

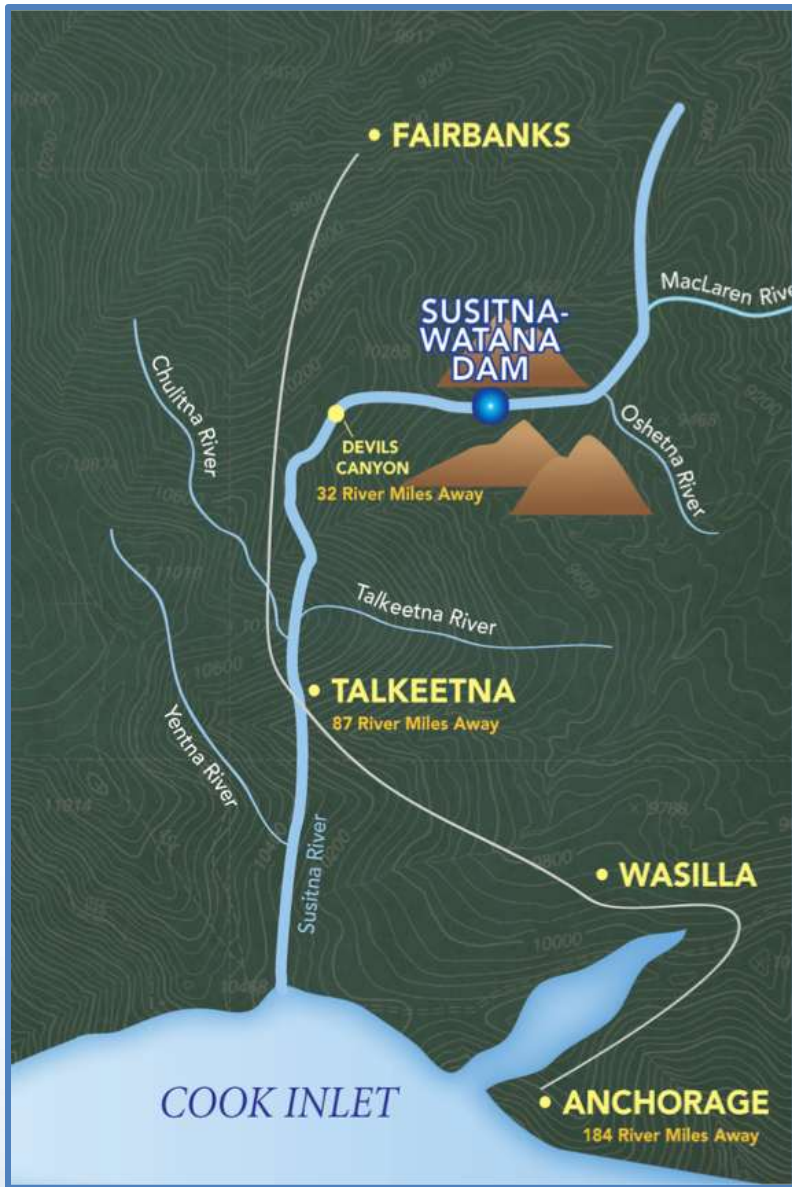
Technical WorkGroup Meeting

Fish and Aquatics Instream Flow

Selection of Focus Areas and Study Sites in the Middle and Lower Susitna River

14 February 2013

Prepared by R2 Resource
Consultants



Evaluating Focus Areas

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- Fish and Aquatics Instream Flow –
 - Based on Habitat Mapping analysis (focus of this presentation)
- Riparian Instream Flow –
 - Based on Process Domain Delineation (ongoing analysis)



Topics of Discussion

- Fish and Aquatics IFS
 - Recap general stratification and site selection process
 - Identify 10 Focus Areas noted in RSP
 - Review habitat mapping results and statistical analysis completed on FAs (major focus)
 - Discuss implications and conclusions of analysis
 - Identify final areas and sites proposed for sampling in 2013 in Middle River Segment
 - Identify proposed sites for sampling in upper portion of Lower River Segment
- Riparian IFS
 - Review methods for FA analysis
- Groundwater
- Geomorphology
- Water Quality



Susitna IFS Site Selection Process

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(As presented at September 2012 TWG)

- Identify potential intensive sites for planning purposes (Sep 2012)
- Use mapping results to evaluate habitat variability, conduct statistical power analysis, refine intensive sites and identify supplementary sites (Dec 2012)
- TWG confirmation of sites (Feb/Mar 2013)
- Collect data during summer 2013
- Evaluate summer 2013 data and modify/add sites as needed in collaboration with TWG (Nov 2013)
- Collect additional data as needed summer 2014



Site Selection Approaches Considered

- Representative Sites or Reaches
- Critical Sites/Reaches
- Randomly Selected Sites or Reaches

Focus Area selection incorporated all three approaches

Sites Also Selected Outside of Focus Areas



What is a Focus Area?

- Areas within the Susitna River where studies would be concentrated across resource disciplines with the goal of providing an overall understanding of interrelationships of river flow dynamics on the physical, chemical, and biological factors that influence fish habitat.
- Provides best opportunity for understanding flow interactions and evaluating potential project effects

Stratification and Site Selection Process

- **Segment → Geomorphic Reach → Mainstem Habitat Type → Main channel Mesohabitats → Edge Habitat Types**

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- Geomorphic Reach – M1 through M8 (see map)
- Mainstem Habitat Types
 - Main channel habitats
 - Split main channel
 - Braided main channel
 - Side channel
 - Off channel habitats
 - Side slough
 - Upland slough
 - Backwater
 - Beaver complex



Selection Criteria for FAs

- All major habitat types (main channel, side channel, side slough, etc.) will be sampled within each geomorphic reach.
- At least one (and up to three) Focus Area(s) per geomorphic reach (excepting Devils Canyon – MR-3 and MR-4) will be studied that is/are representative of other areas.
- A replicate sampling strategy will be used for measuring habitat types within FAs which will include a random selection process of mesohabitat types.

