



## An Introduction to Alberta's Wonderful World of Fishes

From the tiny nine-spine stickleback, which grows to a length of only six centimetres to the two-metre long lake sturgeon, Alberta has a very interesting and varied fish **fauna**. Adjectives such as cool and cold-water, stocked, introduced, native, bait, prey, game and hybrid are used to describe Alberta's fish species.

Of the 62 species of fish in Alberta, 41 species go unnoticed by most people. Generally, these species are small in size, and provide food for fish-eating birds and mammals, and for other fish. With names like northern redbelly dace, emerald shiner, brassy minnow, longnose sucker, slimy sculpin and Iowa darter, these fishes represent a wide range of environmental adaptations, physical characteristics and behaviours.

The remaining 21 species of fish are called game or sport fish, and are of interest to anglers, and commercial and domestic fishers. Sixteen of these species are native to Alberta and five species have been introduced to this province through stocking. Three of the native game species — sauger, mooneye and cisco — are not well known.

The five species of game fish that have been introduced to Alberta are (eastern) brook trout, brown trout, golden trout, smallmouth bass and Dolly Varden (different from our native bull trout, which people used to call Dolly Varden). Most were introduced in the early to mid part of the 20<sup>th</sup> century either as experiments by fisheries managers or by individuals acting on their own initiative. Rainbow trout are *mostly* introduced; the only native populations of rainbow trout exist in the Athabasca River and drainage. The brook, brown, golden and rainbow trout have become integral components of the game fish fauna of Alberta, while the other two introduced species have not. The Dolly Varden occur only in Chester Lake near Canmore and smallmouth bass may still exist in Island Lake, north of the town of Smoky Lake.

*Fauna – animal life of a particular place or time.*

Alberta

Other introduced species (non-game) that have developed self-sustaining populations include, goldfish in Henderson Lake in Lethbridge and the three-spine stickleback in Hasse Lake.

**In case you're counting...** the first edition of The Fishes of Alberta, published in 1970, Paetz & Nelson reported 59 species of fish in Alberta. This total has now changed to 62 to include the introduction of smallmouth bass and the "discovery" of the prickly sculpin in the Peace River. The status of grass carp, stocked in a few dugouts and irrigation canals to control weeds is yet to be determined. Also of note is the renaming of the shorthead sculpin in the St. Mary River in southern Alberta to the *St. Mary River sculpin* - possibly a new and distinct species!

These species were illegally introduced.

The introduction of the sailfin molly, African jewelfish and western mosquito fish in the Cave and Basin hot spring in Banff National Park probably contributed to the 1988 extinction of the Banff longnose dace, which lived in the ponds below the hot springs. The Banff springs snail is an endangered species (2000), due to fish

introductions and other human impacts at the Banff springs. The introduction of new species or even the transfer of fish from one water body to another can threaten the viability of existing fish populations, spread disease and compromise the integrity of our aquatic ecosystems.

## **Fish are Important to Albertans - Food, Recreation and Economic Benefits**

**The Domestic Fishery** - Indian subsistence or "domestic" fishing provides opportunities for Treaty Indians to fish for food for their household needs – a traditional use of Alberta's fish resource. The Indian food fishery is recognized in law and by government policy.

Domestic Fishing Licences are free and allow Indians to fish for food with a net. Other forms of Domestic Fishing Licences available from Alberta Sustainable Resource Development include: Metis Domestic Fishing Licences issued to residents of Metis Settlements only for lakes on or adjacent to Metis Settlement Lands; and Domestic Fishing Licences issued to individuals after approval of an application showing a need to fish for food for subsistence purposes.

**The Sportfishery** - Each year over 320,000 anglers spend approximately \$340 million on goods and services related to sportfishing in Alberta. In 2000, the most

**Did you know?** In Alberta, the common name "pickereel" is often used for walleye. But that is technically incorrect because "pickereel" is the accepted common name applied to certain types of pike found in eastern Canada.

recent year for which information is available, anglers spent the equivalent of more than 2.9 million days fishing, catching more than 12 million fish, of which over 10 million were released and about

two million were kept. Ice fishing, fishing stocked water bodies and catch-and-release fishing are gaining in popularity. Relaxation, enjoyment of nature, family togetherness, challenge and excitement, catching fish to eat, and improving fishing skills are reasons anglers go fishing.

