current geographic
. As such, the survival of the species requires colonization of new habitats. However, Joshua
n obligate mutualistic relationship with yucca moths that pollinate the flowers but whose off-
consume a portion of the developing seeds. It is not known whether the yucca moths will
chrony with Joshua trees, or how changing environmental conditions may affect the net bene-
s of the yucca moth–Joshua tree interaction. To evaluate the spectrum of conditional outcomes
ction, we examined a range of performance measures and abiotic factors across the elevation
pans the distribution of Joshua trees in Joshua Tree National Park. We found a strong concor-
en tree size, moth and tree abundance, and reproductive success, with peak performance of
rs at intermediate elevation. Within sites, larger trees produced more flowers, attracted more
and had greater seed set. We found that the conditional outcomes of the interaction varied pre-
ng the gradient: Seed set, as well as seed predation, was greatest at intermediate elevations
and pollinators were both at high abundance. At range margins, the proportion of infertile
sed, possibly because low pollinator abundance led to pollen limitation. The reproductive suc-
a trees is tightly linked to pollinator abundance, and the conditional outcomes (magnitude of
enefit) of the mutualism change depending on where it occurs on the elevation gradient.

esa **ECOSPHERE**

Congruence between future distribution models and empirical data for an iconic species at Joshua Tree National Park

Lynn C. Sweet,[1,]† Tyler Green,[2] James G. C. Heintz,[1] Neil Frakes,[3] Nicolas Graver,[2] Jeff S. Rangitsch,[2] Jane E. Rodgers,[3] Scott Heacox,[1] and Cameron W. Barrows[1]

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Citation: Sweet, L. C., T. Green, J. G. C. Heintz, N. Frakes, N. Graver, J. S. Rangitsch, J
C. W. Barrows. 2019. Congruence between future distribution models and empirical data
Tree National Park. Ecosphere 10(6):e02763. 10.1002/ecs2.2763

Abstract. U.S. national parks protect a natural heritage of global significan
those in the arid southwest, are threatened by climate change. Identifying c
national parks using not only statistical models, but also validating predictio
should provide focus for managers in their stewardship of parks' biological re
rounding Joshua Tree National Park (JTNP), which straddles the Colorado and M
California, previous research has predicted the widespread demise of its nar
Joshua tree (*Yucca brevifolia*) due to climate change. In order to assess whethe
Joshua trees in the future at JTNP, we employed both field measurements and s
current distribution point data together with historic climate data, to match co
Joshua trees established, in order to predict the distribution of continuously suit
the end-of-century. While the high and moderate mitigation could result in refu
and 14% of the original area within JTNP, respectively, the business-as-usual sc
complete elimination of Joshua trees from the park. In order to validate model p
community scientists, we measured the demographic patterns of Joshua tree sta
vations within JTNP. Recruitment within stands shows a strong concordance wit
high-recruiting stands were within or closer to modeled refugia and in areas wit
icit, higher precipitation, and lower maximum temperature than low-recruiti
most importantly indicate the importance of regional to global mitigation strate
as reflected in the difference between maintenance of refugia vs. an almost co
species from the park by the end-of-century. This also underscores the need to
support refugia from multiple management threats. Rather than an ominou
climate refugia provide land stewards with targets for focusing protective m
biodiversity places to weather the future.

Biological Conservation 152 (2012) 29–36

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Modeling impacts of climate change on Joshua trees at their southern boundary: How scale impacts predictions

