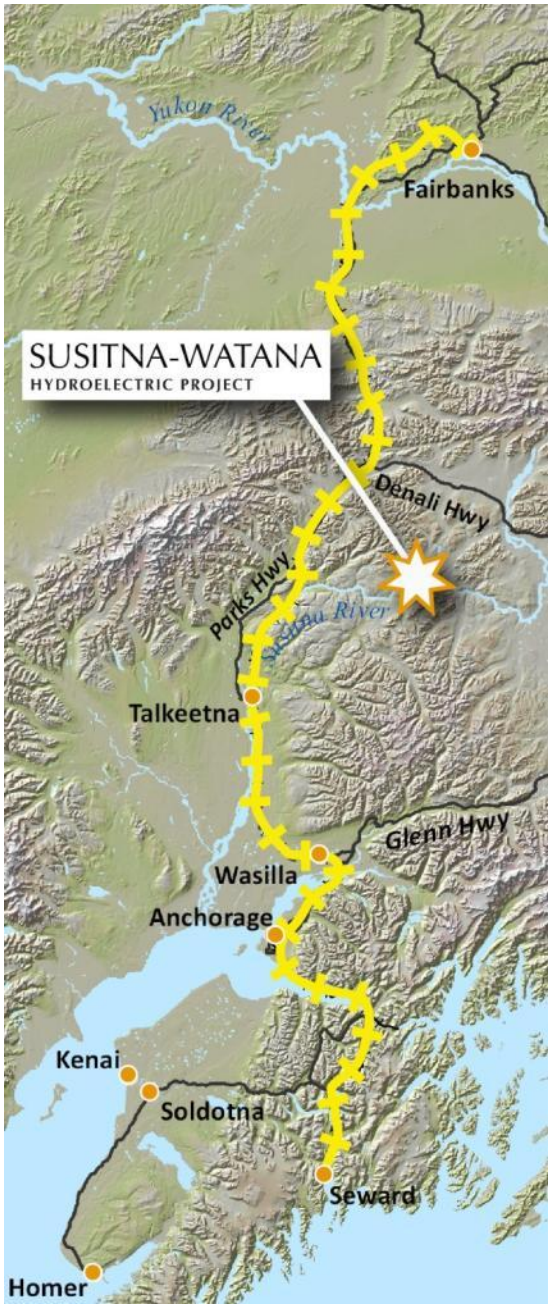


SUSITNA-WATANA
HYDROELECTRIC PROJECT

Technical WorkGroup Meeting
Instream Flow-Fish

September 14, 2012

Prepared by R2 Resource Consultants

ALASKA ENERGY AUTHORITY

Representative Reach

Single-thread channel (Hierarchical Framework)

- Segment the study area by hydrologic input
- Segment the hydrologic reaches based on geomorphic factors
- Segment geomorphic reaches by major habitat units
- Segment the habitat units by pool/riffle if appropriate

Representative Reach

Single-thread channel

- Calculation of geomorphic variables/ channel features
  - Confinement-entrenchment ratio
  - Channel slope
  - Wetted channel width
  - Cross-sectional geometry
  - Dominant substrate
  - Mean velocity
- Typically continuous subsegments

Representative Reach

Single-thread channel

- Proportional length extrapolation
- Sampling design can include replicates of major features to reflect habitat variability
- modeled habitat:flow relationships are characteristic of non-modeled sites

Representative Reach

Multiple-thread channel

- Hierarchical framework (segment by hydrology, then geomorphology, then habitat unit)
- Mapping of mesohabitat units at multiple flows
- Calculate morphologic variables/ channel features of habitat units
  - Breaching flow
  - Channel slope
  - Wetted channel width
  - Cross-sectional geometry
  - Groundwater/open winter leads
  - Dominant substrate
  - Aquatic vegetation/cover

Representative Reach

Multiple-thread channel

- Discontinuous mesohabitat units
- Sampling design to replicate major mesohabitat types based on habitat variability
- Proportional area extrapolation
- Extrapolation from modeled habitat units to non-modeled units using calculated habitat availability index
  - Breaching flow adjustment
  - Structural habitat quality adjustment *(adapted from Aaserude et al. 1985)*
    1. *groundwater contribution*
    2. *substrate size/embeddedness*
    3. *dominant cover and percent cover*

Critical Sites

- Habitat units that are highly affected/sensitive to changes in flow
- Highly important biologically (i.e., limiting a particular lifestage)
- Assumes that Project effects to non-modeled sites and habitats are secondary to critical sites
- Requires modeling of the full range of sites/habitat units to address Project effects after critical sites protected