**The Commercial Fishery** - Commercial fishing in Alberta involves primarily the gill-net fishery, but commercial baitfish fishing operations and the fishing lodge industry are considered part of the overall commercial fishery, too.

Commercial fishing with gill nets has been carried out in Alberta since the late 1800s. This fishery targets lake whitefish, but lake trout, walleye, northern pike, yellow perch, cisco and goldeye are also caught. Commercial fishing regulations are set to minimize the incidental or **by-catch** of **non-target** species.

In 1999/2000 the commercial (gill net) fishing industry produced 2.2 million kilograms of fish valued at \$3.2 million to local economies. More than 85% of this harvest consisted of lake whitefish and cisco. The majority of this fishing occurs during the winter months when the best prices can be gained. The catch is sold either through the Freshwater Fish Marketing Corporation, a federal crown corporation that supplies mainly export markets, or directly to consumers. Approximately 40% of the commercial fishing catch is sold directly to Albertans.

### **Healthy Fish Populations are Indicators of Healthy Ecosystems**

Although fish are valued mainly as a source of food, recreation and economic returns, Albertans' interest in fish, their habits and aquatic environments is growing with increased environmental awareness. Fish populations are sensitive. Therefore, healthy, uncontaminated fish populations can indicate a healthy aquatic environment. The presence of fish can tell us that smaller prey fish species and the small aquatic organisms they eat exist in large numbers. Healthy fish populations can also help the survival of predators like osprey, fishers, mink and bears.

### **Fish Viewing Opportunities and a Source for Scientific Study**

While perhaps not as dramatic or well-known as spawning runs of salmon in British Columbia, there are opportunities to view fish in their natural environment in Alberta. In September, bull trout can be observed spawning in Smith-Dorrien Creek (a tributary of Lower Kananaskis Lake), in the Elbow River between Elbow Falls and Canyon Creek, and in the Sheep River between Sheep Falls and

**Did you know?** Suckers can be seen in many streams such as Fish Creek, Willow Creek at Chain Lakes Reservoir, and creeks in Touchwood Lake campground during their spawning run in May and June. Cutthroat spawn in late June and early July. Brook trout spawn in late September and October. Brown trout spawn from mid-October until late November.

Gorge Creek. Volunteers have helped tag, measure and weigh spawning bull trout as part of a special study conducted at Smith-Dorrien Creek. Each year many scientific studies are conducted to expand our knowledge of our fish resources and aquatic ecosystems.

The public can view fish-rearing areas and interpretive displays at both the Cold Lake and Sam Livingston fish **hatcheries** as well as at the Raven and Allison Creek **brood** trout rearing stations near Caroline. Currently, work is underway to develop a world-class education and interpretive centre, called the Bow Habitat Station, at the Sam Livingston Fish Hatchery in Calgary.

**By-catch** – species of fish caught in commercial fishing gill nets unintentionally. While these nets are set in specific areas, and constructed in such a way as to maximize the harvest of a specific fish (often whitefish), other species are caught.

**Non-target** – species caught unintentionally, i.e. commercial fishers seeking a particular species will catch other species for which they do not have a licence.

**Hatchery** – fish culture facility that raises fish from eggs to stocking size, usually fingerling.

**Brood station** – fish culture facility that raises adult trout for the purpose of supplying fertilized eggs to hatcheries.

# Managing Our Fisheries Resources

## The Demand for Fish Exceeds Supply

Alberta does not have an abundance of fish habitat; only 2.4 percent of Alberta is covered with fresh water. About 800 Alberta lakes contain native game fish populations. Compare this to Saskatchewan's estimated 94,000 fish-bearing lakes, Manitoba's 110,000 and Ontario's 250,000! Another 250 to 300 Alberta water bodies (such as municipal ponds) are stocked annually with rainbow trout.

**Did you know?** While Saskatchewan, Manitoba and Ontario each have a ratio of about two anglers per lake, Alberta's ratio is nearly 400 anglers per lake!

Alberta's human population has been quickly increasing over the past 30 years. Most people live in the central and southern parts of the province, while most of our

fish-bearing waters are in the north. This results in a high demand on the fish resources in the more accessible waters. Fish populations in Alberta have declined as a result of overharvest and habitat alteration.