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ABSTRACT

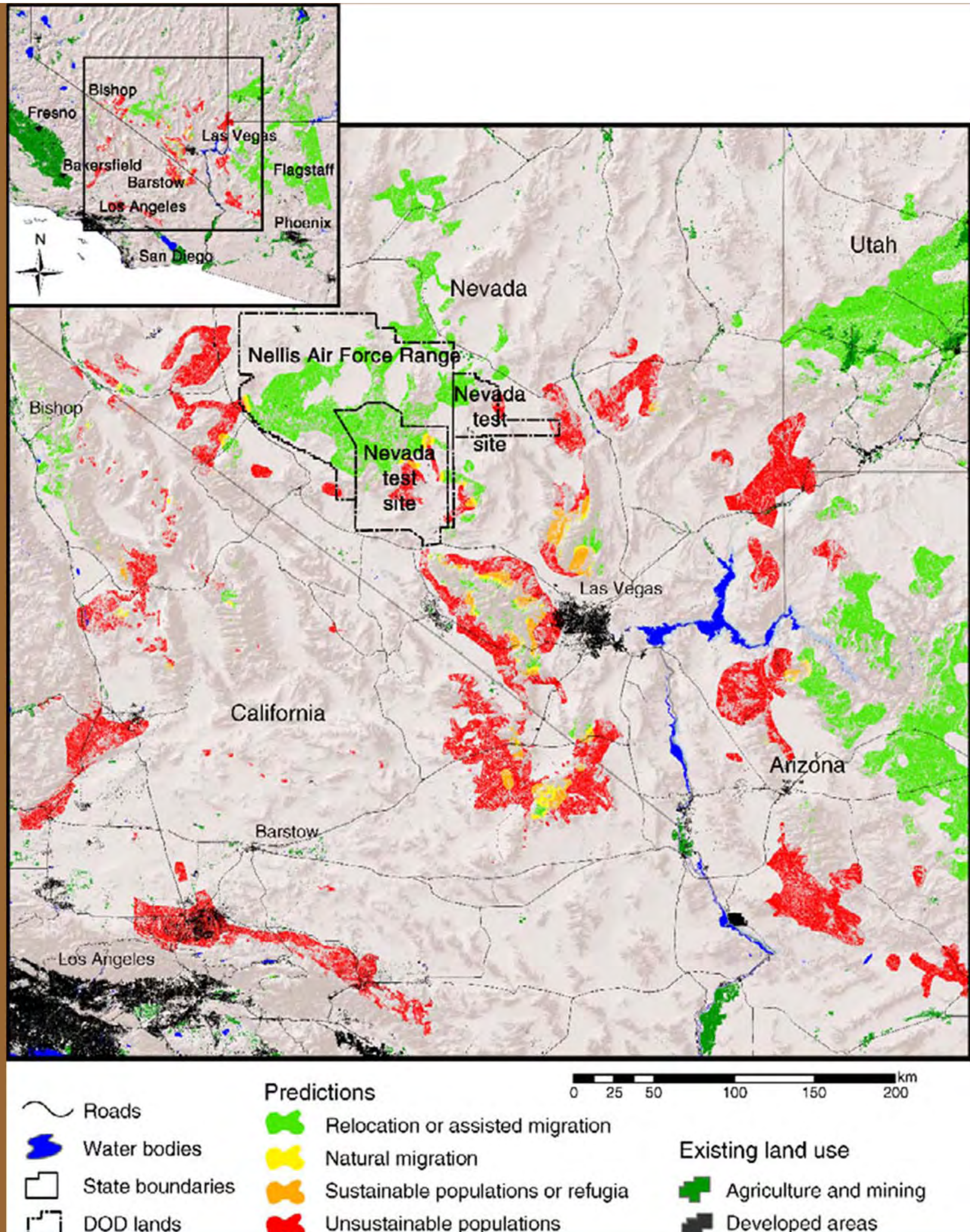
Predicting ecological responses to a changing climate is becoming a critical tool to inform natural resource management efforts. Within Joshua Tree National Park (JTNP), Joshua trees (*Yucca brevifolia*) reach their southern-most distribution. Previous research modeling distributional shifts of Joshua trees in response to climate change have been conducted at large regional scales, predicting widespread extirpation of Joshua trees from their current southern and central distribution. Here we employed the Mahalanobis D^2 statistic and constructed a finer-scale model of the Joshua tree's current distribution within and surrounding JTNP, and then assessed their sensitivity to a gradient of climate change scenar-

Climate Change Impacts on the Western Joshua Tree

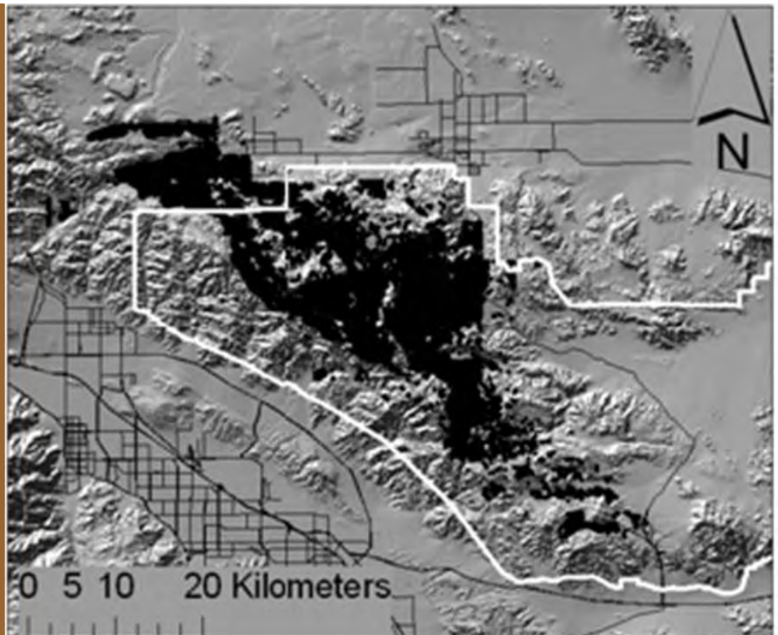
- Cole et al. (2011): Applying predicted changes from climate models shows a severe (~90%) decline in the area of suitable climates for Joshua trees by 2070 to 2099, as the southern and western parts of its range becomes climatically unsuitable.

