



Breaking new ground

Research advances scientific knowledge base

Research by the Peace/Williston Fish and Wildlife Compensation Program (PFWWCP) has contributed greatly to increasing our understanding of the unique ecology and population dynamics of the fisher within a northern environment. The five-year study – the most northerly fisher research done to date – was undertaken in order to better understand and manage fisher populations within the working forests of northern British Columbia.

A member of the weasel family, fishers are medium-sized forest carnivores (meat-eaters) that grow to about one-metre long and can live as long as ten years. Ironically, in spite of their name, they do not eat fish. They prefer smaller rodents, such as snowshoe hares, squirrels and voles, or grouse and even porcupine.

The fisher is a provincially “blue-listed” species, which means it is considered vulnerable to habitat changes as a

result of forest harvesting and may be susceptible to over-harvest by trapping.

We hope our findings will continue to provide information that will advance the management of fisher populations and habitat in north-central BC and elsewhere.

“Until our study, there was limited information on fishers in BC,” said Fraser Corbould, PFWWCP wildlife biologist. “Because this was the farthest north that

research had been done on this animal, we wondered how the relatively colder winters and deeper snowpacks would affect their habitat use.”

The study was conducted in the valley bottom along the west side of the Williston Reservoir between the Nation and Omineca Rivers. Activities involved radio-tagging 21 fishers and then monitoring them to determine their habitat use, movements, and population demographics such as mortality, age structure and reproductive rates. The PFWWCP was helped by Richard Weir of Artemis Wildlife Consultants, who acted as the lead field biologist on the project.

Unlike other regions of North America, female fishers in this study used the same den location (a hollow cavity in a tree) over multiple years. And female fishers in the Williston area appeared only to use larger diameter cottonwood trees for birthing and raising their young. Fishers in other regions use more than one species of tree.

Fishers in this study were also found to have significantly larger home ranges, or territories, than in other parts of North America. Male territories ranged up to 200 square kilometres, while females ranged around 50 square kilometres – an average of two to four times bigger than in other regions.

These large ranges also have consequences for population density, and therefore long-term vulnerability of the species.



A radio-collared female fisher, “Olsie”, begins her 20-metre climb up a large-diameter cottonwood tree to access her cavity den where she birthed and raises her kits.

Taking into account the overlap of male and female territories, there was found to be on average only one fisher per 100 square kilometres in the Williston study area, one of the lowest densities recorded.

The preferred habitat for fishers is riparian areas (areas adjacent to rivers and streams) that have a mixture of younger and older-aged forest stands and a mixture of tree species. The greater the rate and intensity that logging occurs, though, the less likely fishers are to establish a home range in the area.

The findings of the PFWWCP fisher study have already contributed greatly to better understanding this species. A

provincial population estimate for fishers was derived based on the density of fishers in the Williston study. This estimate, together with other factors, was instrumental in de-listing the fisher from the “red” (endangered) to the “blue” (threatened) list. Findings from other components of the project have been presented at an international symposium, published in a scientific journal, and are spawning new investigations.

“We hope our findings will continue to provide information that will advance the management of fisher populations and habitat in north-central BC and elsewhere,” said Weir.



Food for thought

The connection between river and tree root or between fish and the follicles of a grizzly bear's hair may appear distant. But to biologists studying the ecosystem of the Williston watershed, the health of the forests and their furry inhabitants is intimately connected to the abundance of fish in the region's rivers.

Take the following cycle of life as an example. Not long after birth, tiny kokanee fry migrate from rivers to the Williston Reservoir, where they spend the next four years. They then return to the rivers from which they came, where they then spawn and die.



It is hoped that research on expanding kokanee populations will help determine the contribution this fish makes to the diets of mammals such as grizzly bears.

This process provides a huge net input of nutrients to the riparian (streamside) environment, in the form of eggs and kokanee carcasses.

Many species of animals (e.g. common mergansers, herring gulls, bald eagles, wolves, grizzly bears, and many insects and other invertebrates) congregate on the rivers to eat spawning kokanee and their eggs.

As well, the kokanee carcasses fertilize plant growth both in the stream and along the river banks, even for those plants whose roots do not reach the water, because animals remove some kokanee from the river and leave parts on land. In addition, excrement from those animals is often distributed over vast areas.

As plant productivity increases, there will be more food for herbivores and hence their numbers will likely increase. Populations of carnivores that prey on those herbivores will also likely increase.

