

Inventory of Fish Distribution in Matanuska-Susitna Basin Streams, Southcentral Alaska 2009

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Inventory of Fish Distribution in Matanuska-Susitna Basin Streams, Southcentral Alaska, 2009

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Abstract

Poorly planned residential and commercial development in the Matanuska-Susitna (Mat-Su) Borough in southcentral Alaska can be a threat to fish habitat. Fish habitat protection authorities and planning processes in Alaska are constrained by the extent of current knowledge of fish distributions and their habitats. Some protections provided under the Anadromous Fish Act (AS 41.14.870) only apply to waters specified in the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* (AWC). The Anchorage Fish and Wildlife Field Office initiated this project to increase coverage of the AWC for Mat-Su basin water bodies. We sampled 154 reaches in 73 different streams in 2009, resulting in 86 nominations to update the AWC. Coho salmon *Oncorhynchus kisutch* and Dolly Varden *Salvelinus malma* were the most common salmonid species sampled in 2009. Other species captured in 2009 included rainbow trout *O. mykiss*, Chinook salmon *O. tshawytscha*, Alaska blackfish *Dallia pectoralis*, lamprey *Lampetra* spp., burbot *Lota lota*, threespine stickleback *Gasterosteus aculeatus*, ninespine stickleback *Pungitius pungitius*, longnose sucker *Catostomus catostomus*, and sculpin *Cottus* spp. Most streams sampled in 2009 were small (< 5 m width) 1st and 2nd order streams. This project supports the goals and objectives of the Mat-Su Basin Salmon Habitat Partnership and the National Fish Habitat Action Plan.

Introduction

The human population of the Matanuska-Susitna (Mat-Su) Borough is one of the fastest growing in the U.S., with a growth rate of 49% from 1990 to 2000. Population growth and associated development continue to challenge the ability of fisheries and land managers to balance fish habitat conservation with these changes over time. Maintaining healthy fish habitat, including water quality and quantity, is critical to maintain healthy fish populations in the Mat-Su basin.

Concerns for how to effectively protect and restore salmon production in the face of rapid development led to the formation of the Mat-Su Basin Salmon Habitat Partnership (Partnership). The Partnership is one of 13 fish habitat partnerships approved nationwide under the National Fish Habitat Action Plan (NFHAP), a national effort to protect and restore the nation's waterways and fisheries through science-based partnerships of affected stakeholders. The Partnership has developed a Strategic Action Plan, which identifies objectives, actions, and research necessary to protect salmon and salmon habitat in the Mat-Su basin.

Fish habitat protection authorities and planning processes in Alaska are constrained by the extent of current knowledge of fish distributions and their habitats. Some protections provided under AS 41.14.870 only apply to waters specified in the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* (Anadromous Waters Catalog, AWC; Johnson and Weiss 2007). Currently, the AWC contains less than 4,200 miles of the more than 23,900 miles of streams that have been mapped in the Mat-Su basin. Management and

regulatory tools cannot be applied to their full extent until the remainder of likely anadromous fish habitat in the basin is surveyed.

The Anchorage Fish and Wildlife Field Office initiated this project to support the Partnership's Strategic Action Plan and the NFHAP by increasing coverage of the AWC for Mat-Su basin water bodies. The overall goal of this project is to provide information needed for protection and management of the freshwater habitats that support Alaska's anadromous and freshwater fish. The specific objectives of the project are to

1. Maximize the spatial extent of mapped anadromous fish habitat depicted in the AWC within the Mat-Su basin; and
2. Record characteristics of aquatic habitats at each sampling location.

Study Area

The Matanuska and Susitna river watersheds encompass about 24,500 square miles in southcentral Alaska, ranging in elevation from near the highest point in North America (Mount McKinley) to sea level at Cook Inlet. The watersheds meet all freshwater life history needs for Chinook *Oncorhynchus tshawytscha*, chum *O. keta*, coho *O. kisutch*, pink *O. gorbuscha*, and sockeye *O. nerka* salmon. Other fishes common to Mat-Su water bodies include Arctic grayling *Thymallus arcticus*, rainbow trout *O. mykiss*, Dolly Varden *Salvelinus malma*, burbot *Lota lota*, eulachon *Thaleichthys pacificus*, longnose sucker *Catostomus catostomus*, threespine *Gasterosteus aculeatus* and ninespine *Pungitius puntius* stickleback, as well as several species of whitefish (*Coregonus* spp. and *Prosopium* spp.), lamprey *Lampetra* spp., and sculpin *Cottus* spp. Northern pike *Esox lucius* are also common in numerous lakes and streams, although they are not native to Mat-Su basin water bodies.

Methods

Sampling methods were adapted from Buckwalter (2009) and targeted rearing salmonids at their maximum upstream distribution in late summer and early fall. Streams were selected for sampling based on consultations with the Habitat Restoration Branch of the U. S. Fish and Wildlife Service (USFWS) and the Alaska Department of Fish and Game (ADF&G Sport Fish Division and Habitat Division; Palmer, AK). Criteria for stream selection included on-going and expected development, key data gaps, and opportunities to verify or evaluate culvert passage. Prioritization efforts resulted in sampling efforts being concentrated in the watersheds around Petersville, AK and in the Matanuska River. Sampling areas were defined using Hydrological Unit Code (HUC) 10 defined watersheds (Figure1). Successful applications for funding allowed for the use of a helicopter during part of this effort.

Sample reaches within a stream were chosen based on observations of stream size, water flow, and channel slope at or near the apparent upstream limit of anadromous fish distribution. Access used the most direct route possible, and permission from landowners was secured in advance when accessing private property. Sampling at each reach involved collection of fish and aquatic habitat parameters.

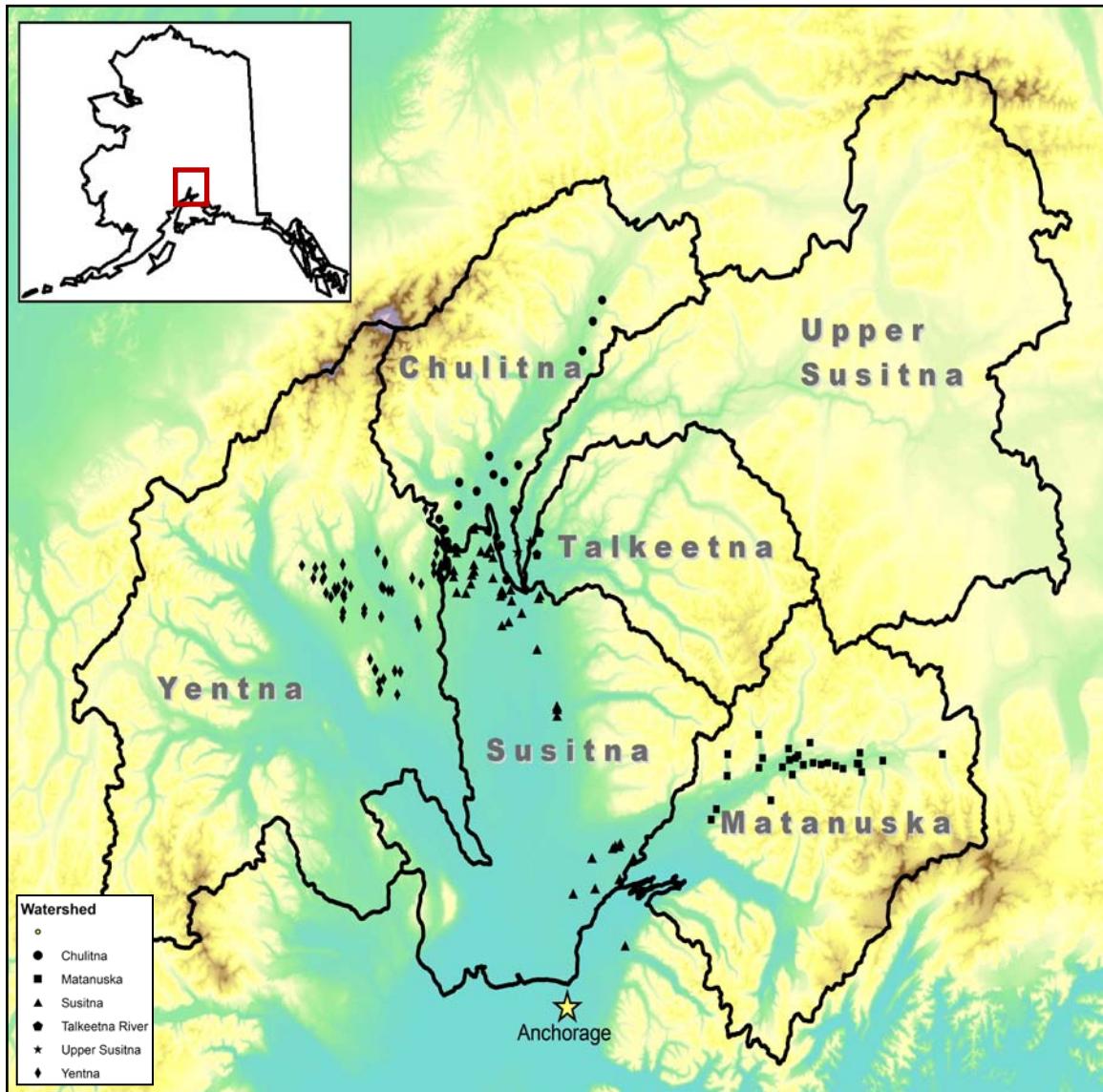


Figure 1. Sampling areas in the Mat-Su basin delineated by HUC 10 watershed, 2009. Sampling sites noted by individual symbols.

The spatial coordinates of the upstream terminus of each sampling reach were recorded in decimal degrees with a handheld global positioning system (Garmin 76CSx GPS) using the North American Datum of 1983 (NAD 83) geographic coordinate system. Reach length (m) was estimated by measuring along the thalweg by pacing. Wetted channel width (m) was measured perpendicular to the thalweg at a representative transect. Reach lengths were set at 40 wetted channel widths for streams \geq 3.75 m wide and reach lengths were set at 150 m for streams $<$ 3.75 m wide (Reynolds et al. 2003); maximum reach length was capped at 300 m for streams $>$ 7.5 m wide.

Sampling methods for polygon nomination to the AWC followed ADF&G nomination guidelines (ADF&G 2009), and targeted rearing salmonids in areas of complex habitat. Examples of possible polygon coverages include wetland areas, well-established beaver complexes, and braided systems. Sampling was conducted around the perimeter and within the proposed polygon. Nominated polygons were submitted with a Geographic Information System (GIS) polygon layer created in ArcGIS 9.3.1 and generated from GPS coordinates recorded during the sampling effort.

Sample reaches were classified following Rosgen (1994), and included visual estimates of substrate type. Channel slope (%) was estimated with a hand-held clinometer following Gordon et al. (1992). Stream order (Strahler 1952) was determined from 1:63,360-scale topographic maps. Water temperature ($^{\circ}$ C), conductivity ($\mu\text{mho}/\text{cm}$), and stream pH was measured using YSI 63 and Hach HQ40d water quality multimeters.

