Fish of the Dempster Country Project 2012

Final Report

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Fish of the Dempster Country Project
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Yukon Fish and Wildlife Enhancement Trust
&
Environment Yukon

Acknowledgments:

This project would not have been possible without funding contributions from the Fish and Wildlife Enhancement Trust and Yukon Parks. Also support and expert input contributed by Environment Yukon Fish and Wildlife Branch, Dawson District Renewable Resource Council, Dawson Regional Planning Commission and Friends of the Dempster Country.

We would also like to thank all who assisted in making this project a success. The project field assistants, equipment loans and ideas all contributed to protecting our fish and local natural resources.

Copies available from the Yukon Fish and Wildlife Enhancement Trust

Or by personal request to: Tr'ondëk Hwëch'in First Nation: Fish and Wildlife Dept.

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1.0 Background:

Long before the Dempster Highway was completed as the "Road to Resources", First Nation peoples of the north used this area for hunting, fishing, gathering and travelling through this land. The First Nations traditional uses of these resources were crucial for survival throughout the isolated and extreme Yukon winters. Amongst these cherished resources were fish, which provided food for the people and for their dogs, which were an important means of transportation for them.

Today the Dempster Highway is the only year round road in North America that links the Canadian Provinces to the land above the Arctic Circle. The current highway follows an old dog sled route used by Inspector William John Dempster of the Royal Canadian Mounted Police. Construction of the Dempster Highway began in 1959 as a result of oil and gas deposits discovered in the Eagle Plains area. The Dempster Highway officially opened in 1979, tagged as "The Road to Resources". As a result the Highway now provides year round road access to otherwise remote and isolated areas of subarctic tundra environments of northern Canada. This includes access to many pristine lakes, rivers and streams which are a part of both the Yukon and Mackenzie River Drainages.

In recent years the Dempster Highway and its surrounding environments have experienced an increased human foot-print. Tourism, exploration and pressure for industrial development have all contributed to this region's increased human presence. Today the highway corridor, with its beautiful natural landscapes and its abundance of natural resources so easily accessible, is becoming increasingly in demand to the world's growing population. With these issues becoming a concern, educated management practices will be what govern the future of this important region.

Pristine and intact areas, such as the Peel River Watershed have faced recent pressures from the Yukon Government and industry to open them up for development. In order to gain an understanding of how this environment and its resources function, past or present, it is necessary to establish studies like "Fish of the Dempster Country" to gather base line data and information. This is an environment which still functions as an intact ecosystem today. By gathering information on the health of this region, we will have a base of referral for the future.

(above): East Blackstone River Km86- July 2012 **photo: M.Samis**

2.0 Project Summary:

The Dempster Highway provides road access to many pristine creeks rivers and lakes, along with intact habitat for a variety of Yukon listed freshwater fish species. However, few studies have been completed on the region's fisheries resource. The most comprehensive study to date was completed by Beak Consultants in 1979 called "The Dempster Lateral Pipeline Project", with regards to the proposed pipeline project. Beak Consultants completed a fish occurrence survey of streams, rivers and lakes considered to be fish-bearing along the proposed pipeline route from Inuvik, North West Territories through Whitehorse, Yukon, to the Skagway, Alaska port. Several other small studies have been completed by DFO and private firms throughout the Highway's 34 year existence. The Yukon Territory took complete control of land and resource responsibilities in 2003 after devolution. Since that time the Yukon Government Fish and Wildlife Branch has expressed an interest in freshwater fish of the Dempster and surrounding areas. Several fisheries-related projects along the Dempster Highway, Tombstone Territorial Park and the Peel River Watershed have been completed in the last decade.

In the summer of 2012, *The Fish of the Dempster Country Project* completed its second year of sampling and data collection. This was in partnership with the *Tr'ondëk Hwëch'in First Nation* with funding support provided from the *Yukon Fish and Wildlife Enhancement Trust Fund 2012 and Yukon Parks*. 15 sites along the Dempster Highway Corridor, Yukon Territory Km 09 to Km 222 were selected as being of interest and importance to the region. The sites represent creeks, rivers and lakes of both the Mackenzie River and Yukon River Drainages. This is in order to establish a general overview of the watersheds occurring throughout the Dempster Country. These results will provide a baseline guide to fish species occurring in the region for future management considerations of this resource.

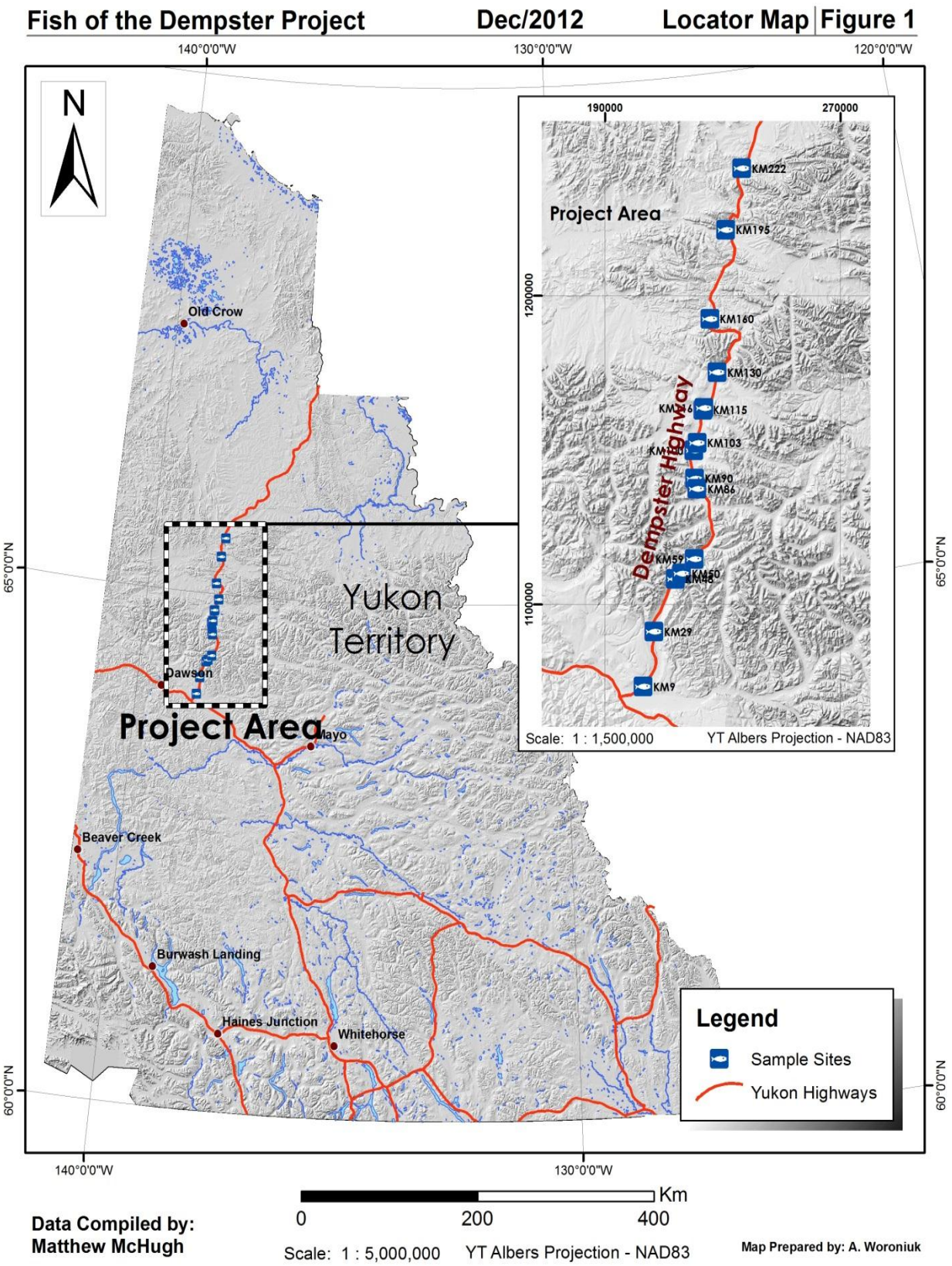


Figure 1.0: Fish of Dempster Study Area, with location in Yukon.

In addition, Fish of the Dempster Country re-examined sites from the 2007 "Dempster Fisheries Assessment" by Yukon Government Fish and Wildlife Branch. The study identified specific culvert crossings along the Dempster Highway, which have potential passage issues for fish migration.

The *Fish of the Dempster Country Project* included and utilized both traditional and local knowledge of the region. This helped to gain an understanding of how fish of this area may have been used, and how they functioned as a natural resource in the past. The project also celebrated a working relationship with the Tr'ondëk Hwëch'in First Nation and local Dawson City youth, through the Yukon Parks "mentorship program". During the grade 12 class field trip of Dawson City's Robert Service School, youth participated in various tasks assisting with the project. This worked well, getting local youth involved with a resource that exists literally in their back-yard. A presentation was delivered at the Tombstone Territorial Park Interpretive Centre at Km 70 on the Dempster Highway in August 2012. This provided the public with an understanding of this project and the concept of what the Dempster Highway and Fish of the Dempster Country mean for today and the many generations to come.

2.1 The objectives of the 2012 Fish of the Dempster Country Project:

- Establish a base-line data set of fish species occurring throughout Dempster Country
- Re-examine the effects of culvert passage issues at sites listed in the *2007 Dempster Fisheries Assessment*, by the YG Fish and Wildlife Branch
- Establish Traditional and Local Knowledge records of the Dempster Country fisheries
- Involve the community and youth as a tool for education and participation, in local natural resources

4.0 Methodology:

The Fish of the Dempster Country Project used low impact collection methods to gather live fish specimens. Information was collected and recorded and fish were released unharmed back to their native environment. This was necessary to gain a better understanding of what fish species were occurring and to observe and record differences and/or similarities in fish migration, behaviour and presence amongst each site. This may have also helped identify changes in habitat characteristics throughout the sampling periods. Sampling occurred once per month throughout the field season; June through September.