- Barrows and Murphy-Mariscal (2012): Increasing mean maximum summer temperatures upwards by 1ºC, 2ºC, and then 3ºC resulted in modeled reductions in the extent of suitable habitat for Joshua trees of 30-35%, 66-78% and 90-98% respectively, depending upon the precipitation variables used.

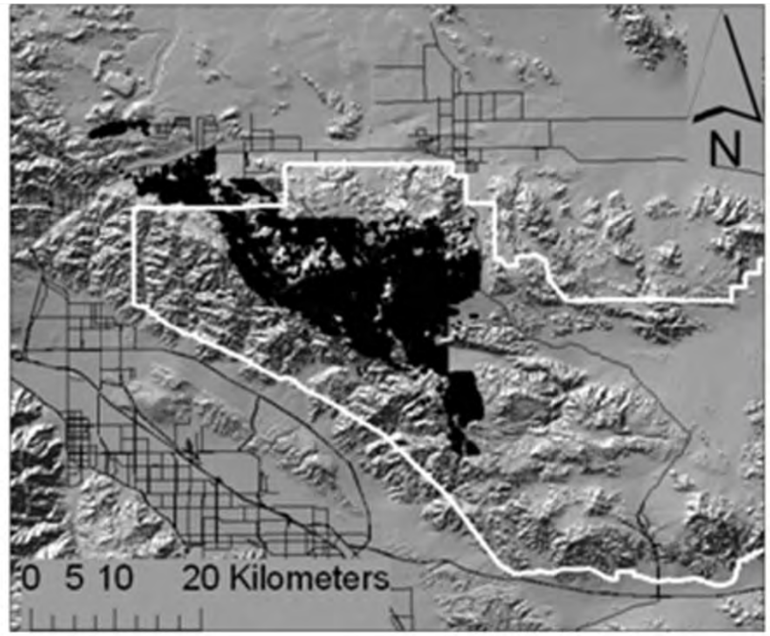
- Sweet et al. (2019): Sought to identify the existence and extent of potential climate refugia within Joshua Tree National Park. Under the most optimistic scenario 18.6% of current occupied areas remained as refugia. However, under the scenario closest to current emissions trajectories, suitable habitat was almost completely eliminated, with only 15 ha, or 0.02% remaining as refugia.



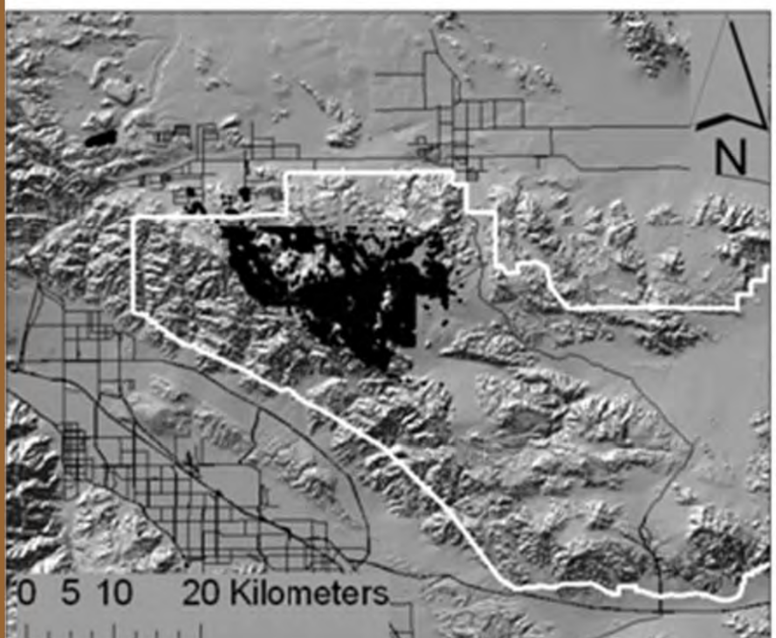
Cole et al. (2011)



