

Susitna-Watana Hydroproject

Middle River Habitat Line Mapping



Data Need

- Instream Flow and Fish Distribution Studies are sampling a subset or representative habitat
- To determine what habitat is representative, a current catalog of existing habitat was required

Existing Information

- Historical habitat mapping studies in 1980s provided a good foundation, but data may not reflect current stream conditions
- The 2012 on the ground Habitat Mapping study provided some data, but did not catalog the entire Middle River

Goals and Objectives

- Frequency map Middle River mainstem aquatic habitats
- Delineate habitat using aerial imagery and videography

Study data used to select:

- Instream flow studies focus sites
- Approach to fish distribution site selection

Tools to Identify/Display Habitat

- LiDAR (Light Detection And Ranging)
- Low-elevation, hi-def aerial videography (September 2012)
- Still Aerial imagery (Matsu Database)
- GIS



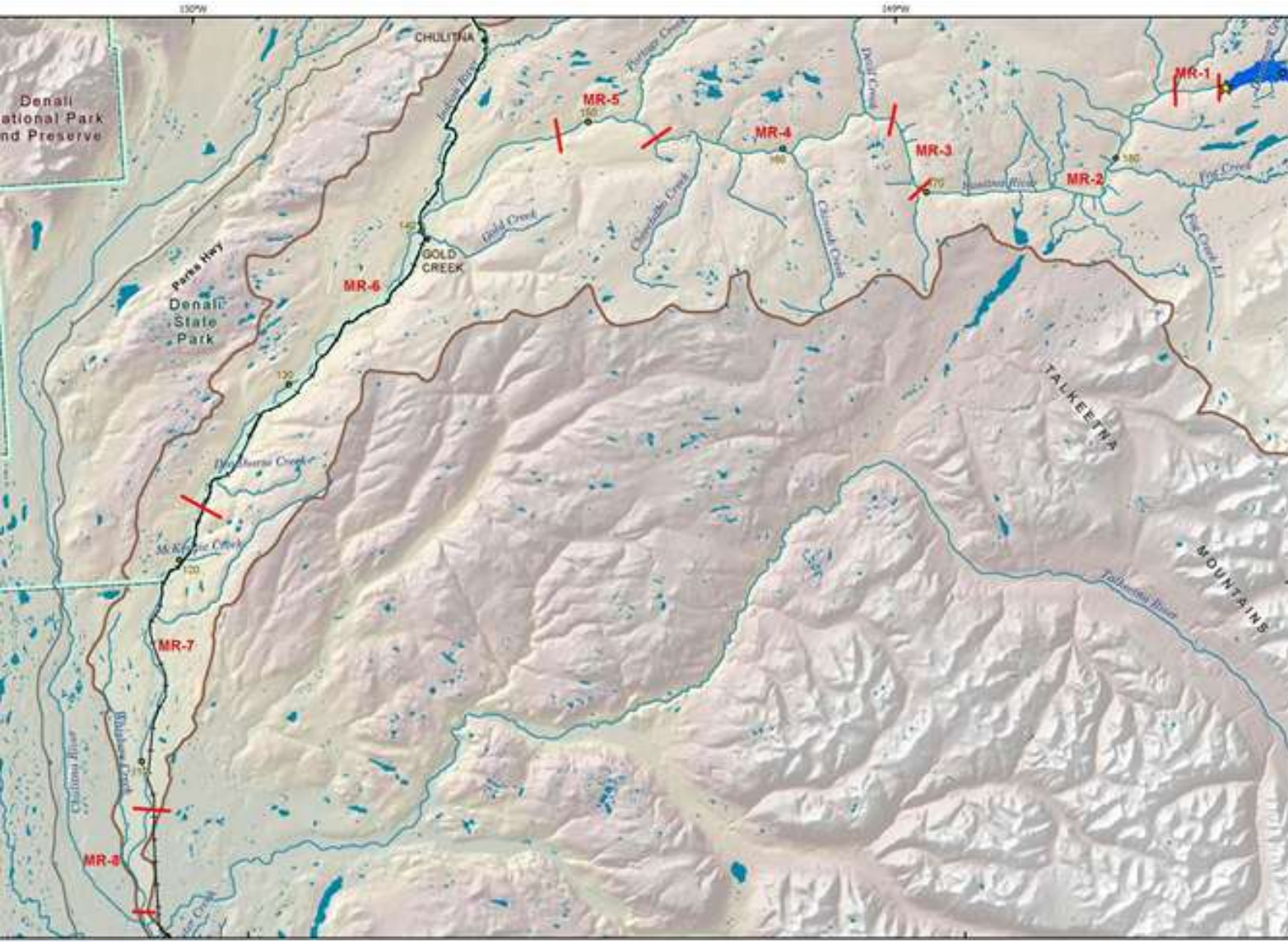
Habitat Mapping Tiered Hierarchical Structure

