

Susitna-Watana Hydroproject

Summary of Aerial Video Habitat Mapping of Susitna River Tributaries from the Upper Extent of Devils Canyon to the Oshetna River



Use of low Altitude Aerial Video for Habitat Mapping

- When good quality is an excellent tool
- Low elevation, slow speed, HD camera
- Lat/Long and stream mile extended
- 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



2012 Aerial Video Habitat Frequency

Sixteen tributaries above Devils Canyon were videotaped:

1. 12 large tributaries and 4 large secondary tributaries
2. Tribs known to support Chinook were videotaped to approx. a 3000' elevation
3. Tribs not known to support Chinook were videotaped to 2,200' elevation
4. Aerial videotaping was terminated if an anadromous barrier was encountered that would not be inundated by the Watana Dam pool.



River Segments and Tributaries Video Taped in 2012

Name	Hydrologic River Segment	Date Videotaped	Stream Section Video Taped (Project Rivermile)
Oshetna River	Upper River	9/8/2012	PRM 0.0 to 15.6
Black River	Upper River	9/8/2012	PRM 0.0 to 3.5
Goose Creek	Upper River	9/8/2012	PRM 0.0 to 7.8
Jay Creek	Upper River	9/9/2012	PRM 0.0 to 10.5
Jay Creek Tributary ²	Upper River	9/9/2012	PRM 0.0 to 1.9
Kosina Creek	Upper River	9/9/2012	PRM 22.1 to 0.0
Tsisi Creek	Upper River	9/9/2012	PRM 0.0 to 2.7
Watana Creek	Upper River	9/9/2012	PRM 0.0 to 18.4
Watana Creek Tributary	Upper River	9/9/2012	PRM 0.0 to 3.0
Deadman Creek	Upper River	9/10/2012	PRM 0.0 to 21.0
Tsusena Creek	Middle River	9/10/2012	PRM 0.0 to 4.2
Tributary 184.0	Middle River	9/10/2012	PRM 0.0 to 1.8
Fog Creek	Middle River	9/10/2012	PRM 0.0 to 17.9
Fog Creek Tributary L1	Middle River	9/10/2012	PRM 7.3 to 0.0
Devil Creek	Middle River	9/7/2012	PRM 0.0 to 2.5
Chinook Creek	Middle River	9/12/2012	PRM 0.0 to 7.1
Cheechako Creek	Middle River	9/12/2012	PRM 0.0 to 1.8

Video-frame Capture of a Tributary Mid-channel Scour Pool



Overhanging cover, boulder and cobble substrate, no stream wood visible.

Mesohabitat Frequency Analysis

- Based on the eleven mesohabitat classifications described in RSP 9.9
- Used a 5-second interval sampling of the videotape
- At this sampling rate observations per mesohabitat unit ranged from 0.5 to 2.9 and averaged more than 1.0 per mesohabitat unit
- Product is a relative frequency and distribution of mesohabitat types



Mesohabitat Type Descriptions – Fast Water

Channel Type (# of Channels)	Hydraulic Type	Mesohabitat Type	Definition
Single (1) Split (2) Channel Complex (3+ channels)	Fast Water	Falls	Steep near vertical drop in water surface elevation greater than approximately 5 ft 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.
		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%.
		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. Generally broad, uniform cross section. Low gradient; usually 0.5-2.0% slope, rarely up to 6%.
		Run/Glide	A habitat area with minimal surface turbulence with generally uniform depth that is greater than the maximum substrate size. 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.

Mesohabitat Type Descriptions –Slow Water

Channel Type (# of Channels)	Hydraulic Type	Mesohabitat Type	Definition
Single (1) Split (2) Channel Complex (3+ 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.
		Pool subtypes	Straight Scour Pool: Formed by mid-channel scour. Generally with a broad scour hole and symmetrical cross section.
			Plunge Pool: Formed by scour below a complete or nearly complete channel obstruction (logs, boulders, or bedrock). Substrate is highly variable. Frequently, but not always, plunge pools are shorter than the active channel width
			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.
			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.
		Beaver Pond	Water impounded by the creation of a beaver dam. May be within main, side, or off-channel habitats.
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. An alcove is differentiated from a backwater being more protected and not scoured at high flows whereas a backwater is part of the active channel and is scoured at high flows.		

Mesohabitat Type Descriptions –Slow Water

Channel Type (# of Channels)	Hydraulic Type	Mesohabitat Type	Definition
Single (1) Split (2) Channel Complex (3+ channels)	Off-channel	Percolation Channel	A slough characterized by groundwater percolation through the floodplain that comes from mainstem stream channel. Upstream surface connection to active channel cut off due to accumulation of sediment/debris at the upstream end. Upstream surface water connection to the active channel present only during high flows.

