

*The Montana*  
**LAKE**  
**BOOK**

*Actions You Can Take to Protect Your Lake*

**2nd Edition**

# What is the Montana Lake Book?

The Montana Lake Book explains how lakes function, how they are threatened and how they can be protected. It also spells out simple actions you can take to help protect and preserve the lakes of Montana.

Lakes are among our most valued – and most threatened – natural resources. For people, lakes provide recreation and drinking water; for fish and other wildlife, lakes provide habitat. Despite these critical roles, few people understand how their daily actions can threaten our lakes. Even if you live miles from a lake, you live in a watershed that directly affects lake quality, and it is everyone's responsibility to understand how we can protect our lakes and clean water.

Lake protection is an investment in our future and our children's future. Learn how you can make a difference.



*photo courtesy of the University of Montana Flathead Lake Biological Station*

*Yellow Bay on the east shore of Flathead Lake.*

# THE MONTANA LAKE BOOK

## *Actions You Can Take To Protect Your Lake*

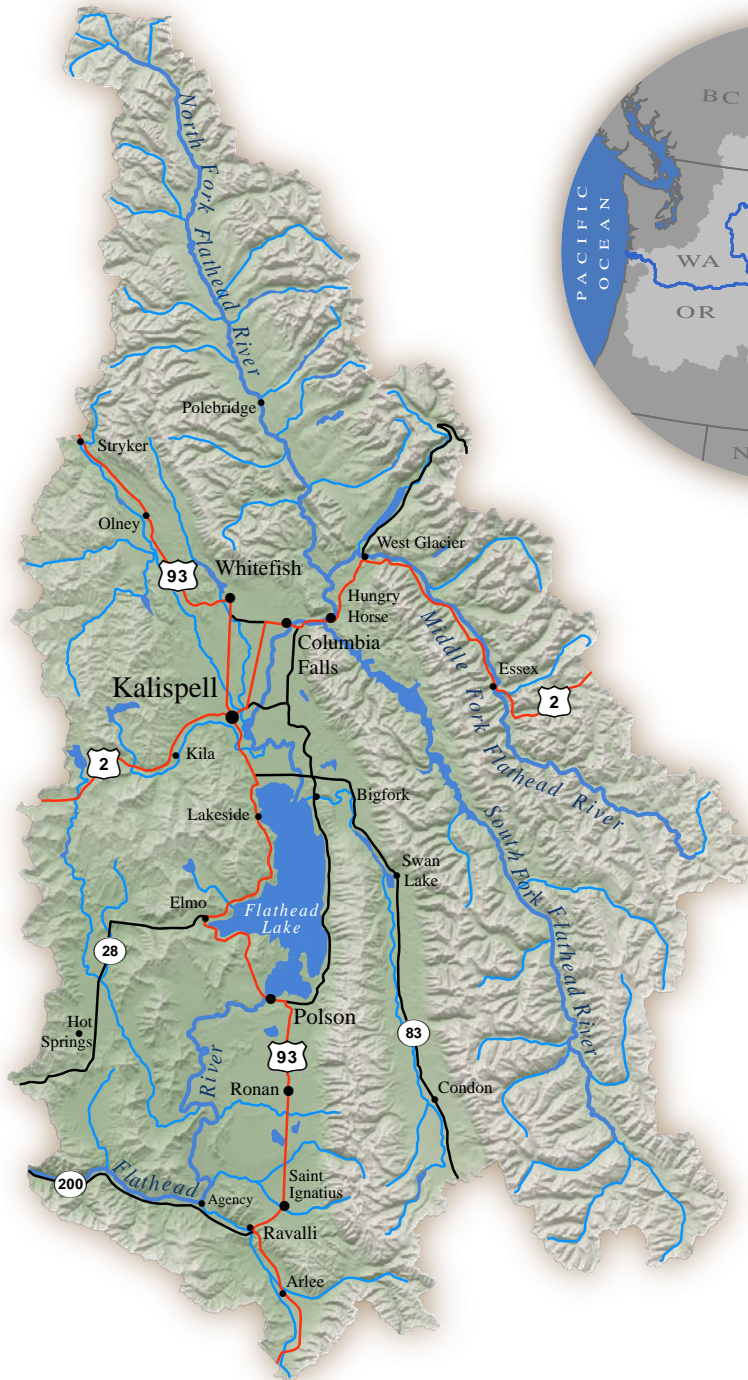
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*“A lake is the landscape’s most beautiful and expressive feature. It is earth’s eye; looking into which the beholder measures the depth of his own nature.”*

*-Henry David Thoreau*

## Flathead Watershed



Flathead Watershed



Columbia River Basin



# Chapter 1: Lake Basics

## What is a Watershed?

A watershed consists of all the land that contributes water to a larger body of water. For example, in Northwest Montana, we have several large rivers and streams that flow into sizeable lakes. In turn, these lakes flow into rivers that eventually make their way to the Pacific Ocean.

To outline a lake watershed boundary, connect the points of highest elevation around a lake on a topographic map. Water falling within these lines flows by gravity into streams and groundwater to the lake.

We all live within the boundaries of a watershed and these boundaries can be quite large, so even

*Lakes play an important role by containing, filtering and evaporating water and by recharging important underground aquifers.*

*...even if you can't see a lake or river from where you are, you are in a watershed.*

if you can't see a lake or river from where you are, you are in a watershed.

Imagine a drop of rainwater landing in your yard, three miles from Flathead Lake. It flows downhill into the roadside ditch where it travels into a culvert under the road and empties into a stream that feeds the lake.

Along the way it picks up phosphorus from lawn fertilizer, motor oil from the road, and sediment from the ditch. All of these things end up in the lake and all of these things contribute to declining water quality.

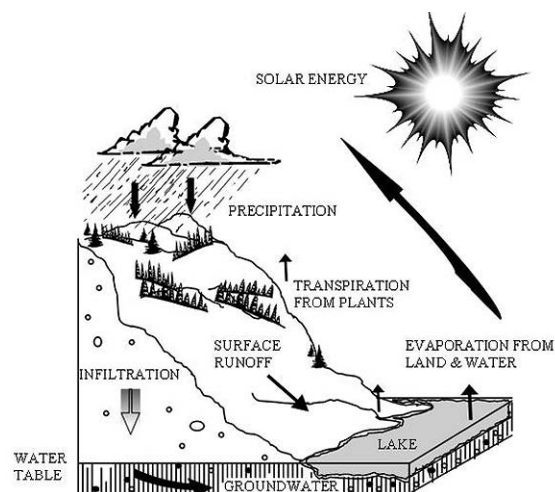
Now imagine what happens when you multiply this one drop by the countless number of raindrops and snowflakes that fall within the Flathead Lake watershed each year.

## The Water Cycle

Lakes are one part of the water cycle. Snowmelt and rainwater flow over the land and fill our lakes, rivers, streams and oceans.

In a natural setting, water from rain and snow is cleansed and filtered by plants and soil. Some water penetrates deep into the ground to become groundwater, eventually discharging into lakes, rivers and oceans. Evaporation starts the cycle all over again.

Lakes play an important role by containing, filtering and evaporating water and by recharging important underground aquifers.



## How Lakes Function



*A photograph of Flathead Lake from space. photo courtesy of NASA*

Lakes are important elements of the landscape for many different reasons. Lakes provide important habitat for wildlife including fish and other aquatic species, many different species of birds, and mammals of all sizes. People enjoy lakes for their beautiful scenery and utilize them for recreational activities such as fishing, hunting, and boating.

Lakes also provide important functions in the landscape. Lakes act as natural regulators of river flow, trapping sediments and nutrients from rivers and streams that flow into them.

Lakes can be divided into two basic layers: deep, open water (pelagic zone) and bottom areas (benthic zone). The deep, open water zone is where we find floating organisms like microscopic

plants and animals, swimming organisms like insect larvae and, most notably, many different fish species.

The bottom areas can be further subdivided into illuminated areas (littoral zone) where green plants are able to grow and dark areas lacking vegetation (profundal zone).

The dark areas are characterized by a lack of photosynthesizing organisms, but that does not imply that there is no life there. Life in this zone is dependent on the contribution of organic carbon from other areas of the lake or surrounding watershed, for example, dead leaves or algae. As this organic material decomposes it uses oxygen, which can deplete oxygen levels in some lakes, disrupting the lake's community of fish and other animals that depend on well-oxygenated water. Increased nutrient inputs

from human activity can also cause greater than normal oxygen declines in this zone of the lake.

Clearly not all lakes are alike. Some lakes are shallow, warm and contain many species of aquatic plants, fish, and other life. Other lakes are deep, with a large volume of cold, well-oxygenated water. These lakes support fewer varieties of plant life and usually provide habitat for trout and salmon.

Lakes of all sizes and depths are found across Montana. The biggest threat to these lakes is deteriorating water quality. Once good water quality is lost, it is extremely difficult and expensive to restore. In many cases, it is impossible to restore.