The May site assessment was eliminated from the 2012 project year due to a late spring thaw, timing constraints and lack of funding. The funds unavailable in May were used later in other areas of the 2012 project, which are outlined in the Project Financial Report, found as an attached document.

Sampling methods included use of gee-minnow traps, a minnow/fry seine net, angling with rod and reel, a snorkel-swim count, and visual observations from shore. Each sampling device was used according to each site's variables and requirements to get the best representative sample for the specific site and species present. An electro-fisher was also obtained with the purpose of sampling fish using this method, but we were unable to use it because of a battery problem. Information on the captured specimens was collected and recorded on individual fish

identification, length (mm), weight (g) and any other notable comments for the sampled specimen. All fish sampling included and followed Department of Fisheries and Oceans and Tombstone Territorial Park licencing and sampling protocols.

At each site a minimum of 3 gee-minnow traps were set and left to soak no more than 24 hours and baited using Yukon River Salmon Roe, for the Yukon Drainage and Tuna and/or cheese for the Peel-McKenzie. If permitted, more traps were set on either side of the Dempster Corridor allowing for better representation or differences in habitat and/or certain species requirements. Sites as mentioned with potential passage issues were re-examined, and a minimum of 3 traps set on either side of the Dempster Highway Corridor if conditions permitted (i.e high water). This was to ensure there was no difference between specimens captured on one side of the Highway corridor from those captured on the other. Rod and reel angling was used with the intention of capturing adults or larger fish that were frequenting each site. A minnow seine was used in rare cases where an abundance of fry were observed, and allowed for an on the spot "grab sample". Species could therefore be properly identified and sampled with this method. A dry suit and snorkel with fin gear was used for a low impact species identification/abundance survey for fish observed at each site. This method allowed us to view fish in pools of streams and in lakes that had otherwise been observed from shore, but not properly identified or recorded for that site.

Water quality and quantity was also recorded at each site, dependent on site conditions, safety and equipment availability. Water quality was recorded with an YSI model 556 WQ meter. The parameters included Temperature, Dissolved Oxygen, Total Dissolved Solids, Conductivity, Turbidity and Ph. Water Quality is thought to be an important aspect of collecting information on fish species presence as it can be used as an indicator for specific species requirements. Water quantity parameters such as wetted, bank-full widths and depths were recorded as conditions allowed.

A habitat Assessment Sheet was used to collect and record information pertaining to site characteristics, such as in-stream and surrounding vegetation, islands or bars present, substrate materials, water colour, water stage and form (pool, riffle, and glide) and any evidence of over-flow. If the study site included a highway crossing, the type (bridge/culvert) was recorded and noted if there were any concerns with fish passage. Other information collected at each site included a GPS Latitude and Longitude coordinate and site photos, for specific site location. Site elevation, weather and air temperatures were recorded along with any notable comments directly or indirectly related to the project and the Dempster Country's natural history.

The project included *Traditional and Local Knowledge* of the area and fish as a resource, with the help of the Tr'ondëk Hwëch'in First Nation and other community members who have lived or had traditional uses within the Dempster Country and surrounding areas in the past or present. This is especially important in realizing how this environment may have functioned in the past with little human impact and no highway corridor. An informal interview type session was set up by the Tr'ondëk Hwëch'in First Nation Heritage Department, to speak with several elders who have experience and history in this area. An audio recorder was used to document the Traditional Knowledge shared by the TH First Nation Elders. Interviews were also completed over the phone.

The 2012 "Fish of the Dempster Country Project" had intended to utilize and incorporate Environment Canada's C.A.B.I.N protocol for the collection of invertebrates from the study sites. Invertebrates are thought to be great indicators of fish presence and specifically, what

species of fish are in an area. Due to logistics, timing constraints and equipment purchasing, this process was left to a basic sample at each site with a kick-net. In the future it would be ideal to review the C.A.B.I.N protocol and carry out these actions.

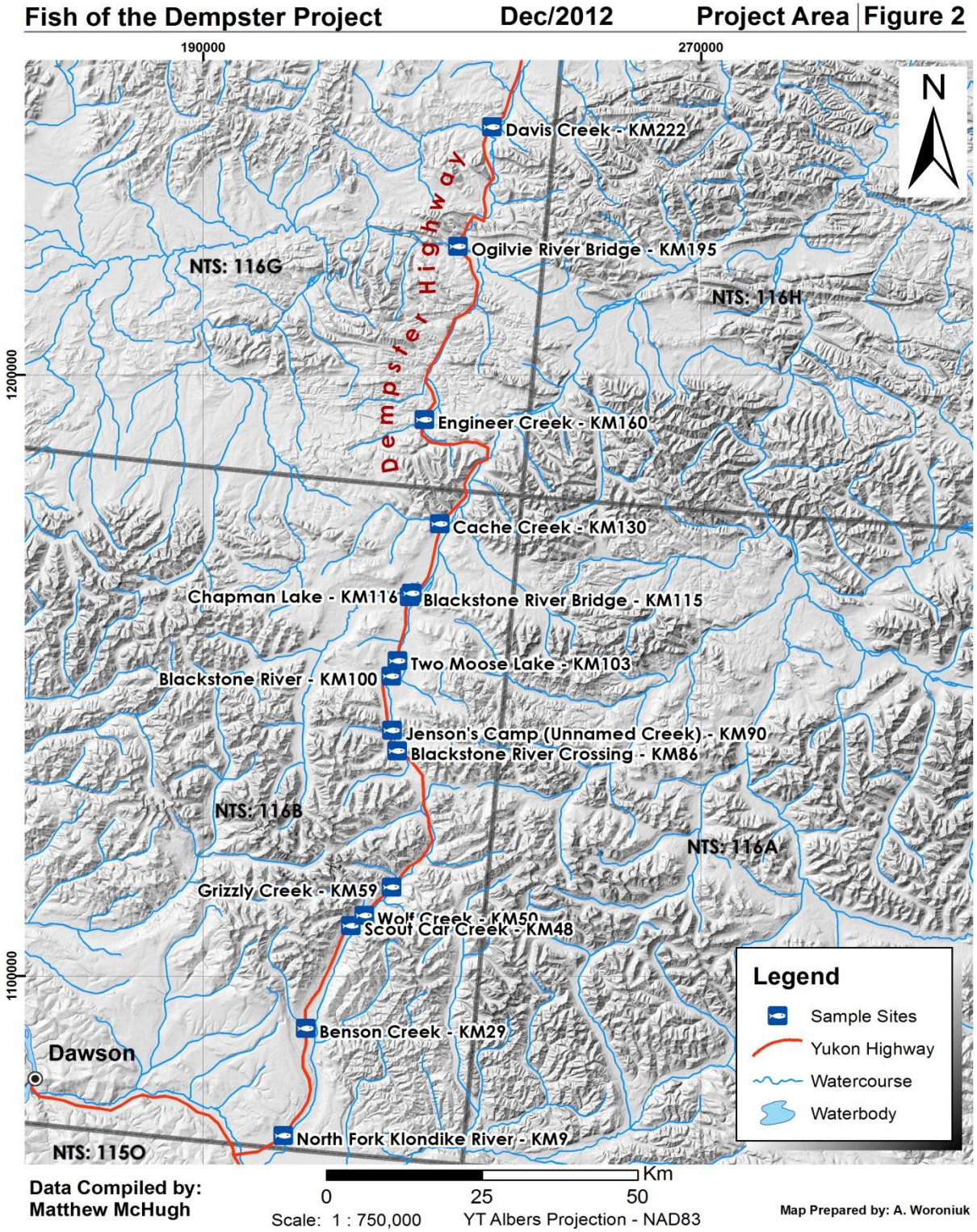


Figure 2.0: Location of Sampling Sites from 2012 "Fish of the Dempster Project"

*please note corrections to the following site documented distances in Km as previously mentioned in the original project proposal:

- Old dam-North Fork North Klondike River: Km 09
- Scout Car Ck: Km 48
- Blackstone River Bridge: Km 115
- Cache Ck: Km 130

*****the site at Jenson's Camp Km 90, referred to as Yakamaw Creek, was labelled incorrectly in the project proposal. For the remainder of the 2012 project year this site will be referred to as Jenson's Camp-Unnamed Ck: Km 90 of the Dempster Highway

The following is a list of individuals who assisted with the Fish of the Dempster Project 2012:

Matthew McHugh:	Project Coordinator, Data Entry, Report Writing/Editing
Kyla Boivin:	Project Field Assistant
Martin Samis:	Project Field Assistant, Photography
Ryan Peterson:	TH Fish and Wildlife Stewart, Expert Knowledge of Dempster
Arron Mendelson:	TH/YG Parks "Mentorship Program", Project Field Assistant
Merran Smith:	Tombstone Park Ranger/project assistant
Sylvia Frisch	Expert Knowledge of Dempster, Project Concepts and Ideas

4.0Project Results:

due to the high volume of data collected at each study site, an excel sheet is attached to this report for referral to the 2012 project results. As scene in *Table 1.0 Sampling Data and Table 1.1 Habitat Assessment Data.

