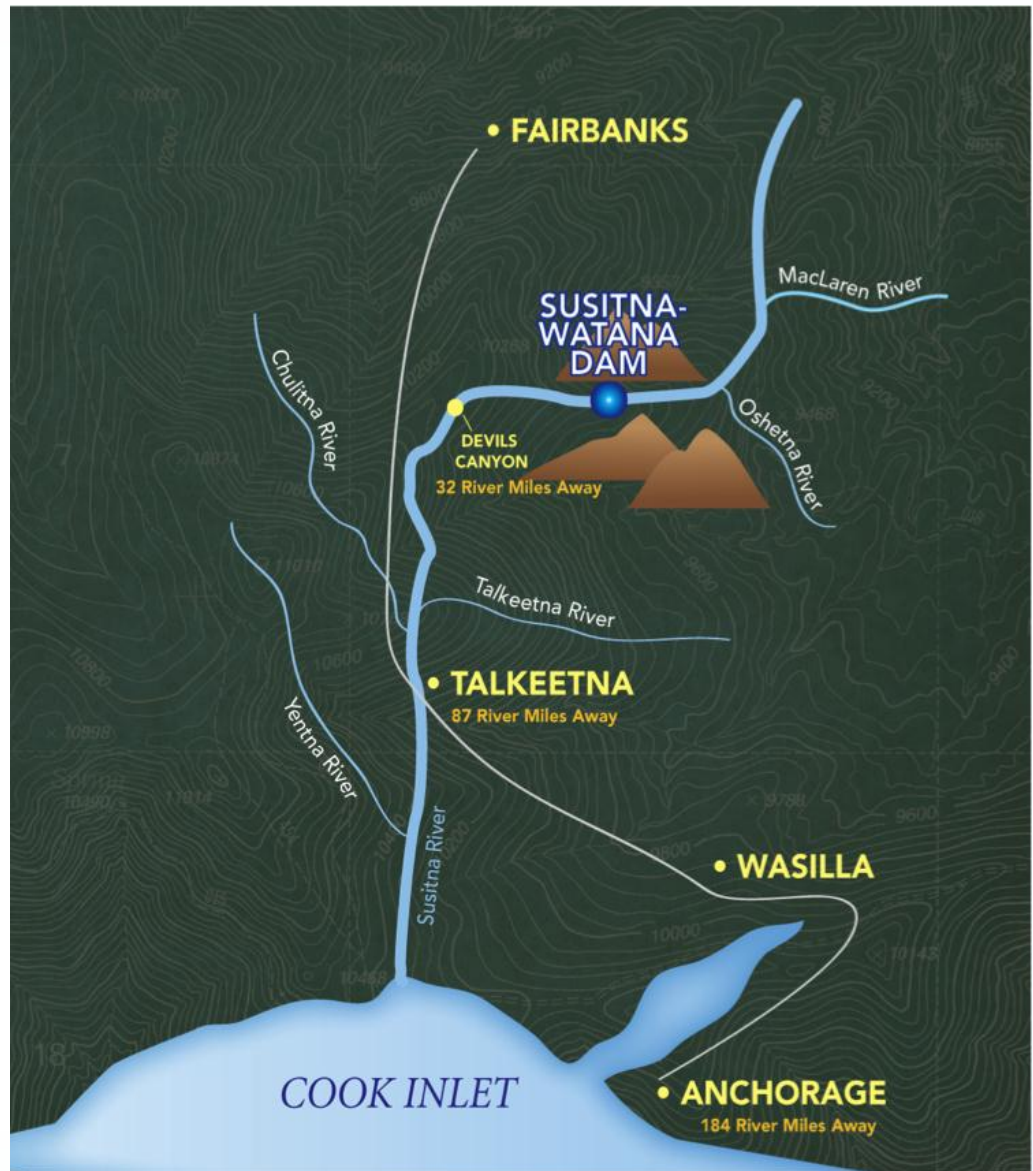


# Riparian Instream Flow Revised Study Plan

## Technical Work Group Meeting

October 24, 2012

Prepared by R2 Resource Consultants,  
Inc.