Frequency of Aerial Video Mapping Observations and Average Mesohabitat Unit Length

	Average Observations Per Mile	Average Distance Between Observations (ft)	Average Mesohabitat Unit Length	Average Observations per Mesohabitat Unit
Upper Susitna River Tributaries				
Oshetna River	36	145	168 ¹	1.2
Black River	28	190	215 ¹	1.1
Goose Creek	36	145	320 ¹	2.2
Jay Creek	49	108	318 ²	2.9
Kosina Creek	26	200	444 ²	2.2
Tsisi Creek	25	213	224 ¹	1.1
Watana Creek	37	141	257 ²	1.8
Watana Creek Tributary	36	147	122 ¹	0.8
Deadman Creek	34	156	No data	--
Middle Susitna River Tributaries above Devils Canyon				
Tsusena Creek	36	149	No data	--
Tributary 184.0	47	113	No data	--
Fog Creek	42	124	185 ¹	1.5
Fog Creek Tributary L1	36	146	76 ¹	0.5
Devil Creek	40	132	No data	--

¹ 2012 fish population data

² Average of 2012 ground survey and fish population mesohabitat length ground measurements

Oshetna River Mesohabitat Frequency

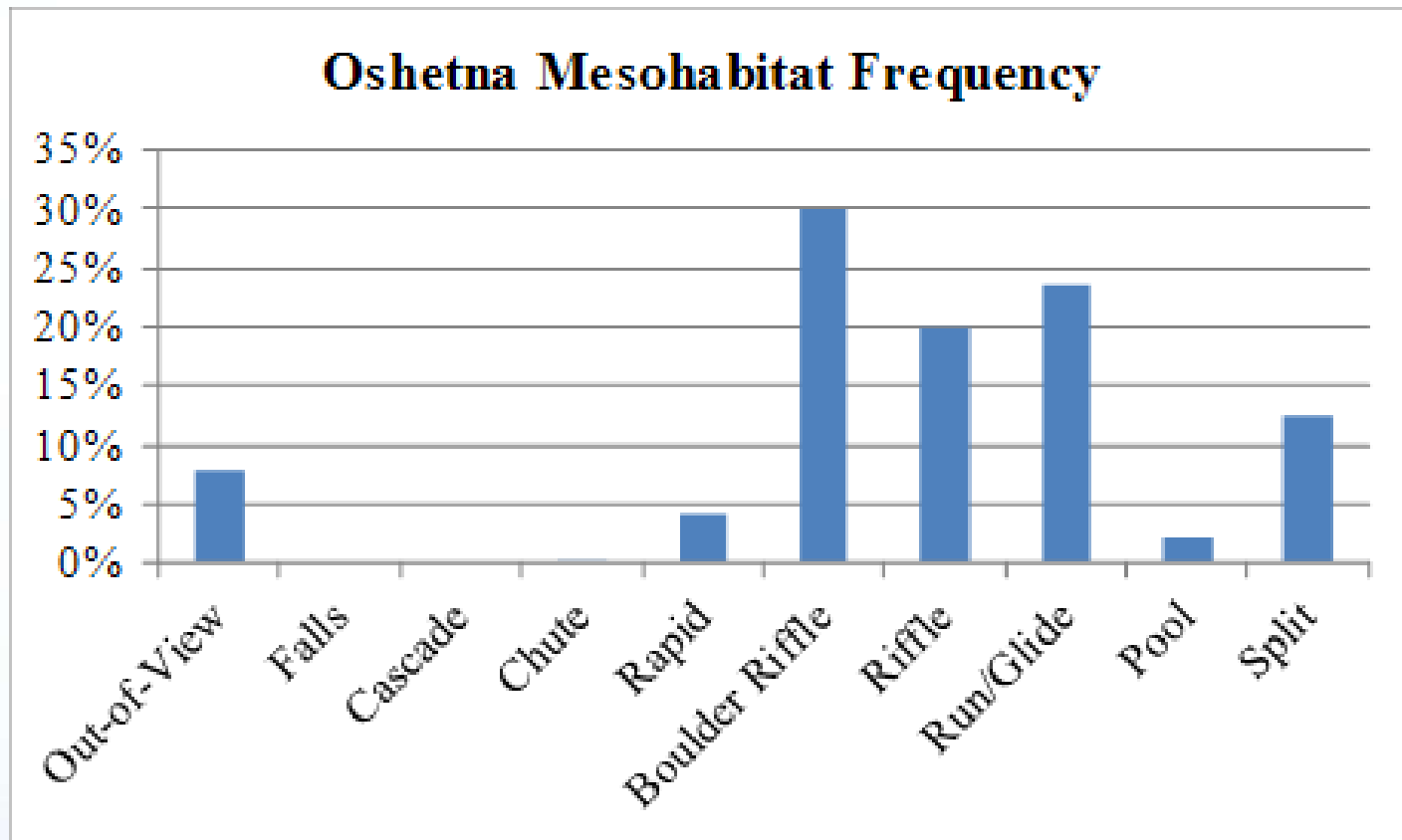
Aerial video method – 5-second interval

Mesohabitat	Main Channel		Split Channel	
	Frequency	Percent	Frequency	Percent
Out-of-View	38	8%	14	10%
Falls	0	0%	0	0%
Cascade	0	0%	0	0%
Chute	1	0%	0	0%
Rapid	20	4%	0	0%
Boulder Riffle	147	30%	14	10%
Riffle	97	20%	25	19%
Run/Glide	115	23%	66	49%
Pool	11	2%	0	0%
Split Channel	61	12%	--	--
Beaver Pond	0	0%	0	0%
Alcove	0	0%	0	0%
Percolation	0	0%	0	0%
Total	490	100%	135	100%