The 2012 *Fish of the Dempster Country Project* sampled 15 sites, in order to best represent fish species occurring throughout the southern half of the Dempster Highway Corridor, Km09-Km222. Although there are many other sites that could have been chosen for the project, the selection was kept to a minimum because of the vast area that the study includes. The Dempster Highway includes two major watersheds, the *Mackenzie and Yukon River Drainages*. Within the Yukon Drainage, the North Klondike River and several tributaries were selected for sampling. The Blackstone and Ogilvie River Basins are drainages included in the Peel-Mackenzie. Several sites of interest and importance were selected for sample within this study. Essentially sites within the project area were selected based on location and interest and divided into the North Klondike Basin from Km 09 to Km 59, the Blackstone Basin Km 86 to Km 130, and the Ogilvie Basin Km 160 to Km 222. The object was not to compare species or habitat amongst each watershed, (although interesting comparisons may be made), but to describe fish and fish habitat presence, specific to each site location. Thus it was necessary to divide them into the following, to gain an understanding of what is occurring throughout the *Dempster Country*.

Please see Figure 3.0 at bottom of results section, mapping documented results outlining some of the sites recognized as summer rearing fish habitat from the 2012 project.

4.1 North Klondike Basin Sites:

4.1.1 Old Dam North Fork-North Klondike River: Km 09

Km 09, Dempster Highway was chosen as a known site by locals and government organizations to represent all life stages of Chinook salmon along with solid habitat for other fish species occurring in the area. The site consists of a large pool with good back-eddy escape for juvenile fish. The old dam timbers act as refuge for fish species and has created excellent fish habitat. The water depth/width was not measured due to safety concerns because of deep water, but the study site was approximately 120-180cm in depth. There is very little flow due to the backwater at this location, but the Klondike River flows through the area with a moderately swift current, creating good turn-over in the pool. With adequate vegetative cover, debris and timbers from the old dam, this site provides excellent cover and rearing habitat for juvenile fish. Slimy Sculpin were captured during more than one month, indicating available food sources and possible nutrients in the area. The substrate materials mostly consist of gravels and algae was observed on rocks and timber surfaces. There were no culverts or road crossings at this site.

Old Dam Site- North Fork: North Klondike River **photo by M.McHugh**

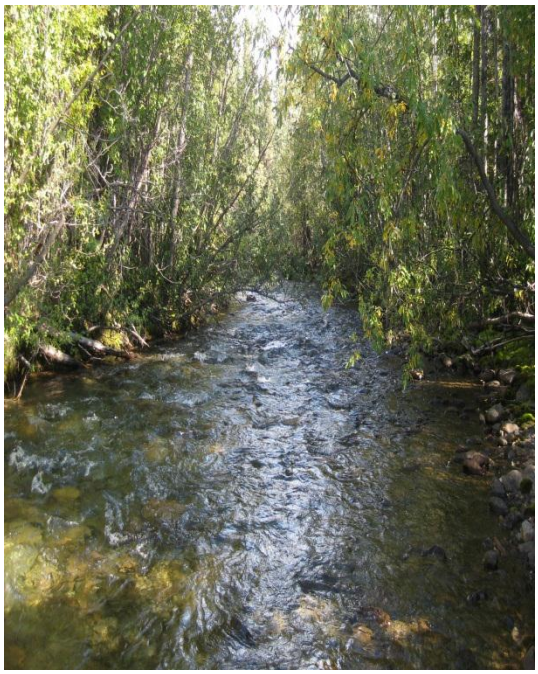
Only Slimy Sculpin were captured at the Old Dam Site during the summer sampling period. With an average of 3 gee-minnow traps and 0.5h of angling conducted each month, these results are not conclusive of the potential of species that could have been present at this site. Continued and longer monitoring efforts of this specific site will most likely provide increased conclusive results. Salmon studies in the area have documented Chinook salmon from fry to adults, although in recent years juvenile Chinook numbers are down. This may be explained in

several studies completed in the last several years, including the Klondike Sonar 2009/10 study and 2011 DDRRC: Yukon River North Main Stewardship. Also Traditional Knowledge documented in the 1997 Yukon River Panel Report: cre-05-97 and local residents living in the North Klondike area have noticed a decline of salmon in the area.

4.1.2 Benson Creek: Km 29/Scout-Car Creek: Km 48/Wolf Creek: Km 50/Grizzly Creek: Km59

The selected sites within the North Klondike River Basin are all similar structure and composition and therefore were described as follows.

The Benson to Grizzly sample sites all consist of small high-energy mountain streams which originate from the Tombstone Mountain Range, part of the Ogilvie Mountains. Directly off the Highway for 100 meters on either side, these sites produce high velocity water discharges with evidence of over-flow from spring freshet. Riffles and glides are present, with deep pools at the outflow of the culverts. Substrate materials mostly consist of cobble and gravel. These sites all had average depths of 20-30cm and were 12-15 meters in width. The creek sites had steep banks, which are known characteristic of Yukon Drainage tributaries. During the sampling periods there were selected areas with backwater/eddies, but high flow velocities with limited coverage from the vegetation canopy would make it difficult for juvenile fish or even adults to establish themselves in the area. Over-wintering potential for any fish species is unlikely in the area based on the streams composition and lack of inflows or ground water sources. Results from the 1978 "*Dempster Lateral Pipeline Project"* showed Slimy Sculpin captured in Benson Creek during early spring when the creek was still iced over (1978 Beak Con Ltd), suggesting these fish may over-winter in sections of Benson Creek. A further study would have to be conducted in order to confirm this for the present time.



Above: A typical view of the North Klondike Tributaries : photo M.McHugh

No fish were captured or observed at the sampled locations throughout the 2012 field season. However it is possible the pools located on the downstream side of the highway culvert could

support adult Arctic Grayling. According to the 1978 *Dempster Lateral Pipeline Study*, Arctic Grayling were captured by use of an electro-fisher at Wolf and Benson Creeks. Although sampling locations were limited to the pipeline route and not the Dempster Highway Corridor, which may include site specific and habitat availabilities. Further up and down-stream of the Dempster Highway there were several areas observed that might support fish species.

The North Klondike tributary creek sites contain 2 x *round 8ft culverts* for road crossings through the Dempster Highway. In a study done in 2007 entitled "*Dempster Fisheries Assessment",* these sites were examined and defined as having a potential passage issue, due to the high perch or step from creek to culvert for migrating fish utilizing the area. These same sites were recognized in the current *"Fish of the Dempster Country Project",* as having an issue for fish migration, especially juveniles, due to the high perch rise from creek surface to culvert entrance, steep plunge and high velocity of water. A discussion on culvert monitoring results and future implications for *the passage issues* may be read under section 4.5 Culvert Review.

The 2 x 8ft Culverts at Grizzly Creek Km 59: photo: M.McHugh

4.1.3 *Chinook salmon* was valued for traditional uses for First Nations and the commercial value as a fisheries resource in the area. A focus was placed on capturing salmon to further our knowledge of the changes in the North Klondike Basin. There are no records found with Chinook salmon documented in Benson Creek Km29 to Grizzly Creek Km 59. However there are reports documenting Salmon in the North Klondike River, up and down-stream of Benson Creek. This suggests that (dependent on habitat availability) these creeks may support Salmon as well. The Frisch family, who have lived off and on at North Fork Km09 since the late 1970s, have many stories of adult and juvenile Chinooks in the area.

4.1.4 The following is a list of Common and scientific names of fish species which are known to be present in the North Klondike River Basin of the Yukon Drainage.

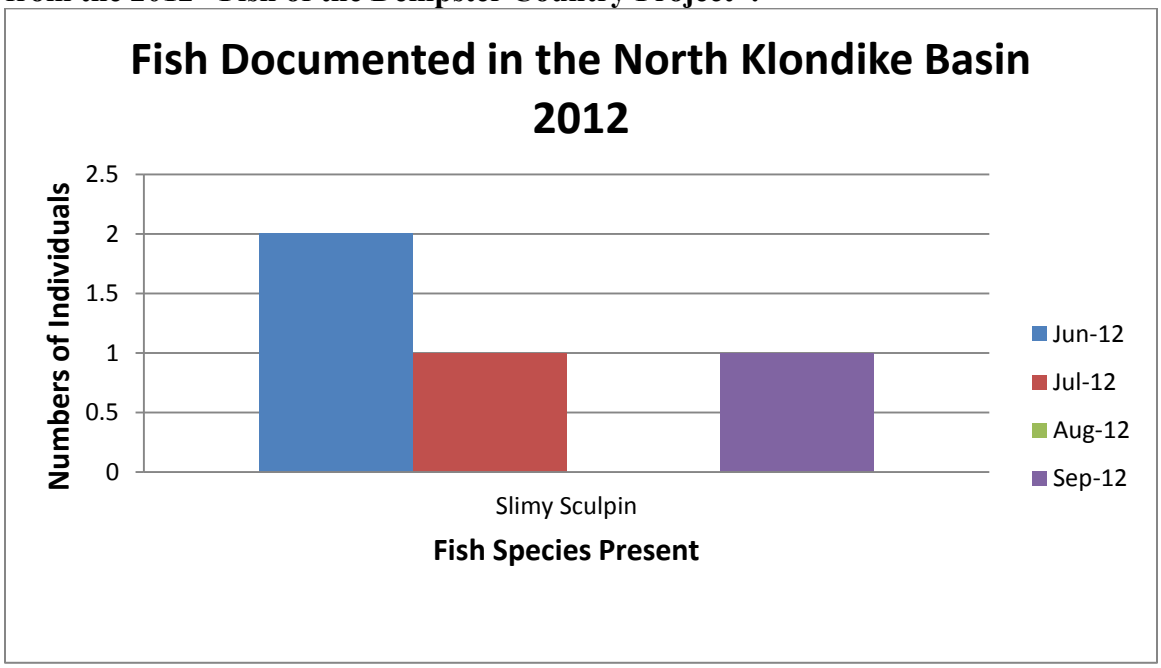
Documented:

