



## Williston's own 'circle of life' Kokanee numbers increasing in Williston watershed

All science experiments take time. Long-term environmental enhancement projects, however, can take a lifetime. If anyone knows that first hand, it's Arne Langston, a biologist with the Peace/Williston Fish and Wildlife Compensation Program (PFWWCP). Langston has been involved with the kokanee stocking program since he joined the PFWWCP in 1991.

Kokanee are a land-locked version of the sockeye salmon, and existed in small numbers in both the Finlay and Parsnip River drainages prior to Williston Reservoir being created in 1968. They thrive in reservoirs such as Williston, where fluctuations in the water levels create large shoreline "draw down" and low populations of insects. Kokanee prefer zooplankton, which are found in much greater abundance in such environments. "Kokanee are so important in the food web of many large lakes and reservoirs in North America that they're often referred to as the 'economic engine' of the systems," said Langston.

The original intent of stocking kokanee was to develop a sport fishery in the semi-protected bays of Williston Reservoir. Additionally, biologists presumed the kokanee would become food for larger game fish in the reservoir, creating a "trophy fishery" for large bull trout and lake trout. Detailed surveys of Williston watershed streams were completed first in 1989 and 1990 to determine the most suitable rivers for stocking. Kokanee were stocked into five Williston tributaries from 1990 to 1998: Carbon Creek, Davis River, Dunlevy Creek, Manson River and Nation River.

The kokanee were stocked in early summer as fry (about six cm long) and migrated almost immediately downstream to Williston Reservoir. The biologists hoped the fish would



"imprint" on the streams they were stocked to and return to them four years later to spawn. Instead, the kokanee populations shifted to locations other than those stocked.

"The Omineca drainage rivers, especially the Germansen and Osilinka Rivers, were where all the action was," Langston said. As it turns out, the kokanee were straying to habitat that was more suited to them than the streams the PFWWCP biologists initially planted them in. "The kokanee obviously have a better idea of what good fish spawning habitat is than we do, which makes sense, of course. After all, the very survival of their babies depends entirely upon the parents ability to select the best location to place their eggs."

The expanding Williston kokanee population is having ripple effects through the entire watershed. Because the streams



*Kokanee have proven they know best when it comes to finding the most appropriate location for spawning, as their populations have been expanding in unexpected locations such as the Germansen River (above and bottom left). The critical role of the kokanee life cycle to the whole Williston Watershed is demonstrated for the next generation in hands-on classroom-based projects in the region's schools (bottom right).*

that feed Williston are extremely low in nutrients, kokanee act as a "nutrient pump," collecting nitrogen and phosphorous in the reservoir and bringing it back up the rivers they spawn in. Kokanee carcasses decaying in the rivers act like a slow-release fertiliser, providing nutrients to other fish, aquatic insect life, and ultimately the kokanee's own offspring.

And the story doesn't end there. The ripple effect extends to the terrestrial environment as well. Eagles, gulls, ospreys, mergansers and other birds concentrate at kokanee spawning locations to feed on the returning fish, recycling the nutrients into the surrounding forest area in the form of bird droppings.

Bears, coyotes, foxes and other terrestrial animals are also expected to take advantage of this new nutrient-rich food source, similarly dragging carcasses and the associated nutrients into the surrounding forests. In other words, the nutrients from the kokanee are also being used by the very plants that overhang the streams, providing shade and ground stability. This in turn protects water quality for all fish.

Biologists are also analyzing hair samples collected from grizzly bears in the area to see if they can detect if kokanee are in bears' diets. Studies are also being contemplated to examine the effect that kokanee may have on the abundance of some species. "Although many species may benefit from kokanee being present, it may not be beneficial for all animals," explained Langston. "Some species of animals – a bird of prey, for example – might increase in overall numbers. Nice for the birds, but the kokanee carcasses as a food source are gone in November and it might not be so nice in June for the field mouse that now has three hungry birds hunting it, instead of two."

Langston uses this kokanee life cycle and the "real world" Williston watershed population as a supporting element in the PFWWCP's classroom-based kokanee education project. Students from elementary schools in the Williston watershed raise fifty kokanee from eggs to juvenile in a specially designed aquarium in their classroom.

