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RESTORATION OF SLOUGHS IN THE FAIRBANKS NORTH STAR BOROUGH (TANANA RIVER WATERSHED)

by Nancy J. Ihlenfeldt

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Alaska Department of Natural Resources
Office of Habitat Management and Permitting

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Introduction:

Sloughs in the Fairbanks North Star Borough (FNSB) are important to Arctic grayling (*Thymallus arcticus*) as they provide spawning and rearing habitat. Arctic grayling are an important species for sport fishing in Interior Alaska. Due to the increase in urbanization and development along the sloughs, degradation of fish spawning and rearing habitat has occurred. Chena Slough, Beaver Springs Slough, Piledriver Slough, Twentythree Mile Slough and Noyes Slough are the most prominent sloughs in the FNSB. Chena Slough (between Chena River and Nordale Road crossing), Twentythree Mile Slough, Piledriver Slough and Noyes Slough are listed in the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* as they support Chinook (*Oncorhynchus tshawytscha*) and chum (*O. keta*) salmon spawning and rearing. Many species of resident fish other than Arctic grayling [e.g., round whitefish (*Prosopium cylindraceum*), northern pike (*Esox lucius*), longnose suckers (*Catostomus catostomus*), slimy sculpin (*Cottus cognatus*), Alaska blackfish (*Dallia pectoralis*) and arctic lamprey (*Lampetra japonica*)] also are found in these waterbodies.

State and Federal agencies, University of Alaska-Fairbanks researchers, Lower Chena River Watershed Management Planning Team (1995-1998), U.S. Army Corp of Engineers (COE) and community-based groups have been working for many years conducting studies, generating alternative restoration plans, identifying goals and searching for funding to restore sloughs in the FNSB.

This document highlights the achievements and goals of the Chena Slough Technical Committee (CSTC), a multi-agency group (see Figure 1) formed in 2000 due to the pressing concern for the declining condition of Chena Slough. The CSTC has been working on replacing culverted crossings with bridges at all non-maintained Alaska Department of Transportation and Public Facilities (ADOT/PF) road crossings of Chena Slough. The CSTC recently implemented a three phase restoration plan. Phase I includes the continued replacement of existing culverts with bridges (or larger, properly installed culverts) at the remaining ADOT/PF maintained road crossings.

History:

Prior to 1945 and before construction of the various control projects, these sloughs were side channels of the Tanana River. Piledriver Slough and Chena Slough were one continuous channel called "Chena Slough" that flowed northwest through the town of Fairbanks and then back into the Tanana River at the west end of Fairbanks. The Chena River flowed into "Chena Slough" about 18 miles northeast of Fairbanks. "Chena Slough" carried a high discharge and sediment load that created a wide channel with high banks. Twentythree Mile Slough and Beaver Springs Slough were side channels of "Chena Slough". The construction of Moose Creek Dike (1945) split "Chena Slough" into two waterbodies now known as Chena Slough (north of the dike) and Piledriver Slough (south of the dike).

Flooding in Fairbanks during the 1930's encouraged the construction of an earthen dam adjacent to the Tanana River south of town at Moose Creek Bluff in 1945. The intent of this dam was to block the flow of Tanana River water into Chena Slough.

In August 1967, the Chena River crested 19 feet above its banks (7 feet above flood stage) and flooded Fairbanks. In addition to the severe destruction in Fairbanks, this event washed out most of the existing crossings (culverts and bridges) on Chena Slough. ADOT/PF and some subdivision developers installed temporary culverts of varying diameter, length and texture in an emergency manner to provide access. Most of these "temporary" culverts exist today.

The Chena River Flood Control Project (dam, levee, floodway and additional dikes) was constructed in the 1970's and became fully operational by 1978. The project includes the Moose Creek Dam across the Chena River, a levee that keeps the Tanana River from reaching Fairbanks, and a floodway that takes backed-up Chena River flood water from the dam south to the Tanana River. This project resulted in sloughs that are mostly groundwater-fed systems with low discharge and low sediment loads that would naturally have narrow channels and low banks. For example, the Chena Slough summer flows went from ~1000 cubic feet per second (cfs) to ~70 cfs, with winter flows as low as 40 cfs (see Figure 2).

