

BOATING

BoatNotes: A Handbook for Boaters on Lake Whatcom

Booklet

Lake Whatcom Cooperative Management

Stop the Invasion: Aquatic Invasive Species

Flyer

City of Bellingham

Whatcom Weeds: Eurasian Watermilfoil

Flyer

Whatcom Noxious Weed Control Board

Milfoil: A Brochure for Boaters

Brochure

City of Federal Way

Stop the Invasion: Zebra and Quagga Mussels

Flyer

Washington Invasive Species Council

Zap the Zebra

Brochure

100th Meridian Initiative

Stop the Invasion: New Zealand Mud Snail

Flyer

Washington Invasive Species Council

New Zealand Mud Snails

Brochure

100th Meridian Initiative



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BOATNOTES

***A HANDBOOK FOR
BOATERS ON LAKE
WHATCOM***



Boatnotes: A Handbook for Boaters on Lake Whatcom

A publication of the Lake Whatcom Management Program



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Cover—North End of Lake Whatcom, Whatcom County Water Resources Division

Page 1—Historic Lake Whatcom Boating, Whatcom Museum of Art and History

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Back Cover—Lake Whatcom Watershed Map, Kara Symonds, City of Bellingham

Environmental Resources

Special thanks to all City of Bellingham, Whatcom County, and Lake Whatcom Water & Sewer District staff and watershed residents who helped develop the content and organization, provided information and references, and reviewed the handbook.

***Disclaimer:** This manual is intended as an educational tool for boaters. It does not constitute a complete reference to federal, state, or local laws. While the Lake Whatcom Management Program has taken great care in identifying and offering environmentally sound products and procedures in Boatnotes, neither the Lake Whatcom Management Program nor any contributing agencies, organizations or individuals assume any liability for the accuracy or completeness of the information presented in the handbook. Inclusion in this handbook is not an endorsement of the companies listed.*

Revised 2006

LAKE WHATCOM JOINT MANAGEMENT PROGRAM

Lake Whatcom is a large multi-purpose reservoir that is the source of drinking water for the City of Bellingham, Lake Whatcom Water and Sewer District, several other smaller water districts/associations, and about 250 homes that draw water directly from the lake. All told, the lake provides water to about half the population of Whatcom County, Washington.

In addition to providing water for drinking, commercial and industrial uses, the lake is used for boating, swimming and fishing. The ongoing management challenge is trying to determine the extent to which these activities and various land-use practices can occur while maintaining safe, clean drinking water.

A variety of agencies, organizations and individuals play a role in managing and protecting Lake Whatcom. As a means to better coordinate and direct the efforts of these various players, an interjurisdictional management program was established in 1990 involving three of the key agencies: the City of Bellingham, Whatcom County and Lake Whatcom Water and Sewer District.

Through the management program, detailed strategies are developed and implemented on an annual basis to protect the water quality of the lake. One of the goals for the program is “Goal 8: Recreation. Allow recreational opportunities which do not adversely impact the watershed or water quality while finding appropriate ways to reduce impacts of existing activities.” To better meet this goal, further education about boating was identified as a need.

For more information about the Lake Whatcom Management Program:

Lake Whatcom Management Committee

- Mark Asmundson, City of Bellingham Mayor
- Pete Kremen, Whatcom County Executive
- Jim Neher, Lake Whatcom Water and Sewer District, General Manager

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BOATING AND LAKE WHATCOM

Boats of all kinds have been plying the waters of Lake Whatcom for centuries. Long before the settlers arrived, local Indians paddled cedar canoes on the lake for transportation, to fish, and to travel to hunting and gathering areas. Prior to settlement, trappers

vessels were introduced and slowly began to replace the steam-driven boats.

Today, there are many more boats on the lake. The majority are recreational vessels powered by gasoline two- and four-stroke engines. In 1986, approximately 800 total boat launches were

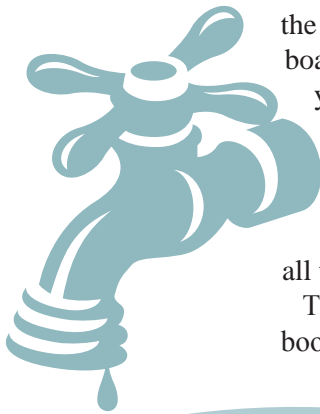


searched for beaver via canoe. When the settlers arrived, they first traveled in canoes, rowboats and sailboats. As logging, mining and settlement increased in the watershed, larger vessels were brought to the lake to move raw materials, goods and people. Commercial and chartered passenger boats, the mail boat, coal barges and tug boats all made regular excursions along the lake, during the late 1800s and early 1900s. Shortly after the turn of the century, gasoline-powered

recorded for the weekends from May 30 to August 30 at Bloedel Donovan Park alone. During the same period in 2000, approximately 1,375 weekend launches took place. These figures do not include launches from private docks and other launch points on the lake. As recreational boating increases, the potential for water quality degradation also increases.

The privilege of boating on Lake Whatcom comes with a great deal of environmental responsibility,

*The lake is
a multi-use
water resource
providing
drinking water
for over 85,000
people.*



as the lake is a multi-use water resource providing drinking water for over 85,000 people in Bellingham and Whatcom County. Boaters also share the lake environment with swimmers, people fishing, and those just seeking a peaceful day at the lake. By being aware of the impacts

boating can have on the lake, you can reduce your additional impact to the lake. Boating responsibly means being aware of the fragile lake environment around you at all times.

The topics found in this handbook reflect a growing concern among community

members, lake managers, and marine facility operators that pleasure boating is causing damage to fragile aquatic environments. Each section of the handbook



begins with an introduction of the topic or issue, followed by specific steps that boaters can take to reduce their impacts on

water quality. For those of you looking for some quick suggestions, check out the “What Can Boaters Do?” highlighted boxes. Words in *colored italics* are defined in the glossary. In the “Resources” section you will find references for information in this handbook, phone numbers, and internet sites of organizations that provide useful information about boating.

Please remember:

- The lake is part of a fragile ecosystem.
- If you live in the Lake Whatcom Watershed the rain will wash spilled oil, fuel, soaps, cleansers, antifreeze etc. from your property, down into Lake Whatcom.
- Many people use the lake for different reasons. Everyone’s actions make a difference for protecting water quality and a healthy lake environment.
- We drink the water from the lake—either you can keep it as clean as possible now, *or* you can pay more later to treat the water.

FUEL, OIL AND BOATS

The operation of boat and *personal watercraft* (PWC) engines impact air and water quality. As the popularity of recreational boating has increased, more research has been done to determine the impacts. Results from the U.S. Environmental Protection Agency (EPA), indicate that the pollution from boat

one pint of spilled oil can create an oil slick over an acre of a lake's surface. Petroleum products that end up in water don't just disappear with time. They may evaporate, drift to other areas, sink into the sediments, dissolve in the water, or be absorbed by living organisms. Wind and waves push residual gasoline and oil into the shallows

*Just one pint
of spilled oil
can create an
oil slick over an
acre of a lake's
surface.*

Collection of Whatcom Museum of Art and History



engines has been underestimated for a long time.

One visible impact of boating on lakes is the presence of petroleum products on the water surface. The iridescent sheen on the water's surface layer comes from spills, leaks and the operation of conventional carbureted two-stroke engines. In calm conditions, just

where it can accumulate in the sediments and enter the food chain.

Gasoline and oil contain chemical compounds that can be harmful to living organisms. The level at which a particular chemical is harmful varies with the compound and the tolerance of the affected organism. The ability to detect

*A 100-horse,
conventional
two-stroke
PWC, operated
for seven hours
emits more
smog-forming
emissions than
a 1998 car
driven more
than 100,000
miles.*

compounds at extremely low levels has improved as more sensitive analytical methods have developed. Therefore, chemicals, such as those found in petroleum products, are more easily detected at extremely low levels in the environment. Because a compound has been detected does not mean it has exceeded established water quality standards or been proven to cause harm; however, more work is needed to further evaluate potential health risks.

PETROLEUM PECULIARITIES

Scientists have been investigating the effects of motorized watercraft use on Lake Tahoe, another multi-use drinking water reservoir. The presence of petroleum compounds in the lake appear directly related to motorized watercraft use.

There are three primary groups of petroleum compounds associated with motorized watercraft including BTEX, PAH, and MTBE.

BTEX

Benzene, toluene, ethylbenzene and xylene (BTEX) are potentially harmful compounds found in gasoline. Research at Lake Tahoe detected low levels of BTEX compounds in the water column after periods of intense boating. The City of Bellingham has also detected low levels of BTEX compounds in Lake Whatcom.

PAH

Polycyclic aromatic hydrocarbons (PAHs), another detrimental byproduct of gasoline combustion, were also found to persist in the water column in Lake Tahoe. PAHs were present in sufficient enough concentrations to cause negative impacts to *aquatic* organisms. PAHs react with the ultraviolet portion of sunlight, becoming more toxic as they break down. This process is known as *phototoxicity*. This is bad news for organisms living at the surface of the lake and in the shallows, like fish and plankton.

MTBE

Methyl tertiary butyl ether (MTBE) is an fuel oxygenate used in areas with poor air quality to allow gasoline to burn more cleanly. MTBE has been tentatively classified by the EPA as a possible human carcinogen. High levels of MTBE during the boating season have raised concerns in California, leading to several bans and restrictions on boating in reservoirs. MTBE is not currently in use in Whatcom County and has not been detected in Lake Whatcom.

NEW BOATING RESTRICTIONS

Whatcom County and the City of Bellingham enacted ordinances to restrict the use of two-stroke carbureted engines on Lake Whatcom. The City's Ordinance took effect in 2006 and the County's Ordinance takes effect in 2009.

The ordinances implement a recommendation from the Lake Whatcom Motorized Watercraft Citizen's Advisory Committee. Engine restrictions are one of many actions taken to implement the Lake Whatcom Management Program to protect Lake Whatcom,

the drinking water reservoir for over 85,000 residents of Bellingham and Whatcom County.

ENGINE POWER

Air Pollution

Traditionally, gas-powered boat engines have not been subjected to the same pollution standards that car engines have. Consequently, most boat engines have no emission controls and contribute significant amounts of air pollution. The U.S. Environmental Protection Agency has determined that boat engines contribute hydrocarbon (HC) and oxides of

Summary of Boating Restriction Timelines

January 1, 2006—The operation of all carbureted two-stroke engine powered watercraft is prohibited on the portion of Lake Whatcom in the City limits, except: Watercraft powered by a two-stroke engine whose engine is certified and labeled as meeting the 2006 or later model year US EPA emission standards and two-stroke carbureted engines of 10 horsepower or less.

January 1, 2007—The operation of all carbureted two-stroke engines including 10 horsepower or less is prohibited on the portion of Lake Whatcom in the City limits.

January 1, 2009—The operation of all carbureted two-stroke engine powered watercraft on Lake Whatcom is prohibited, except: Watercraft powered by a two-stroke engine that is certified and labeled as meeting the 2006 or later model year US EPA emissions standards, auxiliary sailboat engines, 10 horsepower or less engines, and all electronic fuel injected two-stroke engines originally purchased before August 2004.

January 1, 2013—The operation of all carbureted two-stroke auxiliary sailboat engines, all carbureted two-stroke engines of 10 horsepower or less, and all electronic fuel injected two-stroke engines originally purchased before August 2004 is prohibited.

City of Bellingham Ordinance 2005-06-045 and Whatcom County Ordinance 2004-02

For every 10 gallons of fuel used in a conventional two-stroke, 2.5 to 3 gallons may go directly into the air and water. A four-stroke engine PWC would save the user about \$1200 over a conventional two-stroke engine during the watercraft's nine-year life.



nitrogen (NO_x) emissions that affect ground-level ozone and acid rain.

Two-Stroke Engines

Conventional, carbureted two-stroke boat engines have long been favored due to their simplicity, longevity, high rpm output, and high power-to-size ratio. Two-stroke engines have been used extensively to propel personal watercrafts (PWCs) due to their high rpm output and ability to operate at any angle because there is no oil reservoir. Currently, PWCs account for approximately one-third of all national boat sales. PWCs have become the subject of intensive national and international research due to public perception that they are more polluting, noisy, and intrusive than most boats.