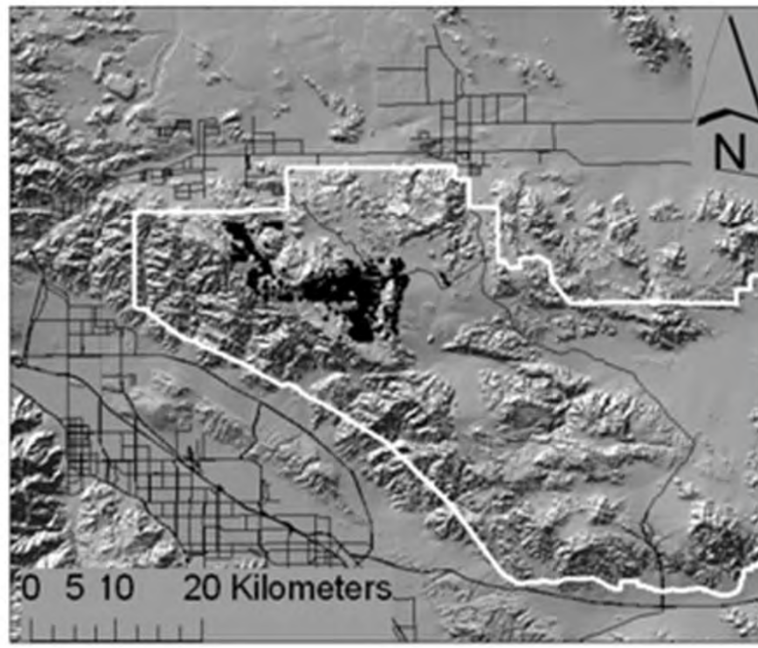
Current niche model



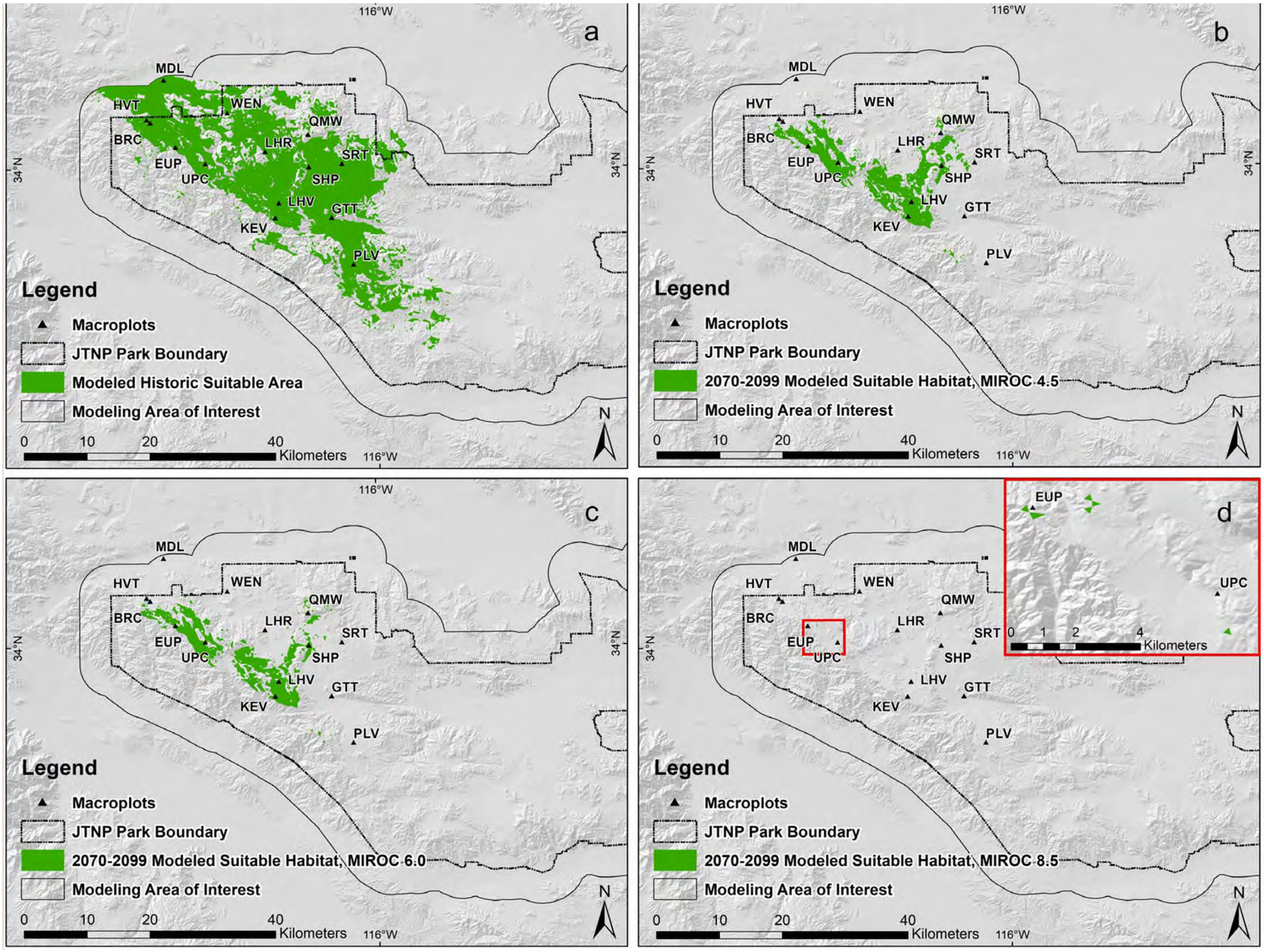
+1°C niche model



+2°C niche model

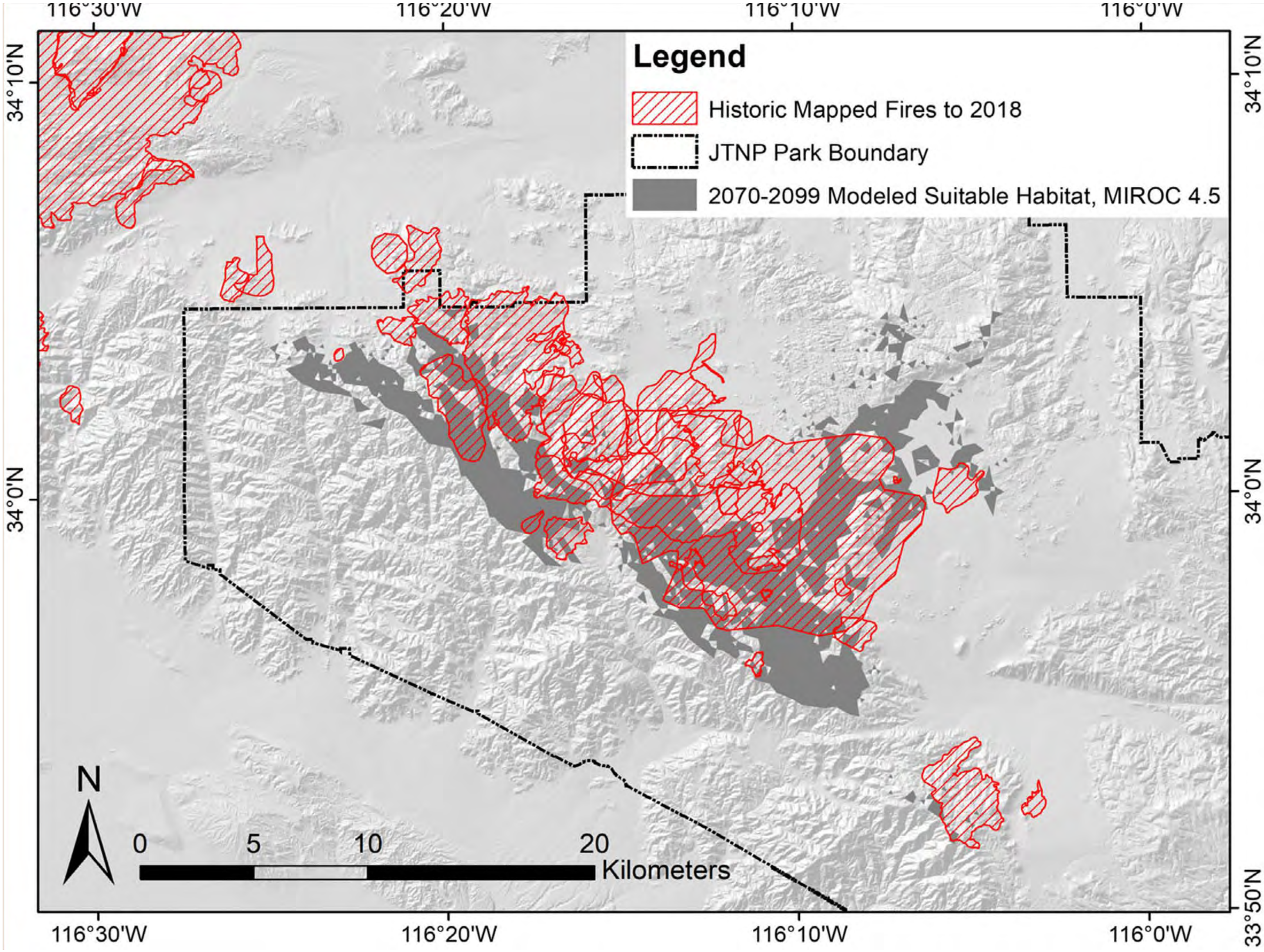


+3°C niche model


a
b
c
d
116°W
34°N
MDL
HVT
WEN
QMW
BRC
LHR
SRT
EUP
UPC
SHP
LHV
GTT
KEV
PLV
Legend
Macroplots
JTNP Park Boundary
Modeled Historic Suitable Area
2070-2099 Modeled Suitable Habitat, MIROC 4.5
2070-2099 Modeled Suitable Habitat, MIROC 6.0
2070-2099 Modeled Suitable Habitat, MIROC 8.5
Modeling Area of Interest
0 10 20 40
Kilometers
0 1 2 4
Kilometers
N

“The areas mapped as Joshua tree refugia, which are found at higher elevation wetter areas, also tend to have the highest covers of invasive annual grasses.”