Level	Unit	Category	Definitions
1	Major Hydrologic Segment	Upper, Middle, Lower River	<p><u>Defined Segment Breaks (used in this report)</u> Upper River – RM 186.7 – 261.3 (<i>habitat mapping will only extend up to mainstem RM 233 and will include the Oshetna River.</i>) Middle River - RM 102.3 – 186.7 Lower River - RM 0 – 102.3</p>
2	Geomorphic Reach	<p>Upper River Segment Geomorphic Reaches 1-6</p> <p>Middle River Segment Geomorphic Reaches 1-8</p> <p>Lower River Segment Geomorphic Reaches 1-6</p>	Geomorphic reaches that uniquely divide the Major Hydrologic Segments based on geomorphic characteristics.
3	Mainstem Habitat	<p>Main Channel Habitat</p> <p>Off-Channel Habitat Types</p> <p>Tributary Habitat</p>	<p><u>Main Channel Habitat:</u> Main Channel – Single dominant main channel. Split Main Channel – Three or fewer distributed dominant channels. Multiple Split Main Channel – Greater than three distributed dominant channels. Side Channel – Channel that is turbid and connected to the active main channel but represents non-dominant proportion of flow. Tributary Mouth - Clear water areas that exist where tributaries flow into Susitna River main channel or side channel habitats (upstream Tributary habitat will be mapped as a separate effort).</p> <p><u>Off-Channel Habitat (also referred to as macrohabitat):</u> Side Slough - Overflow channel contained in the floodplain, but disconnected from the main channel. Has clear water.¹ Upland Slough - Similar to a side slough, but contains a vegetated bar at the head that is rarely overtopped by mainstem flow. Has clear water.¹ Backwater - Found along channel margins and generally within the influence of the active main channel with no independent source of inflow. Water is not clear. Beaver Complex – Complex ponded water body created by beaver dams.</p> <p><u>Tributary Habitat:</u> Tributaries will be mapped to the upper limit of Susitna River hydrological influence.</p>

Level	Unit	Category	Definitions
4	Main Channel	Mesohabitat	<p><u>Main Channel Mesohabitat</u></p> <p>Pool – slow water habitat with minimal turbulence and deeper due to a strong hydraulic control.</p> <p>Glide – An area with generally uniform depth and flow with no surface turbulence. Low gradient; 0-1 percent slope. Glides may have some small scour areas but are distinguished from pools by their overall homogeneity and lack of structure. Generally deeper than riffles with few major flow obstructions and low habitat complexity.²</p> <p>Run – A habitat area with minimal surface turbulence over or around protruding boulders with generally uniform depth that is generally greater than the maximum substrate size.² Velocities are on border of fast and slow water. Gradients are approximately 0.5 percent to less than 2 percent. Generally deeper than riffles with few major flow obstructions and low habitat complexity.²</p> <p>Riffle – A fast water habitat with turbulent, shallow flow over submerged or partially submerged gravel and cobble substrates. Generally broad, uniform cross section. Low gradient; usually 0.5-2.0 percent slope.⁵</p> <p>Rapid - Swift, turbulent flow including small chutes and some hydraulic jumps swirling around boulders. Exposed substrate composed of individual boulders, boulder clusters, and partial bars. Lower gradient and less dense concentration of boulders and white water than Cascade. Moderate gradient; usually 2.0-4.0 percent slope.²</p>
5	Edge Habitat	Length of Shoreline Habitat	<p>Calculation- will be determined by doubling the length of the mapped habitat unit.</p>

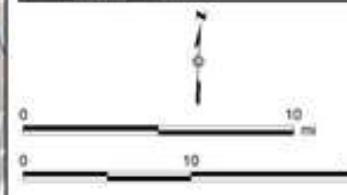
¹ The terms Side Channel, Slough, and Upland Slough are similar but not necessarily synonymous with the terms for macrohabitat type as applied by Trihey (1982) and ADF&G (1983a).

² Adapted from Moore et al. 2006.



- Legend**
- Proposed Watana Dam Site
 - Proposed Watana Reservoir
 - Upper Susitna Subbasin
 - National Park and Preserve
 - Denali State Park (Special Land Use District)
 - Susitna River Reaches
 - Project River Mile Index