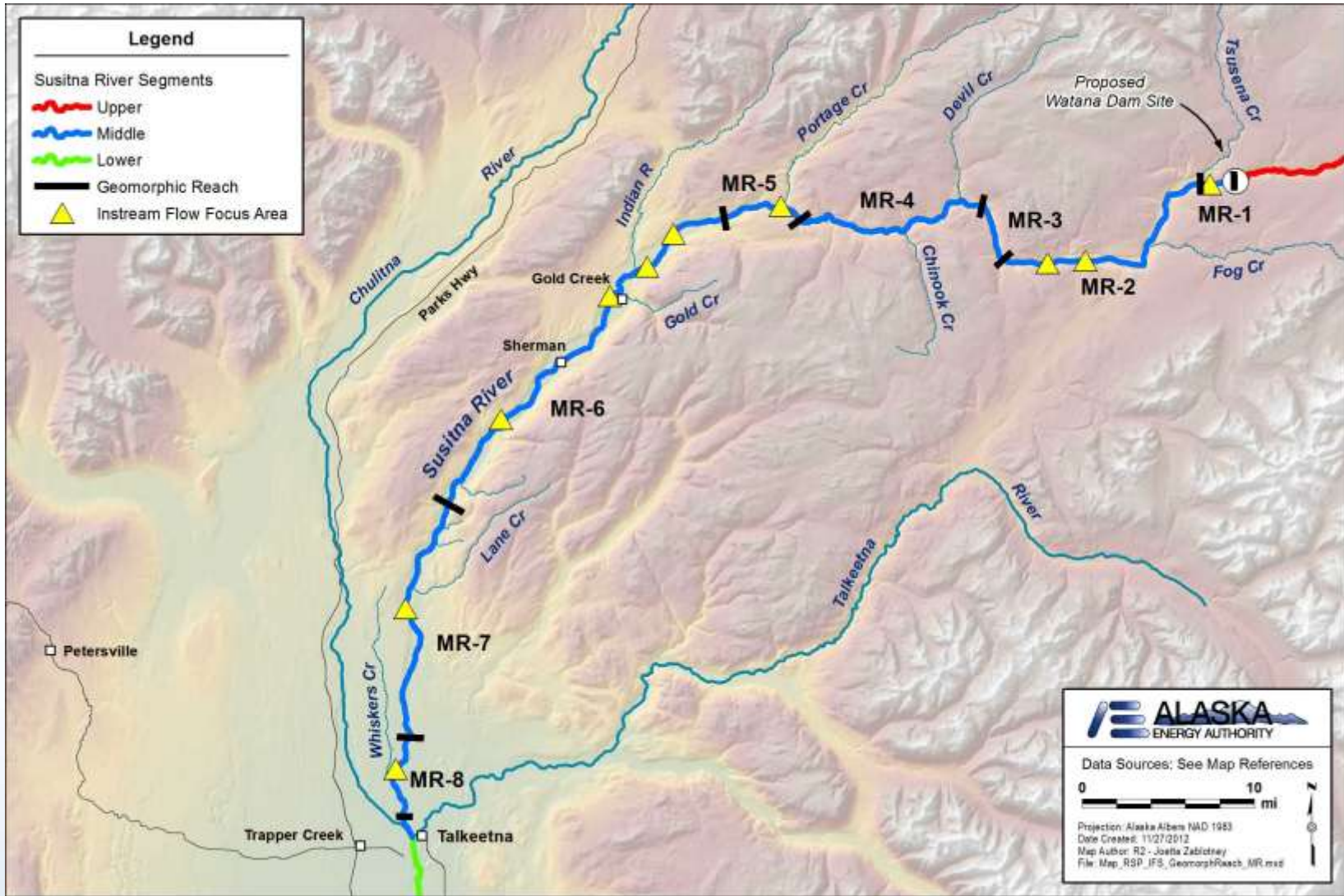


Selection Criteria for FAs

- Areas that are known (based on existing and contemporary data) to be biologically important for salmon spawning/rearing in mainstem and lateral habitats will be sampled (i.e., critical areas).
- Some areas for which little or no fish use has been documented or for which information on fish use is lacking will also be sampled.



Focus Areas Identified in RSP



Focus Areas

See Maps in TM

Evaluating Focus Areas

– IFS Fish and Aquatics

- Habitat Data Compilation and Review
- Evaluation of Representativeness
 - Representation
 - Proportionality
 - Bias
- Testing of Random/Systematic Approach