Conventional carbureted two-stroke engines have been found to be the highest contributors of air

and water pollution due to their design. By design, the intake and exhaust ports on a two-stroke engine are open at the same time during the combustion cycle. Unburned fuel travels through the engine and is released directly into the air and water. Studies conducted by the EPA indicate that conventional two-stroke engines discharge 25-30% of their fuel, unburned, into the environment, when operated at full throttle. For every 10 gallons of fuel used in a conventional two-stroke, 2.5 to 3 gallons may go directly into the air and water. In addition, studies by the California Environmental Protection Agency's Air Resources Board (CARB) show that a 100-horsepower conventional two-stroke PWC, operated for seven hours emits more smog-forming emissions than a 1998 car driven more than 100,000 miles.



One Star – Low Emission

- Meets CARB 2001 and EPA 2006 emission standards
- 75% lower emissions than conventional carbureted two-stroke engines



Two Stars – Very Low Emission

- Meets CARB 2004 emission standards
- 20% lower emissions than Low Emission engines



Three Stars – Ultra Low Emission

- Meets CARB 2008 exhaust emission standards
- 65% lower emissions than Low Emission engines



Four Stars – Super Ultra Low Emission

- Meets CARB 2009 emission standards
- 90% lower emissions than Low Emission engines

What Can Boaters Do?

Engine Pollution

- ◆ Make your next boat one that does not use a gasoline engine for its main source of power, such as a sailboat, kayak, rowboat etc.
- ◆ Use an electric motor.
- ◆ Choose a cleaner and more efficient engine when purchasing a new engine.
- ◆ Limit engine operation at full throttle.
- ◆ Eliminate unnecessary idling.
- ◆ Tune and maintain your engine to increase efficiency and decrease leaks.

New and Improved Technology

Conventional carbureted two-stroke engines are slowly being replaced by more efficient and less polluting four-stroke and fuel-injected two-stroke engines. Both CARB and the EPA have new emissions standards for engines produced, starting 2001 and 2006, respectively. These newer engines, which are already on the market, are 30-40% more fuel-efficient.

CARB estimates that simply switching from a two-stroke to a more efficient four-stroke 90

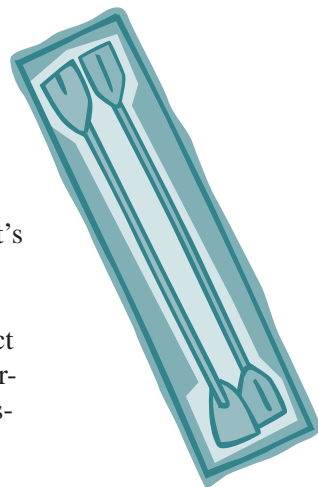
horsepower outboard engine would save the user more than \$2000 in fuel and oil costs over the average sixteen-year life of the engine. A four-stroke engine PWC would save the user about \$1200 over a conventional two-stroke engine during the watercraft's nine-year life.

Recently introduced two-stroke technology uses direct fuel injection to improve performance and decrease emissions. The new engines are approximately 75% cleaner than older two-stroke engines. Even with the improvement in two-stroke technology, most new four-stroke engines are cleaner than the new direct fuel injected two-stroke engines.

As older, less efficient, high-emission engines are phased out, the newer technology will help. Yet, even with cleaner technology, the continued increase of boats and PWC could still result in as much or even more pollution in the long run.

Operation and Maintenance of Your Engine

The way any engine is operated and maintained affects its impact on the environment. "Full throttle" is the least efficient way to operate an engine. Unnecessary idling also wastes fuel and emits additional emissions.



*Ultimately,
the cleanest
engine for
Lake Whatcom
is you!*

*A manual override
can stop the
accidental and
illegal pumping
of contaminated
bilge water.*

A properly tuned engine runs more efficiently. If you run a two-stroke, make sure to mix the oil and gas in the correct ratio to avoid excessive emissions, especially since roughly one-third of that mix goes directly into the environment.

The Cleanest Engine

Ultimately, the cleanest engine for Lake Whatcom is you! There are a number of boating options on the lake that do not involve a gas-powered engine. Try your hand at canoeing, kayaking, sailing or other non-motorized boating fun. This is a great way to enjoy the lake and all it has to offer.

OTHER CONSIDERATIONS WITH FUEL

There are a number of other boat-related activities that can introduce fuel and oil to the lake. You can help keep gas and oil out of the lake by practicing spill avoidance, planning for small spills, maintaining a leak free motor, and properly disposing of used materials.

Fueling

Any refueling of watercraft on or near the lake is a potential spill into the water. Spill prevention begins with slowing down when filling fuel tanks, knowing the size of your tank, and resisting the temptation to top off your tank. Fuel collars, absorbent pads, and fuel/air separators are tools that

you can use to help avoid spills or to contain excess fuel that has accidentally spilled. A fuel collar is a doughnut of *absorbent material* that fits around the fueling nozzle and catches splashes or drips during refueling. Absorbent pads can be used to wipe up excess fuel or to capture fuel from leaks. A fuel/air separator can prevent the escape of fuel from the air vent during filling. These devices are available at most boating stores.

Remember, two-stroke engines present an additional risk of spilling due to the extra step of mixing oil and gas. Take special care when mixing the oil and gas to avoid spills.

That Dirty Bilge

Many boats have a *bilge*. It is the lowest point under the boat deck where water, oil, fuel, antifreeze, and hydraulic fluid may collect before the automatic *bilge pump* takes over and sends them overboard. A manual override can stop the accidental and illegal pumping of contaminated bilge water. Always check the bilge for contaminants before you pump. Use absorbent pads in the bilge to soak up petroleum products before they go overboard. This simple action can help protect the lake and help you avoid a fine for the illegal discharge of contaminated bilge water.

Bilge cleaners can also cause environmental problems and cannot be pumped overboard into Lake

What Can Boaters Do?

Fueling

- ◆ Make sure the gas tank is easily accessible.
- ◆ Take your boat or tank to a gas station. Refill oil and gas away from the water.
- ◆ Pump/pour fuel extremely slowly.
- ◆ Know your fuel tank size prior to filling.
- ◆ Don't top off the tank—leave room for expansion.
- ◆ Have an absorbent pad and/or fuel collar ready for drips.
- ◆ Install a fuel/air separator.
- ◆ Use a gasoline container you can handle easily and hold securely.
- ◆ Use a funnel or a spout with an automatic stop device to prevent overfilling the gas tank.
- ◆ Mix fuel/oil for two-strokes away from the lakeshore, tributaries and stormdrains.

Whatcom. Many bilge cleaners are not biodegradable or non-toxic, regardless of what the label says. Even if the cleaner is environmentally safe, once it has combined with any petroleum product, the resultant mixture becomes harm-

ful to the environment. The best option is to clean the bilge when the boat is out of the water and away from the lake.

Smaller boats and inboard/outboard vessels may not have a bilge. These boats usually have a well for the fuel container. Place an absorbent pad under the gas tank in the well to prevent small leaks or spills from becoming large slicks.

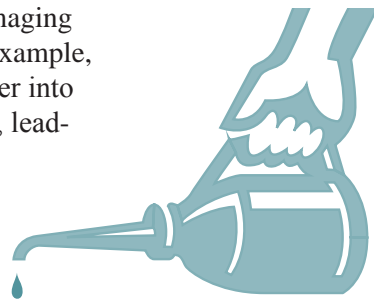
Soap Is for Dishes, Not Spills

Some boaters use dish soap in the bilge or to disperse small spills on the water's surface. These actions are harmful to the environment and illegal. It may appear that the petroleum just "disappears" with the addition of soap. Actually, the petroleum product becomes *emulsified* by the detergent in the soap. This means that the soap breaks the oil into invisible droplets that are difficult to contain and clean up—this is more damaging to aquatic life. For example, emulsified oil can easily enter into fish gills and degrease them, leading to possible suffocation.

Engine Maintenance

Oil, hydraulic fluid, anti-freeze and transmission

*Temporary
storage of fuel
containers
on the beach
or dock is an
accident waiting
to happen!*



What Can Boaters Do?

Engine Pollution

- Maintain a leak-free engine.
- Install a drip pan under the engine.
- Use absorbent pads/pillows in the bilge—keep oil-contaminated bilge water from discharging to the lake. Pumping contaminated bilge water is **ILLEGAL**. (RCW 90.56.320)
- Don't purge gas filters over or near water—use a pad to catch fuel and purge in-boat (if you are on the water) or purge a safe distance from the water.

Spill Prevention

- Close the vent on portable gas tanks when the engine is not in use or when the tank is stored.
- Do not leave fuel containers on or near docks and shoreline.
- Call 911 for spills. Be prepared to answer where, when, how, what and how much.
- If you have a small spill from your gas can or bilge, stop the source of the spill and contain the spill with absorbent materials.

Fuel Disposal

- Keep used products in separate containers for disposal recycling.
- Call the Whatcom County Recycling Hotline (676-5723) for all of your recycling questions.
- Contact the City of Bellingham/Whatcom County Disposal of Toxics Program (380-4640) for their hours of operation and location.

fluid are all chemical compounds that should be kept out of our drinking-water source. When you change fluids, use a pump to transfer the fluids to a leak-proof container. Have absorbent pads ready to catch spills and clean up afterward. Don't use a bilge cleaner and pump it in the lake later. Also, place a plastic bag or pan under the oil filter to catch the drips as you change it. Always keep used fluids separated. If you mix them, they can't be recycled. Recycle what you can and properly dispose of the rest. For antifreeze, use propylene glycol instead of ethylene glycol, as it is the less toxic of the two. Ethylene glycol however, is the one that can be recycled.

Check your lines frequently for leaks or weak spots. Make repairs immediately if you find a problem. Install a drip pan and line it with an absorbent pad or fasten a bilge pillow in the engine compartment to prevent small leaks from creating slicks. Don't purge your gas filters over or near the water. Use an absorbent pad to capture the fuel.

Fuel Storage and Winterization

Temporary storage of fuel containers on the beach or dock is an accident waiting to happen! Waves generated by the nearshore operation of boats and PWC can cause fuel containers to be tipped over or even knocked off of a dock into the water. Keep fuel away from the water. The storage of fuel, oils and other toxic materials is prohibited on docks.

Avoid wasting gas at the end of the season by either using it all up or adding a fuel stabilizer to the fuel that will sit all winter. Fill your tank at the end of the year to reduce the buildup of condensation. Leave space for expansion. Make sure you purchase the appropriate fuel additive for your engine. If you wind up with stale gas, dispose of it properly by calling the Disposal of Toxics Program at 380-4640.

Proper Disposal

Absorbent materials that will soak up oil and gas, but not water, are readily available at local boating and industrial supply stores. As described above, these materials are helpful tools when refueling, cleaning your bilge, working on your engine, or just capturing small leaks during boat operation. Many absorbent products can be wrung out in an appropriate container and used again.

The Disposal of Toxics Program will accept oil, gas-soaked pads, and used oil filters. This is the environmentally safest way to dispose of these items.

Keep all of the used fluids such as

oil, fuel, antifreeze, hydraulic and transmission fluid separately and remember to recycle them. Some locations have curbside pick up for motor oil—call the local Recycling Hotline at 676-5723 to find out what you can recycle and where.

Many sites that accept used fluids also accept used oil filters for recycling. If not, let the filter drain into a used-oil collection container for 24 hours and then wrap it up in paper, double-bag it and throw it away. Gas filters should be drained into an appropriate container and disposed of the same way.



Keep all of the used fluids such as oil, fuel, antifreeze, hydraulic and transmission fluid separated, and remember to recycle.

SPILL PREVENTION

- **Plan for spills**—Keep absorbent materials available and dispose of used materials properly. Contact the Disposal of Toxics Program (360) 380-4640.
- **Inventory the toxic products you use for boat projects**—(1) Consolidate and label the products you have to better manage them; (2) Put them in a tray lined with absorbent materials to catch leaks; (3) Dispose of outdated and unneeded products properly. Contact the Disposal of Toxics Program (360) 380-4640.
- **Handle and store all chemicals with extreme care**—Identify ways to prevent spills (e.g., store containers on a solid surface and keep the lids on tight).

BOAT MAINTENANCE

*Perform
maintenance
projects well
away from water.*

Some people think of a boat as a “hole to throw your money in.” That statement is a bit harsh, but it is true that most boats require frequent maintenance.



