



Williston Watershed Arctic Grayling

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BRITISH
COLUMBIA

Ministry of Water, Land and Air Protection



Why are Williston watershed Arctic Grayling at risk?

Arctic Grayling within the drainage system of the Williston Reservoir have a restricted distribution above the W.A.C. Bennett Dam on the Peace River. Populations within the Williston Reservoir and its tributaries have been isolated from the remainder of the Peace system since at least 1963, when preparations to construct the dam commenced. In 1972, the reservoir achieved full pool. Both the reservoir and stream populations remained reasonably abundant and widespread until about 1982, when grayling in all small and medium-sized streams flowing directly into the reservoir rapidly disappeared. By 1988, only populations native to the largest river systems survived.

Biologists believe that populations declined due to a combination of factors: loss or degradation of key spawning and rearing areas; changes to the food supply and type of cover available; disruption of migration patterns; competition with species more adapted to lake living; and overfishing.

Native grayling are adapted to river environments and some of the decline was due to the change from river habitat to reservoir habitat. Like salmon and trout, grayling return to spawn at the same place where they hatched; several affected populations relied upon spawning and rearing habitat that was inundated as the reservoir filled. Food sources changed from terrestrial insects and invertebrates drifting with the stream current to prey such as plankton in the open water and invertebrates that live on bottom substrates, debris and

unlogged trees. The aquatic community within the reservoir altered, favouring those species most suited to the new conditions.

Industrial activities also contributed to declining populations. Expanding road systems and boat access increased angler harvest in previously remote areas and led to overfishing and enforcement problems. Improper culvert installation created barriers to fish movement. Siltation from logging activities buried stream bottom material, reducing spawning success and the availability of cover and feeding areas. Sun on clear-cuts increased spring snowmelt and stream flows, and decreased late summer flows. Activities involving poor road or pipeline construction or the release of non-native fish species can still threaten grayling survival. In general, Arctic Grayling are specifically adapted to particular habitats and are unable to respond to sudden environmental changes.

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What is their status?

We can get an understanding of the seriousness of the decline by comparing earlier studies to more recent surveys. In 1975, BC Environment surveyed 57 streams in the Parsnip, Finlay and Peace reaches of the reservoir. Arctic Grayling were found in 11 of 29 Parsnip Reach streams, 6 of 13 Finlay Reach streams and 11 of 15 Peace Reach streams, and were numerous wherever they were present. Between 1989 and 1991, BC Environment resurveyed 15 of the 28 streams where grayling were found in 1975. Only 4 of

The decline of the Williston watershed Arctic Grayling was due to the change from river habitat to reservoir habitat.