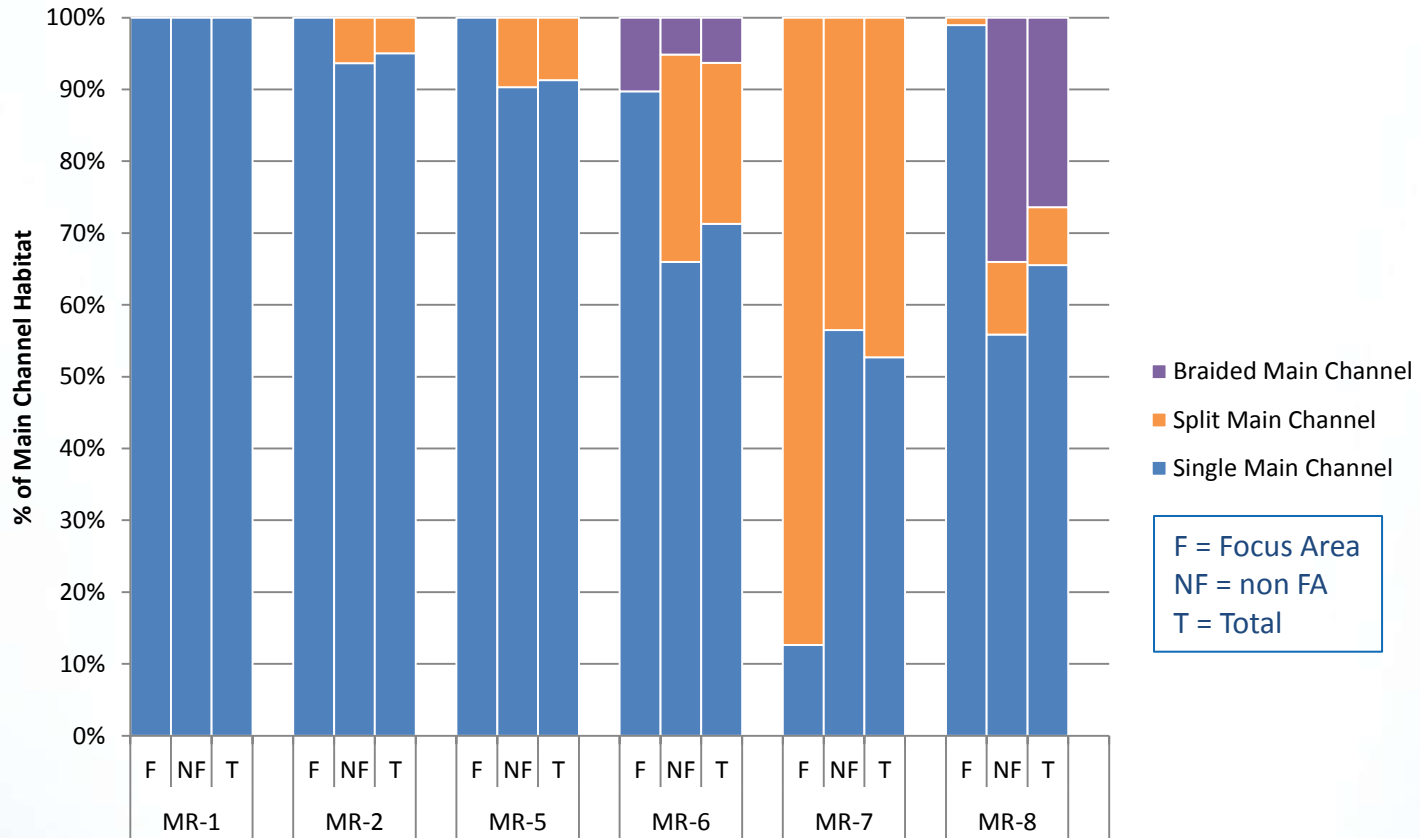


Metrics for Comparing Representation and Proportionality

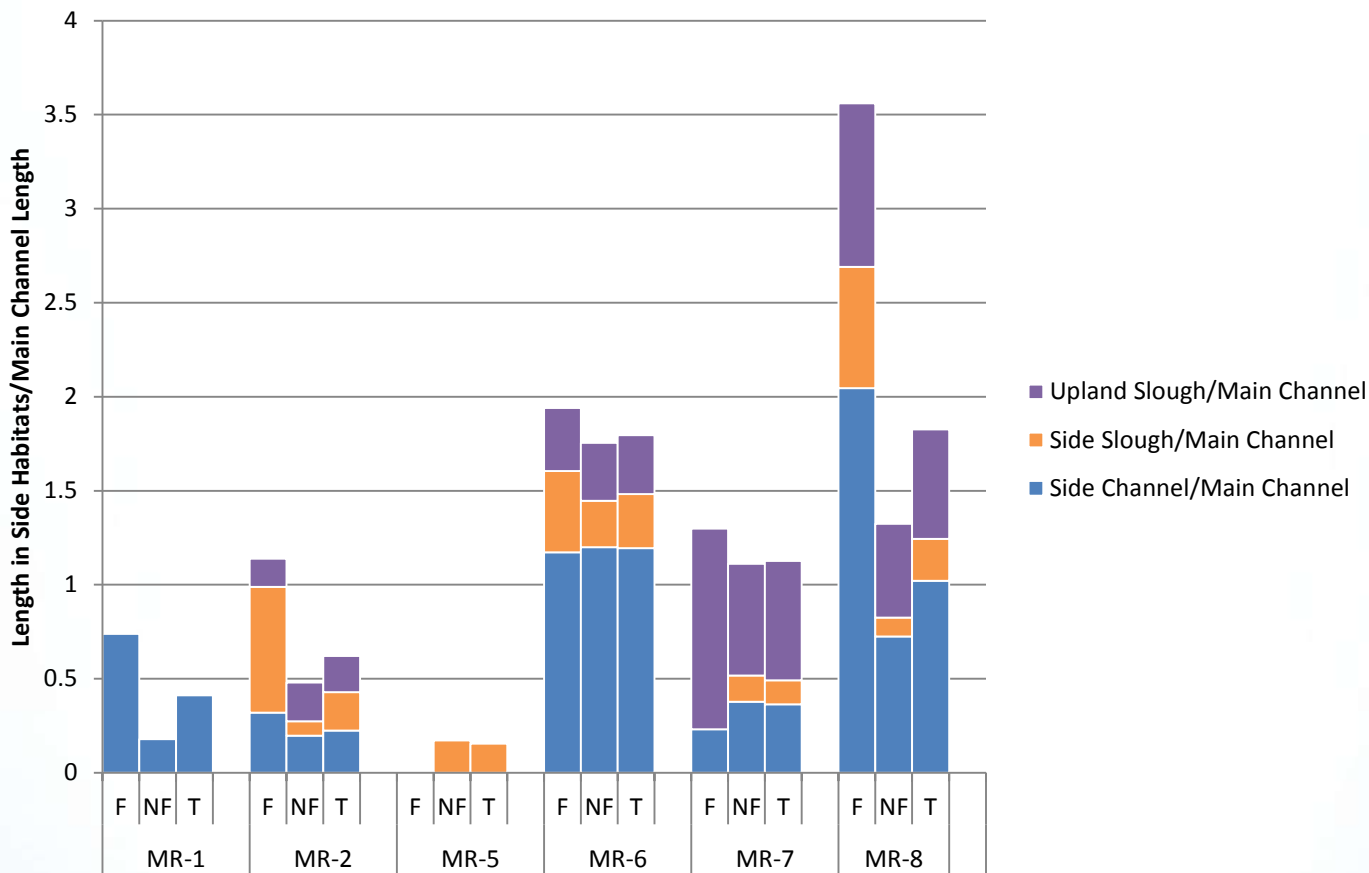
Level	Habitat Type	Comparison Metric	Numerator	Denominator
Macro-Habitat	Main Channel	Percent of main channel that is single unsplit main channel	Length of single main channel habitat (HDR)	Total length of main channel (thalweg, R2)
	Split Main Channel	Percent of main channel that is in split main channel	Length of main channel that is in split main channel (R2 calculated)	Total length of main channel (thalweg, R2)
	Braided Main Channel	Percent of main channel that is in braided main channel	Length of main channel that is in braided main channel (R2 calculated)	Total length of main channel (thalweg, R2)
	Side Channel	Side channel length per river mile	Total length of side channels (HDR)	Total length of main channel (thalweg, R2)
	Upland Slough	Upland slough length per river mile	Total length of upland slough habitat (HDR)	Total length of main channel (thalweg, R2)
	Side Slough	Side slough length per river mile	Total length of side channel habitat (HDR)	Total length of main channel (thalweg, R2)
	Backwater	density of backwaters (#/mile)	# backwaters (HDR)	Total length of main channel (thalweg, R2)
	Tributary	density of tributaries (#/mile)	# tributaries (HDR)	Total length of main channel (thalweg, R2)
	Tributary Mouth	density of tributary mouths (#/mile)	# Tributary Mouths (HDR)	Total length of main channel (thalweg, R2)
	Clear Water Plume	density of plumes (#/mile)	# plumes (HDR)	Total length of main channel (thalweg, R2)
Meso-Habitat	Glide or Run	Percent of main/side channel habitat in glide/run	Total length of glide or run (HDR)	Total length of main + side channel Habitat (HDR)
	Riffle	Percent of main/side channel habitat in riffle	Total length of riffle (HDR)	Total length of main + side channel habitat (HDR)
	Beaver Complex	Percent of slough habitat that is beaver complex	Total length of beaver complex habitat (HDR)	Total length of slough habitat (HDR)

Metrics allow comparisons of FAs to non-FAs in a standardized way

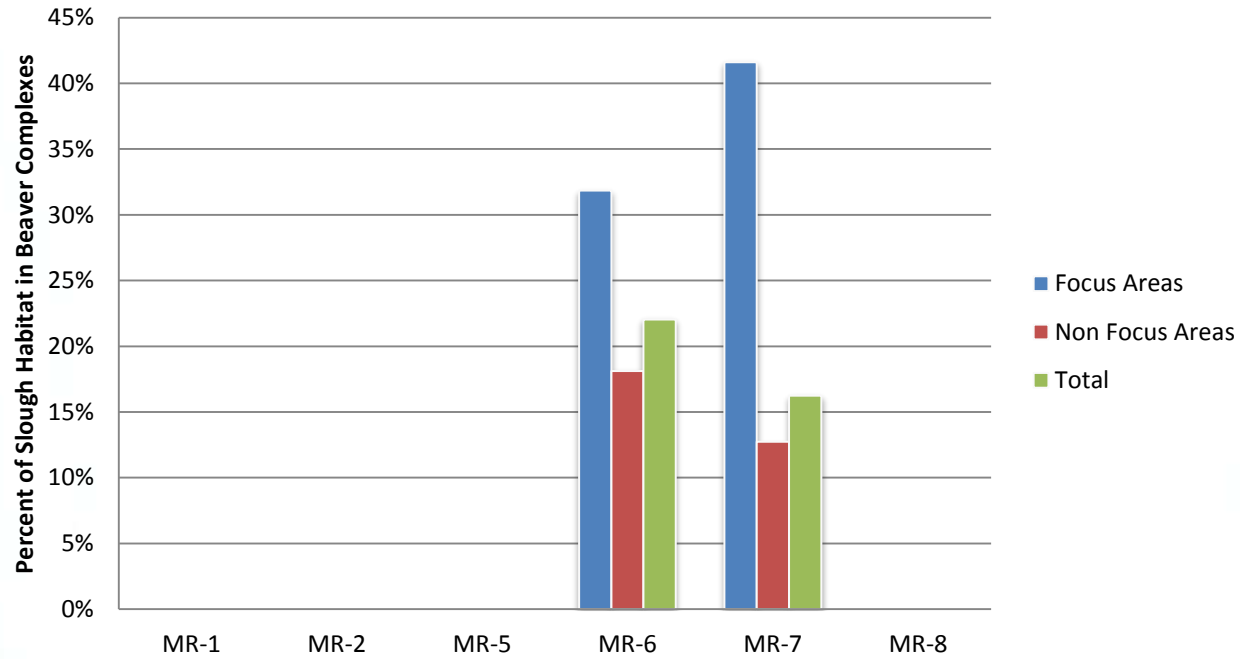
Evaluating Focus Areas: Main Channel Characteristics