Meanwhile, land along the Old Richardson Highway (Piledriver Slough) and the Old Valdez Trail (Twentythree Mile Slough) was being developed for subdivisions, private homes, and agriculture. Much of this property required slough crossings for

access. Many of the property owners installed undersized culverts (requiring many cubic feet of gravel fill material) in the sloughs to gain access to their homes or agricultural fields.

In 2001, the Alaska Department of Fish and Game (ADF&G), Habitat and Restoration Division (now the Alaska Department of Natural Resources [ADNR], Office of Habitat Management and Permitting[OHMP]) conducted a culvert survey on nine road crossings of Chena Slough. Results showed that, with the exception of Nordale Road, fish passage was blocked at all of the culverts when discharges were less than the design fish passage flow (70 cfs). The most common fish passage problems observed included: culverts undersized for the design discharge; grade breaks within the culvert barrel creating hydraulic jumps; culvert slopes not matching the channel gradient; excessive water surface restriction (flow contraction) at the inlet; culverts blocked by debris and/or grates; or the culverts set above the channel thalweg (perched).

Adoptive Restoration Plan for Chena Slough Recommended by the CSTC:

To improve and/or maintain existing fish habitat (mostly Arctic grayling spawning and rearing habitat), maintain recreational use (swimming, fishing, canoeing) and prevent high water problems (septic, yard, or basement flooding) the CSTC developed a three phase restoration plan: (1) assessment and reestablishment of fish passage, (2) major stream channel restoration work and fish monitoring programs, and (3) evaluation of restoration success. Specifically, the plan recommends:

1. Replace culverted crossings with bridges or much larger, correctly placed, depressed culverts that meet proposed width/depth ratio.

   [*To create and maintain free flowing water (year round) for the movement of ice, vegetation and unwanted nutrients and the free passage of fish both upstream and downstream.*]

2. Construct a channel (within the existing channel/floodway) with a width/depth ratio of 20’-30’ wide by 2’-3’ deep, sinuous with intermittent pools, runs, riffles and slack water ponds.

   [*To further enhance the free flowing water; change the water temperature regime to prevent the depletion of dissolved oxygen (DO) and the increase of unwanted*

algae and aquatic macrophytes; and to create a "healthy" stream by constructing a width/depth ratio that "fits" the proposed stream flows while creating fish habitat use areas.]

3. Create a beaver management program and reduce beaver dams.
   [*To further enhance and ensure the continuous, free flowing water*.]
4. Divert water from Moose Creek to Chena Slough to double the existing discharge (existing summer flows = 70-90 cfs, winter flows = 40 cfs) to a proposed 140-180 cfs.
   [*To further enhance the free flowing water that will help flush out the ice, vegetation and unwanted nutrients.]*
5. Conduct fish habitat use studies along the length of the slough.
   [*To ensure that the "new" channel created within the "old" channel contains the habitat types (e.g., spawning, rearing, feeding, resting, eating, predator avoidance areas) that are important for* ***all*** *life stages of fish, but concentrating on the spawning and rearing habitat for Arctic grayling*.]
6. Continue the recreational and educational use of the slough.
   [*The schools, local residents, and summer visitors have enjoyed this slough in the past, are doing so now, and need that opportunity to continue into the future. Chena Slough travels thru North Pole and is a valuable resource to the community*.]

Phase I Completed Projects:

The following is a summary (with before and after photos) of the sites that have been "restored" along Chena Slough and Beaver Springs Slough. Funding for each project is acknowledged. U.S. Fish and Wildlife Service (USFWS) monies are from the federal grant programs "Partners for Fish and Wildlife" and/or "Fish Passage"; the National Fish and Wildlife Foundation (NFWF) Grant was applied for and received in spring of 2001 ($75,000); State Grant monies were from the offices of Senator Gene Therriault ($250,000) and Representative John Coghill ($124,000).