Data Sources: See Map References

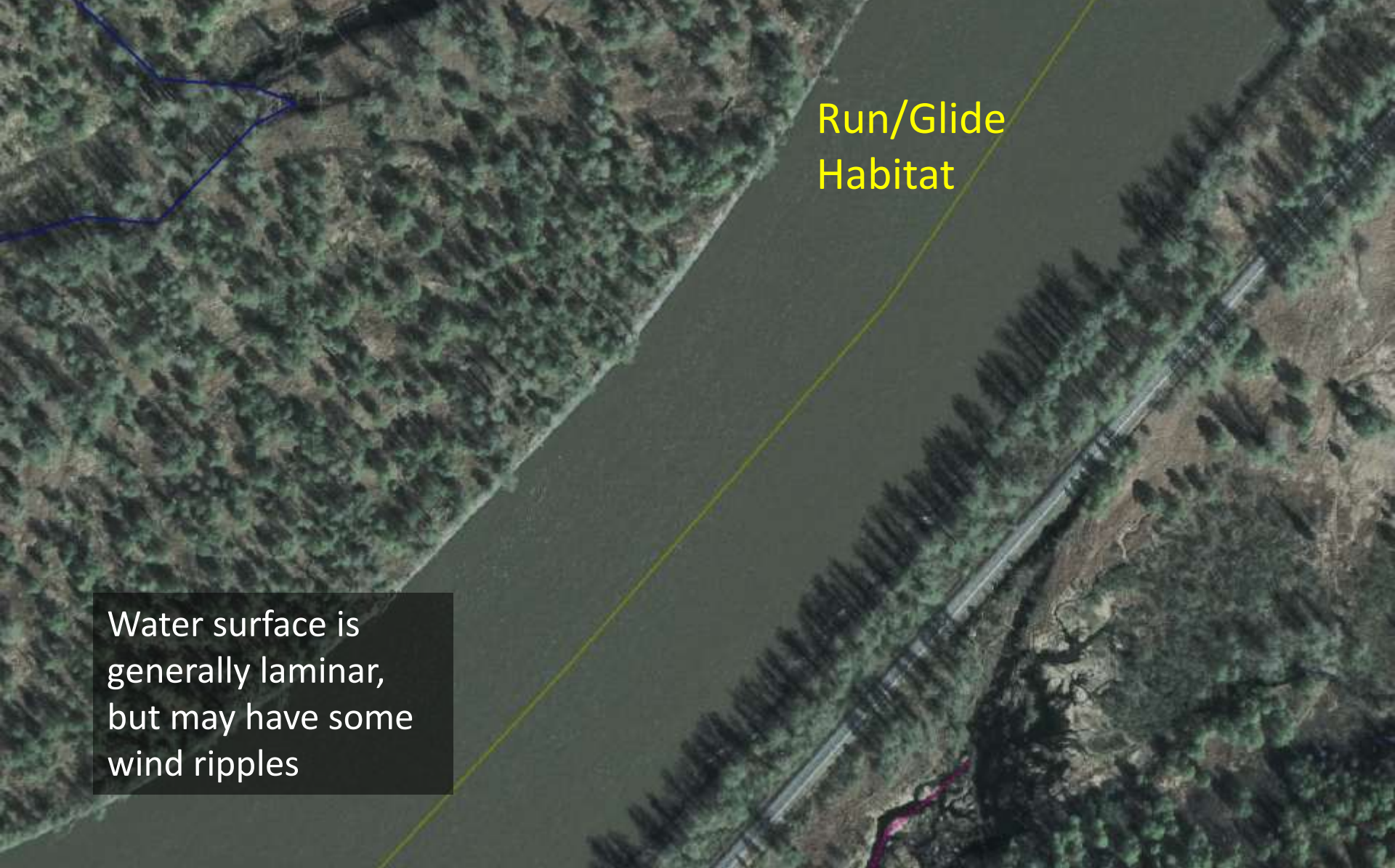


Projection: Alaska Albers MGD 1983
 Date Created: 1/29/2013
 Map Author: HDR Alaska, Inc. - MMC
 File: Chapter9-SubBasinReaches.mxd

Riffle Habitat


Broken Surface Water



An aerial photograph of a river flowing through a dense forest. A yellow line is drawn along the right bank of the river, extending from the top right towards the bottom center. The text 'Run/Glide Habitat' is written in yellow above this line. A blue line is visible on the left bank, and a pink line is visible on the right bank near the bottom. The water surface is dark and appears calm.

Run/Glide Habitat

Water surface is
generally laminar,
but may have some
wind ripples

An aerial photograph of a river flowing through a forested area. The river is characterized by white water rapids and turbulent currents. A prominent, calm pool of water is situated in the upper-middle section of the river. A thin, bright green line is drawn across the river, starting from the left edge and ending on the right edge, passing through the pool. The surrounding landscape is densely forested with green trees, and rocky banks are visible along the river's course.

Pool Habitat

An aerial photograph of a river with rapids. The water is turbulent and white with foam. The banks are covered in dense green forest. A thin green line is drawn across the river, starting from the top left and ending on the right side, following the general flow of the river. The text "Rapid Habitat" is overlaid on the right side of the river.

Rapid Habitat

Open to mainstem at
one end

Side Slough

Headwaters not open
to mainstem

Upland and Side
Slough

Upland Slough

Both have clear water

Example of
an Upland
Slough
Beaver
Complex



Example of a backwater unit-- notice the water is turbid





Tributary

Tributary
Plume

Single Main Channel (long run/glide)