Fish sampling was conducted using a Smith-Root Model LR-24 backpack electrofisher following the safety guidelines outlined in Reynolds (1996) and USFWS (2004). Pulsed direct current (DC) was used with the output parameters adjusted to the minimum level necessary to achieve electrotaxis (forced swimming). Duty cycle was set to 25%, and a frequency of 30 Hz was used to minimize fish injury (Dalbey et al. 1996). Output voltage parameters were recorded along with conductivity ($\mu\text{mho}/\text{cm}$) at each reach for power standardization calculations. A single electrofishing pass at each sample reach was completed starting at the downstream end and working upstream. The reach was sampled using a zigzag pattern in each encountered habitat unit, alternating between left bank, thalweg, and right bank, with an emphasis on cover types. Electrofishing was aborted in reaches containing adult salmonids (USFWS 2004). Minnow traps baited with commercially cured roe were used to supplement fishing efforts in areas where electrofishing was less effective. Captured fish were placed in a 12-L bucket less than one half full with stream water. At the end of each reach, all fish were counted and identified to species, and total length (mm) was recorded for all juvenile salmon and most other salmonids. Genetic samples were collected from Chinook and coho salmon and Dolly Varden following the USFWS Conservation Genetics Lab guidelines. All fish were released into a slack-water area within the sample reach and allowed to recover.

Results

We sampled 154 sites within 73 different streams in 2009 (Table 1). Nineteen sites are within the Chulitna sampling area (Figure 2). Within the core area of the Mat-Su, 27 sampling sites are located in the Matanuska area (Figure 3) and 44 sites are located in the Susitna area (Figure 4). One site, Site S08, falls outside of the defined HUCs, and is included with the Susitna sampling area in order to simplify data presentation (Table 1, Figure 4). Both the Talkeetna and the Upper Susitna sampling areas each have 2 sampling sites (Figure 5). There were 60 sites sampled

within the Yenta sampling area (Figure 6). Of the 154 sites sampled, 86 resulted in nominations to update the AWC.

Habitat data was collected as a secondary objective in order to maintain consistency with ADF&G field efforts (Buckwalter 2009). Most streams sampled in 2009 were small (< 5 m wide) 1st order streams (Table 2). Most reaches were Rosgen type B or E channels, and observed substrates were predominantly gravel and cobble. As a consequence of fish presence defining the upper terminus of sample reaches, habitat complexity resulted in some sites having multiple Rosgen channel type assignments. Observed water temperatures ranged from 4.0 to 27.1°C.

Coho salmon and Dolly Varden were the most common salmonid species sampled in 2009 (Table 3). Juvenile coho salmon were captured in 87 of the 154 sample sites, and Dolly Varden were present in 35 of the 154 reaches. Total length was measured for all of the 440 coho salmon captured and ranged from 34 to 155 mm (Figure 7). Modal lengths were 60 and 100 mm categories, which likely corresponded to cohorts. Most coho salmon were likely age 0 and 1 fish based on length measurements, although ages were not determined from scales or otoliths. Fifty-four Chinook salmon were captured in total, and these ranged from 51 to 80 mm. Other species captured in 2009 included Alaska blackfish *Dallia pectoralis*, threespine stickleback, and sculpin. Electrical output necessary to achieve electrotaxis varied with conductivity, and minnow traps were allowed to soak for an average of 72 minutes (Table 2).

Table 1. Sampling dates and site locations in the Mat-Su basin, 2009. Latitude and longitude coordinates are in decimal degrees, NAD 83.

Date	Site	Latitude	Longitude	Watershed	Nomination
7/15/2009	C01	62.35641	-150.26068	Chulitna	Yes
7/15/2009	C02	62.62434	-150.24217	Chulitna	Yes
7/17/2009	C03	62.96759	-149.65140	Chulitna	No
7/17/2009	C04	63.04596	-149.56593	Chulitna	No
7/17/2009	C05	63.10254	-149.49271	Chulitna	No
8/1/2009	C06	62.53340	-150.70383	Chulitna	No
8/1/2009	C07	62.50506	-150.67789	Chulitna	Yes
8/1/2009	C08	62.47065	-150.65332	Chulitna	Yes
8/1/2009	C09	62.50345	-150.66771	Chulitna	Yes
8/4/2009	C10	62.69776	-150.33684	Chulitna	Yes
8/4/2009	C11	62.64627	-150.31520	Chulitna	Yes
8/4/2009	C12	62.63077	-150.55418	Chulitna	Yes
8/4/2009	C13	62.60336	-150.43626	Chulitna	Yes
8/4/2009	C14	62.45085	-150.28534	Chulitna	Yes
8/4/2009	C15	62.66724	-150.13959	Chulitna	Yes
8/4/2009	C16	62.56891	-150.56911	Chulitna	Yes
8/4/2009	C17	62.47514	-150.31413	Chulitna	Yes
8/5/2009	C18	62.54561	-150.18396	Chulitna	No
8/5/2009	C19	62.49424	-150.37360	Chulitna	Yes
8/12/2009	M01	61.77378	-147.96263	Matanuska	Yes
8/13/2009	M02	61.77409	-148.10620	Matanuska	No
8/13/2009	M03	61.78377	-148.15976	Matanuska	No
8/13/2009	M04	61.78809	-148.25916	Matanuska	No
8/13/2009	M05	61.78521	-148.32607	Matanuska	No
8/14/2009	M06	61.78521	-148.46706	Matanuska	No
8/12/2009	M07	61.74925	-147.93704	Matanuska	No
8/13/2009	M08	61.76409	-148.05948	Matanuska	No
8/13/2009	M09	61.78144	-148.20561	Matanuska	No
8/25/2009	M10	61.87994	-148.60942	Matanuska	No
8/26/2009	M11	61.68704	-148.92662	Matanuska	Yes
8/26/2009	M12	61.69752	-148.55878	Matanuska	No
8/26/2009	M13	61.65992	-148.96761	Matanuska	No
8/27/2009	M14	61.77250	-147.95169	Matanuska	Yes
8/27/2009	M15	61.77499	-147.78973	Matanuska	No
8/27/2009	M16	61.77387	-147.38617	Matanuska	No
8/26/2009	M17	61.81474	-148.59409	Matanuska	Yes
8/26/2009	M18	61.78910	-148.62355	Matanuska	Yes
8/26/2009	M19	61.80668	-148.37328	Matanuska	No
8/25/2009	M20	61.77478	-148.84044	Matanuska	Yes
8/25/2009	M21	61.83399	-148.82646	Matanuska	No
8/25/2009	M22	61.80280	-148.41592	Matanuska	Yes

Table 1. continued.

Date	Site	Latitude	Longitude	Watershed	Nomination
8/26/2009	M23	61.81298	-148.35559	Matanuska	No
8/25/2009	M24	61.76218	-148.40445	Matanuska	No
8/25/2009	M25	61.83363	-148.41516	Matanuska	No
8/25/2009	M26	61.84423	-148.26839	Matanuska	No
8/25/2009	M27	61.80270	-147.93770	Matanuska	No
6/23/2009	S01	61.51705	-149.60356	Susitna	No
6/23/2009	S02	61.51883	-149.60283	Susitna	No
6/29/2009	S03	61.49706	-149.76981	Susitna	Yes
6/30/2009	S04	61.48680	-149.91830	Susitna	Yes
7/6/2009	S05	61.58073	-149.77946	Susitna	Yes
7/7/2009	S06	61.60881	-149.61832	Susitna	No
7/7/2009	S07	61.60389	-149.63536	Susitna	No
7/8/2009	S08	61.33430	-149.59142	Susitna	No
7/8/2009	S09	61.57357	-149.50034	Susitna	Yes
7/9/2009	S10	61.61507	-149.58440	Susitna	No
7/9/2009	S11	61.60669	-149.59702	Susitna	No
7/9/2009	S12	61.60790	-149.59451	Susitna	No
7/13/2009	S13	62.32825	-150.29794	Susitna	Yes
7/13/2009	S14	62.32570	-150.29147	Susitna	No
7/13/2009	S15	62.32074	-150.29132	Susitna	No
7/14/2009	S16	62.30100	-150.04654	Susitna	No
7/14/2009	S17	62.30882	-150.03561	Susitna	Yes
7/16/2009	S18	62.16185	-150.07410	Susitna	No
7/16/2009	S19	62.00064	-149.95618	Susitna	No
7/16/2009	S20	62.00245	-149.96057	Susitna	No
7/16/2009	S21	61.99453	-149.96053	Susitna	No
7/16/2009	S22	61.97565	-149.96297	Susitna	No
7/20/2009	S23	62.26415	-150.16743	Susitna	Yes
7/20/2009	S24	62.32990	-150.23364	Susitna	Yes
7/20/2009	S25	62.24164	-150.25793	Susitna	No
7/21/2009	S26	62.31440	-150.30508	Susitna	Yes
7/21/2009	S27	62.23329	-150.30513	Susitna	Yes
7/21/2009	S28	62.29980	-150.23260	Susitna	Yes
7/22/2009	S29	62.35235	-150.50597	Susitna	Yes
7/22/2009	S30	62.33218	-150.60532	Susitna	Yes
7/24/2009	S31	62.37488	-150.62254	Susitna	Yes
7/24/2009	S32	62.39200	-150.61911	Susitna	Yes
7/25/2009	S33	62.32746	-150.54131	Susitna	Yes
8/1/2009	S34	62.37729	-150.49535	Susitna	Yes
8/1/2009	S35	62.45350	-150.63818	Susitna	No
8/1/2009	S36	62.44067	-150.59302	Susitna	No
8/2/2009	S37	62.36529	-150.35217	Susitna	Yes

Table 1. continued.

Date	Site	Latitude	Longitude	Watershed	Nomination
8/5/2009	S38	62.43389	-150.38219	Susitna	Yes
8/5/2009	S39	62.43967	-150.42653	Susitna	Yes
8/5/2009	S40	62.40450	-150.47856	Susitna	Yes
8/5/2009	S41	62.44860	-150.35928	Susitna	Yes
8/5/2009	S42	62.50190	-150.46567	Susitna	Yes
8/5/2009	S43	62.42072	-150.34610	Susitna	Yes
8/5/2009	S44	62.38721	-150.47949	Susitna	Yes
8/5/2009	T01	62.42124	-150.04208	Talkeetna	Yes
8/5/2009	T02	62.48130	-150.01819	Talkeetna	Yes
8/5/2009	U01	62.45836	-150.08363	Upper Susitna	Yes
8/5/2009	U02	62.43127	-150.17627	Upper Susitna	Yes
7/13/2009	Y01	62.39002	-150.72322	Yentna	No
7/13/2009	Y02	62.38363	-150.72424	Yentna	No
7/13/2009	Y03	62.36915	-150.71616	Yentna	No
7/14/2009	Y04	62.47696	-150.72472	Yentna	No
7/14/2009	Y05	62.47119	-150.72256	Yentna	No
7/23/2009	Y06	62.38854	-150.75554	Yentna	No
7/23/2009	Y07	62.44085	-150.73282	Yentna	Yes
7/24/2009	Y08	62.37674	-150.70605	Yentna	No
7/28/2009	Y09	62.40829	-150.70512	Yentna	Yes
7/28/2009	Y10	62.40894	-150.66635	Yentna	Yes
7/28/2009	Y11	62.40435	-150.69299	Yentna	Yes
7/29/2009	Y12	62.35246	-151.10599	Yentna	No
7/29/2009	Y13	62.34404	-151.04881	Yentna	Yes
7/29/2009	Y14	62.35736	-151.11900	Yentna	Yes
7/29/2009	Y15	62.42089	-151.08926	Yentna	No
7/29/2009	Y16	62.34604	-151.07211	Yentna	No
7/30/2009	Y17	62.27878	-151.39334	Yentna	Yes
7/30/2009	Y18	62.30011	-151.24197	Yentna	No
7/30/2009	Y19	62.27586	-151.12781	Yentna	Yes
7/30/2009	Y20	62.45608	-151.13634	Yentna	Yes
7/30/2009	Y21	62.42766	-151.08801	Yentna	Yes
7/30/2009	Y22	62.29366	-151.39048	Yentna	Yes
7/30/2009	Y23	62.28766	-151.24478	Yentna	Yes
7/30/2009	Y24	62.29369	-151.38623	Yentna	No
7/31/2009	Y25	62.12252	-151.01105	Yentna	No
7/31/2009	Y26	62.06063	-151.03828	Yentna	No
7/31/2009	Y27	62.07612	-151.15401	Yentna	No
7/31/2009	Y28	62.09670	-151.16069	Yentna	Yes
7/31/2009	Y29	62.16120	-151.21526	Yentna	Yes
7/31/2009	Y30	62.12602	-151.05057	Yentna	No
7/31/2009	Y31	62.07187	-151.15843	Yentna	No

Table 1. continued.

