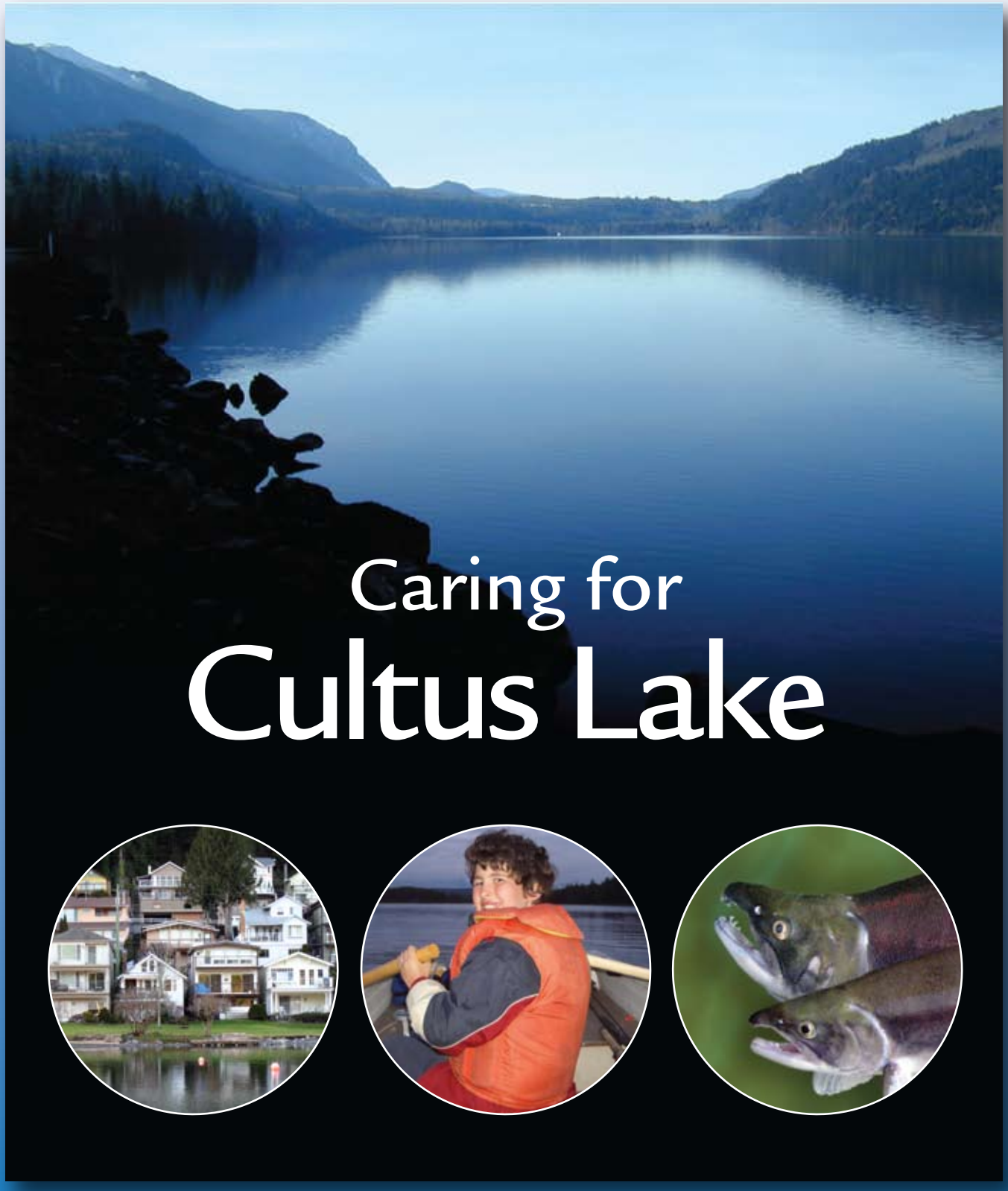
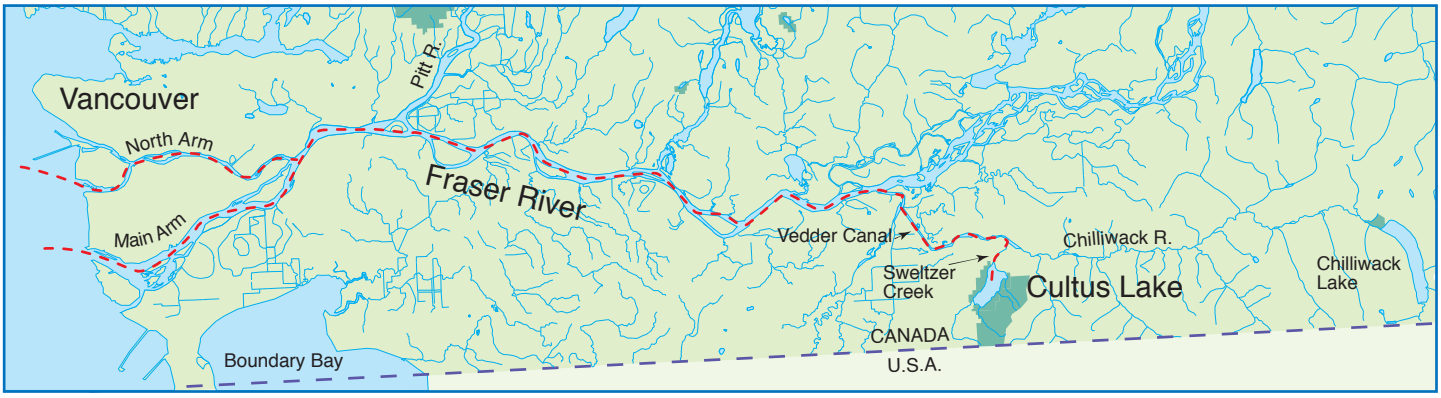


Caring for Cultus Lake

A Handbook for Residents and Visitors



Cultus Lake sockeye migrate through residential, agricultural, and industrial areas of the Lower Mainland on their way to spawn in Cultus Lake.

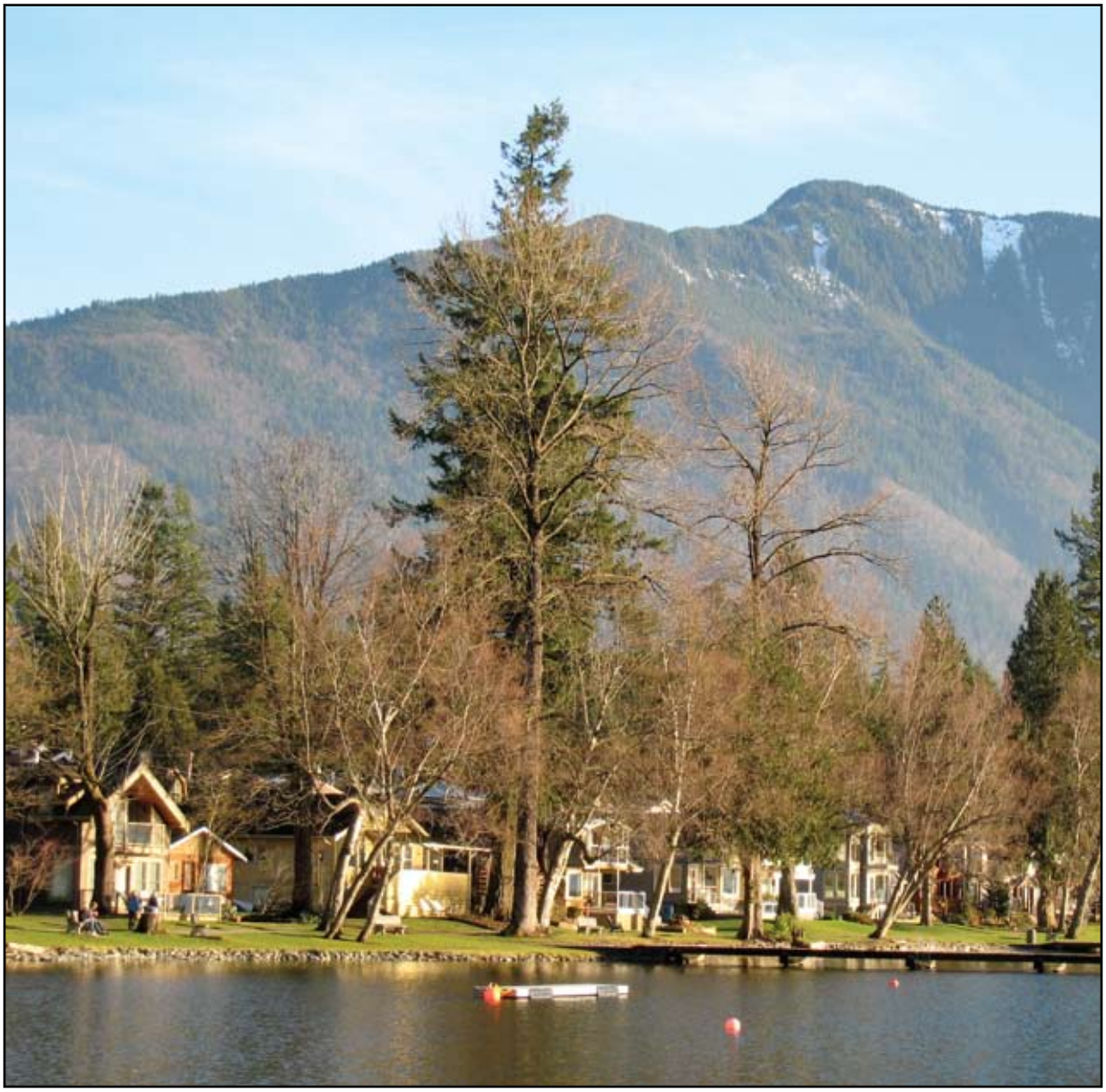
Cultus Lake Salmon Research Laboratory

Sweltzer Creek Counting Fence

Spring Bay spawning area

Lindell Beach spawning area

Contents



On a sunny day in January, Cultus Lake is a place of peace and beauty. Photo: Jennifer Stone

Cultus Lake: Ours to Protect

Cultus Lake is a special place for many British Columbians. Generations of vacationers remember golden summers at its beaches and picnic spots.

