FAIRBANKS GOLD MINING, INC.
A wholly owned subsidiary of
Kinross Gold Corp.

Fort Knox Mine

Reclamation, Environmental Stewardship, Arctic Grayling and Burbot Studies, and Development of Wetlands' Habitat

KINROSS
Gold Corporation

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FORT KNOX

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INTRODUCTION

Gold mining has played a central role in the development of the Alaskan interior in and around Fairbanks. With the opening of the Fort Knox Gold Mine in 1996, gold mining continues to help sustain the economy of the area. Development of the Fort Knox Gold Mine has been conducted with a keen awareness of environmental issues at every step of the way. The result is a fully modernized operation with an exemplary environmental compliance record, a strong community outreach and education program, and a forward-looking vision for reclamation and post-mining land use.

Early in the planning process, opportunities were identified to enhance post-mining sustainable land uses. In particular, the water supply reservoir for the mine was planned & constructed as a permanent structure, to be transferred for public use when mining ends. In addition, reclamation of pre-existing placer mining disturbance as wetlands has created high-quality spawning grounds and habitat for native fish species. The research done on these wetlands, as they were developed, has contributed long-term data that will aid future efforts in wetland rehabilitation. Development of habitat in the water reservoir and wetlands has exceeded expectations, and The State of Alaska Department of Natural Resources honored Fort Knox with the year 2000 Reclamation Award for outstanding reclamation efforts.

The Fort Knox mine provides an excellent example of how environmental management can be integrated as a core business function of a modern hardrock mine, providing sustainable development opportunities for the local community.

BACKGROUND

Fort Knox Gold Mine is operated by Fairbanks Gold Mining, Inc. (FGMI), a wholly owned subsidiary of Kinross Gold Corporation. The mine is located in the Fish Creek drainage of the Fairbanks Mining District, twenty-five road miles northeast of Fairbanks, Alaska. The Fish Creek drainage has been a focus of mining activity since 1902, when Italian prospector Felix Pedro discovered gold in the interior of Alaska and staked a discovery claim on Fish Creek downstream from what is now known as the Fort Knox ore body. Placer mining activity continued into the 1980's when fifty-three more placer mining claims were staked and the name Fort Knox was bestowed. Although no high-grade sources were discovered, trenching and panning of soils indicated that gold mineralization was widespread.

Exploration and planning to develop a modern open pit mine began in 1987. The public was involved throughout the exploration, development, design, permitting, construction, and operation of the Fort Knox Mine. Many public meetings have been held to discuss the project and seek input from the members of the Fairbanks community. State and federal agencies formed a large mine permitting team that allowed joint meetings, permit decisions, and permits being issued in a cooperative effort that enhanced the permitting and design of the mine. Permits were obtained and construction began in 1995, with commissioning in 1996. The permit area covers 7,505 acres. The gold deposit is hosted in a granitic intrusive complex with gold occurring in and along margins of stockwork veins and veinlets. Fort Knox operates year-round as a conventional open pit mine with milling facilities, a tailing impoundment, a water supply reservoir and related facilities. The mine produces 300,000 to 350,000 ounces of gold annually.

The deposit is located on the north flank of Gilmore Dome at elevations ranging from 1,000 to 2,100 feet. The climate is continental sub-arctic with mean annual precipitation of less than twelve inches. The area is predominately forested. The climax forest on well-drained soils of the uplands and the alluvial plains are covered mainly with white spruce, birch, and quaking aspen. Moderately to poorly drained soils with a high permafrost table are covered in black spruce, willows, grasses, mosses, horsetails and low growing shrubs. Permafrost is discontinuous and occurs mainly on north facing slopes.

PLANNING & DESIGN

Environmental factors were extensively incorporated into design & layout of the facility. For example, the mill is built on a hillside to take advantage of gravity. Consequently, pumping is reduced throughout the entire process. The tailing impoundment was located as a valley fill impoundment down gradient of all active mining and milling operations. This reduces the potential for spills to reach sensitive waterways and reduces sediment load to streams and rivers. Fort Knox has an interceptor well system that pumps any embankment seepage that escapes the seepage collection system back into the impoundment and keeps process water contained, in a zero discharge facility, until final treatment and reclamation take place.

To supply water to the mill, a water reservoir was required. Rather than construct this as a mine facility that would be reclaimed once operations ended, during the permitting and planning process it was decided that the water supply reservoir would be a permanent facility that would be transferred for public use

at the end of the mine's life. The reservoir was built downstream of the tailings impoundment, and in conjunction with the habitat development activities described below, has become high-quality habitat for native fish species. A financial mechanism was developed to assure the cost of maintaining the reservoir is funded by Fort Knox and does not place a financial burden on the State of Alaska when mining ceases.

ENVIRONMENTAL PRACTICES

Once operations began, the Fort Knox Mine has continued its commitment to environmental stewardship by implementing a state-of-the-art environmental management system. The mine environmental department monitors and helps maintain a clean and environmentally sound operation that meets or exceeds all compliance goals and Kinross environmental standards. Within the department, environmental management plans, calendars, spreadsheets and bulletin boards all help to track and stay on top of the innumerable details involved. Communication is a primary objective; environmental issues are a major focus of training for every employee at Fort Knox, since all employees at the mine share in the responsibility for effective environmental Management. The environmental department is an integral part of the site management team, involved in all aspects of site operations. Some specific programs are described below.

Water Quality Monitoring

To maintain a zero-discharge from the tailing impoundment Fort Knox continuously pumps six interceptor wells to maintain a cone of depression and collect and return any seepage water that may escape the seepage collection system in the tailing impoundment embankment. Downstream from the interceptor wells are seven monitor wells and the developed wetlands and freshwater supply reservoir. All wells and surface water are sampled and tested on a quarterly basis for a suite of chemical constituents. Close cooperation between the Fort Knox Mine environmental department, analytical labs and state regulatory agencies allows careful monitoring of water quality within and below the tailing impoundment.

Erosion Control

Wherever soil is disturbed by mining activity a variety of erosion controls are used. Brush berms (a best management practice developed by the Fort Knox Mine) and silt fences are used to stop sediment movement and loss. Erosion control textiles are used where appropriate and regular inspections are made of culverts and roads to eliminate erosion problems before they happen. Early seeding and the establishment of a native grass cover to stabilize the soil is used whenever possible.

Reclamation Practices

Concurrent reclamation is practiced to the maximum extent possible. As soon as an area is no longer being used recontouring and reseeding takes place. A mix of native grass species: 50% Arctared Red Fescue, 20% Gruening Alpine Bluegrass, 20% Tundra Glaucous Bluegrass and 10% Nortran Tufted Hairgrass, designed in conjunction with the Alaska Department of Natural Resources- Plant Materials Center, was developed for reclamation on Fort Knox. The preferred method of planting is broadcast seeding. The recommended seeding rate is eleven pounds per acre and no mulching has been necessary. This seeding rate was reduced from the original rate purposed by the Plant Materials Center. Through experimentation, a careful balance has been achieved between the need for erosion control and soil enhancement afforded by planting grass, and a too vigorous vegetative mat that would slow down the invasion of other native species. Willow sprigging is carried out by cutting dormant branches in the spring from shrubs growing in the general area of the reclamation work. An experimental tailing soil test plot is currently planted with four different seeding rates of the native grass mix as well as four fertilizer rates in an effort to determine the best approach for future reclamation of the tailing impoundment.

Dust Control

Dust control on the access and ore haul roads to the mine is a high priority. High-float was used to surface portions of the road near residential developments; calcium chloride is also applied regularly in the summer. Two water trucks are dedicated to keeping the roads as dust free as possible. New and closer water sources are currently being developed to decrease refilling time for water trucks. The environmental department oversees dust control, monitoring and photographing road conditions.

Noise Control

Ore haul trucks from the True North satellite deposit cannot exceed a noise level of 82dBA at a distance of 50-feet from the roadway. All trucks must pass a noise test before they are put into use. An annual noise test, as well as the occasional spot check, is performed by the environmental department to make sure trucks remain in compliance. A smaller number of trucks are run during the night shift to reduce noise to neighboring residential areas. An annual residential noise test is also conducted at private residences closest to the mine to check noise level compliance. In addition, the haul trucks have been fitted with special headlights to minimize any potential impact to aurora borealis viewing.