## Nutrients: The Green Machines

Excess nutrients, such as phosphorus and nitrogen, are a major threat to lake water quality in Montana. These nutrient loads occur naturally in the environment, but their concentrations can increase beyond natural levels due to human activity such as eliminating natural lakeside and streamside vegetation, fertilizing lawns and raising livestock close to lakes and streams. These higher nutrient concentrations can quickly overload lakes and negatively impact the aquatic life.

Nutrients feed microscopic plants called algae. Excessive nutrients accelerate algal growth, which reduces water clarity and can lead to unpleasant odors. As algae die, they fall to the bottom of the lake, decomposing and depleting oxygen levels. Decreased oxygen levels make it difficult for fish and other aquatic animals to survive.

Many seemingly harmless activities added together can cause nutrient overloads. For example, disturbance of the natural landscape during the construction of a new home can increase nutrient concentrations in run-off.

These high concentrations can continue if the surrounding landscape is not returned to its original condition. Nutrient concentrations can

*Excess nutrients, such as phosphorus and nitrogen, are one of the major threats to lake water quality.*

be increased up to 10 times by eliminating natural vegetated buffers that filter and soak up nutrients. Hard surfaces, such as sidewalks, driveways and rooftops, also increase nutrient loads by preventing run-off from soaking into the ground.

The solution is to take action. Some of the ways to take action include protecting or creating buffer strips and using responsible building techniques.



*A sample of toxic blue-green algae from Foy Lake, near Kalispell.*

photo courtesy of Flathead Lake Biological Station

## Checking Lake Water Quality

There are many measures of lake quality, including clarity and suitability for swimming and drinking.

### CLARITY

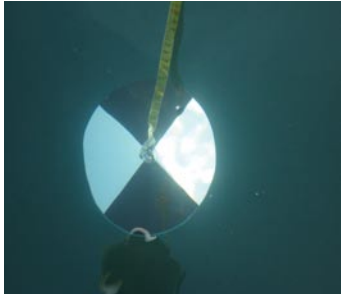
Most people are concerned about how clear and clean the water is, but clarity is not necessarily a measure of purity; many toxic substances are invisible. Clarity, however, does indicate the amount of suspended material in the water such as silt and

algae. Poor clarity may indicate a nutrient overload because excess nutrients promote algal growth and decrease how far light can penetrate into the lake water.

### Checking Water Clarity

One easy way to check water clarity is to use a Secchi disk. Volunteers can be trained to use Secchi disks to monitor their lakes for possible changes in water quality.

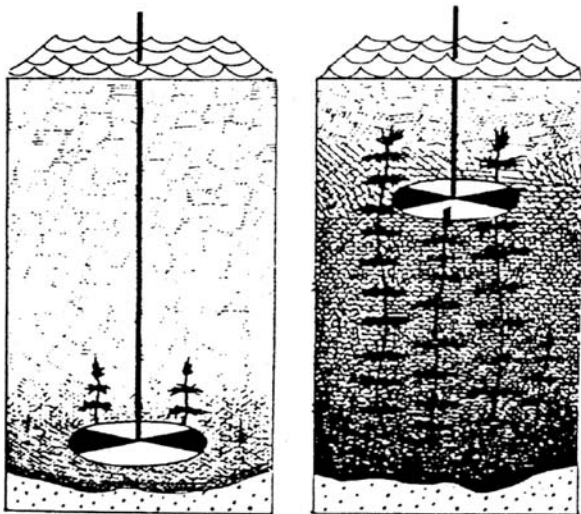
### *Use of the Secchi Disk*



*A Secchi disk that is being lowered into the water.*

By using this remarkably simple instrument, one can determine the general clarity of a lake. The observer lowers the disk down into the water until it is no longer visible. At that point, the depth is recorded. By measuring Secchi disk depths regularly and over a period

of years, historic changes in water quality can be determined and long term trends established.



*Reduced visibility as determined by a Secchi disk may indicate poor water quality.*

### *SUITABILITY FOR SWIMMING*

Lakes are valued for swimming, but under some circumstances swimming may not be desirable or safe. Algal blooms may make swimming undesirable. High fecal coliform bacteria counts at a local beach or in a bay can require temporarily closing an area to swimming. A day or two is usually sufficient to allow nature to lower bacteria counts, unless the source is a poorly maintained septic system or a break in a nearby sewer line.

### *SUITABILITY FOR DRINKING*

Do not drink lake water without disinfecting it. Bacteria, viruses, parasites and toxic algae can cause sickness. Bacteria may naturally occur or come from a malfunctioning septic system or from a sewage treatment plant.

*Do not drink lake water without disinfecting it. Bacteria, viruses, parasites and toxic algae can cause sickness.*

*Father Pietro Secchi, an astrophysicist who was the scientific advisor to the Pope, invented the Secchi Disk. In 1865, Secchi used white disks to measure the clarity of the water in the Mediterranean. Various sizes of disks have been used since that time, but the most frequently used disk is an 8-inch diameter metal disk painted in alternate black and white quadrants.*



## Local Volunteer Water Quality Monitoring Programs

### *Flathead Basin Commission Program*

The Flathead Basin Commission's volunteer water quality monitoring program has been active since 1992 and is the largest of its kind in the inland Pacific Northwest. Over 100 local residents have contributed thousands of hours of their time and effort to monitor water quality on nearly three dozen lakes. What is known about the water quality of many local lakes is based solely on the data produced by these trained citizen volunteers.

The University of Montana's Flathead Lake Biological Station recently analyzed cumulative data recorded by volunteers. The study showed that while many of the monitored lakes are still low in nutrients, the water quality in all of the lakes is changing, making the volunteer efforts even more important.

In 2010, the volunteer monitoring program will begin to monitor for aquatic invasive species.

### *Whitefish to Eureka Lake Program*

In 2008, Montana Fish, Wildlife & Parks and the Whitefish Lake Institute began a partnership to coordinate a volunteer monitoring program on 20 lakes between Whitefish and Eureka. Because little historic data has been gathered from these lakes, volunteers collect valuable information about these resources.

The program trains local volunteers and provides them with equipment to collect baseline water quality information. The program also includes an aquatic invasive species monitoring component to check for unwanted species like zebra mussels and Eurasian Watermilfoil, species that could dramatically alter lake ecology and harm local economies.

*The Flathead Basin Commission's volunteer water quality monitoring program is the largest of its kind in the inland Pacific Northwest.*



*photo courtesy of the Whitefish Lake Institute*

*Volunteer collection of data on local lakes provides valuable information on lake resources.*

## LEARN MORE ABOUT Volunteer Programs

**Flathead County**  
Flathead Basin Commission  
406-752-0081  
[www.flatheadbasincommission.org](http://www.flatheadbasincommission.org)

Whitefish Lake Institute  
406-862-4327  
[www.whitefishlake.org](http://www.whitefishlake.org)

**Lake County**  
Flathead Basin Commission  
406-752-0081  
[www.flatheadbasincommission.org](http://www.flatheadbasincommission.org)

**Lincoln County**  
Montana Fish, Wildlife & Parks  
406-752-5501  
[www.fwp.mt.gov](http://www.fwp.mt.gov)

Whitefish Lake Institute  
406-862-4327  
[www.whitefishlake.org](http://www.whitefishlake.org)

**Other Montana Lakes**  
Montana Watercourse  
406-994-5398  
[www.mtwatercourse.org](http://www.mtwatercourse.org)

LEARN MORE ABOUT

**Local Lake Associations**

Flathead Lakers  
406-883-1346

[www.flatheadlakers.org](http://www.flatheadlakers.org)

Ashley Lake Association  
406-756-5830

Bitterroot Lake Association  
406-755-3964

Rogers Lake Association  
406-257-8952

Lake Mary Ronaners  
406-849-5730

Bull Lake Association  
406-295-2201

Thompson Chain of Lakes  
406-257-5703 or  
406-293-3868

Swan Lakers  
406-837-4511  
[www.swanlakers.com](http://www.swanlakers.com)

Friends of Blanchard Lake  
[www.friendsofblanchardlake.com](http://www.friendsofblanchardlake.com)

Whitefish Lake Institute  
406-862-4327  
[www.whitefishlake.org](http://www.whitefishlake.org)

## Create or Join a Lake Association

Creating a lake association or being a member of one has many benefits for the lake on which you live or recreate.

Some of the benefits are:

- Increased public awareness about your lake, the recreational and ecological benefits it has to offer, and the issues which potentially impact the lake and its habitat;
- Better protection for your lake and its wetlands, wildlife and fish as the association works with elected officials and other non-profit organizations;
- Enforcement of environmental and safety laws;
- Support for legislation that protects your lake and other Montana waters;
- Improvement of your lake's public access sites;
- Improved water quality;
- Prevention of non-native aquatic invasive species,
- Elimination or reduction of pollution in lakes;

Please consider joining your local lake association or creating one if your lake doesn't have one.



*photo courtesy of the Flathead Lakers*

*Dr. Ric Hauer from Flathead Lake Biological Station presents information to the Flathead Lakers during their annual meeting.*

# Chapter 2: Waterfront Living

## Waterfront Property

Living on or near a lake offers many benefits to the homeowner. However, these benefits come with responsibilities and apply to anyone who lives within a lake's watershed.