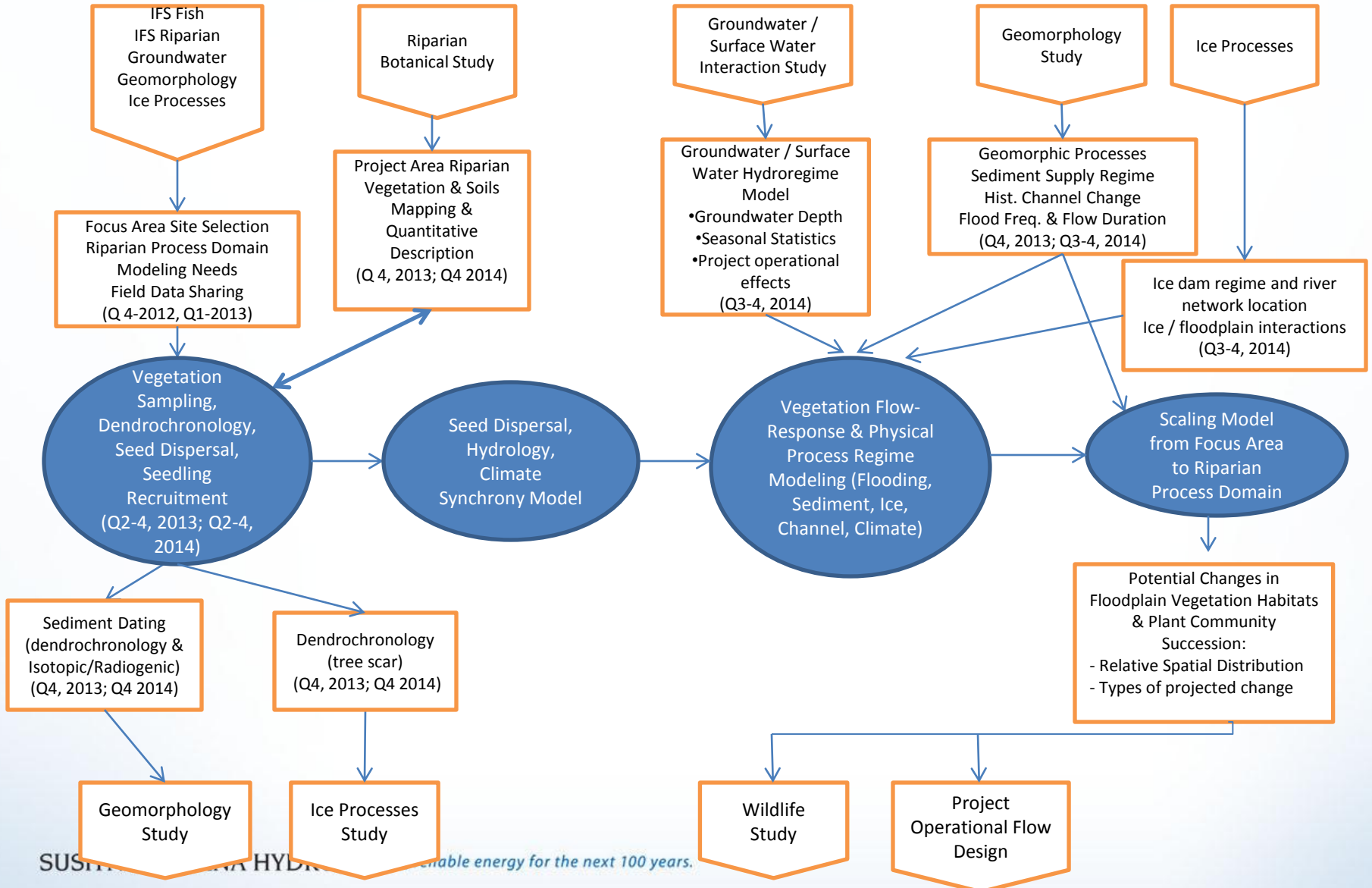
# Riparian Instream Flow Revised Study Plan

Today's Topics:

1. Riparian IFS  
Interdependencies
2. PSP vs RSP:  
Consultation Comments  
Format & Content
3. Project Schedule
4. Recent field  
reconnaissance findings
5. Updated methods:  
sediment direct dating  
techniques



# STUDY INTERDEPENDENCIES FOR INSTREAM FLOW RIPARIAN STUDY



# Consultation Issues: RSP Update Topics

Riparian IFS Technical Working Group  
(Oct 1, 2012)