The students have a unique opportunity to observe first-hand the development of a kokanee from egg to fry (newly hatched fish) and learn about the habitat requirements and needs of kokanee. The students also learn about the environment, water quality, and things they can do to promote and conserve nature. The students release the kokanee annually to Williston watershed streams knowing that the odds of their fifty fish surviving are very low, but with a greater understanding and appreciation of nature.

"I believe the direct ecological effect of the kokanee population growth in Williston watershed may be the most significant change to occur, next to the actual formation of the reservoir itself," said Langston. "The changes that will occur to the flora and fauna of Williston watershed as a result of the increased kokanee population will probably still be occurring long after I retire."



# What we're doing now

## Brian Blackman

The senior fisheries biologist, Brian has been with the program since its inception in 1988. His primary focus has been on



Arctic grayling and how to protect, enhance and restore stocks. In 2005 he was invited to Montana to provide advice on that state's efforts to restore grayling populations. He has also been working on habitat improvements in Dinosaur

Reservoir and monitoring fish population responses to the habitat improvements. This year he was able to initiate a pilot project to enhance the foreshore areas of stream mouth embayments in Williston Reservoir.

## Arne Langston

Arne, a fisheries biologist with the PFWWCP since 1991, is investigating the Williston watershed kokanee and bull trout populations. He is also assisting with pygmy whitefish research and small lake stocking evaluation. Arne is currently organizing the publishing of a new scientific textbook on the "Freshwater Fishes of B.C." to be authored by UBC Professor Emeritus J.D. McPhail. Additionally, Arne delivers the "Kokanee in the Classroom" program with the help of teachers and over a hundred junior scientists at schools throughout the Williston watershed.



## Randy Zemlak

Randy is a fish technician who has been with the program for eleven years. His interests focus mainly on biodiversity and conservation of fish species. Presently, Randy is striving to understand the molecular genetic makeup of the populations of pygmy whitefish within the Williston watershed. In addition, Randy has just started working on the biology and distribution of the little-known brassy minnow populations throughout the watershed.



## Mari Wood

Mari, the senior wildlife biologist, has been with the PFWWCP for 15 years. She works primarily on research projects addressing the conservation of ungulates (hooved animals) and large carnivores. Mari's current focus is a long-term study evaluating the effects of forest harvesting on the use of low-elevation mineral licks by mountain goats. She is also finalizing research projects on Stone's sheep, and the effects of a landfill closure on grizzly bear behaviour.



## Fraser Corbould

Fraser is a wildlife biologist who has been with the program for 14 years. His primary areas of interest have been small carnivore conservation and the enhancement of wetland and forest structure features such as tree cavities. Fraser is currently working with a consultant to document the findings of the PFWWCP fisher habitat use study, and is also very involved with the long-term mountain goat study.



## Jeremy Ayotte

Jeremy recently joined the Wildlife Program for a two-year term in July 2005. His primary function will be assisting Mari and Fraser with data collection and analysis on their long-term mountain goat research project.



# Natureline

## A summary of our activities in 2004/2005

### Fish Updates

#### Williston Reservoir Bull Trout Populations Studied

Bull trout research to be conducted over the coming years will help ensure the protection of bull trout in Williston watershed, and identify appropriate enhancement opportunities, if required. One activity will see PFWWCP biologists employing new techniques to understand trends in Williston Reservoir bull trout numbers.

The bull trout from Williston Reservoir are believed to return every second year or so to the headwaters of large rivers to spawn. Biologists will walk sections of specifically selected streams, called index streams, looking for bull trout redds (gravel nests that bull trout deposit their eggs into). The number of redds present is related to the number of bull trout present.

Redd counts have been conducted on the Davis River since 2001, and have shown some fluctuations over the past five years. However, at least two more index streams need to be examined, over a longer period of time, before a true picture of what is going on develops.

Misinchinka River redd site locations have been examined for the last two years, and hopes are to include it next year as an index stream. Research continues in identifying other potential index streams in the Peace Reach.

Once three or four index sites have been studied over many years, an indication of overall population trends in the reservoir can be determined. With a system the size of Williston, it is perhaps one of the few affordable tools available to assess overall population trends.



Biologist Ray Pillipow from the Ministry of the Environment helps with the study of Misinchinka River bull trout that have come from Williston Reservoir to spawn.