The most routine tasks such as cleaning, polishing, changing the vital fluids, and painting the bottom

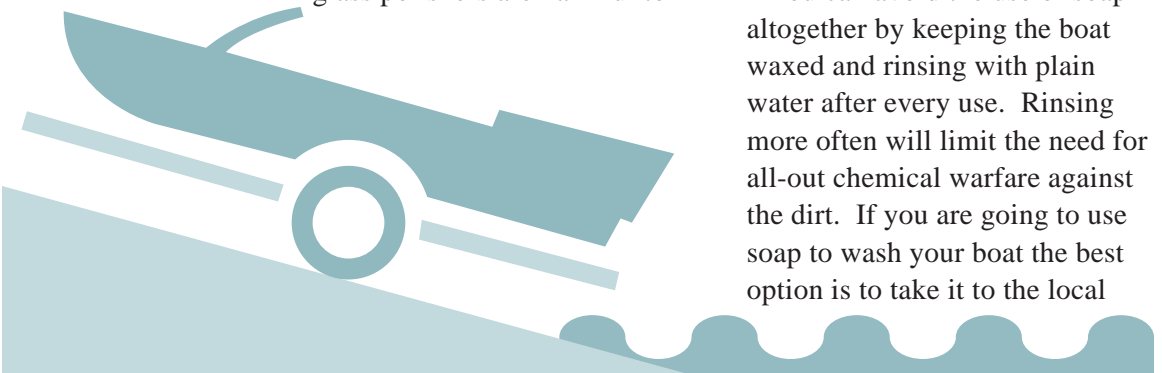
can cause big problems for water quality if the chemicals you use are not handled with care. Chemicals can get rinsed or spilled directly into the water when you tackle maintenance tasks over or near the water. Most detergents, soaps, paints, varnishes, teak cleaners, epoxies, and fiberglass polishers are harmful to

aquatic life. Therefore, perform maintenance projects well away from water and avoid using toxic products in the Lake Whatcom watershed.

SPARKLING BOATS

Washing your boat with soap or detergent may be one of the more tempting things to do near the water—but just say no. Soaps and detergents are harmful to aquatic life. Soaps and detergents work as degreasers by breaking down or *emulsifying* the dirt and grime. Once broken down, contaminants such as oil become more damaging to aquatic life. Also, some cleaning products still contain phosphates. Phosphates add excess phosphorus to the lake, which can feed algal blooms in the warmer months.

You can avoid the use of soap altogether by keeping the boat waxed and rinsing with plain water after every use. Rinsing more often will limit the need for all-out chemical warfare against the dirt. If you are going to use soap to wash your boat the best option is to take it to the local



What Can Boaters Do?

Boat Maintenance

- Do your maintenance projects outside the Lake Whatcom watershed.
- Rinse boats more often with plain water so there is less need for soaps and cleaners.
- Choose non-toxic, phosphate-free, chlorine-free, biodegradable products.
- Follow the instructions on the label. Twice as much cleaner doesn't work twice as well.
- Buy only what is needed for a project. Give the leftovers to another boater.
- If you absolutely have to work over or near the water, use tarps and work on a small area.
- Pressure washing near the lake is not a good idea as it is difficult to manage the wastewater.
- Dispose of leftover household toxics properly—Call Disposal of Toxics Program 380-4640.

commercial car wash where the dirty water goes to the wastewater treatment plant or is recycled on the premises.

If you absolutely have to wash your boat at home, make sure your soapy water does not travel to a stormdrain, neighborhood creek, detention pond, or the lake. Washing the boat over a pervious surface, such as gravel, is a better option than a concrete driveway or road.

OTHER MAINTENANCE PROJECTS

If your boat is in need of major work (e.g., sanding, painting, varnishing etc.), it is best to do the work outside the Lake Whatcom watershed.

At a minimum, the work should be done well away from the lake, tributaries and stormdrains.

If you do boat maintenance within the watershed, it is



*Read the
label on the
products
you buy.*

Alternatives to Toxic Cleaners



- **Soap**—Choose phosphate-free and non-toxic soap, use as little as possible
- **Scouring Powders**—Baking soda
- **Fiberglass**—Baking soda paste
- **Decks and Floors**—One cup white vinegar in two gallons water
- **Windows**—One cup vinegar in one cup warm water, rinse, and squeegee
- **Aluminum**—Two tablespoons cream of tartar in one quart hot water
- **Copper**—Lemon juice and salt
- **Brass**—Worcestershire sauce or paste made of equal parts salt, vinegar, and water; rinse
- **Chrome**—Apple cider vinegar to clean; baby oil to polish
- **Drain Opener**—Pour vinegar and baking soda in drain and follow with boiling water
- **Mildew**—Paste of equal parts of either lemon juice and salt or vinegar and salt
- **Wood**—Three parts olive oil and one part white vinegar
- **For Your Hands**—Baby oil or margarine

important to contain the work.

You can prevent chemicals, sanding dust and paint scrapings from getting in the water by using tarps and keeping the work area clean.

Buy only the amount of product you will use so you won't have unused chemicals left over. Working out of a small container also reduces the chance of having a big spill. If you have to transfer from a larger container, use a



funnel. Keep absorbent pads or rags on hand to deal with spills and drips. Absorbent materials are readily available at boating and industrial supply stores.

GO ALTERNATIVE

Read the label on the products you buy. Many products are labeled as “green,” “environmentally friendly” or “biodegradable.” This doesn’t guarantee that the product is non-toxic to you, your kids or the environment you live in. It could simply mean that the manufacturer is exploiting the “green” market. If the label says “wear respirator and/or gloves,” it probably is not the right product for

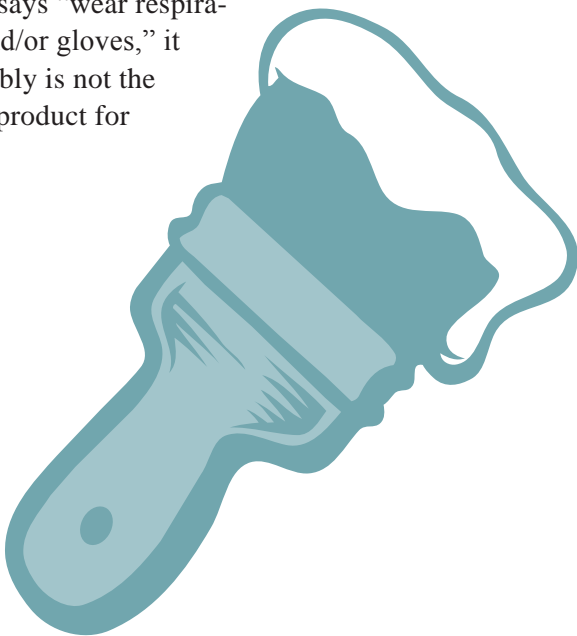
use near the lake. Avoid using detergents that contain ammonia, sodium hypochlorite, chlorinated solvents, petroleum distillates or lye. Products that say “non-toxic” and “phosphate-free” are likely more lake-friendly.

There are many non-toxic products around your home, such as baking soda and vinegar, which can be combined to make effective cleaners. They may not work as quickly as the high strength toxic cleansers, but they do work. Add elbow grease as needed.

Use the alternative cleaners listed on the previous page for your

next cleaning chore on the boat or at home.

There are many non-toxic products around your home, such as baking soda and vinegar, which can be combined to make effective cleaners.



DOCKS AND BOATHOUSES

A dock with a natural, unfinished surface is the lake-friendly option.

Docks, floats and boathouses provide access to the lake for a number of recreational activities. Depending on the design and construction materials, docks and floats can create additional problems for the shoreline environment, especially given their recent proliferation in the developed parts of the lake. Both Whatcom County and the City of Bellingham have provisions in their Shoreline Management Programs for the construction and maintenance of docks and floats. The construction of boathouses is currently prohibited by both governments, although existing boathouses have been grandfathered in.

NEW DOCKS

Even though a lunger may take up residence beneath your dock or a heron may find a good roost, docks do not generally create good habitat for fish and wildlife. Docks are barriers to the movement of aquatic

life. Waterfowl, beaver and otter are forced farther out in the lake, nearer to boat traffic, by docks and floats. Larger docks inhibit the growth of beneficial aquatic plants by shading the *littoral zone*. If pilings are not spaced far enough apart, a dock can change the movement of water along the shoreline, causing erosion and deposition, which will affect the growth of aquatic plants.



If you are thinking about constructing a dock or float or making major repairs to an existing one, you need to contact the Whatcom County Planning and Development Services at 676-6907 or City of Bellingham Planning Department at 676-6982 to obtain the necessary environmental review and permits for your area. You may think that this seems like a big deal just to build a dock, but any work performed below the ordinary high water mark on the lakeshore has the potential to cause

water quality problems.

If constructed in conjunction with a naturally vegetated shoreline, a dock can provide boat moorage, allow access to the water and reduce human impacts to the shoreline environment. Damage to the *riparian area* can be reduced by redirecting heavy use away from the fragile shoreline to a dock.

A community dock shared with neighboring properties, is a great way to avoid the continued proliferation of docks around the developed parts of the shoreline. For simple boat moorage, a buoy is the preferred alternative as it causes the least long-term impact to the lake environment.

The materials used in the construction of docks can introduce a variety of contaminants into the lake. State and local Shoreline Management Programs prohibit the use of wood or pilings treated or coated with paint, pentachlorophenol, arsenated compounds, creosote or other environmentally harmful materials.

MAINTENANCE

Because paints, wood preservatives or other chemicals may end up in the lake during routine maintenance, they are not permitted to be used over or near surface water. A dock with a natural, unfinished surface is the lake-friendly option.

If your dock or boathouse is already painted, you need to exercise extreme care when maintain-

ing it. It is your responsibility to ensure that tarps are used and that the paint scrapings, paint or other materials do not fall into the lake.

Pressure washers are sometimes used for cleaning and prep work. The force of the water from a pressure washer makes it extremely difficult to control the amount of material being washed into the lake. A better alternative is to scrub or wire-brush the surface with tarps around and underneath the work area to contain the scrapings. Bleach, herbicides or pesticides should not be used over the water to control the unwanted living things that take up residence on or around your dock.

What Can Boaters Do? ***Dock Maintenance***

- ◆ A buoy is the most lake-friendly form of moorage.
- ◆ Build a community dock instead of a private one.
- ◆ If you build a dock, make it as small as possible and leave the rest of your shoreline naturally vegetated.
- ◆ Use natural wood or another environmentally safe building material.
- ◆ Do not use wood preservatives as they can wash or leach into the water.
- ◆ Do not spray or treat structures over the water with pesticides or herbicides.
- ◆ Scraping and painting should be done with tarps in place so that nothing falls to the water.
- ◆ Avoid pressure washing materials into lake.
- ◆ Do not store or use chemicals, gas or oil on docks.

WAKES, PROPELLERS AND SAFETY

Boating activities can accelerate erosion on the lakeshore.

In 2002, the Whatcom County Council established a no-wake zone in Lake Whatcom's South Bay.

It can be difficult to see and comprehend some of the other negative effects of boating from the helm, as the impacts often occur far from the boat. For example, the wake from a boat causes shoreline erosion long after that boat has passed. Or if you operate a personal watercraft (PWC) too close to shore, you will never see the wildlife that has to stay undercover until the waves and noise have subsided. Many environmental impacts from boating are avoided when the existing City and County boating regulations are observed.

SHORELINES AND SPEED DON'T MIX

Erosion of the lake's shoreline occurs naturally by wind-generated waves. However, certain boating

activities can accelerate erosion on the lakeshore, which results in increased negative impacts to the lake ecosystem. Excessive erosion may also hit property owners in the wallet. Eroding shorelines can lead to decreased property values and costly erosion prevention and control measures.

Boats and PWC are often operated close to the lakeshore, in the shallows and at excessive speeds. Personal watercraft have an especially high potential for causing shoreline erosion since they can be launched from a beach, and the combination of a jet and shallow *draft* enables them to go very fast even in shallow water.



What Can Boaters Do?

Safe Boat Operation

- ◆ Operate your boat at a speed that causes no wake on shore.
- ◆ Stay out of the shallows.
- ◆ Avoid disturbing wildlife, especially nesting and feeding birds.
- ◆ Observe the speed limit.

Wakes from both boats and PWC can lead to larger more frequent waves on shore, which in turn stir up sediments and erode the shoreline.