Hazardous/Non-Hazardous Waste Management

Fort Knox is very proactive in reducing waste streams and recycling whenever possible. A used oil boiler heats the administration building and a coolant recycler has been installed. In the mill a thickener has been built that will reduce reagent use, especially cyanide. Personnel receive regular training in order to properly handle hazardous materials and waste. Inspections/checklists of all hazardous and non-hazardous waste storage are performed weekly, including: drum integrity, proper spacing and segregating and emergency spill readiness. A detailed electronic spreadsheet tracking system allows "cradle to grave" accountability for all wastes generated on site. The environmental department is dedicated to keeping open lines of communication within the mine to help ensure proper waste drum labeling, storage and disposal as well as constantly reinforcing spill reporting and clean-up procedures.

Air Quality

Environmental personnel also receive training and certification as visible omissions evaluators (smoke school). Fort Knox has a program in place that carefully monitors stack emissions and fugitive dust. A tracking spreadsheet insures timely opacity readings at over thirty possible points of emission. Fort Knox is a clean operation and stack emissions are nearly non-existent.

Safety

Fairbanks Gold Mining has a distinguished safety record, with Fort Knox employees surpassing one million man-hours worked without a lost time accident- twice. This is the direct result of the company's emphasis on the safety and welfare of their people and shows a commitment by supervisors and employees alike to take responsibility for themselves and their co-workers.

FGMI's concern for safety goes beyond the immediate confines of the mine site. A traditional recreational trail system runs through and around the borders of the mine. Fort Knox, in cooperation with trail users and the local community, helps maintain trail crossings where they intersect the mine access and ore haul road, by posting warning signs and building safe, high-visibility trail crossings.

HABITAT DEVELOPMENT THROUGH RECLAMATION

The upper part of the Fish Creek drainage has been historically mined extensively and the stream channel altered by diversion and channelization with riparian habitat removed. High turbidity and settleable solids from non-point and point sources of sediment characterized the water. Substantial habitat alteration to the stream channel, stream banks, stream substrate and riparian zone (approximately 904 acres) since the early 1900's, combined with degraded water quality, created an aquatic habitat in the upper portion of the drainage that was suboptimal for fish and aquatic invertebrates. Several tributaries (Last chance, Barnes, Pearl, and Solo creeks) in the headwaters of Fish creek were also affected by past mining activities. Fish access to Barnes and Pearl creeks had probably not existed for at least ten years prior to reclamation and fish use of other parts of the creek were limited by beaver dams, perched culverts, sedimentation and poor water quality. Low fish densities were reported through out the drainage. These historically disturbed areas were generally diminished in habitat diversity and wildlife usage.

As part of planning for development of the Fort Knox Mine, the Department of Fish and Game, Division Of Habitat and Restoration (now the office of Habitat Management and Permitting within the Department of Natural Resources), in collaboration with FGMI initiated a two-year fish study in 1992 to gather baseline data on fisheries resources, water quality and quantity and benthic invertebrates. It was documented that arctic grayling, burbot and slimy sculpin occurred in a limited area of Fish Creek upstream from the proposed water supply reservoir. Small populations of Arctic grayling were overwintering and rearing young near Solo and Last Chance creeks.

In 1993 a goal was established to create a viable Arctic grayling population in the water supply reservoir from fish trapped upstream of the dam. The objective was to reach a density of ten to twenty Arctic grayling >200 mm per hectare of surface area (i.e., 800 to 1,600 Arctic grayling >200 mm for the water supply reservoir) ten years after project completion. Through concurrent reclamation and other efforts, the Fort Knox Mine has already met and exceeded these goals. The studies initiated in 1992 have been expanded into an ongoing study being conducted by Fort Knox and the State that provides valuable data for habitat development at other sites.

Pond and Stream Reconstruction and Revegetation

Construction began on the Fort Knox Mine in March of 1995. The water supply reservoir and spillway, the first step to improved fish habitat, were completed in July 1996. In designing and constructing the dam, FGMI worked with the Habitat Division and the Army Corp of Engineers to optimize habitat diversity in the area to be flooded by the water supply reservoir. Glaciation and permafrost posed unique challenges in designing, constructing and maintaining the ponds and water supply reservoir.

Concurrent reclamation of the Fish Creek valley between the tailing dam and the water supply reservoir began following construction. Initially, most of the area was reshaped, a berm was constructed to maintain water levels in Ponds A and B, channels were constructed between the ponds in the valley, most of the area was seeded, and willow sprigging was done in selected areas.

In 1999, a channel was constructed to connect Ponds C, D, E, and F with the water supply reservoir. In fall 2001, work was done in Last Chance Creek in an attempt to stabilize the stream channel. In fall 2001 and 2002, additional work was done on the channel and berm separating Ponds D and E. These projects, collectively, have resulted in rapid revegetation in the valley. In addition, the channel that connects the ponds with the water supply reservoir has been used extensively by Arctic grayling for spawning each year since 1999; the wetlands have become the main source of Arctic grayling production in the valley.

Effective Results

The goal of having a viable Arctic grayling population in the water supply reservoir and developed wetlands of between 800 and 1,600 fish >200 mm was attained in 1998, only two years after the construction of the water supply reservoir and years earlier than expected. Successful spawning and survival of age-0 Arctic grayling has been documented every year since 1999 and there is evidence of substantial recruitment to the population. The estimated population for spring 2001 for Arctic grayling >200 mm was 5,623; almost four times the original goal. Furthermore, there are now fairly large numbers of Arctic grayling leaving the water supply reservoir over the spillway – 435 Arctic grayling >200 mm were caught in spring 2002 in the stilling basin. A potential added benefit of this out migration from the Fort Knox water supply reservoir and developed wetlands is a source of recruitment of Arctic grayling to the Chena River system and fishery. The Chena River flows through Fairbanks and is used extensively by local fishermen.

The burbot population in the water supply reservoir also has increased substantially from that found prior to the water supply reservoir. The increase in burbot was not predicted based on baseline information collected. A decrease in numbers was documented in summer 2002, but the population of larger burbot (>400 mm) appears to be stable and small burbot (<200 mm) are present indicating successful spawning in the water supply reservoir. Some of these smaller burbot also are leaving the water supply reservoir.

Water quality data collected has shown that the flooding of permafrost, ice-rich organic materials in this valley have created a condition in which dissolved oxygen concentrations are depressed with depth in both winter and summer, however, conditions appear to be improving over time. Essential to the overwintering survival of fish in the water supply reservoir is the freshwater input from Solo Creek. Another benefit of the water supply reservoir and the connected wetlands; allowing sediments to settle out of the water column, this, combined with revegetation and erosion prevention, have improved the overall water quality greatly. Fairbanks Gold Mining is cooperating with Habitat personnel to achieve the best water quality possible in the reservoir.

Wildlife use of the lower Fish Creek valley generally has increased since creation of the water supply reservoir and rehabilitation of the valley. Moose use the area extensively as a winter range and numerous moose use the valley during portions of the fall and winter; up to fifteen moose have been observed at one time in the valley. In summer, Moose are frequently observed browsing in the rehabilitated uplands and also can be seen foraging on aquatic vegetation in the constructed wetlands. The increased number of willow shrubs has provided a source of winter browse used heavily by moose in the valley. Black bears, grizzly bears, red foxes, and wolves also have been observed in the valley and wolves appear to have denned in the

valley in at least one year since rehabilitation. Aquatic mammals are numerous as well. Beavers and mink are common and river otters have been observed during at least two winter seasons feeding on Arctic grayling in the stilling basin below the spillway.

Numerous waterfowl species have been observed throughout the spring and summer seasons in the valley. Red-necked grebes have fledged young in the water supply reservoir over the past two years. In summer 2002, a juvenile common loon was observed on the reservoir in October; adults were observed there since early spring. Mallard, green-winged teal, greater and lesser scaup, northern pintail, blue-winged teal, northern shoveler, American wigeon, canvasback, redhead, long-tailed duck, surf and white-winged scoter, Barrow's goldeneye, bufflehead, common merganser and ring-necked ducks have all been observed using portions of the wetland complex, water supply reservoir or the stilling basin. Pacific loons, horned grebes, and sandhill cranes also have been observed on the water supply reservoir or surrounding area.

Bald eagles are seen annually during spring, concentrating their hunting efforts near shallow riffle areas containing spawning Arctic grayling. In spring 2001 and 2002, golden eagles also were observed targeting fish in the wetlands and water supply reservoir. Other raptors and birds of prey seen commonly in the rehabilitated valley include northern harriers, rough-legged hawks, and northern hawk owls. Ospreys have occasionally been observed. Additionally, in spring 2000 a migrating band of hundreds of Lapland longspurs stopped in the constructed wetlands to feed during their migration north.