Set in temperate rainforest, nestled between the mountains at its back and the great Fraser River floodplain, the lake's ecosystem is a unique legacy of the last Ice Age. When the ice receded, flora and fauna returned and sometimes evolved in isolated pockets. At least two genetically unique populations live here and nowhere else: the Cultus pygmy sculpin and the Cultus sockeye salmon. The area is also home to other rare fauna, including the Pacific giant salamander, the coastal tailed frog and the red-legged frog. Other residents include coyote, cougar, black bear, blacktail deer, beaver and many species of birds.

First Nations tradition has it that Cultus Lake was a spiritually powerful place. It was so popular for spirit quests that eventually its special power was depleted, giving the lake its Chinook name, which can be interpreted as "useless". Yet today we find that the lake still has the power to amaze and delight us. The more we learn about its ecosystems and its surprising wildlife, the better we can protect it into the future.

Up north: Cultus Lake Park

The north end of the lake, where it flows into Sweltzer Creek, has been popular for recreation since the late 1800s. The lowlands at this end were logged in the early 1900s. Development began in earnest in the 1920s with the construction of boat houses, a gas station, summer residences and businesses.

In 1924, the Crown granted land to create a park. Cultus Lake Park was established as a self-governing entity in 1932 on what is now 259 hectares at the north end of the lake. The Park was granted the power to provide services (water, sewage, roads and electricity) and to establish by-laws to control further development. Today this area has many residences and amenities which include golf courses, water slides, boat and jet-ski rentals and riding stables.

Sunbathing at Main Beach in the 1960s.

East side, west side: Cultus Lake Provincial Park

Development along the east and west sides of the lake was limited by steep slopes. Cultus Lake Provincial Park was established in 1948, protecting 656 hectares on both shores. The 2,080-hectare International Ridge Recreational Area, established in 1969, extends the protected area from the Park's eastern boundary to the watershed boundary. The west side remains largely undeveloped. On the east side, the road to Columbia Valley was upgraded in 1950. Extensive park facilities, including campsites, boat launches and an administrative centre, were built on alluvial fans at Entrance Bay, Delta Grove, Honeymoon Bay and Maple Bay.

A bird's eye view of Cultus Lake, looking south.

Down south: the Columbia Valley and Lindell Beach

The Columbia Valley was first settled in the 1890s and subsequently developed as a sparsely populated agricultural area. The valley was logged in the 1920s and logging on the U.S. side of the Frosst Creek drainage continued until at least 1986. A debris torrent that year swept log jams into the lake and deposited large amounts of rubble and fine sediment at the delta; extensive dyke improvements followed. Lindell Beach began to develop in the late 1940s when the original homestead at the head of the lake was subdivided into small lots. At about this time, Frosst Creek was diverted from the middle of the beach to the west side. Columbia Valley and Lindell Beach comprise a community of over 300 residences, with a year-round population of about 600 that is serviced by a number of businesses and a golf course.

Ours to protect

Cultus Lake is a highly used recreational area. It is also home to many wildlife species that depend on its clear, clean water and foreshore vegetation. Among these are the unique Cultus Lake sockeye. They spend about half of their lives in Cultus Lake, as fry and as spawners. Their lives are inextricably linked with other creatures in the chain – eagles, herons, insects, amphibians and mammals. All deserve our consideration and stewardship. We who enjoy the lake should also undertake to preserve and protect it as well.

Bald eagles are among our neighbours at Cultus Lake. They are celebrated annually at the Fraser Valley Bald Eagle Festival. Photo: Steve McDonald

Living on Cultus Lake

Whether you are a year-round resident, a summer renter, or a day visitor, there are ways you can help to protect and preserve the lake.

Less lawn makes for a better lakeside

With all the work you put into maintaining your lawn, you might be glad to learn that Cultus Lake would be better off with a shoreside buffer strip of native vegetation.

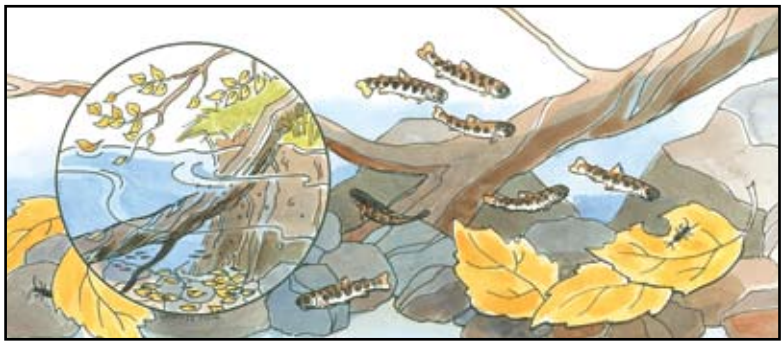
Want to keep Canada geese off your lawn? A lakeside buffer strip acts as a barrier to them.

The single most important way a waterfront resident can help the lake is to leave – or create – a buffer strip of natural vegetation along the shoreline. Natural shorelines resist erosion in a variety of ways. The rocks, branches and sturdy native vegetation are irregular and well-wedged-in. They break the force of the waves and dissipate their energy in many directions. Insects, amphibians and other creatures benefit too, from places to hide and protected routes in and out of the water.

Native plants may not look as tidy as a smooth lawn, but they are suited to our ecosystem. Fertilizer and pesticides, which would end up in the lake after a rain, are not needed by native plants which have evolved in the local soil and climate and have a natural resistance to insects.

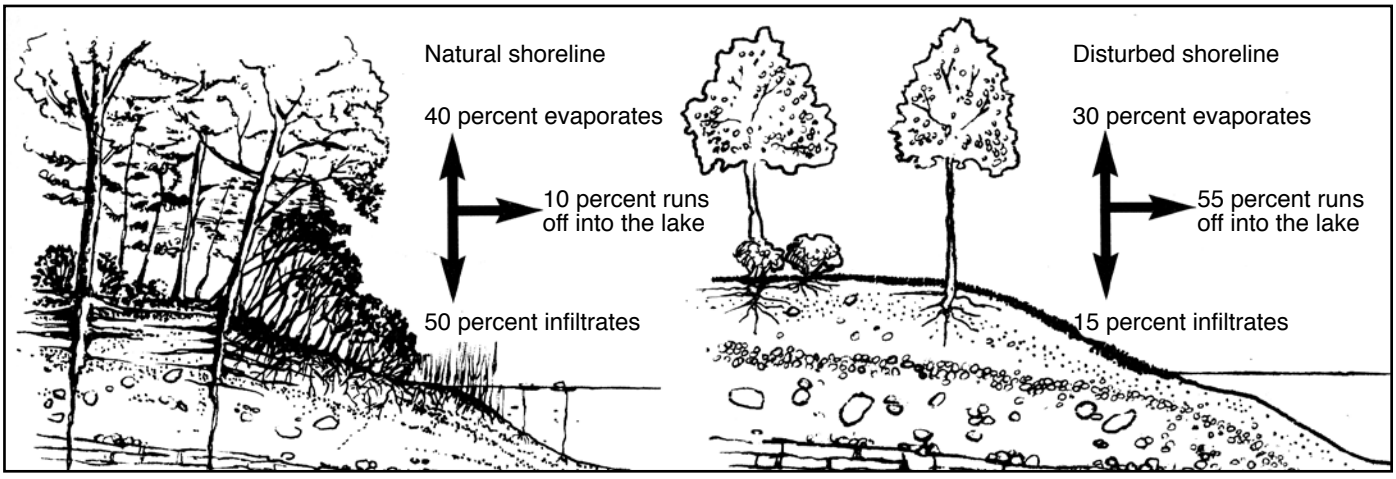
They do a much better job of preventing erosion because their deep roots bind the soil. They filter and slow the runoff from west coast heavy rains, keeping the lake clear and clean. They provide habitat for wildlife and shade for inshore fish.

If you currently have a shoreside lawn, start by leaving a few metres unmown by the water's edge. As the grass is left to grow undisturbed, native plants will also move in, and you can add more yourself. Local nurseries can advise you on which of our many beautiful native plants and shrubs will thrive as the strip develops.



Woody debris and insect drop-off from native plants creates shelter and food for young fish. Illustration, Jen Stone, courtesy of Resort Municipality of Whistler.

The ideal width for a buffer strip is a minimum of 30 metres (100 feet) measured back from the high water line. Most Cultus Lake properties aren't big enough for that! But every bit helps, and, after all, the less mowing you have to do, the better.



A natural shoreline makes a big difference to the amount of runoff. Less runoff means less silt and pollutants ending up in Cultus Lake. Illustration courtesy of The Living by Water Project.

Let it percolate

Rainfall and snowmelt make their way from the mountain peaks to the streams, and ultimately through lakeside properties into Cultus Lake. The water collects soil particles, organic debris, fertilizers, pesticides, gas and oil. If Cultus area residents make their land permeable, much of that can be filtered harmlessly into the soil.

In this "car culture" of ours, an increasing percentage of the land is being paved over for roads and parking lots. When you are putting in a driveway, path or patio on your own property, consider using gravel, paving stones, or flagstones that will let water filter into the soil. If slope-related erosion is a problem, use prefabricated concrete lattice.

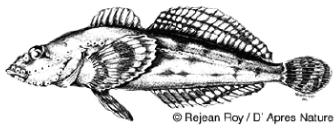
Low ground covers are better than lawns at allowing absorption, and they require less maintenance.