One of the most important things an individual

can do is to get involved with other concerned citizens. Collective efforts can yield the greatest dividends for you and for the lake.

The following are considerations for everyone developing property within a watershed – especially in areas where there are sensitive lakes.

## Design and Maintain Your Homesite With Care

Where you build your home on your property makes a big difference in protecting water quality. Check with your local planning office to find out about local considerations and codes.

When designing your site, set back all buildings at least 100 feet (or the greatest distance possible) from the high water mark and leave a minimum 100 foot buffer of natural vegetation along the lakeshore or streambank. Paths down to the water should be as narrow as possible and wind gently down to the water so that run-off does not have a direct route to the lake or stream. You should also locate buildings on slopes with less than a 20% grade. There is a greater likelihood of erosion on steeper slopes, causing water to run directly into the lake.



*Where you build your home on your property makes a big difference in protecting water quality. This house is too close to the lakeshore. Set back all buildings at least 100 feet from the shoreline and keep all runoff onsite.*

Create, maintain or restore buffer areas so that they can absorb and filter water from rooftops, driveways and other impermeable surfaces.

### *Keep It Natural*

People value lakes because of their natural and scenic beauty, but no one owns the view. Lakeshore property owners have a responsibility to protect views to and from the lake. Think of yourself as a partner with others; keep your section of the lakeshore as close to its natural state as possible and your neighbors will do the same. At the same time you will protect water quality and wildlife habitat.



*Natural shorelines protect water quality and preserve wildlife habitat.*

### Share the Views

- Minimize your building area.
- Keep the shoreline free from permanent structures like boathouses and gazebos.
- Maintain a scenic shoreline by leaving a vegetated, undisturbed buffer strip.
- If you (or someone before you) removed the native vegetation, plant a new buffer and encourage native vegetation to grow back.
- Place new buildings far from the shore and paint them a dark color that blends with the landscape.
- Avoid bright outdoor lights.
- Limit pruning and clearing trees within 100 feet of the water.

### Vegetated Buffer Strips

Vegetated buffer strips along waterbodies, also called riparian buffers, are areas of native vegetation left undisturbed or replanted with native species, not lawn grass or orchard trees. Properly functioning buffer strips are composed of trees, shrubs and a thick

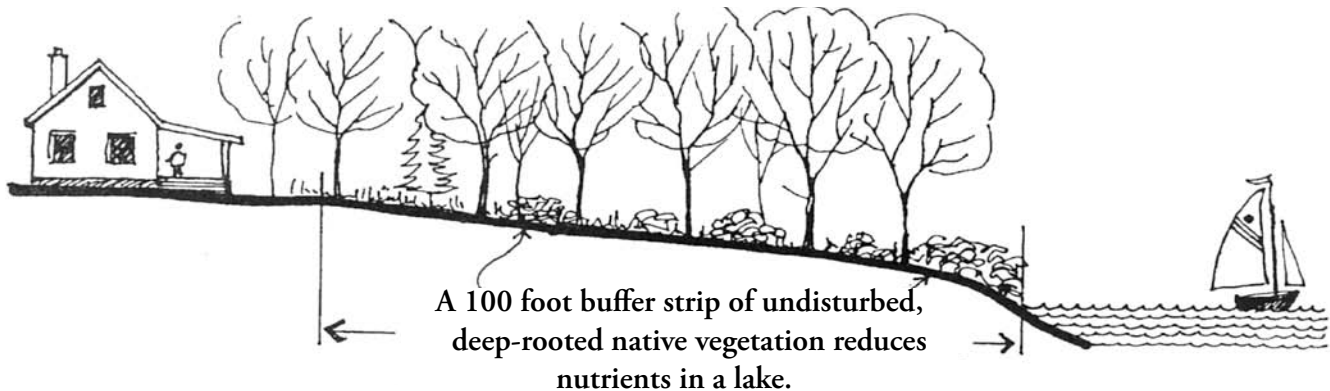
duff layer: pine needles, bark mulch or ground cover.

Buffer strips provide a filter that helps cleanse pollution from run-off coming from our homes, work and recreation areas. The vegetation in the buffer soaks up excess nutrients and absorbs pesticides, herbicides and other pollutants before they reach a lake or stream. If these nutrients reach a water body, they may cause an algal bloom and degrade water quality.

Vegetated buffer strips also help contain sediment that is carried by run-off, another pollutant that can degrade water quality.

### Landscape With Care

- Enjoy the natural beauty and privacy of your site by maintaining large areas of native trees and vegetation. Native plants require less maintenance than other plants and are more likely to survive and provide better wildlife habitat.
- Keep lawns, gardens and other cleared areas small.
- Don't rake leaves or other forest floor debris;



### How to make a buffer

- In areas where native vegetation exists, leave at least 100 feet (or the largest strip possible) of undisturbed vegetation between development and the water body.
- If vegetation has been previously removed, select a variety of native trees, shrubs, grasses and groundcover to replant the area. Use a thick layer of mulch to replace the natural duff layer. Consult your local agriculture extension agent or a native plant professional for a list of species that will work for your area.
- Leave the area as natural as possible, including slope, depressions and other irregularities. Limit hard surfaces such as patios, rooftops and driveways.
- Do not channel runoff. Where possible, direct excess runoff to flat, wet areas of your property. This adds an additional nutrient and sediment filter.

they help trap and filter water and prevent erosion.

- Never use fertilizers in buffer strips and minimize their use in adjacent areas. If you must fertilize apply small amounts over a period of weeks. Never apply fertilizer before or right after a heavy rain or when plants are dormant.
- Choose natural alternatives to herbicides or pesticides for lawns and gardens. These toxins are poisonous and easily carried into a nearby water body.
- Use non-phosphate detergents or plain water when washing vehicles and don't let the rinse water enter a water body.

## LEARN MORE ABOUT Building & Landscaping

Montana Department of  
Environmental Quality  
[www.deq.state.mt.us](http://www.deq.state.mt.us)

Flathead Green Building  
Assoc.  
[www.fbagreen.com/](http://www.fbagreen.com/)

Montana Native Plant Society  
406-387-5527  
[www.mtnativeplants.org](http://www.mtnativeplants.org)

Flathead Conservation District  
406-752-4220  
[www.flatheadcd.org](http://www.flatheadcd.org)

Flathead County Planning  
406-751-8200  
[www.flathead.mt.gov/planning\\_zoning](http://www.flathead.mt.gov/planning_zoning)

Lake County Planning  
Department  
406-883-7235  
[www.lakecounty-mt.org](http://www.lakecounty-mt.org)

Lincoln County Planning  
Department  
406-293-7781  
[www.lincolncountymt.us/planning](http://www.lincolncountymt.us/planning)

## Protect the Natural Shoreline



*Replacing native shrubs with manicured grass reduces bank strength and can cause increased erosion.*

**A** general rule of thumb is that **no beach is a good beach** – unless it was formed naturally over time.

Sand and rocks dumped unnaturally are pollutants that will eventually wash away, requiring continual re-supply. They can also contain nutrients and destroy critical bird, amphibian and fish habitat.

- Leave existing rocks and aquatic plants to break the waves from boats and wind. These prevent erosion and stabilize the shoreline.
- Use temporary docks that are put in and removed seasonally. Don't build a permanent dock as these

structures can disturb bottom habitat, alter wave patterns and cause erosion.

- Use the best products available. Avoid using creosote or pressure treated wood and white Styrofoam. New plastic and vinyl products offer good alternatives.
- Use a public beach, boat launch or marina for access to the lake. By concentrating recreational uses in one area, you protect the shoreline habitat elsewhere.
- If you must build along the shore, remember that any alterations to the shoreline require a permit. Tribal lands may require a separate permitting process. Check with your local planning and building department to determine what kind of permit you need.
- **Seawalls and rip-rap: *Just Say No.*** These changes to the shoreline increase wave energy in the lake and erode adjacent properties. They also change natural currents, alter beach dynamics and impact shallow water habitat that is important for invertebrates, fish and many other species of wildlife.