Numerous shorebirds are present each year at various locations throughout the valley. American golden and semi-palmated plovers, lesser yellowlegs and various sandpipers and other shorebirds commonly are observed.

TRANFERABLITIY OF TECHNIQUES AND PRACTICES

The developed wetlands at Fort Knox have, and will continue, to set an example for future resource development industries. The methodologies and techniques used here are generally accepted reclamation practices, but fined-tuned to the subarctic climate of interior Alaska. The results achieved are available to and repeatable by others with the environmental dedication needed to leave a small footprint behind them. Communication and cooperation between Fairbanks Gold Mining and the State Agencies involved has also set an example worthy of imitation. It was this interchange of information and expertise in a cooperative effort that allowed the wetland development to become such a resounding success.

Fairbanks Gold Mining actively pursues opportunities to share information with interested peers in the mining industry and other public entities. Presentations highlighting various aspects of the wetland development have been given in a number of professional settings such as: Alaskan Miners Association, American Indian Science & Engineers Society, and The American Society of Dam Safety Officials. A video, shown to tour groups and other interested parties, was produced to give an overview of the mine activities and which highlights reclamation success. Over 4000 visitors from around the globe toured Fort Knox Mine in the previous year, along with over 12,000 students since 1996 (grades 3 through college), and all have become familiar with hardrock mining and the process of wetland reclamation. The company has cooperated with the University of Alaska in the development of experimental plots to test reclamation techniques on mine waste. Every summer several student internships are offered to increase the exposure of the mining industry to young people entering the work force and to promote responsible resource development. A number of professors from the University of Alaska, Fairbanks, regularly bring students to Fort Knox as part of their curriculum. The mine is used as an example of environmentally sound mineral development, effective reclamation, and sustainability.

LONG-TERM BENEFITS TO THE COMMUNITY

When Fort Knox has concluded mining activities in the Fish Creek Valley, the mine site will become a recreation area with two large lakes, extensive wetlands and an established fishery. The diversified habitat will support the increasingly abundant wildlife for recreational users to enjoy, along with the spectacular sunsets and aurora borealis. Although the State of Alaska will ultimately determine land use details, wintertime prospects look promising for cross-country skiers, dog mushers, snow-shoers, and snow-machiners. Under proposals submitted to the State, summertime users could enjoy the water reservoir, fishery, berry patches and campsites, as well as biking, hiking, and horseback riding trails, all within easy reach of the Fairbanks community.

Experience gained from the concurrent reclamation efforts will be used in the future; for example, it is expected that eventually the tailings will become part of the wetland network. The tailing impoundment when reclaimed will create very diversified habitats, wetlands, uplands and ponds, for aquatic, avian and terrestrial wildlife, covering approximately 1,213 acres.

A proposal for future development from the Office of Habitat Management and Permitting will rehabilitate another stretch of wetlands on the opposite side of the Fish Creek Valley from the existing developed wetlands. This stream complex, if constructed, would be fed by water from the tailing impoundment at mine closure. Options to further stabilize the habitat along the Last Chance Creek drainage are planned, eventually increasing the stream habitat by 6-8 km available for Arctic grayling and burbot.

The mine pit will become a large, sheltered lake covering approximately 135 acres in an area with few lacustrine habitats. This open water impoundment, where none has existed before, will support wildlife resources. Some of the benches forming the sides of the lake will be covered with topsoil and seeded, where possible, but many of the steep, rocky cliffs will be left in place to create nesting habitat favored by birds of prey. Due to the pristine water quality another fish population may be established in the pit lake to increase recreational fishing options. Though many small side roads will be recontoured and seeded to encourage natural overgrowth, an excellent road system will be left in place to allow access to all these areas.

Another long-term beneficiary of the Fort Knox Mine is the Mental Health Land Trust Office. Their ownership of much of the land now being mined has produced revenue for the State of Alaska. They have a continued interest in post-mining, revenue producing, development of the mine site, including possible residential areas, and a resort enhanced by the future recreational area. Discussions have been held with the University of Alaska, Fairbanks, who may benefit by acquiring the current administration buildings and facilities as an arctic research center and as a possible addition to their fisheries program.

Fort Knox has been a positive economic influence in Fairbanks, Alaska, since its inception. Beyond supplying close to 325 high-paying jobs, the company's emphasis on training and continuing education has given employees valuable training that will help ensure future career success after mine closure. Other interior Alaskan mines, now in the very early stages of development, will be able to draw from a local pool of highly trained personnel with specific and technical skills. Many of the job skills acquired at Fort Knox will apply equally well in other types of business and industry to the future benefit of all involved.

Fairbanks Gold Mining has also given preference to local vendors, which has been advantageous to the business community as a whole. An economic impact study completed by McDowell Group, estimated a total economic benefit of $196 million, from direct and indirect labor, power and support services. In addition to the 300 plus jobs directly generated by the mine another 572 are created by mine activity. The Borough also receives over $4.4 million in mine-related revenues and, due to the mine's purchase of $14 million of electricity, electric rates for residential consumers have been lowered 7 % and commercial buyers from 4-10%. The myriad environmental and economic benefits put forth by the Fort Knox Mine will carry their strengthening influence far into the future for the community of Fairbanks, Alaska.

SUMMARY

Without the Fort Knox hardrock mine the rehabilitation of the headwaters of Fish Creek would not have been feasible. The extent of the disturbance to stream channels, banks and riparian habitat, the cost of rehabilitation, the potential for on-going active placer mining, and the limited fish use that earlier characterized Fish Creek drainage would have made reclamation impractical. Instead of scarred and unproductive terrain, the developed wetlands have allowed fish populations to increase within the wetlands and contributed to downstream fish populations, increased wildlife use due to the diversification of habitat, and will, in future, contribute to the beauty and utility of Fort Knox as a recreation area. Fairbanks Gold Mining is very proud that through careful planning and dedication to excellence these previously mined lands have been reclaimed to a condition that in many ways surpasses its' pre-disturbance state. The close cooperation between Fairbanks Gold Mining and the State and Federal agencies involved in developing these wetlands has set forth a workable blue print for future reclamation projects within the mining industry. The exemplary environmental compliance record, the economic and social contributions of Fort Knox, as well as its reclamation activities, has left a legacy of environmental stewardship for the surrounding community that warrants special acclaim.