Date	Site	Latitude	Longitude	Watershed	Nomination
7/31/2009	Y32	62.10526	-151.12836	Yentna	No
7/31/2009	Y33	62.13199	-151.18488	Yentna	Yes
7/31/2009	Y34	62.13122	-151.18039	Yentna	No
8/1/2009	Y35	62.40609	-150.67374	Yentna	Yes
8/1/2009	Y36	62.56286	-150.79526	Yentna	Yes
8/1/2009	Y37	62.46727	-150.69339	Yentna	No
8/2/2009	Y38	62.42101	-151.51399	Yentna	No
8/2/2009	Y39	62.33534	-151.46873	Yentna	Yes
8/2/2009	Y40	62.36020	-151.44070	Yentna	Yes
8/2/2009	Y41	62.36010	-151.41516	Yentna	Yes
8/2/2009	Y42	62.37456	-151.36798	Yentna	Yes
8/2/2009	Y43	62.41722	-151.56720	Yentna	No
8/2/2009	Y44	62.42599	-151.65977	Yentna	Yes
8/2/2009	Y45	62.39140	-151.51042	Yentna	Yes
8/2/2009	Y46	62.38371	-151.52312	Yentna	Yes
8/2/2009	Y47	62.35190	-151.43410	Yentna	No
8/2/2009	Y48	62.42359	-151.38026	Yentna	No
8/2/2009	Y49	62.36318	-151.33139	Yentna	Yes
8/3/2009	Y50	62.34743	-151.50024	Yentna	Yes
8/3/2009	Y51	62.38956	-151.58417	Yentna	Yes
8/3/2009	Y52	62.26062	-150.88271	Yentna	Yes
8/3/2009	Y53	62.35973	-150.84665	Yentna	Yes
8/3/2009	Y54	62.33261	-151.37852	Yentna	Yes
8/3/2009	Y55	62.34070	-151.38498	Yentna	Yes
8/3/2009	Y56	62.34404	-151.37784	Yentna	Yes
8/3/2009	Y57	62.24428	-150.87347	Yentna	Yes
8/3/2009	Y58	62.37740	-150.90520	Yentna	Yes
8/6/2009	Y59	62.47278	-150.72141	Yentna	Yes
8/6/2009	Y60	62.41075	-150.75339	Yentna	Yes

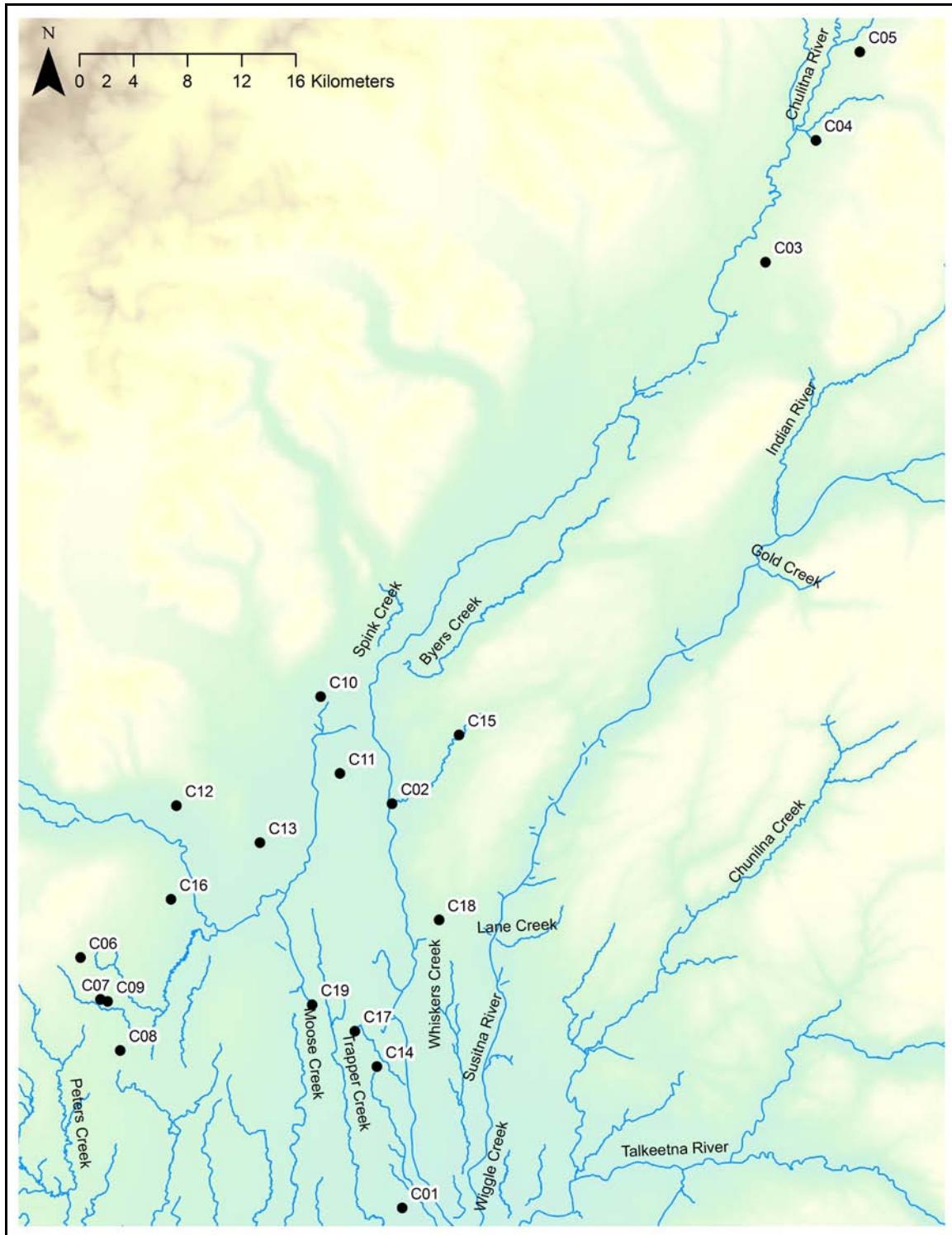


Figure 2. Sampling sites within the Chulitna watershed, 2009.

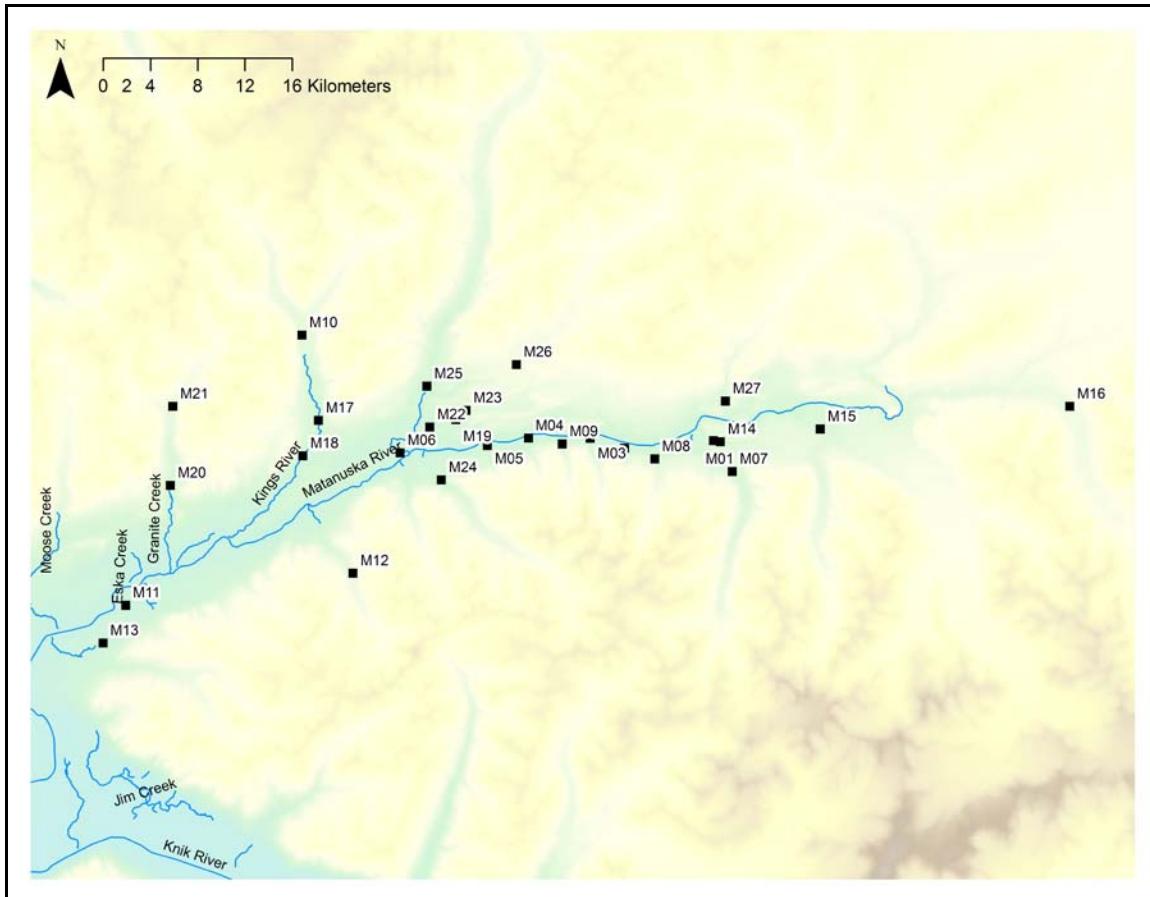


Figure 3. Sampling sites within the Matanuska watershed, 2009.