IMPACTS TO FISH, WILDLIFE AND PLANTS

Most species of aquatic plants, fish and water-dependent wildlife are born, reproduce and die in the shallow transitional zone from the land to the water—the *littoral zone*. The majority of Washington's wildlife also use the upland vegetated area next to the water, the *riparian area*, for feeding or cover. This is also the point where people most often access the lake and stir up sediments during boat and PWC launches.

Clear water is an important visual attribute for all lake users and is essential for healthy aquatic

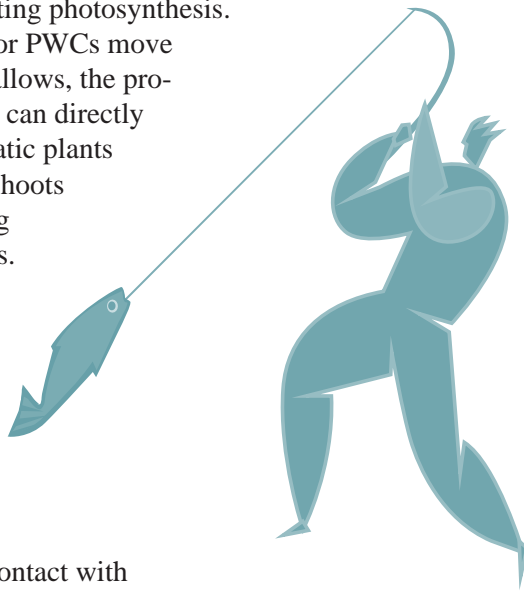
life. Stirred up sediments affect aquatic organisms ability to breathe, find shelter, forage and reproduce. Churned-up sediments may also release nutrients that are stored in the sediments. Nutrients such as phosphorus can support undesirable algal blooms in the summer.

Turbidity, a measure of water clarity, is based on the ability of light to penetrate down into the water. Lower turbidity usually indicates a higher water quality. When turbidity increases, less light penetrates and visibility decreases. Boating in the shallows increases turbidity. An increase in turbidity causes less light to reach plants, limiting photosynthesis.

As boats or PWCs move through shallows, the propeller or jet can directly impact aquatic plants by cutting shoots or uprooting entire plants.

In shallow areas with high use, communities of vegetation decrease due to persistent contact with boat bottoms and propellers.

Fish and wildlife depend upon an undisturbed environment for



nesting, spawning and feeding. The noise or mere presence of a boat or PWC can scare off fish and wildlife without ever touching them. Unfortunately, the start of boating season coincides with an extremely sensitive time for young wildlife. The closer to shore you operate your boat, the more likely you are to cause a scare.

Birds are particularly sensitive to

disturbance. If frightened during nesting and feeding, they may abandon eggs or young. Slowing down, steering clear of wildlife and staying out of the shallows can reduce the needless disturbance of fish and wildlife.

THOSE EXOTIC AQUATICS

Prevent the Invasion

Lake Whatcom hosts boaters from all over Washington as well as Canada. With all these boats coming and going, it is possible that plant and animal stowaways may hitch a ride into the Lake Whatcom watershed.

There are many sites around the country where lake ecology has been severely altered by the introduction of non-native invasive aquatic plant species. In many cases, non-native species

COLLECTING AQUATIC PLANT SPECIMENS

- You can collect an underwater plant by dropping a weighted rake to the bottom of the waterbody and pulling up the plants snagged by the rake. When possible, the entire plant, including the roots, stems, flowers or fruits should be collected. (The flower and fruits of many aquatic plants often stick up above the water in a spike-like arrangement.)
- If its not possible to collect the entire plant, get as much of it as you can, not just the top few inches. Some plants have floating leaves and underwater leaves; be sure to include both types of leaves. Wash the plant in clean water to remove algae, debris and other adhering materials. Do not allow the plant to dry out.
- Make notes of the date, location, collector's name and address, and some details about the site where the plant was collected.

What Can Boaters Do?

Those Exotic Aquatics

- ◆ Remove any plants/animals that may have attached themselves to your boat, motor or trailer.
- ◆ Flush the engine cooling system, bilge and live-bait storage with hot water. It is recommended that the water be 110-140F.
- ◆ Air-dry the boat, trailer, motor etc. for a minimum of five days before launching at another site.

outcompete the natives. This means that swimming and boating areas may become inaccessible due to excessive growth. Control measures are expensive, and not always practical or effective.

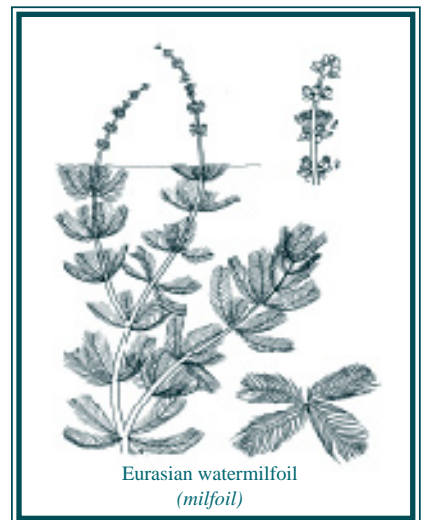
If you use your boat in Lake Whatcom and in other lakes or rivers, you may inadvertently introduce non-native plant and animal species into the lake. As you leave a boating area (including Lake Whatcom), you should always remove any plants or animals that may have attached themselves to your boat, motor, or trailer. Don't put the plants back in the lake—throw them away in a trash container. Make this part of your routine, like strapping the boat down and checking the trailer lights.

Before the boat goes back in the water, flush the engine, cooling system, bilge, and live-bait storage with hot water. It is recommended that the water be 110-140F. Air-dry the boat, trailer and motor for a minimum of five days before launching at another site. This may sound extreme, but you don't want to be the one who introduces an invasive species.

Most Common Aquatic Noxious Weeds

Eurasian watermilfoil (milfoil), a common invasive, exotic, aquatic plant, is present in Lake Whatcom. According to the Whatcom County Noxious Weed Control Board and Dept. of Ecology plant surveys, Lake Whatcom is the only lake in Whatcom County that has Eurasian watermilfoil. Milfoil is most noticeable in the Bloedel swimming area and around Basin One. It is also found in the vicinity of Strawberry Point, Agate Bay and the fish hatchery on the south end of the lake. Most invasive plant species thrive on nutrient runoff

Eurasian watermilfoil is present in Lake Whatcom.



Eurasian watermilfoil
(milfoil)

*Whatever goes
on board should
come back to
shore.*

and poorer water quality, so the urbanized areas of the lake are more susceptible to colonization.

While these other invasive species haven't been found in Lake Whatcom yet, be on the lookout: Brazilian elodea (*Egeria densa*); fanwort (*Cabomba caroliniana*); hydrilla (*Hydrilla verticillata*); parrotfeather (*Myriophyllum aquaticum*).

If you think you have found an invasive plant, you can bring a sample to the Whatcom County Noxious Weed Control Board at 354-3990 or the WSU Cooperative Extension at 676-6736. Call first for drop-off times and use the procedures on page 20 for a successful collection.

The zebra mussel is an exotic nuisance species. It reproduces quickly, can adhere to any surface and has few natural predators in the U.S. As a result, it can clog public water intakes, damage boat engines and threaten water-based recreational activities. Zebra mussels have not appeared in Lake Whatcom yet. Zebra mussels

What Can Boaters Do? Keep the Lake Clean

- ◆ Dump nothing overboard—no trash, food waste, or sewage. (RCW 90.48.080)
- ◆ Use bathrooms on the shore.

average 1/2 inch with alternating dark and light stripes on a D-shaped shell. If you suspect you have found one, collect a sample in a sealed container, note the location and call Washington Department of Fish and Wildlife at 902-2741.

KEEP THE LAKE CLEAN

Litter does not make the world a beautiful place. Litter in the lake can also be harmful to the fish and wildlife as well as foul propellers or engine intakes. Don't let trash get thrown, blown or washed overboard. Whatever goes onboard should come back to shore.



Brazilian elodea
(*Egeria densa*)



Fanwort
(*Cabomba caroliniana*)



Hydrilla
(*Hydrilla verticillata*)



Parrotfeather
(*Myriophyllum aquaticum*)



Zebra Mussel

While the lake does hold a lot of water in its three basins, it is not a toilet. Help keep excess bacteria and nutrients out of the lake—use onshore toilets or keep a holding tank on your boat.

SAFETY COUNTS

Between the months of May and September, Lake Whatcom gets busy with boats, swimmers and others at play, as well as wildlife. Along with the increased use come concerns about safety. Specifically, there is growing concern over the operation of personal watercraft because of their maneuverability, shallow *draft*, and high-speed operation.

Hundreds of boaters and swimmers can be on Lake Whatcom on a single summer day, so every measure should be taken to prevent accidents and to generally respect other lake users and residents.

Boater Rules:

- **Speed Limits:** 6 mph at all times, if you are within 300' from docks and the shore, within 100' of a swimmer, diver, or any non-motorized boat. 8 mph from one-half hour after sunset to one-half hour before sunrise. 40 mph in unrestricted areas one-half hour before sunrise to one-half hour after sunset.

- **Right-of-Way:** Swimmers, divers and fallen skiers have the right-of-way over any watercraft. Similarly, a sailboat, rowboat, canoe, kayak or any other non-motorized vessel has the right-of-way over any motor-powered vessel underway.

- **Safety Equipment:** Personal floatation devices (PFDs or life jackets) that are U.S. Coast Guard approved are required to be aboard for each passenger. Children under the age of 7 must always wear a PFD when aboard any boat, motorized or not. All motorized vessels must carry an approved fire extinguisher and, if over 16' in length, a whistle.

- **Enforcement:** The Whatcom County Sheriff's Office enforces boating regulations on Lake Whatcom. A deputy Sheriff patrols the lake on weekends during the boating season. If there's an emergency or a problem on the lake, call 911.

- **Age:** You must be at least 10 years old to operate motorized watercraft up to 10 HP without an adult aboard. You must be 16 to operate a motorized watercraft with a motor greater than 10 HP.

Whatcom County and the City of Bellingham have information about boating regulations for the lake. It is your responsibility to know them.

FINAL THOUGHTS

As you read this handbook, you have learned that there are many ways for boaters to help protect Lake Whatcom. The activities and practices described in the handbook are straightforward, especially as they become part of your routine.

You'll have to make the next move and look at your boating maintenance and operation habits.

Although numerous studies have been completed on other lakes, to date few studies exist about boating on Lake Whatcom. Across the country,

researchers have been examining boating impacts and attempting to determine the level of these impacts on different lakes and rivers. Most of the studies conclude that impacts change with the level and location of boating activity. When

many boats are concentrated in a small area, the impacts will be greater.

When you boat on Lake Whatcom, your actions affect many aspects of life around the lake.



Collection of Whatcom Museum of Art and History

GLOSSARY

Absorbent materials—*materials such as pads, pillows, and fuel collars that are designed to absorb oil and gas but not water.*

Aquatic—*living or growing in water; taking place in water.*

Bilge—*the void between the inside of the hull and the lowest deck; in many boats it is the collection point for any water that enters the boat and/or fluids that leak from the motor.*

Bilge pump—*a pump that is designed to pump fluids from the bilge to the outside of the boat usually through a hull fitting; they can be automatic or manual.*

Draft—*the depth of water required to float a vessel.*

Emulsify—*to break down into smaller particles causing the permanent or temporary suspension of one liquid in another.*

Littoral Zone—*the shore area.*

Personal watercraft (PWC)—*a shallow-draft vessel less than 16 feet that uses an inboard internal combustion engine to power a water jet pump as its primary source of propulsion. It is designed to be operated by a person who is sitting, standing or kneeling.*

Phototoxicity—*a change in toxicity due to contact with ultraviolet light.*

Riparian Area—*the transitional area located next to a stream, river or lake that contains elements of both aquatic and terrestrial ecosystems.*

Turbidity—*increased sediments in the water leading to reduced water clarity.*

REFERENCES AND RESOURCES

Fuel, Oil and Boats

Nuti, M. P. 1998. Emissions from Two-Stroke Engines. Society of Automotive Engineers Inc. Warrendale, PA.

Tahoe Regional Planning Agency. 1999. *Environmental Assessment for the Prohibition of Certain Two-Stroke Powered Watercraft*.

US Environmental Protection Agency. 2000. *Draft National Management Measures to Control Nonpoint Source Pollution from Marinas and Recreational Boating*. Nonpoint Source Control Branch, Office of Water.