Figures 1-56

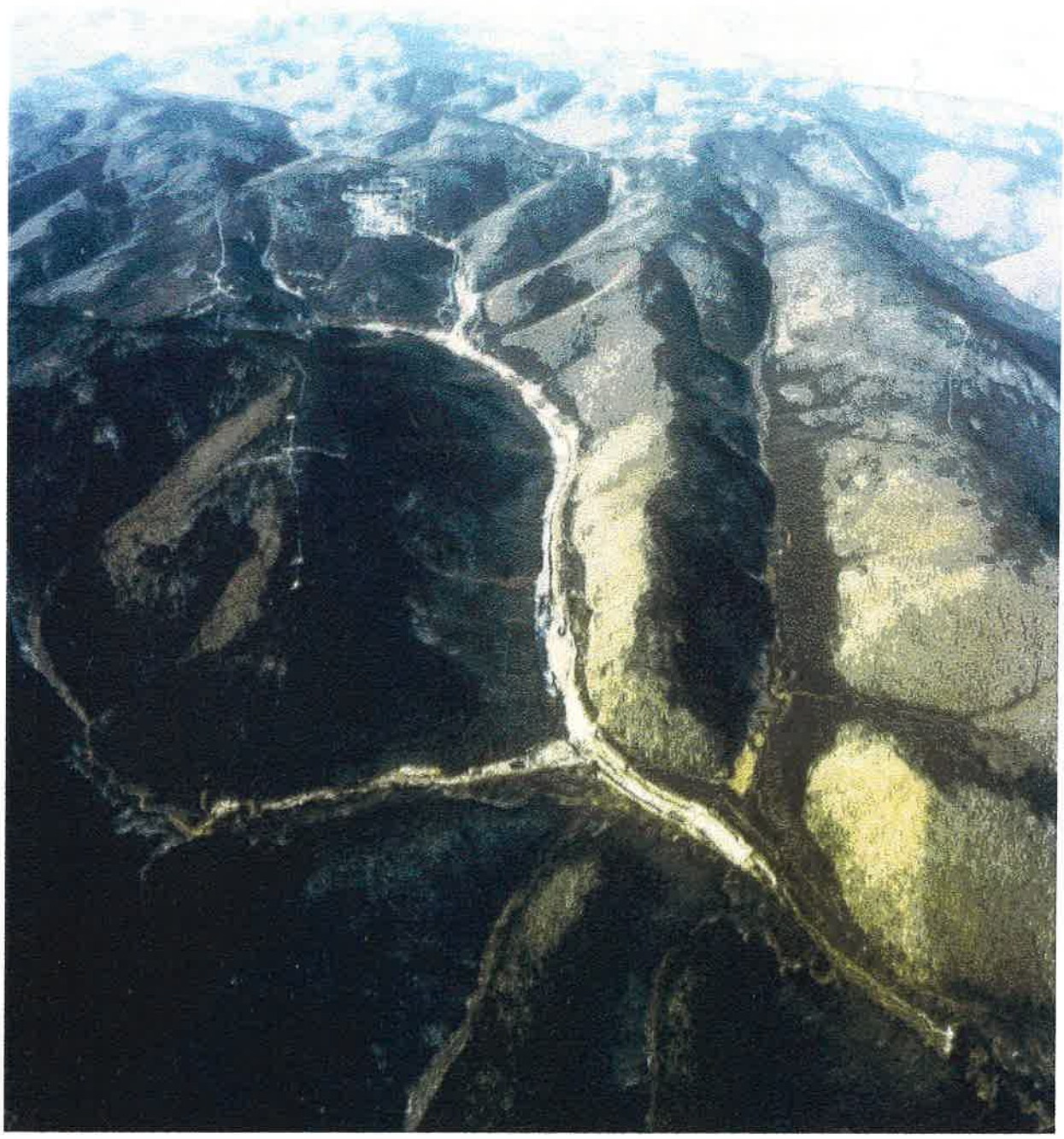


Figure 1: An aerial photo (approx. 1994) of Fish Creek valley before reclamation began, note the narrow stream and isolated pools among the historic placer mining disturbances

Figure 2: An aerial view (approx. 1998) after construction of the water supply reservoir and developed wetlands; the tailing impoundment and mine facilities at the upper center of photo

Figure 3: Ruins of the Fish Creek Dredge, photo taken summer 1993

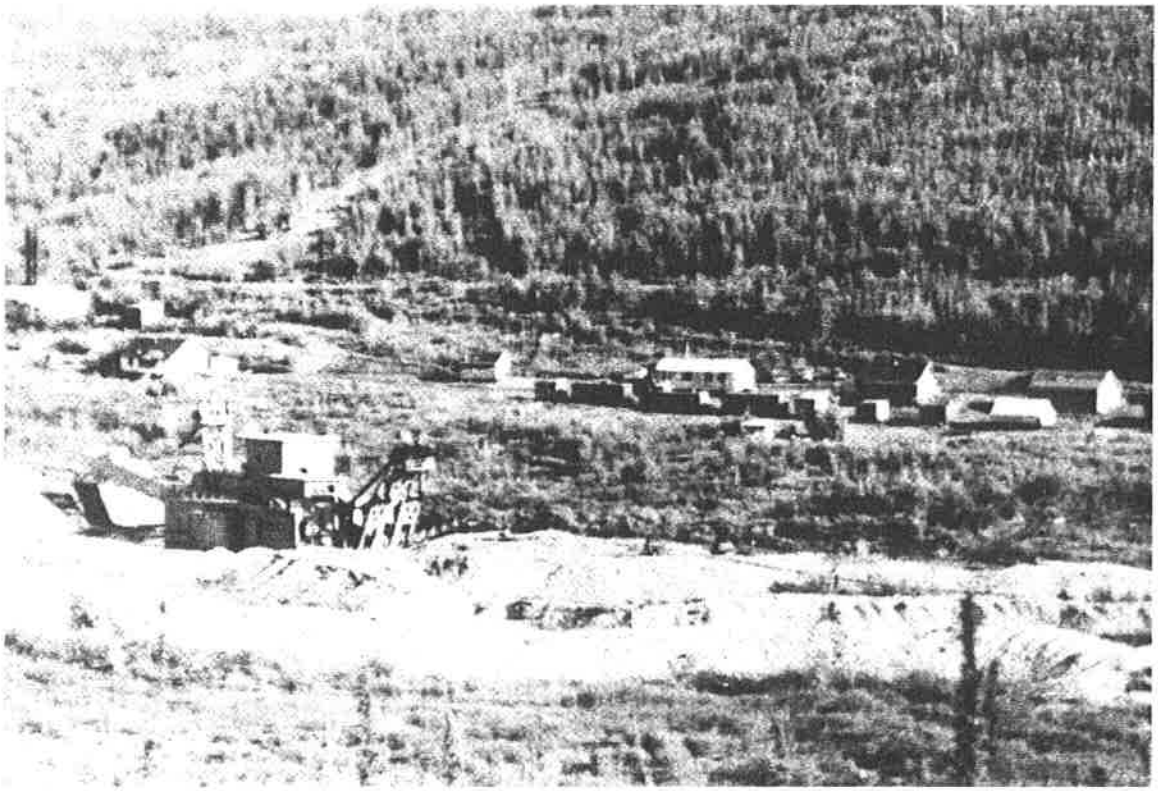


Figure 4: Fish Creek Camp at the height of its development by the Fairbanks Exploration Company around 1940