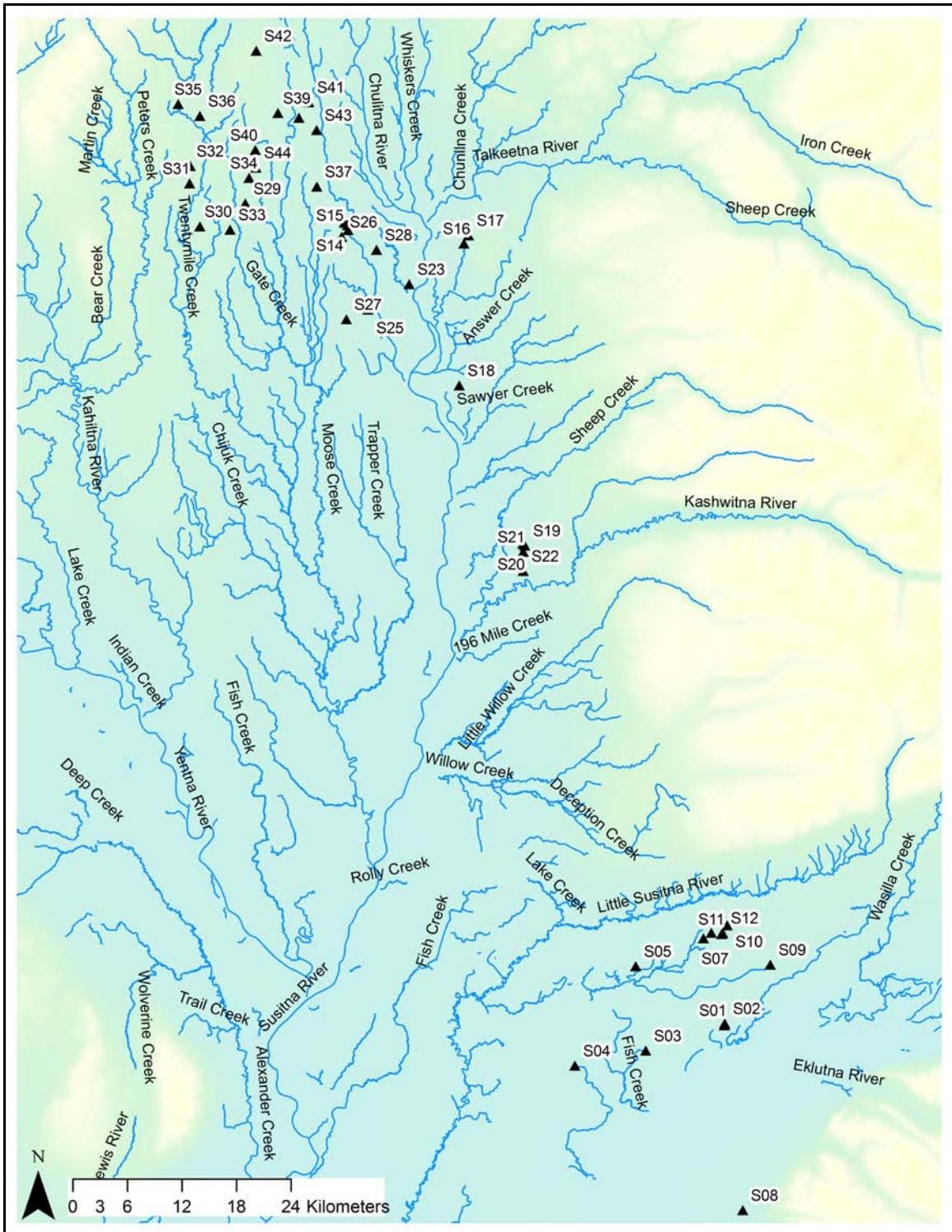


Figure 4. Sampling sites within the Susitna watershed, 2009.

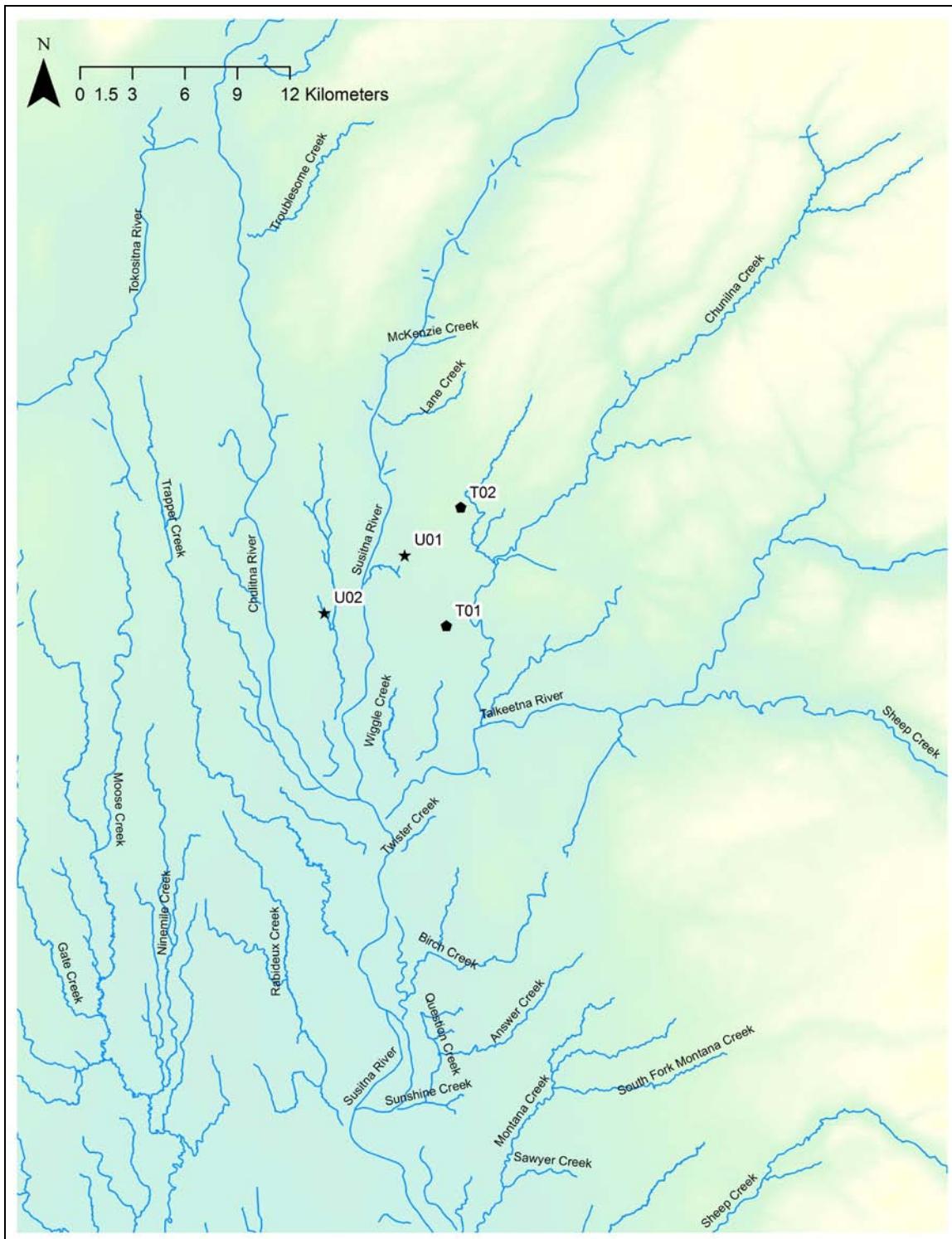


Figure 5. Sampling sites within the Talkeetna and Upper Susitna watersheds, 2009.

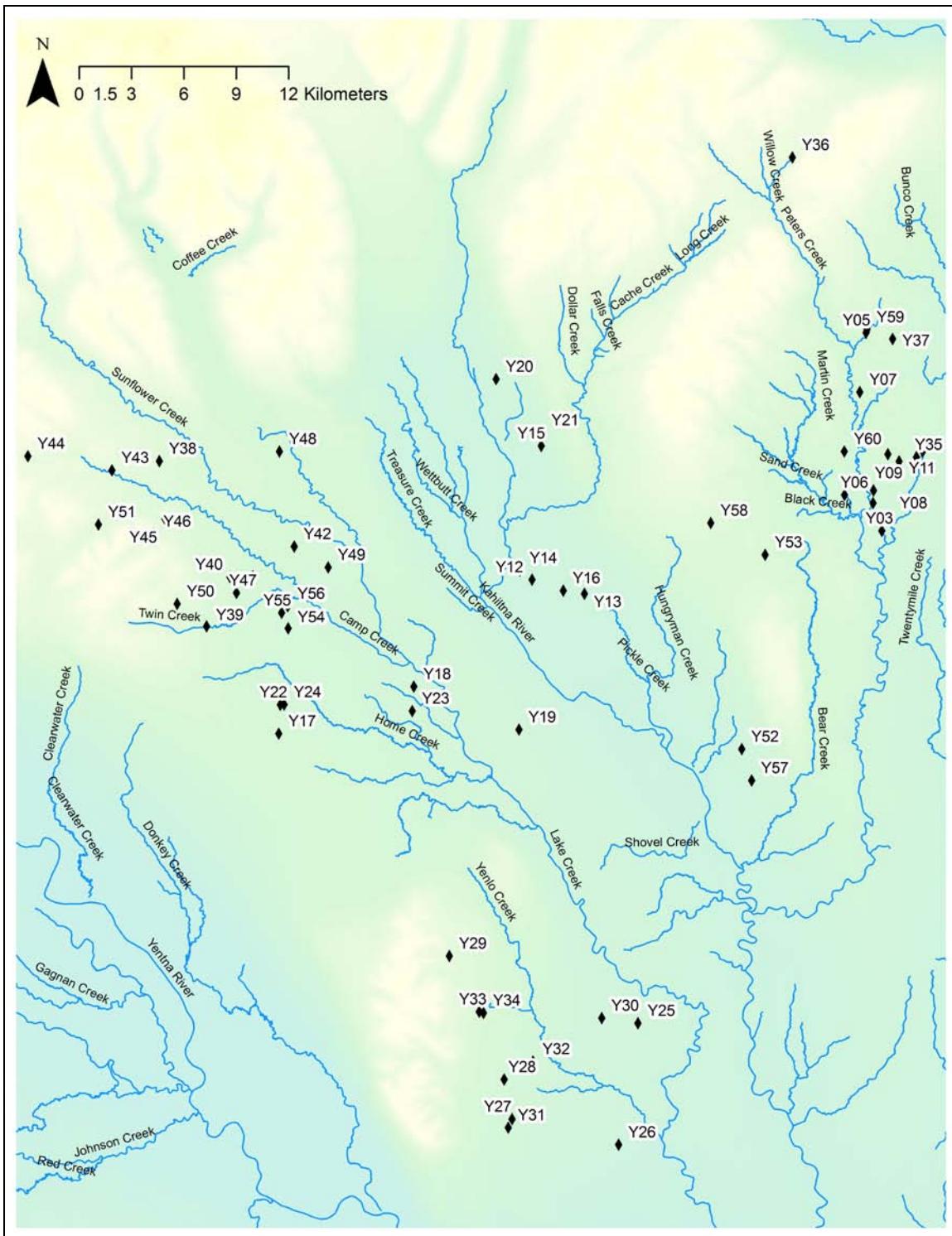


Figure 6. Sampling sites within the Yentna watershed, 2009.

Table 2. Summary of physical habitat parameters, water chemistry, and fishing effort by stream ID for streams in the Mat-Su basin, 2009. Voltage output necessary to achieve taxis and average minnow trap soak times recorded. “--” denotes no data. *Nominated sites.