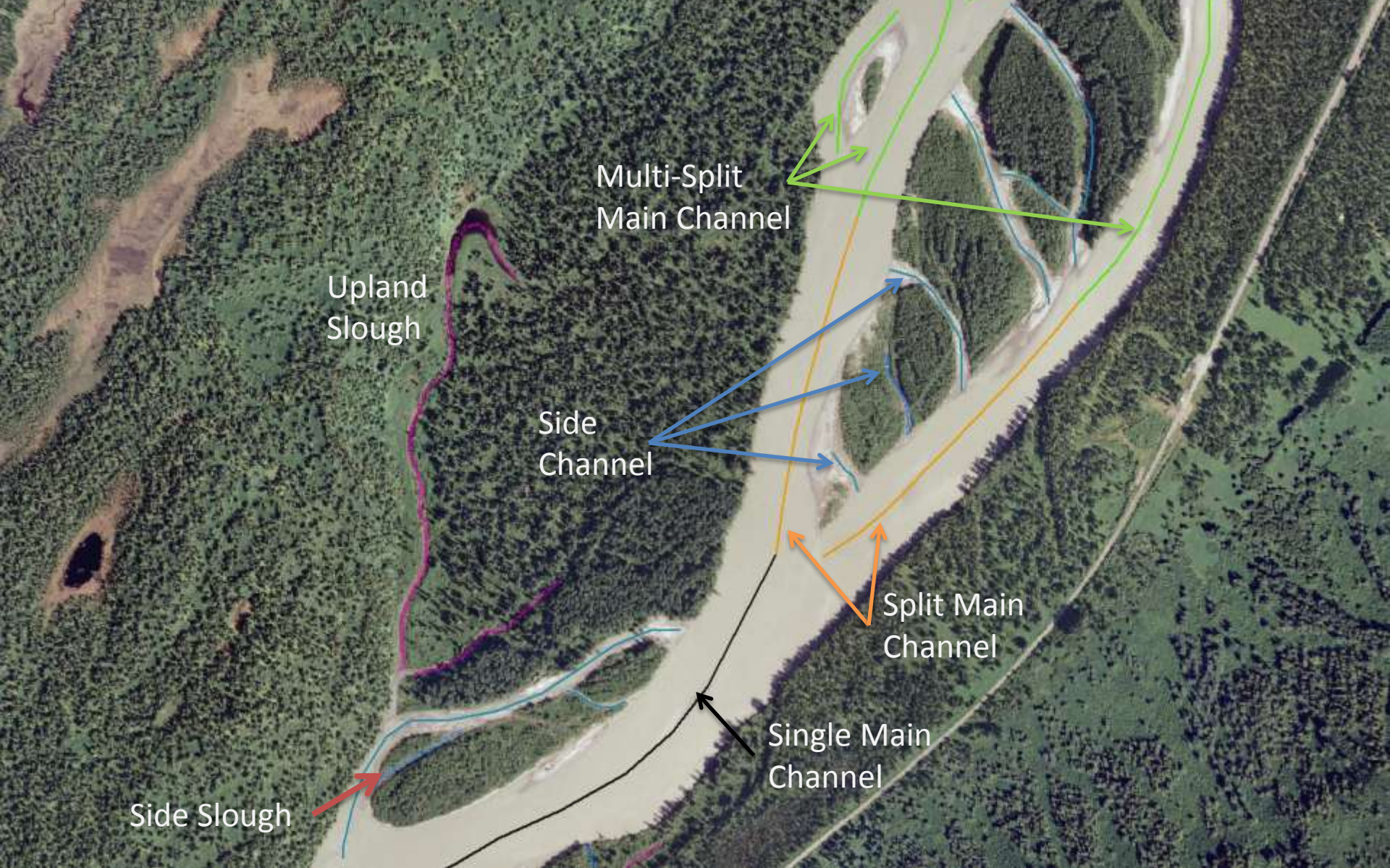


SUSITNA-WATANA HYDRO

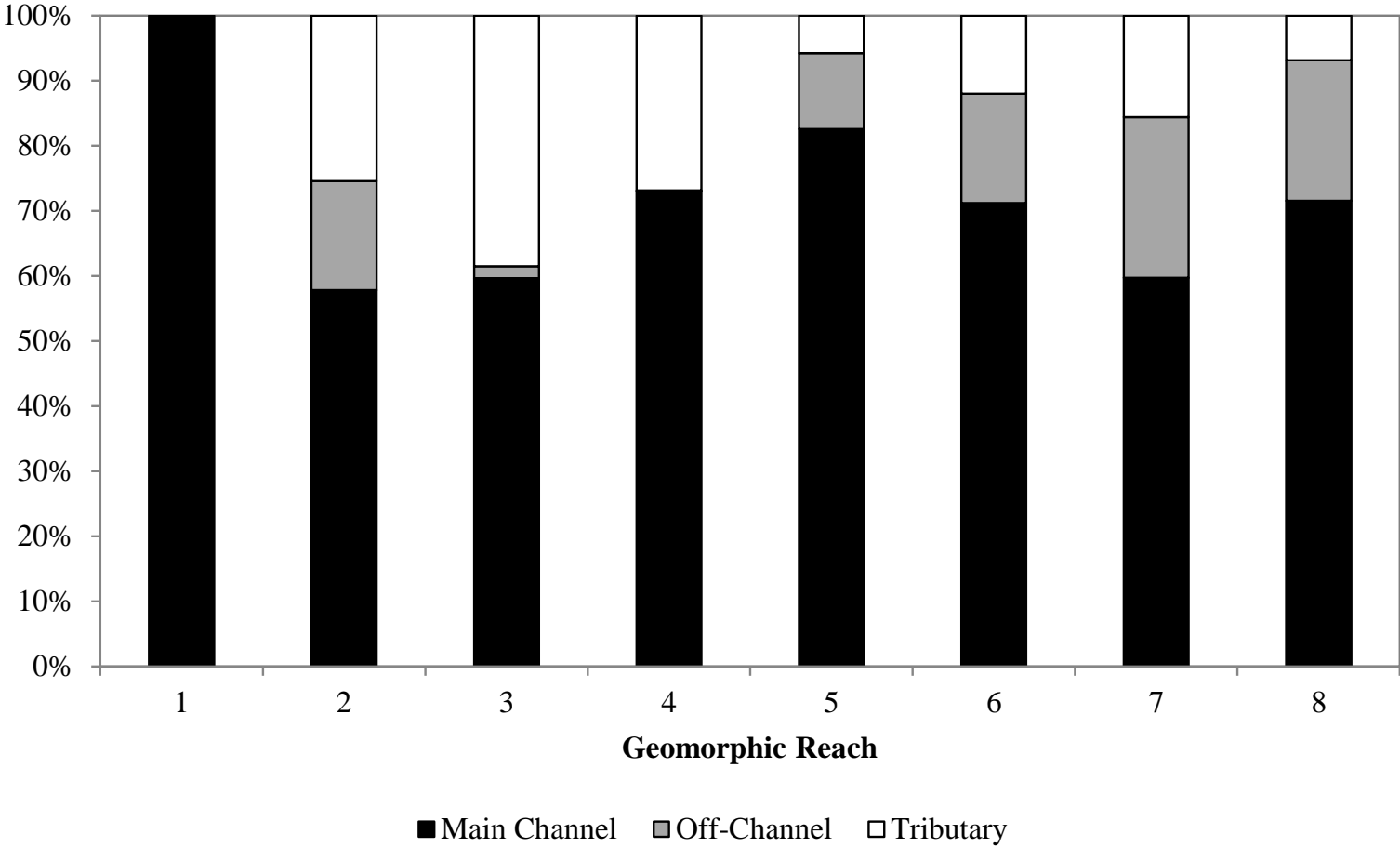
Clean, reliable energy for the next 100 years.

An aerial photograph showing a river confluence. A tributary flows from the top right into a larger river that flows from the bottom left towards the top right. A green outline