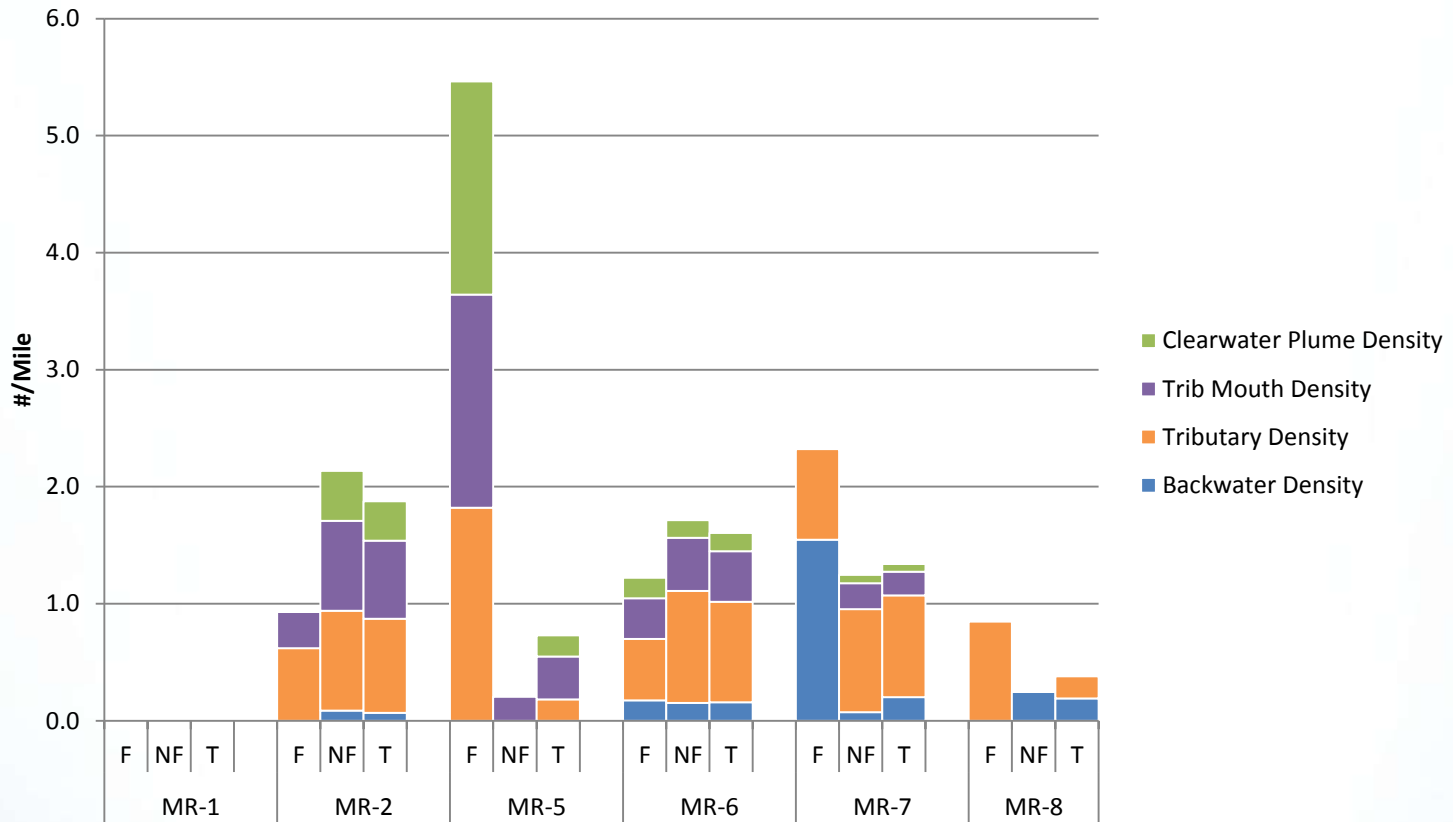
Evaluating Focus Areas: Side and Off-Channel Characteristics



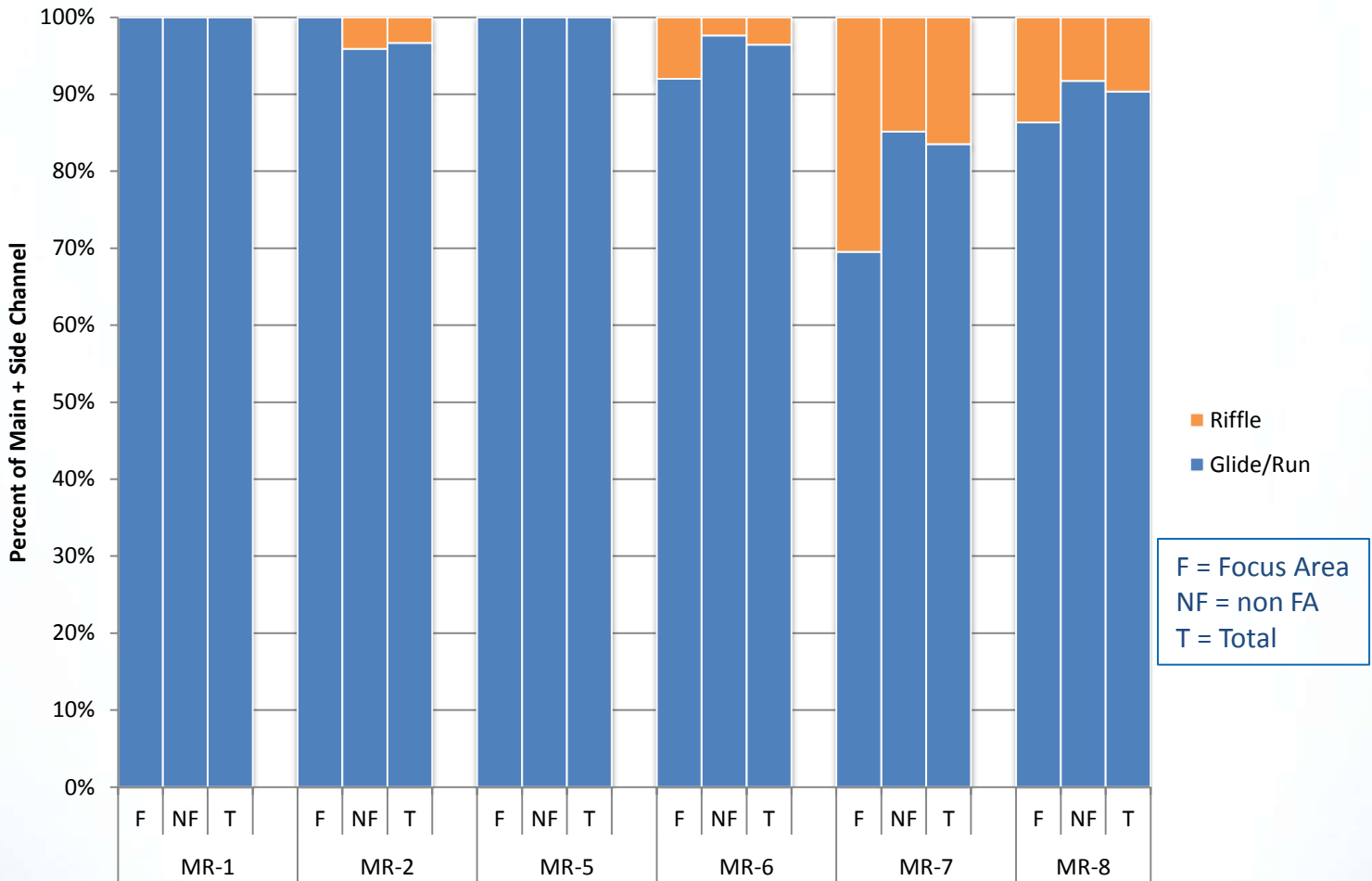
Evaluating Focus Areas: Beaver Complexes