Install a rain barrel to catch runoff from your roof. Alternatively, arrange downspouts so that the water disperses gradually into the garden. If you have enough flow to need a ditch, design it with curves and settling pools to slow runoff, so that the water sinks in rather than flowing unimpeded and unfiltered into the lake.

Runoff affects the neighbours

A species that is restricted to one ecosystem is vulnerable to any kind of environmental change – such as pollution from runoff.

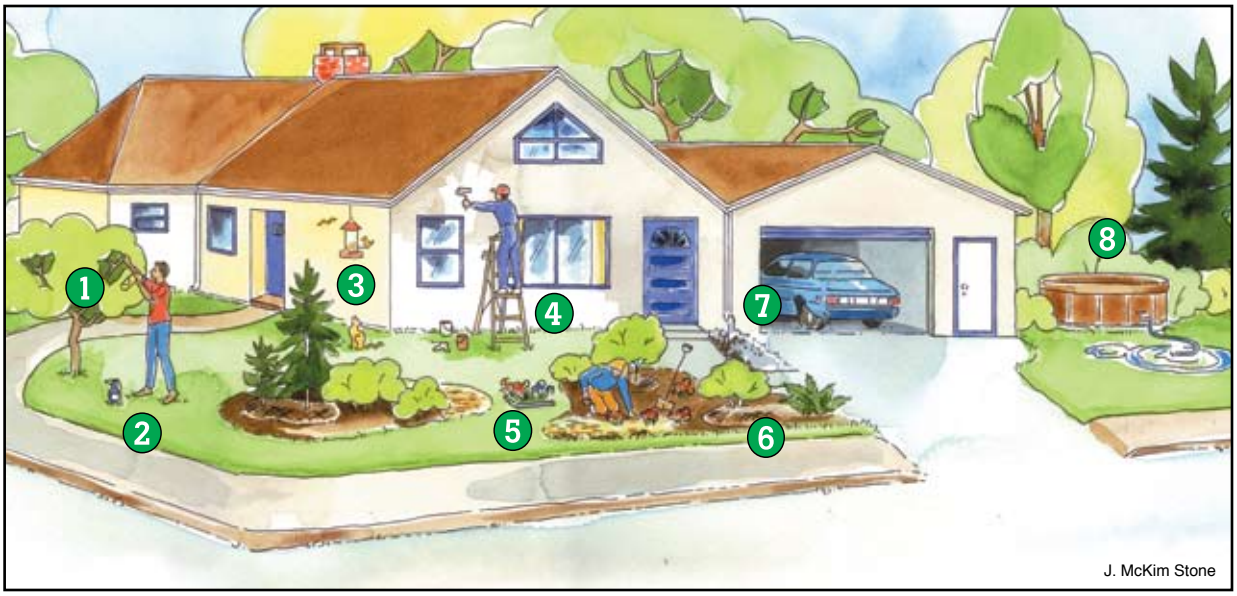
The Cultus pygmy sculpin (Cottus sp.) is found only in Cultus Lake. The pygmy sculpin is tiny. A full-grown adult is roughly 50 mm long. On top it is brown to grey, marked with dark blotches. Its belly is lighter. Spawning males are darker, with an orange band on the first dorsal fin.



Nesting birds, young fish and the insects they feed upon are particularly vulnerable to poisonous substances and choking silt from uncontrolled runoff. Illustration, Jen McKim Stone, courtesy of Resort Municipality of Whistler.

Managing home runoff

Storm runoff collects litter, oil, gas, fertilizer, pesticides and anything else that will float or dissolve. If these untreated pollutants eventually flow directly into the lake, they may affect fish, insects, birds and other wildlife. Here are some tips for controlling the substances you use around your home.



Lawn and Garden Tips

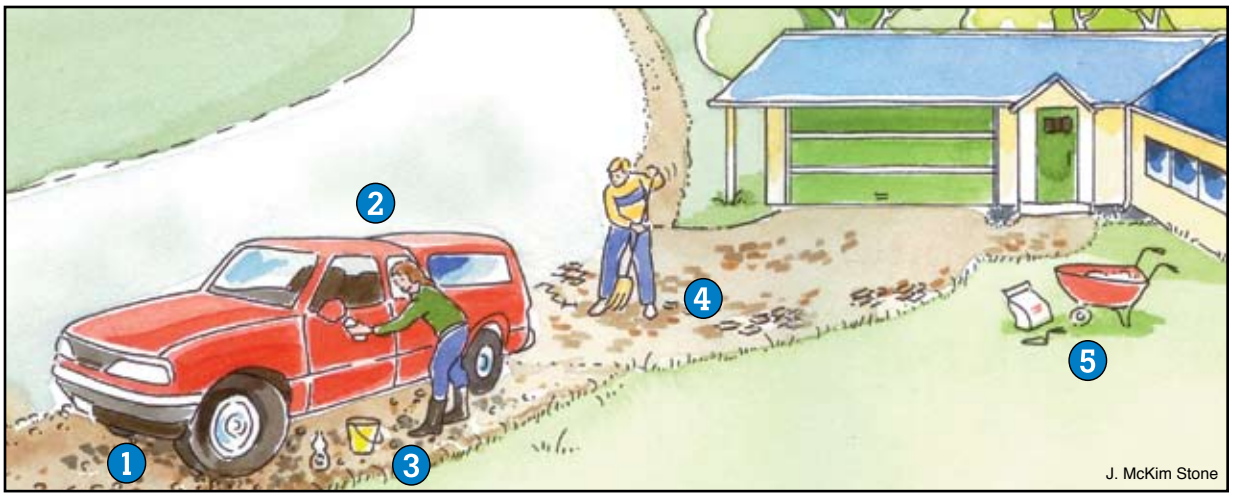
Weed killers and other pesticides can also kill animals, plants and beneficial insects. Fertilizer runoff causes excess weed and algae growth in the lake, which reduces the available oxygen for fish and other aquatic life.

1. Instead of weed killers and other pesticides, consider hand-pulling weeds and using insecticidal soap.
2. If you must use chemicals do not over-apply. Use specific spot treatments rather than general broadcast herbicides. Never spray near ditches. Spray on windless days and not before or during rain.
3. Encourage spiders, ladybugs and lacewings, which eat pest insects. Attract insect-eating birds with tree cover, food during the winter and protection from cats.
4. Dispose of unused paint and chemicals correctly. Never dump into household toilets and sinks or outside ditches, storm drains or streams. See page 31 for recycling options.
5. Use straw, leaves, or grass clippings to keep down weeds and insulate the soil. Limit use of bark mulch near ditches and storm drains, because it leaches toxins.
6. Avoid landscape plastic, which creates runoff. On hillsides, use burlap or landscape fabrics which let water penetrate through to the soil.
7. If possible, redirect roof downspouts away from drain tiles and street storm drains. Gravel drain systems filter and slowly release rain into the groundwater stores, which later enter streams.

Hot Tub and Pool Tips

Chemicals such as chlorine are very toxic to fish and animals.

8. When draining hot tubs or pools, direct the water slowly into the ground away from the lake. Never drain water into streets, storm drains or ditches.



Car and Driveway Tips

Oil, antifreeze and contaminants from car exhaust kill fish.

1. Fix oil and transmission leaks. Place a drip tray under the car. Never dispose of used oils and antifreeze into gutters or storm drains, all of which empty into the lake. Recycle used oil and antifreeze.
2. Wash cars with a minimum of detergent. Where possible, wash on gravel or lawns to avoid runoff entering storm drains.
3. Never dump leftover detergents or cleaning compounds into gutters, storm drains or ditches.
4. Sweep your walks and driveways. Hosing washes litter and pollutants into storm drains and ditches.
5. During construction projects, keep wet concrete from storm drains and ditches. It is very toxic to fish and other wildlife.

Sockeye rely on high quality, well-oxygenated water for egg incubation. There are a number of potential pollution sources in Cultus Lake and its basin that could degrade lake water quality. Inadequately treated sewage from residences and campsites may enter the lake and, although there is no agriculture adjacent to the lake, farms in the Columbia Valley, golf courses and residences around the lake use fertilizers and other chemicals. If not used properly, these may enter the lake directly or through groundwater.

Illustration, Jen McKim Stone, courtesy of Resort Municipality of Whistler.