In October 2001, 3-36” diameter culverts were removed from Airway Road crossing of Chena Slough and replaced with a free-span 40’ long steel bridge (originally used to access a timber sale on Montague Island) purchased and installed with a combination of funding and in-kind services from the NFWF Grant, Fairbanks Soil and Water Conservation District (FSWCD), ADNR-OHMP, ADOT/PF, USFWS, City of North Pole, and Airway Road Service District.

Before

After

In July 2001, a 25’ section of an earth dam was breached to allow for fish passage. The dam was located just downstream from the Mission Road crossing of Chena Slough. Money from the NFWF Grant was used to hire the contractor.

Before

After

In October 2001, to increase fish passage a causeway across Beaver Springs Slough that connected the elementary school to 5th Avenue Park was removed and replaced with a pedestrian footbridge. USFWS grant monies and the City of North Pole funded this project.

Before

After

In August 2003, one-5’ diameter (extremely damaged) culvert was removed from the Doughchee Road crossing of Beaver Springs Slough and replaced with a free-span 40’ long steel bridge (originally used to access a timber sale on Montague Island). Funding was generated from the USFWS grant program, City of North Pole, State grant monies, and NFWF Grant.

Before

After

In September 2004, 3-36” diameter culverts were removed at the Outside Hurst Road crossing of Chena Slough and replaced with a free-span 40’ long steel bridge (originally used as a temporary bridge on the Pogo Mine Road). Funding was from USFWS grants and State grant monies.

Before

After

In September 2004, one-36” culvert was removed from the Spruce Branch Road crossing of Chena Slough and replaced with a free-span 30’ long steel bridge (originally used as a temporary bridge on the Pogo Mine Road). Funding was generated from the USFWS grant program and State grant monies.

Before

After

Completed Projects on other Sloughs:

The following is a summary (with before and after photos) of sites that have been upgraded or "restored" on Twentythree Mile Slough and Piledriver Slough. Again, the funding is acknowledged.

In August 2003, a low water crossing of Twentythree Mile Slough was closed and a 40' long steel bridge (originally used to access a timber sale on Montague Island) was constructed downstream from the low water crossing on the Old Valdez Trail. Funding came from the NFWF Grant, USFWS, and a State grant. Area residents provided material and in-kind work to install this bridge, re-connecting the original route of the Old Valdez Trail.

Before

After

In August 2003, a low water crossing of Twentythree Mile Slough was closed and a 40’ long, free-span steel bridge (flatbed railcar) was constructed upstream from the low water crossing to access agricultural property and private homes. Money for this project was obtained from the USFWS and the private property owner.

Before

After

Piledriver Slough has experienced inundation from the Tanana River several times, most recently in January 2003 and July 2003. This has resulted in severe flooding and the "blow-out" of several road crossings.

In January 2003 extensive overflow on Piledriver Slough at the Old Richardson Highway crossing (one 5', one 4' and one 3' diameter culvert existed at the crossing) made the road unusable. The ADOT/PF Maintenance and Operation (M&O) crew installed a temporary bridge at the crossing site to keep the road open and safe.

Temporary bridge over the culverts

The Old Richardson Highway Piledriver Slough crossing caused problems on a yearly basis. Most often the road fill material would wash out during break-up (probably due to frozen, undersized culverts) and settle immediately downstream. Year after year new fill material would be brought in, and year after year it would wash downstream. This resulted in an extremely wide, braided channel immediately downstream of the crossing with large piles of gravel dividing the channels.

In October 2003, ADOT/PF M&O (with funding assistance from the USFWS) removed the existing culverts, created a “permanent” 30’ wide by 3’ deep channel with a bankfull bench at the downstream left-limit of the crossing, and installed two 12’ diameter arched culverts. The ADNR-OHMP and the USFWS worked closely with ADOT/PF to design and construct the new crossing and channel.