delineates a specific area at the confluence, including a large, light-colored sandbar or island. The surrounding area is densely forested with green trees. A blue line is visible in the upper right, and a red line is visible in the lower left.

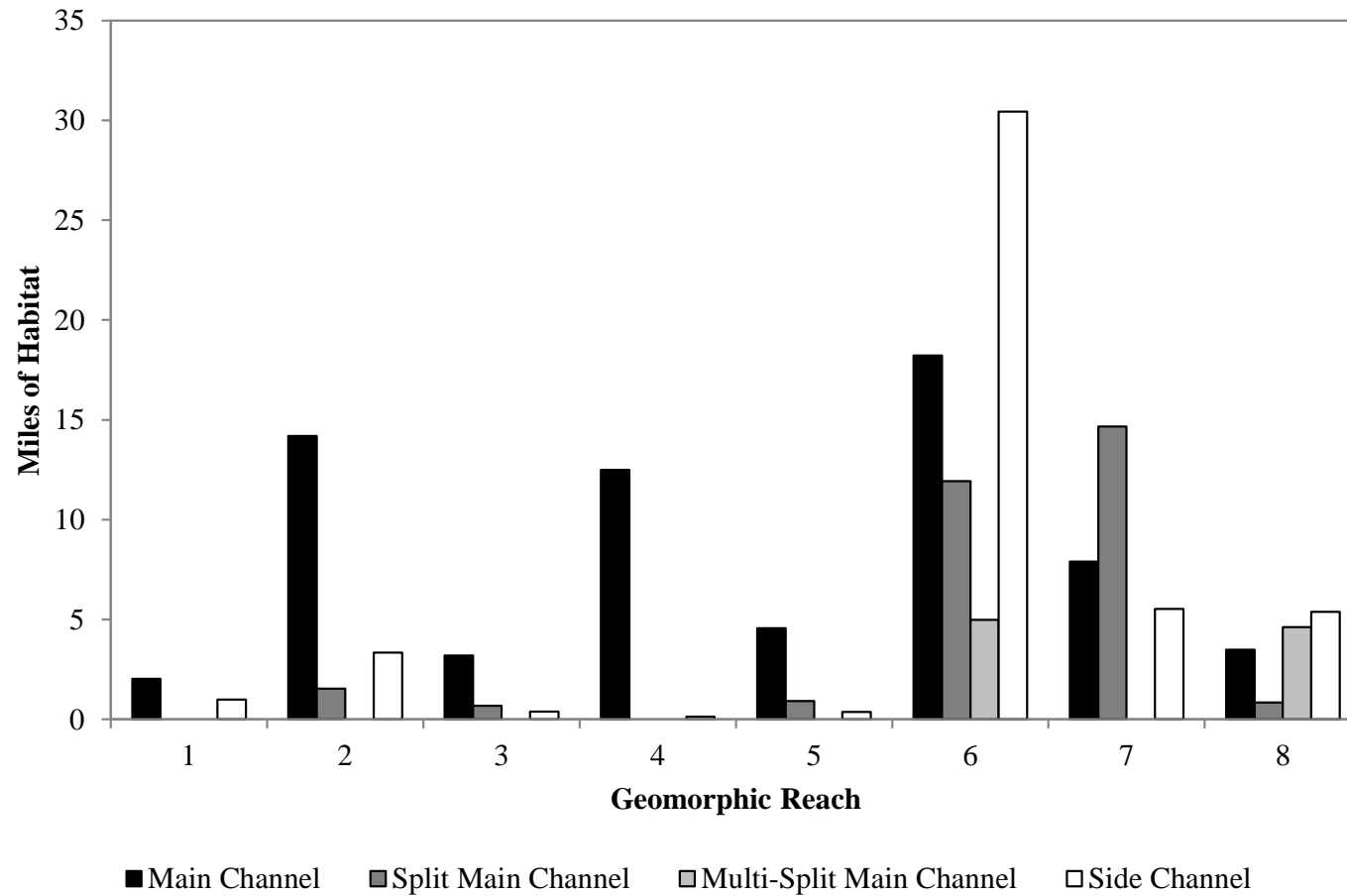
Area of
Tributary
Mouth
Further
Delineated