In 2005/06, PFWWCP biologists undertook a project to try to quantify how much kokanee contribute to the diet of both grizzly bears and black bears.

The project used a combination of high-tech lab techniques and simple field techniques. In the field, a strand of barbed wire was strung around stinky bait (rotten cow blood and rotten kokanee). Bears, attracted to the bait, pushed under the wire and left hair on the barbs. That's the simple part. After the hair was collected, laboratory analysis of the DNA in the hair's root identified which species of bear it was, what sex it was and which individual bear it was. Biologists are still awaiting the results of the analysis.

The rest of the hair will also be analysed for different forms of the carbon and nitrogen atoms. Those forms are called isotopes. Kokanee have concentrations of carbon and nitrogen isotopes that differ from other potential bear foods, so in the end biologists can tell how much kokanee the bears have been eating, and if different species and different genders have different eating habits.

Isotope analysis is also being used to determine how much streamside spruce trees used nitrogen from kokanee. The project is looking at spruce trees because spruce tree growth is usually limited by the availability of nitrogen and nitrogen is a large part of kokanee carcasses.

As kokanee numbers continue to increase these studies can be repeated to see how the distribution, abundance and diet of various wildlife species change around the reservoir.

Natureline

A summary of our activities in 2005/2006

Fish Updates

Small Lake Stocking Program

As part of its mandate to conserve and enhance the natural diversity of the Williston watershed, the PFWWCP has conducted a small number of fish stocking programs in various small lakes within the watershed, specifically in the area around Hudson's Hope and Mackenzie.

Ongoing assessments of these stocking programs are vital to ensure a quality recreational fishery exists in these lakes. Proper assessments will also help determine if stocking efforts are working, and what adjustments might need to be made.

Assessments of stocking programs were undertaken last year at Dina Lake #3 and Dina Lake #7, about twenty-five kilometres northwest of Mackenzie.

Although Dina #3 provides minimal spawning habitat and is sometimes inaccessible for spawning fish due to beaver dam development, eight of the sampled fish in 2005 were spawnbound (eggs had been retained). However, with the latest advancements in non-reproductive fish technology, it is now becoming more feasible to consider stocking Dina Lake #3 with a sterile strain in the future. The benefit of doing so is that sterile fish live longer, grow bigger and have better flesh quality.

In Dina Lake #7, the maximum size of rainbow trout observed was slightly smaller than in Dina #3. One possible explanation for the difference in size is that Dina #7 is a small lake and stocking numbers may be too high for this system. In order to increase the average fish size, future stocking efforts will have to consider the option of reducing the number of stocked fish slightly for the next stocking year.



Due to the lack of available spawning habitat in some of these lakes, female rainbow trout are forced to retain their eggs. The current viable strain of these particular fish will get changed in the future to a sterile type and will provide a better quality recreational fishery.

Genetic Research On Pygmy Whitefish Gets Underway

The historical processes that have shaped the genetic structure for the elusive pygmy whitefish are still not well understood. But, as a result of a collaborative research project between the PFWWCP and the University of BC, biologists in the Williston watershed will be better armed to develop an appropriate management plan for the pygmy whitefish.

Dr. Rick Taylor and Dr. Jonathan Witt of UBC have been working closely with program biologists to collect and analyse samples from a number of different lakes within the Williston watershed.

The main objective during the past year of research has been to analyse pygmy whitefish from various areas of the watershed and determine their genetic relationship to pygmy whitefish populations in other parts of North America.

The fact that the pygmy whitefish population is distributed through the Williston watershed in a number of disconnected watersheds – and that these isolated groups show genetic differences as a result – has important implications for management of the species, said program biologist Randy Zemlak.

Movement between populations in different areas of the Williston watershed is limited, even between those that are perceived to be in close proximity and share a short connection between lakes. For example, the upper



Dr. Rick Taylor and Dr. Jonathan Witt collect tissue samples from a number of pygmy whitefish obtained from the Upper Tacheeda Lakes.

and lower Tacheeda lakes are only separated by a road crossing (i.e. road culvert).

"I would have never guessed that there was a distinct separation between these populations of fish," said Zemlak.

"I've been studying this species for six years but without the help of the university in doing this DNA sequencing, we would have never known the results we have today. This type of information is key to the development of a proper management plan for this species."

Brassy Minnows Get a First Hand Look

The brassy minnow is currently a "yellow-listed" species in BC and should continue to receive strong conservation protection.