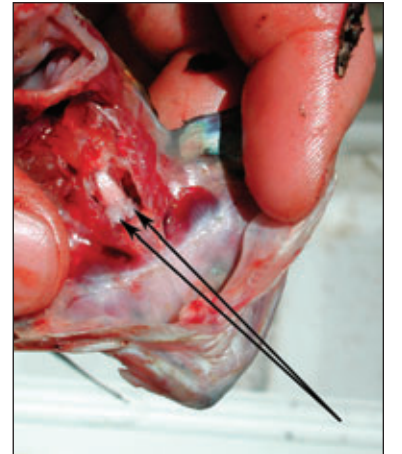
#### Recreation Enhanced With Small Lake Stocking Program

Recreational fishing is an integral part of many northern B.C. lifestyles and is highly valued by residents in the area. One of the PFWWCP strategies is to provide recreational opportunities by stocking lakes with fish. In 2004 four local lakes were stocked with either brook or rainbow trout: Bruce, Dina #3, Dina #7, and Wright Lakes.

"The addition of yearling-sized fish on a set schedule helps sustain recreational fisheries in a number of our small lakes,"

said fish technician Randy Zemlak. "We're working cooperatively with the provincial fish and wildlife agencies to enhance some fishing opportunities by stocking, and we're taking into account wild stock conservation as a priority."

Regular evaluations of these stocked lakes ensure the effectiveness of the stocking program. For example, as a result of low catch rates in Butternut Lake, stocking rates there will be increased. Wright Lake possessed good catch rates and is providing a good recreational opportunity for anglers. Continued assessments for these and other stocked lakes in the Program area will ensure future enjoyable recreational experiences.



The sagittal otolith bones from the head are structures used to age fish and, ultimately, to determine accurate growth estimates of the fish.

#### Woody Debris Helps Improve Rearing Habitat

Previous studies had indicated that Dinosaur Reservoir has a very limited littoral (shallow near shore) zone and that a lack of structure in this zone reduces the overall productive capacity of the reservoir. In other words, there is very limited shallow near shore cover, which is important for rearing habitat, particularly for smaller fish.

Because there is limited cover, fish, particularly smaller fish, tend to leave the reservoir through the Peace Canyon Dam. This lack of rearing habitat has been blamed for the poor capture rate of fish stocked into the reservoir.

Starting in 2002, the PFWWCP has been adding woody debris to shallow near shore areas in the reservoir. Logs are bound together with cables, and the ends are anchored to shore. The space between the logs and shore is then filled with smaller pieces of wood.

Each year, maintenance is done to repair broken logs and add more small wood. Gradually, the amount of good habitat along the shoreline is increasing. Preliminary tests show that up to five times as many fish are using the areas as there were before the wood was added.

#### Arctic Grayling Monitoring

Since 1996 biologists have been monitoring populations of Arctic grayling in the Table and Anzac watersheds by conducting underwater counts to see if their numbers are increasing, since the implementation of catch and release regulations. The numbers of young-of-the-year and one-year-old grayling in a 25-kilometre section of the Parsnip River are also being monitored to determine if there are changes in recruitment.

The distribution and relative numbers of grayling fry in different systems in the watershed are being investigated. So far, the Osilinka, Omineca, Nation, Ingenika and Parsnip systems have been studied. By looking at fry distribution we hope to be able to identify key spawning and rearing areas and identify which watershed streams are producing grayling, so that additional protection can be provided for these critical habits.

# Updates

## Wildlife Updates

### Ospika Mountain Goat Project

This marks the third of six years of monitoring low-elevation mineral lick use by mountain goats in response to timber removal treatments. Goats are monitored using remote telemetry and camera stations located at the mineral licks and along their main access trails. Data from these stations were collected on a regular basis between April and November. Some new and previously collared goats were radio-collared, bringing the number of collared goats to nineteen. Presentations on the project were delivered to ministry and forest licensee staff in Mackenzie and Prince George, and at the First B.C.

Mountain Goat Workshop, held in March 2005. PFWWCP also assisted with the refinement of mountain goat habitat supply models through a series of workshops with Canfor and other Mountain Goat Management Team members.