Site	Reach length (m)	Wetted width (m)	Rosgen channel type	Gradient (%)	Temp (°C)	Conductivity ($\mu\text{mho}/\text{cm}$)	pH	Volts (V)	Soak time (min)
C01*	150	1.8	B4	2	22.1	59.10	6.91	375	--
C02*	--	--	B3	--	6.9	25.70	--	285	--
C03	150	2.9	C4	3.5	10.2	32.90	2.17	--	238
C04	150	2.8	A3	6.5	10.7	41.30	7.20	400	--
C05	150	2.7	E6	<1	18.2	93.40	9.65	350	--
C06	300	1.5	B4, E4	9, 3	11.5	25.7	6.61	750	--
C07*	150	3.4	B4	2	12.8	19.7	6.88	750	--
C08*	150	2.5	E4	2	11.6	15.3	6.55	--	39
C09*	150	0.8	E6, B3	≤5	12.6	26.00	6.31	420	--
C10*	150	2.4	Lake, E6	<1	17.6	24.2	--	--	37
C11*	150	3.2	E6	<1	12.0	46.5	--	--	37
C12*	150	1.2	E4	2	7.9	28.1	--	--	11
C13*	150	3.4	E6	<1	17.7	30.6	--	--	55
C14*	150	2.4	E6	1	16.4	34.2	--	--	30
C15*	250	5.0	B3	≥4	12.4	23.70	6.39	950	--
C16*	150	1.1	E3, B3	1, 3	13.2	40.40	6.36	--	--
C17*	150	3.7	E3	<1	15.7	35.60	5.73	800	--
C18	150	1.9	B3	2	17.8	21.3	--	--	30
C19*	150	5.0	E4	<1	17.3	--	--	--	11
M01*	202	5.1	B4	4	11.1	260.40	--	NR	--
M02	150	2.3	D5	4	4.5	210.40	--	NR	--
M03	150	3.9	A3	8	5.1	292.50	--	NR	--
M04	150	2.7	A3	13	9.1	203.70	--	NR	--
M05	150	2.5	A2	24	9.1	480.00	--	NR	--
M06	300	10.5	B3	5	6.0	115.30	--	NR	--
M07	150	1.5 - 12	Da4	2	4.0	195.20	--	NR	--
M08	250	5 - 12	A3, B3a	8, 10	4.3	206.70	--	NR	--
M09	160	4.0	A2a+	9, 12	5.2	227.60	--	NR	--
M10	300	8.7	B3	1.5	5.2	119.30	--	300	--
M11*	150	1.5	E4	1.5	10.7	154.70	--	250	--
M12	150	2.0	B3	3.5	3.30	102.6	--	250	--
M13	150	1.5	E6	<1	10.0	132.20	--	200	--
M14*	150	2.2	B4, Beaver ponds	4	10.3	234.00	--	250	--
M15	300	10.0		1.5	9.6	352.50	--	200	--
M16	150	3.1	D3	1	7.3	254.50	--	250	--
M17*	288.4	7.2	B3	<1	--	--	--	300	--
M18*	300	40.5	B3	2	6.4	111.50	--	300	--
M19	150	2.2	E6	<1	10.6	191.20	--	300	--
M20*	150	3.5	D3	6	6.9	89.90	--	280	--
M21	196	4.9	B2	4	4.9	84.10	--	260	--
M22*	150	1.9	E4	<1	10.8	196.20	--	290	--
M23	150	1.3	E6	--	11.9	186.00	--	300	--
M24	202	5.1	B3	6.5	6.8	213.60	--	290	--

Table 2. continued.

Site	Reach length (m)	Wetted width (m)	Channel type	Gradient (%)	Temp (°C)	Conductivity ($\mu\text{mho}/\text{cm}$)	pH	Volts (V)	Soak time (min)
M25	300	8.0	B3	2	6.4	116.40	--	--	--
M26	300	8.0	D3	<1	10.0	264.00	--	250	--
M27	300	8.2	B3	2.5	8.3	359.50	--	200	--
S01	150	2.3	E6	--	7.9	252.00	--	220	--
S02	150	1.9	E4, E5	--	--	--	--	220	--
S03*	248	6.2	Lake, E6	<1	22.3	122.50	7.83	200	--
S04*	150	2.7	Lake, E6	<1	20.7	112.50	9.12	200	150
S05*	150	1.6	Wetland, E6	<1	13.4	87.90	6.59	250	--
S06	150	1.0	Wetland, E6	3	14.1	111.20	7.13	250	--
S07	300	11.9	Wetland, E6	1.5	19.8	77.20	6.35	300	80
S08	--	--	Lake	--	24.2	66.80	7.05	--	65
S09*	160	3.7	C4	--	25.4	238.00	8.15	260	--
S10	150	1.4	B4	1.5	18.2	83.80	7.81	250	--
S11	--	--	Lake	--	24.8	112.60	8.06	--	90
S12	150	0.9	E6	1.5	15.0	108.20	8.24	385	--
S13*	--	--	E6, Lake	1	23.2	13.70	5.91	--	100
S14	--	--	Lake	--	27.1	12.50	6.23	--	140
S15	204.8	5.1	E3, E6, Pond	0.5	26.4	17.80	5.95	--	23
S16	150	1.6	E5	0.5	12.9	30.80	7.15	285	--
S17*	150	1.0	B4, B3, A3	12	12.1	30.80	7.02	285	--
S18	300	8.0	C6	1	21.1	30.00	6.49	--	60
S19	150	2.4	Lake	<1	22.3	42.30	7.27	355	--
S20	--	--	Lake	--	--	--	--	--	86
S21	--	--	Lake	--	23.4	28.20	7.25	--	45
S22	--	--	E6, Lake	--	22.6	53.00	--	--	21
S23*	150	3.3	A3	8	7.0	90.40	7.58	420	--
S24*	150	4.1	E6	0	14.8	33.20	6.21	440	--
S25	150	2.5	B3	4	16.1	38.30	6.88	250	60
S26*	150	1.5	E3	1	10.4	37.10	7.16	420	--
S27*	150	1.4	B6, Lake	0	16.7	13.70	6.35	510	120
S28*	150	1.8	D3, E6	1.5	9.6	75.20	5.25	420	--
S29*	150	2.0	E6, E4	2	14.5	37.10	6.37	575	247
S30*	150	1.6	E3, E6	<1	14.2	9.84	7.45	--	159
S31*	150	1.7	E3, B3	<1	12.9	37.10	6.98	480	--
S32*	150	1.8	E2	<1	13.5	97.70	6.89	800	--
S33*	--	--	Lake, E6	--	18.4	35.30	6.43	--	--
S34*	150	1.0	B4	3	10.3	35.6	6.97	400	--
S35	150	2.8	Lake, E3	<1	13.8	40.50	6.29	470	--
S36	150	2.8	E6	<1	12.3	57.00	6.24	550	--
S37*	150	0.9	E6	2	12.5	36.0	6.36	--	25
S38*	150	1.5	E6	<1	12.2	--	--	--	12
S39*	150	4.2	B3	3	13.3	--	--	--	14
S40*	150	1.8	E6	<1	13.0	--	--	--	10
S41*	150	1.2	E6	<1	14.9	--	--	--	15
S42*	196.4	4.9	B3	5	12.1	48.10	6.58	745	--
S43*	150	0.8	E6	<1	10.8	47.50	6.48	745	--
S44*	150	1.2	E4, B3	≤3	7.7	38.70	6.41	745	--

Table 2. continued.

Site	Reach length (m)	Wetted width (m)	Channel type	Gradient (%)	Temp (°C)	Conductivity ($\mu\text{mho}/\text{cm}$)	pH	Volts (V)	Soak time (min)
T01*	150	6.0	E6	<1	12.5	67.1	--	--	15
T02*	150	3.2	E3	<1	14.1	59.20	6.57	640	--
U01*	150	3.1	E3	<1	15.7	43.70	6.49	745	--
U02*	150	2.4	E3	<1	9.7	26.40	5.39	745	--
Y01	150	1.6	E3, E4	0.5	14.4, 23.3	13.50	6.59	250	--
Y02	--	--	--	≥9.5	--	--	--	250	--
Y03	--	--	--	--	--	--	--	--	30
Y04	150	1.0	A3	2	12.7	16.20	6.98	250	60
Y05	150	2.3	B4	6	20.7	15.10	6.59	260	32
Y06	150	1.1	E2, B2, E3	1, 5	13.8	35.30	8.68	--	230
Y07*	150	1.9	Beaver pond, E6	<1	12.7	15.50	9.66	--	20
Y08	150	0.9	B6, E6	2.5	15.6	60.90	6.45	--	47
Y09*	150	1.0	B3	6	13.2	7.50	6.18	--	360
Y10*	150	2.5	E5	1	15.3	53.20	6.44	520	118
Y11*	150	1.5	B3	0.5	13.2	20.40	6.44	500	--
Y12	--	--	E6, Wetlands	--	--	--	--	600	150
Y13*	150	3.5	E6	<1	10.4	31.30	6.30	600	56
Y14*	300	20.0	D5	<1	9.3	59.20	7.03	550	--
Y15	150	3.0	E3	<1	9.5	23.80	6.08	--	--
Y16	150	3.1	E6	<1	14.0	38.90	5.71	--	180
Y17*	150	1.4	B4	1.5	12.9	14.90	6.67	700	--
Y18	150	2.7	E6	3	15.4	19.60	5.77	700	--
Y19*	150	2.2	B3	2	13.6	23.70	6.58	700	25
Y20*	150	1.8	A2, B2	12	10.8	18.60	6.91	800	--
Y21*	150	2.2	E4	<1	8.7	21.37	5.83	900	--
Y22*	--	--	Beaver pond, E3	<1	13.4	23.60	5.91	900	--
Y23*	--	--	E6	--	12.7	19.28	4.80	990	--
Y24	150	1.3	E3	2	11.3	18.91	6.06	400	--
Y25	150	1.7	E6	<1	13.5	13.50	6.55	650	40
Y26	150	2.3	B4	0.1	10.8	21.00	6.74	650	--
Y27	150	3.2	E4	0.1	14.0	4.26	7.20	600	49
Y28*	150	2.7	E4	2	11.9	28.9	6.82	700	10
Y29*	150	1.9	E4	6	11.1	99.0	7.20	650	--
Y30	164.8	4.1	Lake, E6	<1	15.9	12.31	5.83	990	68
Y31	150	3.3	E4, C4	1	14.5	66.50	6.80	520	--
Y32	150	2.1	E4	<1	13.8	23.40	6.29	800	--
Y33*	150	3.0	B4	3	9.5	60.60	7.49	500	--
Y34	150	2.2	E4, B3	2.5	12.6	38.50	6.51	500	--
Y35*	150	1.8	B2, B3	2	11.9	33.8	6.52	650	--
Y36*	150	3.2	E3	1	9.3	64.40	6.82	420	--
Y37	150	1.5	E4	<1	13.8	15.71	6.11	800	60
Y38	150	--	E6	--	--	--	--	--	20
Y39*	150	2.8	B3, B4	6	10.6	8.3	6.70	650	--
Y40*	150	2.4	E4	<1	14.1	16.6	6.45	--	28
Y41*	150	0.8	E4	<1	15.5	4.8	5.57	700	16
Y42*	150	1.9	B4	1	13.9	6.3	6.39	--	9
Y43	300	7.7	C3	1.5	7.9	37.00	7.26	450	--
Y44*	248.4	6.2	B3, A3	3	9.2	52.10	6.69	475	--

Table 2. continued.