Other factors can place more strains on the population. Several species of **prey** and sport fish are known to hybridize or reproduce with other genetically similar species. For example, white suckers hybridize with longnose sucker, and lake whitefish hybridize with cisco. While this is a natural phenomenon occurring when similar species spawn in the same area at the same time, hybridization becomes a concern when native fish hybridize with non-native fish, such as cutthroat trout hybridizing with rainbow trout. These hybrids, called cutbows, along with all other **hybrids**, are sterile and use food and space needed by other fish which *can* reproduce and help sustain the population. In addition, these hybrids dilute the **gene pool** of sport fish native to the watershed.

## How Are Our Fish Resources Managed?

Actually, it's not the fish resources that are managed; it's the users of the resource who are managed with regulations concerning how, when, where and how many fish can be harvested. The impacts of all users — recreational (sport), domestic and commercial — are taken into account, including **angling release mortality** and the bycatch of non-target species in domestic and commercial fishing. Managing for conservation requires both the control of fish harvest and the protection of fish habitat. While Alberta Sustainable Resource Development is responsible for managing our fish resources, Alberta Environment, through the Water Act, protects the aquatic environment and ensures the wise use of water resources.

Tools used by fisheries managers to regulate the sport fishery include *season* and *area closures* to protect spawning fish, *catch limits* to distribute the available harvest of fish among many users, *size limits* to ensure enough fish of spawning size survive to sustain the population, *gear restrictions* to support ethical conduct, and *bait restrictions* to ensure hooks are not taken too deeply, causing hooking mortality. Careful handling and quick release increases fish survival.

**Prey** – an animal hunted or captured by another for food.

**Hybrid** – an animal or plant resulting from a cross between genetically similar, but different species; usually sterile.

**Gene Pool** – genes are the basic unit of hereditary information. The gene pool is the set of genetic information that collectively defines a species. The greater the differences in genes, the better the species can adapt to its environment.

**Angling release mortality** – some of the fish released by anglers (approx. 10%) die due to injuries sustained while being caught and released.

For the domestic net fishery, licence holders are authorized to set one net of 95 metres (100 yards) per lake; a *minimum mesh size* is specified so that only the larger, mature fish that have already spawned a number of times are harvested. Streams and rivers, and the mouths of tributaries, are closed to fishing so that overharvest does not occur, and at certain times of the year, areas in some lakes are closed to fishing in order to protect spawning fish. In addition, *depth restrictions*, or controlling the depth at which nets can be set, protect vulnerable fish stocks while still allowing the harvest of more plentiful fish species such as lake whitefish. Fish caught by domestic fishing licence holders are for their household use only as a source of food and cannot be sold.

Participation in the commercial net fishery is also tightly controlled. Licensed fishermen must abide by *gear restrictions*, and *season* and *area closures*, including *depth restrictions*. Most commercial fishing regulations are geared to maximize the catch of target species such as lake whitefish, while minimizing the incidental catch of non-target species such as walleye, northern pike and lake trout. *Quotas* for the maximum amount of a target species that can be harvested are set on a lake-by-lake basis, as are *tolerance limits* for the maximum amount of non-target species that can be harvested. Each commercial fishery is monitored closely and closed once a target species quota or a non-target species tolerance limit is met or exceeded.

### The Regulation-setting Process

The regulation-setting process seeks to strike a balance between the desires of the users of the resource (demand) and the resource available to be used (supply). This process relies on clear, two-way communication between fisheries managers and the public. The exchange of scientific data and user expectations result in better regulations and better regulation compliance.

During the development of management and recovery plans for walleye, northern pike and the eastern slopes trout fisheries, there was extensive public consultation. The regulations that resulted from this process are complicated in that they are **water body/species specific**. Biologists and anglers agree that this is the best way to recover and maintain fish populations because the allowable

**Did you know?** Fish habitat is defined in the federal Fisheries Act as "spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes". Equally important is the need for a year-round supply of good-quality water.

harvest is linked to the productive capability of each fish population and the productive capacity of the water body.

In the future, regulations may begin to take into account the interactions of species, so that

regulations for all species in a water body, especially where species such as walleye and northern pike compete for the same food source, will be adjusted to provide the fishery the public desires. For example, this could mean developing regulations to support a good walleye fishery or a good pike fishery, in place of regulations that would have supported only an average walleye/pike fishery.