Evaluating Focus Areas: Tributaries and Backwaters



Evaluating Focus Areas: Main and Side Channel Mesohabitat



Focus Area Conclusions – Representation and Proportionality

- Focus Areas are representative of areas and habitat types within the entire Middle River Segment
- Focus Areas are generally representative of areas and habitat types within each Geomorphic Reach
 - *with a few exceptions that may warrant selection of supplemental sites*
- Certain habitat types detected as part of the habitat mapping warrant special consideration – e.g. backwater and tributary plumes



What is Bias and How Determined

- Consistent under- or over- estimation of a known population parameter.
- Examined by considering the geomorphic reaches as independent replicates of potential bias
 - test if average bias is different from zero using a t-test or a non-parametric equivalent
 - *if the FAs selection has consistently under-represented upland sloughs, this analysis would highlight that result.*



Evaluation of Bias

	MR-1	MR-2	MR-5	MR-6	MR-7	MR-8	Average Bias	p-value
Main Channel		-5%	-8.7%	-18%	40%	-33%	-5%	0.70
Split Main		5%	8.7%	22.4%	-40%	7%	0.6%	0.63
Braided Main				-4.0%		26%	11%	n/a
Side Channel	-0.33	-0.10		0.021	0.13	-1.02	-0.26	0.28
Side Slough		-0.46	0.155	-0.14	0.13	-0.42	-0.15	0.32
Upland Slough		0.04		-0.02	-0.43	-0.29	-0.1740	0.22
Backwaters		0.07		-0.018	-1.35	0.19	-0.28	1.00
Tributaries		0.18	-1.64	0.337	0.10	-0.66	-0.34	0.41
Tributary Mouth		0.36	-1.46	0.081	0.20		-0.20	0.88
Clear Water Plumes		0.33	-1.64	-0.018	0.07		-0.31	1.00
Beaver Complex				-9.8%	-25%		-18%	n/a
Glides/Runs		-3.3%		4.43%	14.0%	4.0%	4.8%	0.27
Riffles		3.3%		-4.43%	-14.0%	-4.0%	-4.8%	0.27

No systematic bias detected

- Systematic bias in terms of the FAs selected and the habitat types they contain was not detected.



Would a Random Sample Do Better?

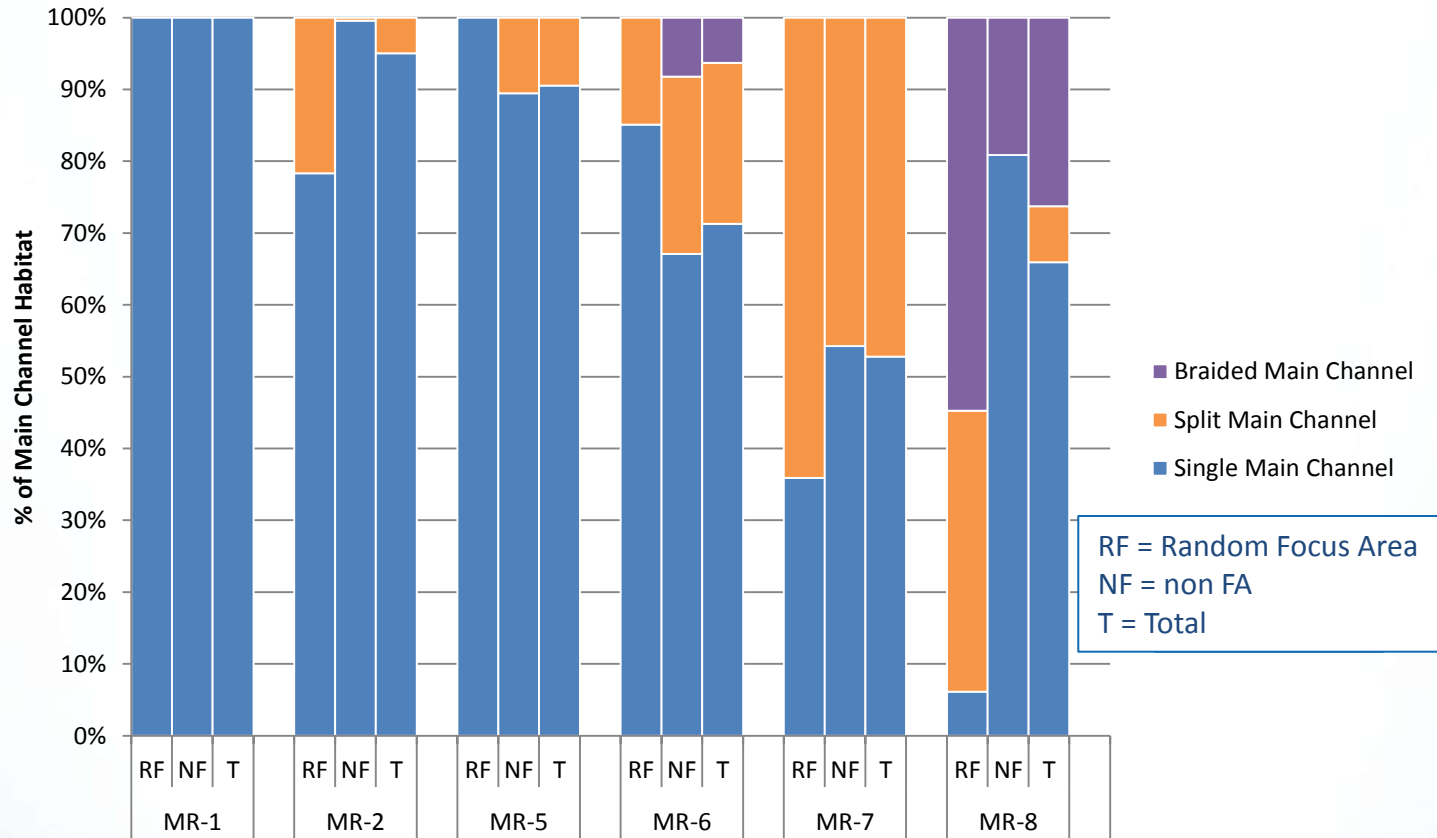
- Select a systematic random sample of focus areas within geomorphic reaches with same overall length
- Examine them in the same way as shown above