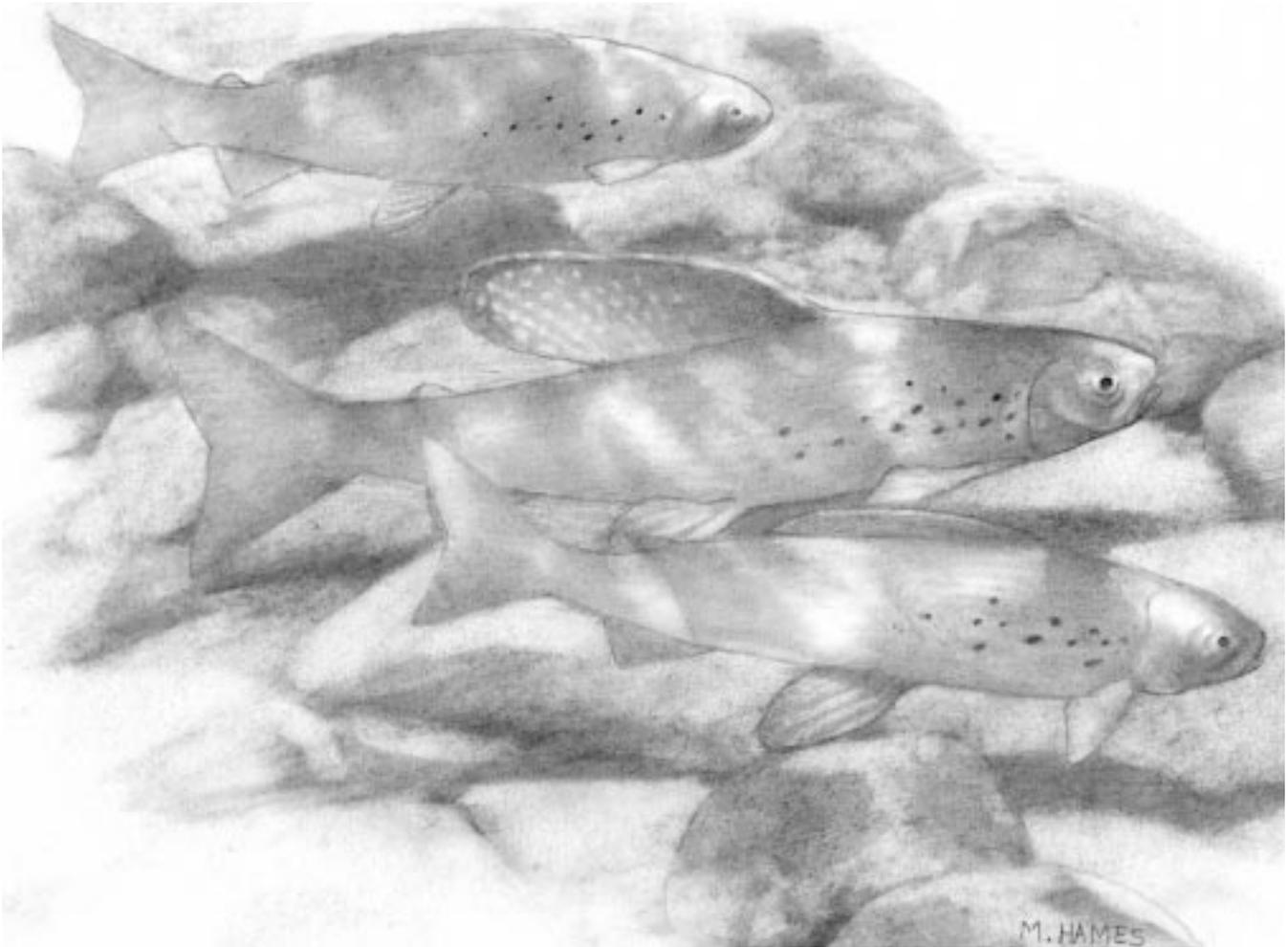
these 15 streams supported grayling. They were absent from all 3 resurveyed Finlay Reach streams, were found in very low numbers in 3 of the 4 Peace Reach streams and were present in only 1 of the 8 Parsnip Reach streams. In a 1977 creel survey, grayling were the most common gamefish taken in the Peace and Finlay Forks areas, making up, respectively, 58 and 23 percent of angler harvests. During a 1989 creel survey, however, grayling comprised about one percent of the catch in these same areas.

Healthy populations of Williston watershed Arctic Grayling now remain only in the larger, often remote systems, such as the Osilinka, Mesilinka, Ominca, Ingenika and Finlay drainages.

In 1995, the BC Conservation Data Centre classified the Williston watershed Arctic Grayling as critically imperilled, placing it on the provincial Red List. The Williston population has been placed in the highest risk class due to the significant declines in several populations and the species' vulnerability to habitat degradation and overfishing. Although no habitat is completely protected, some grayling streams receive enhanced protection through regional and other planning processes. Angling regulations have prohibited a kill fishery since 1995; all Arctic Grayling caught in the watershed must be released.

What do they look like?

In general, Arctic Grayling have trout-like bodies, a short head, large dark-green-and-gold eyes, a small mouth with teeth in both jaws and a deeply forked tail. Their scales are larger than those of either trout or char. They are easily distinguished from other North American fish by their greatly enlarged, fan-shaped dorsal fin. Typically, fish caught by anglers in the Williston drainage vary from 20 to 40 centimetres long and weigh up to 1 kilogram. In other areas they may reach 75 cm and 2.7 kg.