California Environmental Protection Agency Air Resources Board (CARB)
<http://www.arb.ca.gov/msprog/marine/flyer.htm>

US EPA Consumer Information “Boating Pollution Prevention Tips”
<http://www.epa.gov/otaq/boat-fs.htm>

US EPA Office of Water-Marinas and Boating
<http://www.epa.gov/OWOW/NPS/marinas.html>

US EPA Office of Transportation and Air Quality
<http://www.epa.gov/OMSWWW/>

Wakes, Propellers and Safety/ Exotic Aquatics

National Clean Boating Campaign
<http://www.cleanboating.org/>

Whatcom County Noxious Weed Control Board—(360) 354-3990
<http://www.co.whatcom.wa.us/publicworks/weeds/index.jsp>

Washington State Department of Ecology—Aquatic Plants and Lakes
<http://www.ecy.wa.gov/programs/wq/links/plants.html>

Washington State University—Cooperative Extension—(360) 676-6736
<http://www.co.whatcom.wsu.edu/index.htm>

Boating Safety

Whatcom County Code, Title 11 for Boating Regulations
<http://www.mrsc.org/mc/whatcom/whatcont.html>

Washington State Boating Safety
www.boatwashington.org

General Boating Safety Information
<http://www.boatsafe.com/>

Boater Education/ Environmental Impacts

Asplund, T.R. 2000. The Effects of Motorized Watercraft on Aquatic Ecosystems. Wisconsin Department of Natural Resources, Bureau of Integrated Science Services and University of Wisconsin—Madison, Water Chemistry Program. PUBL-SS-948-00.

Buller-Pearson, P. Resource Manual For Pollution Prevention In Marinas. 1998. Washington State Department of Ecology: Water Quality Program-Permit Management Section. Publication #9811

Wetzel, R.G. 1983. *Limnology*. Saunders College Publishing. Orlando, Florida.

EPA Office of Water-Marinas and Boating
<http://www.epa.gov/OWOW/NPS/marinas.html>

Lake Access Organization
<http://www.lakeaccess.org/boaters.html>

National Clean Boating Campaign
<http://www.cleanboating.org/>

Oregon State Marine Board
<http://www.marinebd.osmb.state.or.us/>

Resource Manual for Pollution Prevention in Marinas
<http://www.ecy.wa.gov/biblio/9811.html>

Boating Restrictions

City of Bellingham Lake Whatcom Boating Ordinance 2005-06-045 (PDF):
[http://www.cob.org/web/legilog.nsf/423f25dc0bb7f5ea882566f0006a8054/6cac7f7f874faaa4882570190067731a/\\$FILE/200506045.pdf](http://www.cob.org/web/legilog.nsf/423f25dc0bb7f5ea882566f0006a8054/6cac7f7f874faaa4882570190067731a/$FILE/200506045.pdf)

City of Bellingham Ordinances:
<http://www.cob.org/web/legilog.nsf>

City of Bellingham Municipal Code:
<http://www.cob.org/web/bmcode.nsf>
Title 8 Parks, Cemeteries and Public Places
8.12.135

Whatcom County's Lake Whatcom Boating Ordinance 2004-042 (PDF):
<http://www.co.whatcom.wa.us/council/2004/ord/ord2004-042.pdf>

Whatcom County Ordinances:
http://www.co.whatcome.wa.us/council/code/main_ord_res.jsp
<http://www.mrsc.org/mc/whatcom/whatco11/whatco1132.html>

General Information

City of Bellingham Environmental Resources
(360) 676-6961
<http://www.lakewhatcom.wsu.edu/>

Whatcom County Stormwater Division
(360) 715-7450
<http://www.co.whatcom.wa.us/publicworks/water/index.jsp>

Planning and Development Services—
(360) 676-6907
<http://www.co.whatcom.wa.us/pds/index.jsp>

City of Bellingham Planning Department—
(360) 676-6982
<http://www.cob.org/pcd/index.htm>

City of Bellingham Water Treatment
(360) 676-6850
<http://www.cob.org/pw/water.htm>

Lake Whatcom Water and Sewer District
(360) 734-9224

Whatcom County Sheriff
(360) 676-6650 or (360) 384-5360

Department of Fish & Wildlife
<http://www.wdfw.wa.gov/>
Fish Kill Reports (360) 902-2700
24-Hour Hotline (360) 902-2936

U.S. Coast Guard
(800) 477-6224
<http://www.uscgboating.org/>

To Report A Fuel or Hazardous Material Spill

CALL 911

Uniform State Reporting Number for WA, OR and CA:
(800) OILS-911

Nation Response Center: (800) 424-8802

Department of Ecology Northwest Region—
General information: (425) 649-7000

Hazardous Waste Disposal

This section has numbers to call to find out where and how to dispose of small amounts of household generated toxic waste (e.g., oil, filters, unused or leftover toxic products). Also use these numbers to learn about alternatives to the chemicals you may presently be using.



Whatcom County Recycling Hotline: (360) 676-5723

Disposal of Toxics Program, Whatcom County—
Household Hazardous Waste: (360) 380-4640

Washington Toxics Coalition: (206) 632-1545

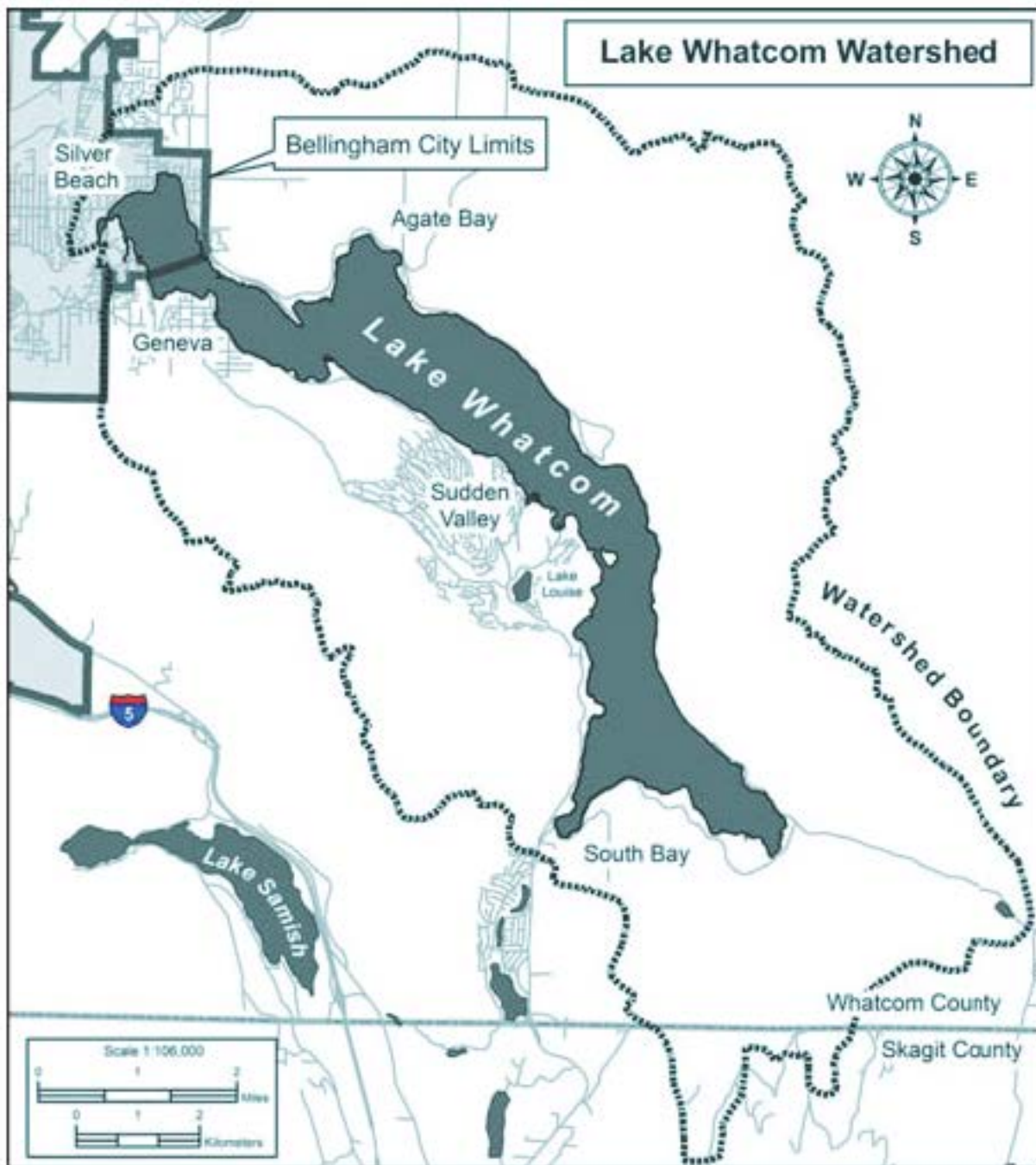
Department of Ecology—

- Hazardous Waste Hotline: (800) 633-7585
- Recycling Hotline: (800) RECYCLE

Washington Department of Fish and Wildlife—
Fish Kill Reports:
(360) 902-2681

Hotline/Poach:
(360) 902-2936 or
(800) 477-6224

Lake Whatcom Watershed



To Report a Fuel or Other Hazardous Material Spill Call 911
New Boating Regulation Information on Page 8

STOP THE INVASION



ZEBRA & QUAGGA MUSSELS



EURASIAN WATERMILFOIL

Unwanted plants and animals can ruin your favorite fishing and boating waters.

Protect Lake Whatcom. Protect your drinking water.

PLEASE remember to follow these simple steps:

☒ **CLEAN**

- Remove **ALL** aquatic plants, animals, and mud and thoroughly wash everything

☒ **DRAIN**

- Drain water from your boat, trailer, tackle and gear **before** leaving the area

☒ **DRY**

- Allow sufficient time for your boat to dry before launching into other waters

And..

- Do **NOT** empty aquariums or bait

If your boat has been in infested waters for an extended period of time, or if you cannot perform the required steps above, you should have your boat *professionally* cleaned with high-pressure hot water (>140 °F) before transporting to any other body of water.

In Washington, it is **unlawful** to transport aquatic weeds, zebra mussels, or other aquatic nuisance species.
(RCW 17.24.061 WAC 16-752-510 WAC 232-12-01701)



Report Sightings:

1-877-9-INFEST

www.InvasiveSpecies.wa.gov

Washington Invasive
Species Council



Whatcom Weeds

Whatcom County Noxious Weed Control Board 901 W. Smith Road Bellingham WA 98226
(360) 715-7470 www.co.whatcom.wa.us/publicworks/weeds

EURASIAN WATERMILFOIL

Myriophyllum spicatum

THREAT: Eurasian watermilfoil (also called Eurasian milfoil) is an aquatic plant native to Europe and Asia. It may have been introduced to North America as early as the late 1800s and was first identified in Washington in 1965. At one time, it was widely sold as an aquarium plant. Eurasian watermilfoil spreads through plant fragments and forms dense mats of vegetation. Infestation can completely change the physical and chemical characteristics of the infested water body, leading to changes such as increased sedimentation and depleted oxygen. This plant can impact all uses of the aquatic system, including recreational uses, water movement, and fish and wildlife habitat. Because of its early spring growth, it can outgrow and shade native aquatic vegetation. This plant also creates excellent habitat for mosquito larvae. Although Eurasian watermilfoil produces seed, reproduction is primarily through plant fragmentation. Even tiny plant fragment can produce a new plant and an entire lake can become infested within two years of the initial introduction.



DESCRIPTION: Eurasian watermilfoil is a submersed perennial plant. It is very adaptable, growing in both still and flowing water, and tolerates a wide range of temperature, salinity and pH. It can grow in water 1 to 10 meters deep and can survive under ice. Eurasian milfoil has featherlike leaflets, arranged in whorls of 4 (rarely 5) around the stem. Each leaflet usually has 12 or more pairs of leaflets, which can help distinguish it from other milfoils. The plants begin growth early in the spring, growing towards the surface. Once near the surface, the plants branch extensively, forming dense mats. When plant growth reaches the surface (usually in mid to late July in Washington), the plants flower. The tiny pinkish flowers occur on reddish spikes that extend several inches above the surface of the water. After flowering, the plants tend to become brittle, breaking apart easily and further spreading the infestation. In colder areas, the plants die back to the root crowns in the fall. However, in western Washington, Eurasian watermilfoil may overwinter in an evergreen form.

