Susitna-Watana Hydro Project

Technical WorkGroup Meeting
Fisheries and Aquatics

Characterization of Aquatic Habitats

Interim DRAFT Revised Study Plan

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Characterization of Aquatic Habitats

Participant	Comment	Response
NMFS	Eric asked how the sampling structure detail would be determined and were all the data would be collected for habitat typing.	The RSP will include the requested detail. See RSP Section 9.9.2, 9.9.5, 9.9.5.3 and 9.9.5.4.
Alaska Ratepayers	Jeff Davis asked why Tongass National Forest method was selected. Jeff asked what level of classification would be used for the video work. Jeff asked if Tier III would be applied in the tributaries. Jeff stated that more detail on methods was needed.	The methods for habitat characterization were discussed and approved in an agency meeting in May 2011. The USFS method is a standardized approach that is widely used to characterize habitats in many rivers, including larger waters. In addition, to using that protocol for habitat characterization we will be revising the Habitat Characterization study to include the delineation and characterization of "edge habitat" in mainstem reaches. See RSP Section 9.9.2, 9.9.5.1, 9.9.5.2, and 9.9.5.3.
ADF&G	Stated that Tier III was satisfactory but more detail on methods was needed.	AEA has added additional detail in the RSP on remote and field surveys See RSP Section 9.9.2, 9.9.5, 9.9.5.3 and 9.9.5.4.
FWS	Stated she has concerns about Tier III and said more detail is needed in the plan. She asked if some form of hierarchical habitat mapping would be done.	The RSP will include hierarchical nesting and expansion of habitat type categories. See RSP Section 9.9.2, 9.9.5, 9.9.5.3 and 9.9.5.4
USFWS	The hierarchally nested aquatic habitats framework is needed to structure fish distribution surveys, the instream flow study and other physical process studies. Without it, the fish surveys will be too narrowly constrained and the instream flow studies will not represent all habitats that may be affected by the proposed project. The Service recommends the following habitat hierarchy for the Susitna River be used for habitat mapping purposes and integration of studies: see email for "Large River Floodplain Habitat Hierarchy" recomendation	AEA has considered the USFWS request and has develop a hierarchically nested aquatic habitat classification system that Is presented in the Habitat Characterization study plan. See RSP Section 9.9.1, 9.9.2, 9.9.5, 9.9.5.3 and 9.9.5.4. Fish distribution sampling and instream flow transects will be structured based on the hierarchical habitat framework. This is further described in RSP Sections 9.6 and 8.5.

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ARRI NMFS	Asked if the non-physical habitat characteristics at the micro level (such as temperature, DO and food source) being considered in site selection.	The habitat characterization study does not incorporate data collection of temperature, dissolved oxygen and food source. The data collection at the Focus Areas covers multiple resource and will include the collection of meso-habitat data, fish presence and relative abundance, water quality, etc. These data will be integrated to describe these habitats in more detail.
ARRI	Jeff is concerned that while sampling in turbid waters it may not be able to differentiate whether individuals are not present or simply not collected due to method limitations.	AEA approach includes non-visual capture methods, such as minnow trapping and seining, that have proven to be effective when fish sampling in turbid environments.
ARRI	Requests an outline for habitat classification and integration of studies.	The Habitat Classification system is outlined in the RSP. In addition the interdependencies section addresses how this study support and integrates with other studies. See RSP section 9.9.
NMFS	Eric is unclear how the changes of habitat types with different flows at a particular location will be addressed when mapping habitat.	It is standard practice to map aquatic habitats at low to moderate stream flows, in part to help determine the most limiting condition for aquatic species. AEA aproach to mapping is consistent with those standards to a large extent. Thus, AEA in not proposing to map habitat changes with flows. Flow-habitat relationships will be developed under the ISF Program.