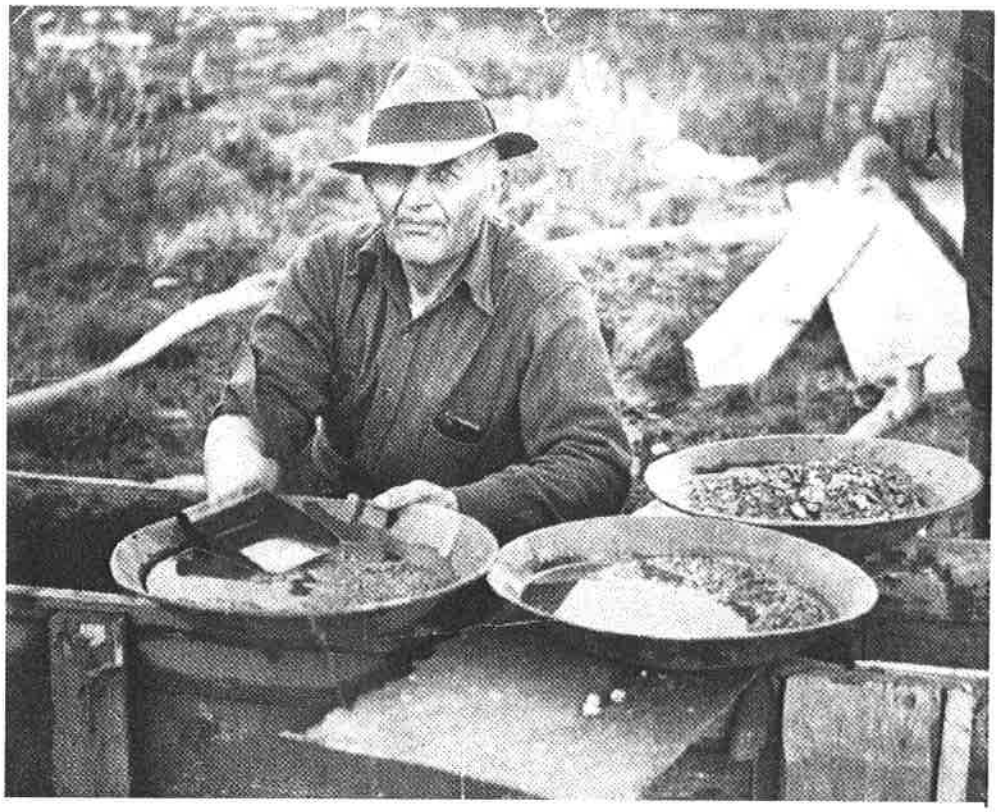


Figure 5: Mike Stepovich filed first mining claim on Fish Creek in 1902

Figure 6: Cabin ruins at Stepovich camp on Yellow Pup Creek, photo taken 1993

Figure 7: Remains of a three-stamp mill found on Melba Creek, 1993

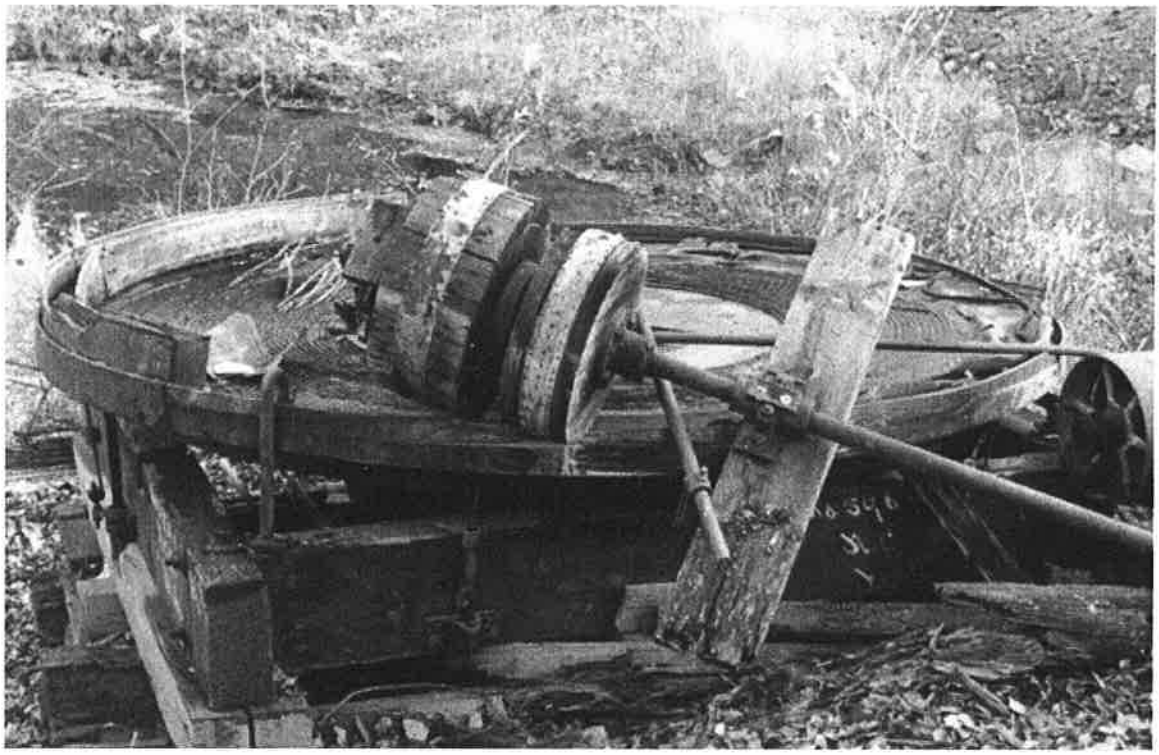


Figure 8: Historic mill component used on Fish Creek that has been moved to Pioneer Park for restoration, 1993.

Photos from *History of Mining on Upper Fish Creek, Fairbanks, Alaska* prepared for Fairbanks Gold Mining, Inc. by Northern Land Use Research, Inc.

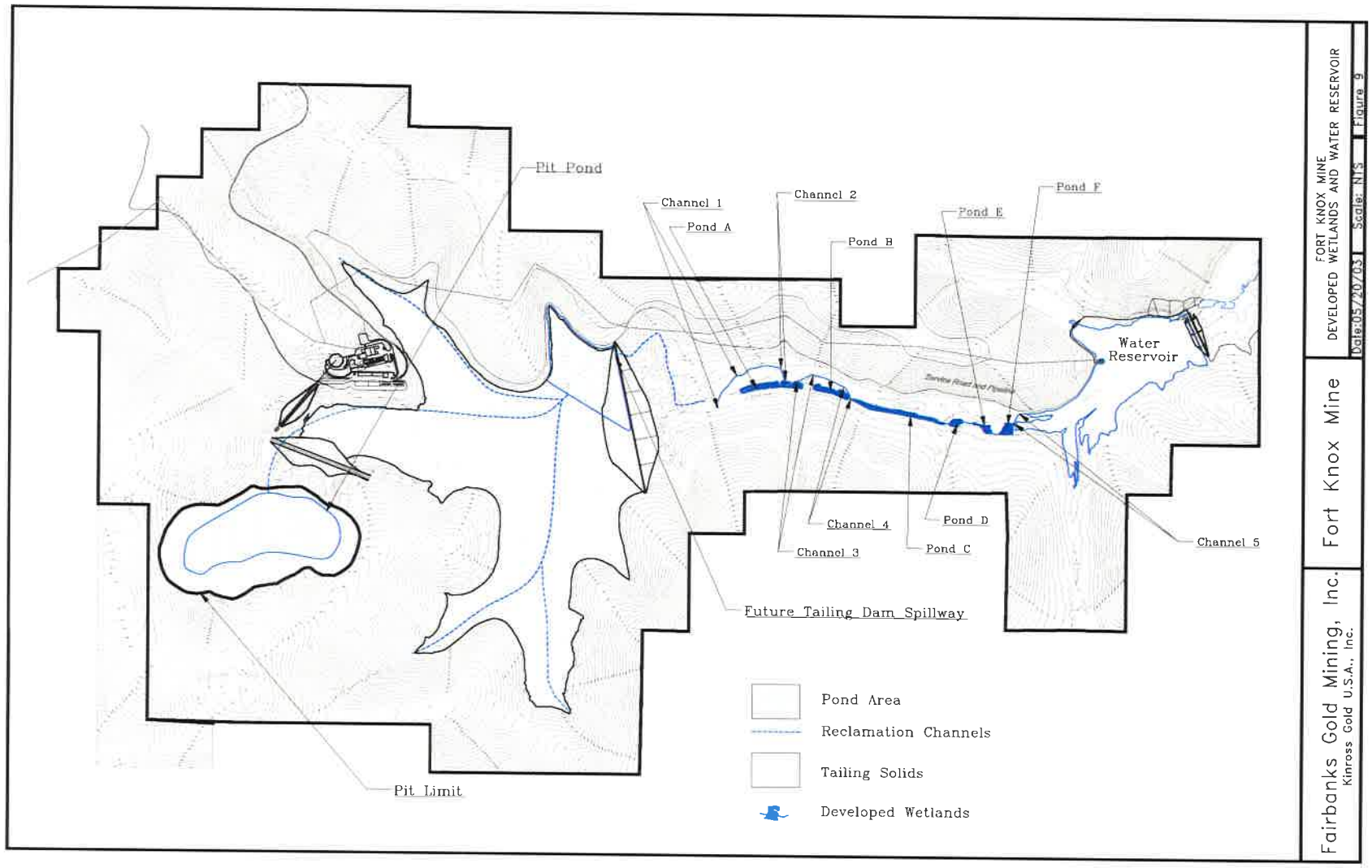

Pit Pond
Channel 1
Pond A
Channel 2
Pond B
Pond E
Pond F
Water Reservoir
Channel 4
Channel 3
Pond D
Pond C
Channel 5
Future Tailing Dam Spillway
Pit Limit
Pond Area
Reclamation Channels
Tailing Solids
Developed Wetlands
FORT KNOX MINE
DEVELOPED WETLANDS AND WATER RESERVOIR
Date:05/20/03
Scale: NTS
Figure 9
Fort Knox Mine
Fairbanks Gold Mining, Inc.
Kinross Gold U.S.A., Inc.