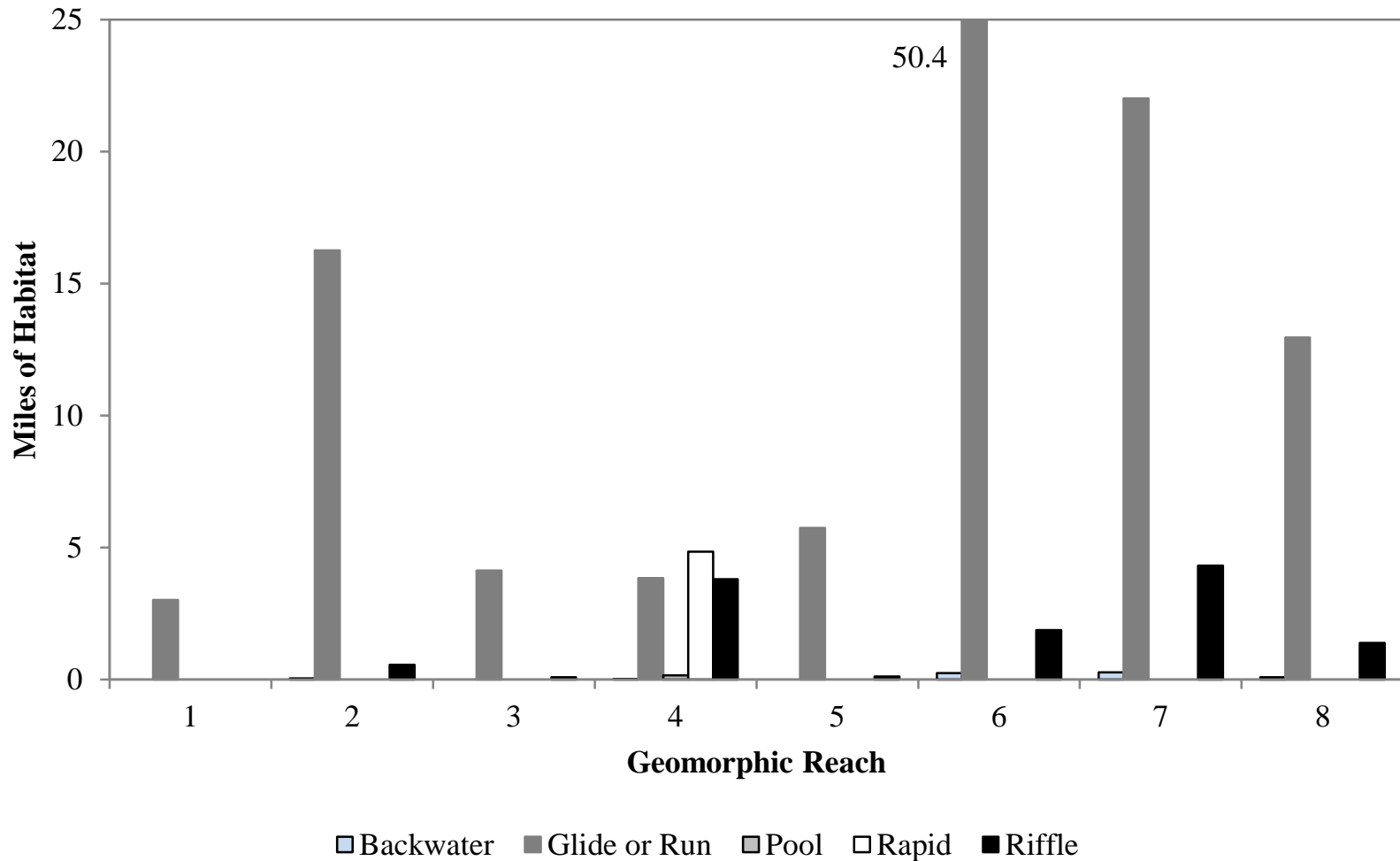
Summary of level 3 habitat classifications in each geomorphic reach in the Middle Susitna River



