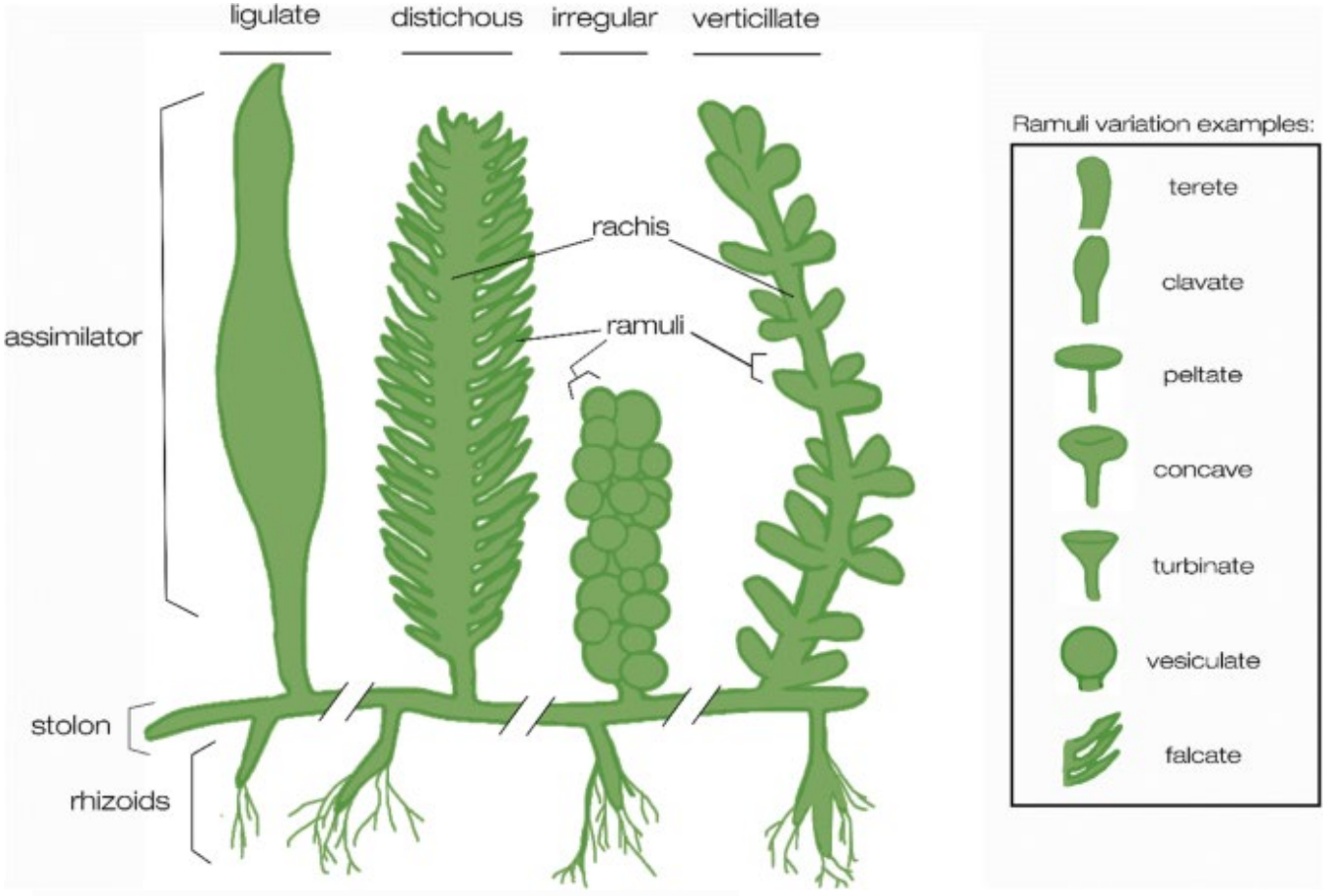
Caulerpa Surveyors Exam study guide

It is imperative that you have reviewed the Caulerpa Control Protocol (CCP) prior to taking the exam as there are new questions based on the CCP. In order to pass the exam you must get all of these CCP questions correct. Please review the following images as the species presented are incorporated in the image portion of the exam.

Caulerpa Anatomy



1Zubia, M., Draisma, S.G.A., Morrissey, K.L. et al. *Concise review of the genus* Caulerpa *J.V. Lamouroux.* J Appl Phycol ***32,*** *23–39 (2020). https://doi.org/10.1007/s10811-019-01868-9*