Controlling the slippery slope

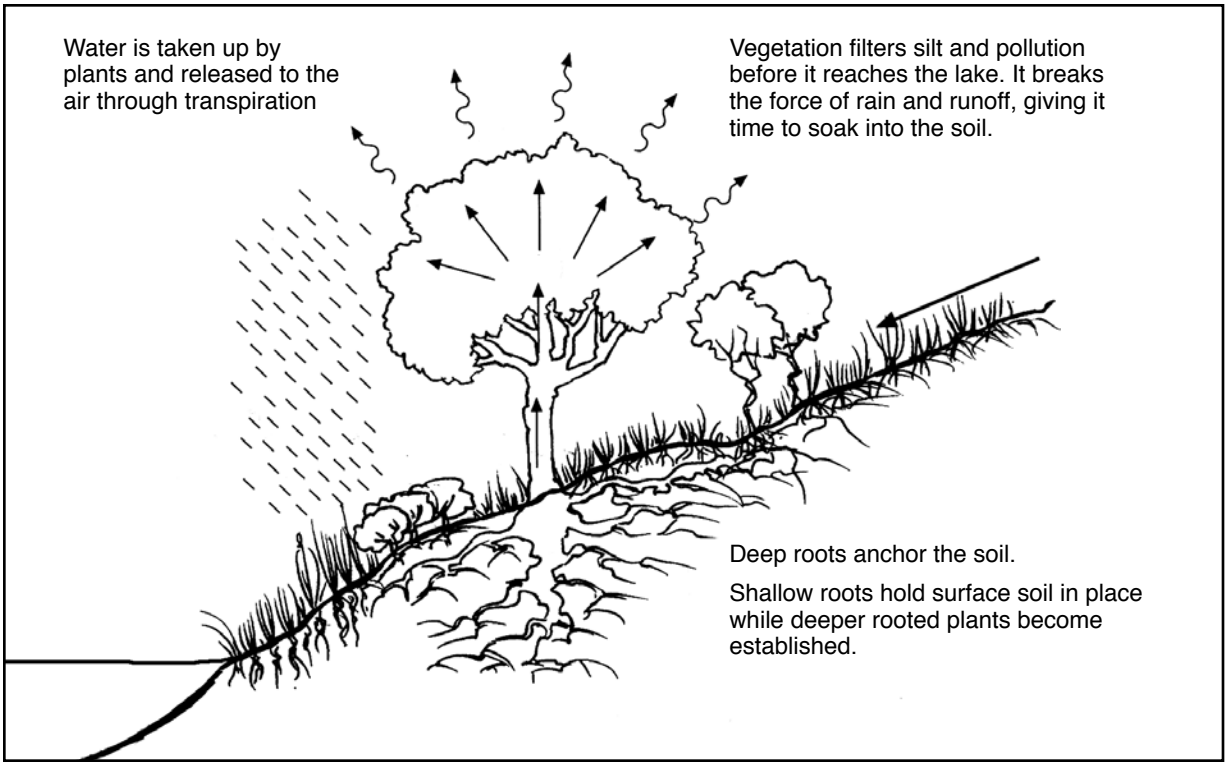
It seems like new housing developments are springing up every day in the Fraser Valley. Often they make use of hillsides, as lower areas are already taken up with homes or farmland. The areas around Cultus Lake are no exception.

Living on a slope requires some planning and maintenance, so that the next rainstorm doesn't wash away your landscaping and send harmful silt into the streams that feed the lake.

Using porous surfacing for patios, driveways and walkways, as already mentioned, will help water drain away slowly and harmlessly. Angling driveways across the slope rather than running them straight downward helps as well. Add landscaping ties as "runoff logs" every few feet, to stop water from running free and cutting a channel. On already-paved driveways, add speed bumps.

Instead of cutting down that tree that blocks the view, thin it or remove some of the limbs. Its roots might be holding your slope in place.

Make sure your drainpipes don't discharge from the top of a slope. The force of the water will carve away the bank. Pipes should drain in a flat area with stabilizing vegetation that will slow the flow and disperse it into the soil.



Encouraging plants, especially native species, is an effective and attractive way of stabilizing your slope.
Illustration courtesy of The Living by Water Project.

Dock talk

Docks can greatly alter the shoreline. They may cause erosion and silting by changing water flows. They can block sunlight from aquatic plants, leading to a loss in fish habitat. Pilings can damage shoreline vegetation and disturb soils.

Rather than building your own dock, consider using the public docks at Main Beach. If you decide a dock is necessary, select a style which allows a free flow of water beneath it and disturbs the lakebed as little as possible. Floating, post-supported, or cantilever docks are generally preferred.

Select non-toxic building materials and methods. Concrete, for instance, is very toxic to aquatic life until it hardens. Use pre-cast concrete structures if possible. Avoid pressure-treated wood and never use old railway ties. Both leach toxic chemicals. This is also not the time to start recycling old materials like steel drums, engine blocks and tires. They release by-products as they deteriorate.

Cedar is excellent for docks because it contains a natural preservative. Ultraviolet-resistant plastics or fibreglass make good decking. Use high quality hardware that resists corrosion.

Do not take building rock from the lake, as you may create an erosion problem and disturb habitat.

Try to minimize working over the water. Build the dock inshore and then move it into place. Pull it ashore for repairs and repainting. Always put a tarp or cloth underneath to catch paint and sawdust.

Cultus Lake's shoreline already has many docks, some of which are available to everyone.

Building a dock requires approval by various federal, provincial and local agencies to protect fish habitat, public access (the shore is Crown land below the high water mark), and so on. You also may find that leases – a common feature at Cultus Lake – affect what you may or may not do along the shoreline.

Get to know your septic system

Septic tanks are a serious problem on many lakes. Tests show that Cultus Lake's water quality is generally good – so far – but we need to keep our tanks pumped out and well-maintained to avoid seepage as population increases and equipment ages.

Warning signs that a septic system is failing

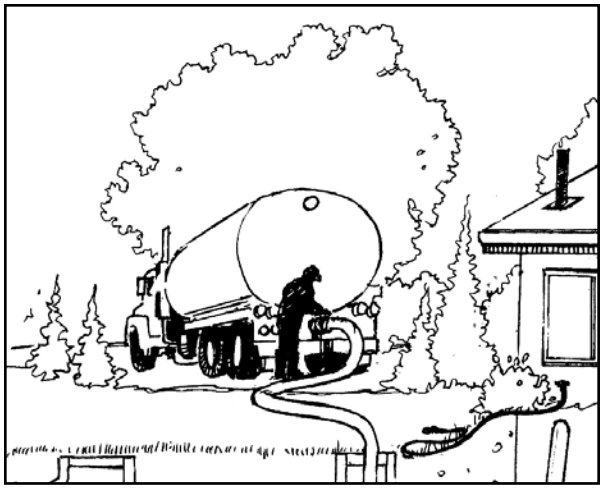
- Grass over the drain field has patches which look abnormally healthy.
- There are soggy areas, surfacing grey water, or surfacing sewage.
- Grass above the drain field is unusually wet.
- Sinks, showers and toilets drain more slowly.
- Sewage backs up in the toilet and drains.
- Your drain field is smelly!

How old is your Cultus Lake home? Maybe your parents built it when you were small, and you came up just for weekends. Now, you've renovated and moved in full-time; or you rent it out steadily from May to October. Either way, your tank and drainage field may not be large enough or efficient enough to process the waste they are receiving these days.

Wastewater flows into the tank, where solid waste settles and is digested and liquefied by anaerobic bacteria (bacteria that do not require oxygen to live). Once the liquid waste has had a chance to clarify through further settling, it is channelled out into the drain field and filters naturally into the soil. Impurities decompose and are used by plants or filter on into the groundwater.

So you can see that if the system is too small or inefficient for its load, impurities could leach into the groundwater, and that if you live right beside the lake, there is a very good chance the leachate will pollute your own waterfront and other water sources, such as wells, in the area. An additional hazard is that the nutrients created, such as phosphorus and nitrogen, will encourage algae and undesirable water weeds that clog propellers, spoil swimming areas, and use up oxygen needed by fish.

Learn about your system and its limitations. Don't put things into it that it can't break down, such as kitchen waste and sanitary products. Remember that cleaners and disinfectants will kill the bacteria that are at work in the tank. Leave clear instructions for renters and guests. Most importantly, have the system serviced and pumped out regularly and often.



Pump out your system regularly. Illustration courtesy of The Living by Water Project.

Beaches: natural is best

If you're lucky enough to have a natural sandy beach, the temptation is to "clean it up" – remove rocks, pull out weeds and shrubs, and haul away the driftwood. However, if you stop to think about it, those are the things that are anchoring your sand.

If your waterfront has been altered to have nothing but sand, consider creating a more natural shoreline by adding rocks, plants and driftwood. They are attractive to look at, add privacy, and might save your beach from washing way. Along with a natural buffer strip above the high water line, your entire waterfront will be better protected than if you had a retaining wall and a vulnerable open beach.

If you don't have a natural beach, consider alternatives before you build an artificial one. People may be tempted to remove rocks and native plants, but these are important habitat for wildlife, and are needed to filter runoff.

Water Plants

They may look slender and delicate, but water plants are an important barrier to erosion and to the migration of sand along the shore. Native species such as cattails, water lilies and pondweed break the force of the waves. They help filter and process chemicals in runoff, and allow sediment to settle. Young fish and insects live among their roots and stems. Birds build nests and raise their young in safety. Try to coexist with your water plants.

Note: Land below the high water mark of any water body usually belongs to the Crown and is public land. You need approvals from both provincial authorities and Fisheries and Oceans Canada for dredging or placing sand.

This undeveloped section of shoreline shows how rocks, native plants and trees help to anchor sand and create a natural beach.

Better boating

Pollution (hydrocarbons and metals), the construction of piers, and the inadvertent introduction and spread of watermilfoil are among the impacts associated with boating on Cultus Lake. There are a number of ways you can reduce the effects of your boat on Cultus Lake's water quality and wildlife habitat.

Reduce wake

Within 150 metres of shore, watch your wake. Slow down if your waves might erode banks and swamp nests. Stay well clear of nesting birds or other wildlife close to shore.

Be aware of B.C.'s Universal Shoreline Speed Restriction. Power boats normally are limited to 10 km/h (5.4 knots) when within 30 metres of shore in inland waters.

Don't stir up the mud

Avoid shallows or turn off the motor and use a paddle if the water is less than two metres deep.

Propellers stir up the bottom and chop up lake weeds. Spawning grounds can be smothered under the settling sediment. If your propeller chops up native lake weed, it reduces fish habitat. If it cuts up Eurasian watermilfoil, it may help propagate this pest.

Reduce fuel pollution

Even small fuel slicks poison or smother micro-organisms on the surface, affecting the whole food chain. Feeding fish take in hydrocarbons. Birds ingest oil as they groom their feathers.

Most spills happen during refuelling. If you have portable fuel tanks, always refuel on shore rather than on the water. Use a funnel and/or a flow-stop spout to give you more control. Avoid topping up; so often, that last little bit is too much. Wrap a rag or pad around the nozzle to catch spills. Have another cloth under the tank or jammed in the scupper to absorb any overflow from the tank.

Trailer your boat home rather than keep it moored on the lake, where it can slowly ooze oil.