Round Whitefish	*Prosopium cylindraceum*
Arctic Grayling	*Thymallus arcticus*
Chinook Salmon	*Oncorhynchus tshawyscha*
Burbot	*Lota lota*
Slimy Sculpin	*Cottus cognatus*

Possible:

Arctic lamprey	*Lampetra japonica*
Inconnu	*Stenodus leucichthys*
Humpback (lake) Whitefish	*Coregonus clupeaformis*
Broad Whitefish	*C. nasus*
Chum Salmon	*Oncorhycus keta*
Northern Pike	*Esox lucius*
Lake Chub	*Couesius plumbus*
Longnose Sucker	*Catostomus catostomus*

The following Chart 1.0 lists fish species documented in the North Klondike River Basin, from the 2012 "Fish of the Dempster Country Project":



*this chart should only be used as a reference for fish species occurrence in the region. Only captured or properly ID fish were included in the chart data, representing fish sampled in the 2012 field season

4.2 Blackstone River Basin:

The *Blackstone River Basin* along with the tributaries and lakes, originates in the cloudy mountain range of the Ogilvie Mountains. Three sites along the river were investigated for study based on interest, ease of access and known fish presence from anglers who have fished the area. The Blackstone is mostly situated in a tundra eco-zone with permafrost throughout. Regardless, sufficient ground water runoff is present throughout the creek sites to potentially provide some source of over-wintering habitat for fish.

4.2.1 The Blackstone River: Km 86/ Km100 & Km115

The sampled river locations all had similar bank structure, set back from the channel in large open valleys with mostly gravel and cobble making up the substrate. Little to moderate vegetation is present, but the shorelines did have thick alder and willow growth. Blackstone River sites averaged 80cm depth and 30 meters width. A swift current contributes to riffles, while sites like the sampling location at Km 100 have back-water pools acting as summer rearing habitat for Arctic Grayling and Northern Dolly-Varden. Dolly-Varden and Slimy Sculpin individuals were captured at these sites, and knowledge from anglers plus the observations made indicated that these sites support both juvenile and adult life stages of Arctic Grayling and Northern Dolly-Varden.

The Bridge crossing at Km 115 appears to have no interference with fish passage or to cause any issues regarding erosion into the Blackstone River. The East Blackstone-Km86 has *2 x 12ft culverts adequate* for the flow and no passage issues identified. Km 100 has no highway crossing or issue.

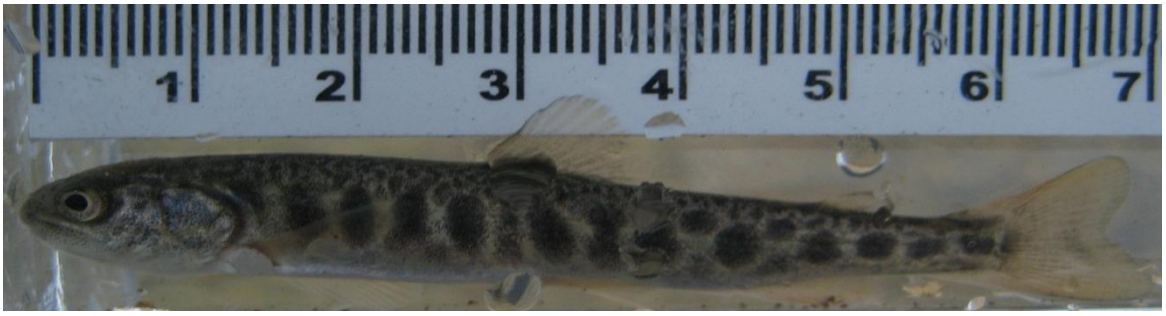
Blackstone River Bridge-Km115: July 2012 (left) and East Blackstone River-Km86: June 2012 photo: Marty Samis

4.2.2 Jenson's Camp-Unnamed Creek: Km 90

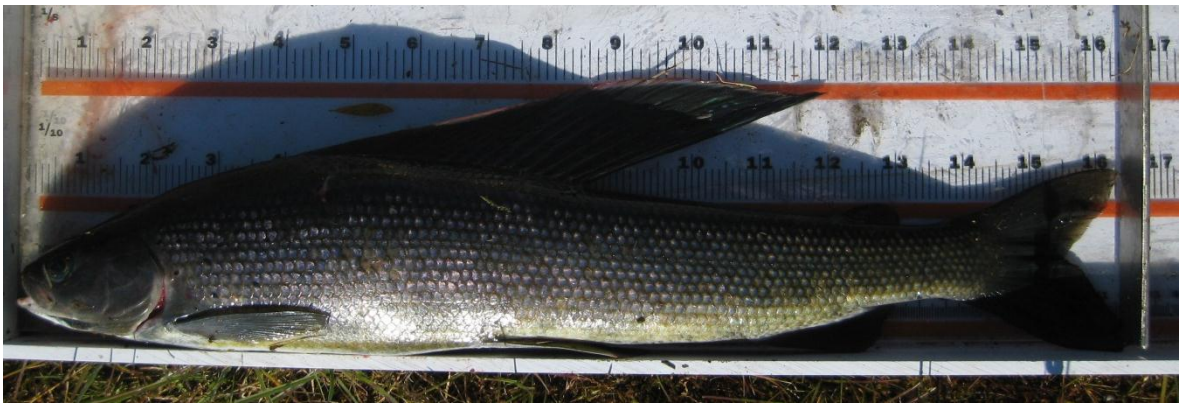
This location is unique and appears to have importance to several fish species frequenting the Dempster region. Originating from the Cloudy Mountain Range in the Ogilvies, it is a low-energy and moderate flowing creek. This site is highly productive even though it is located in an alpine and subarctic region. Approximately 200 meters downstream of the Dempster Highway the creeks enters Yakamaw creek, then drains into the Blackstone River. Over the past two sampling seasons numerous juvenile through adult stages of Northern Dolly-Varden have been documented as using this area for summer rearing habitat. Fry through adult Arctic Grayling captured and recorded in the 1978 "*Dempster lateral Pipeline Project"* were also documented as using this area for summer rearing. On the downstream culvert there is a pool and well defined riffles. The creek quickly goes from a single channel into a serious of braided channels in which Dolly Varden fry (50-100mm length) were observed and captured with a minnow seine net. The creek site had an average depth of 30 cm and 14 meters wetted width. This location provides adequate habitat for various life stages and species of Yukon fish and should be noted as a highly productive environment and considered while making fisheries management decisions for the Dempster and Tombstone Park Regions.

An outfitter camp is located to the right of this site, and locals have said the hunters used it for recreational fishing. The outfitter has yet to be contacted with regards to local knowledge of the creek and the fish species occurring. When possible, residents and/or owners of this camp will be interviewed in order to gain a general knowledge of fish at the site.

Down-stream view (left): June 2012 and Northern Dolly Varden fry-"look close" (right) at Jenson's Camp-Km90:Aug 2012 photo: M. Samis (top left) M. McHugh (top right)



Northern Dolly Varden fry captured in braided channels (see above right photo) at Jenson's Camp-Km90 photo: M.Samis



Adult Arctic Grayling caught with Rod and Reel in down-stream pool at Jenson`s Camp-Km90: Aug 2012 photo: Ryan Peterson

There is *one main 12' elliptical arch culvert* with two other culverts located near the creek, assumed to be for spring run-off. There are no apparent blockages or fish passage issues with the culvert at Jenson's Camp Km 90. It appears adequate for the water source and fish utilizing the creek in the region.

Above: culvert crossing at Jenson's Camp: Km 90 July 2012 photo: M.McHugh

"Filamentus Green Algae" is found throughout the sampling location at this creek, especially in the braided channels, just 20 meters downstream of the Dempster Highway. This algae usually indicates where a ground water source with some level of nutrients in it surfaces. This may also explain the high usage of the area by various fish species. This site may potentially be *over-wintering habitat*, as indicated by the groundwater source and the ease of access to the nearby Blackstone River. Further monitoring and research into the area will be required to determine this idea. Very little is known with regards to where fish species over-winter in the area, therefore this is thought to be a site of importance for future study.