Preliminary genetic analyses of some BC populations (including two lake populations from the Williston watershed) indicate that these provincial fish are a native species. There is a large genetic difference between western (BC) populations and eastern (Ontario and Quebec) populations. These BC populations may be derived postglacially from a Mississippi/Missouri refuge population while the eastern Canadian populations are derived from a separate refuge in the Atlantic basin.

Although little is known about the biology or life history of the brassy minnow, what is known is that there appear to be only four populations, all concentrated in the southern part of the drainage around the Summit Lake area, north of Prince George. No populations of brassy minnow are known to exist north of Davie Lake until one gets past the Alberta border.



Brassy minnow are a small, slender fish that receives its name from the gold or brassy appearance.

Because so little is known about this species, it was decided to do some research on the species to find out more about it. Program biologists conducted preliminary surveys last year. Brassy minnows were observed in Bear Lake and in an inlet stream to Summit Lake.

"We want to have a closer look at this species," said Randy Zemlak, program biologist. "One of our main goals is species conservation, and when you can only identify a few small areas within such a vast watershed where these fish are found, we think it requires further attention."

Program biologists are now in the planning stages for further distribution studies into this little-known species.

updates

Wildlife Updates

Mackenzie Migratory Songbird Banding

The PFWWCP provided its eleventh year of funding to the Mackenzie Nature Observatory (MNO) to support the Mackenzie banding station at Mugaha Marsh. A master bander was again hired for the season and was assisted by volunteers from the MNO, other organizations, and the general public. (If you like getting up early in the morning, we invite you to visit the banding station next year to see how birds are captured and banded.)

Between mid-July and mid-September last year, 2,758 birds of 56 different species were banded at the station. The most commonly banded species were the Ruby-Crowned Kinglet (340), followed by the Northern Waterthrush (276) and American Redstart (275).

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. In 04/05 and again in 05/06, the PFWWCP provided a biologist and funding to support the regional Northern Caribou Recovery Implementation Group (RIG) which is in the process of developing and implementing a recovery plan for these caribou herds.

Peace Arm Stone's Sheep Demographics

In 1999, the PFWWCP launched an investigation into the effects of winter ticks on Stone's sheep in the area of the Peace Arm of Williston Reservoir. During this study, biologists observed some years of low lamb survival and a large number of adult ewe deaths, which prompted further investigation into the rates and causes of Stone's sheep mortality.

In 2003 and 2004, newborn (two- to three-week old) lambs were also captured and radio-collared so that their mortality rates and causes of death could be determined.

Monitoring of the lambs – and of the previously radio-collared adult ewes and rams – continued until June 2005, thus concluding over six years of fieldwork on the Dunlevy and Schooler sheep populations. A final lamb count/population survey was also conducted in June.

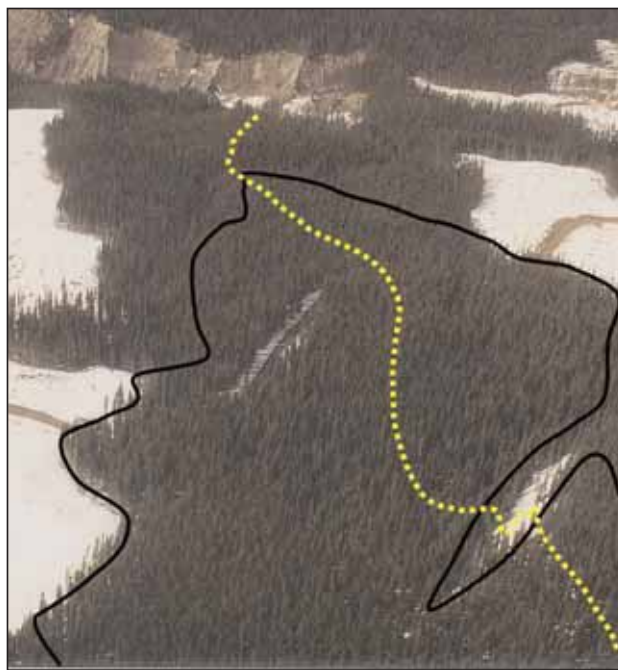
Summarization and analysis of the six years of combined data from both sheep projects was initiated. The final six-year report on the sheep research is scheduled for completion in 2006/07.



A 4-1/2-year-old ram is released after being fitted with a radio collar to monitor its habitat use and survival.