### Mackenzie Migratory Songbird Banding

The PFWWCP provided its tenth year of funding to the Mackenzie Nature Observatory (MNO) to assist with the banding of migratory songbirds during their fall migration. The station was operational between mid-July and mid-September. A master bander was hired for the season and was assisted by volunteers from the MNO, other organizations and the general public.



PFWWCP funding helped hire a master bander, who worked with volunteers to conduct the migratory bird banding program activities.

### Weather Monitoring Stations

Weather monitoring stations located at various sites within the Williston Reservoir watershed are used to obtain snow depth and other microclimate data that will assist ongoing wildlife projects, and help assess site suitability for past and future enhancement projects. In the spring of 2004, data from the previous winter were collected from the eight remote-monitoring stations. Five of these stations were also maintained in the non-winter period to collect microclimate data for the Ospika Goat and Peace Sheep projects. In late fall, data was again collected and all stations were activated for the winter period.



Attaching radio collars to Stone's Sheep neonates (lambs less than one month old) is being done to determine the causes and rates of lamb mortality.

### Peace Arm Stone's Sheep Demographics

Between 1999 and 2004, the PFWWCP conducted a study on the effects of winter ticks on Stone's sheep along the Peace Arm of Williston Reservoir (the "20 Mile Point Stone's Sheep Study"). During this study, biologists observed some years of low lamb survival and high adult ewe mortality, which prompted an investigation into the rates and causes of Stone's sheep lamb and adult mortality ("Peace Sheep Demographics project"). In June 2003 and 2004, newborn (two- to three-week old) lambs were captured and radio-collared so that their mortality rates and causes could be determined. Similarly, radio-collared ewes and rams were also monitored. The final year of data collection will occur in 2005, with the final report scheduled for completion in the spring of 2006.

### Woodland Caribou Recovery Planning

In 2002, woodland caribou living within the Southern Mountains National Ecological Area were designated as "threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Within the Williston reservoir watershed, this included three herds of caribou that reside primarily along the west side of the Reservoir – the Chase, Wolverine, and Scott herds. The PFWWCP provided a biologist and funding to support the regional Northern Caribou Recovery Implementation Group (RIG), which was tasked with development of a Recovery Plan for these caribou herds.

### First B.C. Mountain Goat Workshop

The First B.C. Mountain Goat Workshop (held in Prince George, B.C., March 1 to 2, 2005) was organized and co-funded by the PFWWCP and the Biodiversity Branch of the Ministry of Water, Land and Air Protection. The objectives of the workshop were to present results and techniques from recent research and inventory projects on mountain goats in B.C., and to facilitate discussions on the current status of knowledge on mountain goat ecology, management concerns and future research needs. This was the first workshop ever held in B.C. to address research and management issues pertaining to mountain goats. Workshop information is available on the PFWWCP website at [www.bchydro.com/pwwcp/](http://www.bchydro.com/pwwcp/).

## Partnership helps conserve critical habitat

Important range lands for a number of species of elk, deer, moose and sheep have had their future secured with the help of the Peace/Williston Fish and Wildlife Compensation Program (PFWWCP).

Funding from the PFWWCP recently enabled the Nature Trust of British Columbia to acquire 51 hectares of land in the Peace Arm area of the Williston Reservoir. Located between Adams Creek and Dunlevy Creek, this land purchase adds to the 756 hectares already set aside in the area as winter range land for the animals, collectively referred to in the scientific community as "ungulates."

"The importance of this property purchase to the integrity of the Peace Arm's north shore ungulate winter ranges can't be stressed enough," said Mari Wood, senior wildlife biologist with the PFWWCP. "These south-facing aspen and grassland slopes are the primary winter ranges for a significant elk population and the most southern population of Stone's sheep in B.C. The slopes adjacent to the reservoir, almost as far as Dunlevy Creek, are now Crown or Nature Trust-owned lands and will remain as un-roaded wildlife habitat."