`` Filamentus Green Algae`` scene here in the braided channels at the Jenson`s Camp-Km 90: July 2012 photo: M.McHugh

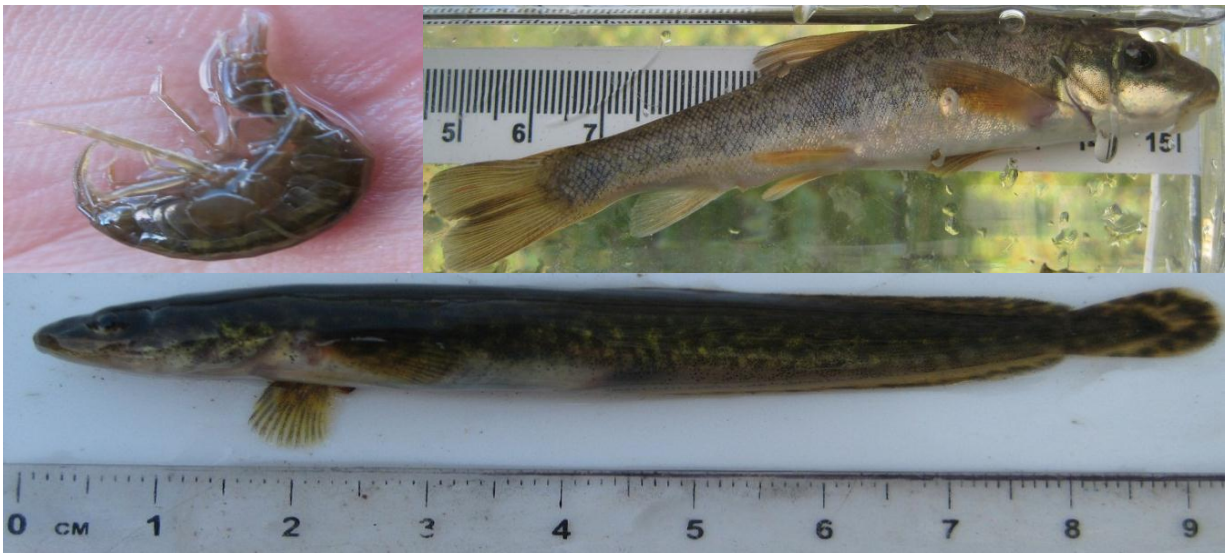
Two-Moose Lake: Km 103 & Chapmen Lake: Km 116

Chapmen and Two-Moose Lakes have similar habitat characteristics, and compositions which indicate thermokarst lake formation. Water quality was also noted to be very consistent in both lakes through the sampling periods. Substrate materials consisted mostly of fine and muddy material, with some aquatic vegetation near shore. Both are shallow lakes as well, at approximately 90-120cm depth. Low willow bush surrounds the lakes, but does not provide much cover for fish along the shores. There are no known culverts or road crossings located at these sites.

Interestingly, the two lakes did not provide similar species results. No fish species were captured or observed while sampling in Two-Moose Lake although it produced an abundance of *fresh water shrimp* invertebrates (see picture below), caught in gee-minnow traps. Where-as Chapmen Lake appears to be a species-rich site with fish such as Long-Nose Sucker, Slimy Sculpin and Burbot captured and observed regularly upon site visits. Also the "*Peel Fisheries Report"* Completed by Environmental Dynamics in 2006 (EDI Peel) documented Round Whitefish in Chapmen Lake as well. Therefore it is thought Chapmen provides all the necessary

habitat requirements for rearing, spawning and over-wintering for a diverse number of fish species.

There are no known culverts or road crossings, located at these lake sites. And no erosion problems observed from the paralleling Highway corridor.



(top left) Fresh-water Shrimp found in G-traps at Two-Moose Lk-Km 103 (top right): Long-Nose Sucker captured at Chapmen Lk: 116 Bottom: Burbot captured at Chapmen Lk:Km116 **photo: M.Samis**

Chapmen Lk-Km116 (left):July 2012

Two-Moose Lk-Km103 (right):July 2012 **photo: M.Samis**

Cache Creek: Km 130

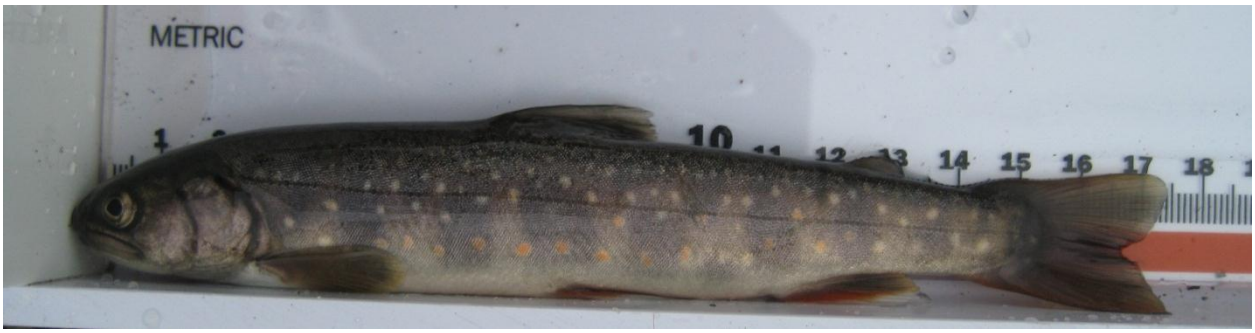
Originating from the Ogilvie Mountains, this site is low to medium energy stream. There are deep pools, riffles and glide water forms present with mostly a gravel/cobble substrate. Depths averaged 20cm and 12.5 meters wetted width. No in-stream vegetation was recorded, but

evidence of an unidentified algae form was observed on the substrate surface. The surrounding vegetation canopy was low, mainly consisting of shrubs and grasses and some conifers.

This site location appears to be fish species rich, based on this projects' two years of sampling, providing adequate summer rearing habitat. Many fish species and their life-stages (juvenile-adults) are found at this location. Documented species from the 2011/2012 "*Fish of the Dempster"* and previous studies on Cache Creek include Burbot, Slimy Sculpin, Arctic Grayling, and Northern Dolly-Varden. An example from the 2011 study year included over 100 Slimy Sculpin individuals captured in a single gee trap, at Cache Creek, over a 12 hour set. This, along with the documented success in capturing various other species, indicates a possible abundance of food and nutrients available and importance to fish frequenting the area.

Left: Cache Ck-Km130 down-stream of Dempster (Right) Culverts at Cache Ck-Km 130 **photo: M.McHugh**

There are *2 x 4ft round culverts* with a third located off the creek, assumingly for spring run-off. There are no passage threats to fish in the area, but a debris load consisting mainly of downed trees and sticks blocked the left (up-stream) culvert during the June and July sampling. This acted as a dam for water passing through the highway and levels in the pool on the up-stream side of the Dempster were above both culverts and creek banks. The debris had cleared for the August sampling and no other problems seem apparent. The culverts should continue to be monitored for the future, as it could affect fish migration and possible erosion to the highway bank.

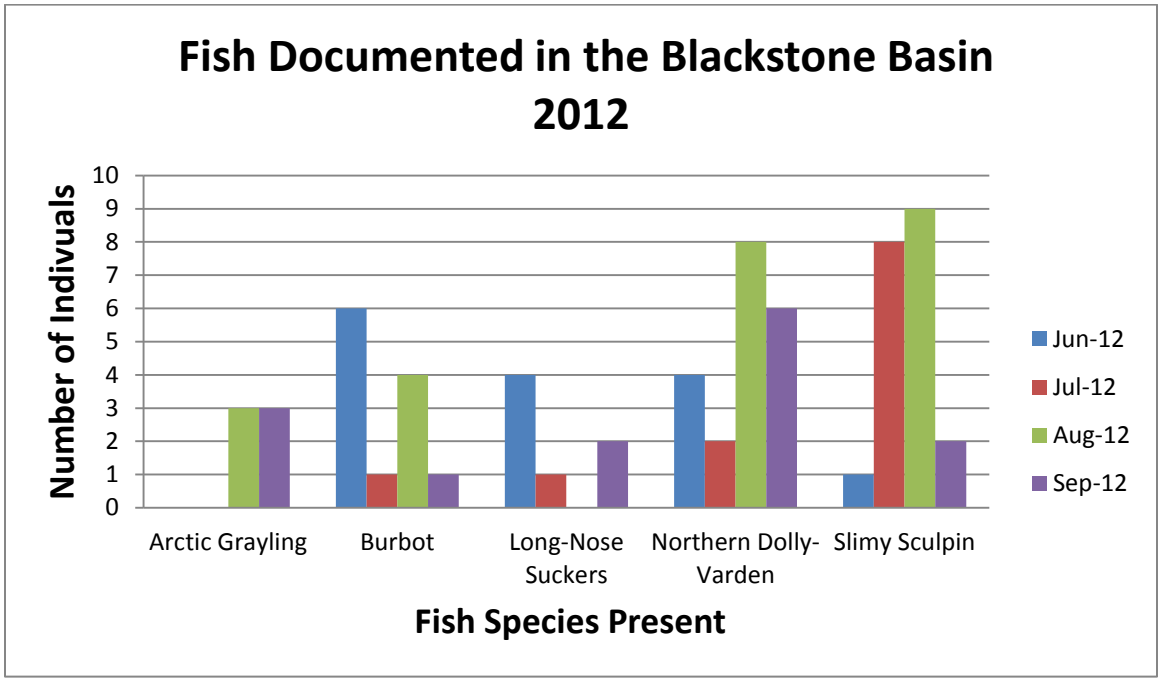


Captured Norther Dolly-Varden at the Cache Ck Site: Km130 in July 2012. **Photo: M.Samis**

The following is a list of common and scientific names of fish species which are known to occur in the Blackstone River Basin:

Northern Dolly-Varden	*Salvelinus malma*
Arctic Grayling	*Thymallus arcticus*
Round Whitefish	*Prosopium cylindraceum*
Burbot	*Lota lota*
Long Nose Sucker	*Catostomus catostomus*
Slimy Sculpin	*Cottus cognatus*
Lake Chub	*Couesius plumbus*

The following Chart 2.0 lists fish species documented in the Blackstone River Basin, from the 2012 "Fish of the Dempster Country Project:



*this Chart should only be used as a reference for fish species occurrence in the region. Only captured or properly ID fish were included in the chart data, representing fish sampled in the 2012 field season.

4.3 Ogilvie River Basin:

The Ogilvie River basin originates north of Dawson City, Yukon in the Ogilvie Mountain Range. It is a medium sized, swiftly flowing river, with a distinctive greenish grey colour. There is 50 Km stretch of the Ogilvie River and several of its tributaries which parallel the Dempster Highway. This leaves the River very accessible to human traffic and recreational fishery. Several sites were selected along Ogilvie area to gain and represent a general understanding of species occurrence. It would have been ideal to sample more locations along Engineer Creek, the Ogilvie River and other creek locations as road and site access are at a premium and species occurrence may increase. This includes documenting Northern Dolly-Varden, of which there are no records of capture, but are assumed to occur in the Basin.