Susitna IFS Site Selection Process

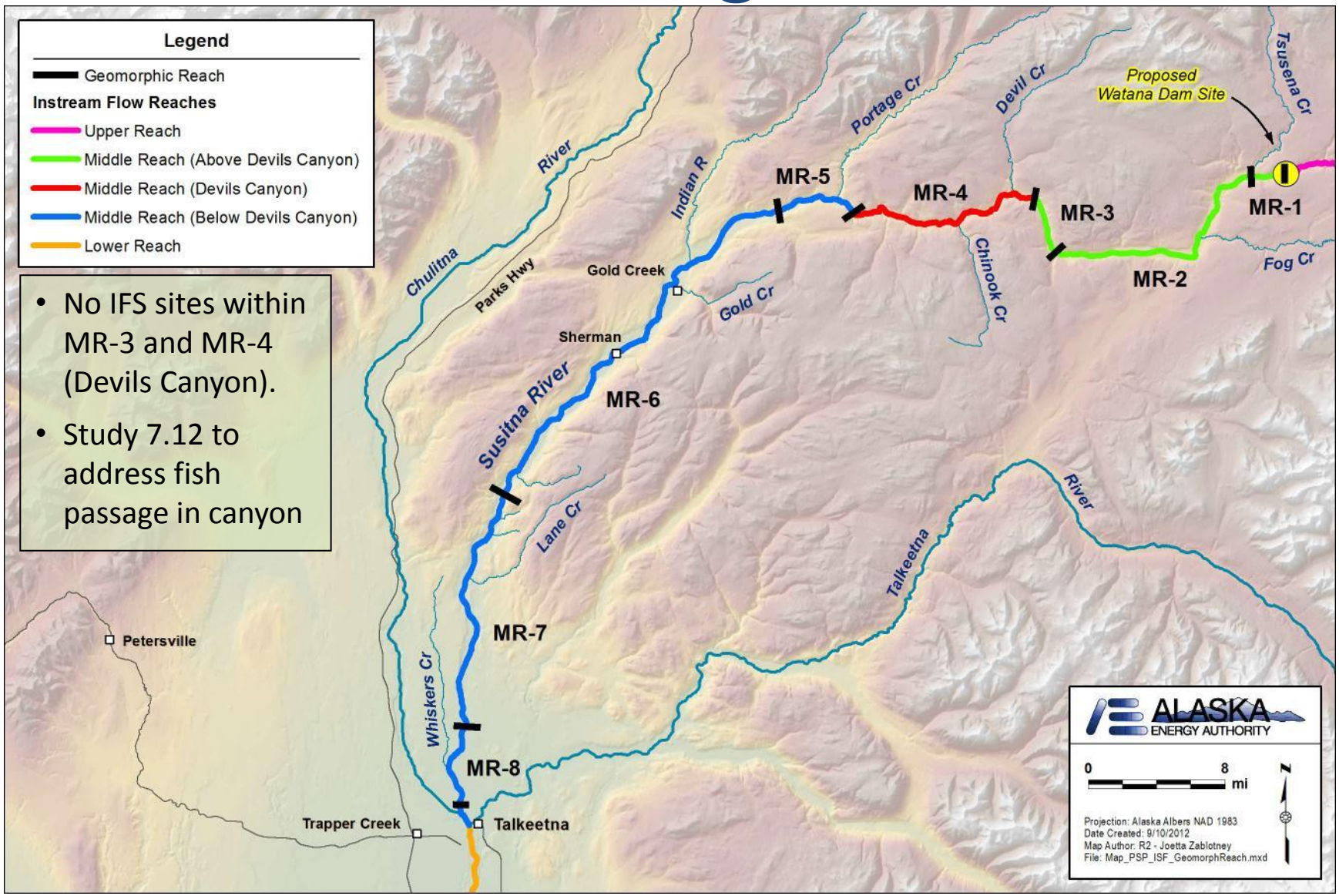
- Identify potential intensive sites for planning purposes (Sep 2012)
- Use mapping results to evaluate habitat variability, conduct statistical power analysis, refine intensive sites and identify supplementary sites (Dec 2012)
- TWG confirmation of sites (Feb/Mar 2013)
- Collect data during summer 2013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

Susitna Instream Flow-Fish Site Selection Criteria

- All major habitat types sampled within each geomorphic reach
- At least one intensive site per geomorphic reach
- Replicate sampling strategy for habitat types
- Include biologically important salmon spawning/rearing sites in mainstem and lateral habitats
- Trib deltas included as habitat unit
- Incorporate multiple study elements

"NO SINGLE PREFERRED METHOD EXISTS FOR SELECTION OF STUDY SITES" (WADDLE 2001)