After (outlet – taken from bankfull bench)

After (inlet)

Constructing the permanent 30’ wide by 3’ deep channel downstream of the culverts and the bankfull bench on the left limit of the channel.

In July 2003, the Ingrid Road crossing of Piledriver Slough was washed out when water from the Tanana River inundated the slough. The subdivision was accessible only by foot for several days.

Piledriver Slough at Ingrid Road crossing

In October 2003, the 3-36" diameter culverts at the Ingrid Road crossing of Piledriver Slough were removed and replaced with a 70' long steel bridge (old weigh station scales). The agencies involved and the contractor agreed to go with the longer bridge in case the Tanana River ever flooded this section of Piledriver Slough again. Funding was obtained from the USFWS, a State grant, and in-kind work performed by the residents of the subdivision.

Before

After

In August 2004, an old (unsafe) bridge with abutments in the stream bed was removed and replaced with a free-span 40’ long steel bridge (flatbed railcar) at the Bradbury Road crossing of Piledriver Slough. The residents had created a low water crossing in the stream immediately downstream of the old bridge. The new bridge was purchased and installed using USFWS grant monies.

Old bridge on left, new bridge on right (over the top of the low water crossing)

In August 2004, one 36” diameter perched culvert was removed from Twentythree Mile Slough. This culverted crossing completely blocked the upstream and downstream passage of fish for 15 years. The ADNR-OHMP, ADNR Lands and US COE had all issued notices of violation and requested that this culvert be removed. This crossing provided access to a private agriculture lot. Once the culverted crossing was removed, a free-span 40’ long steel bridge (flatbed railcar) was installed downstream from this site. Funding for the installation of the bridge was provided by the USFWS and the property owner.

Before

After

New bridge downstream from original crossing

For mitigation, the property owner removed an old earthen/grown-over/beaver dam located approximately 200 feet upstream of his original culverted crossing.

Before

After

In July 2005, one 36” diameter culvert and all the related fill material was removed from a crossing of Piledriver Slough. A 40’ long, single span (flatbed railcar) steel bridge was installed at this private property driveway. Funding for the installation of the bridge was provided by the USFWS and the property owner.

Before

After

In July 2005, one 4’ diameter culvert and all the related fill material was removed from a crossing of Piledriver Slough. A 40’ long, single span (flatbed railcar) steel bridge was installed across this private property driveway. Funding for the installation of the bridge was provided by the USFWS and the property owner.

Before

After

Summary:

Culverts, beaver dams, poorly installed utility lines and illegally placed fill material are acting as barriers for free flowing water and the movement ("flushing") of ice and vegetation and unwanted nutrients in many of the sloughs in the FNSB. To achieve agency and community goals, maintain fish habitat and passage, and maintain or increase recreational use of the sloughs, the continued removal of these barriers is necessary.

Figure 1. Agencies represented in the Chena Slough Technical Committee.

Alaska Department of Environmental Conservation (ADEC)
Alaska Department of Natural Resources (ADNR),
Office of Habitat Management and Permitting (OHMP) and
Division of Mining, Land and Water (DMLW)
Alaska Department of Transportation and Public Facilities (ADOT/PF),
Planning Division
Chena Slough Neighborhood Committee (CSNC),
Chairman
Fairbanks North Star Borough (FNSB),
Planning Department
Fairbanks Soil and Water Conservation District (FSWCD)
Mayor of North Pole – Jeff Jacobson
Natural Resources Conservation Services (NRCS)
University of Alaska-Fairbanks (UAF)
Fisheries
U.S. Army Corps of Engineers (COE),
Regulatory Branch
U.S. Fish and Wildlife Service (USFWS),
Habitat Restoration Division
U.S. Geologic Survey (USGS),
Water Resource Division