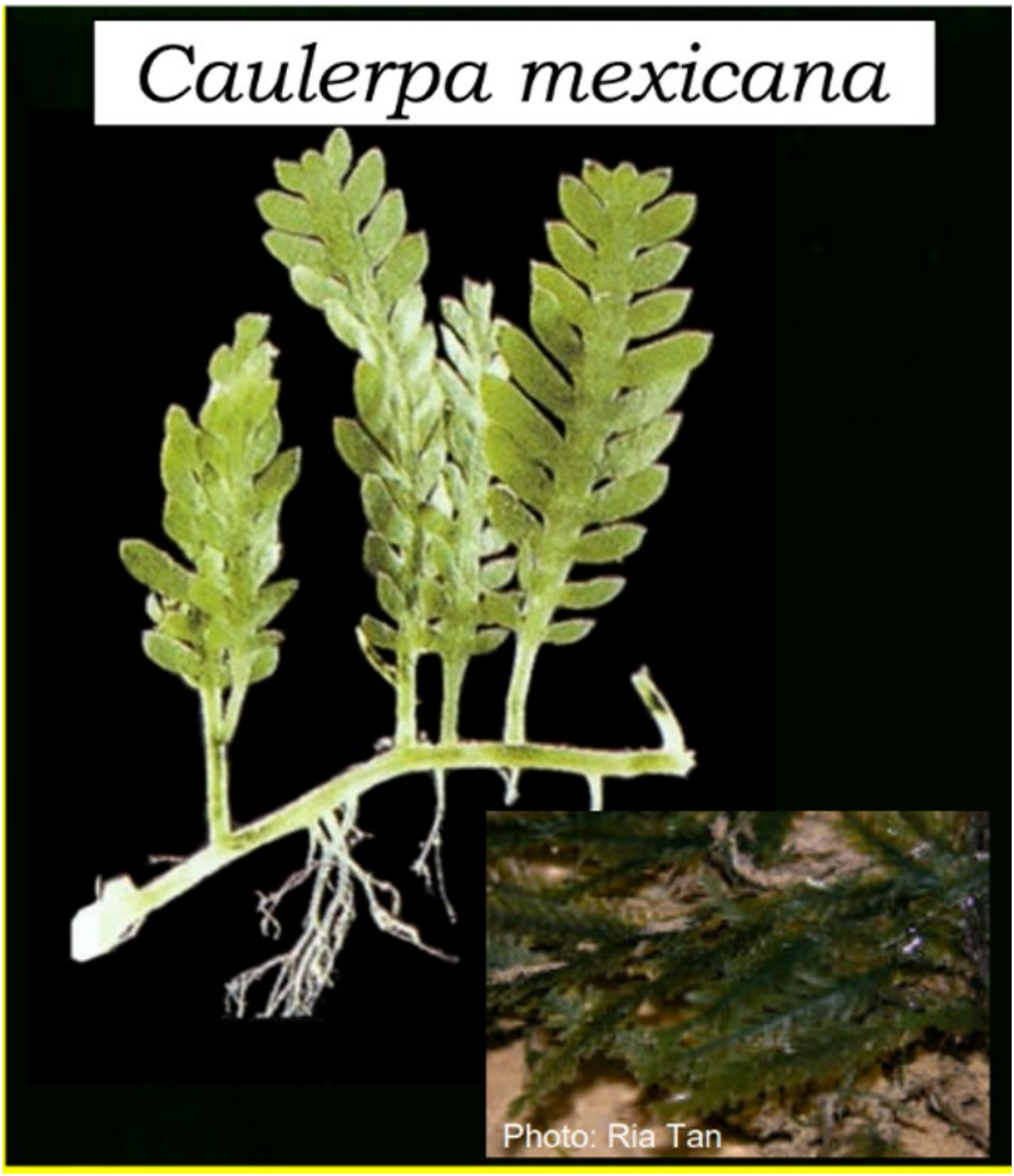
Caulerpa taxifolia

Photo: R. Woodfield

Photo: G. Peters

Photo: R. Woodfield

Caulerpa mexicana



Caulerpa racemosa

Caulerpa cupressoides

Caulerpa ashmeadii