Reach Designations

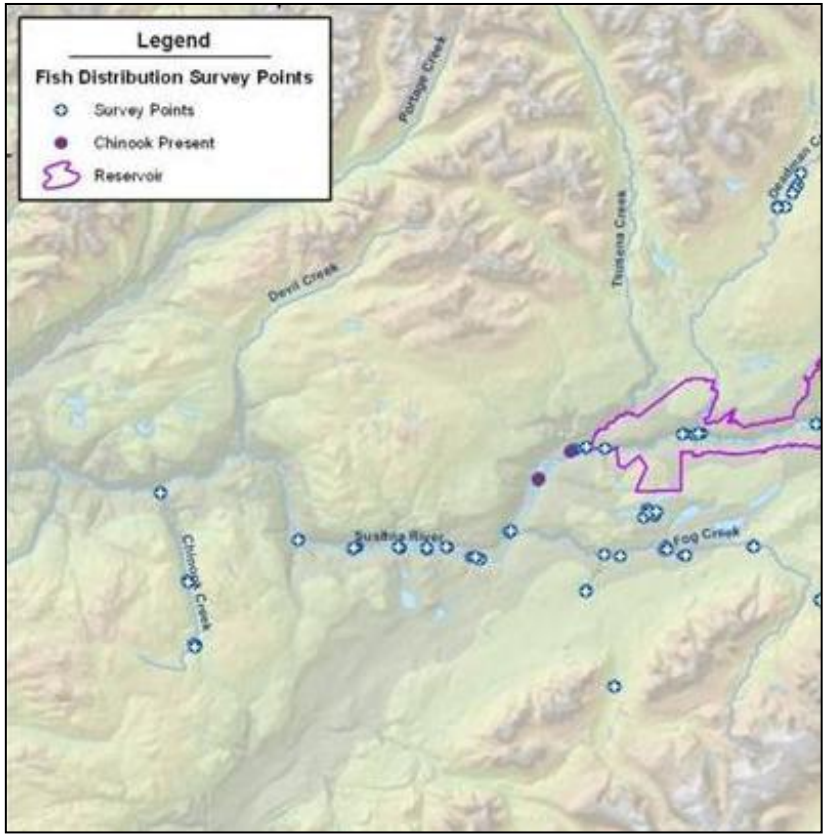


SUSITNA-WATANA HYDROELECTRIC PROJECT

Site Selection

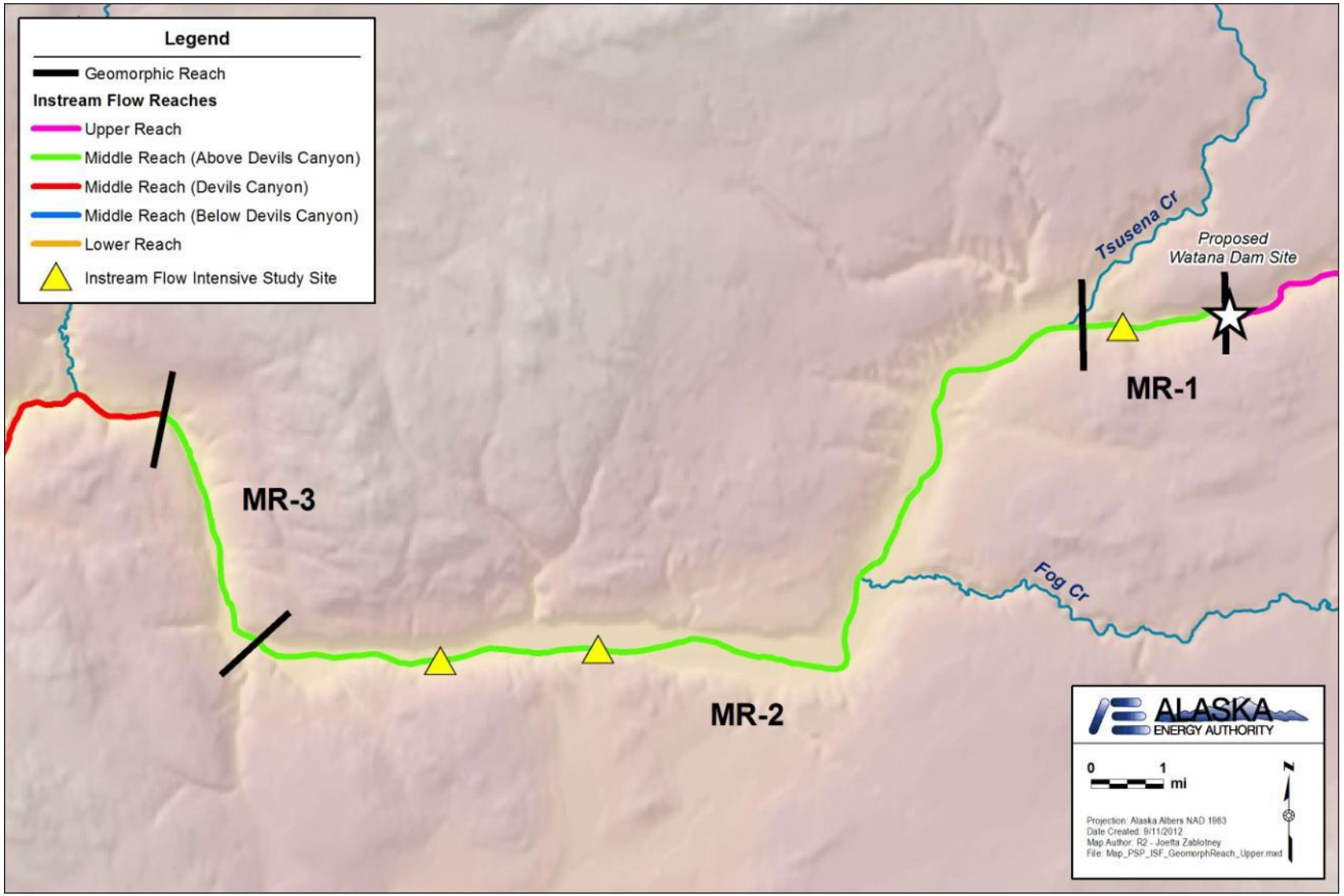
Watana Dam Site (RM 184) to Devils Canyon (RM 166.5)

- Potential intensive sites identified for planning purposes
- 1980s provided little fish data since it was an inundation area
- 2012 fish sampling sites
- Additional fish sampling sites planned 2013-2014
- Video and habitat mapping September 13-15, 2012



SUSITNA-WATANA
HYDROELECTRIC PROJECT

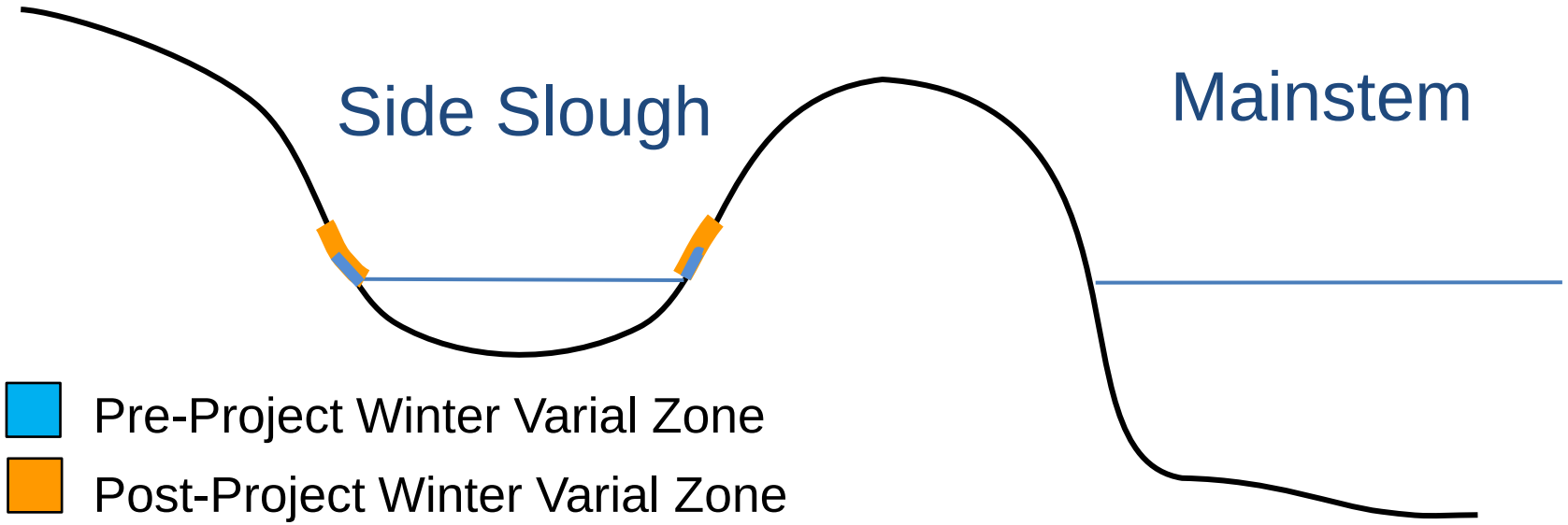
Watana Dam Site (RM 184) to Devils Canyon (RM 166.5)



SUSITNA-WATANA
HYDROELECTRIC PROJECT

Site Selection
Watana Dam Site (RM 184) to Devils Canyon (RM 166.5)

Use GIS platform to review the reach and potential sites



Load-following effects on:

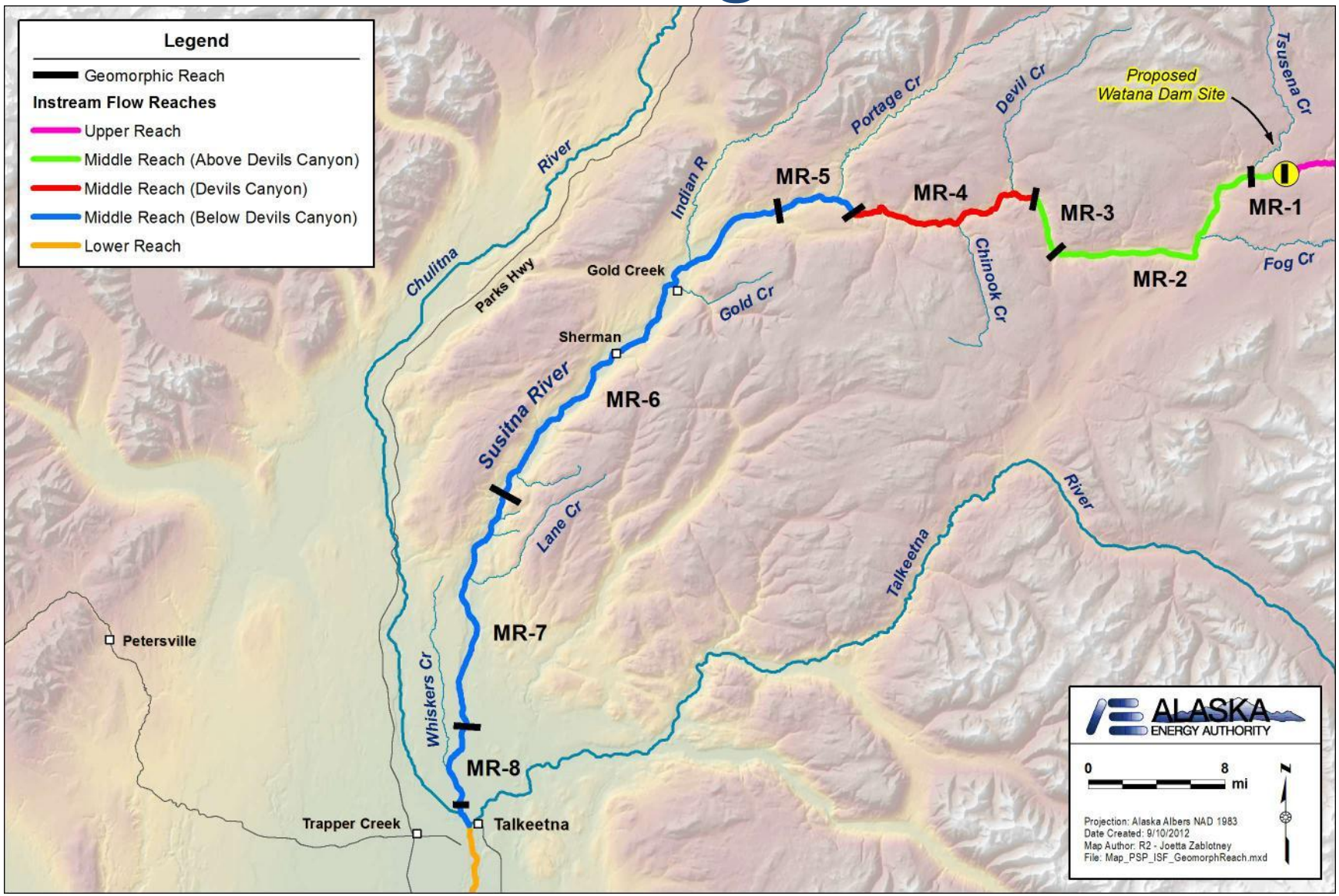
- **magnitude, frequency, timing and duration of dewatering / inundation**
- **varial zone ice formation**
- **groundwater / surface water interactions**
- **slough and intergravel temperatures**
- **stranding/trapping**

SUSITNA-WATANA
HYDROELECTRIC PROJECT

Site Selection
Watana Dam Site (RM 184) to Devils Canyon (RM 166.5)