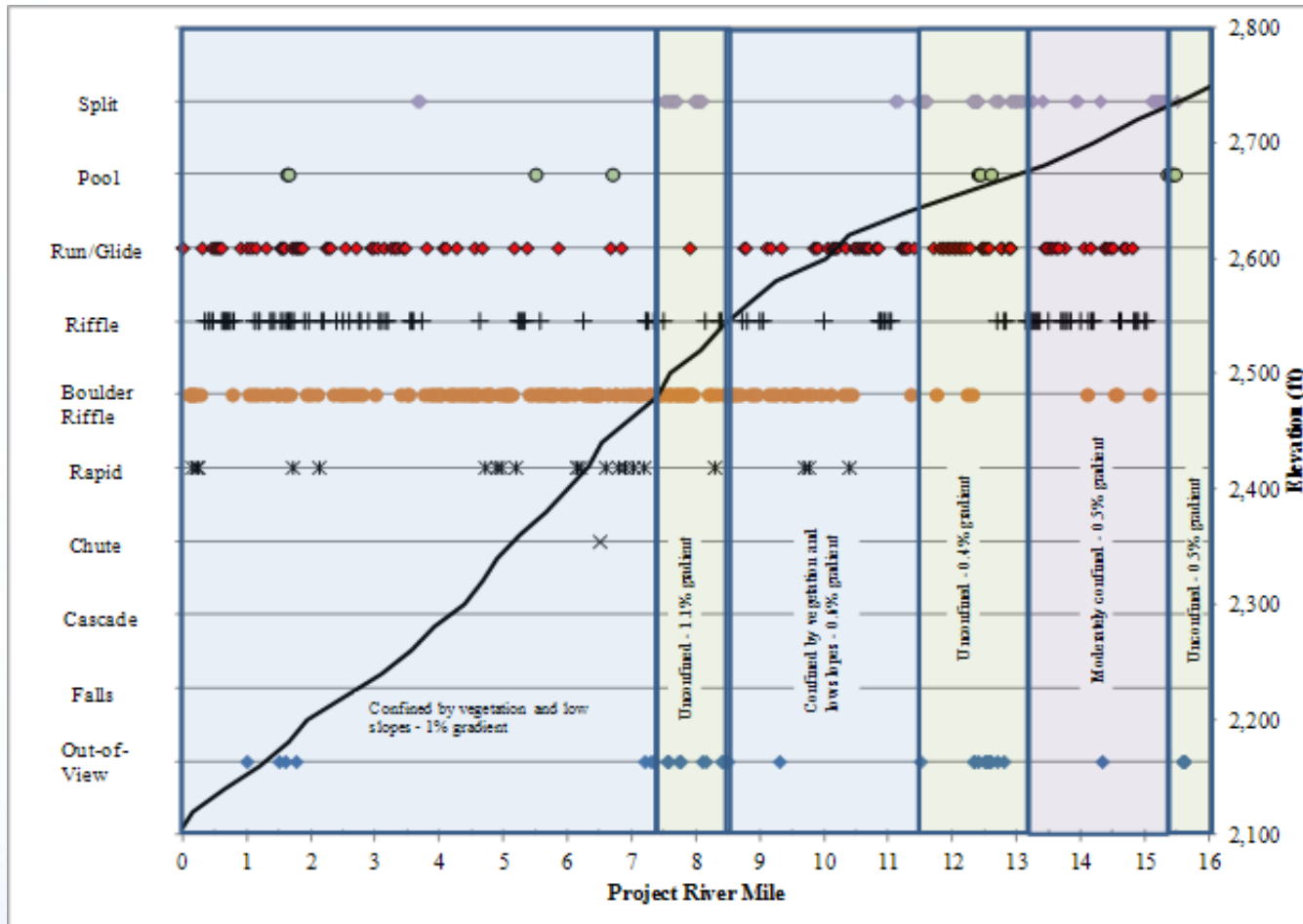


Oshetna Main Channel Mesohabitat Frequency

Aerial video method – 5-second interval



Oshetna River - Distribution of Mesohabitat Types by Rivermile, Gradient, and Geomorphic Reach Type



Oshetna River Video Captures of Example Mesohabitat Types



Rapid



Riffle



Rapid



Lateral scour pool

Questions?