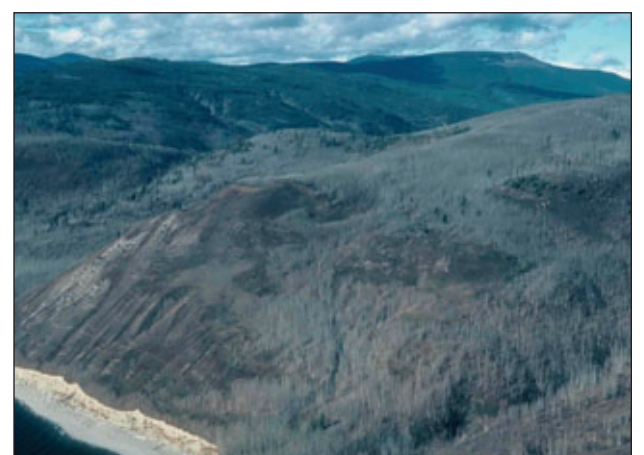
The region is used extensively by Rocky Mountain elk year round, and by mule deer, white-tailed deer and moose. In addition, Stone's sheep migrate through the property between low-elevation winter ranges at Rainbow Rocks and 20 Mile Point. The property is situated in the western foothills of the Rocky Mountains, where snow accumulations are relatively low due to the rain shadow effect and frequent Chinook winds that combine to create the perfect habitat for a variety of wintering ungulates.

"The importance of this property purchase to the integrity of the Peace Arm's north shore ungulate winter ranges can't be stressed enough."

The Nature Trust, with PFWWCP's help, bought the land from the Rocky Mountain Elk Foundation, which had purchased it in the early 1990s. "The staff and members of the Rocky Mountain Elk Foundation are pleased to once again partner with the Nature Trust of B.C. in the purchase of land vital to the future of wild creatures," said Len McRitchie, president and CEO of Canadian operations.

The Nature Trust of B.C. is a leader in protecting B.C.'s natural diversity of plants and animals through the acquisition and conservation of critical habitats and other areas of ecological significance.

The PFWWCP was established in 1988 to enhance and protect fish and wildlife species and habitat affected by the creation of the Williston and Dinosaur reservoirs in north central B.C.



The Peace Arm land purchase will preserve the integrity of the winter ranges of a number of ungulate species (moose, elk, deer and sheep).

# Whitefish research gets international audience

The Peace/Williston Fish and Wildlife Compensation Program (PFWWCP) is fast becoming a world leader in developing a knowledge base on a lesser-known species of whitefish.

The pygmy whitefish is a species about which little was known, until recently. Because of its fragmented distribution and a lack of published data on the species, the pygmy whitefish has started to receive considerable attention from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

This organization determines the national status of Canadian fish and wildlife that are suspected of being at risk of extinction. The pygmy whitefish has been identified as a high priority for assessment by COSEWIC.

To help fill in some of the gaps in knowledge on this species, the PFWWCP spent two seasons studying the animal's biology and habitat use in a local lake near Mackenzie. Information on this study has now been submitted to a scientific journal for publication. "We hope our work here will contribute to the assessment on this species for COSEWIC, and that ultimately we'll be contributing to the management of the species," said Randy Zemlak, a fish technician with the PFWWCP.

There are only about 18 known locations of pygmy whitefish in the Williston Watershed. "This fish can be easily misidentified for another whitefish species and many of the



Traditionally, pygmy whitefish were known to inhabit deep, cold lakes. Program fish technician Randy Zemlak caught these fish in only seven metres of water in Williston Reservoir.

were collected at that time to look at the genetic makeup of these and other pygmy whitefish lake populations in the near future.

"Our work demonstrates that pygmy whitefish are found in lakes of a variety of sizes and can inhabit a wider range of environmental conditions than previously reported," he said. This new information has now been presented and passed on to other scientists, including at a scientific conference on whitefish in Olsztyn, Poland, in August 2005.

As for the future of this enigmatic species, Zemlak says, "We want to get a better understanding of their genetic makeup. We've just started a two-year study with the University of British Columbia to look at the genetic structure of the Williston populations."

The development of conservation and management strategies for freshwater fishes requires an in-depth understanding of their

old inventories on these lakes didn't encompass the current techniques we use today to capture the elusive fish," said Zemlak.

Results from distribution surveys in 2004 revealed the presence of pygmy whitefish in Tacheeda Lakes and the Peace Reach of Williston Reservoir. Small amounts of tissue

distributions. The main purpose of this new study is to employ molecular genetic methods to understand the historical processes that have shaped the genetic structure of this species. Armed with this information, scientists will be better equipped to properly manage this species and ultimately ensure the conservation of pygmy whitefish within the watershed.

