Strategic Plan for Trout and Inland Salmon Hatcheries 2022-2032

The Mission of the Department of Fish and Wildlife is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

The Mission of Department of Fish and Wildlife Trout and Inland Salmon Hatcheries and Stocking Programs is to provide fish for recreational angling and conservation purposes based on the best available science and ecological principles.

California Department of Fish and Wildlife
Strategic Plan for Trout and Inland Salmon Hatcheries, 2022-2032.

Contributing authors and editors: Mark Clifford, Bill Cox, Mark Adkison, Roger Bloom, Kevin Shaffer, Dave Lentz, Jeff Rodzen, Brett Anderson, Frank Riley, Jay Rowan, Farhat Bajjaliya, Michael Mamola, and Christine Mellon (Fisheries Branch), Clark Blanchard (Office of Communications, Education and Outreach), Curtis Milliron and Linda Radford (Northern Region), Kevin Thomas (North Central Region), Brett Wilson (Bay Delta Region), Dean Marston (Central Region), John O'Brian (South Coast Region), Mike Giusti (Inland Deserts Region), Nancee Murray (Office of the General Counsel), Stafford Lehr and Kevin Hunting (Executive Office).

Contents

Executive Summary

Public fish hatcheries have produced trout and inland salmon in California for over 150 years. Through time, biological, physical, political, and societal forces shaped the form, function and objectives of California Department of Fish and Wildlife (Department) trout and inland salmon hatcheries. Most recently this includes compliance with environmental laws, changes to funding sources, legislative production directives, reductions in the number of operational hatcheries, and preparations for climate change impacts including drought and wildfires. In the face of these challenges, Department staff, hatcheries, and stocking programs have evolved to continue providing trout for recreational angling and conservation purposes, while remaining compliant with applicable laws and regulations. Challenges remain, but the Department is confident that trout and inland salmon hatcheries will continue to produce and stock trout efficiently into the future.

This Strategic Plan for Trout and Inland Salmon Hatcheries (Plan) will guide ten years of operations at Department trout and inland salmon (kokanee and inland Chinook) hatcheries. This Plan does not cover Department anadromous hatcheries for salmon and steelhead that migrate to the ocean and then return to freshwater (native Coho salmon, steelhead and various runs of Chinook salmon). Throughout this document trout and inland salmon hatcheries will be referred to simply as "trout hatcheries". The primary purpose of Department trout hatcheries is to provide fish for recreational angling and conservation purposes based on the best available science and ecological principals (Mission). Achieving this Mission requires modernization of hatcheries, equipment, knowledge, perspective, and operations. Hatchery infrastructure upgrades and refined fish husbandry, stocking practices are essential to this modernization. Fish genetics, veterinary science, watershed ecology, the protection of threatened and endangered species, water supply conditioning, water conservation and monitoring technologies, building resiliency to climate change, and producing species of trout native to California are examples of efforts being employed now and into the future by hatchery staff and fishery managers.

Addressing current day challenges while ensuring Department trout hatcheries and stocking programs operate efficiently, remain within budget, maintain environmental stewardship, and are prepared for the

effects of climate change are the impetus for this ten-year strategic plan. The Plan provides guidance for future operations of Department trout hatcheries and stocking programs as outlined in five specific goals:

Goal 1: Augment recreational trout fishing opportunities through supplementation with hatchery produced fish.

Goal 2: Conserve and restore salmonids native to California.

Goal 3: Improve hatchery facilities to ensure climate resiliency and fish production capabilities.

Goal 4: Manage hatcheries and stocking activities in continued compliance with environmental laws and regulations.

Goal 5: Ensure department knowledge and skills are appropriate for science and conservation-based fish husbandry.

This Plan, the Landlocked Salmon Management Plan and the Strategic Plan for Trout Management (SPTM) are the principal documents that guide operations at Department hatcheries and management of trout in California. These documents are supported by numerous policies and the Fish and Game Code. The Department is committed to providing quality trout fisheries through management and supplementation with hatchery reared trout.

The Landlocked Salmon Management Plan is in review and, once adopted, will guide management of inland salmon programs in California.

> The right fish, released for the right purpose, to the right location, in the right numbers, at the right time.

Introduction

Public fish hatcheries were first established in California in 1870 when San Francisco City Hall and the University of California at Berkeley were sites for fish production. In 1960, Department hatcheries produced 34 million trout weighing 1.7 million pounds to satisfy about 1 million licensed recreational anglers (Leitritz, 1970). For comparison, in 2020 Department hatcheries produced over 40 million trout weighing 2.9 million pounds for nearly 1.98 million licensed recreational anglers (Automatic License Data System, 2021). The percent increases from 1960 to 2020 are 70% more pounds of fish and 18% more individual fish for approximately 98% more recreational anglers. Despite the increase in number and pounds of fish planted, the number of recreational anglers in California has outpaced the ability of hatcheries to maintain similar numbers of fish per licensed angler. California anglers regularly express a desire for additional trout fishing opportunities. Maintaining hatcheries and trout production requires careful planning and investment. This is the first large scale Hatchery Strategic Plan ever published by the Department and seeks to set guidelines for effective and efficient trout production and distribution.

Objectives and operations of Department trout hatcheries have changed significantly in the past several decades; from producing sheer numbers of fish for angling harvest, to producing larger fish to satisfy angler preferences, production of native trout species for recreational angling, releasing sterile trout to prevent genetic risk to wild fish, providing safe haven to fish populations in peril from drought, and conservation programs to avoid the extinction of native species. Changes in environmental protection laws have greatly influenced trout production and distribution activities both in California and nationwide. Through these changes the Department remains committed to providing quality trout fisheries for California's anglers. Meeting both traditional and new purposes for Department trout hatcheries will require investments in infrastructure and technology as well as maximizing efficiencies at existing hatcheries.