*Water body/species specific – regulations that are specific to a particular species within a particular water body, rather than a regulation for a fish species, regardless of where it is caught.*

However, this requires a great amount of information about each water body and population.

Critical to the regulation-setting process is information on the **age and size distribution**, and growth rates of each fish population. With the assistance of the Alberta Conservation Association, volunteers, and conservation groups such as Alberta Fish and Game Association and Trout Unlimited, fish population inventories are conducted using such tools as **creel census**, **test netting** and **electrofishing**. Information on spawning success and **recruitment** (rate of reproduction) is very important as well.

### **Making Sense of Regulations**

Some of the regulations require the angler to have a clear understanding of fish biology for the regulations to even make sense. For example, some anglers believe that large fish produce the most eggs and therefore should be released. This belief is contrary to fish biology; biologists know that having more medium-sized fish in a population is more beneficial because their egg-producing capacity is greater than that of a few large fish. And the eggs are of better quality, too. Minimum-size limits are good management tools that protect fish populations while providing anglers with an opportunity to catch and keep large fish.

### **Fish Stocking**

It is illegal to release live fish or live fish eggs into any waters except back to the waters from which they were taken. The Alberta Government's fish stocking

**Did you know?** While fish stocking and fish transfers are useful tools, they are not suitable long-term solutions for fisheries that have declined due to over-harvest. The habitat in Alberta's lakes and rivers can only produce a certain number of fish (whether they have been stocked or not).

program (currently administered by Alberta Sustainable Resource Development) is one exception to this rule. Each year, about four million fry and fingerlings from different species of sport fish are raised and stocked in reservoirs,

lakes, and constructed ponds which cannot support a native fish population. This is done to provide the public with a variety of sportfishing opportunities while taking some pressure off "wild" (non-stocked) fish populations.

All fish stocking is consistent with water body management plans, which consider criteria such as water quality, physical characteristics, public interest and the characteristics of existing fish populations.

### **Protecting Fish Habitat**

An equally important aspect of managing our fish resources involves managing people's activities where fish habitat is concerned. Fish are a product of their habitat, and to produce fish there must be sufficient, suitable habitat available. Work in and around water bodies must result in "no-net-loss". In some cases adverse impacts are temporary and steps can be taken to minimize these impacts (mitigation). Longer-term impacts may require other steps to replace or offset the loss of fish habitat (compensation).

**Age and size distribution** – ranges of ages and sizes of fish species within a water body.

**Creel census** – descriptions of an angler's catch, including the number, size and species of all fish caught.

**Test netting** – using nets to trap sport fish so that biologists can determine the numbers, sex and species of fish in a water body.

**Electrofishing** – using electricity to temporarily stun fish so that sex, age, weight and species may be recorded by biologists, who may also implant fish with radio transmitters for tracking purposes.

**Recruitment** – describes the number and rate at which fish enter or become part of a population, as in "sufficient recruitment is needed to maintain a population, and offset fish harvest."

Activities that are affected by the guideline of **no-net-loss** of productive fish habitat include recreational development, timber harvest, agriculture and cattle grazing, petroleum and mineral exploration and extraction, and any other activity that may affect the aquatic environment. Developers must identify critical habitats for all life stages of the fish affected. Appropriate habitat protection, rehabilitation and compensation measures need to be included in development plans. The effectiveness of habitat rehabilitation and compensation actions must be monitored and maintained.

### **Species of Concern Have a Brighter Future**

By the mid-1990s, populations of bull trout, Alberta's official fish emblem, had declined severely due to overharvest and habitat alteration. However, sportfishing regulations prohibiting the harvest of bull trout (zero catch limit) implemented in 1995 are already having a positive affect. In Lower Kananaskis Lake, where harvest has been prohibited since 1992, there are reports of increased bull trout catch rates and **slower growth rates** for these fish, both signs of population recovery. Elsewhere in the eastern slopes there are reports that the numbers and size of bull trout are increasing. Again, it is important to know something about fish biology to understand the regulations. While anglers may see an increased number of bull trout, they should also know that bull trout are not ready to **spawn** until they are about six years of age, and usually over 40 cm long!