## LEARN MORE ABOUT Septic Systems

Flathead County Environmental  
Health Department  
406-758-5760  
[www.flatheadhealth.org/envhealth](http://www.flatheadhealth.org/envhealth)

Whitefish County Water District  
406-863-4901

Lake County Environmental Health  
Department  
406-883-7236  
[www.lakcecounty-mt.org/envhealth](http://www.lakcecounty-mt.org/envhealth)

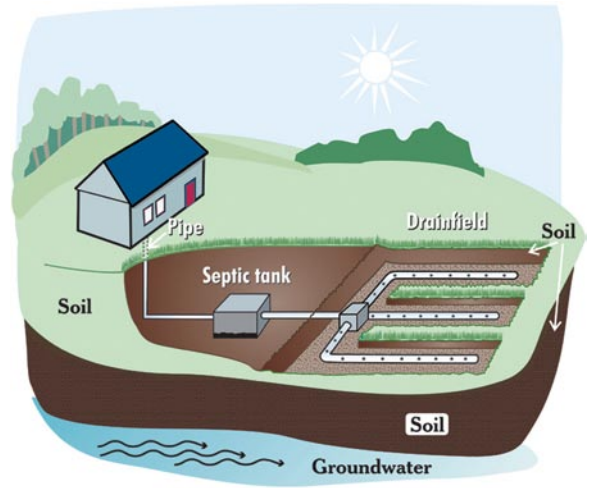
Lincoln County Health Department  
406-293-7781  
[www.lincolncountymt.us/  
environmentalhealth](http://www.lincolncountymt.us/environmentalhealth)

Confederated Salish & Kootenai  
Tribes  
406-675-2700  
[www.cskt.org](http://www.cskt.org)

U.S. Environmental  
Protection Agency  
[www.epa.gov/owm/septic](http://www.epa.gov/owm/septic)

## Understand Your Septic System

A septic system relies on a tank to collect household waste and a leach field to filter pollutants and wastewater. The system relies on natural microorganisms to consume much of the waste. A well-designed, constructed and maintained septic system minimizes contamination of water supplies. If the tank is too full or the microorganisms are dead, solids will overflow into the leach field and clog the system.



Even a well maintained septic system can contaminate ground or surface water over time, so consider hooking up to a sewer system whenever possible.

### *Installing, maintaining and checking your septic system*

#### *Installing*

- Install a properly designed and approved septic system located as far as possible from water, at least 100 feet.

#### *Maintaining*

- Clean your effluent filter at least every year.
- Avoid using chemicals that kill microorganisms.

#### *Checking*

- Check the sludge level in your septic tank every year and pump it every 3-5 years depending on use. If solids are not removed, they will wash into and clog the leach field.
- When checking the sludge level,

also look at the tank to be sure the concrete is in good condition. A tank may last indefinitely, but if you see signs of cracking or chipping, check with your county sanitarian.

- Organize neighborhood septic tank pumping. Pumpers usually reduce the price for large volume jobs.
- Conserve water. The less water you use, the better your septic system will work. Also give the system a rest after heavy use.

*The less water you use, the better your septic will work. Also give the system a rest after heavy use.*

### *Know What to Flush*

There are a number of steps you can take to ensure that your septic system does not contaminate your lake, river or stream.

- Use non-phosphate detergents and soaps; some areas ban them altogether. Be sure to check product labels. Phosphate detergents can double the amount of phosphorus entering a septic system. Leach fields can only treat a finite amount of phosphorus. Reducing the amount of phosphorus prolongs the life and efficiency of a septic system.
- DON'T use commercial products that claim to clean your septic tank without pumping. These products

can clog your leach field and many contain chemicals that can contaminate groundwater.

- DON'T flush expired or unwanted pharmaceuticals down the toilet. Pharmaceuticals often leach into groundwater, and cause contamination of drinking water.
- Both Flathead and Lake Counties have a pharmaceutical and personal care product (PPCP) disposal program.

*Pharmaceuticals often leach into groundwater, and cause contamination of drinking water.*

## **Use and Dispose of Hazardous Materials Responsibly**

- Take advantage of your local landfill's hazardous material collection day. Check with your county to find out when the next collection day is scheduled.
- Reduce your use of toxic materials by replacing them with less hazardous products available at most home improvement stores.
- Store hazardous materials in contained, safe areas. Containment prevents contamination of water supplies and lake water from undetected leaks.
- Dispose of paint thinners and other chemical products responsibly. Check the labels for proper disposal instructions. Do not pour them down the drain where they can damage water treatment systems, destroy septic systems and contaminate ground and surface waters.
- Allow latex paint to air dry in a well-ventilated place until it hardens, then put it in your garbage. This will help prevent toxic wastes from leaking into a landfill and eventually the groundwater.
- Allow used paint thinner and solvents to settle, then pour off the clear liquid and reuse. Air dry the sludge and put it in the garbage.
- Take used motor oils and petroleum products to a recycling or service station. These products and other toxic materials can usually be recycled. Never dispose of these products in drains or on driveways or roads.

### **LEARN MORE ABOUT Disposing of Hazardous Materials**

Flathead County Landfill  
406-758-5910  
[www.flathead.mt.gov/waste](http://www.flathead.mt.gov/waste)

Citizens for a Better Flathead  
Waste Not Project  
406-756-8993  
[www.wastenotproject.org](http://www.wastenotproject.org)

Lake County Solid Waste Program/  
Environmental Health Dept.  
406-883-7236

### *Chemical Cocktails*

In the United States, pharmacists fill over three billion prescriptions a year. In addition to this, undocumented amounts of over-the-counter medications are purchased by consumers.

The potential transport of these contaminants into our water bodies, along with the potential public health risk from exposure to these chemicals, warrants our attention.

Recent studies in Montana and the U.S. have found prescription and over-the-counter pharmaceuticals in rivers, groundwater and municipal drinking water supplies. Unfortunately, septic systems, wastewater treatment plants and drinking water treatment facilities are not designed to treat these contaminants.

The federal government does not have a national policy on pharmaceutical disposal. The most current advice for pharmaceutical disposal is to mix the contents with kitty litter or coffee grounds, seal them in a container and dispose of them with your trash.

A 2008 Montana Water Center Newsletter reported that a joint study between the Montana Bureau of Mines & Geology and

the Montana Department of Environmental Quality surveyed ground water beneath the Helena Valley on two occasions in 2005. They tested 35 domestic water supplies, and found

22 compounds classified as “pharmaceuticals or personal-care products.” These included antibiotics, pain-killers, anti-inflammatory and seizure-control drugs, anti-depressants, estrogens and androgens, caffeine, plasticizers, insect repellent and an herbicide.



*Recent studies in Montana and the U.S. have found prescription and over-the-counter pharmaceuticals in rivers, groundwater and municipal drinking water supplies.*





# Chapter 3: Working in a Watershed

## Farming, Fertilizers and Phosphorus

In many lake watersheds, agriculture is a significant source of nutrient pollution. Large expanses of bare or freshly tilled soil are prone to erosion. Commercial fertilizers, if not carefully stored and applied, can also end up fertilizing the lake. There are actions you can take to protect lake quality and increase crop productivity.

- Plant winter cover crops, if needed, to reduce erosion. The roots stabilize soil during run-off and take up nutrients.
- Maintain or create riparian buffer strips of dense native vegetation at least 100 feet in width along all streams, rivers and lakes.
- Leave a filter strip of rough grass between the riparian area and crops.
- Strip crop and contour plow where appropriate to reduce the potential for erosion; these practices break up large expanses of tilled soil and slow the flow of run-off.
- Minimize use of chemical pesticides and herbicides. Use the least toxic options available to prevent polluting water.
- Apply proper amounts of fertilizer only during the growing season when it can be used by plants. More is not better!
- Store and apply commercial fertilizers carefully, according to recommendations.
- Use Best Management Practices (BMPs). Consult your county extension agent, Conservation District or Natural Resource Conservation Service (NRCS) representative for more information.



*Livestock should not be allowed to trample lakeshores or streambanks.*

## Cattle & Critters

Livestock allowed unrestricted access to water bodies can cause erosion by consuming bank-stabilizing vegetation and trampling stream banks and lake shores. Manure in and near streams and lakes can also contaminate the water. Here are some options:

- Install a fence to keep animals from unrestricted access to water and riparian vegetation.
- Install a water gap or off-source watering device such as a nose pump to provide drinking water.
- Lure livestock away from water by placing salt blocks far from the water.
- Store manure in properly designed pits or stacking sites to reduce nutrient rich run-off that can contaminate groundwater and lakes.

*Large expanses of bare or freshly tilled soil are prone to erosion.*

## LEARN MORE ABOUT

### Agricultural Practices

Flathead Conservation District  
406-752-4220  
[www.flatheadcd.org](http://www.flatheadcd.org)

Lake County Conservation District  
406-676-2842  
[www.lakecounty-mt.org](http://www.lakecounty-mt.org)

Lincoln County Conservation District  
406-293-7781  
[www.lincolncd.org](http://www.lincolncd.org)

### Timber Harvest

Montana Dept of Natural Resources and Conservation  
406-752-7994  
[www.dnrc.mt.gov](http://www.dnrc.mt.gov)

Natural Resources Conservation Service (NRCS)  
[www.nrcs.usda.gov](http://www.nrcs.usda.gov)

Montana Logging Association  
406-752-3168  
[www.logging.org](http://www.logging.org)

MSU Extension, Forestry  
406-243-2773  
[www.cfc.umt.edu/extensionforestry/](http://www.cfc.umt.edu/extensionforestry/)

### Weed Control

Flathead County Weed Department  
406-758-5798  
[www.flathead.mt.gov/weeds](http://www.flathead.mt.gov/weeds)

Lake County Weed Department  
406-883-7330  
[www.lakecountyweeddistrict.org](http://www.lakecountyweeddistrict.org)

Lincoln County Weed Department  
406-293-7781  
[www.lincolncountymt.us/weeds](http://www.lincolncountymt.us/weeds)

Montana Noxious Weeds Program  
406-444-3140  
<http://agr.mt.gov/weedpest/>

- If you must graze livestock in a riparian area, follow a well developed, site specific management plan that limits time of year and duration of grazing.
- Take an active role in management by checking the condition of fences and vegetation at least once a year.