Ospika Mountain Goat Project

The 2005 field season marked the fourth of six years of monitoring mountain goat use of low-elevation mineral licks in response to timber removal treatments in the Ospika River valley. During the first phase, a forested buffer was left along the main access trail. The buffer was removed for the second phase.



Mountain goat use of the access trail to a mineral lick appears to have dropped off even though a forested buffer (top) was retained. Use following removal of the forested buffer (above) is being monitored in 2006 and 2007.

Goat use of the mineral licks and their main access trail were monitored using remote radio-telemetry and camera stations. Data from these stations were collected on a regular basis between April and November. Four new goats were captured and radio-collared, bringing the number of collared goats to twenty-one. Interpretation of the telemetry data (e.g., when and how long did a goat use a lick) from the first four years was completed, a statistical analysis framework for the remote camera data was developed, and analyses for the first phase of the project was initiated.

Upon preliminary analysis of the data for the first phase of the project, it appears that goats were still coming to the lick but were not using the trail through the buffer strip as often, instead some were traveling through the clearcut. In November 2005, the forested buffer was logged to initiate the second phase of the project, with data being collected in 2006 and 2007.

Questions answered on mercury content

There are two questions PFWWCP biologists get asked more than any others, according to program biologist Arne Langston.

One is, "Where's the best place to go fishing?" The other question he is often asked, said Langston, is, "Are the fish in Williston Reservoir safe to eat?"

"A lot of misconceptions have evolved around this issue," he said. "In fact, there is only one health advisory in place for only one species of fish in Williston Reservoir."

The 2006/2007 Freshwater Fishing Regulations Synopsis (page 78) presents a mercury warning which in part states:

"Mercury levels in bull trout (Dolly Varden) from Williston Lake... may be high. Normal consumption is not a significant hazard to human health but high consumption may be. For further information, contact the BC Ministry of Health through your local health unit."

Mercury is naturally present in soils and vegetation. When Williston Reservoir was first formed, the soils and vegetation now underwater were exposed to complex biological processes that made it possible for some mercury to be transformed into methylmercury and end up in the food bull trout eat.

Bacteria incorporate the mercury and transform it to the toxic methylmercury form. The bacteria are eaten by zooplankton (very small microscopic animals), which in turn are eaten by small fish such as lake whitefish and kokanee.

The methylmercury is stored in the body tissues of fish. Even though the amount consumed is very small, there can be a buildup after a long period of eating minuscule amounts of methylmercury: this process is called bioaccumulation. Even after twenty years of bioaccumulating methylmercury, however, the amount of methylmercury may still be minute and inconsequential.

The main food source for bull trout in Williston Reservoir is believed to be lake whitefish. Lake whitefish can live for a surprisingly long time. The oldest has been estimated at 28 years of age. Bull trout feeding primarily on these lake whitefish can then incorporate years of bioaccumulated methylmercury into their body and, in effect, biomagnify the level of methylmercury.

It is because of this magnification of the methylmercury that some bull trout in Williston Reservoir were found in 1988 to contain mercury levels above the acceptable Canadian level and the "Consumption Advisory" was issued in 1991 by the BC Ministry of Health.

However, no consumption advisories have been issued for any other fish in Williston or Dinosaur Reservoir.

Kokanee and rainbow trout are less likely to contain as much methylmercury as bull trout because of their age and diet. Kokanee live a maximum of four years and rainbow trout rarely exceed ten years of age. With such relatively short lives they are less likely to bioaccumulate as much methylmercury as species with longer life spans.

Kokanee also feed primarily on zooplankton and not other fish, so the effects of biomagnification are not present. Rainbow trout feed mostly on insects, though larger rainbow trout can feed on other fish. Because rainbow trout, unlike bull trout, do not feed primarily on fish and do not live as long, they are less likely to bioaccumulate and biomagnify mercury.

The Peace Water Advisory Council has written to Northern Health and Health Canada requesting a review of the Consumption Advisory to determine if the fish still contain mercury in amounts that should be of concern, and for clarification of what "normal" and "high" consumption rates are. There had been no response as of press deadline. For more information, please call Northern Health at 250-612-7021.



The Williston Ranger has helped conservation and enhancement efforts by providing biologists a safe and reliable environment in which to conduct research.

Home, home on the Ranger

Boat supports reservoir research

Biologists with the PFWWCP have an essential tool for research and enhancement projects – the research vessel Williston Ranger. The nine-metre boat has become an integral component of the PFWWCP research and enhancement efforts since it was launched in 2001.