Main Channel Habitat classifications by geomorphic reach in the Middle Susitna River



Mesohabitat classifications by geomorphic reach in the main and side channels in the Middle Susitna River



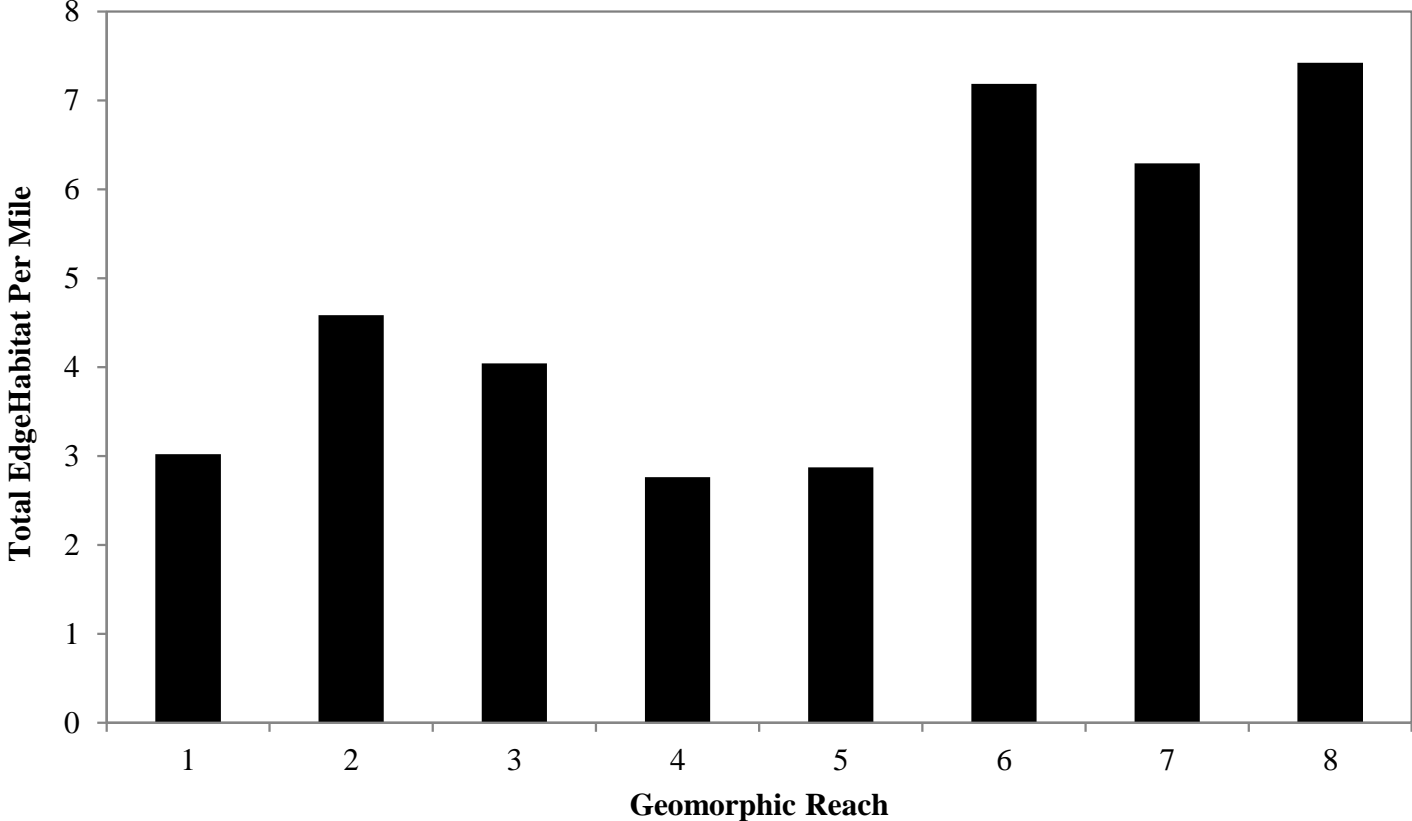
Total length and percent composition (by geomorphic reach) of main Channel mesohabitat classifications in the Middle Susitna River

