PROTECT YOUR BOAT!
FIGHT QUAGGA AND ZEBRA MUSSELS

A GUIDE TO CLEANING BOATS

AND PREVENTING MUSSEL DAMAGE

DON'T MOVE A MUSSEL

2009

What is being done to contain the Quagga/Zebra?

State and federal agencies have joined forces to avert further infestations of Quagga/Zebra mussels and are urging boaters to help stop the spread of Quagga/Zebra mussels in California.

A multi-agency taskforce, including the California Departments of Fish and Game, Boating and Waterways, Water Resources, Parks and Recreation, and Food and Agriculture as well as the U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, National Park Services, and many local governments and water agencies, has launched a statewide outreach campaign to alert the public – and particularly boat owners – about the Quagga/Zebra mussel threat.

Boaters should be aware that laws now make it illegal to transport Quagga/Zebra mussels. Boats found with evidence of the mussels may be quarantined and boat owners may face fines in some states. Many local authorities have instituted mandatory inspection programs at their lakes and reservoirs. Contaminated or suspect boats are being turned away.

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www.dfg.ca.gov/invasives/quaggamussel

Thanks to Utah State Parks for their photographic contributions.

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An alternate communication format is available upon request. If reasonable accommodation is needed, call 916-322-8911 or the California Relay (Telephone) Service for the hearing-impaired from TDD phones at 1-800-735-2929 or 711.

Protect Your Boat!
Keep Freshwaters Open to Boating and Fishing!

How can you help fight the Quagga/Zebra mussel invasion?

Boater and watercraft users can stop the mussels from spreading.

This guide was compiled specifically for boat owners and watercraft users. The information contains general guidelines for all boaters and a basic checklist for inspecting and cleaning boats and recreational equipment for Quagga/Zebra mussels. There are also additional inspection and cleaning checklists for specific types of boats and equipment. By taking the time to inspect and clean your boat, you can:

- Protect your boat, the aquatic environment, and the boating facilities you use (marinas, gas docks, piers).
- Keep waterways open for recreational boating and fishing.
- Prevent an economic disaster resulting in millions of dollars in damage to water transport facilities.
- Comply with state and federal laws regarding the spread of Quagga/Zebra mussels.

Quagga/Zebra mussels have invaded the West!

California's waterways currently face an enormous challenge: an invasion by Quagga mussels (*Dreissena rostriformis bugensis*) and Zebra mussels (*Dreissena polymorpha*). Zebra mussels, a native species of Eastern Europe, were first introduced in the United States through ballast water released into the Great Lakes in the late-1980s. Quagga mussels soon followed.

Great efforts were made to prevent the spread of these fresh water mollusks west of the 100th Meridian. In January 2007, Quagga mussels were discovered in Lake Mead and later in other reservoirs of the Lower Colorado River. Now they infest water bodies in Riverside, San Diego, Imperial and Orange counties. In January 2008, Zebra mussels were discovered in San Justo Reservoir in San Benito County. The spread of these mussels to additional California waters will seriously impact the state's aquatic environment and water delivery systems, endangering recreational boating and fishing.

What do they look like?

Quagga/Zebra mussels vary in color and often have dark and light stripes on their shells. They differ in size, from microscopic young to adults an inch or two in length. These invasive mussels cluster in huge colonies.

Zebra mussels next to dime.

Zebra mussels at San Justo Reservoir (right/below)

Various sizes of Quagga/Zebra mussels.

Photos San Benito County Water District

Quagga/Zebra mussels could severely reduce recreational boating and fishing activities if more waters become infested.

Quagga/Zebra mussels pose serious threats

Quagga/Zebra mussels may be tiny, but are highly destructive in freshwater systems because they can:

- Reproduce quickly and in very large numbers, up to 1 million larvae per spawning season.
- Colonize on both hard and soft surfaces, from the water's surface to more than 400 feet down, including boat hulls, propellers, anchors, docks, and boat trailers.
- Coat submerged surfaces such as piers, pilings, rocks, cables, boat ramps, docks, lines, pipes and fish screens, increasing maintenance costs.
- Infiltrate and damage boat engines, bilges, live wells, and steering components.
- Threaten the state's water treatment plants, hydroelectric plants, and reservoirs.
- Clog municipal water intake structures and obstruct the flow of drinking water.
- Cost taxpayers millions of dollars to repair damaged pipes and water transport facilities.
- Wreak havoc on the environment by disrupting the food chain by filtering the water column of phytoplankton and out-competing other species, including sport fish and endangered species.
- Change water conditions, causing heavier aquatic plant growth, oxygen loss, and fish kills.
- Result in infested waters being closed to boating and fishing altogether.