A major challenge currently impacting Department trout hatcheries is maintaining adequate trout production within existing budgets, with significantly increased operational costs, while addressing aging infrastructure. California and other state fish hatchery systems have experienced rising costs of fish production, especially in the areas of staffing, fish feeds, fish stocking, sterilized fish production (triploids), compliance with environmental laws, and hatchery technologies necessary to address the effects of climate change such as water temperature and new or increased pathogens. In accordance with Fish and Game Code 13007, Department trout hatcheries are funded with a portion of the annual sales of recreational fishing licenses. Fishing license sales have remained relatively

stable in the past several years. When codified in 2006, the funding structure of Fish and Game Code 13007 did not account for rising operational costs at hatcheries, or for the necessary funding of other Department responsibilities including scientists, administration, and law enforcement. Trout hatchery staff make every effort to maximize economic resources and produce as many quality trout as possible, while remaining within budget. Department trout hatcheries strive to address aging infrastructure and invest in modernizing facilities while also continuing to provide fish for recreational angling. Striking a balance between investment and continued operations is economically challenging. For this reason, additional funding, such as what is provided for deferred maintenance through California Proposition 68 (2018), is essential to maintaining and improving the Department's statewide trout hatchery system.

Department trout hatcheries play a pivotal role in providing trout for recreational angling, but also provide public education opportunities and motivate interest in outdoor activities and aquatic ecosystems. Trout hatchery locations provide opportunities for viewing wildlife, public outreach and youth education, scientific research, and support other Department functions such as Law Enforcement and the Wild Trout Program. Hatchery staff regularly participate in outdoor recreation trade shows, fairs, science and children's events, and host hatchery educational events for the public, such as Trout Fest and kids fishing days.

This Plan is consistent with Department laws and policies. The Department's hatchery operations are governed by both laws set forth by California's State Legislature and policies adopted by the California Fish and Game Commission. Several Fish and Game Code Sections address Department trout hatcheries and stocking programs, as well as establish the foundation for both modernized fish culture and the rearing of native and heritage trout species**. Pertinent excerpts from Code Sections include:

- *The Commission shall establish fish hatcheries for stocking the waters of this State with fish. The department shall maintain and operate such hatcheries* (State Fish Hatcheries. Code 1120).
- *Hatchery production and stocking of California's waters started over 140 years ago and is an enduring part of California's history and attempts to steward its natural resources* (Trout Management. Code 1726.1a).
- *Sustainable and adaptive management provides and improves recreational angling opportunities while protecting and maintaining native and wild fisheries…* (Trout Management. Code 1726.1b).
- *Establishing ecologically and environmentally sustainable hatchery and stocking practices for native trout…* (Strategic Plan for Trout Management. Code 1728 C, 4).
- *Hatchery produced trout and inland salmon shall be stocked to support sustainable angling recreation and promote angler access to trout fishing, including but not limited to, urban fisheries* (Priority to Stocking Native Hatchery-Produced Species. Code 1729b).
- Language describing funding and support for Department trout and inland salmon hatcheries to sustain recreational angling for trout and inland salmon (Hatchery and Inland Fisheries Fund; License Fees Deposited Into: Use of Funds. Code 13007).

***The Department defines "native" trout production programs as species or strains of trout native to California, reared and released to any waters of California, as approved by Department fishery managers. The Department defines "heritage" trout production programs as species or strains of trout native to California, reared and released to waters within their historic watersheds.*

State Fish and Game Commission policies that govern operation of Department trout hatcheries are also noted in Policies Adopted by the Fish and Game Commission Pursuant to Section 703 of the Fish and Game Code. These Fisheries Policies include guidance on the stocking of catchable, fingerling and sub-catchable fish, appropriate harvest rate goals for stocked waters, cooperative stocking programs, support for maintaining Golden Trout broodstock, and planting fish for youth camps and youth fishing programs.

Trout hatcheries contribute a unique and important element toward accomplishing the Department's mission, and it is imperative that fish rearing, and stocking practices are both efficient and effective. Department trout hatcheries must also be modernized for scientifically appropriate fish culture, water saving technologies, environmental compliance, and resilience to climate change. As of 2020, the average age of Department trout hatcheries is 78 years, with one as old as 132 years (Mt. Shasta Hatchery; the oldest operating hatchery in the United States west of the Mississippi River).

Fisheries Branch is responsible for developing standards and procedures relating to allotment oversight. The development and implementation of hatchery fish allotments is carried out by Department Regional Fisheries Management staff. These decisions determine what fish species, strain, size, and ploidy are stocked to a specific water, at what time of the year, and ensure that such activities are in accordance with the Department's SPTM, environmental laws, and best ecological principles. The Plan, as an ancillary document to the SPTM, will guide current and future operations for Department trout hatcheries for the next decade. This Plan identifies goals, strategies, and necessities to support trout production for recreational angling and conservation purposes, using the best available science and ecological principles. Along with the SPTM, the goals and objectives of the Plan outline the Department's design for maintaining quality trout fishing, as desired by anglers in California.

Goals

Strategic Plan for Trout and Inland Salmon Hatcheries 2022-2032 Goals:

GOAL 1: Augment Recreational Trout Fishing Opportunities through Supplementation with Hatchery Produced Fish.

GOAL 2: Conserve and Restore Salmonids Native to California.

GOAL 3: Improve Hatchery Facilities to Ensure Climate Resiliency and Fish Production Capabilities.

GOAL 4: Manage Hatcheries and Stocking Activities in Continued Compliance with Environmental Laws and Regulations.

GOAL 5: Ensure Department Knowledge and Skills are Appropriate for Science and Conservation Based Fish Husbandry.

GOAL 1: Augment Recreational Trout Fishing Opportunities Through Supplementation with Hatchery Produced Fish.