MANAGEMENT OPTIONS: Like all aquatic weeds, control is difficult and eradication may be unrealistic. To prevent the spread of any of these plants, trailers, boats and fishing gear should be carefully inspected to avoid transporting plant materials between water bodies. Aquarium plants should never be discarded in sewer systems or water bodies. Accurate identification of Eurasian watermilfoil is essential before control work can begin, as it resembles other aquatic plants, including some native species. Control efforts can include chemical and mechanical measures, although success is usually limited. Cutting the plants will open up the

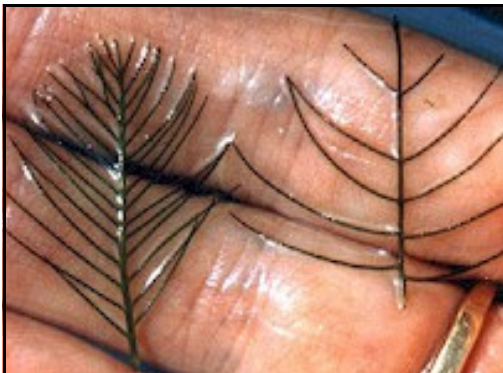


water body, but does not kill the plant, and needs to be done at least twice a season. All plant pieces must be removed from the water as escaped plant fragments will spread the infestation. Underwater rototilling has been used with some success in Canada, with control lasting for two years. Grass carp prefer other plants to Eurasian watermilfoil and will only eat it when other vegetation is gone. Water drawdowns have also been used to control populations, but success depends on several variables (degree of desiccation, substrate type, temperature and presence of snow). For small bodies of water or small areas within larger water bodies (such as at boat launches or swimming areas), bottom barriers can be installed to prevent all plant growth. A weevil native to North America feeds on both Eurasian watermilfoil and the native milfoil but is not present in high enough numbers

to control Eurasian watermilfoil. Research is continuing on this possible biocontrol agent. Contact the weed control board for site-specific chemical recommendations.

Milfoil - the Common Enemy

Eurasian Watermilfoil is a noxious aquatic weed that is a common enemy to aquatic life, boaters and lake residents alike. Milfoil is an invasive stringy green weed which propagates through fragmentation and grows up from the bottom the lake forming dense tangled mats near the surface of the water hindering boating, fishing, swimming and wildlife.



The Battle Against Milfoil

The City of Federal Way, King County and many other jurisdictions are fighting a constant and costly battle with milfoil and other aquatic weeds on our lakes. These aquatic weeds are primarily spread by boats and boat trailers going from lake to lake carrying plant matter and seed. Please help us in this effort by cleaning your boats and trailers before you leave any boating area.



City of Federal Way
33325 8th Avenue S.
PO Box 9718
Federal Way, WA 98063-9718

For more information about milfoil
check out these web pages:
[http://dnr.metrokc.gov/wlr/lands/weeds/
milfoil.htm](http://dnr.metrokc.gov/wlr/lands/weeds/milfoil.htm)
or
[www.ecy.wa.gov/programs/wq/plants/weeds/
milfoil.html](http://www.ecy.wa.gov/programs/wq/plants/weeds/milfoil.html)

What a Tangled Web We Weave



Milfoil forms dense tangled mats near the surface of the water which interfere with swimming, boating and fishing. Even wildlife have been know to get tangled up in these dense mats of vegetation.

Looks Aren't Everything

While it may look like an attractive feathery green plant, this noxious weed reproduces rapidly and can infest an entire lake within two years of introduction to the system. It grows much faster and earlier than native plants and chokes them out by blocking off their sunlight.



Eurasian Milfoil

Be Sure to Clean Your Boat



City of Federal Way
33325 8th Avenue S.
PO Box 9718
Federal Way, WA 98063-9718

For more information about milfoil
check out these web pages:
[http://dnr.metrokc.gov/wlr/lands/weeds/
milfoil.htm](http://dnr.metrokc.gov/wlr/lands/weeds/milfoil.htm)
or
[www.ecy.wa.gov/programs/wq/plants/
weeds/milfoil.html](http://www.ecy.wa.gov/programs/wq/plants/weeds/milfoil.html)

For additional copies of this
brochure, call 253 835-2752.



Milfoil is an invasive aquatic weed that can ruin your favorite fishing hole very quickly, however it is simple to prevent. **Simply clean your boat and trailer of aquatic plants before you put your boat in the water and before you leave a boating area.** Also be sure to drain all water from your boat and trailer before you leave the area.



STOP

The Invasion



Photos courtesy of Washington Department of Fish and Wildlife

Zebra and Quagga Mussel

Dreissena polymorpha and
Dreissena bugensis

Report Sightings

1-877-9-INFEST
InvasiveSpecies.wa.gov



What are they?

Zebra and quagga mussels are freshwater mollusks that colonizes lakes and rivers. Their preferred habitats include the calm waters upstream of dams. They are most abundant on hard, particularly rocky surfaces.

Are they here yet?

No, but they are only a day's drive away. They attach themselves to boats, so if someone uses a boat in an infected lake and then launches the boat in Washington waters, they could be introduced here. The Washington Department of Fish and Wildlife has an early detection program, but everyone's help is needed to spot them before they become a problem.

Why should I care?

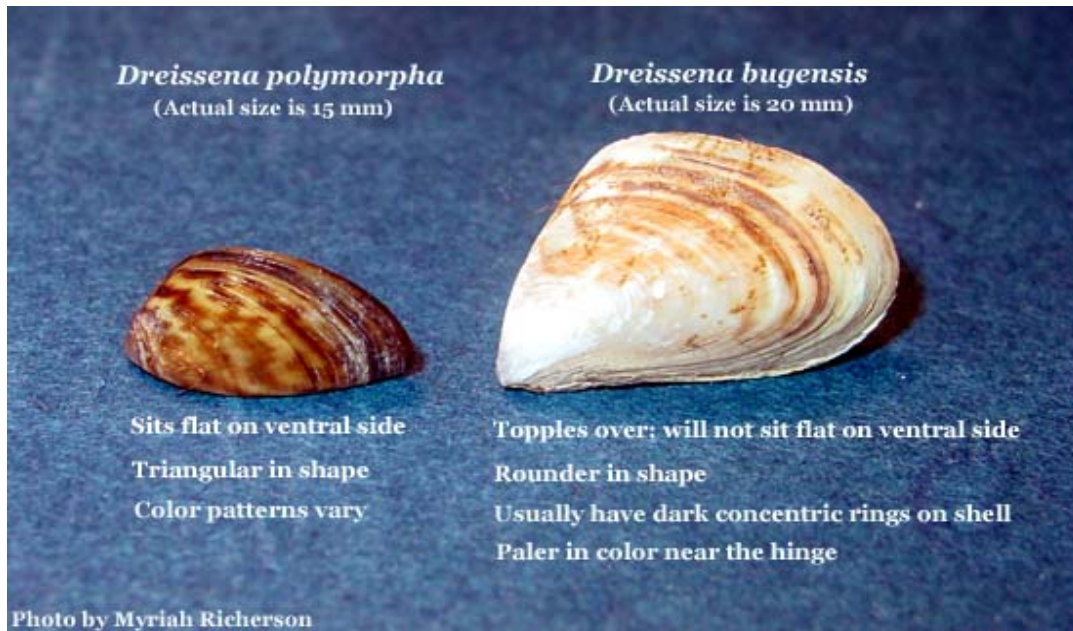
These species could cost taxpayers hundreds of millions of dollars a year and disrupt access to recreational and commercial opportunities on state waters. They clog water intake pipes and filters, reducing water pumping capabilities for power and water treatment plants. Once established, these mussels will change ecosystems and food sources critical to native mussels and species such as salmon and trout.

How can we stop them?

Clean, drain, and dry all watercraft and equipment before using them in another water body to prevent spreading the mussels. It is illegal to transport, possess, or release these species, and there are severe penalties for doing so.

What should I do if I find a zebra or quagga mussel?

Call: 1-877-9-INFEST or report online at www.InvasiveSpecies.wa.gov.



Zebra Mussel Characteristics

- Adults range from 1/8 to 2 inches in length.
- Mostly white or cream-colored with jagged brown or black stripes across the shell. Shell is D-shaped.
- Byssal threads (or ropes) are on the hinge edge of its shell. These threads are unique to zebra and quagga mussels and are not found on native mussels.

Quagga Mussel Characteristics

- Shell is normally striped, as is that of the zebra mussel.
- Byssal threads (or ropes) are on the hinge edge of its shell.
- The adults are slightly larger than the zebra mussels. They can be up to 0.8 inch wide and more than 2 inches in length.
- Shell is more rounded (fan shaped with pointed edges at either side) on the hinge edge than zebra mussel shells. If you place a shell with its hinge edge on a table, the shell will roll off of the hinge.
- The shells of the quagga mussels are thinner and lighter when they live on soft surfaces, and thicker and heavier when they live on hard or rocky surfaces.

For More Information, Visit

<http://wdfw.wa.gov/fish/ans/index.htm>

<http://wdfw.wa.gov/enforcement/index.html>

<http://www.protectyourwaters.net/>

<http://100thmeridian.org/>

**Report
Sightings**

1-877-9-INFEST

InvasiveSpecies.wa.gov



STOP AQUATIC HITCHHIKERS!

www.ProtectYourWaters.net

Follow these simple steps:

✓ Clean

Remove all plants, animals, mud and thoroughly wash everything, especially all crevices and other hidden areas.

✓ Drain

Eliminate all water before leaving the area, including wells, ballast, and engine cooling water.

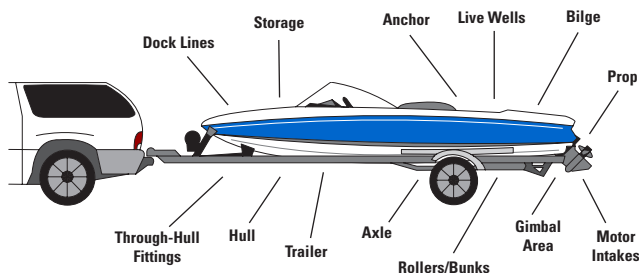
✓ Dry

Allow sufficient time for your boat to completely dry before launching in other waters.

If your boat has been in infested waters for an extended period of time, or if you cannot perform the required steps above, you should have your boat *professionally* cleaned with high-pressure scalding hot water (>140 °F) before transporting to any body of water.

Before launching and before leaving...

Inspect everything!



Quagga mussels encrusting a boat motor



Zebra and quagga mussels are a nuisance for anglers and boaters. They can ruin your equipment, clog motor cooling systems, foul hulls, and jam the centerboard wells under sailboats.



100th Meridian Initiative

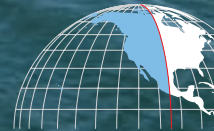


Image Credits: Zebra Mussels on a Fishing Lure by Marc Murrell, Kansas Department of Wildlife and Parks • Zebra Mussels, Zebra Mussels on a Beer Can, Zebra Mussels on a Native Mussel, Bait Bucket, Quagga Mussels, Zebra/Quagga Mussel Distribution January 2009 by David Britton, U.S. Fish & Wildlife Service • Zebra Mussels in a Cut-Away Pipe by Don Schlosser, Great Lakes Science Center • Zebra Mussels in a Pipe by Craig Czamecki, Michigan Sea Grant • Quagga Mussels Encrusting a Boat Motor by Matt Watson, The University of Texas at Arlington • The distribution map is based on data compiled by the U.S. Geological Survey's Nonindigenous Aquatic Species Program (<http://nas.er.usgs.gov>).

100th Meridian Initiative



Please report any sighting by calling our National Hotline:

1-877-STOP-ANS

1-877-786-7267



Invasive Mussels: Expensive Damage!

When zebra and/or quagga mussels invade our local waters they clog power-plant and public-water intakes and pipes. Routine treatment is necessary and very expensive. This leads to increased utility bills. If you use water and electricity, you do not want these mussels.



Zebra mussels in a cut-away pipe



Zebra mussels blocking a pipe

Zebra/Quagga Mussels May Use Your Boat to Invade Additional Waters!