Site	Reach length (m)	Wetted width (m)	Channel type	Gradient (%)	Temp (°C)	Conductivity (μmho/cm)	pH	Volts (V)	Soak time (min)	
Y45*	150	1.4	E4	<1	13.1	21.87	6.52	650	--	
Y46*	--	--	B3	2.5	8.1	28.50	6.24	650	--	
Y47	150	1.5	E4	<1	11.9	11.96	5.50	650	--	
Y48	150	2.9	E6	<1	19.3	11.39	4.67	--	35	
Y49*	150	2.2	E4	<1	14.9	34.00	6.27	800	--	
Y50*	150	2.9	B3	4	8.0	5.9	6.81	400	--	
Y51*	150	4.3	B4	<1	8.0	28.6	6.96	400	--	
Y52*	150	0.8	E6, E4	<1	9.5	35.6	6.93	450	--	
Y53*	150	1.8	E6, E3	2	15.7	22.0	6.04	450	78	
Y54*	150	1.9	E4	<1	10.6	18.49	6.17	660	--	
Y55*	150	2.5	E4, Beaver pond, DA4		<1	12.7	18.27	5.43	660	--
Y56*	150	1.3	E4	<1	9.1	22.40	5.12	695	--	
Y57*	150	1.2	E4, E6	<1	14.9	40.00	5.67	650	--	
Y58*	150	1.1	B2	1	12.7	17.38	5.27	650	--	
Y59*	150	2.6	B4	<1	11.8	--	--	--	25	
Y60*	150	1.8	E4	<1	13.9	12.21	5.55	900	--	

Table 3. Summary of total number of fish captured and range of total fish length (mm) in the Mat-Su basin, 2009. “--” denotes no data. *Nominated sites.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Stickleback	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
<i>Chulitna Sampling Area</i>														
C01*	Count	2	3	--	2	--	10	--	--	--	--	7	--	--
	Min. Length	54	--	--	107	--	--	--	--	--	--	--	--	--
	Max. Length	144	--	--	107	--	--	--	--	--	--	--	--	--
C02*	Count	--	--	--	3	--	--	--	--	--	--	--	1	--
	Min. Length	--	--	--	34	--	--	--	--	--	--	--	35	--
	Max. Length	--	--	--	38	--	--	--	--	--	--	--	35	--
C03	Count	--	--	--	--	--	--	--	--	--	--	6	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
C04	Count	1	--	--	--	--	--	--	--	--	--	--	--	--
	Min. Length	160	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	160	--	--	--	--	--	--	--	--	--	--	--	--
C05	Count	--	--	--	--	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	147	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	176	--	--	--	--	--	--	--	--
C06	Count	--	--	--	--	--	--	--	--	--	--	18	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
C07*	Count	--	--	1	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	59	48	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	59	63	--	--	--	--	--	--	--	--	--
C08*	Count	--	--	--	13	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	82	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	111	--	--	--	--	--	--	--	--	--
C09*	Count	--	--	--	3	1	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	69	165	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	105	165	--	--	--	--	--	--	--	--
C10*	Count	--	--	--	36	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	46	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	129	--	--	--	--	--	--	--	--	--
C11*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	112	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	115	--	--	--	--	--	--	--	--	--
C12*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	43	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	102	--	--	--	--	--	--	--	--	--
C13*	Count	--	--	--	2	--	--	--	--	--	--	--	30	--
	Min. Length	--	--	--	106	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	127	--	--	--	--	--	--	--	--	--
C14*	Count	--	--	--	12	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	49	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	109	--	--	--	--	--	--	--	--	--
C15*	Count	--	--	2	8	3	--	--	--	--	3	6	--	--
	Min. Length	--	--	53	39	49	--	--	--	--	103	--	--	--
	Max. Length	--	--	66	56	110	--	--	--	--	181	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
C16*	Count	--	--	--	6	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	39	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	56	--	--	--	--	--	--	--	--	--
C17*	Count	--	--	--	10	--	--	--	--	--	1	--	--	--
	Min. Length	--	--	--	46	--	--	--	--	--	115	--	--	--
	Max. Length	--	--	--	125	--	--	--	--	--	115	--	--	--
C18	Count	--	--	--	--	--	--	--	18	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
C19*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	71	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
<i>Matanuska Sampling Area</i>														
M01*	Count	--	--	--	2	1	--	--	--	--	7	11	--	--
	Min. Length	--	--	--	52	100	--	--	--	--	30	--	--	--
	Max. Length	--	--	--	62	100	--	--	--	--	107	--	--	--
M02	Count	--	--	--	--	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	186	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	223	--	--	--	--	--	--	--	--
M03	Count	--	--	--	--	--	--	--	--	--	--	2	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
M04	Count	--	--	--	--	1	--	--	--	--	--	1	--	--
	Min. Length	--	--	--	--	187	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	187	--	--	--	--	--	--	--	--
M05	Count	--	--	--	--	3	--	--	--	--	2	--	--	--
	Min. Length	--	--	--	--	164	--	--	--	--	106	--	--	--
	Max. Length	--	--	--	--	216	--	--	--	--	200	--	--	--
M06	Count	--	--	--	--	5	--	--	--	--	4	--	--	--
	Min. Length	--	--	--	--	85	--	--	--	--	107	--	--	--
	Max. Length	--	--	--	--	145	--	--	--	--	200	--	--	--
M07	Count	--	--	--	--	4	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	70	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	205	--	--	--	--	--	--	--	--
M08	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
M09	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
M10	Count	--	--	--	--	7	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	50	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	146	--	--	--	--	--	--	--	--
M11*	Count	--	--	6	1	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	45	150	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	70	150	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
M12	Count	--	--	--	--	19	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	36	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	230	--	--	--	--	--	--	--	--
M13	Count	--	--	--	--	4	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	140	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	219	--	--	--	--	--	--	--	--
M14*	Count	--	--	--	--	1	1	--	--	--	6	4	--	--
	Min. Length	--	--	--	--	112	115	--	--	--	107	--	--	--
	Max. Length	--	--	--	--	112	115	--	--	--	205	--	--	--
M15	Count	1	--	--	--	8	--	--	--	--	--	--	--	--
	Min. Length	225	--	--	--	97	--	--	--	--	--	--	--	--
	Max. Length	225	--	--	--	190	--	--	--	--	--	--	--	--
M16	Count	1	--	--	--	15	--	--	--	--	1	--	--	--
	Min. Length	105	--	--	--	53	--	--	--	--	93	--	--	--
	Max. Length	105	--	--	--	142	--	--	--	--	93	--	--	--
M17*	Count	--	--	15	--	4	--	--	--	--	--	--	--	--
	Min. Length	--	--	51	--	45	--	--	--	--	--	--	--	--
	Max. Length	--	--	71	--	108	--	--	--	--	--	--	--	--
M18*	Count	--	--	14	--	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	60	--	191	--	--	--	--	--	--	--	--
	Max. Length	--	--	75	--	211	--	--	--	--	--	--	--	--
M19	Count	--	--	--	--	--	--	--	--	--	16	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	41	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	137	--	--	--
M20*	Count	--	--	10	--	7	--	--	--	--	--	--	--	--
	Min. Length	--	--	57	--	82	--	--	--	--	--	--	--	--
	Max. Length	--	--	69	--	189	--	--	--	--	--	--	--	--
M21	Count	--	--	--	--	15	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	41	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	229	--	--	--	--	--	--	--	--
M22*	Count	--	--	--	--	17	--	--	--	--	6	11	--	--
	Min. Length	--	--	--	--	41	--	--	--	--	92	--	--	--
	Max. Length	--	--	--	--	63	--	--	--	--	168	--	--	--
M23	Count	--	--	--	--	--	--	--	--	--	17	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	31	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	116	--	--	--
M24	Count	--	--	--	--	3	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	76	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	98	--	--	--	--	--	--	--	--
M25	Count	--	--	--	--	7	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	78	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	125	--	--	--	--	--	--	--	--
M26	Count	--	--	--	--	--	--	--	--	--	7	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	30	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	223	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
M27	Count	1	--	--	--	8	--	--	--	--	--	11	--	2
	Min. Length	160	--	--	--	138	--	--	--	--	--	--	--	--
	Max. Length	160	--	--	--	198	--	--	--	--	--	--	--	--
<i>Susitna Sampling Area</i>														
S01	Count	--	--	--	--	7	--	--	--	--	--	2	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S02	Count	--	--	--	--	4	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S03*	Count	--	--	--	4	--	--	--	--	--	--	--	--	68
	Min. Length	--	--	--	88	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	96	--	--	--	--	--	--	--	--	--
S04*	Count	--	--	--	3	--	--	1	1	--	1	--	--	352
	Min. Length	--	--	--	99	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	112	--	--	--	--	--	--	--	--	--
S05*	Count	--	--	--	5	--	--	--	--	--	--	--	--	1
	Min. Length	--	--	--	53	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	67	--	--	--	--	--	--	--	--	--
S06	Count	--	--	--	--	--	--	--	--	--	--	--	--	8
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S07	Count	--	--	--	--	--	--	4	--	--	--	--	--	11
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S09*	Count	--	--	--	2	--	--	3	--	1	--	--	--	16
	Min. Length	--	--	--	79	--	--	--	--	209	--	--	--	--
	Max. Length	--	--	--	92	--	--	--	--	209	--	--	--	--
S10	Count	--	--	--	--	--	--	--	--	--	6	--	--	11
	Min. Length	--	--	--	--	--	--	--	--	--	30	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	94	--	--	--
S11	Count	--	--	--	--	--	--	34	--	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S12	Count	--	--	--	--	--	--	--	--	--	1	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	30	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	30	--	--	--
S13*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	121	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	126	--	--	--	--	--	--	--	--	--
S14	Count	--	--	--	--	--	--	--	--	--	0	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S15	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	108	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	110	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
S16	Count	--	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	64	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	72	--	--	--	--	--	--	--	--	--
S17*	Count	--	--	--	3	--	--	--	--	--	6	2	--	--
	Min. Length	--	--	--	67	--	--	--	--	--	78	--	--	--
	Max. Length	--	--	--	87	--	--	--	--	--	150	--	--	--
S18	Count	--	--	--	--	--	--	--	--	--	--	--	--	140
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S19	Count	--	--	--	--	--	--	--	--	4	--	--	--	1
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S20	Count	--	--	--	--	--	--	--	3	--	--	--	--	31
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S21	Count	--	--	--	--	--	--	--	--	--	--	--	--	133
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S22	Count	--	--	--	--	--	--	--	--	--	--	--	--	31
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S23*	Count	--	1	--	1	--	--	--	--	--	--	--	2	2
	Min. Length	--	--	--	139	--	--	--	--	--	--	--	79	--
	Max. Length	--	--	--	139	--	--	--	--	--	--	--	81	--
S24*	Count	--	--	--	7	--	--	--	1	--	--	--	--	11
	Min. Length	--	--	--	48	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	91	--	--	--	--	--	--	--	--	--
S25	Count	--	--	--	10	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	53	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	96	--	--	--	--	--	--	--	--	--
S26*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	47	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	97	--	--	--	--	--	--	--	--	--
S27*	Count	--	--	--	11	--	--	--	1	--	--	2	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	107	--	--	--	--	--	--	--	--	--
S28*	Count	--	--	--	8	--	--	--	2	--	--	--	--	15
	Min. Length	--	--	--	61	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	112	--	--	--	--	--	--	--	--	--
S29*	Count	--	--	--	6	--	--	--	--	--	--	1	--	--
	Min. Length	--	--	--	53	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	116	--	--	--	--	--	--	--	--	--
S30*	Count	--	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	120	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	125	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
S31*	Count	--	--	--	3	--	--	--	--	--	1	1	--	--
	Min. Length	--	--	--	50	--	--	--	--	--	33	--	--	--
	Max. Length	--	--	--	52	--	--	--	--	--	33	--	--	--
S32*	Count	--	--	--	6	--	--	1	--	--	--	2	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	110	--	--	--	--	--	--	--	--	--
S33*	Count	--	--	--	3	--	--	--	--	--	--	--	--	20
	Min. Length	--	--	--	99	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	106	--	--	--	--	--	--	--	--	--
S34*	Count	--	--	--	2	--	--	--	--	--	1	--	--	--
	Min. Length	--	--	--	78	--	--	--	--	--	87	--	--	--
	Max. Length	--	--	--	79	--	--	--	--	--	87	--	--	--
S35	Count	--	3	--	--	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S36	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
S37*	Count	--	--	--	6	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	81	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	116	--	--	--	--	--	--	--	--	--
S38*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
S39*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	96	--	--	--	--	--	--	--	--	--
S40*	Count	--	--	--	7	--	--	--	--	--	--	1	--	--
	Min. Length	--	--	--	74	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
S41*	Count	--	--	--	7	--	--	--	--	--	--	--	--	5
	Min. Length	--	--	--	92	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	125	--	--	--	--	--	--	--	--	--
S42*	Count	--	--	--	6	--	--	--	--	--	3	15	--	--
	Min. Length	--	--	--	52	--	--	--	--	--	82	--	--	--
	Max. Length	--	--	--	108	--	--	--	--	--	138	--	--	--
S43*	Count	--	--	--	2	--	--	--	--	--	--	3	--	--
	Min. Length	--	--	--	56	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	57	--	--	--	--	--	--	--	--	--
S44*	Count	--	--	--	5	--	--	--	--	--	31	--	--	--
	Min. Length	--	--	--	41	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	111	--	--	--	--	--	--	--	--	--
<i>Talkeetna Sampling Area</i>														
T01*	Count	--	--	2	--	--	--	--	--	--	1	--	16	
	Min. Length	--	--	102	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	119	--	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
T02*	Count	--	--	1	4	--	--	--	--	--	3	--	--	--
	Min. Length	--	--	80	105	--	--	--	--	--	44	--	--	--
	Max. Length	--	--	80	112	--	--	--	--	--	101	--	--	--
<i>Upper Susitna Sampling Area</i>														
U01*	Count	--	--	--	5	--	--	--	--	--	1	--	--	--
	Min. Length	--	--	--	91	--	--	--	--	--	157	--	--	--
	Max. Length	--	--	--	104	--	--	--	--	--	157	--	--	--
U02*	Count	--	--	--	15	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	99	--	--	--	--	--	--	--	--	--
<i>Yentna Sampling Area</i>														
Y01	Count	--	--	--	--	--	--	--	--	--	--	2	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y02	Count	--	--	--	--	--	--	--	--	--	0	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y03	Count	--	--	--	--	--	--	--	--	--	0	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y04	Count	--	--	--	--	--	--	--	--	--	--	1	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y05	Count	--	--	--	15	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	85	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	114	--	--	--	--	--	--	--	--	--
Y06	Count	--	--	--	--	--	--	--	--	--	--	11	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y07*	Count	--	--	--	15	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	78	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	101	--	--	--	--	--	--	--	--	--
Y08	Count	--	--	--	--	--	--	--	--	--	0	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y09*	Count	--	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	70	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	92	--	--	--	--	--	--	--	--	--
Y10*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	109	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	155	--	--	--	--	--	--	--	--	--
Y11*	Count	--	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	86	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	104	--	--	--	--	--	--	--	--	--
Y12	Count	--	--	--	--	--	--	--	--	--	0	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
Y13*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	90	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	124	--	--	--	--	--	--	--	--	--
Y14*	Count	--	--	1	1	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	52	53	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	52	53	--	--	--	--	--	--	--	--	--
Y15	Count	--	--	--	7	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	40	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	45	--	--	--	--	--	--	--	--	--
Y16	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y17*	Count	--	--	--	3	--	--	--	--	--	--	6	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	57	--	--	--	--	--	--	--	--	--
Y18	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y19*	Count	--	--	--	7	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	81	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	110	--	--	--	--	--	--	--	--	--
Y20*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	55	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	65	--	--	--	--	--	--	--	--	--
Y21*	Count	--	--	--	3	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	77	74	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	87	86	--	--	--	--	--	--	--	--
Y22*	Count	--	--	--	7	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	90	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	102	--	--	--	--	--	--	--	--	--
Y23*	Count	--	--	--	1	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	81	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	81	--	--	--	--	--	--	--	--	--
Y24	Count	--	--	--	--	--	--	--	--	--	--	9	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y25	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y26	Count	--	--	--	--	6	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	53	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	119	--	--	--	--	--	--	--	--
Y27	Count	--	--	--	--	6	--	--	--	--	2	54	--	--
	Min. Length	--	--	--	--	49	--	--	--	--	40	--	--	--
	Max. Length	--	--	--	--	137	--	--	--	--	148	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
Y28*	Count	--	--	--	10	--	--	--	--	--	--	--	7	--
	Min. Length	--	--	--	44	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
Y29*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	61	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	75	--	--	--	--	--	--	--	--	--
Y30	Count	1	--	--	--	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y31	Count	--	--	--	--	--	--	6	--	--	--	--	--	--
	Min. Length	--	--	--	--	--	--	66	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	131	--	--	--	--	--	--
Y32	Count	--	--	--	--	--	--	--	--	--	--	--	2	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y33*	Count	--	--	--	4	11	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	47	65	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	51	161	--	--	--	--	--	--	--	--
Y34	Count	--	--	--	--	--	--	--	--	--	--	--	12	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y35*	Count	--	--	--	7	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	75	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	105	--	--	--	--	--	--	--	--	--
Y36*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	52	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	66	--	--	--	--	--	--	--	--	--
Y37	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y38	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y39*	Count	--	--	--	6	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	39	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	46	--	--	--	--	--	--	--	--	--
Y40*	Count	--	--	--	3	--	--	--	--	--	--	--	21	--
	Min. Length	--	--	--	97	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	119	--	--	--	--	--	--	--	--	--
Y41*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	53	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	110	--	--	--	--	--	--	--	--	--
Y42*	Count	--	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	67	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	118	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
Y43	Count	--	--	4	1	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	52	37	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	62	37	--	--	--	--	--	--	--	--	--
Y44*	Count	--	--	--	1	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	97	135	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	97	161	--	--	--	--	--	--	--	--
Y45*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	38	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	82	--	--	--	--	--	--	--	--	--
Y46*	Count	--	--	--	3	2	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	41	36	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	45	75	--	--	--	--	--	--	--	--
Y47	Count	--	--	--	--	--	--	--	--	--	--	7	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y48	Count	--	--	--	--	--	--	--	--	0	--	--	--	--
	Min. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	--	--	--	--	--	--	--	--	--	--
Y49*	Count	2	--	1	4	--	--	--	--	--	--	--	--	--
	Min. Length	50	--	73	56	--	--	--	--	--	--	--	--	--
	Max. Length	98	--	73	103	--	--	--	--	--	--	--	--	--
Y50*	Count	--	--	--	2	1	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	48	89	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	53	89	--	--	--	--	--	--	--	--
Y51*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	50	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	59	--	--	--	--	--	--	--	--	--
Y52*	Count	--	--	--	2	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	41	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	42	--	--	--	--	--	--	--	--	--
Y53*	Count	--	--	--	2	1	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	103	101	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	109	101	--	--	--	--	--	--	--	--
Y54*	Count	1	--	--	3	--	--	--	--	--	--	--	--	--
	Min. Length	109	--	--	47	--	--	--	--	--	--	--	--	--
	Max. Length	109	--	--	51	--	--	--	--	--	--	--	--	--
Y55*	Count	--	--	--	4	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	54	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	119	--	--	--	--	--	--	--	--	--
Y56*	Count	--	--	--	2	1	--	--	--	--	--	13	--	--
	Min. Length	--	--	--	48	78	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	60	78	--	--	--	--	--	--	--	--
Y57*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	49	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	89	--	--	--	--	--	--	--	--	--