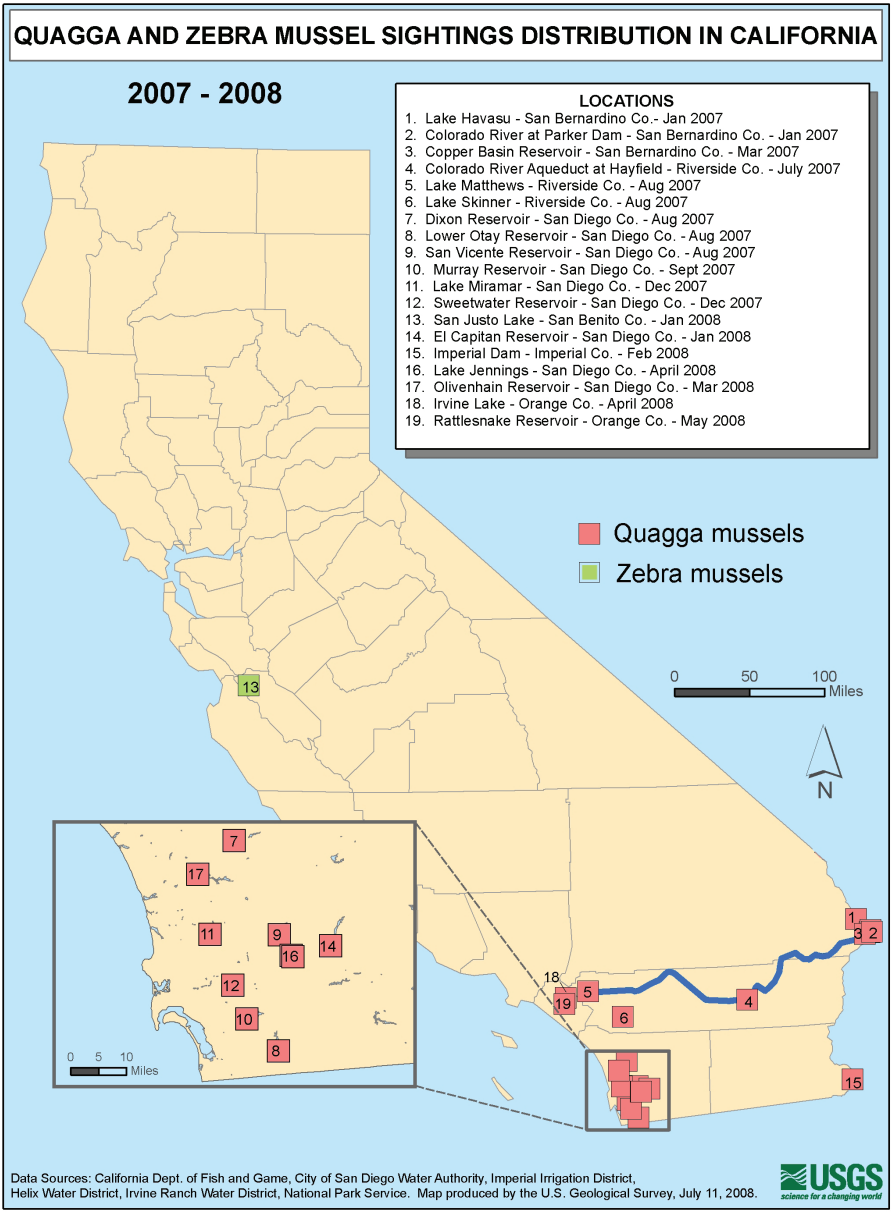
Once Quagga/Zebra mussels are established, in most cases it is impossible to eradicate them with current techologies.