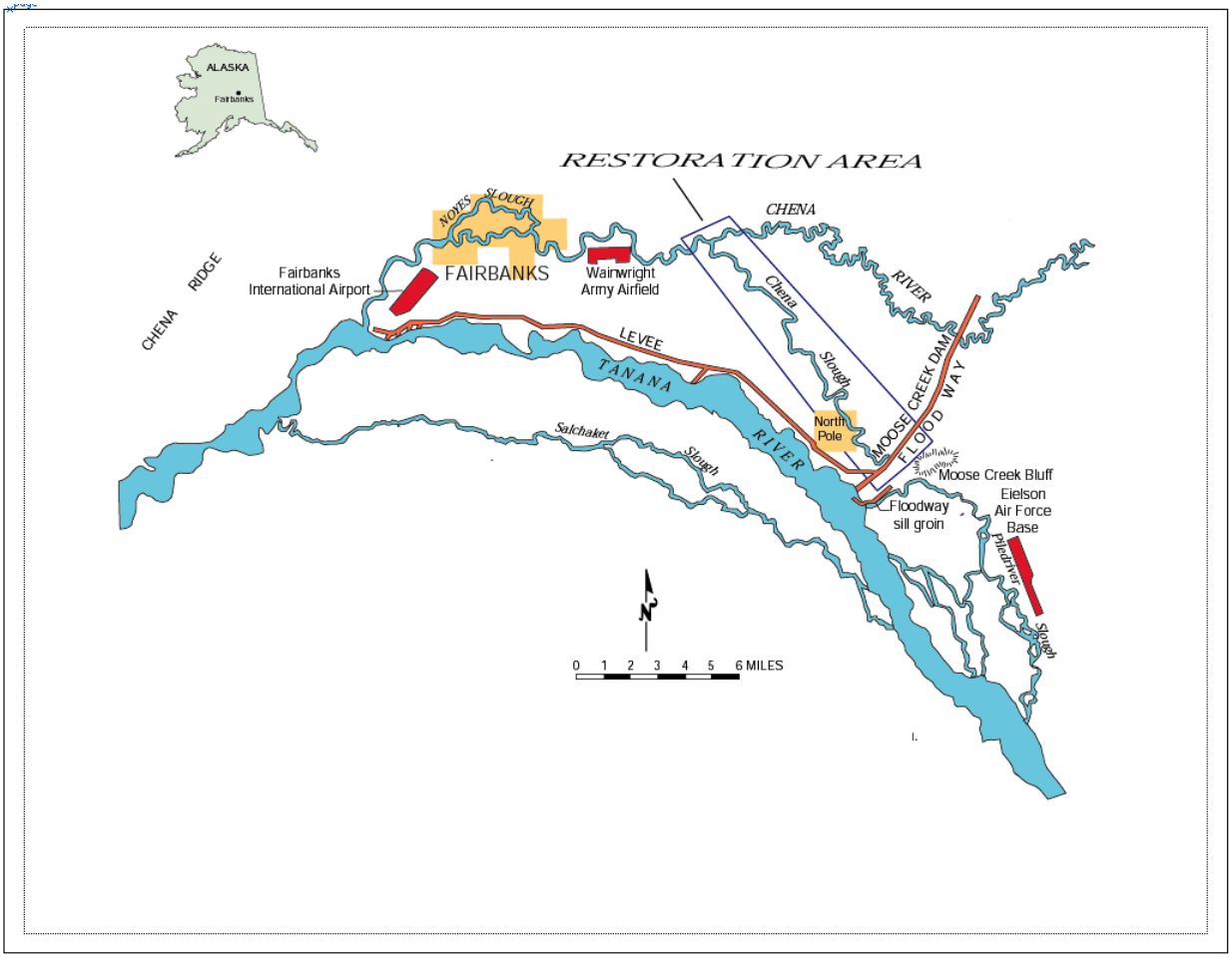

Figure 2. – Location of sloughs and the Chena River Flood Control Project dam, floodway and levee (figure provided by Ben Kennedy, USGS Water Resource Division).