Break for lunch

Reach Designations



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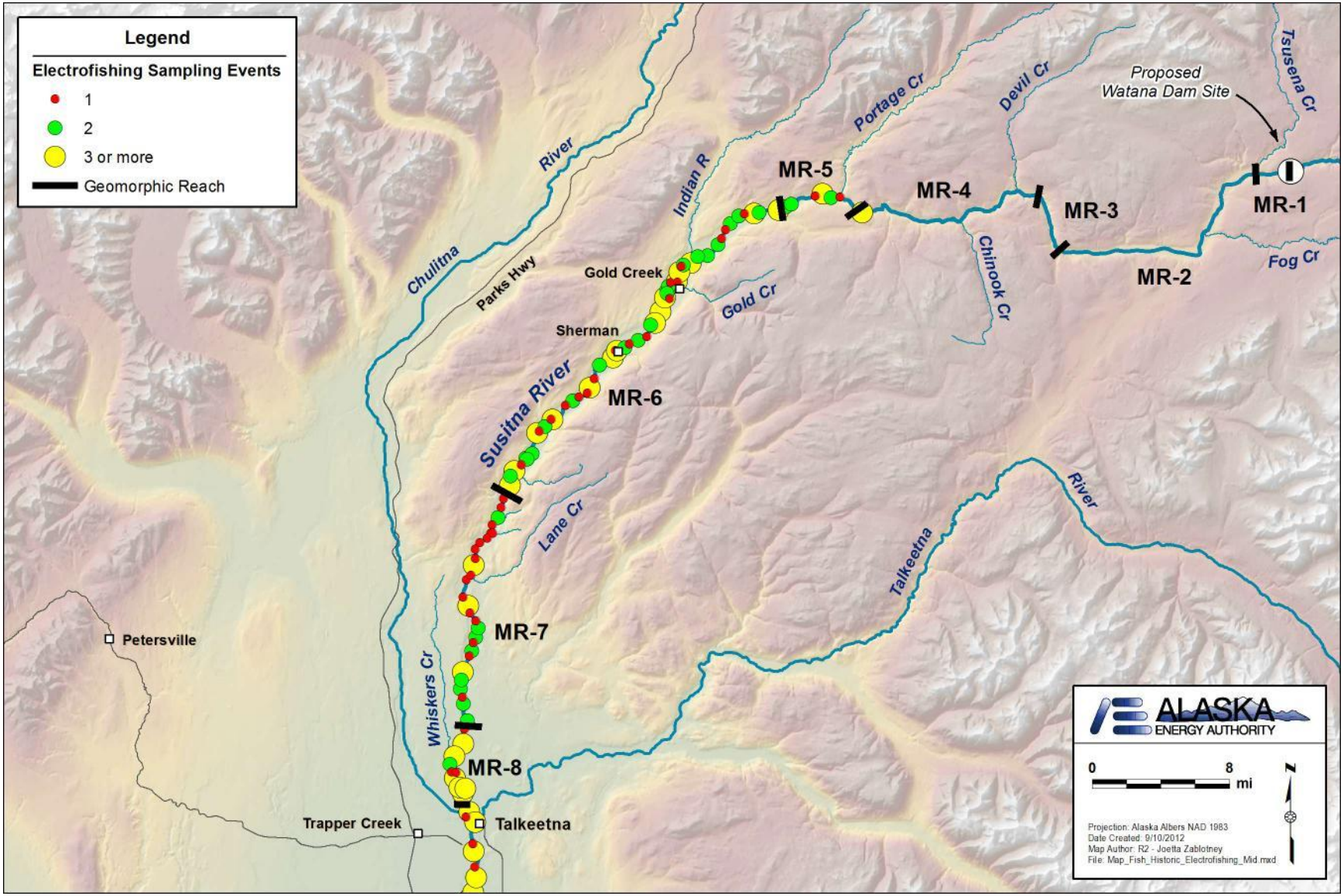
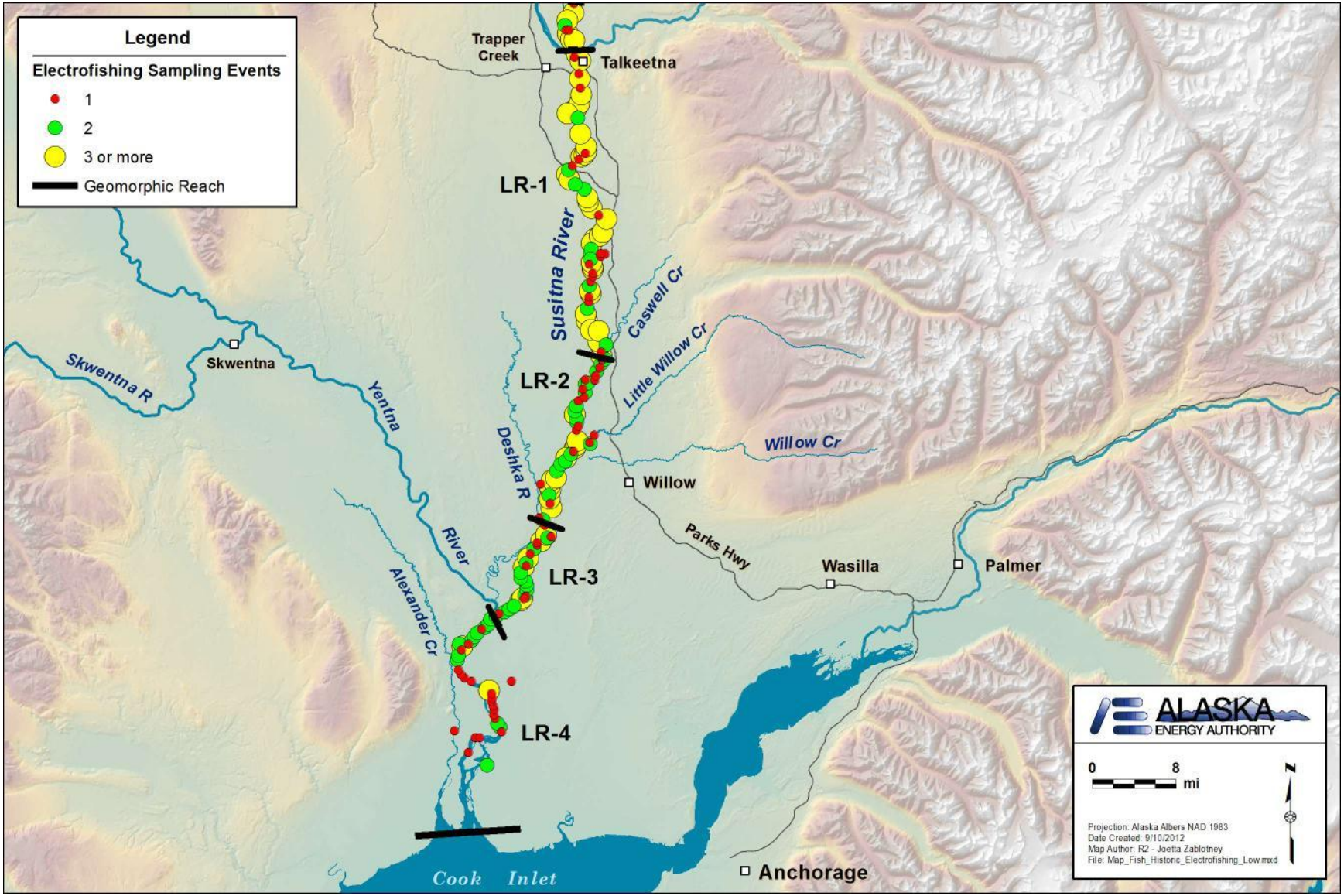
HYDROELECTRIC PROJECT