Caulerpa floridana

Photo: Vincent B. Hargreaves

Caulerpa sertulariodes

Photo: John Rice

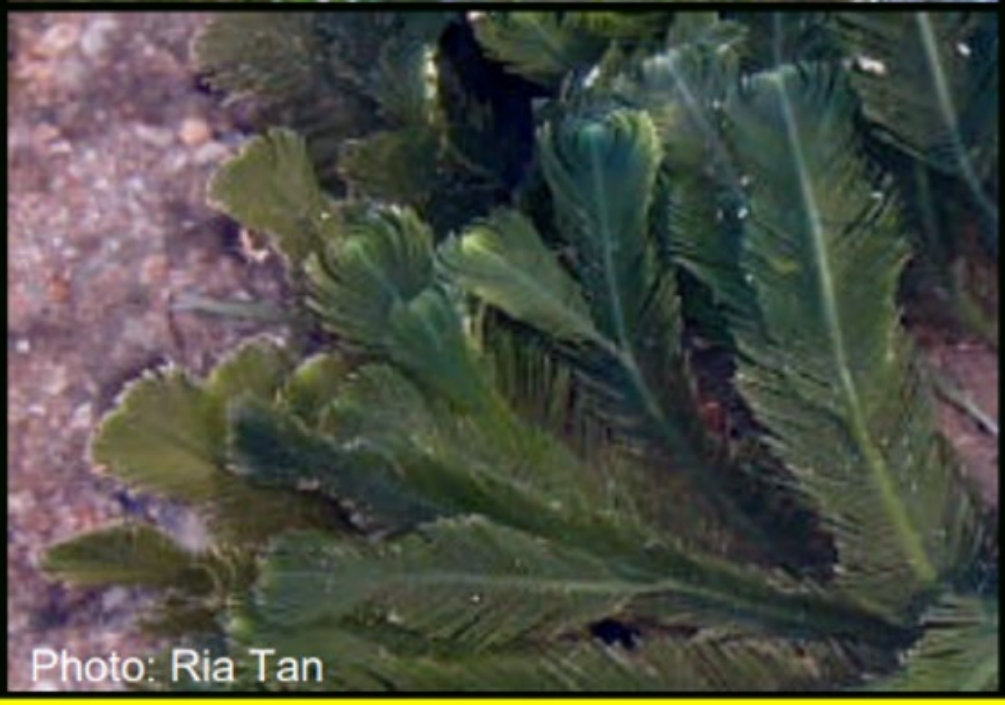
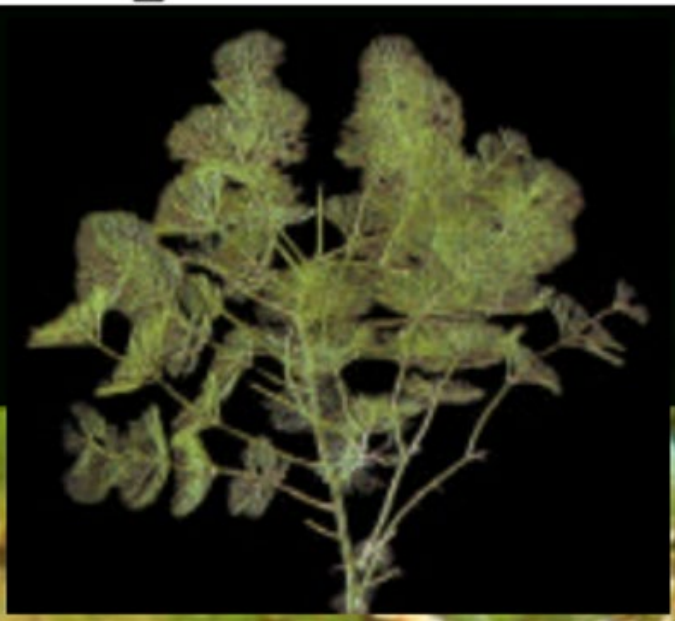
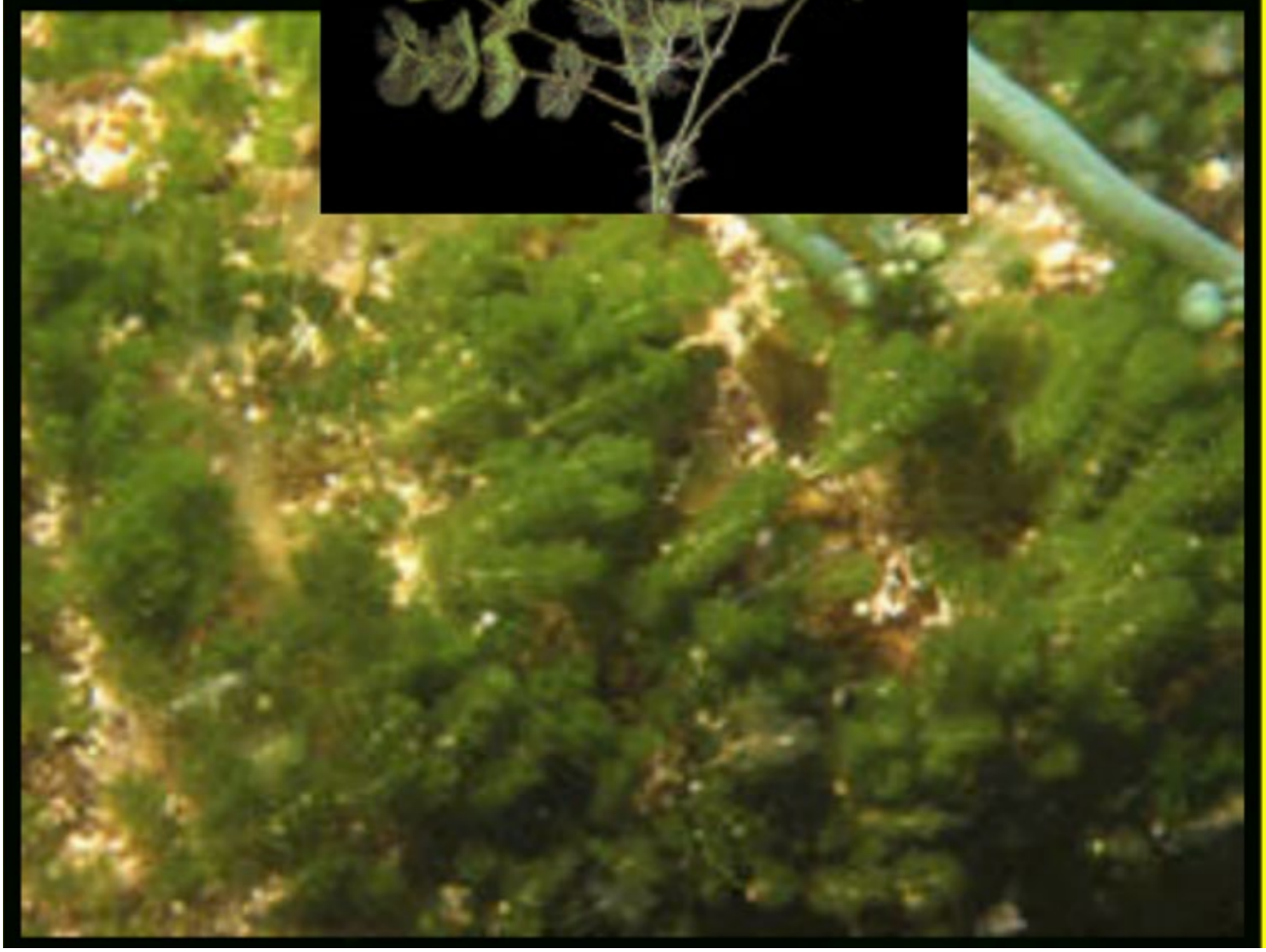


