Invasive Mussel Surface Survey Protocol*

*This protocol was adapted from the California Department of Water Resources *Zebra/Quagga Mussel Surface Survey Protocol*.

Tactile-visual surface surveys are the most efficient and cost-effective method to monitor for the presence of juvenile and adult invasive mussels.

When, Where, and How to Monitor

Surface surveys should be conducted year-round at least monthly, access permitting. Mussels are often found in dark locations, on the undersides of objects and in cracks and crevices. Surface surveys involve feeling docks, walls, rocks etc. for the presence of mussels (Figure 1). You can also visually inspect the undersides of objects that can be removed from the water (Figure 2). Visually inspect and feel hard and soft substrates, exercising caution when sticking your hands where you cannot see, or rubbing them on unknown surfaces. Gently run fingers over surfaces, checking for gritty feeling or small "seed-like" or "pebble-like" objects. Fan areas covered with silt to expose what is underneath it. Inspect dark areas, dark substrates, and low light / shaded areas. Flows exceeding 2 meters/second preclude veliger settlement, therefore in flowing waters inspect surfaces out of the main channel, in backwaters and sheltered low velocity waters.

Invasive mussels prefer dark substrates and low light/dark areas. They prefer concrete and other rough surfaces. Search areas at or near boat ramps, gas docks, docks near marina stores, other docks in high traffic areas, all concrete structures, and low flow areas. Do not disturb private vessels or property.

Other areas that should be inspected include dock flotation, buoys, mooring lines, cables, rocks, concrete, logs, driftwood, vegetation, and anything else that has been in the water for a long time.

Minimum Sample Size

The minimum number of linear meters to be searched per substrate is defined below. Sampling more than the minimum increases the potential to find something if it is there. You can stop before meeting the minimum distance if invasive mussels are found in 3 or more locations within the survey location, or if all available substrate has been searched.

- Dock – 60 m. Thoroughly examine any features present, including:
    - Mooring/dock lines (portion hanging in water)
    - Anchor/dock cable or chain (portion under water)

    - All accessible buoys and fenders
- Boat ramp bottom – 5 m (~16 ft).
- Shoreline – 30 m if at a marina, 60 m if at a survey location with only a boat ramp. Thoroughly examine any features present, including:
    - Logs and woody debris
    - Boulders and rocks
- Concrete structures – 30 m

Make a notation in "Comments" section if minimum sample size requirements could not be met.

Specimen Collection

If you suspect you have found a mussel, immediately contact the appropriate CDFW regional mussel contact. To aid identification, first take a clear close-up photograph of each specimen. Next, collect the specimen(s) and place in a vial with 70% ethanol. Label the vial with location, date, and name of collector. If ethanol is not available, place the sample in a rigid container (to prevent crushing) without water, label, and refrigerate. E-mail the photos to the CDFW contact and they will attempt to identify the specimens from the photographs and will request the actual specimen(s) to make a positive identification.

Record the latitude and longitude (in decimal degrees and use WSG 84) of the mussels' location(s) and draw a map of and describe location(s) in the space provided on the datasheet. If possible, take photos of the mussels as a record of the density. Also take photos of the surroundings to aid in locating the site. Record the type of substrate(s) the mussel(s) was found on (for example: concrete, plastic, rope, chain, buoy).

Data Recording and Reporting

Every time a survey is conducted the data must be recorded on a datasheet before leaving the field. Absence information is as important to document as presence, so complete and submit a datasheet even if no mussels are found. Send datasheets to the appropriate CDFW regional contact. All data will be entered into a data reporting system, and the datasheets will be retained on-site.

Datasheets are available at:

CDFW Surface Survey Datasheet

CDFW Regional Scientist Contacts:

CDFW Invasive Mussel Regional Contacts

Figure 2. Tactile-visual survey of the underside of a dock.

Figure 2. The image shows the underside of buoy covered with golden mussel. The buoy needed to be taken from the water and turned around to see the mussels covering the underside.

California Department of Fish and Wildlife
Surface Survey Datasheet

Waterbody:	**County:**
Location Description:	**GPS Coordinates:**
Date:	**Collector:**
# of Linear Meters: Boat Ramp Bottom (5m):_____ Dock (60m):_____ % dock/marina/boat ramp searched:_____	**# of Linear Meters**: Shoreline(30m @ marina, 60m @ ramp only):_____ Concrete Structure (30m):_____ Other:_____
Quagga/Zebra/Golden Mussels Present: Y/N	**Specimens Collected: Y/N**
If mussels present, complete this section for up to 4 mussel locations	
1. Approximate Number (circle one) 1-10 10-100 >100 Substrate Type:_____	2. Approximate Number (circle one) 1-10 10-100 >100 Substrate Type:_____
3. Approximate Number (circle one) 1-10 10-100 >100 Substrate Type:_____	4. Approximate Number (circle one) 1-10 10-100 >100 Substrate Type:_____
Draw a map showing where the mussels were observed and note any landmarks that will aid in locating them, and take a photograph to include with the datasheet	
Corbicula Clams Present: Y / N	**Snails Present: Y / N**
Other Mussel/Clam Species Present: Y / N	**Specimens Collected: Y / N**
Comments:_____	