Sweet et al. (2019)



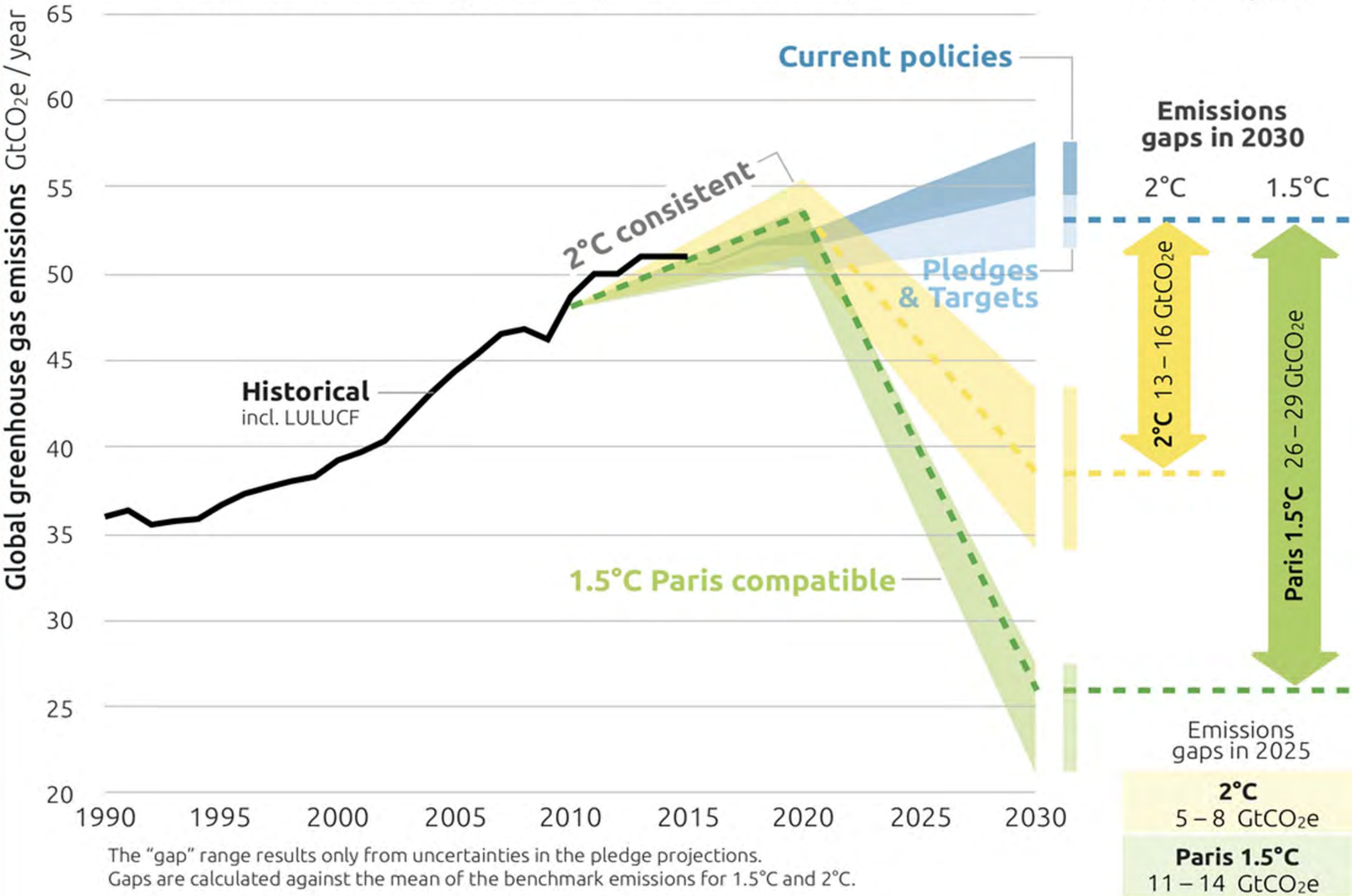
116°30'W
116°20'W
116°10'W
116°0'W
34°10'N
34°0'N
33°50'N
Legend
Historic Mapped Fires to 2018
JTNP Park Boundary
2070-2099 Modeled Suitable Habitat, MIROC 4.5
N
0
5
10
20
Kilometers

Atmospheric Concentration of Carbon Dioxide

Jul. 28, 2020	**413.73 ppm**
Jul. 28, 2019	**409.23 ppm**
1 Year Change	4.50 ppm (1.10%)

2030 EMISSIONS GAPS

CAT projections and resulting emissions gaps in meeting the 1.5°C Paris Agreement goal vs 2°C Cancún goal



The "gap" range results only from uncertainties in the pledge projections.
Gaps are calculated against the mean of the benchmark emissions for 1.5°C and 2°C.