Natural trout production in many waters of California is incapable of meeting angling demand. The Department augments natural trout production with hatchery reared fish when necessary to meet that demand. The Department intends to continue this practice and will rear the appropriate fish for designated waters according to fishery management needs. The overall intent is to meet fisheries management goals using fish that are of the desired trout species and strains, are economical to produce, and meet laws and policy requirements pertaining to fish stocking. The Department recognizes that there is a balance between maximizing fish production numbers and ensuring the quality of trout produced (species, strain, size, and appearance). To accomplish this goal, several objectives have been identified that aim to improve hatchery production and efficiency.

Goal 1; Objective 1: Evaluate and Modify Hatchery Operations to Increase Efficiencies

1.1.a. Broodstock Numbers
1.1.b. Broodstock Genetics
1.1.c. Egg and Fish Survival
1.1.d. Photoperiod
1.1.e. Feed Efficiencies
1.1.f. Distribution Efficiencies and Stocking Locations
1.1.g. Support Efficient Hatcheries and Practices
1.1.h. Ensure Adequate Staffing Levels
1.1.i. Put and Grow Fisheries
1.1.a. Broodstock* Numbers.

1.1.a. Broodstock Numbers

By 2023, Department Regional Hatchery Supervisors and the Hatchery Operations Broodstock sub-committee (Broodstock Committee) will review the upcoming stocking allotments and egg requests from Department hatcheries to inform the needs of the state-wide hatchery production program. Findings and recommendations on appropriate broodstock numbers for each species and strain will be presented to the Hatchery Operations Committee (HOC) on an annual basis.

** Broodstock are defined as male and female fish maintained at hatcheries or natural waters for obtaining milt and eggs for fertilized eggs. Fertilized eggs are then incubated and reared for fish production.*

1.1.b. Broodstock Genetics

By 2023, Department Hatchery Managers, Regional and Statewide Fisheries Managers, Research Scientists in the Genetics Research Laboratory (GRL) and Veterinarians in the Fish Health Laboratory (FHL), will conduct evaluations of current trout broodstock strains and species to meet the SPTM and this Plan's goals and individual water management goals. Evaluations may include an assessment of a.) growth rates b.) disease resistance c.) appearance d.) genetic fitness measures e.) angling suitability and desirability f.) catchability and g.) economic practicality. Where less than desirable results are found, existing broodstock sources will be phased out in favor of fish with more desirable attributes that meet SPTM and fishery management goals, as well as legislative requirements.

1.1.c. Egg and Fish Survival

Department hatchery facilities will continue to invest in the utilization of new egg incubation and fish rearing technologies, including investments in water supply filtration, disinfection, and monitoring. By 2023, the HOC will submit a prioritized 5-year capital outlay list to executive leadership and Lands and Facilities Engineering Branch of Department hatchery facility improvements related to egg incubation and fish rearing technologies. The lists will be updated annually. The Regional Hatchery Supervisors and Statewide Hatchery Program Manager will apply for funding through Budget Change Proposals (BCP), grant programs, etc. as necessary to obtain funding for projects.

1.1.d. Photoperiod

Artificially manipulating photoperiods (reoccurring cycle of light and dark periods) can induce sexual maturation outside of normal spawning timing which allows for additional egg production events to occur within a year. By 2024, the Department will begin to utilize and expand the photoperiod process to additional hatchery facilities to diversify fertilized egg production timing for statewide hatchery needs. Egg production needs will be evaluated by the Broodstock Committee and HOC to prioritize which egg production facilities to extend photoperiod technology to based on program needs and funding availability.

1.1.e. Feed Efficiencies

By 2024, Hatchery staff will receive regular training from Hatchery Managers, FHL staff, the Statewide Hatchery Coordinator, and external experts on the efficient use of fish feed, appropriate feeding techniques, trout nutrition, and commercial diets available and their applications.

1.1.f. Distribution Efficiencies and Stocking Locations

Beginning in 2023, each Department trout hatchery will begin obtaining and utilizing suitable vehicles with appropriately sized transport tanks to maximize the efficiency of fish stocking load and ensure appropriate health of fish into receiving waters. Older fish planting vehicles and tanks will be replaced with newer, more fuel efficient, and lower carbon footprint vehicles.

By 2023, Statewide and Regional fisheries managers, Hatchery Managers, and Regional Hatchery Supervisors will evaluate trout stocking allotments and locations to minimize distribution costs and prioritize angling opportunity. This will be achieved by utilizing the Pre-stocking Evaluation (PSE) Protocol Water Prioritization in the annual trout allotment setting meeting to ensure water allotments prioritize the stocking of high use, easy access, roadside waters from the Department hatchery with appropriate fish strains closest to the receiving

water, as well as waters in or adjacent to population centers throughout the entirety of the State.

1.1.g. Support Efficient Hatcheries and Practices.

By 2023, the HOC and Hatchery Program Manager will provide to the Fisheries Management Committee (FMC) and executive leadership an annual cost evaluation of existing fish production facilities and a corresponding assessment of where funds will be most efficiently utilized.

1.1.h. Ensure Adequate Staffing Levels

By 2025 the HOC will provide Department executive leadership recommended staffing levels that are needed to meet production goals at each Department hatchery based on 2021 production levels. By 2030, each Department trout hatchery will be appropriately staffed and funded to match established production goals for each facility.

1.1.i. Use of "Put and Grow" Fisheries

Department hatchery production costs can be reduced by changing some fish allotments from catchable size fish to fingerling and sub-catchable size fish. By 2025, as directed in the Fish and Game Commission Trout Policy, Regional Fisheries Managers will identify waters where fishery management goals can be met by stocking fingerling and sub-catchable size fish to augment recreational fisheries. Hatchery Managers and Supervisors will coordinate with Regional Fisheries Managers to modify annal trout allotments to increase put and grow stocking opportunities in the identified waters. Fisheries Branch will develop standards and procedures for Regional Staff to implement those modifications.