4.3.1 Engineer Creek: Km 160

This site was sampled upstream of several tributaries' entrance (at km160). The creek originates in the Ogilvie Mountains. This site has a low to moderate discharge through the summer. Although with 3 large culverts for water passage, it is assumed spring freshet brings high, fast flowing water velocities through the area. The creek had an average depth of 20cm and is 11 meters in width. Substrate materials included mostly cobble and gravel, with pools, riffles and glides all present. Little to no vegetation is present at the site for cover or bank stability.

Sampling results from Engineer Creek showed an abundance of Arctic Grayling juveniles and adults. Arctic Grayling were present in the down-stream pool of the Highway, identified during a snorkel swim in the down-stream pool. Interestingly, no Grayling were observed in the September 2012 visit, possibly due to lack of available food or movement into over-wintering habitats. Grayling were also observed swimming through the culverts upstream. This site is likely used as summer rearing habitat for the Arctic Grayling. It is unlikely that fish over-winter at the Highway site, due to freezing and lack of ground water observed, entering the creek in the area.

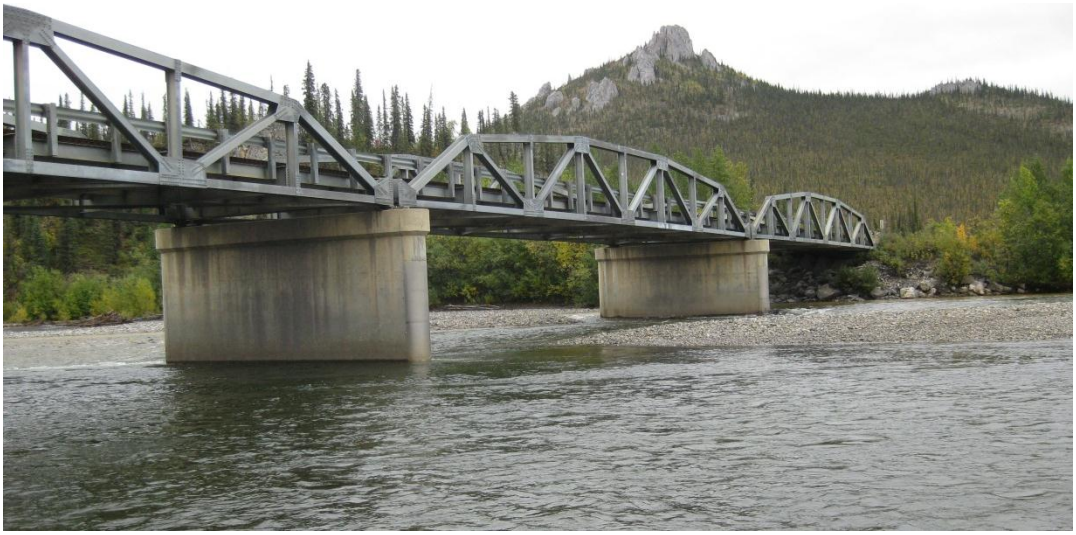
Identifying Arctic Grayling in downstream pool at Engineer Ck-Km160: August 2012 photo: Kyla Boivin

There are *3 x 12ft Elliptical Arch Culverts* at Engineer creek Km160. There were no obvious signs of blockage or fish passage issues at this location. There is a short perch on one of the culverts (see far right culvert in picture), but with adequate passage through the other two, no passage issue was identified. It appears from the June sampling, with an abundance of ice still present and government de-icing equipment left at the site, that at least two of the three culverts freeze solid from glaciation and therefore would make poor over-wintering habitat for fish. This however, would have to be assessed through a winter study and site visit.

Ogilvie River Bridge: Km 195

This site was chosen as a known great fishing location by tourists and locals, as well as for the ease of access via the road crossing/bridge. No measurements were taken during the sample season due to fast moving deeper water. Bank structures are moderate but are generally set back and stable. There is adequate vegetation cover of mixed deciduous/coniferous forest with willow and alder species present on the shoreline.

No fish were caught or recorded at this site in the 2012 study. Sampling fry and/or juveniles at this site was limited to gee-minnow trapping, with rod and reel for adults. It is unlikely juveniles frequent this area, as there is little cover from the fast current or from predation. If more time was allocated, better results may have been achieved, as this site is well known for good fishing. Records show no Northern Dolly-Varden (NDV) captured at this site to date, but it is highly possible that there are based on NDV migration in the Blackstone and Peel Watershed.



Above: Ogilvie River Bridge-Km 195: August 2012 **photo: M.McHugh**

Davis Creek: Km 222

This creek location drains into the Ogilvie River, right at the Highway crossing. It is a low-medium energy stream with depths averaging 25 cm and a wetted width of 12.5 meters at the site. Pools, riffles and glides are present, with gravel/cobble substrate. There was no in-stream vegetation present, and the vegetation canopy was moderate for cover. Slimy Sculpin and

Burbot were captured at this site during sampling in 2012. The possibility of other fish species occurring at this location exist with good access to the Ogilvie River and abundant fish habitat throughout the study area of the creek.

Above: Down-stream view of culverts at Davis Creek-Km 222: August 2012 **photo: M.McHugh**

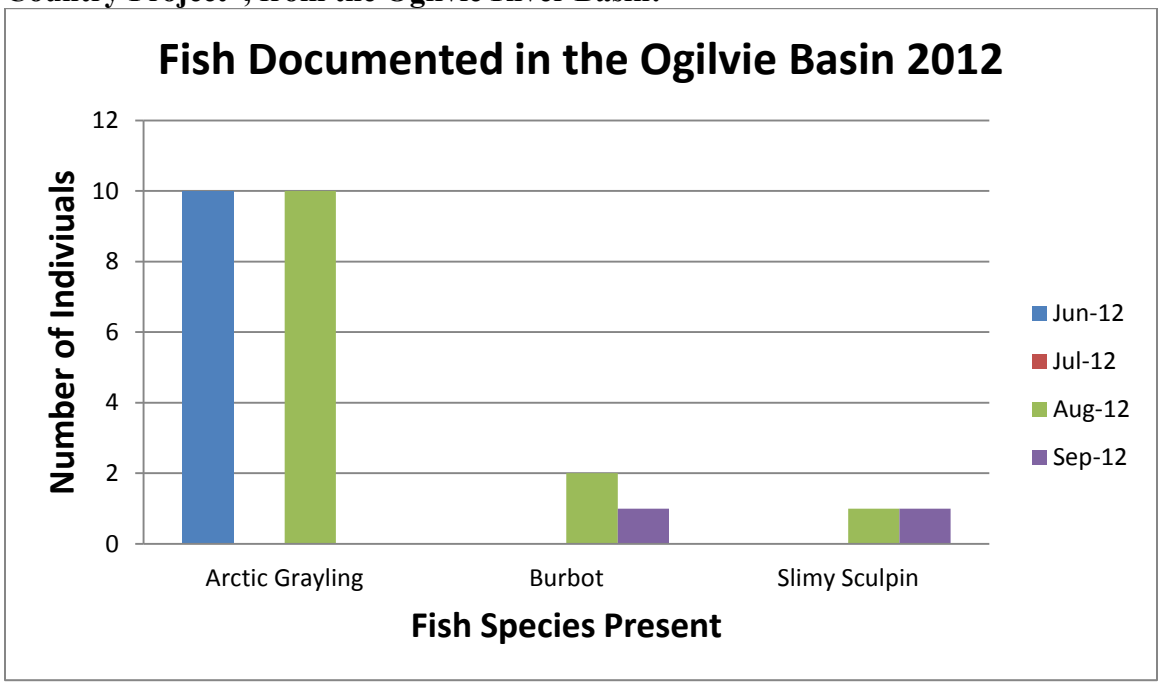
There is *3 x 12ft Elliptical Arch Culverts* located at this site. No apparent blockages or passage issues were identified at the site with regards to fish migration in 2012.

The following is a list of common and scientific names of fish species which are known to occur in the Ogilvie River Basin:

Documented Species:

Arctic Grayling	*Thymallus arcticus*
Burbot	*Lota lota*
Slimy Sculpin	*Cottus cognatus*
Long-Nosed Sucker	*Catostomus catostomus*
Round Whitefish	*Prosopium cylindraceum*

The following Chart 3.0 lists fish species captured during the 2012 "Fish of the Dempster Country Project", from the Ogilvie River Basin:



*this chart should only be used as a reference for fish species occurrence in the region. Only captured or properly ID fish were included in the chart data, representing fish sampled in the 2012 field season