PSP Revised Based on the Following

– inclusion of agency comments to the PSP
– “lessons learned” in 2012
– evolving needs of other dependent studies
– completion of the aerial video in 2012

Study methods are differentiated by tributary and mainstem

- Tributaries
  - Upper River Tributaries
  - Middle Mainstem tributary segments influenced by mainstem flow
- Mainstem
  - Upper River Mainstem
  - Middle River Mainstem
  - Lower River Mainstem

Revised Existing Sources of Information for Habitat Mapping

River Section	Existing Information Available for Habitat Mapping
Upper River Tributaries	• IFSAR 20 foot contour topographic data • Low altitude aerial video
Upper River Mainstem	• IFSAR 20 foot contour topographic data • Low altitude aerial video • Matanuska-Susitna Borough LiDAR and Imagery • River cross sectional profiles of depth and velocity • 2012 geomorphic mapping of channel types
Middle River Mainstem	• IFSAR 20 foot contour topographic data • Low altitude aerial video • Matanuska-Susitna Borough LiDAR and Imagery • River cross sectional profiles of depth and velocity • 2012 geomorphic mapping of channel types • 1980's geomorphic mapping of channel types
Lower River Mainstem	• IFSAR 20 foot contour topographic data • Matanuska-Susitna Borough LiDAR and Imagery • River cross sectional profiles of depth and velocity • 2012 partial geomorphic mapping of channel types

Use of Low Altitude Aerial Video for Habitat Mapping

- When good quality is an excellent tool
- Low elevation, slow speed, HD camera
- Lat/Lon and stream mile indexed
- 100% coverage of stream segment length
- Mesohabitat frequency analysis by time interval
- Characterize dominant substrate, riparian cover, wood count
- Dimensions not possible
- Coupled with ground sub-sampling

River Segments and Tributaries Video Taped in 2012

Tributary	Mainstem
Oshetna	Upper River RM 184 to RM 233.5
Black River	
Goose Creek	
Jay Creek	
Jay Creek Tributary	
Kosina Creek	
Tsisi Creek	Middle River RM 98 to RM 184
Watana Creek	
Deadman Creek	
Tsusena Creek	Lower River Test at RM 65
Tributary 181.2	
Devils Creek	
Chinook Creek	
Cheechako Creek	

Video frame capture of a tributary mid-channel scour pool (overhanging cover, boulder and cobble substrate, no stream wood visible).

Video capture of a Middle River main channel riffle

Video capture Middle River side channels and sloughs

Video capture of rapid in Devils Canyon

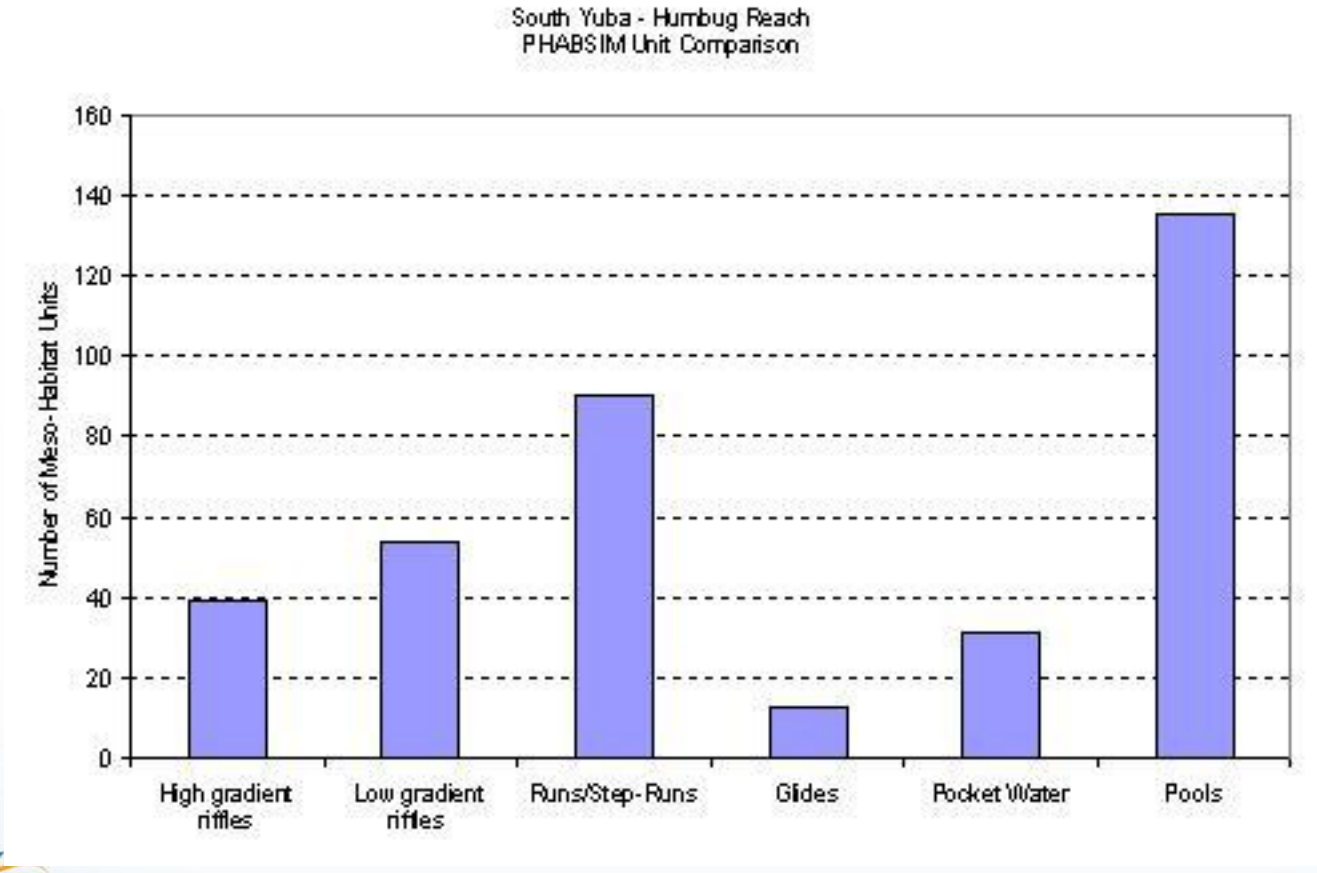
Lower River test at 2,200 ft el. near RM 65