Goal 1; Objective 2: Produce and Stock Trout and Inland Salmon to Provide Public Recreational Angling Opportunities

1.2.a. Agreement with the Strategic Plan for Trout Management, Landlocked Salmon Management Plan, Fish and Game Codes, and Environmental Regulations.
1.2.b. Evaluate and Refine Trout Stocking Locations and Allotments
1.2.c. Domesticated Strains and Species
1.2.d. Native Strains and Species
1.2.e. Priority to Producing and Stocking Native Strains and Species
1.2.f. Cryopreservation for Economic Efficiency

1.2.a. Agreement with the Strategic Plan for Trout Management, Landlocked Salmon Management Plan Fish and Game Code and Environmental Regulations

By 2023, all actions proposed in this Plan will be undertaken in tandem with the SPTM; and all actions proposed will follow Fish and Game Codes, and all State and Federal Environmental Regulations.

1.2.b. Evaluate and Refine Trout Stocking Locations and Allotments

By 2023, Regional Senior Hatchery Supervisors and Hatchery Managers will utilize the water prioritization component of the PSE during the fish planting scheduling process to ensure fish are prioritized for stocking into high priority waters (those with high use, roadside, and easy accessibility) within the designated stocking timeframe. Those waters ranked in the "High" range will be assured that the entirety of the yearly planned allotment for those waters is allocated to be stocked within in the designated stocking timeframe. Only after all "High" priority waters have secured allotments will lower prioritized waters have fish allocated to meet their stocking allotments.

1.2.c. Domesticated Strains and Species

Hatchery production of domestic strains and species of trout will continue to ensure trout are available to support fishery management goals in state waters. By 2023, Regional and Statewide Fisheries Managers will perform regular evaluations of hatchery propagated trout to determine if a given strain in production is meeting all stated fisheries management goals.

By 2026, Regional and Statewide fisheries managers and the HOC will produce a "Hatchery Fish Menu" that describes fishery performance attributes of each of the strains of fish raised by Department trout hatcheries. The Hatchery Fish Menu will be used by Regional Fisheries Managers to select strains for their waters that best meet the fishery management goals for the water.

1.2.d. Native Strains and Species

Native strains and species of trout will continue to be produced by Department trout hatcheries to ensure fish are available to meet legislative requirements and fisheries management goals. There may be a desire of Statewide or Regional fisheries managers to expand production to include new native trout strains or species. By 2024, Fisheries Branch in conjunction with Regional staff will create conservation hatchery guidelines to select new native trout strains or species for potential hatchery production. Conservation Hatchery Guidelines will include at a minimum an evaluation of potential impacts to listed species, genetic analysis of potential source populations, economic and feasibility analysis, establishment of fishery management goals, hatchery production goals, development of a broodstock genetics management plan, and development of a hatchery biosecurity plan.

1.2.e. Priority to Producing and Stocking Native Hatchery-Produced Species, Fish and Game Code 1729

By 2025, Regional Hatchery Supervisors and Hatchery Managers will refer to the Water Prioritization exercise conducted as part of the PSE and the annual trout stocking allotments to determine the priority for trout production and stocking. The priority for fish production goals will be given to native strains and species of trout over meeting fish production goals of domesticated or non-native trout strains.

1.2.f. Cryopreservation for Economic Efficiency

By 2024, Department GRL-Cryopreservation Laboratory staff will train hatchery staff on how to utilize cryopreservation to freeze fish milt (i.e., sperm). Following training and development of cryopreservation methodology, cryopreservation of milt will be incorporated into the Statewide hatchery broodstock programs to increase hatchery program efficiency.

GOAL 2: Conserve and Restore Salmonids Native to California

2.1. Native and Heritage Trout Production Programs
2.2. Conservation Programs, Safe Haven, and Captive Rearing
2.3. Broodstock Management, Genetic Analyses and Spawning Matrices
2.4. Cryopreservation for Conservation Purposes
2.5. New Rearing Infrastructure Technologies

Department trout hatcheries require a shift in infrastructure, equipment, and practices to maintain and propagate trout populations native to California that come from "wild" stocks and have not been domesticated to perform well in hatcheries. As mentioned in sections 1.2.d and 1.2.e above, Department trout hatcheries are increasingly producing trout native to California for recreational angling. Department trout hatcheries have also begun to increase their capability to achieve conservation objectives including providing a limited number of dedicated holding spaces for safe haven from potential climate change related catastrophic events, and propagating native trout populations of special concern, or those that are listed as threatened or endangered. In this regard, Department trout hatcheries are attempting to increase resiliency to the effects of climate change. During the historic drought of 2012-2016, Department trout hatcheries were utilized to provide safe haven for several at-risk salmonid populations. Rescued fish were held at several hatcheries and then released to their wild habitat once habitat conditions improved. These included McCloud River Redband Trout, Southern Oregon and Northern California Coast Coho salmon, Central Valley steelhead, California Golden Trout, Three-Spined Stickleback and various populations of landlocked Southern California steelhead.

Conservation efforts by the Department's trout hatcheries have demonstrated success in the breeding, rearing and release of trout strains and species native to California given the proper funding, equipment, and hatchery infrastructure, however the ability to

respond to increasingly catastrophic climate events and expand production of new native strains of trout is limited by funding and aging or inadequate hatchery infrastructure. Future efforts to conserve and restore salmonid populations native to California is a priority of the Department and will need to be supported by dedicated funding and commitment to modernize Hatchery facilities.