## 1. Review of Consultation Issues / RSP Updates

- Study Goal and Objectives
- RSP Methods format:
  - Objectives, Methods, Data Input, Data Output
- Study Project Area delineation

## 2. USFWS Objectives & Study Components: RIFS-1 through 6



## Revised Study Plan

### 8 Instream Flow Study: Fish, Aquatics and Riparian

#### 8.1 Introduction

#### 8.2 Nexus between Project Construction / Existence / Operations and Effects on Resources to be Studied

#### 8.3 Resource Management Goals and Objectives

##### 8.3.1 National Marine Fisheries Service

##### 8.3.2 U.S. Fish and Wildlife Service

##### 8.3.3 Alaska Department of Fish and Game

##### 8.3.4 Alaska Native Entities

#### 8.4 Summary of Consultation with Agencies, Alaska Native Entities, and Other Stakeholders

#### 8.5 Fish and Aquatics Instream Flow Study

### 8.5.18.6 Riparian Instream Flow Study

#### 8.6.1 General Description of the Proposed Study

#### 8.6.2 Study Area

### 8.6.3 Study Methods

#### 8.6.4 Consistency with Generally Accepted Scientific Practice

#### 8.6.5 Schedule

#### 8.6.6 Level of Effort and Cost

#### 8.6.7 Draft Glossary

#### 8.6.8 Literature Cited

# Instream Flows for Floodplain and Riparian Vegetation Study Components (USFW May 2012)

RISF-1 Synthesize historical physical and biological data for Susitna River floodplain and riparian vegetation, including the 1980's studies and other hydro projects that may provide insights for project operations.

RISF-2 Select and Design Study Sites

RISF-3 Characterize seed dispersal timing, water-level regime required for establishment, and frequency of establishment, and then predict potential plant community change resulting from project operations.

# Six Instream Flows for Floodplain and Riparian Vegetation Study Components (USFW May 2012)

RISF-4 Characterize the role of river ice in the establishment and recruitment of dominant riparian species, and then predict potential plant community change resulting from Project operations.

RISF-5 Characterize the role of sediment deposition in the formation of floodplain and riparian soils, and then predict potential plant community change resulting from Project operations.

RISF-6 Characterize the water-level regime required to maintain floodplain and riparian plant communities, and then predict potential plant community change resulting from Project operations.

RISF-1 Synthesize historical physical and biological data for Susitna River floodplain and riparian vegetation, including the 1980's studies and other hydro projects that may provide insights for project operations.

**USFWS Comment:** In addition to other North American hydro-projects, this review should also include a review of relatively undisturbed riverine systems.

Source: Robert Henszey, USFWS, 9/11/2012 email

AEA Response:

Scientific literature available concerning relatively undisturbed riverine floodplain systems will be incorporated into the historical data synthesis.





# RISF-2 Select and Design Study Sites

**USFWS Comment:** The number of study sites should provide sufficient replication to address the needs of the objectives, and should include sites where Project operation is expected to cause early channel bed degradation or aggradation.

Source: Robert Henszey, USFWS, 9/11/2012 email

# RISF-2 Select and Design Study Sites

## AEA Response:

1. Focus Areas have been proposed in the Middle River between the Project site, RM 184, and Devils Canyon, the river segment likely to exhibit early channel bed degradation in response to Project operations.

2. The issue of pseudoreplication and number of sample sites is addressed in the hierarchical riparian process domain sampling design. The Focus Areas will be representative of specific riparian process domains and their channel / floodplain characteristics (ice process domains, channel plan form, channel slope, channel confinement). The Focus Area physical processes will be modeled and floodplain vegetation-flow response relationships determined.

# RISF-2 Select and Design Study Sites

AEA Response:

3. The Riparian Botanical Survey is designed to provide Project Area wide representative sample replicates of floodplain vegetation, soils and alluvial terrain relationships. Furthermore, surface water flood regime for the Project Area will be modeled providing flow regime plant community relationship analysis replicates throughout the Project Area, in addition to the Focus Area sites.



RISF-3 Characterize seed dispersal timing, water-level regime required for establishment, and frequency of establishment, and then predict potential plant community change resulting from project operations.

**USFWS Comment:** How will the Susitna River bimodal peak flows be addressed? How will the fate of these "second peak" seedlings be addressed? How will the role of precipitation in maintaining favorable soil moisture conditions be evaluated? Will soil texture be considered? If so, how will the soil profile be described?