Photo: Ria Tan

Caulerpa scalpelliformis

Caulerpa verticillata





Caulerpa prolifera

CAULERPA CONTROL PROTOCOL

(Version 5 – October 20, 2021)

A. Background Information:

The genus *Caulerpa* comprises a group of green algae with a wide global distribution throughout the marine realm. Although primarily found in shallow tropical and subtropical waters, some species can inhabit brackish lagoons. *Caulerpa* species possess unique characteristics that enable them to withstand a broad range of environmental conditions and give them great invasive potential. Recognizing the threat posed by *Caulerpa* species, the Aquatic Nuisance Species Task Force[1] developed the "National Management Plan for the Genus *Caulerpa.*" This National Management Plan contains specific goals to address *Caulerpa* at the genus level, including preventing the introduction and spread of *Caulerpa* and eradicating populations in U.S. waters where they are not native.

There are no *Caulerpa* species native to California. Therefore, *Caulerpa* species pose a substantial threat to marine ecosystems in California, particularly to the extensive eelgrass meadows and other benthic environments that make coastal waters such a rich and productive environment. The eelgrass beds and other coastal resources that could be impacted by an invasion of *Caulerpa* are part of a food web that is critical to the survival of numerous native marine species including those of commercial and recreational importance.

Infestations from two *Caulerpa* species, *C. taxifolia* and *C. prolifera*, have been detected in California. Both species can rapidly colonize new areas from small fragments and have the potential to cause substantial negative impacts on native ecosystems. For instance, a particularly cold tolerant clone (tolerant of temperatures at least as low as 10 °C for a period of three months) of *C. taxifolia* has proven to be highly invasive in areas of the Mediterranean Sea, and efforts to control its spread have been unsuccessful. In areas where the species has become well established, it has caused ecological and economic devastation by overgrowing and eliminating native seaweeds, seagrasses, reefs, and other communities. *C. taxifolia* had previously been detected in 2000, but was eradicated in two locations in southern California. Another *Caulerpa* species detected in California, *C. prolifera,* can grow at least as deep as 50 meters and appears more tolerant of low light environments than most other macroalgae. In some areas, especially the Mediterranean Sea, seagrass meadows have been impacted, and even replaced, by *Caulerpa* species, including *C. prolifera*, which can have ecosystem scale implications. In March 2021, *C. prolifera* was discovered in Newport Bay, California. In response, the Southern California *Caulerpa* Action Team reconvened and implemented eradication efforts shortly thereafter, and those efforts are ongoing. Other infestations of *Caulerpa* species may also exist but remain undetected.

[1] The Aquatic Nuisance Species Task Force (ANSTF) is an intergovernmental body responsible for coordination of national efforts to prevent the introduction and spread of aquatic invasive species. Co-chaired by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, the ANSTF is composed of 13 Federal and 15 ex-officio members.

In September 2001, Assembly Bill 1334 was enacted by the State of California banning the transport, sale, and possession of nine potentially invasive species of *Caulerpa*, including *C. taxifolia*, *C. mexicana, C. racemosa, C. cupressoides, C. sertularioides, C. ashmeadii, C. floridana, C. scalpelliformis, and C. verticillata.* There was no evidence that *C. prolifera*, a popular saltwater aquarium plant, was potentially invasive in California at the time and it was not included in this list. However, new information, including the discovery of a *C. prolifera* infestation in Newport Bay, demonstrates that it, and all species in the genus *Caulerpa*, should be considered potentially invasive.

In order to detect existing infestations as well as avoid the spread of these invasive species within other systems, the following provisions have been established for California nearshore coastal and enclosed bays, estuaries, and harbors from Morro Bay to the U.S./Mexican border. This protocol outlines the certification, survey, and reporting guidelines required when surveying for all *Caulerpa* species with the exception of those exempted areas listed in Section G.

B. Definitions:

Bottom Disturbing Activity – a work activity (e.g., bulkhead repair, pile driving, dredging, placement of navigation aids, research) initiated by a permit holder which could fragment or disseminate *Caulerpa.*

Area of Potential Effect (APE) – the area surrounding an authorized project site that could be affected by a Bottom Disturbing Activity related to the implementation of the project work. This includes the project footprint, areas where equipment is stored or moored, areas where vessel prop-wash could occur in association with work, or in-water disposal areas used by the project. It does not include U.S. Environmental Protection Agency (EPA) designated deep-ocean disposal sites.

High Growth Period – March 1 to October 31.