Table 3. continued.

Site		Arctic Grayling	Burbot	Chinook	Coho	Dolly Varden	Lamprey (Spp.)	Longnose Sucker	9-spine Stickleback	None	Rainbow Trout	Sculpin (Spp.)	Sockeye	3-spine Stickleback
Y58*	Count	--	--	--	5	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	46	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	89	--	--	--	--	--	--	--	--	--
Y59*	Count	--	--	--	10	--	--	--	--	--	--	--	--	--
	Min. Length	--	--	--	95	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	103	--	--	--	--	--	--	--	--	--
Y60*	Count	--	--	--	3	--	--	--	--	--	--	8	--	--
	Min. Length	--	--	--	85	--	--	--	--	--	--	--	--	--
	Max. Length	--	--	--	99	--	--	--	--	--	--	--	--	--

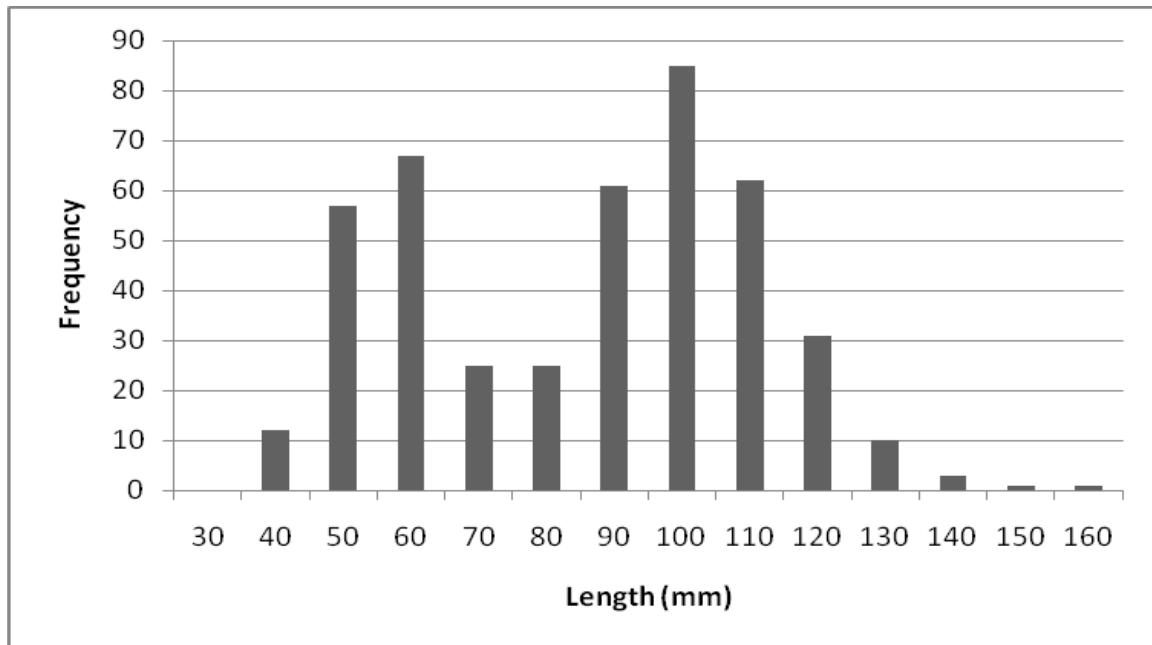


Figure 7. Length-frequency distribution of coho salmon sampled in Mat-Su basin streams, 2009.

Chulitna River sampling area

The Chulitna sampling area lies east of the Parks Highway, with its southern boundary near the town of Trapper Creek, AK (Figure 2). Access to this sampling area was via helicopter and the road system. Coho salmon dominated within the Chulitna watershed, with 101 coho salmon captured, ranging from 71 to 95 mm. Fourteen of the 19 sites in this sampling area received AWC nominations (Table 1).