2.1. Native and Heritage Trout* Production Programs

Department trout hatcheries will coordinate with Statewide and Regional fisheries managers to implement increased production, or production of new trout strains or species native to California for recreational angling as identified using the conservation hatchery guidelines described in objective 1.2.d. Increases in current native species production or addition of new trout strains or species may include: Eagle Lake Rainbow Trout, Lahontan Cutthroat Trout, California Golden Trout, McCloud River Redband Trout, Kern River Rainbow Trout, and native Steelhead.

2.2. Conservation Programs, Safe Haven, and Captive Rearing

By 2023, five Department trout hatcheries will be prepared to provide safe haven for at-risk populations of native fish via extraction from the wild. These safe haven hatcheries will be prepared for long-term retainment of those fish at hatchery facilities. Fish extracted from the wild and brought into Department trout hatcheries will follow established Department fish rescue policies and procedures that are currently in place, as well as being developed via the Strategic Plan for Trout Management. Dedicated funding for hatchery safe haven activities will be identified prior to rescue activities.

2.3. Broodstock Management, Genetic Analyses and Spawning Matrices.

By 2023, Regional Hatchery Supervisors and Hatchery Managers will refer to genetic management plans, Department genetic guidelines, DRAFT Department guidance on Adaptive Conservation Propagation Programs, and coordinate closely with GRL Research Scientists on broodstock selection and management to ensure proper native species and strain conservation measures are implemented in all native trout spawning programs.

By 2026 all Department Heritage and Native trout hatchery Broodstock programs shall have written broodstock genetic management plans or spawning matrices implemented. No new native trout broodstock programs shall be started without a written broodstock genetics management plan and spawning matrix.

2.4. Cryopreservation for Conservation Purposes

By 2024, Department hatcheries will begin collection, cryopreservation, and storage of fish milt from native trout, and state and federally listed salmonids and Species of Special Concern to aid in conserving and restoring populations of salmonids native to California. Milt will be stored and utilized as needed for implementation of genetic management plans.
By 2024, Department will demonstrate viability of cryopreservation process by incorporating cryopreserved milt into at least one hatchery spawning program.

2.5. New Rearing Infrastructure Technologies

By 2024, Hatchery Supervisors and Hatchery Managers will assess equipment and infrastructure needs and begin planning for investments in recirculating aquaculture, water quality monitoring systems, and other state of the art fish production technologies, as a means of improving native fish production. The HOC will put forward a prioritized list of desired projects in the 5-year capital outlay and 5-year deferred maintenance lists to executive leadership and Engineering Branch annually. Projects will be implemented as funding allows.

GOAL 3: Improve Hatchery Facilities to Ensure Climate Resiliency and Fish Production Capabilities

3.1. Infrastructure Improvements
3.2. Deferred Maintenance
3.3. Vehicle Replacement
3.4. Water Saving, Conditioning, and Monitoring Technologies
3.5. Diversify Broodstock Location and Fertilized Egg Availability

The Department's trout hatcheries require infrastructure maintenance and improvement, and vehicle fleet replacement and modernization to reduce the Department's carbon footprint, build resilience to climate change related impacts, expand native fish production, and improve efficiencies. The science of trout production is evolving rapidly and revealing methods and technologies that are more efficient, environmentally friendly, and better for maintaining the genetic integrity and diversity of the fish produced. The Department's trout hatcheries must remain current with the best available science and utilize modern technology to remain effective, efficient, and adaptable to future needs.

The California Department of Fish and Wildlife's hatchery system is possibly the oldest and the largest publicly owned hatchery system in North America. These distinctions are simultaneously a badge of honor and a harbinger of jeopardy. Aging infrastructure requires maintenance, repair, or replacement with modern aquaculture systems and energy saving equipment. The average age of Department trout hatcheries is approximately 78 years with an average commencement year of 1943 (Table 1). In addition, many trout hatcheries are in high-risk fire areas. Infrastructure needs such as fish culture tanks, plumbing, electrical, roadways, structures, solar power, fire suppression systems, and adequate defensible space must be addressed for optimal operations, and more importantly for human health and safety.

In 2016 approximately 7 million dollars was provided by the State's General Fund to address a long and maturing list of deferred maintenance needs at Department trout hatcheries. Several capital outlay projects were approved to upgrade trout husbandry infrastructure and support new fish husbandry technologies. In 2018, California voters approved Proposition 68

which includes 50 million dollars to address deferred maintenance at Department fish hatcheries and lands including wildlife areas and ecological reserves. Financial support for deferred maintenance and improved technology projects is required annually so that operations and the safety of staff and the visiting public can be assured. The Department has and will continue investing in water reuse and monitoring technologies and diversify broodstock programs to buffer against the future effects of drought, catastrophic fires, and other climate change impacts.

From 2007 to 2015, the average cost of repairing and maintaining the aged hatchery fleet of vehicles was $238,199 per year. The aged vehicles, combined with the disruption to hatchery operations and the associated inefficient use of staff time, justify the replacement of the vehicles in a phased approach. The Department has implemented that a minimum of three hatchery vehicles be replaced per year, at an approximate annual cost of $250,000. This is expected to result in more efficient use of fuel, reduced diesel emissions, reduced staff time, and the avoidance of costly and consistent vehicle repair. New fish hauling trucks with larger and modern tanks can accommodate larger loads of fish, thereby reducing the number of trips required to deliver fish, further reducing fuel, emissions, and staff time. The Department is also investing in zero emission vehicles on hatchery grounds where possible to reduce dependency on fossil fuels.

Table 1. California Department of Fish and Wildlife Trout Hatcheries in 2019.