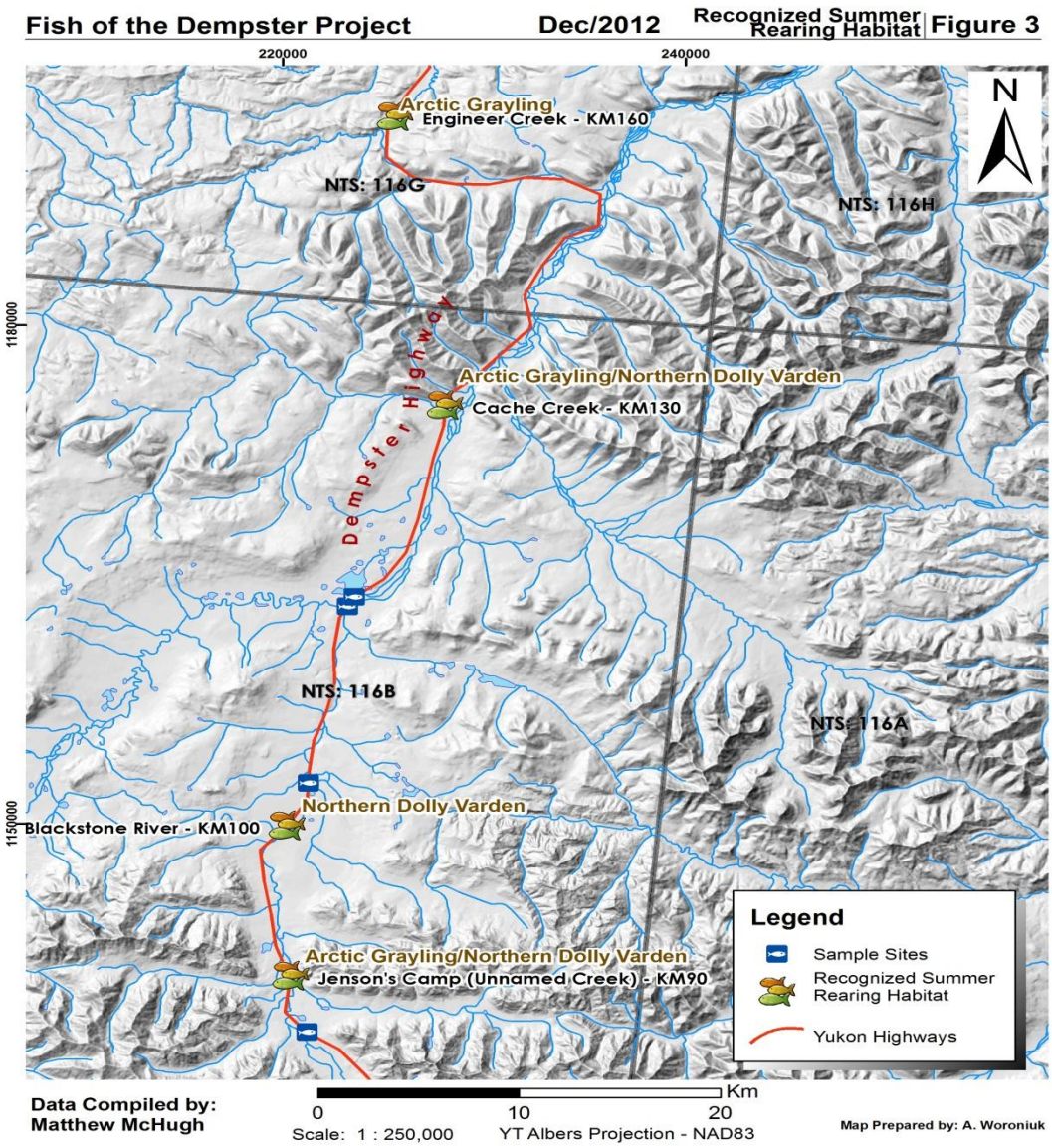


Figure 3.0: Recognized Summer Rearing Habitat within the study area

4.4 Tradition Knowledge:

Traditional Knowledge of the Dempster region's fisheries resource was used in order to fill information gaps for the project. Little is known about the fish and fish habitats of this vast environment and few studies have been completed to date. It was a therefore a great honour to speak with several elders who have family history or who themselves travelled and lived in this area long before the Dempster Highway was established.

Two elders from the Tr'ondëk Hwëch'in First Nation, Percy Henry and Peggy Kormandy were interviewed (courtesy of the TH Heritage Department) in Dawson City, Yukon. Robert Alexie Jr. of the Tetlit Gwich'in was interviewed over the phone from his home in Fort McPherson, NT.

During the interview with Percy Henry, many characteristics of the Dempster and surrounding country were talked about with regards to the traditional uses of fish by the First Nation Peoples. Percy talked about how he was born on the Wind River, and about his upbringing in the Peel Watershed. He spent his childhood living and traveling through the Hart and Blackstone River Country. His family's connection to the Blackstone and the fish within were very important. "Fish nets were made out of sinew from the animals they hunted and traps were made out of willow sticks to capture fish" (PH 2012). He mentioned the willow had to be peeled in order to attract fish and formed a cone shape to trap the fish. Species such as Arctic Grayling, Burbot and Dolly-Varden were harvested for food and for the dogs. Percy talked about how the area has changed since the construction of the highway. With more tourists and the development from mines like the Brewery Creek site, fish populations are declining. He noted fish "numbers going down in areas like Chapmen Lake and the Blackstone River. The Blackstone in the fall time used to be black from all the fish". He spoke of how his people only took what they needed from an area, and then left the area to recover.

In an interview with Peggy Kormandy in December of 2012, she talked about her father Jonny Sinco's relationship with the Peel Watershed and "Black City" near the confluence of Cache Creek and the Blackstone River. "Black City was used as hunting and fishing camp protected them from wind", she remembers. Remnants of wooden fish traps were found in the Black City area in the 1960's. These traps were used for "small fish" harvest for them and their dogs. With the abundance of Arctic Grayling in the area, she was most likely referring to Arctic Grayling when she said "small fish". Peggy was also adamant; her family only took what they needed during hunting and gathering.

A phone conversation with Robert Alexie Jr. from his home in Fort McPhearson in January 2013 talked about his life growing up in the Peel Watershed. "My father (Walter Alexie) was born and raised in the Blackstone Country." Walter Alexie used to travel with his children from the Blackstone to Dawson City in the 1950's. Robert Alexie Jr. spent most of his youth travelling the Blackstone and Peel Watershed. He mentioned the abundance of Arctic Grayling and Dolly-Varden found in the Blackstone Basin and how today the numbers are decreasing. His family would harvest fish for food while travelling through the mountains. They used wire to make hooks, baited them with caribou fat, and they would cook the fish on hot coals of a fire.

A general note of interest was that, after speaking with each of the Elders, their general message was ``we only take what we need for today and protect this area for the future``.

4.5 Culvert Review:

Migration is a natural and important behaviour for fish, used for spawning, rearing and protection from predation. Without the ability to access required habitat, fish species find it difficult to thrive. In the northern setting like the Yukon, where fish species seem to be extremely migratory, it is important we allow this process to occur, even if an area of fish bearing streams is developed, such as from road crossings. Proper analysis must be done in order for the local fish stocks to maintain their migration routes and life history.

As areas become more developed it is necessary to build roads, and therefore road crossings, over/ through fish-bearing streams. There are two options for building a road through a stream course; bridges or culverts. *Bridges* are considered the best method because of low

impact to fish and fish habitat, although they are complex and expensive to build. *Culverts* are the most common and cost effective method for a road crossing over a stream. If the proper considerations and designs are chosen while installing a culvert, it can provide adequate passage and have little effect on fish and fish habitat of a particular stream. In some cases it has helped enhance the available habitat, creating pools or backwater for fish. In many cases, fish and fish habitat were not considered in the design and construction of the road crossing, and have left a potential barrier for migrating fish trying to access required habitat on one side of the road or the other.

During the 2012 *"Fish of the Dempster Country Project"* road crossings were assessed at sites with bridge and culvert crossings, and defined as having a fish passage issue or not. These sites were assessed as to which may pose a *passage issue* for migrating fish. The criteria assessed were as follows:

- Water velocity from culvert (high/low)
- Culvert slop
- Outlet drop-off (perched)
- Debris Blockages (dead-fall, rocks, garbage)

Sites that were examined in the 2007 *"Dempster Fisheries Assessment"* (YG Fisheries Branch) were re-examined in the current 2012 study. After doing an assessment on the 15 sites included in the project, it was determined that the Benson Creek, Scout-Car Creek, Wolf Creek and Grizzly Creek locations should be considered as having potential passage issues for fish. This was due in all cases to the high perch from the surface of the creek to culvert outlet. High velocity water discharge and a slight plunge at all of these sites would make it very difficult for fry and juvenile fish to travel through these culverts.

There were no records of fish captured or observed at these sites in the past two years sampling for the *Fish of the Dempster Project.* There were however, fish documented at the Benson and Wolf Creek sampling locations from the 1978 *Dempster Lateral Pipeline Assessment*, at locations sampled near the highway. Therefore consideration should be taken with regards to fish passage at these locations.

(Top): Down-stream view at Benson Ck-km29 of perched culverts (Below): heavy debris load blocks left culvert Cache Ck-Km130 August 2012 photo: M.McHugh

A copy of this report will be made available to the Yukon Government's Highway and Public Works Department in order for them to be made aware of the *culvert issues* found at the sites. This is may assist in devising a plan to correct these *culvert issues*.

5.0 Discussion:

Results gathered in the 2012 "Fish of the Dempster Country Project" have increased the level of knowledge and appreciation of fish and fish habitat occurring in the region. Culvert sites that have been identified as passage issues for fish will be forwarded to the proper authorities. A review of the project results with regards to the culvert findings can be conducted in order to make these sites `fish friendly``.

Of the 15 sampling locations that were sampled through the summer field season, data was recorded regardless of catch numbers from each. This data will assist in developing an ongoing baseline data set for Tombstone Territorial Park and the Dempster Highway Corridor. It is important to establish and maintain knowledge of the health of fish species utilizing this habitat for management decisions made for the region. Greater pressures from increased tourism, oil&gas and mineral exploration in the area make monitoring and managing this resource today key in preserving stocks for tomorrow. Important topics which influence how we manage and preserve fish stocks in the Dawson area include; traditional uses from First Nations, food security for the future and education for youth. With these ideas in mind, this project can assist in preparing the Dempster region in processes such as the *Dawson Regional Planning Commission* and the *Tombstone Territorial Park Management Plan,* for the future. A continued effort into monitoring this environment will contribute to the level of knowledge learned for the *Dempster Country* and surrounding regions' fisheries resource.