Infected System – any bay, harbor, estuary, lagoon, or ecological unit in which *Caulerpa* has been identified, regardless of where the infestation occurs geographically within the system, unless determined otherwise by NOAA's National Marine Fisheries Service (NOAA Fisheries) and California Department of Fish and Wildlife (CDFW). Following eradication and subsequent verification surveillance for at least two High Growth Periods, an Infected System may be re-designated as a "*Caulerpa*-Free System" by NOAA Fisheries and CDFW. Prior infected systems where eradication was successfully completed include:

Agua Hedionda Lagoon
Huntington Harbour (including Seal Beach Weapons Station/National Wildlife Refuge and Anaheim Bay)

Current infected systems are:

Newport Bay

NOAA Fisheries/CDFW Contacts – the designated federal and state agency contacts for submittal of survey reports and reports of *Caulerpa* findings. All submitted material must be provided to these agencies at the following addresses:

National Marine Fisheries Service
West Coast Regional Office
501 West Ocean Boulevard, Suite 4200
Long Beach, CA 90802
Attn: Bryant Chesney
ph.: (562) 980-4037
fx.: (562) 980-4092
e-mail: nmfs.wcr.caulerpa@noaa.gov

Calif. Dept. of Fish & Wildlife
Marine Region
3883 Ruffin Rd.
San Diego, CA 92123
Attn: Christopher Potter
ph: (415) 740-9869
e-mail: Caulerpa@wildlife.ca.gov

Survey Area – the area over which surveys are conducted, typically synonymous with the Area of Potential Effect.

Survey Level – the level of intensity of the survey within the survey area. Survey levels are defined as either:

1) *Surveillance Level* – General survey coverage providing a systematic sub-sampling of the entire APE during which at least 20% of the bottom is inspected and widespread occurrences of *Caulerpa* would be expected to be identified if present. Surveys may be accomplished using diver transects, remote cameras, and acoustic surveys with visual ground truthing. Other proposed methods may be approved on a case-by-case basis by NOAA Fisheries and CDFW.

2) *High Intensity Level*– More intensive survey using a systematic sub-sampling of the entire APE during which at least 50% of the bottom is inspected. Surveys may be accomplished using diver or remote camera transects. Other proposed methods may be approved on a case-by-case basis by NOAA Fisheries and CDFW.

3) *Eradication Level* – This is the most intensive survey using a systematic and comprehensive survey of the entire APE during which 100% of the bottom is inspected. Surveys must be accomplished using divers moving at a rate appropriate to the site conditions to ensure that all areas are comprehensively searched irrespective of site conditions which may complicate surveys. Other proposed methods may be approved on a case-by-case basis by NOAA Fisheries and CDFW.

Surveyors – Individuals conducting *Caulerpa* surveys must be certified by NOAA Fisheries or CDFW. That certification shall consist of passing an exam demonstrating their ability to identify all *Caulerpa* species. Upon successfully passing that exam, individuals shall be certified for a set two-year period. Recertification may be completed up to 120 days prior to expiration of current certification. Any individual who fails the exam may retake the exam once within a six month period.

C. Reporting Requirements:

1. Surveys conducted in accordance with requirements outlined in this document shall be submitted to the NOAA Fisheries/CDFW Contacts within 15 calendar days of completion of each survey. Surveys shall be completed by certified *Caulerpa* surveyors and submitted on the attached survey form or in a suitable reproduction of the form fields.

2. If *Caulerpa* is identified at an authorized project site during a survey or at any other time prior, during, or after completion of authorized activities, the NOAA Fisheries/CDFW Contacts shall be contacted within 24 hours of first noting the occurrence.

3. For surveys that will be conducted within an Infected System or for actions requiring input from NOAA Fisheries/CDFW contacts, please provide information in a timely fashion and allow at least 5 working days for agency coordination and feedback.

4. Eradication Level survey reports require NOAA Fisheries/CDFW approval prior to conducting any authorized Bottom Disturbing Activity.

D. Surveys within *Caulerpa*-Free System:

The following survey conditions shall apply to any authorized Bottom Disturbing Activity within *Caulerpa*-Free Systems.

1. Prior to initiation of any authorized Bottom Disturbing Activity, a pre-construction survey of the project APE shall be conducted to determine the presence or absence of *Caulerpa*. This survey shall be conducted at a Surveillance Level. Survey work shall be completed not earlier than 90 days prior to the Bottom Disturbing Activity and not later than 30 days prior to the Bottom Disturbing Activity and shall be completed, to the extent feasible, during the high growth period of March 1 – October 31. Surveys outside of the high growth period shall be allowed on a case-by-case basis by the appropriate regulatory agency in consultation with NOAA Fisheries and CDFW.

2. In the event that *Caulerpa* is detected, the Bottom Disturbing Activity shall not be conducted until such time as the infestation has been isolated, treated or the risk of spread from the proposed Bottom Disturbing Activity is eliminated in accordance with section F.

3. Exemptions – Individual, privately owned boat docks and related structures are exempt from provisions 1 and 2 of this section when such facilities are found in *Caulerpa*-Free Systems and authorized activities are limited to structural repairs, replacement, modification, and pile driving and do not include dredging or other significant Bottom Disturbing Activities.