Figure 10: Below the water supply reservoir the area was recontoured and seeded after construction of the embankment, Summer 1996

Figure 11: Two years later, the same area below the water supply reservoir embankment after being seeded with a native grass mix; natural invasion of other native species has begun, Summer 1998

Figure 12: A view of the water supply reservoir looking upstream toward the developed wetlands; the embankment can be seen in the lower right hand corner, 1998

Figure 13: An upstream view of the water supply reservoir, spillway in upper left corner, 1999

Figure 14: Upstream from the water supply reservoir flooding produced diverse, shallow shoreline habitat; the channel between the long narrow islands is Polar Bay, 1998

Figure 15: A closer view of the islands around Polar Bay, 1999

Figure 16: The shallow channel constructed to allow grayling to enter the wetlands for spawning, June 2000

Figure 17: Looking up Fish Creek valley towards the tailing embankment, historically disturbed areas being recontoured during construction of Channel 1, Summer 1997

Figure 18: Another shot of recontoured historic mining disturbance with the tailing impoundment in the background, 1997

Figure 19: Looking downstream from the tailing impoundment and across the developing wetlands, Summer 2001

Figure 20: Steep sided pits and uneven terrain were sloped in preparation for seeding reclaimed wetlands downstream from the tailing impound, 1999

Figure 21: One year after seeding, old placer mining disturbances are unrecognizable as wetlands develop a whole new character, Summer 2000

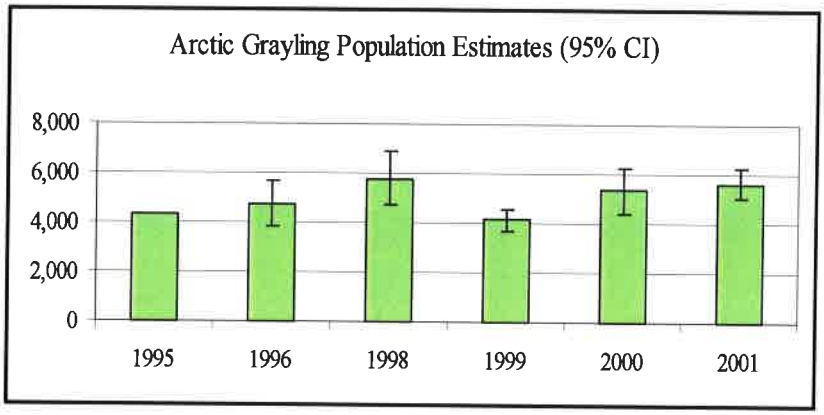
Figure 22: Typical historical mining disturbance in the Fish Creek valley

Figure 23: Recontoured and seeded to native grasses, these developed wetlands, near the tailing impoundment are becoming productive wetland habitat, mid-summer 2000

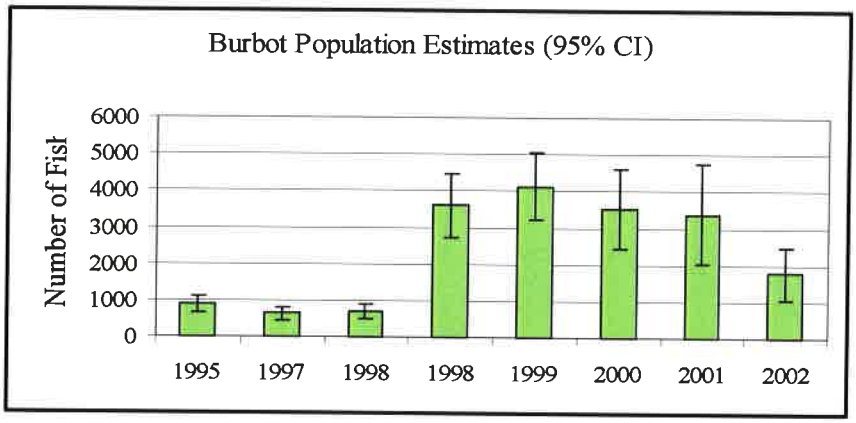
Figure 24: Pond E, wetland habitat teeming with grayling; all traces of historical mining disturbance gone, June 2000

Figure 25: Male Grayling netted for tagging in developed wetlands in early spring 2003

Figure 26: Al Ott, Habitat Biologist with fyke-net in the shallow end of the water supply reservoir, capturing grayling to be tagged, early spring 2003



Estimates of the Arctic grayling population in the water supply reservoir at the Fort Knox Mine (1995 to 2001). Capture and recapture events were done using fyke-nets.

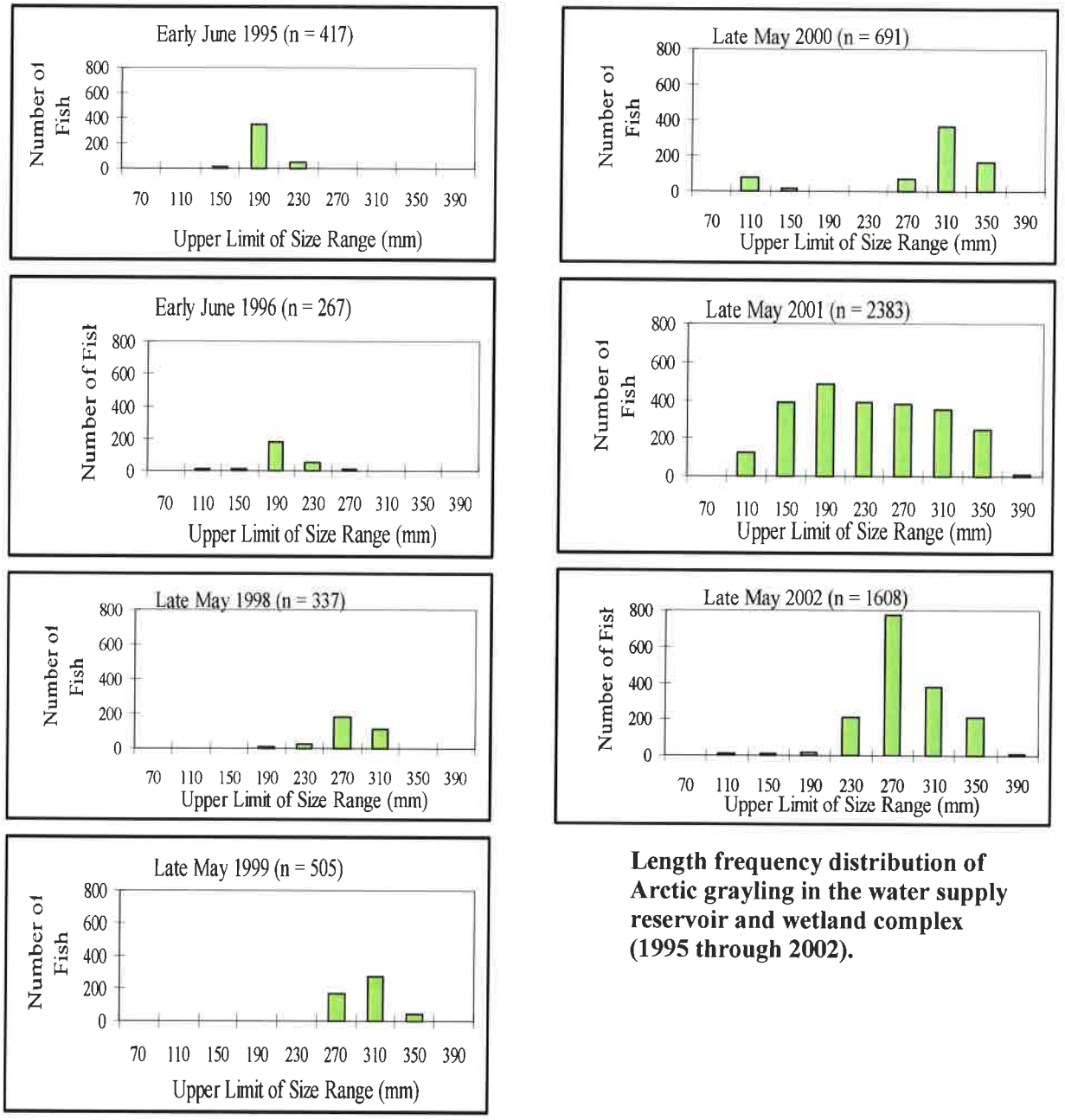


Estimates of the burbot population in the water supply reservoir at the Fort Knox Mine (1995 to 2002). The first 1998 estimate was in season while the second 1998 estimate is based on the 1999 recapture event when adequate recaptures of small burbot occurred making the population estimate possible.

Figure 27: These graphs show a population estimate of Arctic grayling and burbot after the building of the water supply reservoir and developed wetlands.

Technical Report No. 02-06, Alaska Department of Fish and Game Habitat and Restoration Division, *Arctic Grayling and Burbot Studies in the Fort Knox Water Supply Reservoir, Stilling basin, and developed Wetlands, 2002*. By Alvin G. Ott and William A. Morris

ARCTIC GRAYLING



Length frequency distribution of Arctic grayling in the water supply reservoir and wetland complex (1995 through 2002).

Figure 28: These graphs depict an increase in juvenile fish, an indication of spawning success after the construction of channel #5 in 1999.