How do Quagga/Zebra mussels ruin boats?

Quagga/Zebra mussels produce larvae (called veligers) too small to see with the naked eye. Newly settled young feel like sandpaper on smooth surfaces. As they quickly grow larger, Quagga/Zebra can be seen on boat hulls, especially around trim tabs and transducers along keels, and on trailers, anchors, and propellers. The mussels can also be found in or on boat bilges, ballast water, live wells, motors, fenders, life jackets, ropes – basically anything that comes into contact with infested water and can serve as a reservoir or "pocket" in which they can survive.

Quagga/Zebra mussels pose serious risks and costs to you as a boat owner because they can:

- Ruin your engine by blocking the cooling system and causing overheating.
- Increase drag on the bottom of your boat, reducing speed, and wasting fuel.
- Jam your boat's steering equipment.
- Require you to scrape and repaint your boat's hull.



The California Department of Fish and Game coordinates with the U.S. Geological Survey to generate a map of known locations of Quagga/Zebra mussels in the state. New locations are posted as soon as samples are positively identified. View the most current map:
http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/CaliforniaDreissenaMap.jpg

General Guidelines: All Boaters

It is important for all boaters to cooperate with vessel inspections conducted at California Department of Food and Agriculture Border Protection Stations and on waterways around the state. Remember, you do not want to transport any Quagga/Zebra mussels from an infested water body to another location currently free of Quagga/Zebra mussels. In addition, California law makes it illegal to transport these aquatic species, even if done so unintentionally.

Trailered boats are the primary way that Quagga/Zebra mussels are introduced to unconnected water bodies.

After boating in any freshwater system:

- Carefully inspect, clean, and drain your boat when you leave the water, using the checklists provided in this guide.
- All areas must be dry (including live wells) and clear of debris, and no standing water should be on board your boat in any manner (including bait cans or buckets).

Before traveling to any freshwater for boating:

- Inspect your boat for Quagga/Zebra mussels, which can survive five days out of water in California's hot summer and up to 30 days in cool, wet weather.
- If any residual water or mussels are discovered upon an inspection, clean your boat and all equipment using the same checklist procedures and let the vessel dry for five to 30 days, depending on the weather, before you enter the water.

Calculate your drying time at:
http://www.100thmeridian.org/Emersion.asp

Failure to clean your vessel can result in it being quarantined.

Quagga mussels on boat hull found at California Border Protection Station.
Photo California Dept. of Fish and Game

Basic Inspection and Cleaning Checklist: All Watercraft

Whenever you leave freshwater, take the following actions:

1. **Remove the boat from the water** and **away from the launch ramp** for vessel inspection and cleaning.
2. **Thoroughly inspect all exposed surfaces on your vessel and trailer**. If you find any mussels, scrape them off and kill them by crushing them. Dispose of the remains in the trash. Alert the Department of Fish and Game at 866-440-9530.
3. **Remove all plants and mud** from your boat, trailer, and all equipment. Dispose of all material in the trash.
4. **Carefully feel your boat's hull** for any rough or gritty spots, which may be young mussels that have settled on your vessel and cannot be seen. Microscopic Quagga/Zebra mussels will feel like sandpaper.
5. **Away from the waterway, wash your boat's hull**, trailer, equipment, bilge, and any other exposed surfaces with high-pressure, hot water. When possible use water at a temperature of 140° F (60° C) at the hull – or about 155° (68° C) at the nozzle – which will kill the mussels. Dry the boat as much as possible.
6. **Drain all water from your boat** (pull all plugs) and **dry all areas**, including the motor, motor cooling system, live wells, ballast tanks, bladders, bilges, and lower outboard units. Make sure that all life jackets, water skis or other items that have been in the water, including anchors, ropes, etc., are inspected, cleaned, and dried.
7. **Empty and dry all buckets** and **dispose of all bait** in trash receptacles before you leave. Do not take bait home, or leave it on the ground or dump it in any waterway.
8. **Thoroughly clean all fishing and recreational equipment** (fishing nets, etc).
9. **Clean and dry personal belongings, clothing, and footwear** that have come in contact with the water.
10. **Wash, dry, and brush pets** that have been in the water.
11. **Keep your watercraft dry for at least five days in warm, dry weather and up to 30 days in cool, moist weather** before launching into a freshwater.