Maintenance

Wash your boat where the runoff will not get into the lake – such as your lawn.

Take waste oils and antifreeze to a marina or service station for recycling.

Two-stroke, four-stroke or electric?

The best way to minimize water pollution (and save on fuel!) is to replace your two-stroke motor.

Older two-stroke engines may leave as much as a quarter of their oil and gas unburned, discharging it as exhaust into the water. ***You're paying for four litres of gas and you are essentially pouring one of them right into the water.***

The contaminants are toxic to fish even in small doses. Some are carcinogenic and may bio-accumulate in the food chain.

Consider a new direct-fuel-injection two-stroke engine. Four-stroke motors are probably even better. They are quieter, less smoky, well sealed against leakage, and burn fuel efficiently. Emissions may be five to 15 times lower than even a direct fuel-injection two-stroke.

Some manufacturers are phasing out two-stroke models. In Canada, any new engine for sale must bear a sticker attesting that it meets USA Environmental Protection Agency emissions standards. Ask the dealer to confirm that that particular model meets the standards. A loophole in the law allows even the most polluting motor to get a sticker provided the manufacturer's model line-up conforms to the standard on average.

Best of all, try to be emissions free! An electric motor is all you may need for a small lake. Or, if you have a bigger boat, consider an electric "kicker" for low-speed activities like trolling.

Help prevent the spread of invasive species

Non-native aquatic species have devastated some of B.C.'s freshwater ecosystems through habitat degradation and competition, predation and interbreeding with native species. Boaters and anglers can help keep them out of Cultus Lake.

Yellow perch and bass breed quickly and compete with and feed on native fish. They have not yet been found in Cultus Lake, but they are in nearby waters. Bullhead feed on native fish species and degrade habitat.

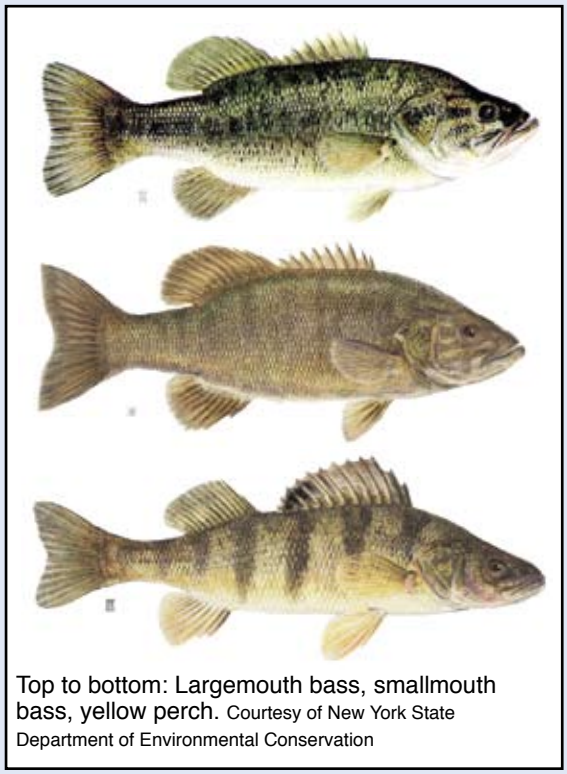
Bullfrogs spread quickly and compete with or feed on native amphibians, and even birds and fish.

Eurasian watermilfoil spreads quickly, degrading fish habitat and impairing boating, swimming and fishing activities. This plant has been identified as a major threat to sockeye in Cultus Lake.

You can help

- Do not move live fish, aquatic animals or plants between waterbodies. It is illegal to possess or move live fish without a permit, or to use live fish for bait.
- Do not use parts of fish caught in one waterbody as bait elsewhere. Dispose of guts appropriately.
- Report illegal activities. If you see any activities associated with the intentional or accidental movement of live fish and other aquatic organisms, please report these activities to B.C.'s Report All Poachers and Polluters (RAPP) line, toll-free: 1-877-952-7277.
- Thoroughly wash all boating and fishing gear. Before you leave the boat launch, drain the water from motors, bilges, transom wells and other containers; and remove plant parts, mud and other organisms from all gear. Wash and sun dry your boat, tackle, nets, waders and other equipment before you go to another lake or river or launch in the ocean.
- ***Please note:*** Whirling disease has attacked trout populations in Montana, just south of B.C. New Zealand mud snails, which can alter aquatic food webs, have been found in Idaho and Montana. If your boat and gear have been used in these areas, take extra care to thoroughly sterilize them. You'll find more information at **www.env.gov.bc.ca/fw/fish/ethics/stop_alien_invaders.html**

Bullfrog. Photo: Jennifer Stone



Top to bottom: Largemouth bass, smallmouth bass, yellow perch. Courtesy of New York State Department of Environmental Conservation

Eurasian watermilfoil

Eurasian watermilfoil is a non-native aquatic plant introduced to eastern North America in the late 1800s. It was first documented in Cultus Lake in the 1970s. It spread widely and rapidly and now covers most of the shallow area of Cultus Lake, approximately 30 hectares.

Control of watermilfoil is important for the health and safety of swimmers and boaters in Cultus Lake. The plant has broad impacts on shallow-water fish, insect communities and water quality. It adversely affects sockeye by decreasing the available spawning habitat. A known threat to juvenile sockeye in the lake is the northern pikeminnow, a native fish. Eurasian watermilfoil may extend the rearing habitat of pikeminnow, likely increasing predation pressure on sockeye juveniles.

How does it grow and spread?

Hand pulling may prove somewhat effective but it is labour-intensive and slow.

Watermilfoil fragments are created by waves and boaters and spread by water currents. When the water temperature is above 10C, sunken fragments take root.

Attacking the problem

Currently, two methods of watermilfoil removal are considered practical in Cultus Lake.

Rototilling removes the upper five feet of the plant. It has been used successfully in limited areas. It results in clear swimming spots but risks creating the fragments that allow the weed to spread.

The other way is for scuba divers to hand pull the entire plant and root.

Evaluation of this work is ongoing.

How you can help

- Learn to identify Eurasian watermilfoil.
- Clear plant material from boats, trailers and motors and dispose of plants away from the water, so you don't infect another lake.
- Work cooperatively with local authorities to control infestations.

Fish and fishing at Cultus Lake

Resident or migratory sport fish that call Cultus Lake home include kokanee, Dolly Varden, bull trout, rainbow trout, cutthroat trout and Rocky Mountain whitefish.

Other species include threespine stickleback, northern pikeminnow, peamouth chub, largescale sucker, redside shiner, western brook lamprey, Pacific lamprey and several sculpin species.

All five varieties of salmon - sockeye, chum, coho, chinook and pink - can be found here.

Spawning sites for salmonids are mainly in Sweltzer, Frosst or Spring Creeks. Chum, sockeye and kokanee are known to spawn in upwelling areas along beaches. Northern pikeminnow typically spawn off beaches in May, June or July, when the water warms up.

A combination of clarity and temperature creates ideal conditions for plankton, which makes Cultus Lake a prime feeding location for juvenile fish, especially sockeye and kokanee. Juvenile coho, cutthroat, steelhead and possibly bull trout and Dolly Varden migrate up Sweltzer Creek to spend up to two years feeding in the lake.

Local anglers and tourists find that fishing is best in the spring and fall, when the busy boating season is over. Trolling is the preferred method.

Fishing is prohibited in Sweltzer Creek.

Fishing for the five salmon varieties is not permitted in Cultus Lake.

When fishing for other species, there are measures you can take to avoid hooking or disturbing the salmon while they are waiting to spawn or actually laying their eggs. Use fishing gear which will avoid hooking salmon. Fly fishing gear with a floating line and a dry fly is preferable to sinking lines or spoons which might foul-hook spawners. If bait is allowed, use worms, grasshoppers or other insects, as these do not attract salmon.

Follow British Columbia's freshwater fishing regulations, and possess a valid freshwater fishing licence.

A mysterious monster

White sturgeon are the largest freshwater fish in North America, sometimes exceeding 6 metres in length. They are intriguing and mysterious denizens of the Fraser River watershed. Sturgeon have been sighted in Cultus Lake, and one was accidentally caught in a net used for culling pikeminnows. It was released alive.

Photo: David Willis

In 2003, the Committee on the Status of Wildlife in Canada (COSEWIC) designated white sturgeon an endangered species and it is now being considered for listing under the *Species at Risk Act* (SARA). For the latest information, visit www.cosewic.gc.ca and the SARA registry at www.speciesatrisk.gc.ca.

Sportfishing ethics

Code of Conduct

Fishing responsibly not only means protecting the environment and the resource, but also practising safe fishing habits and respect towards others. This Code of Conduct has been developed and endorsed by the Sport Fishing Advisory Board.

- Handle all fish with care.
- Limit your catch to ensure fish for the future.
- Leave your fishing spot cleaner than you found it.
- Respect the rights of property owners and other outdoor enthusiasts.
- Use the proper tackle and methods for the species being targeted.

Observe, Record, Report (ORR)

Observe: Some common violations are: exceeding the daily limit, fishing in a closed area, using illegal gear, damage to fish habitat and pollution.

Record: Carry a pencil and record your observations:

- Date, time and location
- Identity or description of violators
- Boat or vehicle description (e.g.: licence, colour, make)
- Evidence at the scene
- Action of violator(s)

Report: Violations should be reported as soon as possible to DFO's ORR phone line: 1-800-465-4336.

The provincial Ministry of Environment has established a toll-free hotline, Report All Poachers and Polluters (RAPP): 1-877-952-RAPP (7277)

The British Columbia Wildlife Federation offers rewards of up to $2,000 for information leading to charges being laid against a person harming fish and wildlife and their habitat, as well as to private property belonging to mining, forestry, farmers and ranchers or other private concerns. Call the RAPP line.