E. Surveys within Infected Systems:

The following survey conditions shall apply to any authorized Bottom Disturbing Activity within Infected Systems.

1. Prior to initiation of any authorized Bottom Disturbing Activity within an Infected System, two surveys, initiated not less than 60 days apart, shall be conducted within the project APE. The first survey shall be conducted using High Intensity Level techniques and the second survey shall be conducted using Eradication Area Level techniques. Both surveys shall be conducted within the same High Growth Period. Deviations from this condition may be considered on a case-by-case basis by the appropriate regulatory agency in consultation with NOAA Fisheries and CDFW.

2. At least one survey shall be conducted within 45 days of initiation of an authorized Bottom Disturbing Activity (a "Pre-Act Survey"). This survey could be the second (Eradication Area Level) survey conducted during the High Growth Period. However, project delays may require that a third survey be conducted prior to initiation of the Bottom Disturbing Activity in order to meet this 45-day requirement. If a third survey is required, this survey shall be conducted at either a High Intensity Level or Eradication Area Level as determined by the NOAA Fisheries/CDFW Contacts based upon site circumstances and proximity to infestations. To determine appropriate survey level, please contact the NOAA Fisheries/CDFW Contacts with project specific information.

3. If the Bottom Disturbing Activity extends for over 90 calendar days, the portions of the APE that would be expected to be impacted by a Bottom Disturbing Activity within the subsequent 90 days must be re-surveyed at a High Intensity Level. This subsequent survey must be conducted within 15 days following the first 90 days. Prolonged activities would require a repetition of this phased survey requirement.

4. If dredged material is removed from the APE and placed elsewhere in the marine environment, then between 60 and 120 days after placement of the dredged materials and, to the extent feasible, during the High Growth Period, the applicant shall conduct a Surveillance Level survey at all disposal areas except where material is disposed of within an existing U.S. EPA designated deep ocean disposal site. Deviations from this condition may be considered on a case-by-case basis by the appropriate regulatory agency in consultation with NOAA Fisheries and CDFW.

F. If Caulerpa is Found:

1. If *Caulerpa* is found, then the NOAA Fisheries/CDFW Contacts shall be notified within 24 hours of the discovery.

2. All *Caulerpa* assessment and treatment shall be conducted under the auspices of the CDFW and NOAA Fisheries as the state and federal lead agencies for implementation of *Caulerpa* eradication in California.

3. Within seven days of notification, NOAA Fisheries and CDFW will coordinate with the SCCAT and relevant permitting and resource agencies (and project proponent, as warranted) to fully document the extent of the *Caulerpa* infestation within the project APE. *Caulerpa* eradication activities, which are subject to review and approval by NOAA Fisheries and CDFW, in coordination with the SCCAT and relevant permitting and resource agencies, shall be undertaken using the best available technologies at the time and will depend upon the specific circumstances of the infestation. This activity may include in situ treatment using contained chlorine applications, mechanical removal, or other appropriate methods. The eradication technique is subject to change at the discretion of NOAA Fisheries and CDFW and as technologies are refined.

4. The efficacy of treatment shall be determined prior to proceeding with authorized bottom disturbing activities. To determine effectiveness of the treatment efforts, a written Survey Plan shall be prepared. The plan shall be developed in conjunction with the CDFW and NOAA Fisheries and shall be approved by these agencies prior to implementation.

5. This policy does not vacate any additional restrictions on the handling, transport, or disposal of *Caulerpa* that may apply at the time of permit issuance or in the future. It is incumbent upon the permittee to comply with any other applicable State or Federal regulations, restrictions, or changes to the Protocol that may be in effect at the time of initiation of authorized activities.

G. Exempted Areas and Activities from the Requirements of Sections B-D.

1. The Channel Islands off of southern California including all areas of Anacapa, San Miguel, Santa Cruz, Santa Rosa, San Clemente, San Nicolas, and Santa Barbara Islands. The exempted area also applies to all of Santa Catalina with the exception of the Avalon and Two Harbors areas.