Day boats or those that "come and go" and spend only a few hours in the water are still at risk for picking up and transporting mussels that may be attached to aquatic weeds. The basic cleaning steps apply to any and all watercraft.

Additional steps for specific boats follow.

Vessels that are slipped and moored at infested waters run greater risk of having settlers and adult mussels.

General Inspection and Cleaning

Boat Exterior: Entire hull, floor, transom wall, ballast tanks, ropes and lines, anchors, lights, pitot tube, depth sounders, trim tabs, cavitation plates, thru-hull fittings, depth transducers, water intakes and outlets

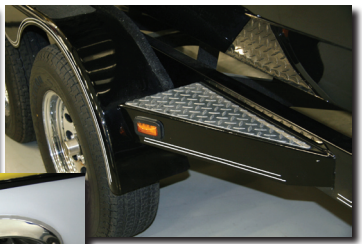
Motor: Entire exterior housing, propeller, propeller shaft, propeller shaft support, propeller guards, propulsion units, lower unit, gimbal area, water intakes and outlets

Boat Equipment and Contents: All fishing nets and other fishing equipment, lines and ropes, float belts, life jackets, float cushions, water skis and tow ropes, ski gloves, equipment lockers, waterfowl decoys and camouflage blinds, clothing and footwear, floats, fenders, dock guards inner tubes and other inflatable items, downriggers and other fishing equipment, bait containers/buckets and live wells, trolling motors, and internal ballast tanks

Trailer: Trailer frame, axles, license plate and holders, lights and wiring, fenders, hangers, trailer tires and wheels, rollers and bunks, wiring, springs, pockets and hollow spaces

Photos Utah State Parks and California Department of Fish and Game

Drain the engine, dry the motor well, check the prop and system components, clean trolling motors, make sure everything is drained and dried. Remove all aquatic weeds.



Be sure to check the trailer for aquatic weeds and other areas on the boat like bow lights.

All vessels should be cleaned, drained, and dried!

Photos Utah State Parks

Check all areas listed under general inspection and cleaning. Feel the hull and check the trim tabs to ensure no standing water (veligers) or adults have taken hold. Check for weeds and other material as well.

Vessels should be thoroughly cleaned. Those contaminated with mussels should be scraped, washed, drained and dried. Dry time may be between five days in hot, dry California summers and up to 30 days in cool moist weather.

Photos California Department of Fish and Game

Check, clean, drain and dry live wells, all drains, and any other area where water might collect.

Remember: Most storm drains flow directly into rivers and other waters. Do not wash your vessel or drain it near a storm drain.

To prevent illegal discharge of oil when draining or flushing the bilge, use oil absorbents where possible. Oil absorbents should be disposed of as hazardous waste in California. Call 800-253-2687 for drop off locations.

Water Ski Boats

1. **After completing the basic checklist, drain water** from every internal ballast tank system as much as possible.

2. **Resume normal ballast system operation** when you go boating again. Be sure to winterize the vessel when boating season ends.

Southern California Marine Association

California Department of Fish and Game

Ski boat covers open.

Ski boat ballast water lines.

Ballast system water pump, water lines, and caps should all be flushed and cleaned.

Trim tabs on transom.

Follow these actions to stop mussels from growing inside the entire system. Failure to do so could result in restriction of water lines, overheating and pump damage, as well as the increased likelihood of needing to replace expensive system components.

Houseboats, Pontoon Boats, and Other Large Vessels

1. **After completing the basic checklist**, **completely drain and dry all water systems that use lake water** including air conditioning, personal sanitation, and washdown systems. Note: Vessel sewage must be disposed of at a pump-out facility or dump station. The longer the boat has been in the water, the higher the chance these systems have been contaminated.

2. **Take special care to protect system components** including water supply and discharge lines, filter screens, pumps, valves, and associated parts. Small passages in the air conditioning radiator core are highly susceptible to being plugged by mussels.