1982 Electrofishing Efforts



SUSITNA-WATANA
HYDROELECTRIC PROJECT

1982 Electrofishing Efforts



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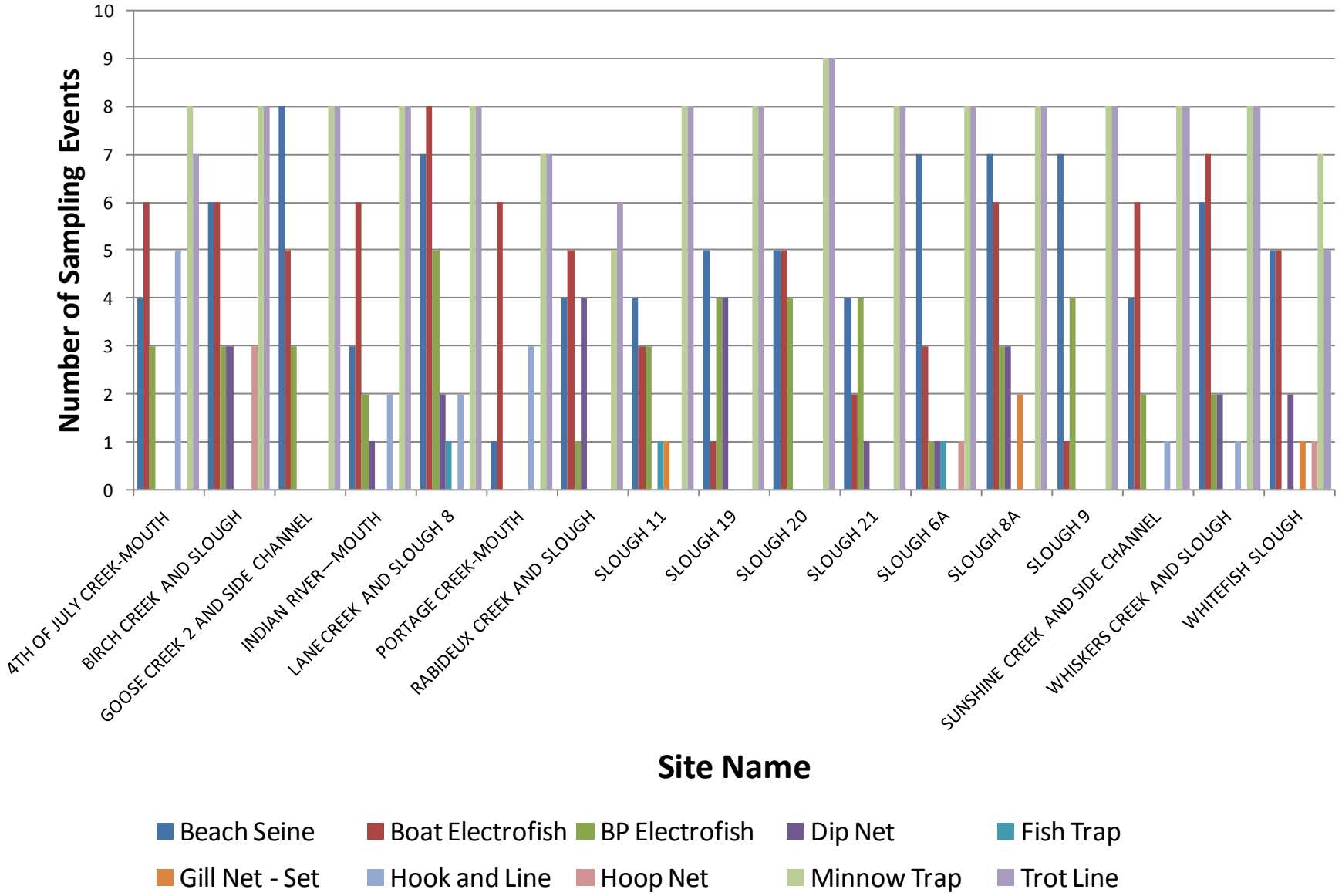
HYDROELECTRIC PROJECT

1982 Sampling at Designated Fish Habitat Sites

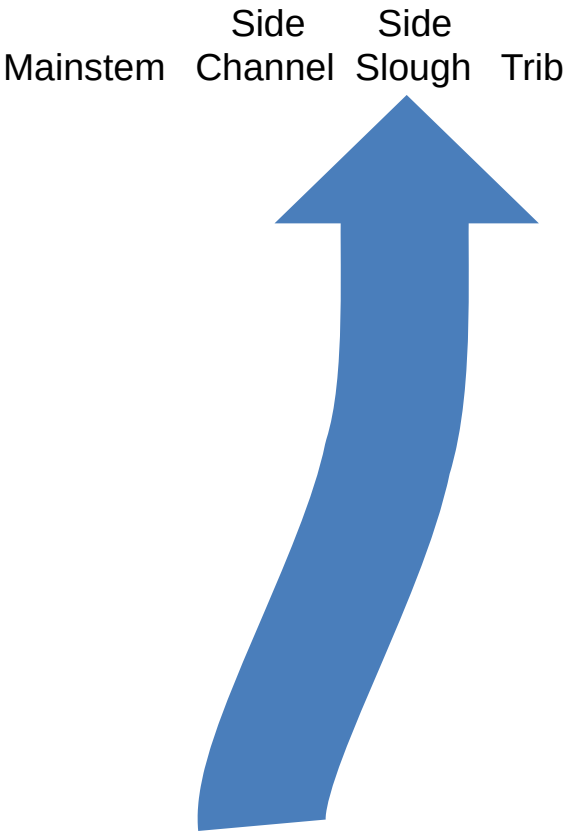


SUSITNA-WATANA
HYDROELECTRIC PROJECT

Sockeye

Observations from the 1980s

- Almost no mainstem spawning in 1981 or 1982
- 92% of sockeye spawned in sloughs 11, 8A, 21, and 9. More than 70% in slough 11.
- Fry leave the river in their first summer or rear in upland sloughs (connected to the mainstem at high flows).



Sockeye
2,400
1981-1984 Average

(Distribution adapted from Estes and Vincent-Lang 1984, escapement from Barrett et a. 1985, compiled by W. Trihey)

Chum

Observations from the 1980s

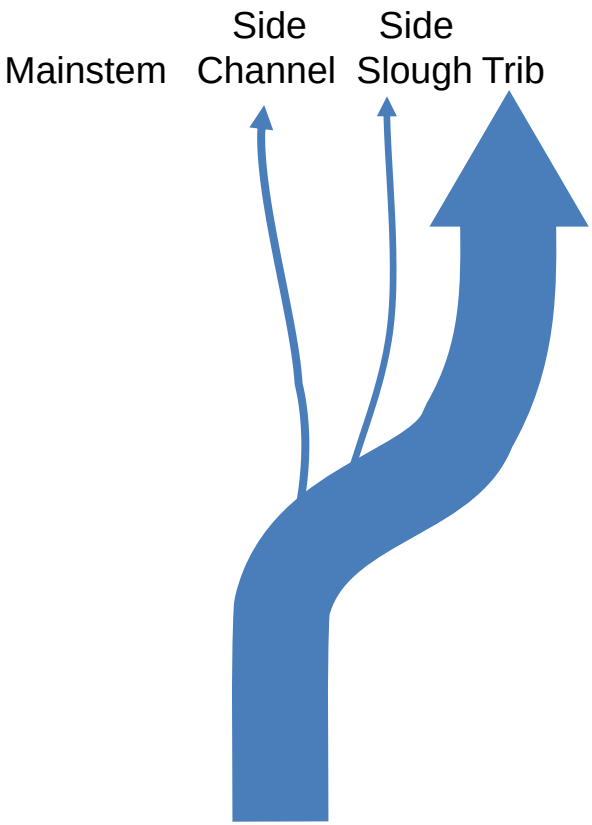
- Spawn in or near upwelling, using sloughs or tribs, with a small fraction using mainstem.
- 70% of slough spawning chum occurred in sloughs 21, 9, 11, and 8A.
- Fry emerge in April-May and rear through late June.