Is the Western Joshua Tree a Threatened Species?

Under the California Endangered Species Act (CESA) a "**threatened** species" is "a native species or subspecies of a … plant that, **although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future** in the absence of the special protection and management efforts . . . ." Cal. Fish & Game Code § 2067.

What are the Consequences of CESA Protection?

- CESA contains both affirmative mandates and prohibitions.
- CESA declares that "it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat and that it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species."
- Conservation mandate applies to all state agencies (e.g. State Parks, Caltrans, the CEC and CPUC), all of whom would have to take conservation of the Joshua tree into consideration when approving projects.
- Under CESA, DFW would be tasked with preparing a recovery plan for the species that lays out the measures necessary to conserve the species. The recovery plan serves as a guide for other state agencies to follow in meeting CESA's conservation mandate.

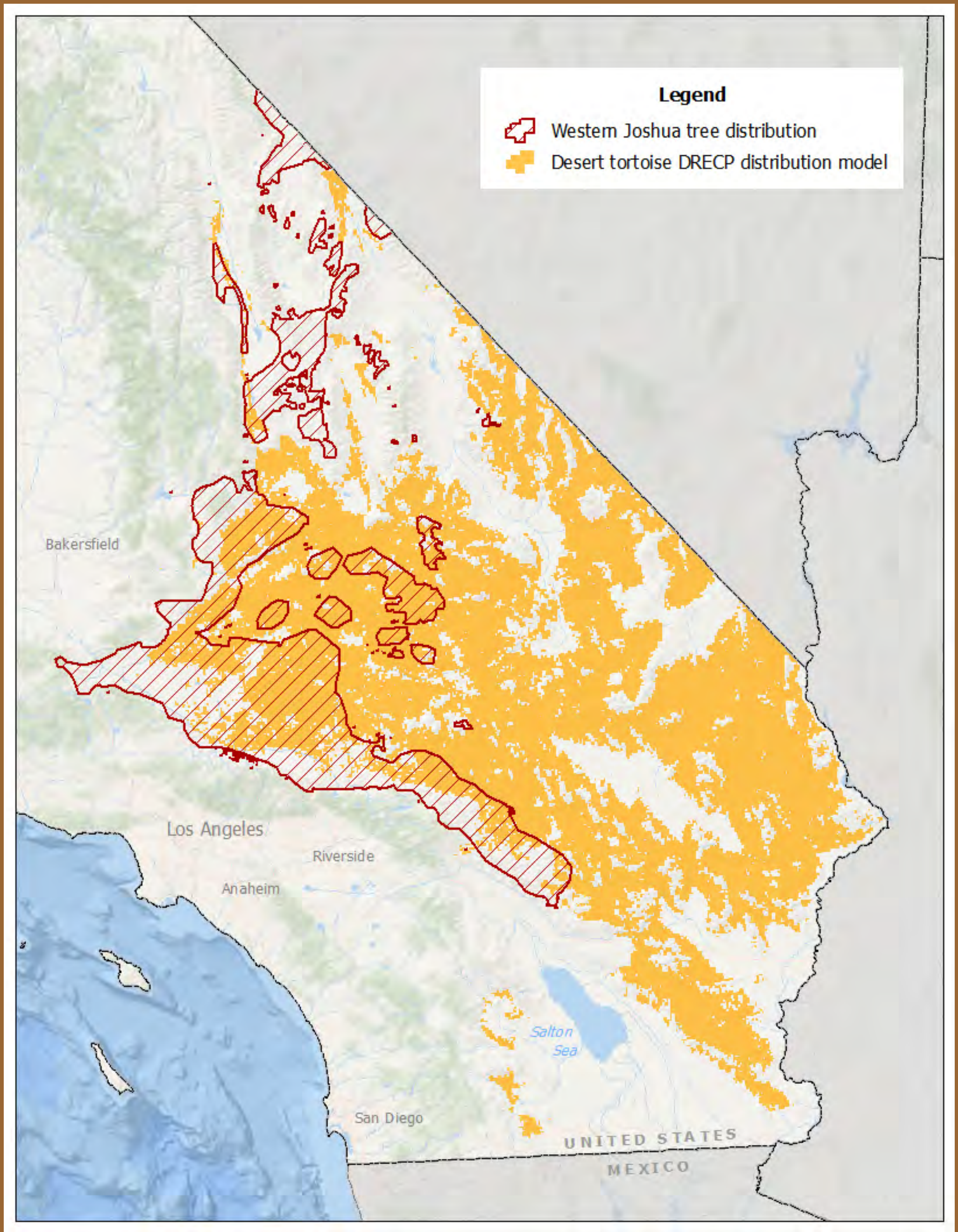
What are the Consequences of CESA Protection?