## What the PFWWCP program is about

The Peace/Williston Fish and Wildlife Compensation Program (PFWWCP) is designed to conserve and enhance fish and wildlife in the Williston and Dinosaur reservoir watersheds in north-central B.C. Launched in 1988, the program is a joint initiative of BC Hydro, the Ministry of Environment, and the Department of Fisheries and Oceans. It is intended to compensate for the effects of the W.A.C. Bennett Dam, which was constructed on the Peace River in 1967, and the Peace Canyon Dam, which was constructed in 1980, about 23 kilometres downstream of the W.A.C. Bennett Dam. The two reservoirs created by the dams control water from a catchment area of approximately 70,000 square kilometres, an area more than twice as large as Vancouver Island and slightly smaller than Scotland.

In 1988 an original \$11 million fund was established to finance the program. By 2005 the fund had grown to \$27 million. It generates an operating budget of just over \$1 million annually and is managed to maintain the program in perpetuity.

For more information on the PFWWCP, visit [www.bchydro.com/pwcp](http://www.bchydro.com/pwcp).

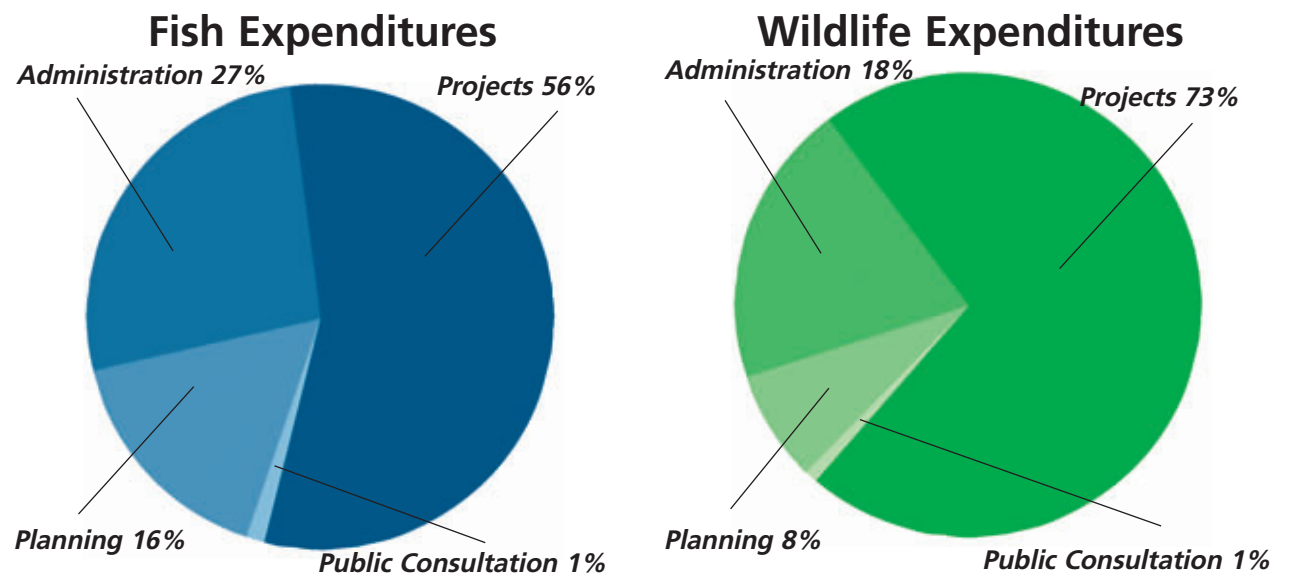
## Publications

Since the program's inception, more than 200 projects have been undertaken, often with the help of volunteers. These efforts include stocking fish in barren lakes, improvements to wetlands, and studies of species as diverse as grayling, fishers and caribou. Over 290 reports have been produced as a result of this research. They can be found in pdf form on our website at: [www.bchydro.com/pwcp/](http://www.bchydro.com/pwcp/).

## Donations

The PFWWCP, in conjunction with BC Hydro, offers donations for programs and services relevant to its goals and objectives being undertaken by non-profit groups in the Williston watershed. For information on our donations program, go to: [www.bchydro.com/outreach/](http://www.bchydro.com/outreach/).

## PFWWCP Budget Expenditures for 2004/05



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