2. Pile driving activities by the U.S. Navy in San Diego Bay and Ports of Los Angeles, Long Beach, and San Diego.

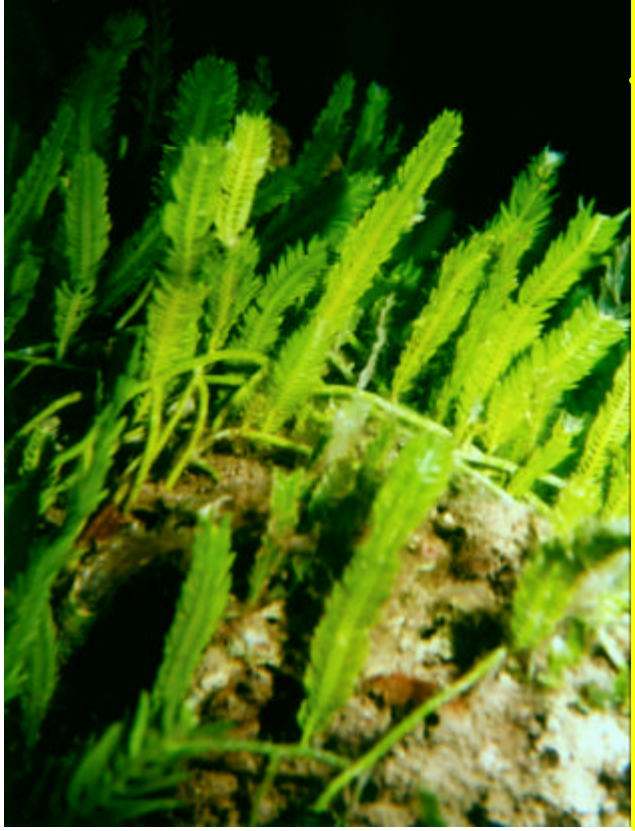
Caulerpa Survey Reporting Form

Surveys shall only be completed by certified *Caulerpa* surveyors. A current list of certified surveyors is available online (https://www.fisheries.noaa.gov/west-coast/habitat-conservation/certified-caulerpa-surveyors). This form is required to be submitted for any surveys conducted for *Caulerpa* species that are required under federal or state permits and authorizations issued by the U.S. Army Corps of Engineers, California Coastal Commission, or Regional Water Quality Control Boards. The form has been designed to assist in controlling the costs of reporting while ensuring that the required information necessary to identify and control any potential impacts of the authorized actions on the spread of *Caulerpa*. Surveys required to be conducted for this species are subject to modification through publication of revisions to the *Caulerpa* survey policy. It is incumbent upon the authorized permittee to ensure that survey work is following the latest protocols. For further information on these protocols, please contact: Bryant Chesney, National Marine Fisheries Service (NOAA Fisheries), (562) 980-4037, or Christopher Potter, California Department of Fish and Wildlife, (415) 740-9869.

Report Date:	
Name of bay, estuary, lagoon, or harbor:	
Specific Location Name: (address or common reference)	
Site Coordinates: (UTM, Lat./Long., datum, accuracy level, and an electronic survey area map or hard copy of the map **must** be included)	
Survey Contact: (name, phone, e-mail)	
Personnel Conducting Survey (if other than above): (name, phone, e-mail)	
Permit Reference: (ACOE Permit No., RWQCB Order or Cert. No.)	
Which survey is this for this project (e.g., first, second, etc.)?	
Was *Caulerpa* Detected?: (if *Caulerpa* is found, please immediately contact NOAA Fisheries or CDFW personnel identified above)	☐ **Yes, *Caulerpa* was found at this site and has been contacted on_____date.** ☐ **No, *Caulerpa* was not found at this site.**

Description of Authorized Work: (describe briefly the work to be conducted at the site under the permits identified above)		
Description of Site: (describe the physical and biological conditions within the survey area at the time of the survey and provide insight into variability, if known. Please provide units for all numerical information).	*Depth range:*	
	Substrate type:	
	Temperature:	
	Salinity:	
	Dominant flora:	
	Dominant fauna:	
	Exotic species encountered (including all Caulerpa species):	
	Other site description notes:	
Description of Survey Effort: (please describe the surveys conducted including type of survey (SCUBA, remote video, etc.) and survey methods employed, date of work, and survey density (estimated percentage of the bottom actually viewed). Describe any limitations encountered during the survey efforts).	*Survey date and time period:*	
	Horizontal visibility in water:	
	Survey type and methods:	
	Survey personnel:	
	Survey density:	
	Survey limitations:	
Other Information: (use this space to provide additional information or references to attached maps, reports, etc.)		

A Guide to the Nine Species of *Caulerpa*



Caulerpa taxifolia

Photo: R. Woodfield

Photo: G. Peters

Photo: R. Woodfield

Caulerpa mexicana

Photo: Ria Tan

Caulerpa racemosa

Photo: R. Woodfield

Caulerpa cupressoides

Photo: Ria Tan

Caulerpa sertulariodes

Photo: John Rice

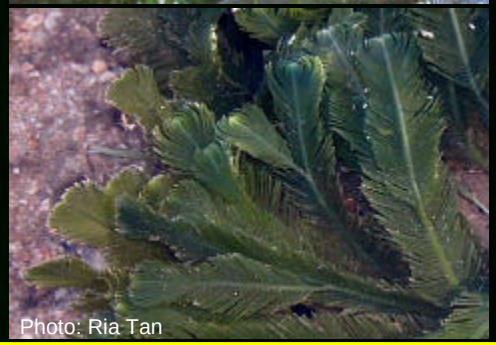


Photo: Ria Tan

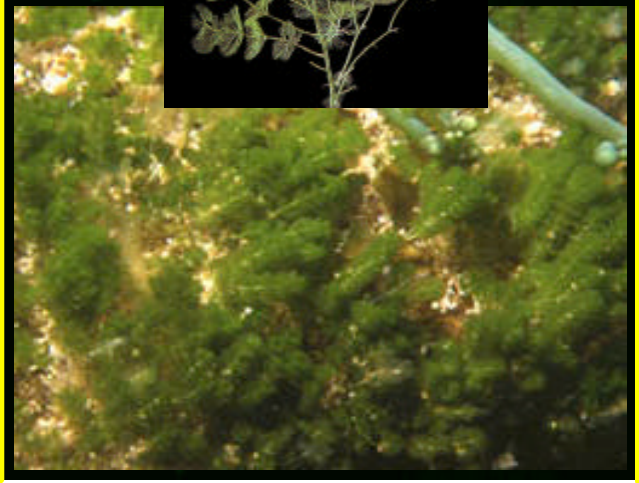
Caulerpa ashmeadii

Caulerpa floridana

Photo: Vincent B. Hargreaves

Caulerpa scalpelliformis

Caulerpa verticillata



Your Help is Needed!