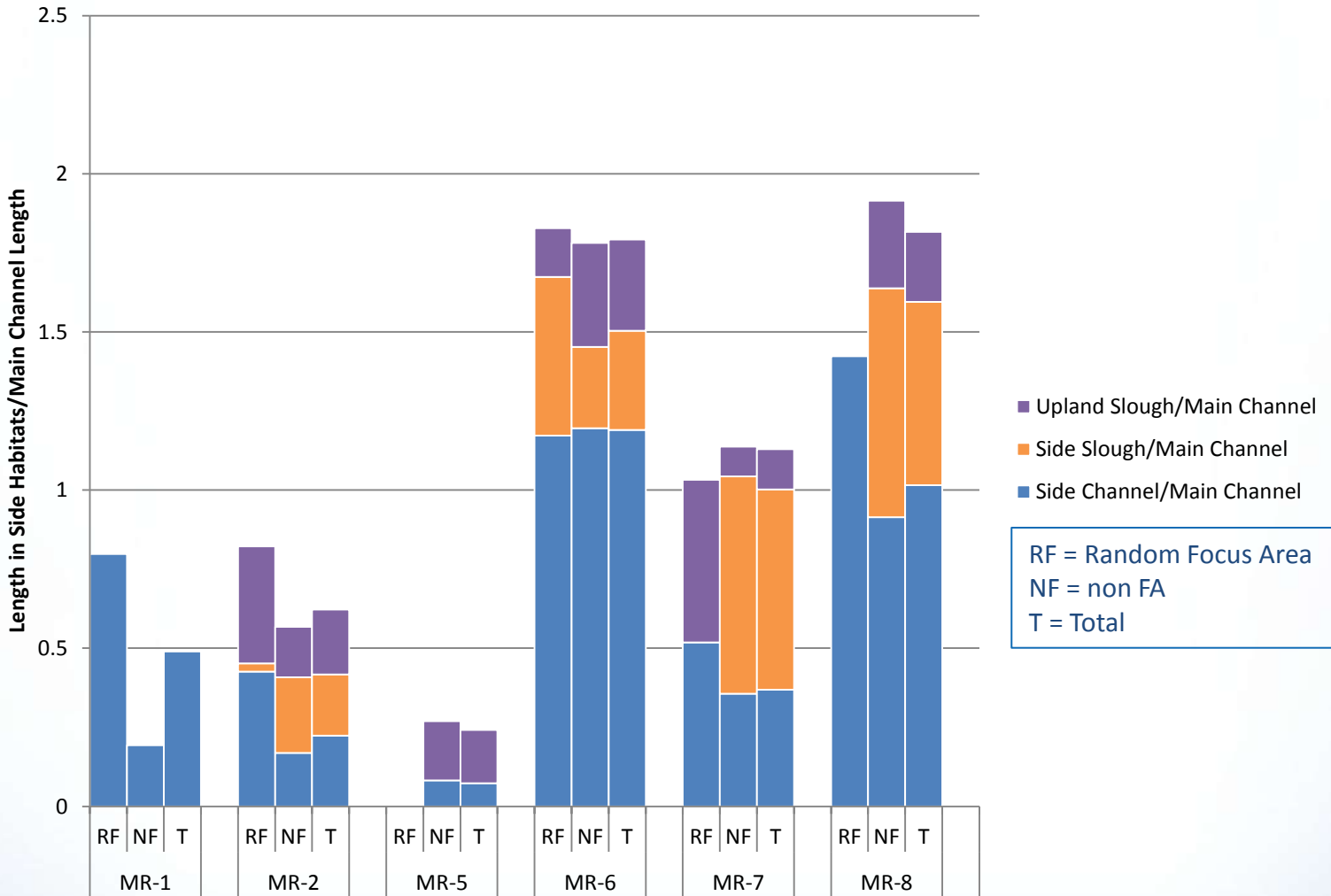
Systematic Random Sample

Geomorphic Reach	Geomorphic Reach			Current Focus Area			Random Focus Area		
	Start	End	Length	Start	End	Length	Start	End	Length
MR-1	187.1	184.6	2.5	185.7	184.7	1	186.2	185.2	1
MR-2	184.6	169.6	15	175.4	173.6	1.8	181.4	179.8	1.6
				173	171.6	1.4	175.0	173.4	1.6
MR-5	153.9	148.4	5.5	152.3	151.8	0.5	152.8	152.3	0.5
MR-6	148.4	122.7	25.7	145.7	144.4	1.3	146.8	145.3	1.5
				143.4	141.8	1.6	140.8	139.3	1.5
				140	138.7	1.3	134.8	133.3	1.5
				129.7	128.1	1.6	128.8	127.3	1.5
MR-7	122.7	107.8	14.9	116.5	115.3	1.2	117.8	116.6	1.2
MR-8	107.8	102.4	5.4	106	104.8	1.2	104.9	103.7	1.2

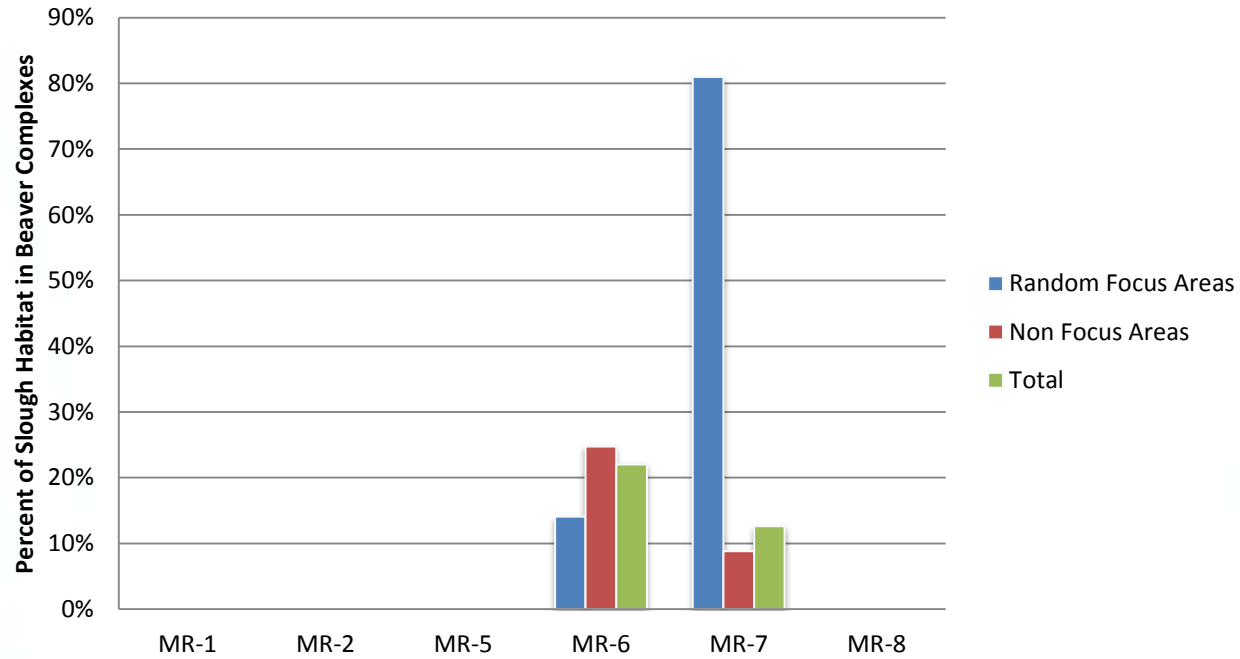
Evaluating Focus Areas: Main Channel Characteristics