Management plans developed from 1996 to 1998 to maintain and recover populations of walleye, and east slopes cold-water fish species such as Arctic grayling, rainbow trout, brown trout and cutthroat trout have brought into place more restrictive regulations. But the restrictions are also more realistic considering the **productive capabilities** of these populations and current angling pressure.

### **Regulation Compliance and Enforcement**

The first steps taken to protect and ensure the wise use of Alberta's fish resources should always be proactive and preventive. Public consultation and education activities undertaken by fisheries managers and biologists, Conservation Officers, and conservation groups help anglers and others to understand the biological requirements of fish populations and the need for more restrictive harvest regulations. The enforcement presence shown by Conservation Officers on routine patrols acts as a deterrent to would-be resource violators.

Fortunately, most anglers and other resource users comply with regulations. When illegal activities do occur, Conservation Officers take enforcement action. Penalties include licence suspensions, fines up to \$100,000 and jail for up to six months. Judges ensure the severity of the penalty relates to the severity of the offence.

Investigations conducted by Conservation Officers sometime lead to the prosecution of organized groups or "**poaching rings**". These rings severely impact fish resources by harvesting very high numbers of fish, sometimes from vulnerable populations, for sale on the **black market**. However, by far, the

***No-net-loss** – overall, there must be at least as much same or better fish habitat, when comparing the habitat before and after development.*

***Slower growth rates** – an indicator of fish numbers. Fast-growing fish indicate little or no competition for food, while slower growth can indicate many fish, or lots of competition for food.*

***Spawn** – to lay and fertilize eggs. Both mature male and female fish can be referred to as spawners.*

***Productive capabilities** – abilities of a fish to spawn and reproduce. Ages of fish and stream suitability are two determining*

***Poaching** – illegal harvest of wildlife (wildlife includes fish).*

***Black market** – "underground" or illegal system whereby goods and money are exchanged without legal declaration, documentation, taxation, etc.*

greatest number of resource violations involve individuals contravening catch and size limits. While some may consider these infractions to be minor, especially where they involve “just” one or two fish over the limit or fish “just” a centimetre or two below the legal size, it is the large number of these infractions that can and has negatively impacted fish populations.

The Report-A-Poacher (RAP) program was established to involve all Albertans in reporting illegal wildlife activities, regarding fishing and hunting. Offences can be reported 24 hours a day, toll-free to 1-800-642-3800. Assistance from the public is critical to the protection of the fishery.

### **Whirling Disease and other Unwanted Invaders**

Aquatic organisms can be accidentally moved from water body to water body. Undesirable species, parasites and diseases can easily upset the delicate balance in aquatic ecosystems and fisheries. Eurasian water milfoil is a restricted aquatic weed that can spread rapidly and outcompete other plants. Whirling disease, a potentially fatal illness of trout, has been found in Montana and many other western states. The tiny parasite that causes whirling disease can survive within live fish, dead fish and in water and riverbed mud. It can even survive in dry mud, including that on boats, trailers and equipment.

Anglers and boaters are urged to clean their equipment well, to not transport fish, plants or water from one water body to another, and to not dispose of fish parts in or near water when cleaning fish.

### **History of Fisheries Management in Alberta**

“We’ve come a long way,” doesn’t begin to describe the evolution of fisheries management in Alberta. With the benefit of hindsight we can say that mistakes were made, despite our forefather’s beliefs and good intentions. We are learning from these mistakes and beginning to rebuild depleted fish populations.

When the first pioneers settled this province they looked upon its resources as endless, a land of plenty. They believed that these resources, including fish, could support themselves and many others. This attitude prevailed until the latter part of the 20<sup>th</sup> century when serious fish stock problems were evident.

Before the 1960s and 1970s, a very small number of government staff members and a handful of university academics undertook “fisheries management” in Alberta. It wasn’t until the provincial government began hiring biologists and technicians that our fish resources and the users of this resource were monitored. The prevailing management philosophy of the time required biologists to prove that fish populations were being depleted before regulations could be changed. The public was concerned that their fishing “rights” would be taken away from them unfairly. During the time required to gather this “proof”, fish populations were further depleted.

Today, fisheries management operates under a restrictive code (termed “precautionary management”), where conservation is the primary goal and harvesting fish is permitted if a surplus is available.