## Forestry and Timber Harvest

Poorly managed forestry operations can be a significant source of sedimentation and subsequent phosphorus pollution. Timber harvesting operations can be a problem when logging roads, stream crossings, skid trails and log landings are improperly built and used.

### *Avoid Erosion on Logging Jobs*

- Consult with Montana Department of Natural Resources and Conservation personnel before you plan your timber harvest. They can provide information about professional logging contractors, forestry consultants and information on streamside management zone (SMZ) laws.
- Use Forestry Best Management Practices

*Avoid removing tree cover along stream banks and lakeshores, this can increase runoff and erosion.*

(BMPs) to prevent erosion during and after timber harvest and road construction operations. Contact your local planning department or Montana's DNRC for BMPs.

- Follow the stream management zone (SMZ) law requirements to help filter run-off. Buffer strips wider than the minimum may be necessary to adequately protect streams and lakes.
- Check with your local conservation district to find out if you need a permit for crossing streams or wetlands on your property. Not all activities require permits and some crossings are permitted without review. Both the landowner and contractor may be legally responsible for obtaining permits.
- Avoid working in wet areas and during wet weather. The soil's ability to hold and filter water can be damaged by heavy equipment.
- Logging equipment can spread noxious weeds and should be washed before the timber harvest and when the job is completed.
- To reduce erosion and combat the spread of noxious weeds, replant bare disturbed soil with grasses that promote existing vegetation or native trees and shrubs.

## Roads, Driveways & Ditches: Pollution Highways

Paved, dirt or gravel roads, ATV trails, new roads and driveways close to the shore, culverts and roadside ditches – even worn footpaths – are all highways for sediment, nutrients and other pollutants to get to a stream or lake.

Vehicles compact soil, reducing its ability to absorb and retain water. Compacted soil results in increased water flow across the ground, concentrating water and pollutants and increasing soil erosion.

It doesn't take much to start the process. Water from a heavy thunderstorm will concentrate on roads



photo courtesy of Whitefish Lake Institute

*Poor road design can increase sediment loads to local water bodies.*

*An erosion site miles from the lake, but still in the watershed can alter lake water quality because the sediment from the eroded site flows downhill until it reaches the lake.*

and trails, picking up speed and energy. This water can scour open ground on a construction site, erode a sloping path or wash out a newly constructed roadside ditch. An erosion site miles from the lake, but still in the watershed can alter lake water quality because the sediment from the eroded site flows downhill until it reaches the lake. Numerous erosion sites along miles of roads and ditches have a severe, cumulative impact on water quality – especially during a downpour.

Flowing water scours erosion channels and picks up sediments, nutrients and other pollutants. The faster the water flows, the more pollution ends up in the lake.

Roads also function as super highways for terrestrial weeds that can spread to the banks of lakes, rivers and streams. Once weeds become established along lakes, bank stability is compromised because weeds do not provide the same soil stabilizing root system as native plants. The deep root systems of native plant communities prevent erosion and sedimentation and should therefore be maintained.

*The deep root systems of native plant communities prevent erosion and sedimentation and should therefore be maintained.*

## Build Driveways and Roads Responsibly

- Limit the clearing of vegetation and reduce disturbing the duff layer, which stores nutrients.
- Reduce the amount of roads; they compact soil and increase the flow of nutrients to nearby waterways.
- Design and build new roads and driveways with culverts, drainage diversions, ditches and roadside buffers to deal with run-off from major storms. Ask your local conservation district for help.
- Work with your county to adopt local road standards that will reduce nutrient run-off.
- Avoid construction on slopes greater than 20%. On all slopes use water bars and diversions to help reduce erosion.
- Keep road and driveway lengths to a minimum. Clustering development reduces road length. The longer the paved surface, the higher the velocity of water flowing over that surface. This higher velocity causes additional erosion and sedimentation.
- Divert run-off from roads and driveways into ditches that are U-shaped, not V-shaped.

*The longer the paved surface, the higher the velocity of the water flowing over that surface. This higher velocity causes additional erosion and sedimentation.*

- Divert water flowing in roadside ditches that have long sloping runs into flat wooded areas where sediments, nutrients and pollutants are

filtered out. Use frequent ditch turn-outs to slow water flow.

- Retain or plant buffer strips along roads and uphill from ditches to intercept nutrient rich run-off before it gets into the ditch.
- Organize volunteers to go out during or right after a heavy rainstorm to identify and trace sources of erosion. Determine which streams and rivulets are brown with silt to find out where erosion occurs. Then work with landowners to correct the problems.

For projects involving more than one acre of disturbance, contact Montana DEQ's Water Protection Bureau, 406-444-4969.

### LEARN MORE ABOUT Road Construction

Flathead Conservation District  
406-752-4220  
[www.flatheadcd.org](http://www.flatheadcd.org)

Lake County Conservation District  
406-676-2842  
[www.lakecounty-mt.org](http://www.lakecounty-mt.org)

Lincoln County Conservation District  
406-293-7781  
[www.lincolncd.org](http://www.lincolncd.org)

For more information see  
[www.nwc.cog.co.us/docs/wss/  
Mountain-Driveways\\_BMPs.pdf](http://www.nwc.cog.co.us/docs/wss/Mountain-Driveways_BMPs.pdf)

# Chapter 4: Water Recreation

Recreation in Montana brings millions of dollars to the local economies each year. Fishing, water skiing and boating bring tens of thousands of visitors for the vacation of a lifetime – and that is why it is so important to use caution when we are on the water.

## Boating Boom...erang

Many lakes suffer from a “boomerang” affliction: they attract boaters and personal watercraft because of their beauty, but too many watercraft and careless boating decreases their attractiveness.

Boating has always been part of the lake experience. However, as use of motors has grown, problems have increased. The most serious boating problems are safety, congestion, noise pollution, accelerated shoreline erosion and sedimentation from bigger wakes. Air and water



*Each boater must be responsible for his or her actions in order to ensure the safety of all boaters.*

pollution can result from poorly tuned engines. Wildlife harassment, gas spills and human waste are other boating problems. Each of us must be responsible for our own actions and must work to ensure the safety of all boaters.

## Practice Responsible Boating

- Drive at safe, fuel-efficient speeds.
- Watch your wake and slow down if it gets too big. Large wakes erode the shoreline and damage wildlife habitat.
- Observe no wake speeds within 200 feet of all shorelines.
- Stay away from shallow areas. Motors churn up bottom areas and resuspend nutrient rich sediments.
- Keep a trash bag handy to collect and store all trash, including cut fishing line.
- NEVER dispose of sewage overboard – it is ILLEGAL. Keep all sewage sealed in a holding tank for appropriate disposal at a marina.
- Plan ahead; sewage-dumping stations near lakes are extremely limited.
- Enjoy the natural quiet of the lake. Consider canoeing, rowing and sailing. Avoid playing loud music because sound carries easily over water.
- Stay away from birds and their nests, as well as other animals. It is illegal to harass wildlife and you may separate the young from their parents or chase them out of their natural habitat.
- Operate personal watercraft safely and courteously. Avoid congested areas when possible.
- Obtain a copy of and abide by Montana's boating laws.

LEARN MORE ABOUT

Volunteer Water Watch Program

Patterned after Neighborhood Watch Programs, Montana has an innovative program that teams concerned citizens with the Montana Fish, Wildlife & Parks in an effort to make our waters safer for recreation. Contact MT FWP for more information at 406-752-5501.

*BTEX are known to cause a myriad of human health concerns including: cancer, birth defects, and damage to the nervous system, liver, and kidneys.*

Boat Motors

Benefits of 4-stroke:

- Quiet and smooth;
- More fuel efficient;
- Less polluting;
- Reliable;
- Gasoline ready – no mixing oil and gas;
- Smooth idling;
- Great trolling motors;
- Accepted at any body of water, some areas in the U.S. have banned 2-stroke boat engines;
- Readily available, almost all new production is 4-stroke.

Motorized Watercraft: It's a Gas

Gasoline constituents, in the form of volatile organic compounds (VOCs), include BTEX (benzene, toluene, ethylbenzene and xylene). Studies conducted on Lake Tahoe and Whitefish Lake indicate that BTEX and other compounds found in water bodies appear to be directly related to motorized watercraft activity.

BTEX are known to cause a myriad of human health concerns,

including: cancer, birth defects and damage to the nervous system, liver, and kidneys. BTEX exposure can result from inhalation, ingestion and/or contact absorption through the skin. BTEX also has an adverse effect on aquatic plants and animals.

2-Stroke vs. 4-Stroke

A 1996 EPA report found that 4-stroke engines are 75- 95% cleaner than carbureted two-stroke engines. Scientific reports indicate that engine inefficiencies in carbureted 2-stroke engines can affect water

quality: 30% of 2-stroke watercraft fuel is released unburned directly into the water via the exhaust system.