- Promote the sport by teaching children and new participants how to fish.
- Become informed about your fishery and participate in its management.
- Report all illegal fishing activities to the proper authorities.
- Respect the space of others; leave enough room for everyone to fish.
- Learn the fishing and boating laws and abide by them.

Catch and release techniques

- Use large lures or artificial baits to reduce the incidental catch of undersize fish.
- Do not overplay the fish; bring it in as quickly as possible.
- For a salmon under 30 cm, unhook it at the water surface to minimize handling. For a larger salmon, if it is too difficult to unhook it in the water, bring it onboard, remove the hook quickly and release it. This will cause less stress and damage to the fish.
- Use a soft knotless net to minimize scale loss.
- Handle the fish securely. Keep it immobile while the hook is removed then quickly release the fish into the water.
- Remove the hook with needle-nose pliers or surgical haemostats.
- Do not touch or handle a fish by its gills.
- To avoid injury, support the fish when lifting by placing one hand around the base of its tail and the other under its belly.
- To return the fish to water, release it at a 45 degree angle with the head pointing down and just above the waterline. If the fish is exhausted, revive it in the water by keeping a grip on its tail; move it back and forth slowly to increase water flow over the gills; wait until it is strong enough to swim out of your hands.
- Some fish may be hooked deep inside the mouth. If this is the case, cut the line as close to the hook as possible and leave it in. The hook will erode in time.

Cultus Lake Sockeye

Cultus Lake's unique sockeye are at the centre of conservation efforts that benefit the whole lake ecosystem.

The Cultus sockeye life cycle

The Cultus sockeye is a genetically unique population of salmon. Sockeye usually spawn in rivers and streams but Cultus sockeye spawn exclusively in the lake. They are also the latest to spawn of all the Fraser River sockeye. Cultus sockeye have a unique adaptation to spawning time: eggs that are spawned later actually develop faster. The fry also behave unlike most other sockeye fry: they school and move into deeper waters immediately after swimming up from the gravel, likely an adaptation to the many predators in Cultus Lake.

Cultus Lake sockeye have been counted and studied since the 1920s, longer than any other in B.C, making this salmon population one of the world's best-documented.

In 2002 Cultus sockeye were designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "endangered".

In mid-summer four-year-old sockeye return from the ocean to the Strait of Georgia. From July to December, they migrate into the Fraser River, through the Chilliwack-Vedder river system and up Sweltzer Creek to spawn in Cultus Lake.

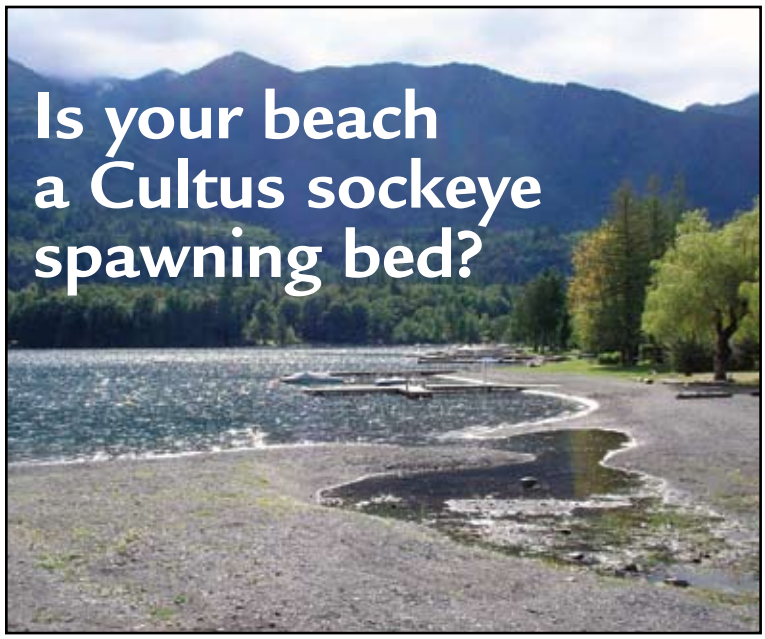
In the ocean young sockeye travel through the Strait of Georgia into the North Pacific Ocean, growing to adults over the next two years.

Eggs are laid and fertilized in gravel along Cultus Lake shoreline areas (November to December).

Smolts develop from fry, adapting to salt water as they migrate to the Fraser River estuary and into the ocean (April to May).

Alevins hatch from the eggs and continue to develop in the gravel (December to March).

Fry develop from alevins and swim up from the gravel, then move immediately to deeper lake water (March to April). Fry remain in the lake to feed and grow for one and sometimes two years.



The waters off Lindell Beach were once a favourite sockeye nursery.

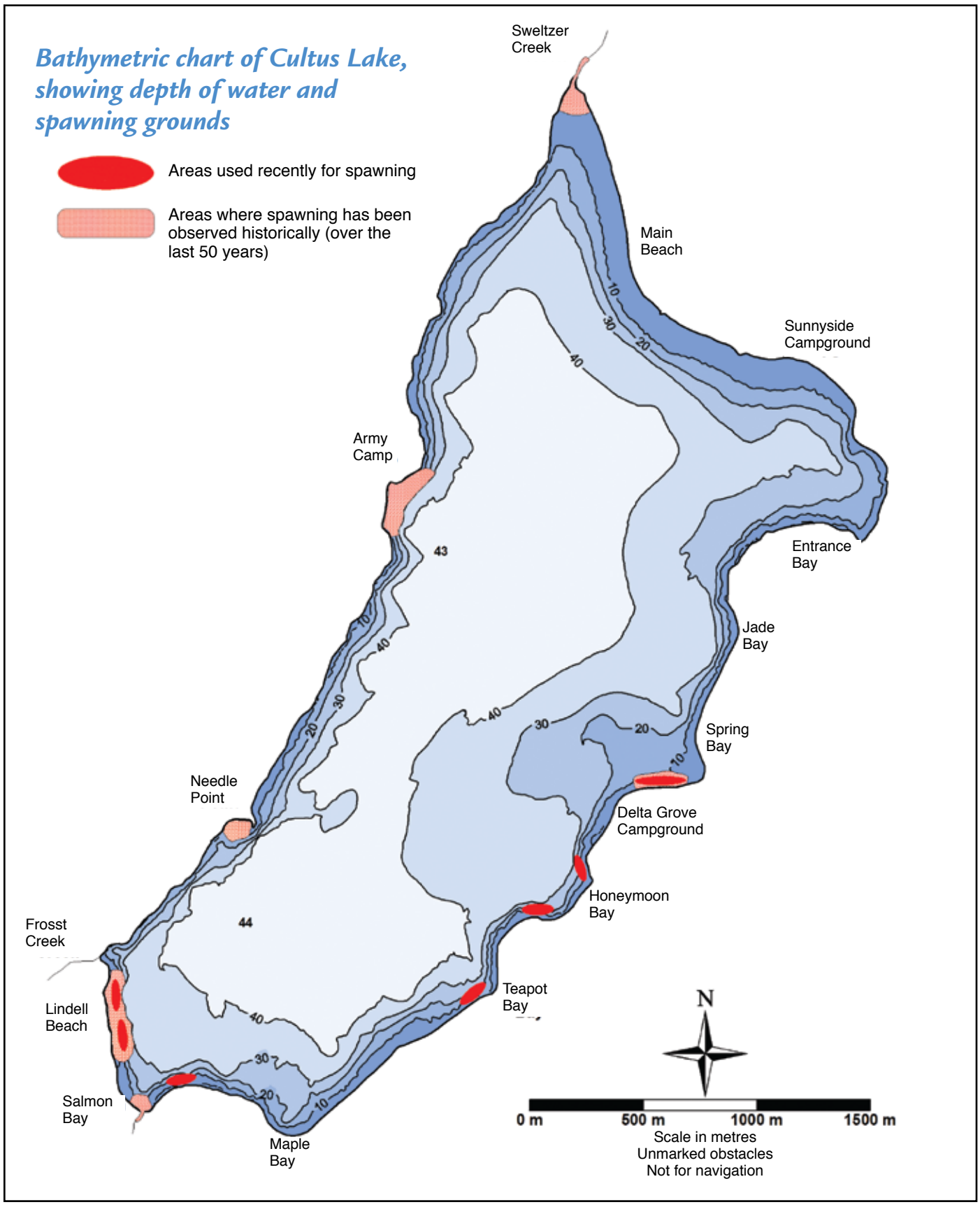
Most salmon spawn in rivers and creeks. One of the things that makes our Cultus sockeye unique is that they spawn right in the lake itself.

Eggs are laid and fertilized in gravel along Cultus Lake shoreline areas, in water as deep as 18 metres. Good spawning areas consist of gravel with a flow of well-oxygenated water and few aquatic plants.

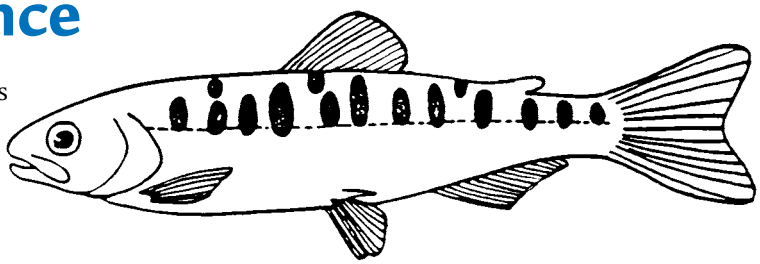
Historic spawning areas in Cultus Lake comprise about six hectares of eroded cobble and gravel along the lake shore at Lindell Beach, Snag Point, Spring Bay, Honeymoon Bay and Mallard Bay. Only about half of those sites were used in some recent years, mostly at Spring Bay, with a few spawners at Lindell Beach, Salmon Bay and Honeymoon Bay. Spawning has been observed at depths of 0.5 to six metres, and more recently in much deeper water.