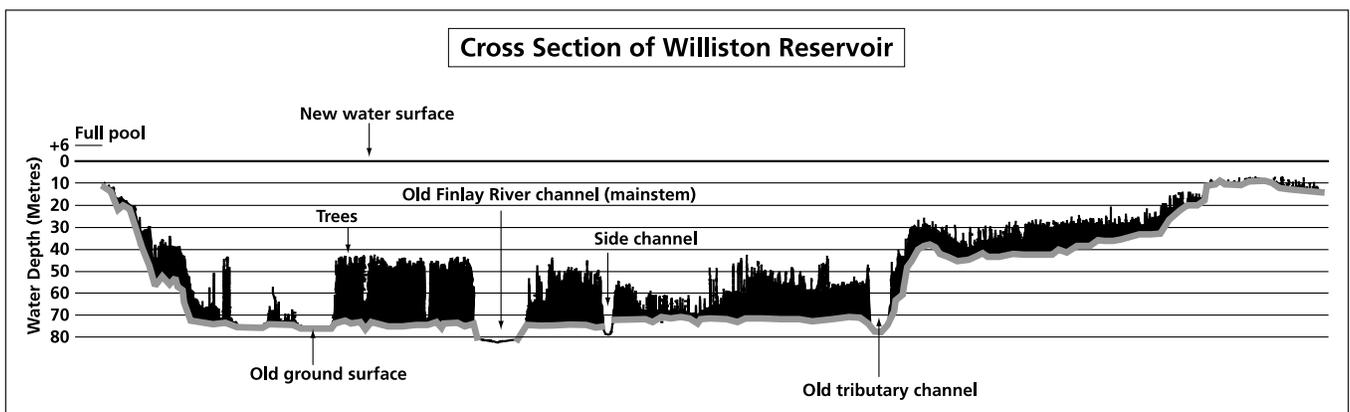
The adult Arctic Grayling is strikingly coloured. The head is olive green and iridescent mauve. The body is steely grey with hints of olive, blue or purple, with scattered black spots towards the front (younger fish have more spots along the sides). The scales along the sides are silvery grey to dark blue, with a spectacular blue-green iridescence. Under sunlight, the scales may be outlined in yellow.

The black dorsal fin is edged with mauve, often with a wider blue band below. Between each of the 19 to 24 supporting rays are columns of spots. Those near the edge may be orange-red, mauve or wine-coloured, while the remainder are iridescent blue-green to emerald green. The pelvic fins are black with mauve or orange lines. The remaining fins are dusky to bronze.

Males are more vividly coloured than females, especially during spawning. Mature males have much longer dorsal and pelvic fins than mature females.

What makes them unique?

The Rocky Mountains are one of the major barriers to fish movement in North America and very different species groups are found to the west



and east. Upper Peace grayling coexist with a group of fish species unique in North America. This situation is thought to have arisen as glacial ice melted and allowed fish to move across the Rocky Mountains between the upper Peace and Fraser rivers. This occurred less than 10 000 years ago. Arctic Grayling were apparently unable to cross over or establish a population, as they are not found in the Fraser system.

Williston grayling do not appear to be genetically diverse, which suggests that they evolved from a relatively small founder population.

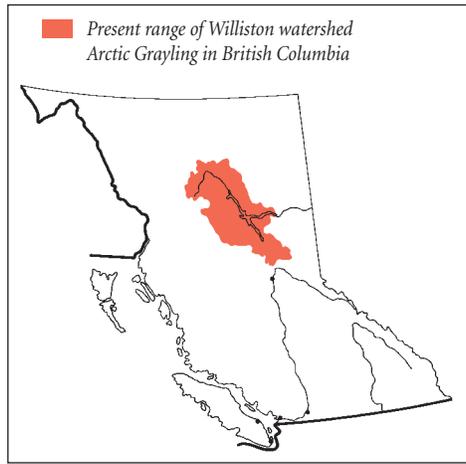
How do they reproduce?