Revised Nested Mesohabitat Type Classification for Tributaries

Channel Type (# of channels)	Hydraulic Type	Mesohabitat Type	Definition
Single (1) Split (2) Channel Complex (3 or > channels)	Fast Water	Falls	Steep near vertical drop in water surface elevation greater than approximately 5 feet over a permanent feature, generally bedrock.
		Cascade	A fast water habitat with turbulent flow; many hydraulic jumps, strong chutes, and eddies and between 30-80% white water. High gradient; usually greater than 4% slope. Much of the exposed substrate composed of boulders organized into clusters, partial bars, or step-pool sequences. [3]
		Chute	An area where most of the flow is constricted to a channel much narrower than the average channel width. Laterally concentrated flow is generally created by a channel impingement or a laterally asymmetric bathymetric profile. Flow is fast and turbulent.
		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% slope, occasionally 7.0-8.0%. [3]
		Boulder Riffle	Same flow and gradient as Riffle but with numerous boulders that can create sub-unit sized pools or pocket water created by scour.
		Riffle	A fast water habitat with turbulent, shallow flow over submerged or partially submerged gravel and cobble substrates. [3] Gradients are approximately 2 to less than 4%.
		Run/Glide	A habitat area with minimal surface turbulence with generally uniform depth that is greater than the maximum substrate size. [3] Velocities are on border of fast and slow water. Gradients are approximately 0 to less than 2%. Generally deeper than riffles with few major flow obstructions and low habitat complexity. [3]