Hatchery Name	Year Initiated	Age in years (as of 2020)	Primary Purpose	Species Reared*
AMERICAN RIVER	1968	52	Trout production, native species	BN, LCT, ELT, KOK, RT
BLACK ROCK	1941	79	Trout production	RT
CRYSTAL LAKE	1947	73	Trout production, broodstock, native species	BN, CHIN, ELT, RT, GT
DARRAH SPRINGS	1954	66	Trout production, broodstock, native species	LCT, ELT, RT
FILLMORE	1940	80	Trout production, native species	ELT, RT, BN, LCT, GT
FISH SPRINGS	1952	68	Trout production, native species	ELT, RT, GT
HOT CREEK	1931	89	Trout production, broodstock, native species	BN, LCT, ELT, RT
KERN RIVER	1928	92	Planting base, future broodstock, native species	ELT, RT
MOCCASIN CREEK	1954	66	Trout production, native species	BN, RT, ELT, LCT, GT
MOJAVE RIVER	1947	73	Trout production, native species	ELT, RT, BN
MOUNT SHASTA	1888	132	Broodstock, trout production, native species	BN, RT, ELT, RT-RB
SAN JOAQUIN	1955	65	Trout production, broodstock, native species	ELT, GT, KOK, RT
SILVERADO PLANTING BASE	1957	63	Planting base, quarantine station, trout production, native species	CHIN, ELT, KOK, RT, GT

***Fish Species and Strain Acronyms**

RT- rainbow trout (*Oncorhynchus mykiss*)
Department Strains of RT include Shasta, Kamloops, Hot Creek, Pit River, West Virginia, and Hofer
ELT- Eagle Lake trout (*Oncorhynchus mykiss aquilarum*)
RT-RB- McCloud River Redband trout (*Oncorhynchus mykiss stonei*)
LCT- Cutthroat trout (Lahontan)- (*Oncorhynchus clarkii henshawi**
*Department strains of LCT include Pilot Peak and Independence (i.e. Heenan Lake)
Department strains of LCT include Pilot Peak and Independence (Heenan Lake)
GT- Golden trout (*Oncorhynchus aguabonita*)
BN- Brown trout (*Salmo trutta*)
CHIN- Chinook Salmon (*Oncorhynchus tshawytscha*)
KOK- Kokanee Salmon (land-locked *Oncorhynchus nerka*)

3.1. Infrastructure improvements

Aging infrastructure within Department trout hatcheries will continue to be upgraded to state of the art fish culture and water and energy saving systems such as recirculating aquaculture systems, variable speed well pumps, solar power, and water quality treatment and monitoring. The Department will seek funding via Capital Outlay, Proposition 68, and Budget Change Proposal processes to aid in increased fish husbandry efficiency and effectiveness, as well as providing a safe working environment for staff when present at the work site. By 2023, the HOC will put forward a prioritized 5-year Capital Outlay list to executive leadership and Engineering Branch and will apply for external funding for projects on a yearly basis. The 5-year list will be updated annually. Projects will be implemented as funding allows.

3.2. Deferred maintenance

The HOC will put forward a prioritized 5-year list of Deferred Maintenance Projects to executive leadership and Engineering Branch annually and will apply for external funding on a yearly basis. The 5-year list will be updated annually. Projects will be implemented as funding allows.

3.3. Vehicle Replacement

By 2024, the Department hatchery program will replace all diesel retrofit stocking vehicles and associated fish hauling tanks. By Fiscal Year 2022-2023 the HOC will evaluate the entire hatchery fleet annually and create a prioritize list of vehicles for replacement. The Hatchery Program Manager will budget sufficient funds from the Hatchery Inland Fisheries Fund (HIFF) to replace at least the three highest priority hatchery fleet assets (planting trucks, trailers, passenger vehicles, forklifts, carts, etc.) from the prioritized list each year. The Department will make additional investments to transition away from aging vehicles and towards fuel-efficient vehicles as budgets allow.

3.4. Water Saving, Conditioning, and Monitoring Technologies

By 2026, the HOC will coordinate with Engineering Branch to evaluate each hatchery for potential water saving, conditioning, and monitoring technologies, including investments in recirculating aquaculture systems, variable speed pumps, and water quality monitoring needs at all trout hatcheries and report a prioritized list of projects (5-year Capital outlay list) to executive leadership and Engineering Branch. Regional Hatchery Seniors and Program Managers, and the statewide Hatchery Program Manager will apply for project funding through grants, BCPP, etc. Projects will be implemented as funding allows.

3.5. Diversify Broodstock Location and Fertilized Egg Availability

By 2024, Regional Hatchery Supervisors and the Broodstock Committee will compile a list of state trout hatcheries that could potentially implement new broodstock projects, including any necessary infrastructure improvements such as construction or

modifications of hatchery buildings, fish rearing tanks, or equipment for photo period, to diversify Department trout hatchery egg production locations and increase resiliency of egg supplies to effects of climate change. A prioritized list along with necessary infrastructure improvements will be provided to the HOC for evaluation and implementation as funding allows.

GOAL 4: Manage Hatcheries and Stocking Activities in Continued Compliance with all Environmental Laws and Regulations

Federal • State • Local

In 2006, the Department underwent litigation for trout hatcheries and fish stocking practices that were believed to not be in compliance with the California Environmental Quality Act. The litigation resulted in the publication of the Hatchery and Stocking Program Environmental Impact Report (EIR) in 2010. The mitigation measures in the EIR include:

- Minimizing contaminants and pathogens in hatchery discharges.
- Monitoring and best management practices to minimize risk of disease transmission to native amphibian populations.
- Stocking triploid trout to reduce the potential for interbreeding with steelhead.
- Minimizing unintentional releases.
- Minimizing disturbance in riparian areas.
- Preparing and implementing hatchery specific Hazard Analysis and Critical Control Point Plans to better detect and control aquatic invasive species at Department hatcheries.
- Educating anglers to control invasive species.
- Preparing and implementing hatchery genetic and management plans.
- Implementing measures to reduce non-target harvest.
- Implementing a pre-stocking evaluation assessment to minimize risk of stocking in habitat of sensitive species.