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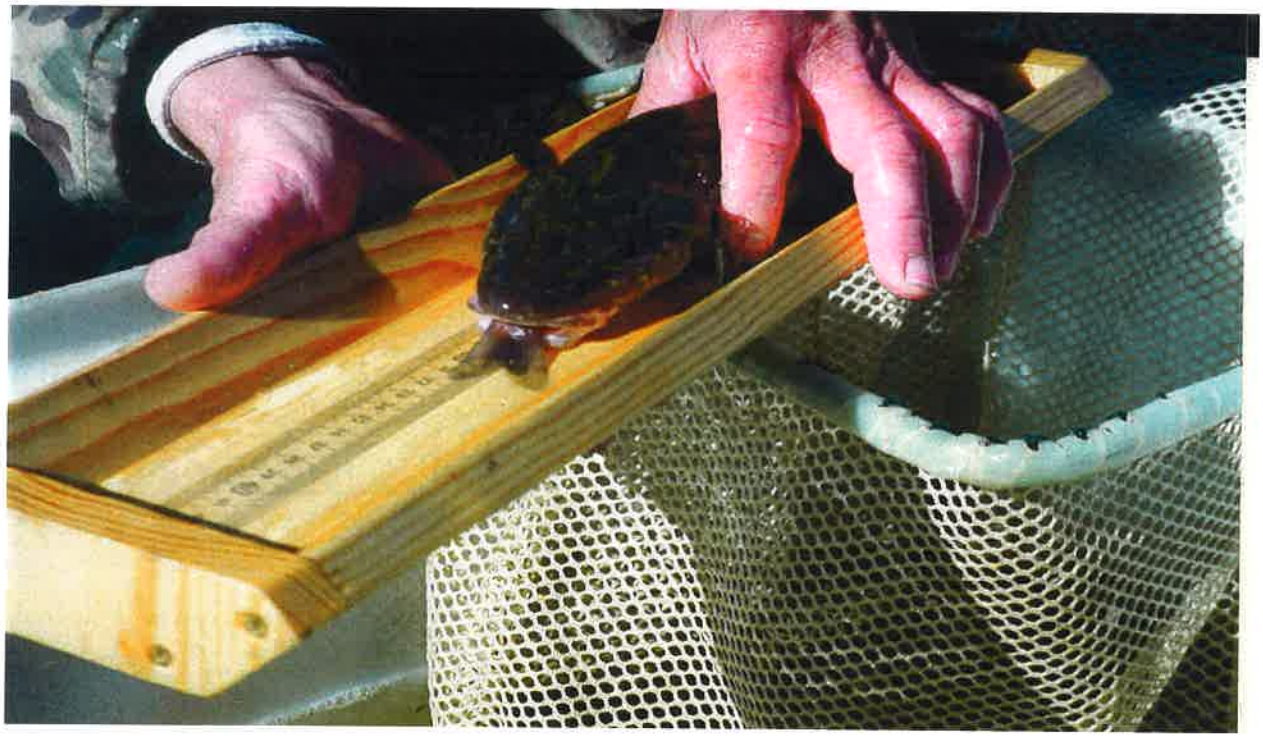
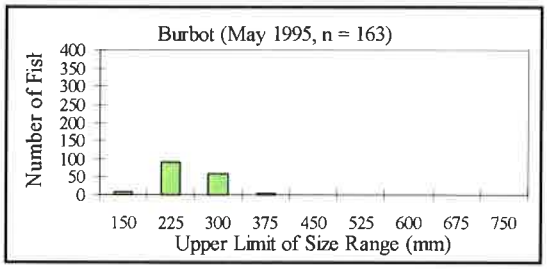
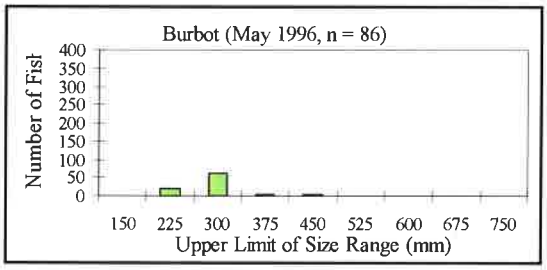


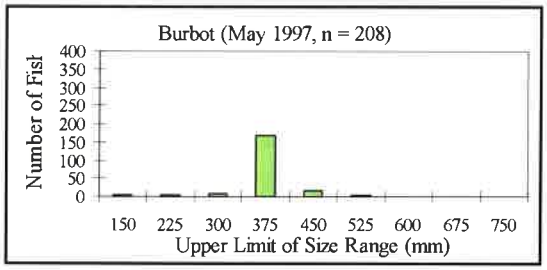
Figure 29: Predatory burbot enjoying an Arctic grayling lunch, 1999

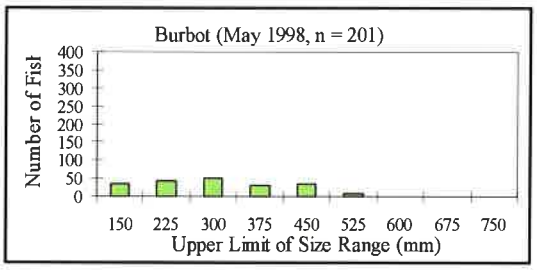
Figure 30: Normal mottled burbot and less common gray burbot netted by Habitat biologists from Fort Knox water supply reservoir October 2002

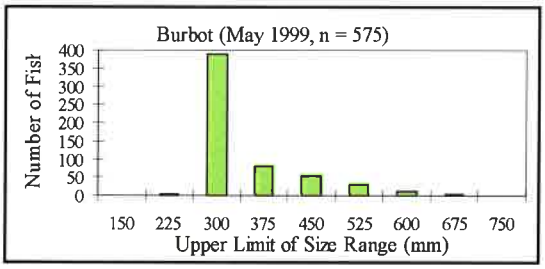
BURBOT

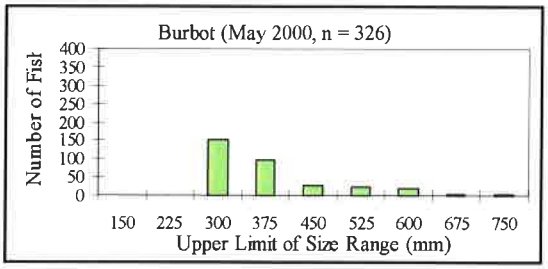


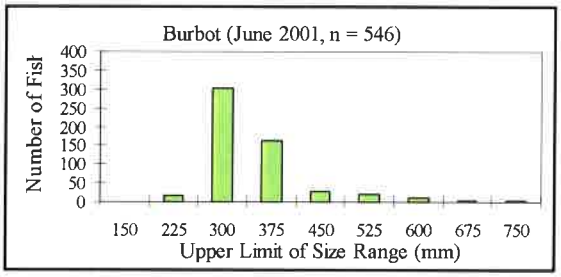


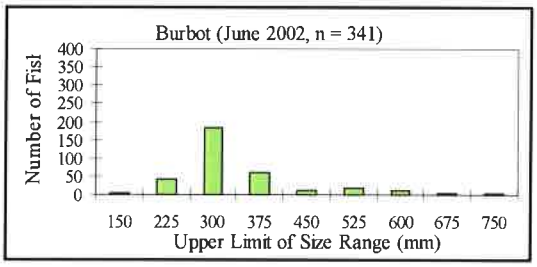












Length-frequency distribution of burbot caught in the water supply reservoir, 1995 to 2002.

Figure 31: Since 1995 burbot have shown an increase in the number of larger fish present in the water supply reservoir.