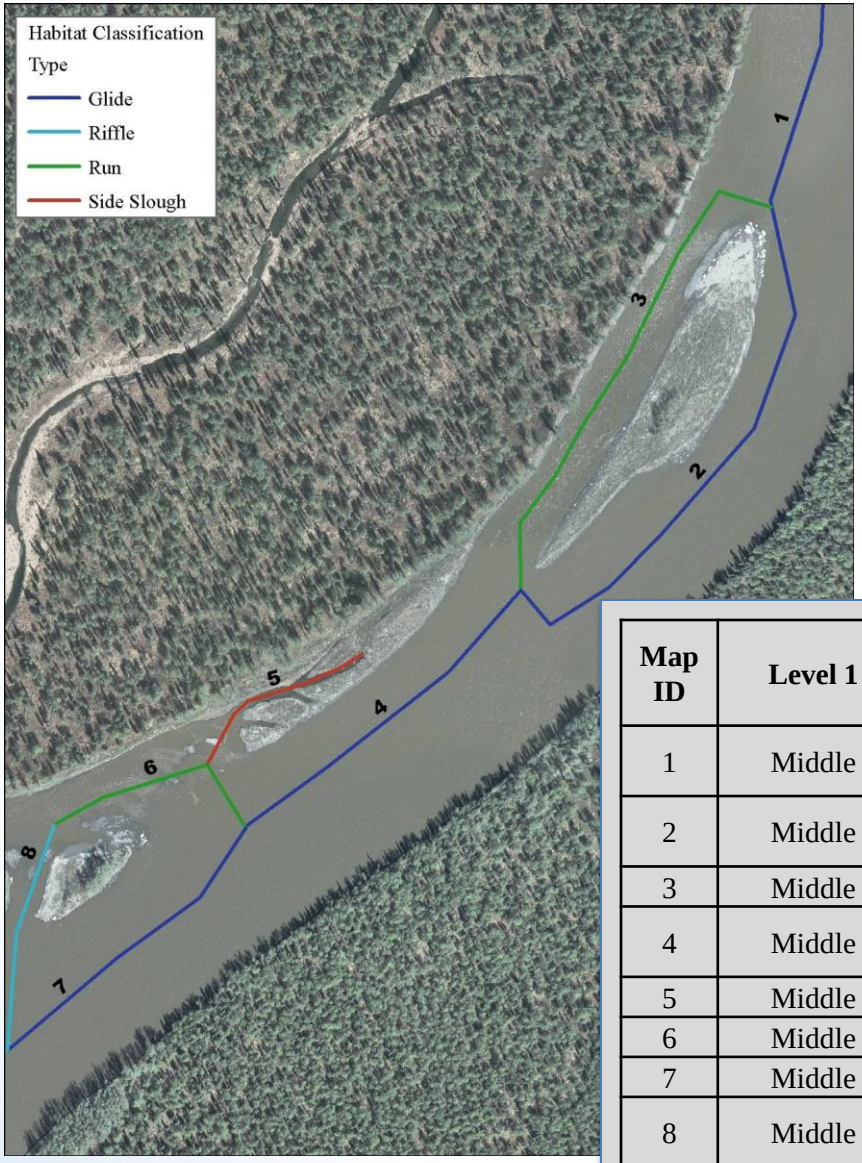
Single (1) Split (2) Channel Complex (3 or > channels)	Slow Water	Pool	A slow water habitat with a flat surface slope and low water velocity that is deeper than the average channel depth. Substrate is highly variable. [3]
		Pool subtypes	**Straight Scour Pool**: Formed by mid-channel scour. Generally with a broad scour hole and symmetrical cross section.[3]
			Plunge Pool: Formed by scour below a complete or nearly complete channel obstruction (logs, boulders, or bedrock). Pool must be Substrate is highly variable. Frequently, but not always, shorter than the active channel width.[3]
			Lateral Scour Pool: Formed by flow impinging against one stream bank or partial obstruction (logs, root wad, or bedrock). Asymmetrical cross section. Includes corner pools in meandering lowland or valley bottom streams.[3]
			Backwater Pool: Found along channel margins; created by eddies around obstructions such as boulders, root wads, or woody debris. Part of active channel at most flows; scoured at high flow. Substrate typically sand, gravel, and cobble. Generally not as long as the full channel width. [3]
		Beaver Pond	Water impounded by the creation of a beaver dam. Maybe within main, side, or off-channel habitats. [3]
		Alcove	An off-channel habitat that is laterally displaced from the general bounds of the active channel and formed during extreme flow events or by beaver activity; not scoured during typical high flows. Substrate is typically sand and organic matter. Generally not as long as the full channel width. [3]

Histograms and tables of mesohabitat frequency by geomorphic reach (example)