Southern California Marine Association

All areas that can hold water should be drained and dried. Pontoons should be inspected for mussels, settlers, and aquatic weeds that may have mussels attached.

Photos Utah State Parks

Vessels should be thoroughly cleaned. Those contaminated with mussels should be washed, scraped, drained and dried. Dry time may be between five days in hot, dry California summers and up to 30 days in cool moist weather.

Vessels that are slipped and moored at infested waters run greater risk of having settlers and adult mussels.

Hulls should be inspected; all motors, intakes and any equipment that comes into contact with the water should be flushed, washed, drained and dried whether the equipment is attached to the boat (like a slide) or unattached like skis or floatation devices.

Since large vessel water systems are located deep within the hull, they require extra effort to access, clean, and dry to protect them. Failure to properly clean could result in costly replacement of system components if infestation occurs.

Large Vessels continued *Sailboats (over)*

Sailboats

1. **After completing the basic checklist**, **completely drain and dry all water systems that use lake water**, including your air conditioning, personal sanitation, and washdown systems. Note: Vessel sewage must be disposed of at a pump-out facility or dump station. The longer your boat has been in the water, the more likely the chance these systems have been contaminated.

2. **Take special care to protect system components** including water supply and discharge lines, filter screens, pumps, valves, and associated parts. Small passages in the air conditioning radiator core are highly susceptible to being plugged by mussels.

3. **Give special attention to the centerboard trunk**, including the rudder and transom, keel and fittings, which is a major concern.

4. **Of special concern on sailboats is the removal of aquatic weeds.** Remove all vegetation from the vessel.

Vessels that are slipped and moored at infested waters run greater risk of having settlers and adult mussels. Boaters should check their vessels for mussels and vegetation that could carry mussels. Some vegetation is an invasive species as well, like water hyacinth.

California Department of Fish and Game

High Performance Speed Boats

1. **After completing the basic checklist, make sure that you flush your 'external' cooling system.** Flushing your system when retrieving your boat with fresh water supplied by the marina or boat ramp you use may help eliminate the Quagga/Zebra Mussel invasion.

2. **If your boat is not currently equipped with a 'flush kit' visit your local marine service center for details.** It is important for boat owners to recognize that the 'external' system for cooling is the problem area and although many engine suppliers equip new boats with a 'flush system', not all do. Having a 'flush kit' installed correctly (typically by a marine engine service center) would address the problem. Many older boats likely do not have a 'flush kit', but could have one installed.

Closed cooling system.

Photo Mercury Marine

Photos Southern California Marine Association

Personal Watercraft

1. **Avoid running craft through aquatic plants** because this may damage the craft, plug water intakes, and increase mussel contamination.

2. **Stop the engine** when water activities cease**.**

3. **Push or winch craft** onto the trailer, without running the engine.

4. **Remove the craft from the water** and **away from the launch ramp** for vessel inspection and cleaning.

5. **After completing the basic checklist**, **inspect and clean** all of the systems and components that apply specifically to the craft.

6. **Start and run the engine** for five to 10 seconds to blow out water and contaminants from the underbody jet drive system.

7. **Stop the engine** and **remove all plants, mud, and other contaminants** from the steering nozzle and the rest of the hull.

8. **Check underneath the craft for Quagga/Zebra mussels**, especially the water intake area (including the edges of the intake grate).

9. **Dry any pockets** that may be wet or holding water.

10. **Drain any ballasts** on the craft, **rinse with hot water,** and **allow to dry**.

Photos Utah State Parks

Personal watercraft should be drained of all water, washed, and dried.

The steering nozzle should be inspected for aquatic weeds that might have mussels.

Kayaks, Canoes, and Inflatable Rafts

1. **After completing the basic checklist, inspect and clean** any components that apply specifically to the craft.

2. **Allow the craft to dry thoroughly** before using it in any other water body.

3. **Take special care to dry inflatables** before rolling them up.