The first of the Chulitna area sites was sampled on 15 July, a period of unseasonably warm, dry weather in the area. Site C1 on “Drywater Creek” (local name) did not have continuous flow, and as a result of low water levels, the creek was a series of dry gravel/cobble runs interrupted with occasional pools. Due to refugia/stranding, sampling within the pools at C1 yielded the greatest amount of species richness, with Arctic grayling, burbot, coho salmon, lamprey, and sculpin captured. This stream was nominated for inclusion in the AWC, but the upper terminus of anadromy was likely limited by low flow levels hindering fish passage.

Two unnamed tributaries to the Chulitna River received nominations for extension in the AWC. The first tributary (Site C14) is located just east of Trapper Creek. This tributary is fairly entrenched, with a well-developed floodplain and overhanging vegetation, primarily shrubs and sedges. The second tributary (Site C17) is located upriver from Site C14's tributary. An illegal fill damming the width of the stream (Figure 8) at Site C17 presented a barrier to fish passage, and artificially limited the extent of anadromy. Coho salmon and rainbow trout were captured via electrofishing up to the base of the barrier, but no fish were captured upstream. Both tributaries are narrow, E-type channels.

Troublesome Creek, which drains from west of the Parks Highway, received two AWC nominations to substantiate the presence of rearing sockeye salmon at Site C2, and to document the presence of both coho and Chinook salmon at Site C15. The likely limit of anadromy on Troublesome Creek appears to be below a series of small cascading falls in a bedrock substrate (Figure 9); however, resident Dolly Varden continued to be captured upstream from this location.

Three sites (Sites C3 – C5) in the upper Chulitna area were sampled via access from the Parks Highway, but were not successfully fished for anadromous species, though salmonids were captured in two of the sites (Arctic grayling at Site C4 and Dolly Varden at Site C5).

Two sites in the Chulitna area illustrate sampling method limitations. When sampling Site C11, an unnamed tributary to Tokositna River, we were able to see a great deal of fish activity at the surface of the water; however, the switch on our backpack electrofisher anode failed, and we were limited to sampling only with minnow traps, which proved biased against the larger juveniles present. We suspect this site would have been successful for capturing age 1+ juvenile salmon if the electrofisher had been operational. In Evelyn Creek (Site C16), adult Arctic grayling were present; therefore electrofishing was not employed; however, juvenile coho were present in enough abundance that we were able to successfully dip net fish.



Figure 8. Illegal fill discovered in an unnamed tributary to the Chulitna River at Site C17, 2009.



Figure 9. The upper extent of observed anadromy in Troublesome Creek (Site C15), 2009.

Matanuska River sampling area

The Matanuska River (Figure 3) is a large glacial-fed system draining from east to west. It is characterized by its complex and dynamic floodplain. Most of the system is confined within a steep valley, and as a result, many of its tributaries are gradient-limiting for anadromous species. Sites in this sampling area were accessed by float trip and by helicopter. This is the one sampling area where Chinook salmon were captured in greater density than coho salmon. Thirty-nine Chinook salmon were captured at 3 different sites compared to only 29 coho salmon captured at 4 sites. Other salmonids captured in the Matanuska watershed included 66 rainbow trout ranging from 30 to 223 mm and 117 Dolly Varden ranging from 36 to 230 mm. Of the 27 sites sampled within the Matanuska watershed, only 7 received AWC nominations (Table 1).

Two sites (Sites M1 and M14) are located on Lake Creek, a small tributary to Tatondan Lake. In 2008, Tatondan Lake was identified as an important coho and sockeye salmon spawning location (Anderson 2009). Lake Creek is a B-type stream that alternates between riffle habitat and small beaver complexes. Large woody debris was noted as a significant feature in both these streams.

Rowen Creek (Site M11) is a short stream of approximately 1 km. The limit of anadromy is located at the base of a 7 m waterfall. The habitat downstream of this knik point is described as an E-type channel with vegetative cover and woody debris characteristic to beaver activity. Coho salmon were captured both upstream of and downstream of the beaver dam.

Difficulty fishing was reported for 5 sites in the Matanuska area due to glacial flows and the high levels of turbidity. At both Carpenter Creek (Site M12) and Glacier Creek (Site M15), sampling in the glacial mainstem was unsuccessful for capturing any fish, but sampling in the clearwater side channels captured Dolly Varden. Sampling in the braided area of the South Fork of the Matanuska River (Site M16) also resulted in Dolly Varden captured but no anadromous species. Two additional tributaries where turbidity was noted to be problematic for effective sampling are Coal Creek (Site M24) and Hicks Creek (Site M27). Again, non-anadromous species were captured, but crews reported missing netting other fish due to low visibility.

Kings River produced the most Chinook salmon captured (29 out of 54 total fish) at Sites M17 and M18. Mesohabitat that can almost be described as a submerged point bar was the prevalent habitat type in which rearing Chinook salmon were captured in the Matanuska watershed (Figure 10). These discrete areas - that are not quite side channel habitats - provide refuge for rearing salmonids in the form of small boulders, woody debris, and overhanging riparian vegetation.



Figure 10. Site M18 on the Kings River as seen facing downriver (top) and facing upriver (bottom), 2009. This site exemplifies the mesohabitat in which rearing Chinook salmon were captured within the Matanuska watershed.

Susitna River sampling area

The Susitna River sampling area is artificially separated from its upper reaches per the HUC 10 subbasin assignment (Figure 4). The Parks Highway runs through this sampling area from the city of Wasilla to the town of Trapper Creek. Most of this sampling area was accessed by road, with helicopter access needed for a quarter of the area. Of the 44 sites sampled within the Susitna area, 25 sites captured coho salmon and were nominated for inclusion or extension within the AWC (Table 1).

For Rabideaux Creek, Site S14 was sampled at the outlet for a source lake to the creek, and Site S13 was sampled further downstream. At both sites, flow was very low, and the surrounding wetland was disconnected from the lake and primary channel. Electrofishing was unsuccessful at both sites, though fish rising was observed in both locations. Minnow trapping was successful in capturing coho salmon at Site S13, and resulted in a nomination.

One Susitna site was nominated as a polygon coverage in 2009. The Owl Creek polygon (Site S05) is located north of Little Meadow Creek, and covers a wetland complex containing as many as 7 interconnected channels. GPS coordinates were recorded at 33 points around and within the wetland area, and the site was examined for barriers to passage within any portion of the proposed polygon. Electrofishing was successful in capturing rearing coho salmon.

Talkeetna River and Upper Susitna River sampling areas

Both the Talkeetna and the Upper Susitna areas have 2 sampling sites within their respective boundaries (Figure 5). All four of these sampling sites were accessed by helicopter, and resulted in nominations to the AWC. Site T01, an unnamed tributary to Wiggle Creek, is located approximately 5 km southeast of Mile 236 of the Alaska Railroad, and is in an area with active ATV trails and multiple private cabins. The stream below Site T01 drains a wetland area containing multiple beaver complexes. The second site in the Talkeetna area is on an unnamed tributary to Chunilna Creek (Site T02). Electrofishing efforts at Site T02 captured rearing coho and Chinook salmon, as well as rainbow trout.

The first site within the Upper Susitna sampling area (Site U01) is an unnamed tributary to the Susitna River, and is located only 1.5 km east of Chase, AK. While desirable taxis was achieved in electrofishing for coho salmon, the one rainbow trout captured at Site U01 sustained branding (bruising), and was only 1 of 2 known injuries that resulted from our electrofishing in 2009. The next site, an unnamed tributary to Whiskers Creek (Site U02), is an E type channel within the sample reach, but at the upper limit becomes a B type stream with cobble substrate (Figure 11). At the transition area from E to B stream types, the flow becomes discontinuous.



Figure 11. Site U02, on an unnamed tributary to Whiskers Creek, transitions from an E type channel (top) to a B type channel (bottom), where the flow becomes discontinuous, 2009.

Yentna River sampling area

The Yentna River sampling area is located primarily west of the Petersville area (Figure 6). Sample sites within this area were accessed both by Petersville Road and via helicopter. Property permissions were not granted for accessing the primary target tributary to Cache Creek, and helicopter access is not feasible due to very steep slopes and dense vegetation surrounding the deeply incised stream. Sixty sites were sampled in the Yentna watershed, resulting in 36 nominations to update the AWC in 2009 (Table 1). Most sites (33) were nominated for the inclusion of coho salmon, and three sites were nominated to add Chinook salmon.

Large beaver complexes were frequently observed for Yentna area streams. These complexes were characterized by a series of dams and lodges, sometimes forming terraces of small ponds through low gradient valleys. Coho salmon ranging in length from 85 to 111 mm were captured in Drop Creek at Site Y5 (Figure 12). Several of the larger coho salmon at this site appeared to be presmolt.

An unnamed tributary draining a wetland area into Peters Creek appeared to host juvenile coho salmon. Although electrofishing and minnow trapping was unsuccessful at Site Y2, young of year salmon were visually identified. Electrofishing and minnow trapping also proved unsuccessful in Phillip Creek, but crews captured juvenile coho salmon using dip nets at Site Y15, resulting in an AWC nomination.



Figure 12. An example of the large beaver complexes located throughout the Yentna River sampling area. This photo was taken at Drop Creek (Site Y5), 2009.

Discussion

The Anchorage Fish and Wildlife Field Office initiated this project in 2007 to support the Partnership's Strategic Action Plan and the NFHAP by increasing coverage of the AWC for Mat-Su basin water bodies. The overall goal of this project is to provide information needed for protection and management of the freshwater habitats that support Alaska's anadromous and freshwater fish. We successfully met this goal, sampling 154 reaches in 73 different streams, which resulted in 86 nominations to the AWC.

One significant recommendation made in 2008 for future work relates to the type of nominations submitted to the AWC. Wetland areas, well-established beaver complexes, and braided systems may qualify for a polygon nomination as long as the area is appropriately sampled and documented. Polygon nominations may afford better protection for these dynamic or convoluted anadromous habitats. In 2009, we nominated polygon coverage at one site in the Susitna sampling area that was composed of complex, wetland habitat and multiple braided channels. This nomination was accepted to the AWC as a new (linear) stream section with rearing coho salmon. However, this nomination was not accepted to the AWC as polygon coverage. The defined area appeared linear on the AWC map, which was created at a scale too small (1:63,360) for this small narrow waterbody to appear as a polygon. Nonetheless, the thorough, spatially rigorous sampling that polygon nominations require will likely prove to be a cost-benefit in areas with a high or moderate level of threat. We highly recommend that polygon nominations be submitted in lieu of point nominations where appropriate and at an adequate scale for future AWC work throughout the state of Alaska.

There were two common problems identified in 2008 that continue to be an issue with available map stream layers. Streams are mobile, changing landscape features. As a result, maps may not represent current streambed locations. Additionally, we continued to encounter unmapped streams (i.e. not documented on USGS 1:24,000 maps). This can be problematic during operational planning for field sampling and during the reporting process. Unmapped streams are not likely to be sampled unless they are found and identified as such on-the-ground. Once sampled, these unidentified streams need to be physically mapped for reporting, which can be a time-consuming process.

Increased funding in 2009 allowed us to expand our field sampling locations and increase our efficiency. In 2008, this office sampled 83 reaches in 36 streams, resulting in 20 nominations to update the AWC within the Mat-Su basin. In 2009, we sampled 154 reaches in 73 streams for 86 AWC nominations. This increase in productivity is a direct result of helicopter charter funding, which provided us access to remote locations that we would not have been able to otherwise access.

This project should continue in future years in support of the Partnership's strategic action plan and the NFHAP. Inclusion of stream reaches in the AWC offers basic levels of protection under AS 41.14.870, which addresses goals and objectives of the NFHAP and the Partnership. Consultations with USFWS and ADF&G personnel to select sample areas should continue in future years.

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