Heirachical and Nested Habitat Typing and Classification for the Mainstem

Level	Unit	Category	Definitions
1	Major Hydrologic Segment	Upper, Middle, Lower River	**Defined Reach Breaks** ***Upper River*** - RM184-248 (*Note Mapping only extends to RM 233*) ***Middle River*** - RM 98.5-184 ***Lower River*** - RM 28-98.5
2	Geomorphic Reach	Upper River Reaches 1-6 Middle River Reaches 1-8 Lower River Reaches 1-4	Geomorphic reaches that uniquely divide major hydraulic segments for the upper, middle and lower river based on geomorphic characteristics
3	Mainstem Habitat	Main Channel Habitat Off-Channel Habitat Types[1] Tributary Habitat	**Main Channel Habitat:** ***Main Channel*** **–** Single dominant main channel ***Split Main Channel*** **–** Less than 3 distributed dominant channels ***Braided Main Channel*** **–** Greater than 3 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) **Off-Channel Habitat:** (will be mapped to mesohabitat level in Focus Sites and representative non-Focus Sites) ***Side Slough:*** Overflow channel contained in the floodplain, but disconnected from the main channel. Has clear water.[2] ***Upland Slough:*** Similar to a side slough, but contains a vegetated bar and is rarely overtopped by mainstem flow. Has clear water. [2] ***Backwater:*** Found along channel margins and generally within the influence of the active mainchannel. Water is not clear. ***Beaver Complex*** **–** Complex ponded waterbody created by beaver dams **Tributary Habitat:** Tributaries will be mapped to the upper hydrological influence of the mainstem
4	Main Channel Mesohabitat	Main Channel and Tributary Habitat	**Main Channel and Tributary Mesohabitat:** ***Cascades*** **–** A fast water habitat with turbulent flow and hydraulic steps ***Riffle*** **–** fast turbulent water with shallow flow ***Pool*** **–** slow water habitat with minimal turbulence and deeper in depth due to a hydraulic control ***Run*** **–** fast water with minimal to moderate turbulence ***Glide*** **–** slower water with minimal turbulence
5	Edge Habitat	Length of Shoreline Habitat	***Calculation***- will be determined by doubling the length of the mapped habitat unit



Example of Mainstem Habitat Line Mapping

Map ID	Level 1	Level 2	Level 3	Level 4	Turbid	Unit Length	Level 5 Edge Length
1	Middle	MR-7[1]	Main Channel	Glide	Yes	2,819	5,638
2	Middle	MR-7	Main Channel	Glide	Yes	2,339	4,678
3	Middle	MR-7	Side Channel	Run	Yes	2,101	4,202
4	Middle	MR-7	Main Channel	Glide	Yes	1,503	3,006
5	Middle	MR-7	Side Slough	Side Slough	No	824	1,648
6	Middle	MR-7	Side Channel	Run	Yes	978	1,956
7	Middle	MR-7	Side Channel	Glide	Yes	1,356	2,712
8	Middle	MR-7	Main Channel	Riffle	Yes	954	1,908

Example of Possible OutputUsing the Heirachical Nested Method

Level 1	Level 2	Level 3	Level 4	Segment Count	Total Length (ft)	% of MR-7
Middle	MR-7[1]	Main Channel	Glide	3	6,661	51.7%
			Riffle	1	954	7.4%
		Side Channel	Glide	1	1,356	10.5%
			Run	2	3,079	23.9%
		Side Slough	Side Slough	1	824	6.4%
			Total	**8**	**12,874**	**100.0%**

Main Channel Mesohabitat	Total Length (ft)	%	Off-Channel Habitat	Total Length (ft)	%
Glide	8,017	66.5%	Main Channel	7,615	59.2%
Riffle	954	7.9%	Side Channel	4,435	34.4%
Run	3,079	25.6%	Side Slough	824	6.4%
Total	**12,050**	**100.0%**	**Total**	**12,874**	**100.0%**

Type-index - Falls

Type-index - Cascade

Type-index - Chute

Type-index- Rapid

Type-index - Boulder Riffle

Type-index - Cobble/Gravel Riffle - Spit Channel

Type-index – Run/Glide

Type-index – Run/Glide

Type-index - Mid Channel Scour Pool

Type-index - Lateral Scour Pool - Braided Channel

Type-index – Alcove – Special Habitat Feature.

Type-index – Beaver Complex – Special Habitat Feature.

Type-index - Unclassified - Boulder Riffle, Boulder Garden? Kosina Creek. Stream width is 200-300 feet

Type-index - Unclassified – Braided Channel? Upper end of Kosina Creek. Stream section 300 – 400 feet wide.