Photo California State Parks

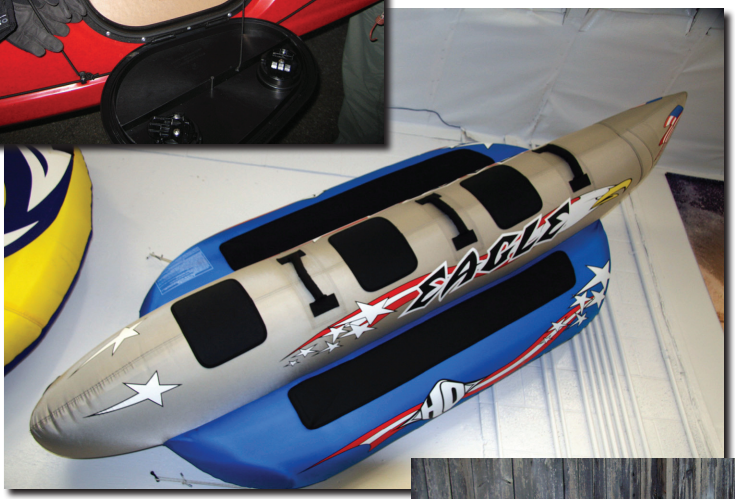


Photo Utah State Parks

Kayaks, canoes and all inflatables need to be cleaned, drained, and dried.

Any equipment that goes into the water needs to be inspected and cleaned.

Photo California Department of Fish and Game

Dive Gear

1. **Check all gear that could potentially hide any water (veligers)** (include regulators, buoyancy compensation device, wetsuits, masks, gloves, boots, snorkels, and any other dive gear).

2. **Thoroughly clean all regulators, BCDs, wetsuits, masks, snorkels, and any other dive gear,** making sure to clean both the inside and outside of the BCD to ensure that no mud or organic matter is present – use a brush to scrub if necessary.

3. **After cleaning, rinse your suit, equipment and inside of BCD with hot (<40° C or 104°F) or salt water (1/2 cup salt/gallon)**. Note, if you use the salt-water solution, it is very important to thoroughly rinse the equipment in freshwater after your cleaning because the salt crystals can harm your equipment. Divers can also use potassium at 100mg/liter at a temperature of >30° C, or using commercially available dive equipment cleaning compound that contains ammonia, vinegar, or chlorine. Dispose of cleaning solution properly.

4. **Allow gear, suit, and other equipment to dry** before diving in different waters. Veligers can survive on a wetsuit if left damp.

5. **If feasible, consider freezing** your equipment overnight to kill any veligers.

Remember: Most storm drains flow directly into rivers and other waters. Do not wash your vessel, equipment or gear or drain it near a storm drain. Stop the spread of mussels!

Additional Resources

For more information:

- General information on Quagga/Zebra mussels:
  http://www.dfg.ca.gov/invasives/quaggamussel/
- Boat cleaning tips: http://100thmeridian.org/
- General invasive species information:
  http://www.fws.gov/contaminants/Issues/InvasiveSpecies.cfm

You may also contact the following state departments for additional information or assistance:

- Department of Fish and Game: 866-440-9530
- Department of Boating and Waterways: 888-326-2822
- Department of Water Resources: 916-653-9712
- Department of Parks and Recreation: 916-654-7538

If you discover mussels in a new location, report it to the Quagga/Zebra hotline 866-440-9530

California Codes that Apply to Quagga/Zebra Mussels

- Fish and Game Code § 2301
  - Specific to Dreissenid Mussels
  - Includes both adults and water that may contain them
- Title 14 CCR § 671 (F&G Code § 2118)
  - Places restrictions on Importation, Possession and Transportation of Live Animals
- Title 14 CCR §230 (f) and (h)
  - Special conditions on tournaments to provide for welfare of fish

The law gives the California Department of Fish and Game the authority to:

- Stop and inspect conveyances
  - vehicles
  - boats and other watercraft
  - containers
  - trailers
- Order conveyances that contain water be drained, dried, or decontaminated
- Impound or quarantine conveyances
- Revoke or deny permits for failure to comply

DON'T MOVE A MUSSEL

Enjoy the water and the fishing!

Support checkpoints!

STOP AQUATIC HITCHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.

www.ProtectYourWaters.net

Help keep our waters clean!