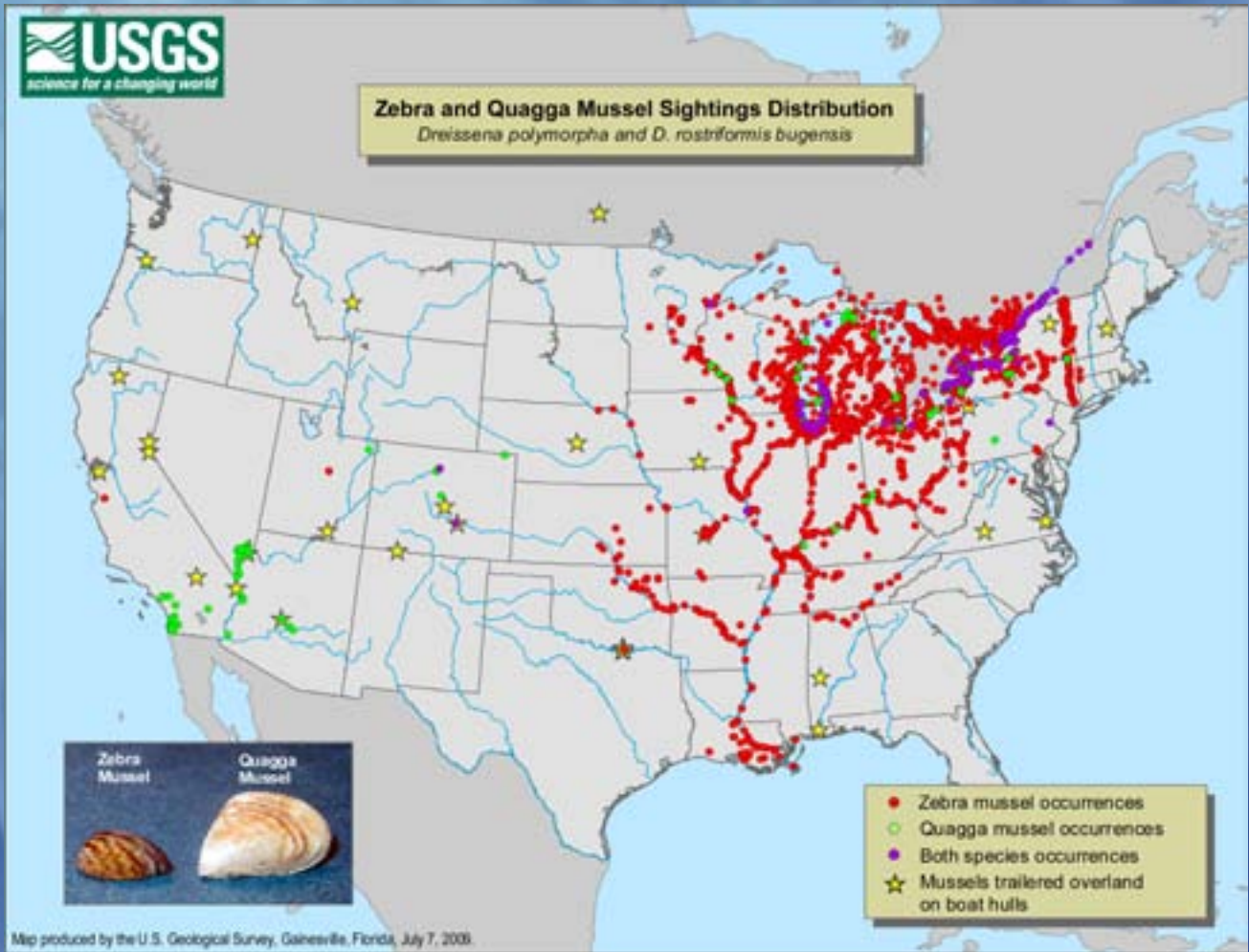
Once a boat has been in infested waters, it could carry invasive mussels. These mussels can spread to new habitats on boats trailered by commercial haulers or the public. Zebra and quagga mussels attach to boats and aquatic plants carried by boats. These mussels also commonly attach to bait buckets and other aquatic recreational equipment. An adult female zebra mussel can release up to a million eggs in a year. Please take precautions outlined in this brochure to help reduce the chance that zebra or quagga mussels will spread from your boat or equipment to uninfested areas.



Before zebra mussels



After zebra mussels



Zebra/Quagga Mussels Harm Native Aquatic Life



Zebra mussels on a crayfish

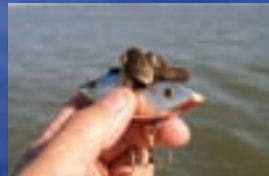


Zebra mussels on a native mussel

Zebra/Quagga Mussels Encrust Any Hard Surface



Zebra mussels on a beer can



Zebra mussels on a fishing lure

Zebra Mussels / Quagga Mussels

What are they?

Both are closely related, invasive, freshwater bivalve (mollusk) species that encrust hard surfaces.

Where do they come from?

These species came from the Black and Caspian Sea Drainages in Eurasia.

What size are they?

Larvae are microscopic and adults may be up to two inches long. They are usually found in clusters.

Why “Zebra” mussels?

Both species are sometimes referred to as “zebra” mussels because they both have light and dark alternating stripes. Quagga mussels are actually a distinct (but similar) species named after an extinct animal related to zebras.

STOP

The Invasion



Photo courtesy of Robyn Draheim, Portland State University

New Zealand Mud Snail

Potamopyrgus antipodarum

Report Sightings

1-877-9-INFEST
InvasiveSpecies.wa.gov



Photo courtesy of U.S. Geological Survey

What is it?

New Zealand mud snails are tiny (less than 6 mm) aquatic snails that are adaptable to diverse climates and environmental conditions. They are found in freshwater and brackish environments.

Is it here yet?

Yes. New Zealand mud snails were first discovered in the lower Columbia River in 2002 and, on November 16, 2009, in Olympia's Capitol Lake. The only other known locations are in the lower Columbia River and on the Long Beach peninsula.

Why should I care?

New Zealand mud snails are considered a high invasive threat to freshwater and brackish water environments. They can dominate river and lakebed habitat by achieving densities of more than 100,000 per square meter. They out-compete native aquatic snails and insects that other species depend on for food. Disruption of the food chain can lead to reduced growth rates and lower populations of fish.

How can we stop it?

Clean, drain, and dry any watercraft after use—this prevents hitchhiking of any aquatic invasive species, including fish and shellfish diseases. Thoroughly brush off any debris from waders, boots, and equipment that came in contact with stream or lake water, then wash the gear in hot water (140°F), or freeze the gear overnight.

What should I do if I find a New Zealand mud snail?

Call: 1-888-WDFW-AIS, 1-877-9-INFEST, or report online at www.invasivespecies.wa.gov



New Zealand Mud Snail Characteristics

- New Zealand mud snails have five or six whorls and generally are light to dark brown, but can appear black in color, especially when wet.
- Adults are 4 to 6 mm in length.
- Generally self-reproducing by cloning — a single snail can rapidly reproduce and colonize a new area.
- The opening of the shell has a movable cover called the operculum, that allows the snail to seal itself inside, which protects it from short-term exposure to chemicals. It can survive out of water for weeks in damp, cool conditions, and it can pass-through the digestive tracts of fish and birds unharmed.
- It can tolerate a wide range of habitats, including brackish water, and many different substrates such as rock, gravel, sand, and mud.
- It is a nighttime grazer, feeding on plant and animal detritus, algae, sediments, and diatoms.

New Zealand Mud Snails may be Confused with

- Several species of native freshwater and estuarine snails because of their small size. A powerful magnifying loop or microscope may be needed to positively identify them.

For More Information

<http://wdfw.wa.gov/fish/ans/index.htm>

<http://www.esg.montana.edu/aim/mollusca/nzms/>

<http://www.clr.pdx.edu/projects/ans/nzms.php>

<http://www.anstaskforce.gov/spoc/nzms.php>

http://www.protectyourwaters.net/hitchhikers/mollusks_new_zealand_mudsnail.php

<http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=1008>

Report Sightings

1-877-9-INFEST
InvasiveSpecies.wa.gov



Design by Stefania M. Padalino.

Cover photos: top three photos by D. L. Gustafson; bottom two photos by Jane and Michael Liu.

ORESU-G-10-001

IF YOU FIND MUDSNAILS

If you suspect you have found mudsnails, collect 5 to 10 individuals and place them in a plastic bag into which you have sprinkled water. Check against the simple traits above and on this Web page to confirm identification: <http://www.esg.montana.edu/aim/mollusca/nzms>

Please save the samples and contact the Oregon Invasive Species Council (1-866-INVADER or online at oregoninvasiveshotline.org) and one of these specialists:

Sam Chan and Tania Siemens
Oregon State University
Oregon Sea Grant Extension
samuel.chan@oregonstate.edu

Robyn Draheim
Center for Lakes and Reservoirs
Portland State University
draheim@pdx.edu

Paul Heimowitz
U.S. Fish and Wildlife Service
Paul_Heimowitz@fws.gov

Cynthia Tait
USDA Forest Service
ctait@fs.fed.gov

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PNW Research Station
USDA Forest Service
johnsons@fsl.orst.edu

NEW ZEALAND MUDSNAILS



HOW TO PREVENT THE SPREAD OF NEW ZEALAND MUDSNAILS THROUGH FIELD GEAR



This brochure is a guide for field detection and for treating field gear to prevent the spread of New Zealand mudsnails. It is intended for researchers, monitoring crews, watershed survey groups, and anyone else who travels frequently between aquatic or riparian locations.

*Second Edition
February 2010*

To order copies of this brochure, call 541-737-4849 or e-mail Oregon Sea Grant, sea.grant.communications@oregonstate.edu. You can also download a pdf at <http://seagrants.oregonstate.edu/sppubs/onlinepubs.html>





Devils Lake, Oregon, is heavily infested with New Zealand mudsnails. Prevent the spread of New Zealand mudsnails by cleaning gear and boats and not moving water from infested waters into new bodies of water. (Photo by Jane and Michael Liu.)

INTRODUCTION

The New Zealand mudsnail (*Potamopyrgus antipodarum*) is an introduced aquatic species that has invaded estuaries, lakes, rivers, and streams in Washington, Oregon, California, and many other states in the western U.S. It was first noted in the Snake River and has since spread throughout the West.

The small size (< 5 mm), cryptic coloration, and ability to survive out of water for weeks make the New Zealand mudsnail an ideal hitchhiker.



Snails can be inadvertently transported in bootlaces (center—note different color). (Photo by Jane and Michael Liu.)

Range expansion of the mudsnail has been unwittingly hastened by anglers, hunters, and field personnel—in other words, people who frequently move between streams and lakes in watersheds, hauling wet waders, nets, and other gear with them. Once the mudsnail is established in a new habitat, it is impossible to eradicate it without damaging other components of the ecosystem. Thus, inspecting, removing, and treating gear before moving to a new water body is the most effective means of preventing the spread of mudsnails.



The New Zealand mudsnail is often less than 5 mm long. (Photo by Jane and Michael Liu.)

IDENTIFYING THE NEW ZEALAND MUDSNAIL



Size: A mature snail is usually less than 5 mm (.2 in) long. (Photo by Jane and Michael Liu.)



Shape: Shell is elongated and dextral (its whorls or spirals lean toward the right). Snail typically has between 5 to 6 whorls on its shell. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)

1 whorl



Color: Most snails have a light- to dark-brown shell that may appear to be black when wet. (Photo by Jane and Michael Liu.)



Embryos: Upon dissection, mature snails will have brooded embryos. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)



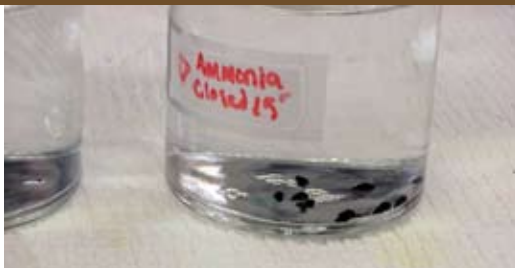
Operculum: The mudsnail operculum (a rounded plate that seals the mouth of the shell when the animal's body is inside) can be seen on live snails but is not easily visible on dead or preserved snails. (Photo by D. L. Gustafson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)

chloride [DDAC]). Formula 409® Cleaner Degreaser Disinfectant has been proven effective for killing mudsnails at 50% dilution.

■ The compounds Quat 128® and Sparquat 256® are commercial disinfectants with an active ingredient (QAC) similar to that of Formula 409® Cleaner Degreaser Disinfectant, which has proven effective for killing mudsnails and other aquatic invasive species (see the table on the foldout page for dilution rates).