Throughout their global range Arctic Grayling mature at varying ages, depending on growth rate and location. In the Williston watershed, spawners likely average four to five years at maturity and normally live six to eight years. Mature fish may spawn every year.

Typically, grayling begin migrating to their spawning grounds before the ice breaks up in the spring. They begin spawning just after spring floodwaters peak, when water temperatures reach 4°C, and continue from mid May to mid June.

Arctic Grayling usually spawn in tributary streams over clean stones in 30 to 80 cm of water. Males arrive at the spawning grounds first, seeking isolated spawning territories among stones, boulders, bedrock or large woody debris. The strongest males occupy the best spawning territories, which they aggressively defend against any other male that they can see. Their spectacular dorsal fin is prominently displayed to impress rival males.

Females hold in deep pools before briefly entering male territories to release their eggs. Female grayling do



not build nests or redds, although shallow pits may be formed during pre-spawning activity. Males and females swim side by side, the male

Grayling are easily distinguished from other North American fish by their greatly enlarged, fan-shaped dorsal fin.

arches its dorsal fin over the female's back, both fish vibrate and they release the eggs and sperm together. Female grayling produce between 3000 and 14 000 small, sticky eggs, which become lodged 2 to 3 cm deep among the stones. The eggs hatch in two to four weeks, depending on water temperature. After three to four days, the small, weakly swimming fry emerge from the gravel. Arctic Grayling are at their most vulnerable during this part of their life cycle and can easily be killed by high water, turbulence, starvation or stranding.

What do they eat?

Both juvenile and adult Arctic Grayling are opportunistic feeders. Fry feed on aquatic stages of midges, black flies and stoneflies and other benthic (bottom dwelling) invertebrates, or the young stages of insects as

they drift downstream. As fry grow, their diet may include larger terrestrial insects that fall into the water.

Larger fish eat a more varied diet, but prefer both the larval and adult stages of aquatic insects and terrestrial species like bees, grasshoppers, wasps and ants. They may also feed on zooplankton, fish eggs and small fish. Terrestrial insects are a favourite summer food in many populations. In the Sukunka River, just east of the Williston watershed, a study found that two to five year olds fed mostly on surface or drifting insects in the summer and on benthic insects in the winter. Older grayling establish and maintain feeding territories through a series of ritualized challenge displays.

Where do they live?

Arctic Grayling are found throughout the northern drainages of Canada. In British Columbia they are distributed from the Peace and Stikine river systems north to the Yukon border. Williston watershed Arctic Grayling are found in the reservoir and several large rivers draining to the reservoir, including the Finlay, Ingenika, Omineca, Mesilinka, Parsnip and Nation watersheds.

Within the Williston watershed, Arctic Grayling prefer the clear, cold waters of stream habitats ranging from large mainstem rivers to small streams. They may make seasonal use of some systems, such as the Wicked River.

After hatching and emerging, fry swim downstream from the spawning grounds to take up residence in shallow, low-velocity areas along stream edges or in side channels. For two to three weeks after hatching, the fry feed constantly in small groups or dense schools. As they grow, they move to deeper, faster water.

Arctic Grayling are known for migrating long distances between

spawning, summer feeding and overwintering areas. They usually return to the same areas each year and do not stray elsewhere. In many areas, grayling distribute themselves in the summer by size, with juveniles using the lower reaches, subadults in the middle reaches and the largest adults occupying the upper stream reaches. Adults prefer to feed in pools or glides downstream of long, steep riffles, often with schools of Mountain Whitefish. When they share deep-water habitat with Mountain Whitefish, the Arctic Grayling remain close to the top,

watching the surface for food to drift by, while the whitefish stay near the bottom, hunting for prey among the rocks.