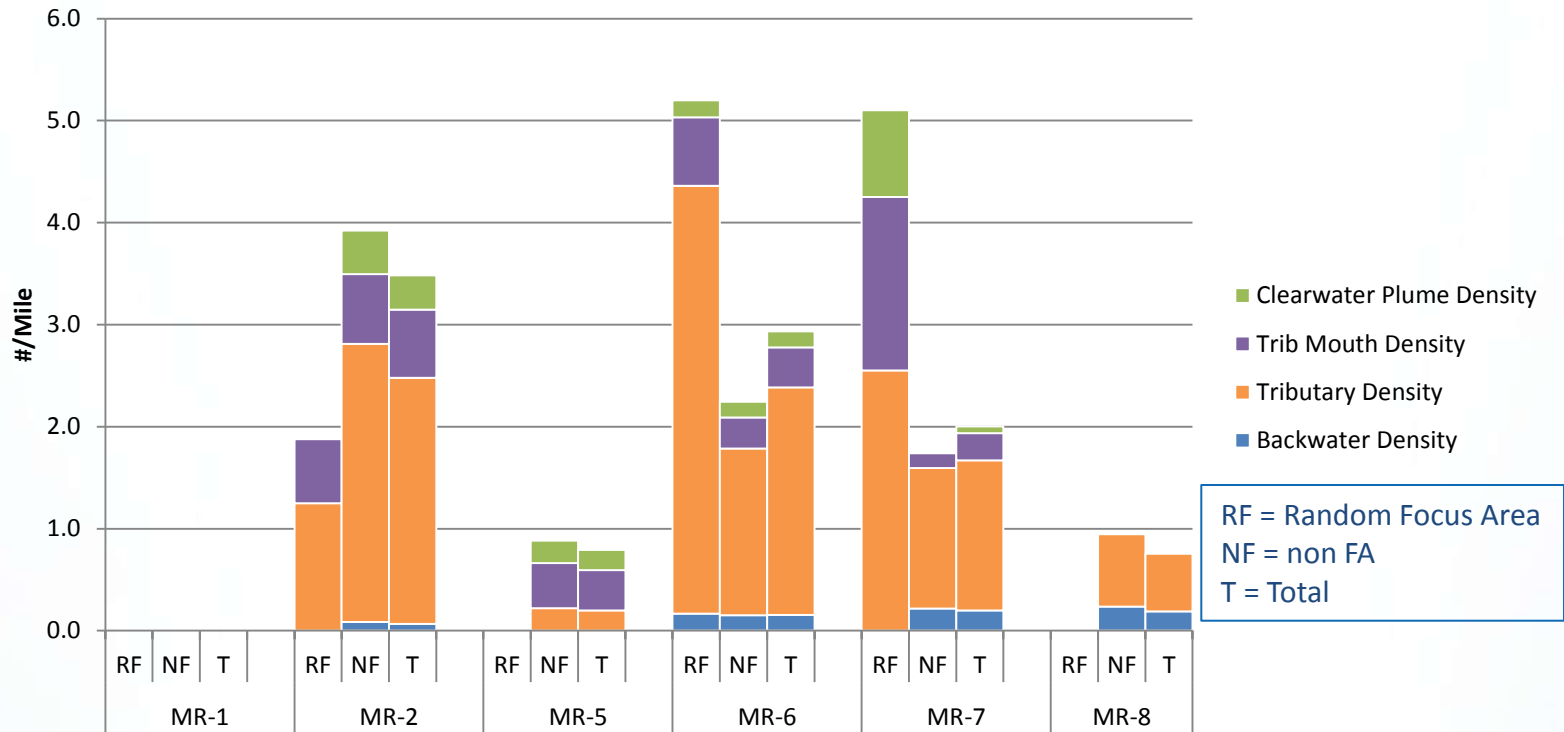
Evaluating Focus Areas: Side and Off-Channel Characteristics



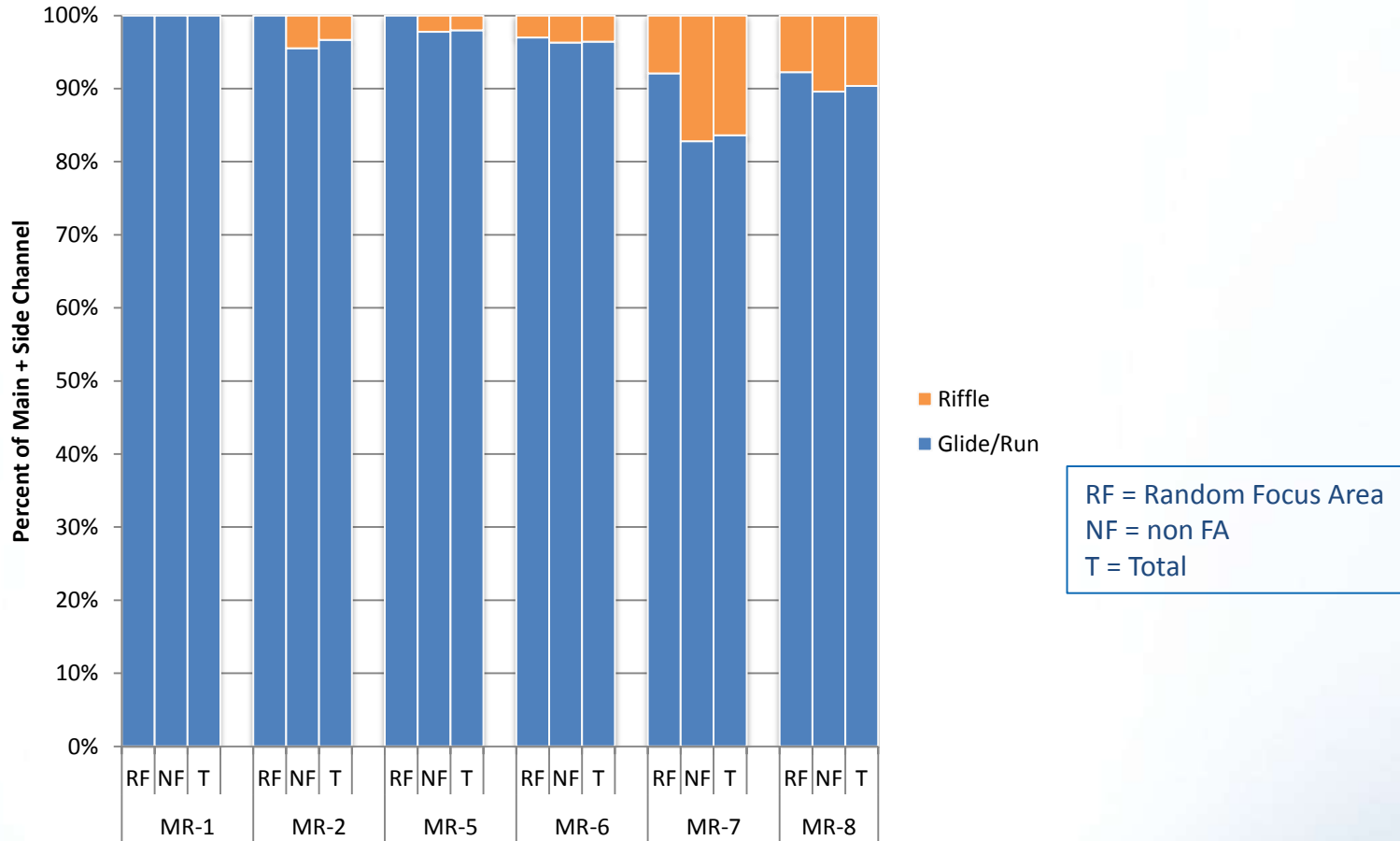
Evaluating Focus Areas: Beaver Complexes