6.0 Conclusion:

Based on samples collected and fish documented at each location, this study should not be used as a representation of all species occurring or present at each site, rather as a general overview or guideline of certain fish stocks occurring while sampling. This is attributed to various environmental conditions and human error throughout the sampling period. For example, certain locations did not have suitable locations for setting the gee-minnow traps or, in one case, a highway washout did not allow access to locations north of Km 160. Also certain

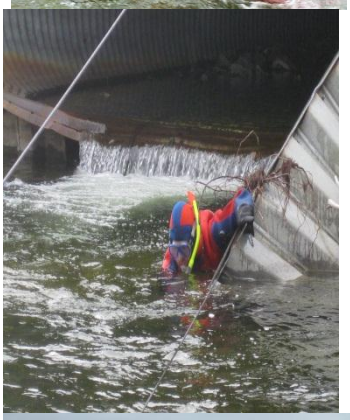
species are not as likely to enter baited traps, and therefore form a bias of what is captured and documented at that specific site. Results from the 2012 project should be considered and viewed as having increased the wealth of knowledge towards fish, their habitats, and future management decisions that will be needed to sustain this resource.

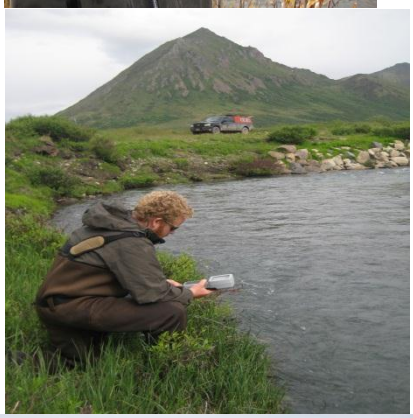
Overall, the collection methods used in this study should be considered as good ways of establishing an understanding of what is occurring using low impact sampling. To better understand presence at each study site, equipment such as an electro-fisher can be implemented in order to get a representative sample of all fish in the area occurring at the time of sampling. Continued monitoring of the selected sample sites will continue to improve our understanding of fisheries stocks of the `Dempster Country`.

A local angler with his 2lbs Arctic Grayling at the Blackstone River Km100

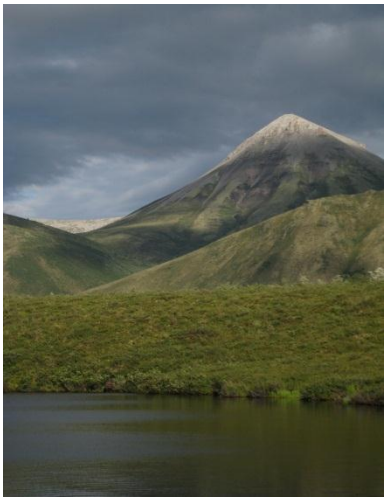
The Project in Action: photos










7.0 Special to the Enhancement Trust Fund:

7.1 Project Activities:

The 2012 Fish of the Dempster Country Project completed various activities which contribute to reaching goals of establishing baseline data of fish and fish habitat occurrence in the Dempster region. Traditional and Local Knowledge records were established to begin filling gaps on the "patchy" information known to date for the area. Working with the youth of Robert Service School from Dawson City, in an August 2012 class field trip (to the Dempster) proved engaging and educational. Students were involved in various project activities and remained interactive throughout the 1 day exercise.

Results gathered in the 2012 project will assist in making educated management decisions for the fish stocks of the region. The knowledge from this area will continue to engage the local youth and community towards stewardship of fish of the Dempster Country.

Negative actions included sampling results and methods that were not representative of all the species present during the specified sampling period, as what was intended for the project results. Because of this discrepancy these results should only be regarded as a general overview of fish species occurrence. Variances in sampling are a result of environmental factors such as high or low water levels where we could not set traps, or due to fish habitat availability. This was learned to be a standard while conducting sampling on any given environment during a given time period.

Positive results included identifying several important fish rearing and potential spawning and over-wintering sites. These locations revealed a variety of fish species and habitat situations. Further study and focus may provide a greater knowledge of fish behaviour at these locations.

Activities such as Environment Canada's C.A.B.I.N protocol for sampling invertebrates were eliminated due to time constraints, logistics and available sampling gear. A kick net was used at certain sites to obtain invertebrate samples, but we were unsuccessful in properly identifying these specimens, this was left incomplete. A review of the protocol for the future would enable us to better complete these tasks. Due to a July Highway washout and lack of suitable sites for setting traps, certain sites were not properly accessed. This may be read in the *Results Tables 1.0 and 2.0* attached to this report.

Results from this study contributed to the protection and enhancement of fish stocks within Km 09-Km222 of the Dempster Highway by providing an updated knowledge of key fish and fish habitats available in the area. These results may be used as a guideline while establishing management plans for the region by such organizations as the Dawson Regional Planning Commission, Dawson District Renewable Resource Council and the Tombstone Territorial Park Management Plan. Also these records will be available through the Yukon Fish and Wildlife Enhancement Trust for future referral for this and other project studies in the area.

7.2 Communication:

The project also involved a presentation in August 2012 at the Tombstone Interpretive Centre, Km 71 of the Dempster. Here members of the public, related organizations and governments were invited to a talk about the project results. A March 2013 presentation to the DDRRC informed the members about results from the 2012 project. The Enhancement Trust was recognized as a key funder of the project. Mention of funding partners was made while explaining the project details to interested community members during the Robert Service School and any interested community, wondering information about the project. An advertisement of appreciation for the Fish and Wildlife Enhancement Trust's support of the project will be made public in the Dawson City's Post Office.

7.3 Applicant Suggestions:

Completing this survey of fish and fish habitats along the Dempster region was crucial in establishing a base of understanding for areas of importance for future studies. Much was learned about these dynamic and complex systems despite the generalized nature of the project. Results published by the Trust Fund will provide a reference for future species and habitat monitoring in the Dempster region.

By continuing to monitor these and other selected sites, an overview of fish species occurring can be mapped in order to make educated management decisions. Specific trends may also be realized that would have otherwise not been documented. Certain characteristics at sites recorded during the 2012 project are the framework for identifying important habitat requirements for fish within this environment. Examples include observing ground water sources used for over-wintering habitat, and identifying culvert passage issues. Knowledge of these critical aspects of the Dempster Fish will help protect the future welfare of this resource.

If this project was to continue monitoring and recording fish in the Dempster region, there would be several changes needed in order to make the project work more efficiently and effectively. Although it was the good intention of the project to record detailed trends and fish behaviour throughout a 5 month period, this is not feasible for a project manager working a full time (i.e-job/dad) schedule. The amount of sampling sites chosen, the given distance and the time set aside to do the sampling was unrealistic in the 2012 study. Although the project was completed to its fullest and many key findings were recorded, this will not be effective in the future. In the future I would recommend doing an assessment in the spring and fall to understand migration patterns and potential spawning and over-wintering observations. And then completing the bulk of work and sampling during a 7-10 day period in mid-summer. By limiting the amount of sites selected and taking fewer samples per day, a more detailed and complete assessment will be achieved at each study site. Thus the behaviour of fish and their habitat may be defined in greater detail.

Receiving funds from and working with the Enhancement Trust Fund for the *2012 Fish of the Dempster Country Project* was crucial in the success of the project as outlined in the

submitted 2012 proposal. All expectations of the Trust Fund were outlined clearly by its manager, and were made readily available over the internet and by phone. I have no further suggestions in making this process perform better. The Enhancement Trust Fund manager clearly outlined the contribution agreement in the packages sent after the approval of the project. It was of great honour to have been selected for funding through the Trust.

That's all folks!

Thanks and hope see you next year!

8.0 List of References:

ANDERTON, I. 2006. Peel River Watershed Fisheries Information Summary Report. Environmental Dynamics Inc. EDI Project#:06-YC-0011, Whitehorse, Yukon, Canada

BARKER, O., N.MILLAR, AND A. FOOS. 2011. Peel Watershed Fish Habitat Assessment. Yukon Fish and Wildlife Branch Report TR-11-12, Whitehorse, Yukon, Canada.

BEAK. 1978. Dempster Lateral Pipeline Fisheries Assessment. Beak Consultants Ltd. Calgary, Alberta, Canada

MERCER, B. 2010. Klondike River DIDSON Sonar. Mercer and Associates Ltd. For Yukon River Panel cre-16-10, Whitehorse, Yukon, Canada

NORTH, D. 1978. The Lost Patrol. Raincoast Books, Vancouver, British Columbia, Canada

TAYLOR, L. 2011. Yukon River North Mainstem Stewardship. Dawson District Renewable Resource Council: cre-06-11, Dawson, Yukon, Canada

YUKON GOV. 2008. Dempster Highway Fisheries Assessment Data Report. Fisheries Section: Environment Yukon, Whitehorse, Yukon, Canada.

VON FINSTER, A. 2003. Notes on fish and fish habitat of the waters of the Yukon Territory - Evergreen Paper. Department of Fisheries and Oceans, Habitat and Enhancement Branch: Whitehorse, Yukon, Canada.

VON FINSTER, A. unknown date. Fish of the Tombstone Mountains and Blackstone Uplands.

VON FINSTER, A. Personal Communication into knowledge of "filamentus green algea". Aug 2012.

Traditional Knowledge:

Percy Henry Interview, in person by Matthew McHugh. Feb 2012.

Peggy Kormandy Interview, in person by Matthew McHugh. Dec 2012.

Robert Alexie Interview, over the phone by Matthew McHugh. Jan 2013.