In the Parsnip watershed, grayling use mainstem and tributary habitat for fry, juvenile and subadult rearing. Studies in the Sukunka drainage east of the reservoir showed that grayling used a variety of habitats depending on life stage and season. Recently emerged fry were found in slow back channels, older fry in the side-channel riffles and larger juveniles and adults in the pools. Adults swim downstream in September and October to hold over the winter in the reservoir or large mainstem pools. Most fry also migrate to deeper winter habitat. From December to March, most fish remain at one location.

Arctic Grayling are found with a variety of other species in the Williston watershed. Rainbow Trout can tolerate warmer water and often predominate in these conditions. Mountain Whitefish, always the most abundant species, often accompany grayling schools. Similarly, small Longnose Suckers may mix with young grayling fry. Other fish species present include



MALE GRAYLING SHOWING LARGE DORSAL AND PELVIC FINS (WHEN VIEWED THROUGH WATER, COLOURS APPEAR SUBDUED). *Ted Down photo*

Largescale Suckers, Lake Whitefish, Slimy and Prickly sculpins, Kokanee and several smaller species. Bull Trout, Lake Char, Northern Pikeminnow and Burbot are the top predators in the ecosystem; some of these predators may occasionally feed on grayling.

What can we do?

The habitat provisions of the Fisheries Act, angling regulations and Red-listing status alone will not guarantee that Williston watershed Arctic Grayling habitat and populations will be protected or restored. Although catch and release regulations have been implemented, their effectiveness is unknown and remaining populations are still vulnerable. Intensive angling can readily capture most of the fish in a given population.

Efforts are needed on several fronts. Although much research has been done under the Peace/Williston Fish and Wildlife Compensation Program, biologists and managers still lack sufficient information to make informed land use

decisions in some areas. Further studies of Williston grayling life history, stocks and ecology are necessary.

To conserve and restore grayling populations, watershed management plans are being developed. This is particularly important in view of the declining populations facing rapid resource and access development. Where feasible, restoration projects can be helpful. Stream fertilization is also being explored to offset the impacts of flooding.

Resource and land use practices now incorporate methods for reducing habi-

tat impacts. Road planning attempts to minimize sedimentation, channel and stream flow changes, and access problems. Roads and culverts are being designed and maintained with grayling needs and capabilities in mind.

These fish prefer the clear, cold waters of stream habitats ranging from large mainstem rivers to small streams.

Pipeline routes and crossings are being planned to reduce or eliminate sediment impacts.

Since grayling are found throughout northern Canada and British Columbia, most people are unaware that Williston Reservoir populations are imperilled. Continuing widespread public and industry awareness is vital to galvanize efforts to conserve the habitat and popu-

lations of this beautiful northern species.

If you are interested in conserving the Williston grayling, you can begin by learning about these fish and their needs. If you are an angler, follow the



LAND USE PRACTICES THAT CHANGE NATURAL STREAM FLOWS CAN CAUSE POPULATION NUMBERS TO DECLINE. LOW SUMMER FLOWS LIMIT HABITAT AVAILABILITY AND RAISE WATER TEMPERATURES. *Peace/Williston Fish & Wildlife Compensation Program photo*



GRAYLING DO WELL IN CLEAN, COLD, NATURALLY FLOWING STREAMS WITH LARGE WOODY DEBRIS, STONES, BOULDERS OR BEDROCK. THESE STRUCTURES PROVIDE DEEP HOLDING POOLS. *Ted Down photo*

angling regulations. You can also help by supporting or volunteering for conservation or stewardship groups. Enforcing laws and regulations is difficult in remote areas; if you see any violations, Observe, Record and Report them by calling the hotline at 1-800-663-WILD (9453) or contacting your local RCMP detachment, Conservation Officer or fisheries staff. Ultimately, the future of Williston Reservoir Arctic Grayling will rest on the combined efforts of citizens, industry, scientists and government. 



GRAYLING OVER ROCKY STREAM BOTTOM SHOWING DORSAL FIN IN NORMAL SWIMMING POSITION. *Peace/Williston Fish & Wildlife Compensation Program photo*

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