“One day the vessel acts as a floating scientific research laboratory and the next it performs ‘work horse’ functions,” said Arne Langston, a fisheries biologist with the program, who was involved in the original acquisition and design of the Williston Ranger.

The Ranger provides a stable platform from which cutting-edge scientific research projects can be conducted, but is also sturdy enough to offer the brute strength required for such tasks as hauling logs for fish habitat enhancement structures. The boat has been used for many PFWWCP projects including: pygmy whitefish research projects on Williston Reservoir, Williston Reservoir limnology studies, Dinosaur Reservoir fish population studies, and the creation of habitat enhancement structures on Dinosaur Reservoir, to name a few.

“Williston Reservoir is the largest body of fresh water in BC, and correspondingly we experience some of the largest waves and most challenging boating conditions,” said Langston.

The Williston Ranger is equipped with twin in-board jet engines, electronic navigational and communication equip-

ment, and more safety equipment than required for a boat its size, which allows biologists to work safely on the reservoir. The boat also has rudimentary live-aboard facilities for a crew of three, offering the option of extended work periods of up to two weeks without requiring re-supplying.

Langston reports that even though the Ranger is a large vessel, “there have been numerous times we have

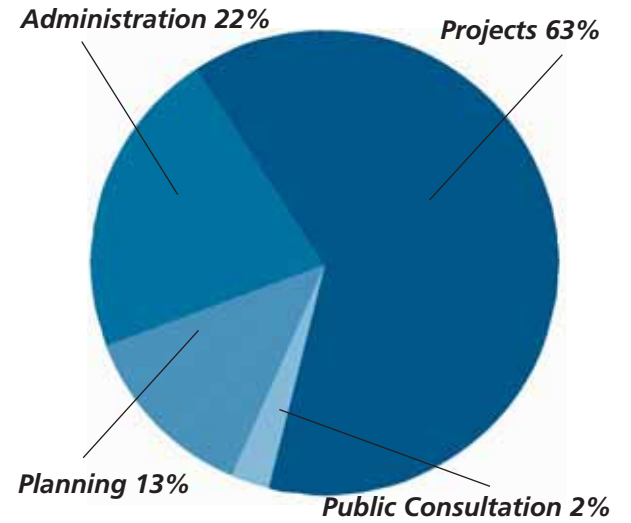
had to respect the weather and wave conditions on Williston Reservoir and simply anchor in a protected bay to await safer conditions.”

The next time you are out boating on Williston or Dinosaur Reservoir, watch for and wave at the Williston Ranger and crew. The boat and program staff are working hard to conserve and enhance the fish and fish habitat of Williston and Dinosaur Reservoirs.

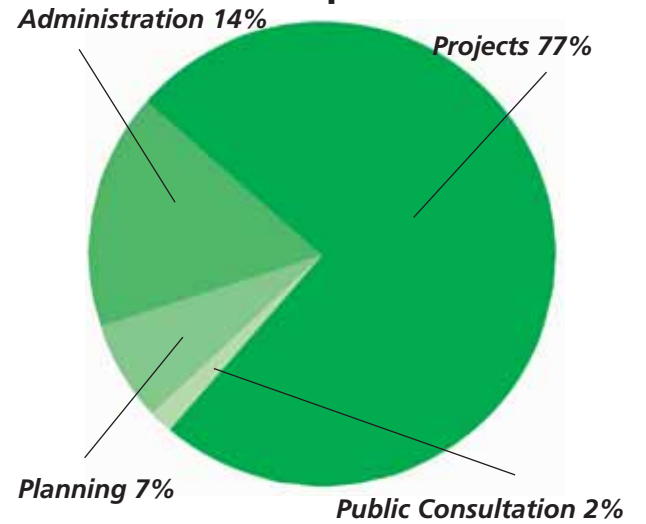
One day the vessel acts as a floating scientific research laboratory and the next it performs ‘work horse’ functions.

PFWWCP Budget Expenditures for 2005/06

Fish Expenditures



Wildlife Expenditures



PFWWCP built from strong foundations

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 WAC 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 WAC 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 our website at: www.bchydro/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/reports.html

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/community/outreach/outreach2335.html

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Please check the box if you would like to have your name added to the mailing list to receive a copy of future Natureline newsletters and updates about the Peace/Williston Fish and Wildlife Compensation Program.

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