Chum
28,000
1981 - 1984 Average

Pink

Observations from the 1980s

- Most pinks spawn in tribs; although a small number spawn in about 10 different sloughs
- By decreasing density - sloughs 11, 15, 21, 20, 6A, 8B, 8A, and 9.
- 44 % of the slough spawning pink were in 11, 21, 8A and 9.
- Fry emerge April to June and immediately migrate downstream



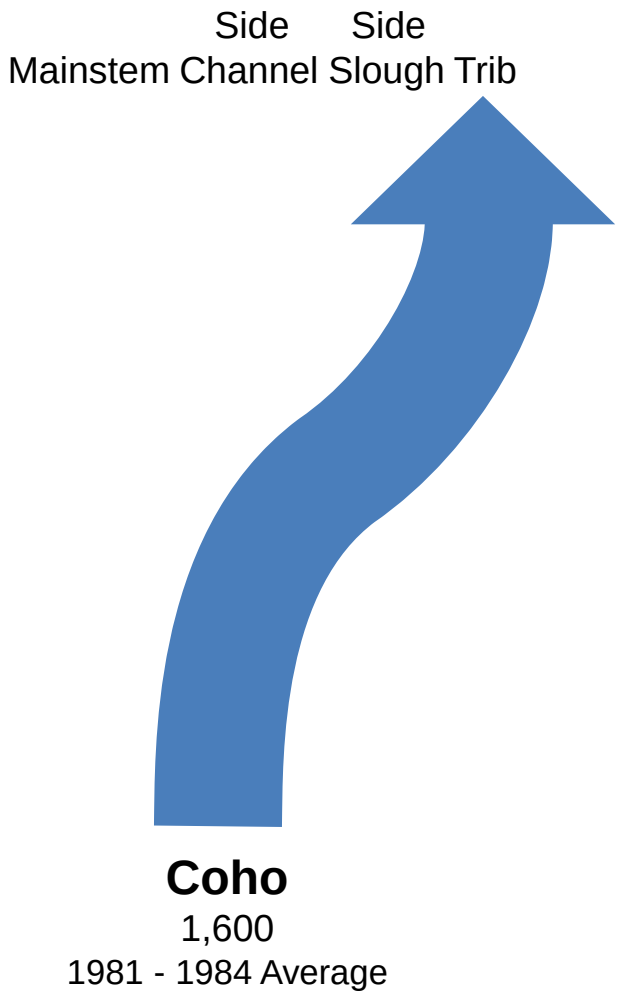
Pink
3,300 odd years
88,000 even years
1981 - 1984 Average

SUSITNA-WATANA
HYDROELECTRIC PROJECT

Coho

Observations from the 1980s

- Except for occasional coho found in slough and mainstem habitats, coho spawn in tributaries.
- Upon emergence in April to June, coho juveniles are most found in slough, side channel and mainstem sites; downstream from Talkeetna at trib mouths.
- Peak smolt outmigration occurred in June 1981-1982 and consisted of age 1+ and 2+ fish.



Chinook

Observations from the 1980s

- Most Chinook spawn in tributaries
  - 11 of 18 tribs supported spawning
  - almost entire Susitna River escapement above Talkeetna spawned in Indian River, Portage Cr.
- Fry emerge in April-June, rear for a year and smolt in their 2nd year of life.
  - Trib mouths and sloughs provide summer rearing habitat
- Most juvenile Chinook overwinter in slough and mainstem habitats

Chinook
13,000
1982 - 1984 Average

Biologically Important Sites

- Observations from the 1980s -

Talkeetna (RM 98.5) to Chinook Creek (156.8) in Devils Canyon were 18 tribs and 34 major sloughs

Spawning

92% of the sockeye, 70 % of the chum and 44 % of the slough spawning pink were in just four sloughs.

Rearing

Most juvenile Chinook migrate from tribs into lateral habitats to overwinter

Coho juveniles were found in lateral habitats ; downstream from Talkeetna at trib mouths.

Habitats proximal to tribs higher importance?

Critical Sites?

- Observations from the 1980s -

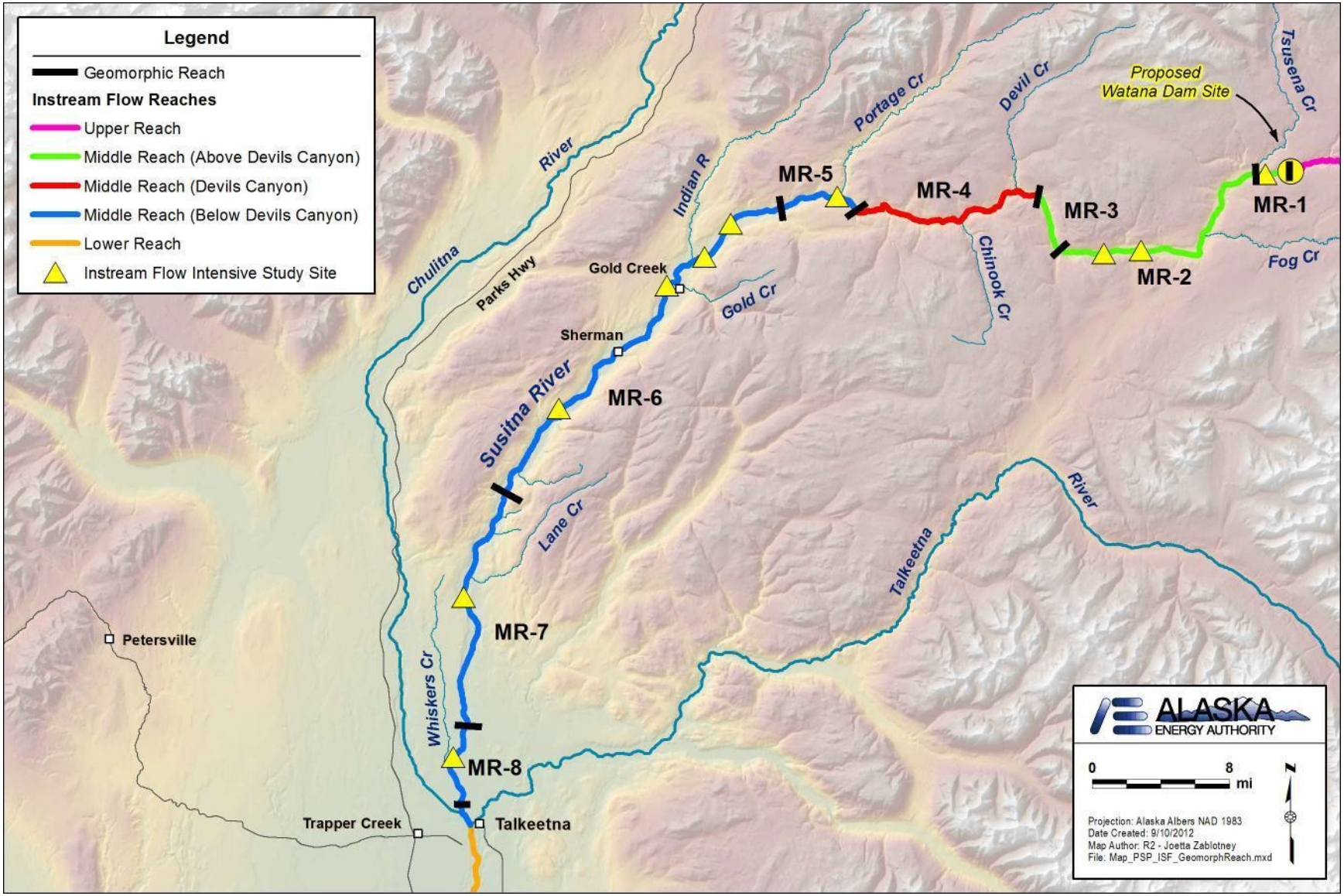
Spawning	Rearing	RM	Reach
	6A	112.3	MR-7
8A	8A	125.3	MR-6
9		129.2	MR-6
	10	133.8	MR-6
11	11	135.3	MR-6
21	21	141.2	MR-6