In 2004 and 2005 studies were conducted at the four main spawning beaches. Most spawning habitat appears to be in good shape, though not all of it. Some areas were partially silted. Eurasian watermilfoil has taken over some spawning areas, possibly causing the sockeye to spawn in deeper, less optimal locations than in the past.

Quieter Spring Bay has become a more popular choice.


Bathymetric chart of Cultus Lake, showing depth of water and spawning grounds
Areas used recently for spawning
Areas where spawning has been observed historically (over the last 50 years)
Sweltzer Creek
Main Beach
Sunnyside Campground
Army Camp
Entrance Bay
Jade Bay
Spring Bay
Needle Point
Delta Grove Campground
Honeymoon Bay
Frosst Creek
Teapot Bay
Lindell Beach
Salmon Bay
Maple Bay
43
44
10
20
30
40
N
0 m
500 m
1000 m
1500 m
Scale in metres
Unmarked obstacles
Not for navigation

A delicate balance



The Cultus sockeye spawning system is beautifully geared to the attributes of the lake itself.

In river habitat, where most other salmon spawn and rear, the water is kept cool and oxygenated because of riffles; vegetation on the banks provides shade, and woody debris and deeper pools provide hiding places. Cultus Lake sockeye get their shelter, food and oxygen through very different lake processes.

Upwelling groundwater and circulating lake water are key attributes of Cultus Lake. Cultus sockeye spawn late in the year. They may require incubation areas where warmer groundwater (8C) mixes with cooler lake water (average 6.4C, but as low as 2.5C) so that eggs can develop fast enough for emergence in April and May. Groundwater also removes the fine sediment and metabolic wastes that are removed by the current in rivers.

Groundwater has little or no oxygen. However, the lake solves that problem too!

In winter, highly oxygenated surface water cools and sinks, and strong winds across the lake promote circulating lake currents.

Because wind intensity varies across the lake, the strength of currents may also vary from place to place. Consequently, the substrates selected for spawning in areas with less circulation may have to be more permeable to permit oxygenated water to reach the eggs. Thus, suitable spawning habitat depends on a complex interaction of temperature, oxygen and substrate.

Fry swim up from the gravel then move immediately to deeper lake water in March and April. They remain in the lake to feed and grow for one and sometimes two years.

Cultus Lake's small size and its typically calm and warm summer weather result in temperatures in the upper water layer that approach the lethal limit for sockeye. In the summer, surface waters may exceed 20C while lake bottom temperatures average 6C.

But, because it is such a clear lake, light can penetrate the deeper, cooler waters as far down as 16 metres. Cultus Lake also has naturally high nitrogen and phosphorus concentrations. These features are favourable for the production of phytoplankton. These microscopic aquatic plants are prey for zooplankton (microscopic aquatic animals), which are a favourite food for sockeye.

Salmon eggs need a combination of low temperatures and sufficient oxygen to incubate successfully. Photo: Jeremy Heighton

The pikeminnow problem

The northern pikeminnow is a native resident fish species. They are major predators of juvenile sockeye salmon in Cultus Lake. There are now fewer sockeye in Cultus Lake than pikeminnow and this creates a significant threat to salmon survival.

A tagging program begun in 2004 found an estimated population of 60,000 to 70,000 adult pikeminnow in Cultus Lake. Greater knowledge of pikeminnow locations and movements at all times of the year, using acoustic tags and underwater receivers, is helping to assess their impact on sockeye and assist in their removal when necessary. Research to date suggests that pikeminnow predation on juvenile sockeye is likely highest in the fall and winter months.

In 2006 and 2007 commercial purse seiners helped out by removing 15,000 adult pikeminnow each year. All bycatch, such as trout and char, were released unharmed. Photo: Vivian Magnusson

Northern pikeminnow (*Ptychocheilus oregonensis*)

Past research shows that predator removal can increase the number of sockeye fry. Stationary trap nets, seining and angling have proved effective methods of capturing pikeminnow, as has the annual pikeminnow fishing derby.

This family is taking part in the Fraser River Salmon Society's annual pikeminnow fishing derby.

The perilous years at sea

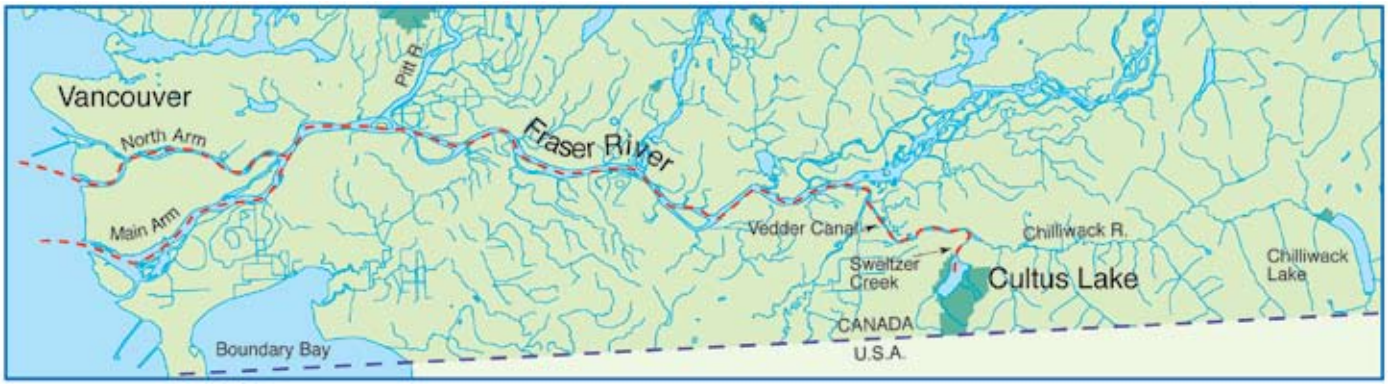
During the two or more years of their life cycle when they are out to sea or heading up the Fraser River, Cultus sockeye are mixed in with other salmon populations. Fisheries managers apply a variety of strategies to monitor them and, where possible, control how many are caught.

Cultus sockeye are harvested by commercial, recreational and Native fisheries over a broad geographic area from Johnstone Strait, Straits of Juan de Fuca and Georgia and throughout the Fraser River and its tributaries.

Cultus sockeye belong to one of approximately 40 unique Fraser River sockeye stocks. For fishery management purposes, Cultus sockeye are grouped among the Late run stocks. Since the Late run fish are all returning to the Fraser River at roughly the same time, it is very difficult to separate the different stocks until they arrived at their natal spawning grounds.

Before 1990, the total harvest of Fraser River sockeye averaged over 70 per cent and was often over 80 per cent (seven to eight out of every 10 fish returning were caught). However, with the recent decline of the Late run, fisheries managers reduced takes to the range of 10 to 30 per cent. When necessary, further reductions to between 10 and 12 per cent are implemented to help Cultus sockeye recover.

Fishing restrictions have had severe impacts for commercial, recreational and Native fisheries. A newly developed evaluation model assists fishery managers in assessing different combinations of recovery measures. Results show that if smolt survival can be improved through predator control and habitat improvement, and hatchery enhancement is continued or expanded, Cultus sockeye may be harvested at somewhat higher exploitation rates and still recover.



The last stage of the adult sockeye's journey takes him or her through the busiest, most densely populated region of British Columbia.

The Sweltzer Creek corridor

The sockeye have survived deep sea fisheries. They've made it up the Fraser River. They are almost home to Cultus Lake, but there is one more gauntlet to run: Sweltzer Creek.

In the creek, migrating adult sockeye swim in bursts through shallow areas and rest in deeper pools. Consequently, flows must be sufficient to allow passage over riffles and barriers, and large woody debris and boulders are needed to provide resting areas and cool water refuges. Riparian (streamside) vegetation moderates water temperature and can provide protection from predators.

Sweltzer Creek is a critical part of the migration corridor for the sockeye.

Young salmon move downstream in the spring months and the adults return through the creek to spawn in Cultus Lake in the autumn. The highest period of adult migration is late August and September. This corresponds with high water temperatures – which result in less oxygen for fish – and peak recreational activity. People need to be very cautious. Any disturbance of the salmon at this time may delay their migration and hinder their ability to successfully mate and reproduce. You can help by staying out of the creek, and keeping dogs away from it as well.

Hey, you! Out of the creek, please!

Sweltzer Creek is short and relatively shallow with little channel complexity or large woody debris. Water temperatures can exceed 25C in August and September, although cut-off seepage channels from the Chilliwack River and groundwater infiltrating pools may provide cooler refuge areas. Prolonged exposure to high temperatures can be lethal to sockeye. Any delays while swimming up Sweltzer Creek may decrease spawning success or increase mortality.

For the population to have a chance at recovery, these areas need to be minimally obstructed or disturbed so that the fish pass through the three kilometres as quickly as possible. Activities that may threaten the population are those that would delay fish in the creek, including recreation in and near the creek and at the lake and creek outlets. Some activities of concern are angling near the mouth, swimming at a campsite in the middle reaches, swimming in the upper reaches and around the lake outlet, boating and the operation of a low level weir (to control lake levels) at the lake outlet. The population is more vulnerable here than at any other point on the migratory corridor (with the possible exception of net fisheries) so it is very important to minimize disturbance.