Evaluating Focus Areas: Tributaries and Backwaters



Evaluating Focus Areas: Main and Side Channel Mesohabitat



Focus Area Conclusions – Comparison to Random Sample

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- Random systematic sample misses habitats and over- or under-represents some habitats
- Random sample would likely miss critical areas
- Random sample draws dividing lines through major habitat units



Evaluation of Bias

	MR-1			MR-2			MR-5			MR-6			MR-7			MR-8		
Habitat	FA	CS	NEED	FA	CS	NEED	FA	CS	NEED	FA	CS	NEED	FA	CS	NEED	FA	CS	NEED
Main Channel	X			X			X			X			X			X		
Split Main Channel	n/a					X			X		X		X			X		
Braided Main Channel	n/a			n/a			n/a			X			n/a				X	
Side Channel	X			X			n/a			X			X			X		
Side Slough	n/a			X					X					X		X		
Upland Slough	n/a			X			n/a			X			X			X		
Beaver Complex	n/a			n/a			n/a			X			X			X		
Backwater	n/a					X	n/a			X			X					X
Tributary	n/a			X			X			X			X			X		
Tributary Mouth	n/a			X			X			X					X	n/a		
Clear Water Plume	n/a				X		X			X					X	n/a		

FA = Represented in Focus Area

CS = Captured with Non-Focus Area Transects

NEED = Will be added

Focus Area Conclusions

- Focus Areas identified in IFS RSP should be studied in 2013 as part of Joint Resource Investigations:
 - Focus Area 184
 - Focus Area 173
 - Focus Area 171
 - Focus Area 151
 - Focus Area 144
 - Focus Area 141
 - Focus Area 138
 - Focus Area 128
 - Focus Area 115
 - Focus Area 104
- Supplemental sites outside of the FAs will be added as needed to ensure capture of FA habitat types as well as special habitats

Focus Area Conclusions

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- Review data and information from 2013 studies; and
- Refine, modify or add supplemental areas in Middle River Segment in 2014

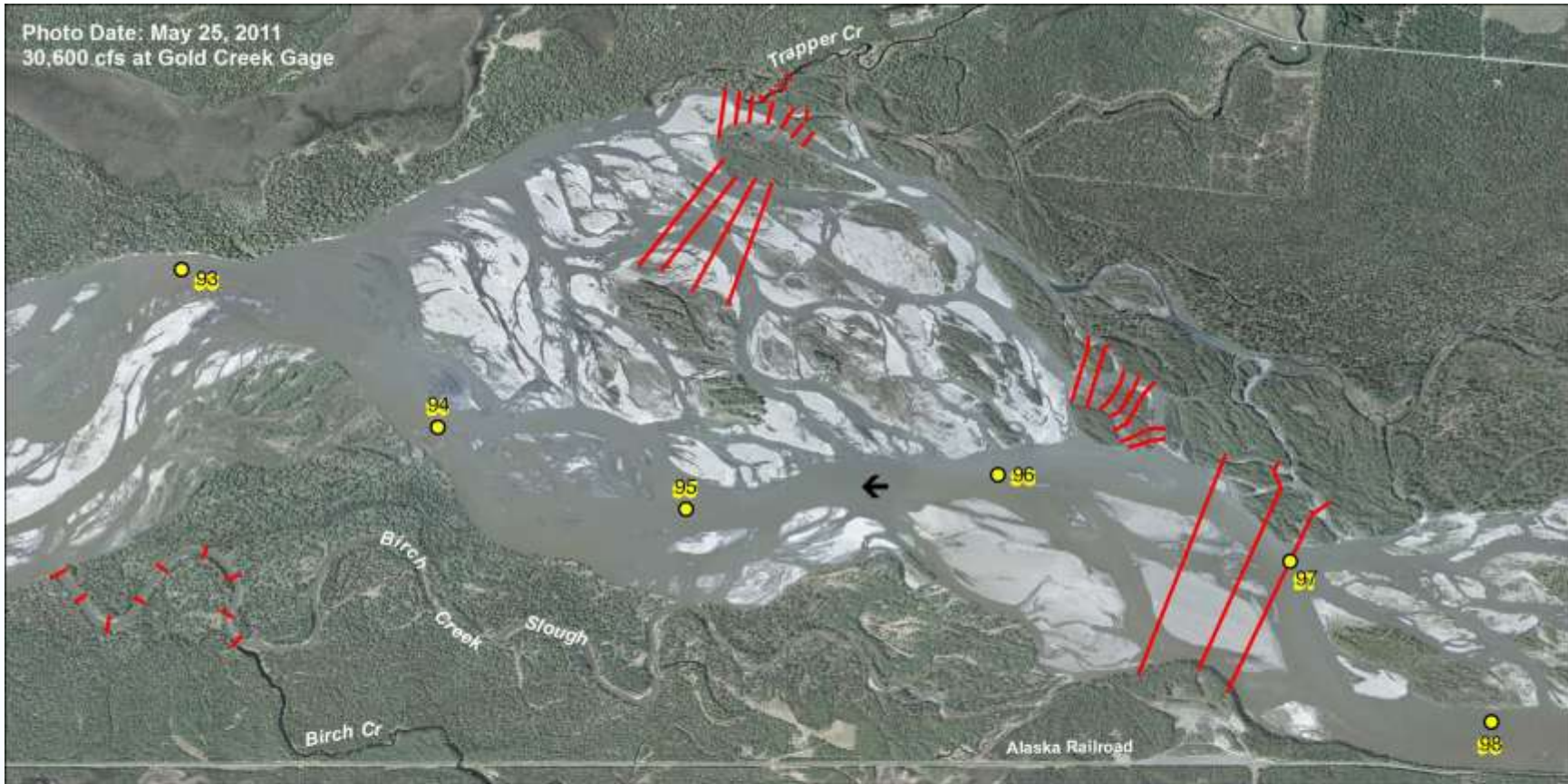


IFS Fish and Aquatics Study Site Selection in Lower River Segment

- 2D modeling of entire Focus Area NOT applicable
- Representative/Critical Habitat Approach
 - Identify key mainstem habitat types based on both habitat data and historic and contemporary fish utilization data
 - Tributary mouths
 - Side sloughs
 - Side channels
 - Single/split/braid main channels
 - Concentrate 2013 efforts on upper portion of Lower Segment - develop habitat-flow relationships at selected habitat units.



Photo Date: May 25, 2011
30,600 cfs at Gold Creek Gage



Legend

- Instream Flow Study Transect
- Flow Arrow
- Project River Mile



Projection: Alaska Albers NAD 1983
Date Created: 2/7/2013
Map Author: R2 - Joetta Zabolney
File: Map_TM_IFS_FocusAreas_LR.mxd



Orthophoto Source: 2011 Matanuska-Susitna Borough LIDAR & Imagery Project

IFS Fish and Aquatics Study Site Selection in Lower River Segment cont.

- Complete habitat mapping exercise of Lower River at beginning of Q3 2013
- Collect new data from Lower River in 2013 (fish, geomorphology, habitat mapping, habitat modeling)
- Refine study area selection process for Lower River and review with TWG at end of Q3 2013
- Finalize Lower River Study Areas – Q4 2013
- Complete IFS Lower River Studies - 2014