The California Air Resources Board found that a typical personal



watercraft (carbureted 2-stroke) that consumed five gallons of gasoline per hour and operated 41 hours per year discharged between 50 and 60 gallons of unburned fuel into the environment.

The watercraft industry is responding to this issue by improving technology. However, if you're in the market to purchase a personal watercraft or outboard motor, make sure the model you are looking at is not the carbureted 2-stroke type.

*Four-stroke engines are 75-95% cleaner than carbureted two-strokes.*

For all outboard motors, make sure your engine is tuned so that it operates at maximum efficiency. Take care not to spill oil or gas while refueling.

# UFOs: Unidentified Floating Objects



## Murky, Green-Colored Water

**Description:** *Murky, green-colored water that looks like green paint on the windward shore; unpleasant odor*

**Analysis:** Algae. Algae are microscopic plants that are natural components of lakes and streams. When high nutrient concentrations occur, one species of algae will out-compete others and become so abundant that the water becomes murky. People should avoid swimming in algae blooms because toxins in some algae cause skin irritation. Consumption of water by livestock and other animals such as pets during an algal bloom can result in intestinal distress and, in extreme cases, death.



## Yellow-Green Dust

**Description:** *Yellow-green dust on the lake in early summer*

**Analysis:** Pollen from nearby trees. The pollen might look similar to algae, but pollen is more yellow and dust-like and floats on the surface. Over time the pollen will become waterlogged and sink from sight. Pollen usually has little effect on water quality.



## Red, Itchy Rash

**Description:** *Red, itchy rash on swimmers soon after coming out of the water*

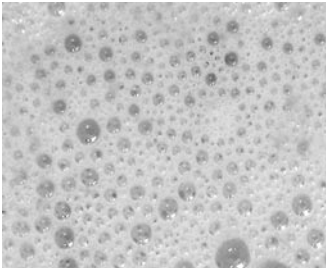
**Analysis:** Swimmer's itch. Swimmer's itch is caused by a parasite that typically uses waterfowl and snails as hosts, but can irritate humans. The swimmer may notice a prickling sensation after getting out of the water and may develop red spots and swelling that can last a week or more. To prevent swimmer's itch, towel off vigorously or take a shower immediately after coming out of the water—especially in mid to late summer when the parasite is most prevalent. It is not dangerous or contagious, but can be very uncomfortable.



## Dead Fish

**Description:** *Dead fish in the water or on the shore*

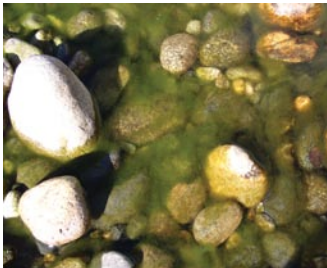
**Analysis:** A few dead fish along the shore is not significant and may result from natural causes, such as spawning, or bacterial infection from warm summer water. Numerous dead fish (dozens or more) or dead fish of more than one species is a cause for concern. Contact the Montana Fish, Wildlife & Parks immediately to report the problem.



### **Foam**

***Description: Foam “soap suds” along the shore***

Analysis: Foam along the shore does not necessarily indicate pollution from laundry waste. Foam is created when the surface tension of water is reduced and air is introduced. This causes bubbles. Many natural organic compounds will reduce surface tension and when these compounds are mixed with air by wind and currents, they produce foam. Natural foam has a somewhat earthy or fishy smell while detergent foam will smell of perfume.



### **Green Cotton Candy**

***Description: Green, cotton candy-like clouds in shallow waters***

Analysis: Filamentous algae. It is common in some lakes and may not indicate a water quality problem. These clouds may appear after heavy run-off in the spring or following a long, hot spell in the summer. However, localized concentrations may indicate a pollution source nearby.



### **Dark Cloud**

***Description: Dark cloud in the water accompanied by an oily sheen.***

Analysis: The cloud may be insect cases left behind from a hatch of aquatic insects, which hatch any time during the open water season. Wind often concentrates the cases along the shore, and as they decompose, an oily film can form on the water's surface. Dark oily clouds can also occur near decomposing leaves, typically in the fall.



### **Worm-like animals**

***Description: Flat, worm-like animals attached to skin.***

Analysis: Leeches. Leeches are found in shallow, protected waters and are active on hot summer days and at night. They are attracted to water disturbance around docks and swimming areas. The best way to avoid leeches is to swim in deep waters.



# Chapter 5: Protecting our Fisheries

The lakes of Montana are diverse and teeming with life. The variety of fish species and other aquatic organisms make our lakes, rivers and streams an angler's paradise and provide a multi-million dollar boost to the local economy.

## Different Fish for Different Lakes

Some lakes are shallow, warm and have lots of aquatic plants. Species such as bass, perch and pike like these warm-water lakes. Other lakes are deep, with large volumes of cold water. These lakes support trout and salmon fisheries.

Not every lake is suitable for every kind of fish. Temperature and oxygen levels are the two major factors that control whether or not certain fish species are present. Other factors such as available habitat, competing species and stocking practices are influences as well.

Declining water quality may result in the loss

*Not every lake is suitable for every kind of fish. Temperature and oxygen levels are the two major factors that control whether or not certain fish species are present.*

of a cold-water fishery. Increased nutrients, for example, can ultimately lead to the loss of oxygen in the deeper regions of the lake. Once cold water fish habitat is lost, it usually cannot be restored – and rarely can it be restored to support trout and salmon.



*A native west-slope cutthroat trout.*

photo courtesy of Montana Fish, Wildlife & Parks

Although we associate fishing with lakes and streams, some lakes and streams have no fish. These areas provide habitat for frogs and salamanders, critical species for many ecosystems. Introduction of fish to such areas can decimate these amphibian populations and impact other important wildlife populations. It is very important to protect remaining amphibian habitat.

## Native and Non-Native Species

Many non-native fish and aquatic species have been legally introduced by agencies into our lakes and rivers to enhance angling opportunities. In fact, early fisheries management in the United States centered on the introduction of non-native game fish. Some planned introductions have benefited angling opportunities in certain waters, while others have had unexpected and damaging results. Introduced non-native species can cause problems because they are often more aggressive and more adaptable to ecosystem changes. Often,

***Non-native species can severely affect native sport fishing.***

they reproduce more rapidly than native species.

One example of an unexpected and drastic change caused by an introduction is that of the *Mysis* shrimp into the Flathead Basin. This introduction was intended to provide a better food source for kokanee salmon—a popular fish amongst anglers. Instead of boosting the kokanee salmon, the *Mysis* shrimp is the primary cause for the collapse of the salmon population in Flathead Lake and gave rise to a fish community dominated by non-native lake trout and non-native whitefish.

Our understanding of the ecological impacts of introduced species has advanced. Legislation, like the Endangered Species Act, now places a high value on native species and mandates their protection. Today, managers carefully weigh the costs and benefits associated with new species introduction or the continued stocking of non-native fishes to our waters.

In Montana, fisheries managers emphasize

preserving and enhancing wild fish populations. They also give special consideration to populations of native fish. Montana is home to many valuable native species, including white sturgeon, mountain whitefish, grayling, bull trout and Montana's State Fish—the cutthroat trout.

**Illegal fish introductions**

Illegal introduction of non-native species is also of great concern. Fish like carp, yellow perch, suckers, shiners, sunfish and even certain game fish can severely affect sport fisheries. When people move live fish from one body of water to another, the future of their own fishing is at stake. Anglers illegally introduce species by using live bait, dumping bait buckets and even intentionally stocking rivers and lakes.

***Bucket biology – the practice of transporting live fish from one water body to another to artificially stock the second water body – IS A CRIME.***

**Actions you can take to protect your local fishery**

- Obtain a copy of Montana Fishing Regulations and abide by them.
- Become proficient at identifying different species of fish so that you don't accidentally hurt endangered species.
- Do not release any fish into your lake that were not caught there. IT IS ILLEGAL. Introduced species may out-compete existing species for food and habitat, may introduce diseases, and may degrade water quality.
- Keep sediments from entering streams, rivers and lakes. Sediments can smother lake spawning areas, aquatic plants and fish food such as crayfish, insects, etc.
- Prevent nutrients and pollutants from getting into the lake by reducing your use of chemical fertilizers and maintaining your septic system.
- Do not remove cover in the water such as trees, logs or aquatic plants. These materials provide critical habitat, protect bank stability and prevent rapid increase in water temperatures that harm cold-water fish.
- Guard against the introduction of aquatic plants, invertebrates and fish species not naturally found in your lake.
- Don't leave cut fishing line in the water and clean up any line that you may find in the water.
- When cleaning fish, either sink the entrails in the water body where the fish was caught, or put them in garbage cans.
- Drain and clean live wells, transom wells, and bilges thoroughly and away from any river, lake or water body.