■ Many household bath and kitchen disinfectants contain quaternary ammonium compounds (check the label for active ingredients containing alkyl dimethyl benzylammonium chloride [ADBAC]; diacyl dimethyl ammonium chloride [DDAC]).

These and other chemical treatments are constantly being evaluated and are updated online at seagrant.oregonstate.edu/themes/invasives/



This test chamber contains a New Zealand mudsnail with chemical test solution. (Photo by Robert Hosea.)

CAUTION

Treating field gear with chemical methods may result in unintended contamination of the environment. In particular, extreme caution must be taken to avoid contamination of waterways and wetlands. DO NOT rinse your treated gear in a water body.

Treating rubber gear or boots with Formula 409® and other disinfectants with QACs may result in surface cracking of the rubber and loss of water repellency. Chemical methods are not always effective in killing mudsnails. Always scrub your gear and consider using physical methods before resorting to chemical methods. For more information on the testing of chemical treatment methodology, see R. C. Hosea, and B. Finlayson, 2005, *Controlling the Spread of New Zealand Mud Snails on Wading Gear*, Administrative Report 2005-02, Rancho Cordova, California: Resources Agency, California Department of Fish and Game.

THE MUDSNAIL PROBLEM

The New Zealand mudsnail is a threat to our waters. By competing with native invertebrates for food and habitat, it has a detrimental impact on fish populations, vegetation, and other native biota.

Mudsnails can tolerate a wide range of habitats, including brackish water, and are found living in high densities (often over 400,000 snails/sq meter) on many different substrates (rock, gravel, sand, mud, vegetation, and even the shells of other organisms).



Mudsnails can attach to the seam of a stream boot. Unintentional transport from one stream location to another by hitchhiking on waders or wading boots is one of the primary vectors for spreading New Zealand mudsnails. (Photo by Jane and Michael Liu.)

The biology, ecology, and distribution rate of the mudsnail suggest that many habitats are suitable for further expansion.

Mudsnail populations in the West are self-reproducing brooders; they clone themselves and retain the embryos inside their shell until they are large enough to release. Also known as parthenogenesis, this reproductive technique means that a single mudsnail can rapidly colonize a new location.

Mudsnails are easily transported to new habitats by recreationists and field crews because the snails readily attach to or are wedged into the many cracks, crevices, and crannies presented by waders, boot soles, nets, and buckets. New Zealand mudsnails can live for weeks in damp, cool conditions; can easily survive on field gear for long periods of time; and can be transferred to a new environment when that gear is reused.



1995

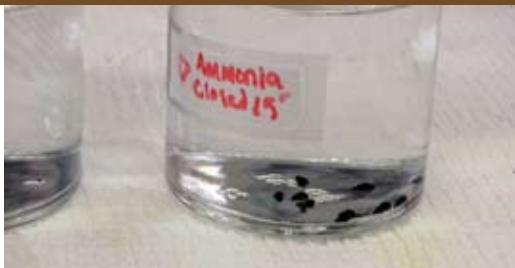


2001



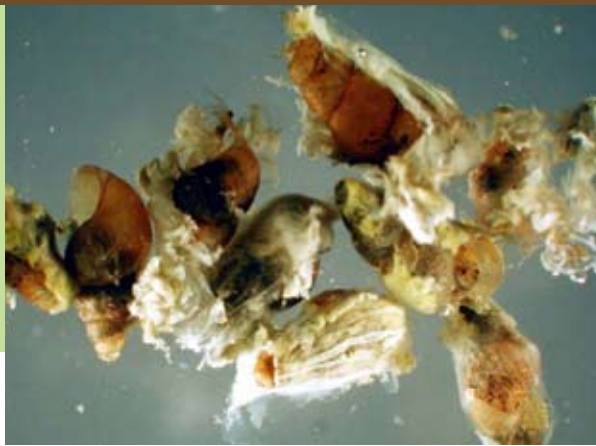
2009

These maps show the spread of the New Zealand mudsnail from 1995 to 2009 in the western U.S. New Zealand mudsnails have recently been found in parts of the Great Lakes region. (Maps courtesy of Amy Benson, U.S. Geological Survey.)



Fishing docks and boats are potential conduits for spreading the New Zealand mudsnail. (Photo by Jane and Michael Liu.)

Mudsnails can pass through the intestinal tract of a fish. Almost half the mudsnails survived this trip. (Photo by M. Vinson, <http://www.esg.montana.edu/aim/mollusca/nzms>.)



PREVENTION

To prevent the survival of mudsnails on field clothing and equipment, you will need first to clean your field gear and then to treat it, using either the physical or chemical methods listed below. We recommend the following steps:

- 1** If possible, keep several changes of field gear for use in different bodies of water.
 - 2** **Clean** all gear before leaving a site, scrubbing with a stiff-bristled scrub brush and rinsing with water, preferably high-pressure. This is often the simplest and most effective for prevention.
 - 3** **Inspect** gear before it is packed for transport. Visible traces of sand, mud, gravel, and plant fragments are signs that gear has not been properly cleaned and mudsnails may have been retained.
 - 4** **Select** a treatment method in addition to scrubbing and rinsing if mudsnails are present or suspected to be present.
- **Freezing, hot water, or drying treatments** are recommended over chemical treatments because they are usually less expensive, more environmentally sound, and possibly less destructive to gear. However, most physical methods require longer treatment times and often cannot be performed in the field.
 - **Chemical treatments** require a 10-minute soak in a special solution (see “CHEMICAL,” page 5). After chemical treatment, gear must be rinsed thoroughly with tap water away from all bodies of water, and all soak solutions and rinse water must be properly disposed of.

PHYSICAL

These methods for cleaning gear are effective as well as environmentally sound. Use *one* of the following methods:

- Freeze your gear for a minimum of 4 hours to kill all mudsnails. Freezer temperatures should be at 26°F (-3°C) or below.
- Soak gear in a bath of hot water (at least 120°F, 46°C) for 10 minutes. This method is not advised for Gortex.
- Dry your gear before reuse. A drying time of at least 48 hours under low humidity is recommended to remove all pockets of dampness. Gear must be completely dry for a minimum of 24 hours. Check to ensure that boots are totally dry.

CHEMICAL

Common disinfecting cleaners containing quaternary ammonium compounds (e.g., alkyl dimethyl benzylammonium chloride [ADBAC]; diethyl dimethyl ammonium chloride [DDAC]) are effective for decontaminating gear. Disinfectants listed below will kill other aquatic invasive species but may not result in 100% mortality (see table on foldout page).

Gear should be soaked in *one* of the following solutions for 5 minutes and then rinsed thoroughly with tap water, away from the water body. Store and dispose of solution and used rinse water properly.

- Commercial disinfectant solutions containing quaternary ammonium compounds (QAC) (e.g., Formula 409® Cleaner Degreaser Disinfectant, alkyl dimethyl benzylammonium chloride [ADBAC]; diethyl dimethyl ammonium



The toe of this rubber wader boot has cracked after being exposed to repeated applications of benzethonium chloride. (Photo by Robert Hosea.)

A worker filters the cleaning solution after removing wading gear. (Photo by Robert Hosea.)

MUDSNAIL LOOK-ALIKES

Several freshwater snails native to the Pacific northwest are commonly misidentified as New Zealand mudsnails (*Potamopyrgus antipodarum*) (see Figure 1). “Pebblesnails” (*Fluminicola*) can be distinguished by its more-rounded, globose-shaped shell (vs. the conical New Zealand mudsnail) and a bottom whorl that is proportionally larger than its upper whorls (as compared to the New Zealand mudsnail, which tends to have more-uniform whorls). Air-breathing “pond” snails (*Lymnaeidae*) can also be very small, like New Zealand mudsnails, but they lack an operculum. “Rock” snails (*Juga sp.*) can be as small as New Zealand mudsnails when juveniles, but they grow to be much larger (up to 2.5 cm; New Zealand mudsnails are no larger than 6 mm). When small, *Juga plicifera* can be distinguished by its grooved whorls; however, other species of *Juga* such as *Juga silicula* can have smooth whorls similar to the New Zealand mudsnail.

In estuaries, New Zealand mudsnail habitat overlaps with another nonnative invasive snail, *Assiminea parisitologica*, which is an intermediate host to the human lung fluke parasite, first discovered in Coos Bay, Oregon, in 2007. *Assiminea parisitologica*, native to Japan, occurs more frequently in higher saline to brackish waters, while the New Zealand mudsnail, native to New Zealand, occurs in brackish to freshwater environments. *Assiminea parisitologica* can be distinguished by its globose shape, larger bottom whorl, and a white tip (see Figure 2). *Assiminea parisitologica* is also a high-alert invasive species that should be reported. Remember: report any species you suspect could be invasive. It is better to have a suspected report than to miss a new infestation!



Figure 1. Comparison of the New Zealand mudsnail (*Potamopyrgus antipodarum*) with three freshwater snails native to the Pacific Northwest. From left to right: New Zealand mudsnail, a pond snail (Family Lymnaeidae), two pebblesnails (*Fluminicola* sp.), and two rock snails (*Juga plicifera*).



Figure 2. Comparison of the New Zealand mud snail (three snails on right) with *Assiminea parisitologica* (three snails on left). Both invasive snails might be found together in brackish-water estuaries.

Aquatic Invasive Species of Concern, and Current Methods for Disinfection of Gear and Equipment

(Adapted from USDA Forest Service Region 4 Guidelines for disinfecting fire equipment, summarized by Cynthia Tait: http://www.fs.fed.us/r4/resources/aquatic/guidelines/aq_invasives_interim_fire_guidance08_final.pdf)

NOTE: A more complete—and continuously updated—table is available online at seagrant.oregonstate.edu/themes/invasives/

Decontam. Method	Whirling Disease	New Zealand Mudsnails	Chytrid Fungus	Zebra/Quagga Mussels	Didymo	Eurasian Watermilfoil
Hot water or freezing	90°C (195°F); 10 minutes	46°C (120°F); minimum of 5 minutes -3°C (27°F); > 4 hours	60°C (140°F); minimum of 5 minutes	≥ 60°C (140°F) water for minimum of 1 minute. Freezing may be effective, but not tested	60°C (140°F); 1 minute	No data, but likely effective
Drying	Be dry for 24 hours, in sunlight best	Be dry for 48 hours, in sunlight best	Be dry for 3 hours, in sunlight best	3–5 days, in sunlight best	Be dry for 48 hours, in sunlight best	No data, but likely effective
Bleach (e.g., Clorox® or equivalent bleach product) 6% sodium hypochlorite (NaClO)	For 10 minutes: 1% bleach solution (500 ppm NaClO) • 1.1 liquid oz bleach per gallon water • 2.2 Tbsp liquid bleach per gallon water • 0.9 gallons each per 100 gallons water	Not effective at the necessary concentrations without risk of damaging gear and equipment	For 10 minutes: 7% bleach solution (0.4% NaClO) (>3,500 ppm NaClO) • 9 liquid oz bleach per gallon water • 7 gallons bleach per 100 gallons water	Gear rinsed with 0.5% bleach solution (250 ppm NaClO) • 0.6 liquid oz bleach per gallon water • 1.1 Tbsp liquid oz bleach per gallon water • 0.5 gallons bleach per 100 gallons water	For 1 minute: 2% bleach solution (800 ppm NaClO) • 1.8 liquid oz bleach per gallon water • 3.6 Tbsp liquid Clorox per gallon water • 1.4 gallons Clorox per 100 gallons water	No data, but likely effective
Quaternary ammonium compounds (QAC) (e.g., alkyl dimethyl benzylammonium chloride [ADBAC]; dicyl dimethyl ammonium chloride [DDAC])	15-minute exposure 4.4% Quat 128® (1,500 ppm QAC active ingredient) • 6.1 liquid oz. Quat 128 per gallon of water OR 3.1% Sparquat 256® • 4.1 liquid oz. per gallon water	10-minute exposure 4.6% Quat 128 (1,570 ppm QAC active ingredient) • 6.4 liquid oz. Quat 128 per gallon of water OR 3.1% Sparquat 256 • 4.3 liquid oz. per gallon water OR Dilute 1 part Formula 409® Cleaner Degreaser Disinfectant to 1 part water	30-second exposure to 0.015% Quat 128 (5 ppm QAC active ingredient) • 1/8 tsp per gallon water	No published data, but likely effective	No published data, but likely effective	No data