- CESA contains prohibitions applicable to agencies, including local jurisdictions such as counties and towns.
  - Agencies cannot approve projects that would jeopardize a listed species or destroy or adversely modify essential habitat. Such analysis is focused on population level impacts rather than on impacts to individual members of a listed species.
- CESA has prohibitions that apply to private entities and individuals, who are not allowed to import, export, take, possess, purchase, or sell a listed species absent a permit or authorization.
  - The term “take” means to hunt, pursue, catch, capture, or kill. Most relevant to Joshua trees, this means that an action likely to kill a Joshua tree would be prohibited without a permit or other authorization.

What are the Consequences of CESA Protection?

- There are several exceptions to CESA's prohibitions.
- Individuals and other entities may be authorized via permits or memorandums of understanding to import, export, take or possess a listed species for scientific, educational or management purposes.
  - Under one of these exceptions, an entity could be authorized to, for example, collect seeds and grow Joshua trees for restoration efforts.
- Take of a listed species may also be authorized if the take is incidental to an otherwise lawful activity.
  - Such a permit requires that impacts to the species be minimized and fully mitigated.
  - An incidental take permit can be sought at any scale, ranging from an individual property owner who wishes to build on their land, a larger development project such as a shopping mall or energy project, to an entire city or county.
  - The cost, timeframe and amount of mitigation required to acquire an incidental take permit varies commensurate with the scale of the project.
  - An incidental take permit can be for a single species, or for multiple listed species.

Because the western Joshua tree shares much of its range with the desert tortoise, which is also protected as threatened, many projects that would require an incidental take permit for the Joshua tree would likely also already require a permit for the desert tortoise.



What are the Consequences of CESA Protection?

- Take of a listed species can also be authorized at a regional scale through a Natural Communities Conservation Plan (NCCP).
-
- An NCCP requires landscape scale conservation but also authorizes take of all covered species in the plan area.
- An individual landowner in an area covered by an NCCP does not have to individually apply for a take permit if their proposed activities are consistent with the NCCP.
- There are 14 approved NCCPs in California, including in San Diego, Orange and Riverside counties.
- San Bernardino and other counties and local jurisdictions in the Mojave Desert have never managed to successfully develop an NCCP despite the listing of the desert tortoise 30 years ago.
- The Town of Apple Valley is, at present, alone among desert communities in proactively seeking to develop an NCCP.

Recommended Recovery Actions for the Western Joshua Tree

1. The governor declares a climate emergency and takes all necessary action to set California on a path to full decarbonization of our economy by no later than 2045 (e.g. banning the sale of new fossil fuel vehicles by 2030 and requiring the generation of all electricity from carbon-free sources by 2030).

2. DFW prepares a recovery plan for *Y. brevifolia* pursuant to Cal. Fish & Game Code § 2079.1.

3. DFW works with local jurisdictions to develop NCCPs that protect from development all high-density Joshua tree habitat remaining on private lands.

4. The California Department of Parks and Recreation develops and implements management plans (including fire management plans) focused on Joshua tree protection for relevant state park units (Red Rock Canyon, Eastern Kern County Onyx Ranch SVRA, Saddleback, Arthur B. Ripley Desert Woodland and Antelope Valley California Poppy Reserve).

5. The California Department of Parks and Recreation seeks to acquire habitat to expand and connect existing state parks for protection and restoration of Joshua tree habitat.

Recommended Recovery Actions for the Western Joshua Tree

6. DFW expands its cooperative work with relevant federal agencies (NPS, DoD, BLM, USFWS) to better protect Joshua trees on federal land.

7. DFW works with the University of California, California Invasive Plants Council and other institutions and agencies to develop effective measures to control the spread of invasive grasses in *Y. brevifolia* habitat.

8. DFW works with CAL-FIRE to develop protocols for fire suppression activities within the range of *Y. brevifolia* that maximize protection of the species, while minimizing ground disturbance that may foster the spread of non-native grasses and other invasive species.

9. DFW works with relevant entities to establish and maintain a seed bank of *Y. brevifolia* collected throughout the range of the species to ensure protection of its genetic diversity.

10. DFW works with relevant entities to identify potential sites for assisted migration and develop protocols for carrying out such activities.

Contacts

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