**Bucket biology** – the practice of transporting live fish from one water body to another to artificially stock the second water body – IS A CRIME. You can be arrested and fined heavily in Montana and you can cause significant damage to a fishery. Introduced fish may:

- Cause the decline of many threatened and endangered species;
- Reproduce rapidly and outcompete native species;
- Interbreed with native or established species, thereby reducing the long term survival of native species;
- Carry and spread new diseases and parasites;
- Directly alter the existing habitat;
- Require difficult and costly management decisions that may or may not be successful in restoring native fishes.

## Aquatic Habitat

Rooted native aquatic plants grow in shallow, protected waters. Although they may seem like nothing more than weeds at times, their overall benefit is immense. Native aquatic plants:

- Provide spawning habitat for certain fish species and nursery areas for virtually all fish;
- Provide habitat for many small insects and crustaceans, which in turn are important food sources for fish;
- Stabilize lake sediments by absorbing the force of waves and reducing shoreline erosion. Their roots trap sediment particles and hold them in place;
- Absorb nutrients and thus reduce undesirable algae growth;
- The presence of aquatic plants does not necessarily indicate a pollution problem. However, they may thrive where shoreline tree removal, landscaping alterations from construction and shoreline erosion have occurred.

## Whirling Disease in Montana

Whirling disease is a parasitic infection that affects salmonid fishes (trout, salmon, char, whitefish, grayling). The disease is named for one of the symptoms of infection: erratic,



photo courtesy of Stephen Atkinson, Oregon State University

*A fish with clear signs of whirling disease.*

tail chasing “whirling” behavior. Infection can lead to physical deformities of the head, spine and cartilage and a blackening of the tail. Severe infection can lead to death as these deformities reduce a fish’s ability to feed and avoid predators. In some cases, whirling disease has caused major fishery losses and associated economic costs. There is no known cure or vaccine for whirling disease.

Whirling disease is caused by the microscopic parasite, *Myxobolus cerebralis*, which was introduced from Europe to the US in 1956. The disease-causing parasite has a complex, two host life cycle that depends upon salmonid fishes and a small, common aquatic worm called

*The disease is named for one of the symptoms of infection: erratic, tail chasing “whirling” behavior.*

*Tubifex tubifex*. Whirling disease cannot infect humans, mammals or non-salmonid fishes.

Whirling disease is spread through the movement of infected fish or fish parts, and by the movement of water or mud that contains parasites. This can happen naturally within a watershed, but the spread into new watersheds is typically done inadvertently by humans. Whirling disease was first discovered in Montana in 1994 and has spread throughout most of Western and Central Montana since then. The Whirling Disease Initiative at Montana State University was created to monitor and help prevent the spread of whirling disease in the state. Their website has many informative resources, <http://whirlingdisease.montana.edu/initiative/>.

### *Combat Whirling Disease*

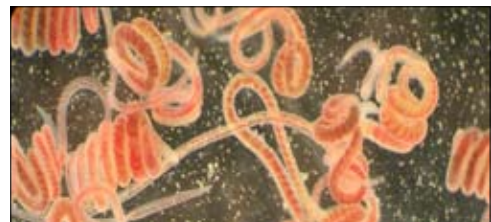
- Know whether you are fishing or recreating in waters infected by whirling disease. Whirling disease has been detected in most major watersheds of Western and Central Montana.
- After leaving a stream or lake, be sure to thoroughly inspect, clean, drain and dry all of your fishing and boating equipment, including your waders. Mud and water may hold tubifex worms, whirling disease spores, and other invasive species.
- Never transport live fish, live bait, insects or plants from one water body to another. **It is illegal in Montana.**
- Don't use salmonid (trout, char, salmon, whitefish, grayling) parts as cut bait. **It is illegal.**
- Don't collect sculpins or use them as bait. **It is illegal.**
- When cleaning fish, either sink the entrails in

### *In Montana it is ILLEGAL to:*

- *Transport live fish, live bait, insects or plants from one water body to another.*
- *Use salmonid (trout, char, salmon, whitefish, grayling) parts as cut bait.*
- *Collect sculpins or using them as bait.*

the water body where the fish was caught or put them in garbage cans. Whirling disease may be able to survive wastewater treatment systems, so do not put fish parts down the kitchen disposal. Fish parts should be disposed of in the garbage, by burying, or by burning.

- Talk to your friends and colleagues about this issue. Share what you know about whirling disease.
- If you see fish with whirling disease symptoms in an area where whirling disease has not been reported, contact Montana Fish, Wildlife & Parks.



*The aquatic worm, Tubifex tubifex*

*Photo from Whirling Disease  
in the United States, 2009*

## Don't pick up aquatic hitchhikers

### *For Boaters...*

- Before launching: inspect, clean, drain and dry your boat.
- After leaving a lake or river, remove aquatic plants from boat, motor and trailer. Check all underwater fittings and equipment. Put plants in a sealed container and dispose of in a trash can.
- Before leaving a lake or river, drain lake or river water from your equipment including the motor, bilges, live wells, bait buckets and coolers.
- Clean boat and equipment with high-pressure hot water – or dry everything for at least 5 days.
- Dispose of unwanted live bait in a sealed trash container.

### *For Personal Watercraft Users...*

- Impeller areas can contain zebra mussels and aquatic plants. Once on the trailer, run the engine for 5-10 seconds to blow out excess water that may contain hitchhikers.
- Before driving away from the lake, inspect and remove any plants or animals from the intake, steering nozzle, hull and trailer.

### *For Anglers ...*

- Avoid felt soled waders because the boots are notorious for transporting aquatic invasive species.
- Clean and dry all fishing equipment and apparel after each use.

### *Spread the word – not the weeds!*

- Familiarize yourself with all invasive species. Your local weed district and Montana Fish, Wildlife & Parks can provide information that will help you identify invasive species.
- Report any sightings immediately to Montana Fish, Wildlife & Parks.
- Sometimes word of mouth is best – tell and teach your friends and neighbors about aquatic invasive species.



*Before leaving a lake or river, remove aquatic plants from boat, motor and trailer.*

# Chapter 6: Stop the Invasion

One of the biggest threats to our lakes comes in the form of small organisms and weeds that can best be described as invasive species. Montana lakes provide prime habitat and food for many non-native species to thrive and take over, limiting habitat for local, native species. It is extremely important to pay attention to “hitchhikers” – especially when boating in many different lakes throughout the state or country.

## Zap the Zebra!

Since their introduction to the Great Lakes in 1986 in ships’ ballast water, zebra and quagga mussels have quickly spread and are now found in at least twenty states and two Canadian provinces.

The primary cause for zebra and quagga mussel’s movement westward is boats trailered by the public or by commercial haulers. Zebra and quagga mussels can spread on boat hulls, in water (as microscopic larvae) and on aquatic plants. A female zebra mussel can release up to one million eggs each season so transporting just one zebra mussel can spell trouble for Montana waters and your boat. And remember, IT IS ILLEGAL to



*Just one zebra mussel can spell trouble for Montana waters and your boat. It is ILLEGAL to transport zebra mussels, even if it’s by accident.*

transport zebra mussels and other invasive species into Montana – even if it’s by accident.

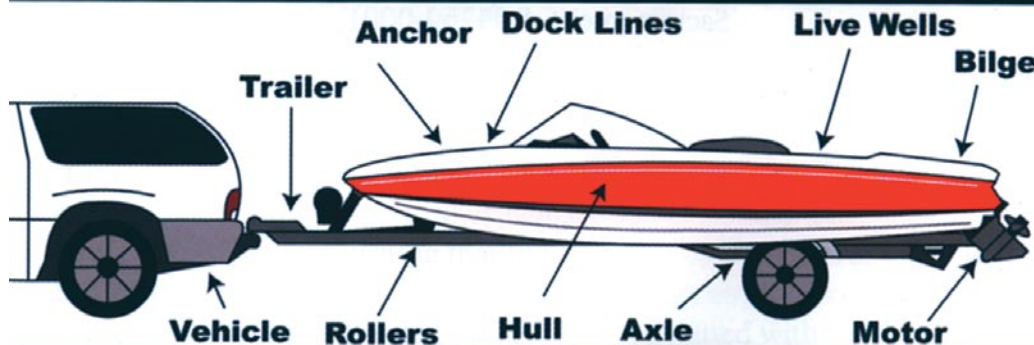
## Stop the Snails

New Zealand mudsnails (NZMS) are native only to New Zealand, but spread to North America in the late 1980s. This small invader quickly spread to waters in Yellowstone National Park and is now found in many waters across the West. People spread NZMS attached to waders

and fishing gear or by moving fish or bait.

- NZMS average 1/8 inch in size but may be as small as a grain of sand. They have a gray, brown or black cone-shaped shell with 5 or 6 whorls.
- They live in all types of waters, from silted river bottoms to clear mountain streams to estuaries.