- Never discharge aquariums or release pets/plants into the wild.
- Help spread the word about *Caulerpa*.
- Report observations of *Caulerpa* in the wild or in pet stores.
- If you find *Caulerpa* in the wild:
  - -Note as much information as possible (location, depth, bottom type, patch size).
  - -Record the location with a GPS and make a map if possible.
  - -Carefully collect a small piece and press it flat in newspaper.
  - -Take a photo if possible.

REPORT ANY SIGHTINGS TO:

NOAA FISHERIES

(562) 980-4043

or

CALIFORNIA DEPT OF FISH AND GAME

(858) 467-4218

Prepared by ***Merkel & Associates, Inc.***

Invasive Algae Response

v2023

What Is Caulerpa?

Caulerpa is an invasive algae considered a "living pollutant" because it spreads quickly and has previously caused significant and expensive damage to coastal waters in California. This species group has also had extensive impacts elsewhere, including throughout the Mediterranean. Caulerpa can take over natural habitats, disrupting the ecosystem and displacing native plants and the animals that rely on them.

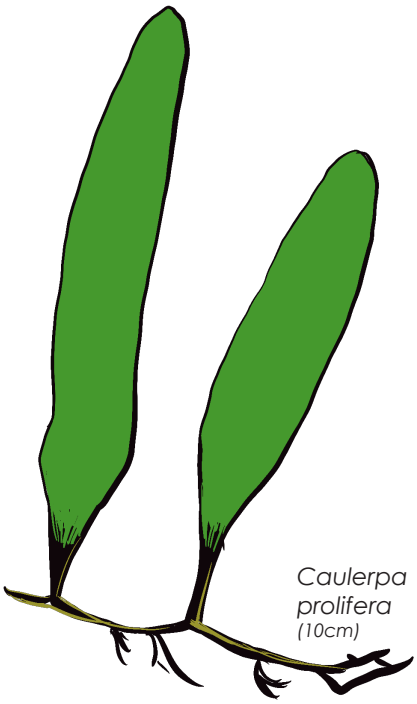
Previous Caulerpa Impacts

***Caulerpa taxifolia* invaded Agua Hedionda Lagoon and Huntington Harbor in the mid 2000s. In 2006, the $7 million, multiagency battle against *C. taxifolia* ended in success. The ground-breaking effort resulted in a helpful list of critical elements for successful future eradication responses.**

Caulerpa taxifolia (15 cm)

Partners

During the 2000-2008 *C. taxifolia* eradication, the Southern California Caulerpa Action Team (SCCAT) was formed for the prevention and detection of new infestations through outreach and surveillance. This includes the California Department of Fish and Wildlife, the Regional Water Quality Control Boards, NOAA National Marine Fisheries Service, U.S. Department of Agriculture, Agricultural Research, and local cities and ports.



Caulerpa prolifera (10cm)

New Invasion Alert!

As of September 2023, there is a new *Caulerpa prolifera* infestation offshore the Coronado Cays in San Diego Bay. Scientific consensus is that immediate action to eradicate this population is needed. If not eliminated, Caulerpa could spread within the bay and to the important coastal habitats outside the bay. The Department is working with the SCCAT and other partners to address this new invasion.

Existing Laws

Assembly Bill 665 (2023) bans the sale, possession, transportation, and receipt of all species of Caulerpa in California. The City of San Diego also has an ordinance banning the possession, sale, and transport of the entire genus of Caulerpa within city limits. The Federal Noxious Weed Act (1999) and the Federal Plant Protection Act (2000) prohibit the import, interstate sale, and transport of the aquarium strain of *C. taxifolia*.

https://wildlife.ca.gov/Conservation/Invasives/Species/Caulerpa

HELP FIND CAULERPA INVASIONS!

We are counting on you to find the next invasion of the aquarium seaweed *Caulerpa prolifera*. Watch for it!

***Caulerpa prolifera* is a non-native invasive alga. It can grow quickly, choking out native seaweeds and seagrasses and harming marine life through lost habitat. In 2021, an infestation was confirmed in Newport Bay. In 2023, an additional infestation was confirmed in San Diego Bay. Any new potential infestations should be reported.**

Identify ***Caulerpa prolifera*** by its bright green color, ~ 4 inch long blades, and long, horizontal runners. Caulerpa does NOT float and is most likely to be found on the seafloor, rather than on docks, boats, seawalls, or beaches.

How Divers Can Help:

Learn to recognize Caulerpa. Watch for it on saltwater dives (oceans, harbors, bays).
If found, report it by following the QR code or web link below:
- Note the location, depth, and patch size.
- Record the location with a GPS if available.
- Take a photo if possible.
- DO NOT collect or disturb!

(Be careful - even a tiny fragment can start a new infestation).

v2023

To See Photos and Report A Sighting:
https://wildlife.ca.gov/Conservation/Invasives/Species/Caulerpa