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Figure 32: This good-sized burbot was netted from its preferred habitat, the deeper, cooler waters of the reservoir, June 2000

Figure 33: Anesthetized grayling about to be measured and tagged, Summer 2000

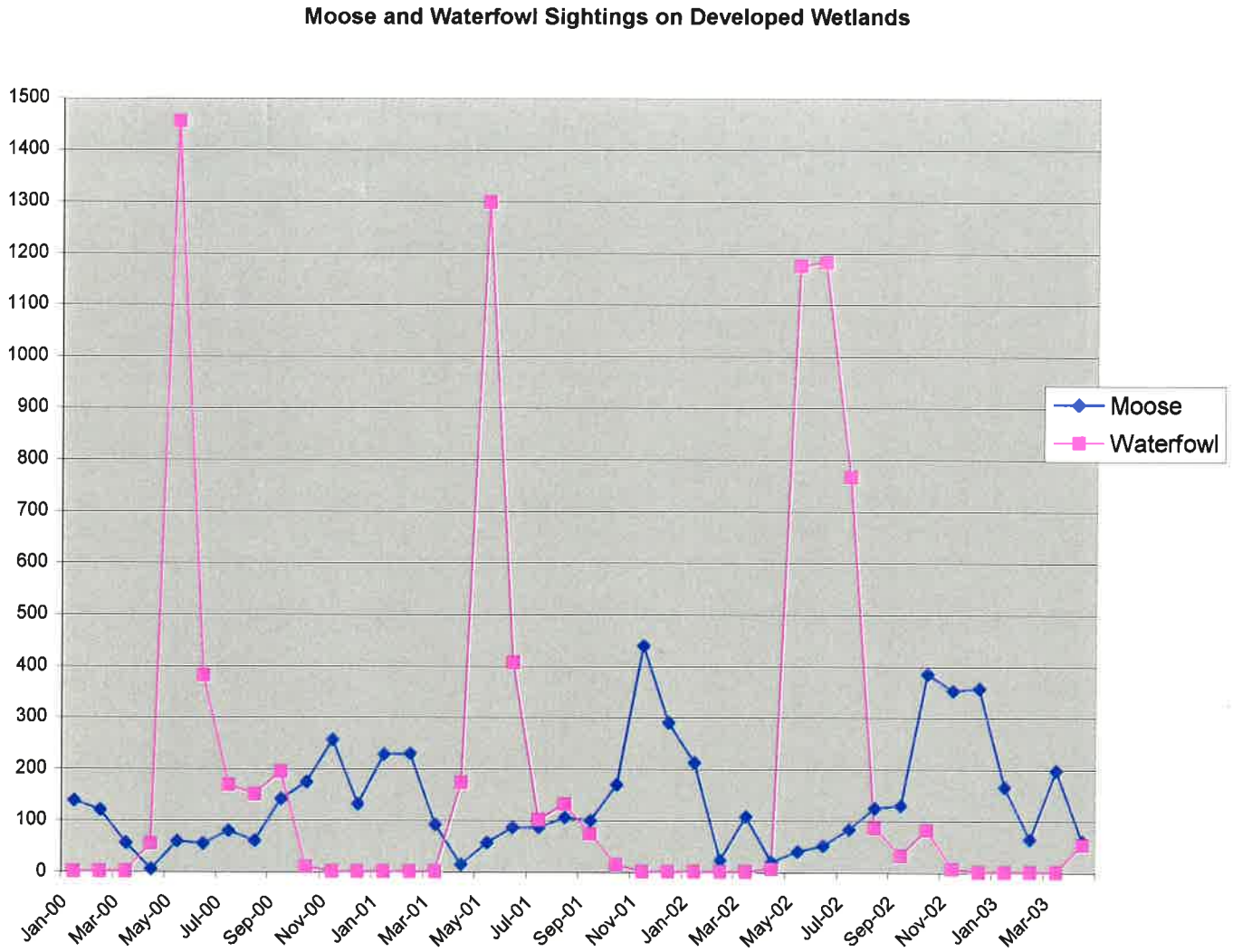

Figure 34: Graph depicts seasonal wildlife use; waterfowl numbers increase when open water is present, and moose utilization increases with winter browsing

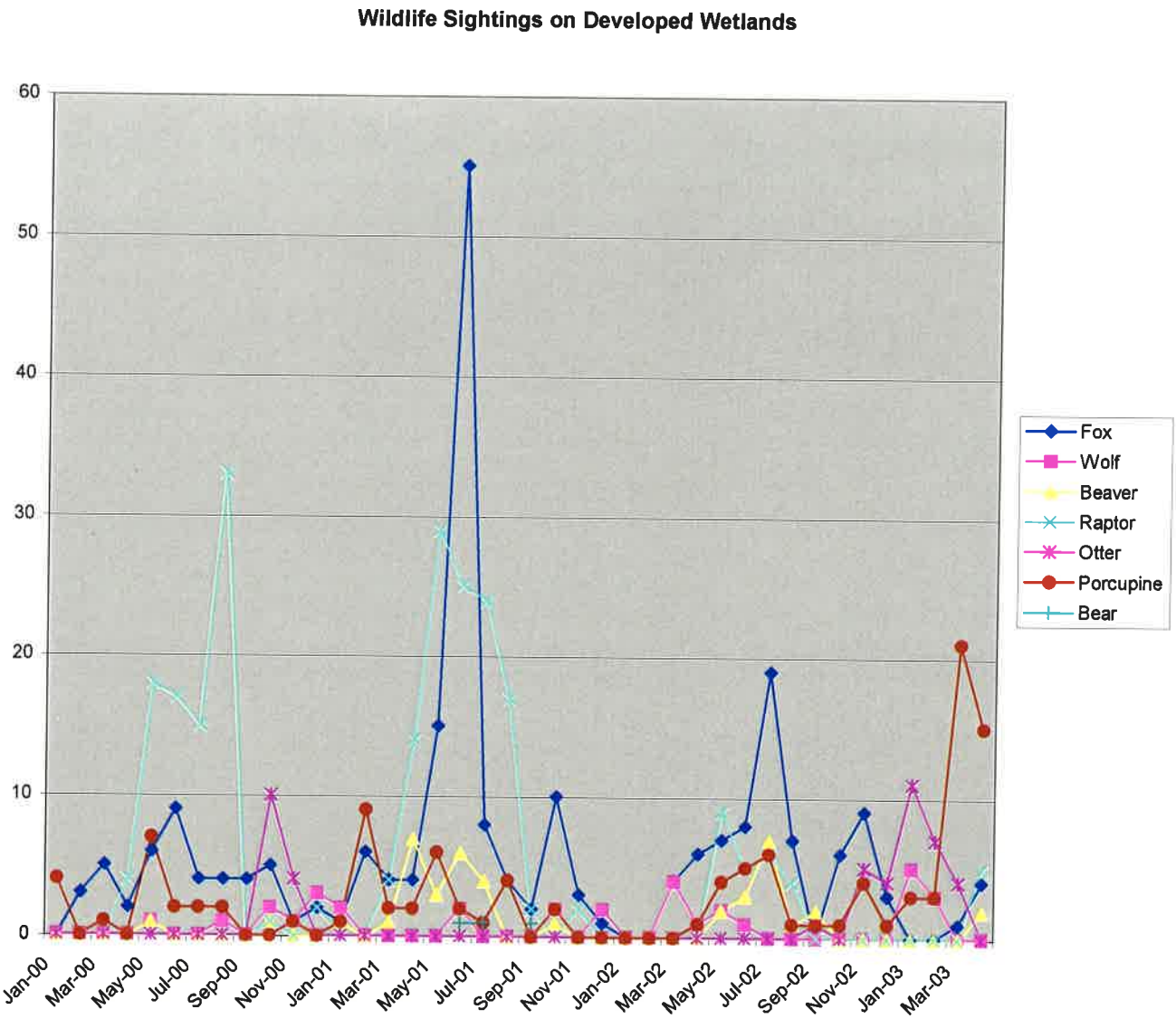

Figure 35: Animal sightings give an estimate of usage by wildlife in the developed wetlands

Figure 36: Wolf below the tailing impoundment, Summer 2000

Figure 37: Porcupine on hillside above tailing impoundment, May 2003

Figure 38: Moose investigating reclamation work, probably Summer of 1996

Figure 39: Moose enjoying aquatic plants in developed wetlands, tailing impoundment in background, 2000

Figure 40: Wolf below tailing impoundment, 2000

Figure 41: Wolf in the morning mist, 2000

Figure 42: Moose by Pipeline road, May 2003

Figure 43: Moose in the birch trees near developed wetlands, May 2003


Figure 44: Wolf watching, Summer 2000


Figure 45: Defensive Porcupine, May 2003


Figure 46: Loping wolf in developed wetlands, 2000

Figure 47: Bald Eagle perched on water pipeline next to road, with a good view to fishing grayling in the wetlands, May 2003

Figure 48: Woodchuck near developed wetlands, May 2003

Figure 49: Ringneck Duck in developed wetlands, August 2001

Figure 50: Moose and calf seeking winter browse in developed wetlands, December 2002

Figure 51: Water supply reservoir spillway/otter slide, in the bottom left corner of photo are faint slide marks left by playful otters, December 2002

Figure 52: Comet and aurora borealis over Fort Knox

Figure 53: Developed wetlands in winter, December 2002

Figure 54: Fort Knox in snow

Figure 55: Aurora borealis over Fort Knox

Figure 56: Pond F with banks clothed in Fireweed; an excellent example of wetland rehabilitation, Summer 1999