While work remains for trout hatchery genetic and management plans, all other EIR mitigation measures were fully implemented by Department trout hatcheries and stocking programs. In 2015, a Court of Appeal generally upheld and validated the EIR after several challenges had been filed. The Department is working with the United States Fish and Wildlife Service to complete the process required pursuant to the National Environmental Policy Act that would support a Biological Assessment and/or Biological Opinion, in compliance with Section 7 of the federal Endangered Species Act for continued eligibility for federal funding at Department trout hatcheries. The most notable implication of the EIR was a significant reduction in the number of water bodies approved to receive hatchery produced trout. These measures were justified to protect any plant or animal species listed as threatened or endangered by state or federal endangered species acts.

Objectives:

By 2023, Department hatchery and regional and statewide fisheries management staff will ensure that trout hatchery operations and fish stocking activities remain in compliance with all applicable federal, state, and local environmental laws and regulations.

GOAL 5: Ensure Department knowledge and skills are appropriate for science and conservation-based fish husbandry.

Objectives:

By 2024, Regional Hatchery Supervisors, Statewide Hatchery Coordinator, Program Manager, and the FHL will ensure that hatchery staff, scientists and management stay informed of new hatchery science, through review and dissemination of primary journal publications and other published literature. Additionally, hatchery program staff will attend annual meetings and workshops of state, federal, tribal, university and private industry to acquire knowledge of current scientific information on trout husbandry and stocking.

The Statewide Hatchery Coordinator and Program Manager, and Regional Hatchery Supervisors will continue collaboration and information sharing through annual meetings and communications. Through the HOC, hatchery staff and scientists will receive regular presentations from industry representatives, Department, and other state and federal experts on modern hatchery technologies. Regional Hatchery Supervisors will ensure that Hatchery Managers provide this information to hatchery staff at all levels. Regional Hatchery Supervisors will ensure that Hatchery Managers and staff receive regular trainings within California, and when possible outside the state that address topics including but not limited to first aid, forklift driving, Class A vehicle driving, swift water rescue, fish husbandry, data collection and entry, National Pollutant Discharge Elimination System water sample collection, recirculating aquaculture, fish health maintenance and fish nutrition.

Conclusion

The Future: Onward and Upward

The Strategic Plan for Trout and Inland Salmon Hatcheries (2022-2032) was developed to guide Department trout hatchery operations for the next ten years with the greatest efficacy and efficiency. The overarching theme is to maintain trout production and stocking for recreational and conservation purposes, with adequate facilities, adequate staffing, in accordance with pertinent laws, using the best available science and ecological principles. Department trout hatcheries have provided fish for recreational fisheries, education, and research, for well over 100 years. The first public fish hatchery in California began 150 years ago. This long and rich history is filled with hard-working visionaries and pioneers in the field, from those using newly constructed railroads for the transportation of fish, to modern-day molecular biologists using state of the art genetic techniques to manage and improve hatchery stocks. Innumerable opportunities exist for the future of Department trout hatcheries. As science progresses into the future for another 150 years, Department trout hatcheries intend to remain effective and applicable; for the societal benefit of fisheries and recreational angling, and for the intrinsic value of trout native to California's heritage of natural resources and aquatic ecosystems.

Implementation Plan: Strategic Plan for Trout and Inland Salmon Hatcheries 2022-2032

This section defines the Department's plan to implement the goals and objectives of the Strategic Plan for Trout and Inland Salmon Hatcheries, 2022-2032. The Implementation Plan will state who is responsible for the action, when the action is to take place, and if additional resources are required.

1. Action Item

Goals and objectives are listed as Action Items and are numbered in exact order as presented in the Strategic Plan for Trout and Inland Salmon Hatcheries, 2022-2032.

- **Goal 1.** Augment recreational trout fishing opportunities through supplementation with hatchery produced fish
  - **Objective 1.** Evaluate and Modify Hatchery Operations to Increase Efficiencies
  - **Objective 2.** Produce and Stock Trout to Provide Public Recreational Angling Opportunities
- **Goal 2.** Conserve and Restore Populations of Salmonids Native to California
- **Goal 3.** Improve Hatchery Facilities to Ensure Climate Resiliency and Fish Production Capabilities
- **Goal 4.** Manage Hatcheries and Stocking Activities in Continued Compliance with all applicable Environmental Laws and Regulations
- **Goal 5.** Ensure Department Knowledge and Skills are Appropriate for Science and Conservation Based Fish Husbandry

2. Timeline

2022-2032

3. Responsible Party

Department staff or committee responsible for completing the Strategic Plan's goals and objectives (as Action Items).

4. Funded

This column indicates if an Action Item is currently funded or requires additional resources for full implementation.

- Yes: Action Items currently funded
- No: Action Items not currently funded
- Needed: Action Items funded in part as of August 2020. Immediately achieving all goals of this Strategic Plan would benefit from access to additional funding.

Table 2. Summary of goals and associated action items.