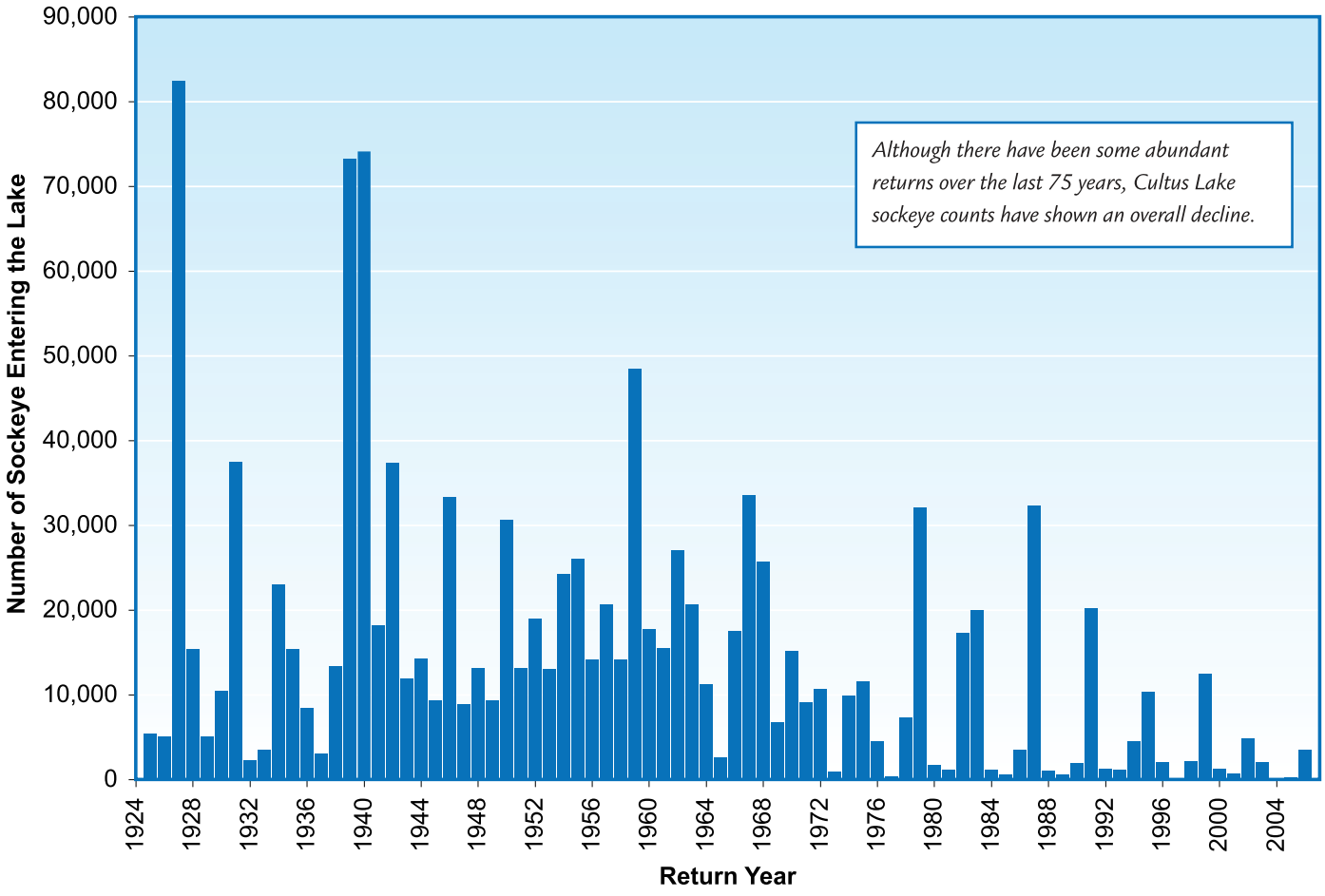
The years of decline

In the last few decades Cultus Lake sockeye have seriously declined.

There was a time when more than 70,000 fish returned to spawn. But in latter years, the population has declined to the point where fewer than 500 fish return some years, and there is evidence that irreplaceable genetic diversity is being lost.

Three main factors were the cause:

- Over-fishing before 1995
- Warmer ocean temperatures from El Niño, a warm current of water that appears every three to seven years in the eastern Pacific Ocean. This reduces survival rates when the salmon are out to sea.
- Since 1995, high pre-spawn mortality caused by unusually early migrations into freshwater and associated infections



The road to recovery

Work is underway to save endangered Cultus sockeye. A Cultus sockeye conservation team has been assembled from various disciplines throughout Fisheries and Oceans Pacific Region. Cooperative partnerships have been formed between government, local interest groups and concerned citizens. Together, they are taking action to ensure the survival of the unique Cultus Lake sockeye.

A National Conservation Strategy has set out four objectives to help the team reach its goal. This is to halt the decline of the Cultus sockeye population and to return it to the status of a viable, self-sustaining and genetically robust wild population that will contribute to its ecosystems and have the potential to support sustainable use.

Objective 1

Ensure the genetic integrity of the population by exceeding 1,000 successful adult spawners with no fewer than 500 successful adult spawners on any one cycle.

Objective 2

Ensure growth of the successful adult spawner population for each generation (that is, across four years relative to the previous four years), and on each cycle (relative to its brood year).

Objective 3

Rebuild the population to the level of abundance at which its "endangered" designation, as listed by the Committee on the Status of Endangered Wildlife in Canada, can be changed to "not at risk."

Objective 4

Over the long term, rebuild the population to a level of abundance that will support ecosystem function and sustainable use.

The Sweltzer Creek counting fence is a vital tool in monitoring the success of recovery initiatives. Volunteers and staff in the Cultus Lake community help to count the adults and smolts that travel into and out of the lake during migration periods. To measure the enhancement program, hatchery fish are fin-clipped to distinguish them from wild sockeye.

The Captive Brood Program

Wild (non-fin-clipped) sockeye are recovered at Sweltzer Counting Fence.

Sockeye adults return to Cultus Lake in autumn. Hatchery (fin-clipped) fish are counted as they pass into the lake, where they spawn naturally.

Adults travel great distances, spending 28 to 30 months in the Pacific Ocean.

The fry grow rapidly and in their second spring as smolts they migrate to the sea.

The fin-clipped fish are transported to Cultus Lake by tank truck, and released throughout the year at various sizes.

Up to one million extra eggs from the captive broodstock are reared to fry/smolt stage. These are fin-clipped for future identification.

From these, 500 adults will be kept in captivity as broodstock. Fry or smolts not needed are released to the wild.

6 eggs from each group (3000 eggs) are raised at Inch and Rosewall Hatcheries.

500 groups of genetically distinct eggs are collected and safely incubated at Cultus Lake Salmon Research Laboratory.

The goal of the Captive Brood Program is to produce 500 genetically diverse adults each year, kept in captivity to be used as broodstock. These adults are representative of the wild Cultus sockeye population. Their offspring will help maintain this unique run until it has the ability to sustain itself.

Our community cares

Groups and individuals in the Cultus Lake community have come up with some innovative and effective ways to nurture the lake's ecosystems and to help the sockeye recover. Here are just a few examples.

Join in!

More volunteers are always welcome as we carry on the work of caring for Cultus Lake!

Cultus Lake Elementary School students have created a Stream of Dreams on their schoolyard fence. It reminds residents and visitors that Cultus Lake is a special place to live that should be shared with all wild things.

The Fraser Valley Salmon Society organizes the annual Cultus Lake Pikeminnow Derby. Northern pikeminnow prey on sockeye, and this Father's Day event helps reduce the population.

The Chilliwack High School Environmental Club helps with sockeye recovery efforts such as counting fish at Sweltzer Creek fence, improving awareness of habitat sensitivity among summer lake visitors and assisting with organization of public meetings.

Students from local schools are preparing to become the next generation of environmentalists and scientists. These students are working with Eurasian watermilfoil at Cultus Lake Salmon Research Laboratory.

Contacts and Resources

Environmental Protection

Chilliwack Waste Disposal and Recycling Options
www.chilliwack.com/main/page.cfm?id=202

Forest Fire Reporting
1-800-663-5555

Observe, Record, Report (ORR)
Report fisheries and wildlife violations
1-800-465-4336

Provincial Emergency Program
Toxic spills, flood, earthquake
1-800-663-3456

Recycling Council of BC Hotline
1-800-667-4321.

Report All Poachers and Polluters (RAPP)
1-877-952-RAPP (7277)

Report Illegal Dumping
1-800-655-DUMP (3867)

Community Organizations

Chilliwack River Action Committee
www.fishingwithrod.com/crac/

Cultus Lake Aquatic Stewardship Strategy
604-826-1661

Cultus Lake Community Association
604-858-7192

Fraser Valley Bald Eagle Festival
604-826-6914l
www.fraservalleybaldeaglefestival.ca

Fraser Valley Conservancy
604-864-5530
www.fraservalleyconservancy.ca

Fraser Valley Regional Watersheds Coalition
604-702-5006
www.fvrwc.org

Great Blue Heron Nature Reserve Society
604-823-6603
www.chilliwackblueheron.com

Local Government and Administration

Chilliwack River Hatchery
604-858-7227
www-heb.pac.dfo-mpo.gc.ca/ facilities/
chilliwack/chilliwack_e.htm

City of Chilliwack
604-792-9311
www.chilliwack.com

Cultus Lake Parks Board
604-858-3334
www.cultuslake.bc.ca

Cultus Lake Provincial Park
604-466-8325
www.env.gov.bc.ca/bcparks/explore/parkpgs/
cultus.html

Cultus Lake Salmon Research Laboratory
604-824-4700

Fisheries and Oceans Canada
Community Advisor, Eastern Fraser Valley
604-824-4715

Fisheries and Oceans Canada
Sport Fishing Information
(24-hour recorded message): 1-866-431-3474
Greater Vancouver: 604-666-2828
www.pac.dfo-mpo.gc.ca/recfish

Fraser Valley Regional District
604-702-5000
www.fvrd.ca

Soowahlie First Nation
604-858-4631

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Caring for Cultus Lake

A Handbook for Residents and Visitors

Whether you live here year round or spend a week in summer, the unique beauty of Cultus Lake is important to you. This book is designed to help us all to understand the lake and its needs, and to become its stewards so that it will delight generations to come.