Site Selection
Devils Canyon (RM 150) to Talkeetna (RM 98)

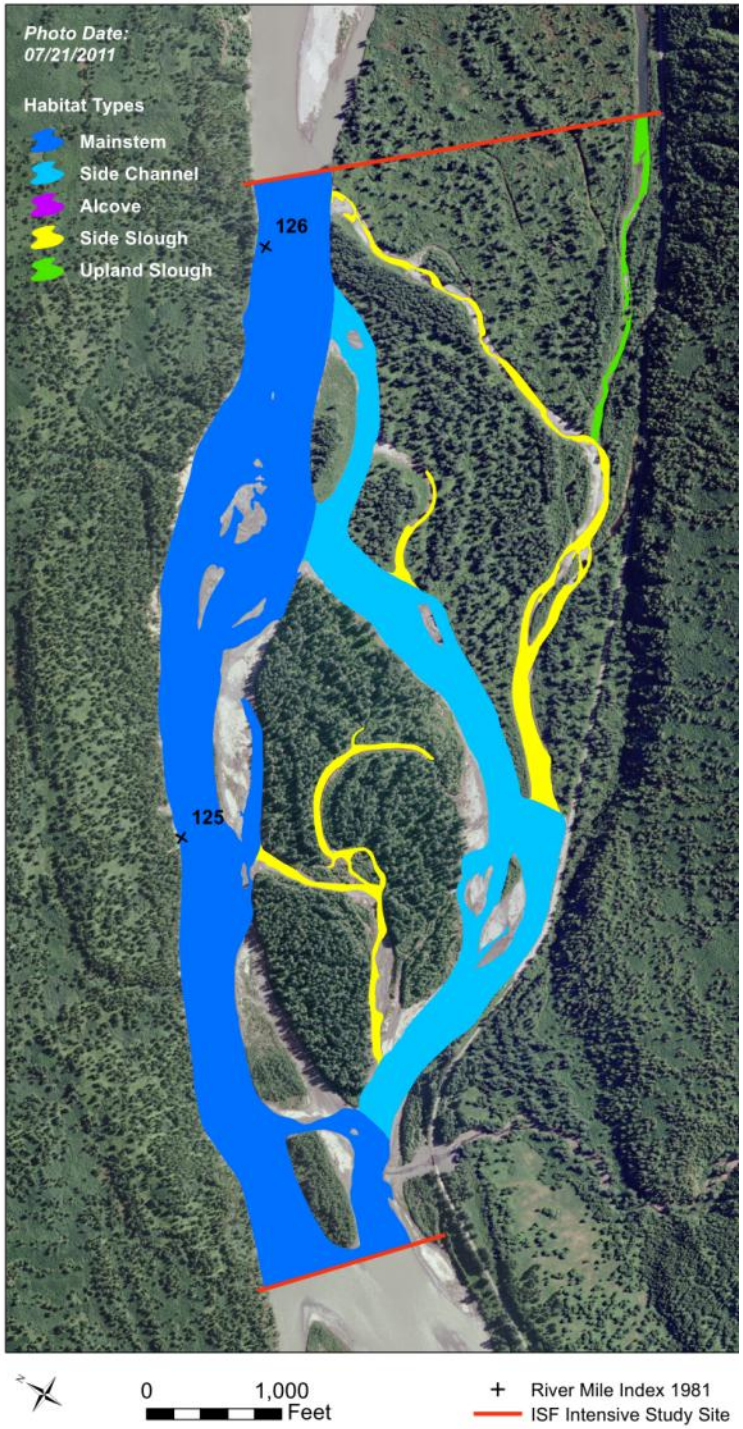
Use GIS platform to review

RM 150 to RM 98 and consider potential sites

Intensive Study Site Locations



SUSITNA-WATANA HYDROELECTRIC PROJECT



IFS Potential Intensive Study Site

(MR-6, Slough 8A, RM 124.2–126.1)

- Extrapolation of modeled to non-modeled by habitat area
- Accuracy will depend on number of sites (sample size) and variability among habitat units (habitat mapping results)
- Multiple habitat units within a site are not replicates - not independent
- Trade-off between extent of intensive site and replication of habitat units

SUSITNA-WATANA
HYDROELECTRIC PROJECT

Site Selection
Downstream of Talkeetna Confluence (RM 98.5)

- Potential site(s) not yet identified
- 1980s data indicated salmonid rearing at trib mouths
- Anecdotal observations while seining in 2012 are consistent with rearing at trib mouths, but data not yet analyzed
- Video and habitat mapping September 13-15, 2012

Summary

Sites will be selected in collaboration with the TWG following a process, criteria and schedule

- Potential intensive sites identified (Sep 2012)
- Refine and identify supplementary sites (Dec 2012)
- TWG confirmation of sites (Feb/Mar 2013)
- Collect data (summer 2013)
- Evaluate and modify/add sites (Nov 2013)
- Collect additional data as needed (summer 2014)

Next Steps

- Develop details on process, criteria and schedule for other instream flow study steps (e.g., HSC, habitat model selection, decision framework) in the RSP
- Provide specific response to comments (RSP)
- Identify TWG schedule and prospective meeting topics for 2013-2014 (RSP)
- Next meeting September 26 with site visit September 27-28