Goal	Action Item	Timeline	Responsible party	Funded
1.1	Broodstock Numbers	2023	Regional Hatchery Supervisors, Broodstock Sub-Committee, HOC	Yes
1.1	Broodstock Genetics	2023	Hatchery Managers, Regional / Statewide Fisheries Managers, Genetics Research Laboratory	Yes
1.1	Egg and Fish Survival	2022	HOC, Regional Hatchery Supervisors, Statewide Hatchery Program Manager	Yes
1.1	Photoperiod	2024	Broodstock Committee, HOC	Needed
1.1	Feed Efficiencies	2024	Hatchery Managers, Fish Health Laboratory Staff, Statewide Hatchery Coordinator, External Experts	Yes
1.1	Distribution Efficiencies and Stocking Locations	2023	Statewide / Regional Fisheries Managers, Hatchery Managers, Regional Hatchery Supervisors	Yes
1.1	Support Efficient Hatcheries and Practices	2023	HOC	Needed
1.1	Ensure Adequate Staffing Levels	2025-2030	HOC	Needed
1.1	Put and Grow Fisheries	2025	Regional Fisheries Managers	Yes

Goal	Action Item	Timeline	Responsible party	Funded
1.2	Agreement with the Strategic Trout Management Plan, Fish and Game Codes, and Environmental Regulations	2023	All Appropriate Department Staff	Yes
1.2	Evaluate and Refine Trout Stocking Locations and Allotments	2023	Regional Senior Hatchery Supervisors, Hatchery Managers	Yes
1.2	Domesticated Strains and Species	2023-2026	Regional / Statewide Fisheries Managers, HOC	Yes
1.2	Native Strains and Species	2024	Fisheries Management Committee	Needed
1.2	Priority to Producing and Stocking Native Strains and Species	2025	Regional Hatchery Supervisors, Hatchery Managers	Yes
1.2	Cryopreservation for Economic Efficiency	2024	GRL-Cryopreservation Laboratory Staff	Yes
2.1	Native and Heritage Trout Production Programs	Ongoing	Statewide / Regional Fisheries Managers, Trout Hatcheries	Needed
2.2	Conservation Programs	2023	Trout Hatcheries	Needed
2.3	Broodstock Management, Genetic Analyses and Spawning Matrices	2023-2026	Regional Hatchery Supervisors, Hatchery Managers	Yes
2.4	Cryopreservation for Conservation Purposes	2024	Trout Hatcheries	Yes
2.5	New Rearing Infrastructure Technologies	2024	Hatchery Supervisors, Hatchery Managers, HOC	Needed
3.1	Infrastructure Improvements	2022-2030	HOC	No
3.2	Deferred Maintenance	2023-2030	HOC	Needed
3.3	Vehicle Replacement	2024-2030	HOC	Needed
3.4	Water Saving and Conditioning Technologies	2026	HOC, Engineering Branch, Regional Hatchery Seniors, Regional Program Managers, Statewide Hatchery Program Manager	No
3.5	Diversify Broodstock Location and Fertilized Egg Availability	2024	Regional Hatchery Supervisors, Broodstock Committee, HOC	Needed
4.1	Federal, State, Local	2023	Hatchery and Fisheries Management Staff	Yes
5.1	Hatchery Staff (all levels)	2024	Regional Hatchery Supervisors, Statewide Hatchery Coordinator and Program Manager, Fish Health Laboratory, Hatchery Program Staff (all levels), HOC	Yes

References

Bignon, William et. al. Captive Rearing Environment Affects Bull Trout Phenotype: Implications for recovery strategies. 2014. Personal communication. Information presented at the North West Fish Culture Concepts annual meeting and workshop, Pendleton OR, 2014. Abstract Accessed on January 18, 2017 at https://afs.confex.com/afs/2015/webprogram/Paper19376.html.

California Department of Fish and Wildlife. 2019. Sport Fishing License Sales Statistics. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=59818&inline.

California Fish and Game Code, 2019. Law Tech Publishing. Also available at: http://codes.findlaw.com/ca/fish-and-game-code/

Leitritz, Earl. 1970. A History of California's Fish Hatcheries 1870-1960. Fish Bulletin 150. State of California Resources Agency, Department of Fish and Game.

Southwick Associates. Sportfishing in America: An Economic Force for Conservation. 2012. Produced for the American Sportfish Association (ASA) under a U.S. Fish and Wildlife Service (USFWS) Sportfish Restoration Grant (F12AP00137, VA M-26-R) awarded by the Association of Fish and Wildlife Agencies (AFWA).

Appendix 1.

Primary and Ancillary Benefits of Department Hatcheries

- Recreational Angling
  - Domesticated and native species
- Value to local, state and national economy
  - Proven economic multiplier
- Promotes a healthy outdoor activity
- Ensures a lasting outdoor legacy
  - Excise taxes on angling support restoration and preservation activities
- Provides diverse fisheries including native and heritage trout species
- Provides recreational angling to urban populations that may not have easy access to national forests or other natural areas
- Conservation of threatened and endangered species
  - Fish rescue and safe haven
  - Adaptive Conservation Propagation Programs
  - Genetic banking
  - Buffering effects of climate change
  - Providing resilience to drought
- Propagation of listed species
  - Species recovery
- Outreach and Education
  - Public visitation
  - School tours
  - Visitors center and education programs
  - Mentoring, internships and volunteer programs
  - Supply of eggs for classroom projects
  - Classroom Aquatic Education Program/Trout in the Classroom
  - Trout Fest (free public education and community activity)
  - Youth angling opportunities

- Wildlife viewing at hatchery grounds
  - Department facilities with picnic areas
  - Public lands with terrestrial, riparian and aquatic habitat
- Natural resources career opportunities.
  - Most often, but not exclusively, in rural areas
- Ready supply of trout fish and eggs:
  - For academic research
  - For fisheries management
  - For fish health/pathogen science
  - For public educational displays
  - For educational dissections and science curricula
- Support facilities for Department wildlife investigations and Law Enforcement Division
- Public relations
  - Hatchery staff in uniform are often the first, and only Department representatives known to the public
- Local community support
  - As members of local communities, hatchery staff regularly interact with public and local officials
- Hatcheries provide watershed monitoring for:
  - Pathogens
  - Aquatic invasive species
  - Water quality parameters (for example):
- Water quality
  - Flow
  - Dissolved oxygen
  - Temperature
  - Suspended solids
  - pH
  - Nitrates
- Hatchery locations and activities support riparian habitats
- Department trout hatcheries are non-consumptive users of water