Main Channel Mesohabitat	MR 1 (PRM 186.7 – 184.7)		MR 2 (PRM 184.7-169.7)		MR 3 (PRM 169.7-166.1)		MR 4 (PRM 166.1-153.5)		MR 5 (PRM 153.5-148.5)		MR 6 (PRM 148.5-122.7)		MR 7 (PRM 122.7-107.7)		MR 8 (PRM 107.7-102.3)	
	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)	% of Total	Total (ft)
Main Channel	67.2%	10,702	68.5%	74,908	73.2%	16,935	98.3%	66,004	75.9%	24,114	27.5%	96,245	28.0%	41,756	24.3%	18,432
<i>Glide or Run</i>	67.2%	10,702	65.8%	71,956	71.3%	16,495	30.2%	20,305	75.9%	24,114	25.9%	90,760	22.9%	34,058	24.3%	18,432
<i>Pool</i>	0.0%	0	0.0%	0	0.0%	0	0.7%	500	0.0%	0	0.0%	0	0.0%	0	0.0%	0
<i>Rapid</i>	0.0%	0	0.0%	0	0.0%	0	38.0%	25,519	0.0%	0	0.0%	0	0.0%	0	0.0%	0
<i>Riffle</i>	0.0%	0	2.7%	2,953	1.9%	440	29.3%	19,680	0.0%	0	1.6%	5,485	5.2%	7,698	0.0%	0
Split Main Channel	0.0%	0	7.5%	8,148	15.6%	3,600	0.0%	0	15.2%	4,835	18.0%	62,885	52.0%	77,407	5.9%	4,453
<i>Glide or Run</i>	0.0%	0	7.5%	8,148	15.6%	3,600	0.0%	0	15.2%	4,835	17.7%	61,922	42.1%	62,623	5.9%	4,453
<i>Riffle</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.3%	963	9.9%	14,784	0.0%	0
Multi-Split Main Channel	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	7.5%	26,400	0.0%	0	32.3%	24,430
<i>Glide or Run</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	7.1%	24,922	0.0%	0	31.7%	24,008
<i>Riffle</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.3%	882	0.0%	0	0.6%	422
<i>Unidentified</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.2%	595	0.0%	0	0.0%	0
Side Channel	32.8%	5,235	16.1%	17,646	9.0%	2,090	1.0%	699	6.2%	1,954	45.9%	160,659	19.6%	29,178	37.5%	28,398
<i>Glide or Run</i>	32.8%	5,235	5.2%	5,716	7.2%	1,677	0.0%	0	4.2%	1,329	25.3%	88,662	13.1%	19,536	28.4%	21,528
<i>Pool</i>	0.0%	0	0.0%	0	0.0%	0	0.5%	342	0.0%	0	0.0%	0	0.0%	0	0.0%	0
<i>Riffle</i>	0.0%	0	0.0%	0	0.0%	0	0.5%	357	2.0%	625	0.7%	2,522	0.2%	279	9.1%	6,870
<i>Unidentified</i>	0.0%	0	10.9%	11,930	1.8%	414	0.0%	0	0.0%	0	19.9%	69,475	6.3%	9,363	0.0%	0
Tributary Mouth	0.0%	0	1.0%	1,113	0.6%	129	0.6%	426	1.0%	305	0.4%	1,545	0.2%	319	0.0%	0
Clear Water Plume	0.0%	0	6.8%	7,470	1.7%	383	0.0%	0	1.7%	549	0.6%	2,143	0.2%	240	0.0%	0
Total	100%	15,937	100%	109,285	100%	23,137	100%	67,128	100%	31,758	100%	349,877	100%	148,900	100%	75,714

Total length and percent composition (by geomorphic reach) of off channel habitats classified in the Middle Susitna River

Off-Channel and Tributary Habitats	MR 1 (PRM 186.7-184.7)		MR 2 (PRM 184.7-169.7)		MR 3 (PRM 169.7-166.1)		MR 4 (PRM 166.1-153.5)		MR 5 (PRM 153.5-148.5)		MR 6 (PRM 148.5-122.7)		MR 7 (PRM 122.7-107.7)		MR 8 (PRM 107.7-102.3)	
	%	Total (ft)	%	Total (ft)	%	Total (ft)	%	Total (ft)	%	Total (ft)	%	Total (ft)	%	Total (ft)	%	Total (ft)
Backwater	0.0%	0	0.0%	0	0.4%	91	0.0%	0	0.9%	1,236	1.5%	1,458	1.5%	453	0.3%	201
Side Slough	0.0%	0	4.5%	712	0.0%	0	66.8%	4,482	27.5%	38,898	10.0%	10,038	20.6%	6,195	20.2%	16,130
<i>Beaver Complex</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	3.8%	5,393	2.6%	2,584	0.0%	0	0.0%	0
<i>Side Slough</i>	0.0%	0	4.5%	712	0.0%	0	66.8%	4,482	23.7%	33,505	7.4%	7,454	20.6%	6,195	20.2%	16,130
Tributary	0.0%	0	95.5%	14,946	99.6%	24,700	33.2%	2,232	41.7%	59,066	38.8%	38,945	24.1%	7,266	60.4%	48,143
Upland Slough	0.0%	0	0.0%	0	0.0%	0	0.0%	0	29.9%	42,361	49.8%	50,067	53.8%	16,190	19.1%	15,261
<i>Beaver Complex</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	8.8%	12,512	5.0%	5,011	0.0%	0	0.0%	0
<i>Upland Slough</i>	0.0%	0	0.0%	0	0.0%	0	0.0%	0	21.1%	29,849	44.8%	45,056	53.8%	16,190	19.1%	15,261
Grand Total	0.0%	0	100%	79,735	100%	15,658	100%	24,791	100%	6,713	100%	141,561	100%	100,508	100%	30,104

Summary of the amount of edge habitat per mile in each geomorphic reach of the Middle Susitna River as an indicator of habitat complexity



Questions?