## LOOK FOR MUSSELS HERE

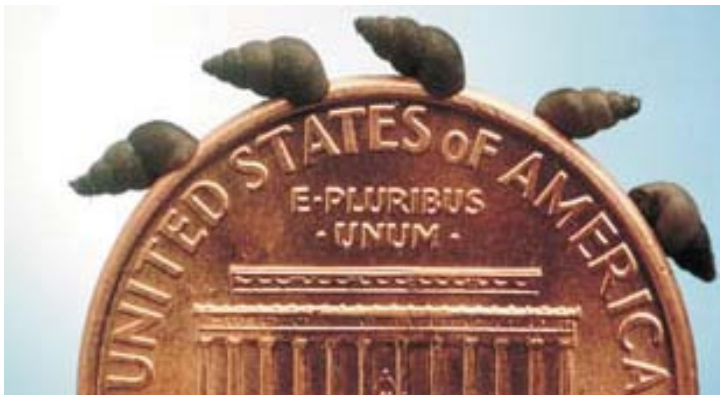


## CHECK YOUR BOAT, TRAILER AND VEHICLE

## TAKE ACTION

Prevent the spread of New Zealand mudsnails by taking at least one of the following actions after using gear:

- Rinse waders and other gear with disinfectant and scrub with a stiff brush to remove mud and debris.
- Remove snails from nooks and crannies (e.g. boot laces).
- Use separate sets of gear for infested and non-infested waters.
- Freeze gear for 6 to 8 hours (preferably overnight).
- Use a hot water bath of at least 130 ° F for a minimum of 5 minutes.
- Dry gear completely for at least several days.
- Clean boats and trailers after each use.



*New Zealand Mudsnails*

*Photo by Billings Gazette*

- Temperature tolerance is 32° - 77° F (66° F optimum).
- They reproduce by cloning, so it only takes ONE.
- Densities of over 500,000 per square yard have been reported in rivers in Yellowstone National Park.
- They can survive for days out of water on moist gear.

At high densities, NZMS alter aquatic habitats and food webs by eating algae and out-competing native bottom-dwelling organisms. These ecosystem impacts can reduce trout and other recreational fisheries FOREVER. Help stop the spread!

## Halt the Spread of Unwanted Aquatic Weeds

Eurasian Watermilfoil is perhaps the most dangerous unwanted aquatic weed because it is extremely aggressive. Its dense weed beds grow rapidly, choke native plants and spread easily to new areas. Eurasian Watermilfoil currently



*Photo by Univ. WI Extension Lakes*

*Eurasian Watermilfoil*

*One of the biggest threats to our lakes comes in the form of small organisms and weeds that can best be described as invasive species.*

flourishes in Idaho, Washington, British Columbia and in Montana in the Lower Clark Fork River and Noxon and Cabinet Reservoirs. It is a serious threat to our rivers and lakes.

Once introduced into a river or lake, Eurasian Watermilfoil rapidly forms thick mats that severely hamper swimming, boating and fishing. On some stretches of the Pend Oreille River in Washington, navigation and recreation have

become virtually impossible.

Eurasian watermilfoil reproduces by a process called “fragmentation.” The plants easily break into small pieces and each piece can form roots. It can easily spread between lakes and rivers by boaters unwittingly carrying plant fragments in their hulls and on their trailers.

### *Living with aquatic plants*

Some people complain about aquatic plants, but we need to learn to appreciate native plants and recognize the vital role they play in nature while simultaneously preventing the spread of harmful invasive plants.

Plant fragments and attached organisms can travel with boats to a new lake where they can spread. So be sure to remove plant fragments from boats and trailers before leaving a lake. Even if your lake has not been invaded by harmful species, it could happen if you are not vigilant. It is especially important to check your boat when traveling from one lake to another. It is critical that all boaters and anglers inspect, wash and dry watercraft, waders, and other gear after EVERY visit to a water body.



*Plant fragments and attached organisms can travel with the boat to a new lake where they can spread.*

**Avoid Spreading  
Aquatic Invasive  
Species:**

**Inspect  
Clean  
Drain  
Dry**

**Your boat AND  
your fishing  
equipment.**

#### **LEARN MORE ABOUT**

**Aquatic Invasive Species**

[www.protectyourwaters.net](http://www.protectyourwaters.net)

[www.100thmeridian.org](http://www.100thmeridian.org)

[www.anstaskforce.gov](http://www.anstaskforce.gov)

[www.fwp.mt.gov/fishing/fishingmontana/ANS/default.html](http://www.fwp.mt.gov/fishing/fishingmontana/ANS/default.html)

[www.psmfc.org/Aquatic\\_Nuisance\\_Species\\_Prevention\\_Program](http://www.psmfc.org/Aquatic_Nuisance_Species_Prevention_Program)

[www.aquaticnuisance.org](http://www.aquaticnuisance.org)



# Appendix: Publications & Websites

## LEARN MORE ABOUT

### Montana Lake Publications

Flathead Basin Biennial Report  
Flathead Basin Commission  
406-752-0081  
[www.flatheadbasincommission.org](http://www.flatheadbasincommission.org)

Headwaters to a Continent: A  
Reference Guide to Montana Water  
Resources  
Montana Watercourse  
406-994-6671  
[www.mtwatercourse.org/](http://www.mtwatercourse.org/)  
Publications

Who Does What With Montana's  
Water: A Directory  
Montana State University  
406-994-6671  
[www.water.montana.edu](http://www.water.montana.edu)

Flathead Lake Journal  
Flathead Lake Biological Station  
406-982-3301  
[www.umt.edu/FLBS](http://www.umt.edu/FLBS)

Flathead Lake Monitor  
Flathead Lakers  
406-883-1346  
[www.flatheadlakers.org](http://www.flatheadlakers.org)

*LakeFront*  
Whitefish Lake Institute  
406-862-4327  
[www.whitefishlake.org](http://www.whitefishlake.org)

Confederated Salish and Kootenai Tribes  
[www.cskt.org](http://www.cskt.org)

Friends of Blanchard Lake Association  
[www.friendsofblanchardlake.com](http://www.friendsofblanchardlake.com)

Flathead Basin Commission  
[www.flatheadbasincommission.org](http://www.flatheadbasincommission.org)

Flathead Conservation District  
[www.flatheadcd.org](http://www.flatheadcd.org)

Flathead Community of Resource Educators (CORE)  
[www.flatheadcore.org](http://www.flatheadcore.org)

Flathead County Planning and Zoning Office  
[www.co.flathead.mt.us/fcpz](http://www.co.flathead.mt.us/fcpz)

Flathead Lake Biological Station  
[www.umt.edu/flbs/](http://www.umt.edu/flbs/)

Flathead Lakers  
[www.flatheadlakers.org](http://www.flatheadlakers.org)

Flathead Land Trust  
[www.flatheadlandtrust.org/](http://www.flatheadlandtrust.org/)

Lake County Planning Department  
[www.lakecounty-mt.org/planning](http://www.lakecounty-mt.org/planning)

Lincoln County Planning Department  
[www.lincolncountymt.us/planning](http://www.lincolncountymt.us/planning)

Montana Department of Environmental Quality  
[www.deq.mt.gov](http://www.deq.mt.gov)

Montana Department of Fish, Wildlife & Parks  
[www.fwp.mt.gov](http://www.fwp.mt.gov)

Montana Department of Natural Resources and Conservation  
[www.dnrc.mt.gov](http://www.dnrc.mt.gov)

Montana Water Center  
[www.watercenter.montana.edu](http://www.watercenter.montana.edu)

Montana Watershed Coordination Council  
[www.mwcc.montana.edu](http://www.mwcc.montana.edu)

United States Environmental Protection Agency  
[www.epa.gov](http://www.epa.gov)

United States Forest Service, Flathead National Forest  
[www.fs.fed.us/r1/flathead](http://www.fs.fed.us/r1/flathead)

Whitefish Lake Institute  
[www.whitefishlake.org](http://www.whitefishlake.org)

North American Lake Management Society (NALMS)  
[www.nalms.org](http://www.nalms.org)

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# Notes



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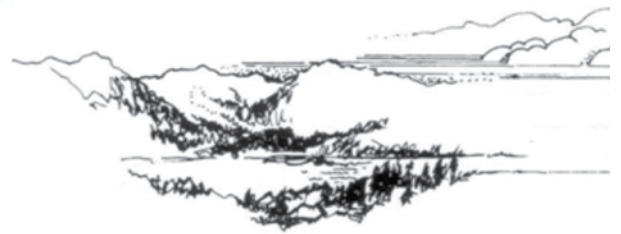
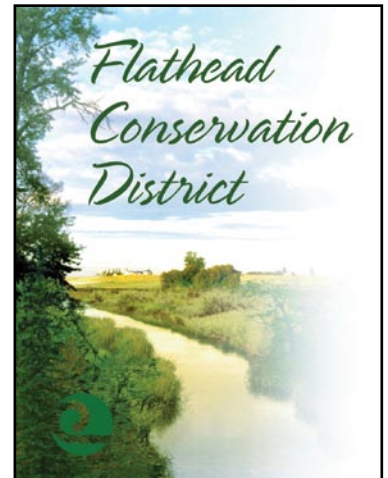


**Montana Fish,  
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Montana Department of  
**ENVIRONMENTAL  
QUALITY**

## Flathead County River Commission



Whitefish County  
Water District



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INSTITUTE**



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