**Did you know?** The first general sportfishing licence in Alberta was introduced in 1956, although licences for trout fishing were required as far back as the 1930s. This first general licence was required by all anglers 16 years of age and older, and was probably introduced as part of an administrative exercise—a way of keeping track of the number of anglers. It sold for \$1.00 and was purchased by 100,883

Prevailing attitudes and beliefs influenced activities in our past. The bull trout (Alberta’s fish emblem), was once considered “ungodly and barbaric” for its fish-eating behavior that at times included cannibalism. Bull trout were systematically removed and destroyed; Conservation Officers of the 1930s reported on the number of bull trout

destroyed in government reports. Negative attitudes toward northern pike, also called “slough sharks” and “slimy snakes,” included the belief that they could never be overharvested. Small pike were pickled whole while spawners were harvested with pitchforks and fed to pigs.

Fish stocking and fish transfers have a colourful history in Alberta. Fisheries managers introduced large and smallmouth bass into Sylvan, Gull and Cooking lakes in 1908 and into Lac La Nonne in 1924. Atlantic salmon was introduced into several water bodies in both Banff and Jasper National Parks from 1915 to 1962. None of these populations became self-sustaining.

During the construction of the Canadian Pacific Railroad circa 1903, (eastern) brook trout were carried in cream cans to Alberta’s east slopes and deposited in streams to “improve” our stream fisheries. Brown trout were stocked in the same waters for the same reasons, and with the hope that they would displace the “inferior” bull trout that was much less exciting to catch. The natural ranges of cutthroat trout and rainbow trout in Alberta were expanded as well. Yellow perch and northern pike were transferred from water body to water body by Conservation Officers, biologists, and sometimes by people who simply felt that it was a good idea.

Not only are we dealing with past mistakes, but also with diverse beliefs and technological advances of the present. Improved access afforded by new boats and roadways, combined with improved technology in the form of powerbaits and GPS equipment make the harvest of fish easier now than it has ever been.

One goal of present-day fisheries managers is to bring our fish resources “back to the future”. Those who began

**Did you know?** Catch-and-release Fishing is Catching On! The Canada-wide sportfishing survey (2000) shows that 89% of anglers in Alberta practice catch-and-release fishing and voluntarily release 83% of the fish they catch.

sportfishing in the 1990s were introduced to a resource that was already depleted. It will take patience, time, and the acceptance of restrictive harvest regulations

in order to return as many of our fisheries as possible to their former glory.

## **Keep Fish in Our Future**

There are many ways to support and improve the status of Alberta’s fish populations. All Albertans can volunteer their time, money and/or equipment to

help enhance, restore or create fish habitat, to provide lake aeration systems, assist biologists in conducting fish inventories and provide input during public consultations. The Alberta Conservation Association, Alberta Fish and Game Association, Trout Unlimited, or your local fish conservation group may have more information about volunteer opportunities. Anglers can be a good role model for other anglers by sharing their knowledge and fishing ethics and practicing safe fish handling techniques for catch-and-release fishing. And, by supporting and complying with regulations, they can help maintain and recover fish populations.

Fisheries are a valuable public resource that all Albertans are responsible for safe-keeping. Ensuring wise management and healthy fish stocks now will guarantee healthy and abundant fish populations for the future.

Again, information on suspected violations, including the destruction of fish habitat, should be reported immediately to the *Report-A-Poacher (RAP)* hotline, 24-hrs. a day at 1-800-642-3800. Know the RAP line and don't hesitate to call it; it is everyone's responsibility to ***keep fish in our future!***

### Sources of More Information

- Teacher's Guide and videos about bull trout
- Video about walleye
- Video on catch-and-release from Alberta Fish and Game Association
- Series of brochures: bull trout, walleye, sturgeon
- Various management plans (bull trout, walleye, northern pike, Arctic grayling)
- Other brochures (e.g. whirling disease, fish stocking program, domestic fishing, Handle and Release Fish with Care!, A Fish Conservation Strategy for Alberta, Alberta Guide to Sportfishing, etc.)
- Cows and Fish program – how to maintain and restore healthy riparian areas

For any of the above, contact the Information Centre of Alberta Environment & Sustainable Resource Development at 310-ESRD (3773).

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Additional information on Fisheries Management is available on the Alberta Environment & Sustainable Resource Development website at [www.ESRD.Alberta.ca](http://www.ESRD.Alberta.ca) and search "Fish Management"