Source: Robert Henszey, USFWS, 9/11/2012 email



# RISF-3:

## AEA Response:

- Bimodal peak flows will be addressed by measuring and modeling such flows at each Focus Area.
- “Second peak” seedling fate will be assessed in the seedling recruitment plot study by aging woody seedlings and quantifying these “recruitment flow regime” characteristics.
- The role of precipitation in maintaining favorable soil moisture conditions will be evaluated by measuring precipitation at each Focus Area meteorological station and soil surface moisture at each Focus Area. Further methodological details will be provided in the Groundwater Study RSP Sec 7.5.
- Soil texture will be considered by sampling, measuring and describing soil stratigraphy using standard NRCS soils survey protocols (Field Book for Describing and Sampling Soils by Schoeneberger, Wysocki, Benham, and Broderson, 2002).



# RISF-3 Characterize seed dispersal and frequency of establishment.

**USFWS Comment:** MODFLOW is a groundwater model, and may not be sensitive enough to quantify hydroperiod relationships for seedlings. What other metrics will be used to quantify/separate surface water, groundwater, soil moisture, precipitation, and other potential hydrological process that support seedling establishment and recruitment?

Source: Robert Henszey, USFWS, 9/11/2012 email



# RISF-3 Characterize seed dispersal and frequency of establishment.

## AEA Response:

Seedling plot groundwater regime will be both modeled with MODFLOW and a subset of wells will be located within seedling areas allowing for groundwater seedling response curves to be developed to check precision of MODFLOW results with local well data.

Detailed groundwater / surface water modeling metrics necessary to assess seedling establishment and recruitment conditions will be provided in the Groundwater RSP. Metrics will include: met stations at each Focus Area to measure local precipitation, and measurements of the height of the capillary fringe relative to the groundwater surface at well points to measure effective soil pore water availability to seedlings.

# RISF-3 Characterize seed dispersal and frequency of establishment.

**USFWS Comment:** How will the results from this objective be used to predict potential Project-related changes in seedling establishment and recruitment into the population?

Source: Robert Henszey, USFWS, 9/11/2012 email





# RISF-3 Characterize seed dispersal and frequency of establishment.

AEA Response: Natural seed dispersal hydro and sediment regime relationships will be measured in the field (individual studies). Project operational changes to the natural hydro and sediment regimes will be assessed and changes to the natural seedling recruitment and establishment “physical template” will be assessed.

Potential Project-related changes to seedling recruitment and establishment sites will be compared first at the Focus Area sites and then throughout the Project Area to model potential Project-related changes in the recruitment “safe site” conditions (Harper, J. 1977. Population Biology of Plants), RSP Sec 8.6.3.5 and Sec 8.6.3.7.



RISF-4 Characterize the role of river ice in the establishment and recruitment of dominant riparian species, and then predict potential plant community change resulting from Project operations.

**USFWS Comment:** The goal of this study should be to characterize the role of river ice in the establishment (colonization), survival (first 3 years) and recruitment into the future reproductive population of dominant riparian species (e.g., balsam poplar, willows). Have others investigated the role of ice on riparian plant communities? If so, can their methods be used here? How will the magnitude, frequency, and longitudinal distribution of ice events affecting dominant riparian species/communities be evaluated?

Source: Robert Henszey, USFWS, 9/11/2012 email

# RISF-4 Characterize the role of river ice

## AEA Response:

1. One goal of this study will be to characterize the role of river ice in establishment, survival and recruitment of dominant riparian species. There has been limited research into this question on boreal rivers: Engstrom et al., Effects of River Ice on riparian vegetation. (Freshwater Biology 2011, 56: 1095-1105).
2. A similar study approach and methods will be developed and is presented in the RSP.
3. The magnitude, frequency and longitudinal distribution of ice events affecting riparian species/communities will be assessed by a combination of on-the-ground surveys of tree ice scar distribution (mapping and aging with dendrochronology) and the results of the ice processes modeling.



# RISF-4 Characterize the role of river ice

## AEA Response:

4. A geospatial analysis of the modeled, and empirically mapped locations, of ice floodplain interactions will be conducted.
6. Tree ice scars will be used to map ice floodplain interaction zones along the river.
7. Ice process modeling will also be used to identify the vertical and lateral extent of ice floodplain vegetation interaction zones.

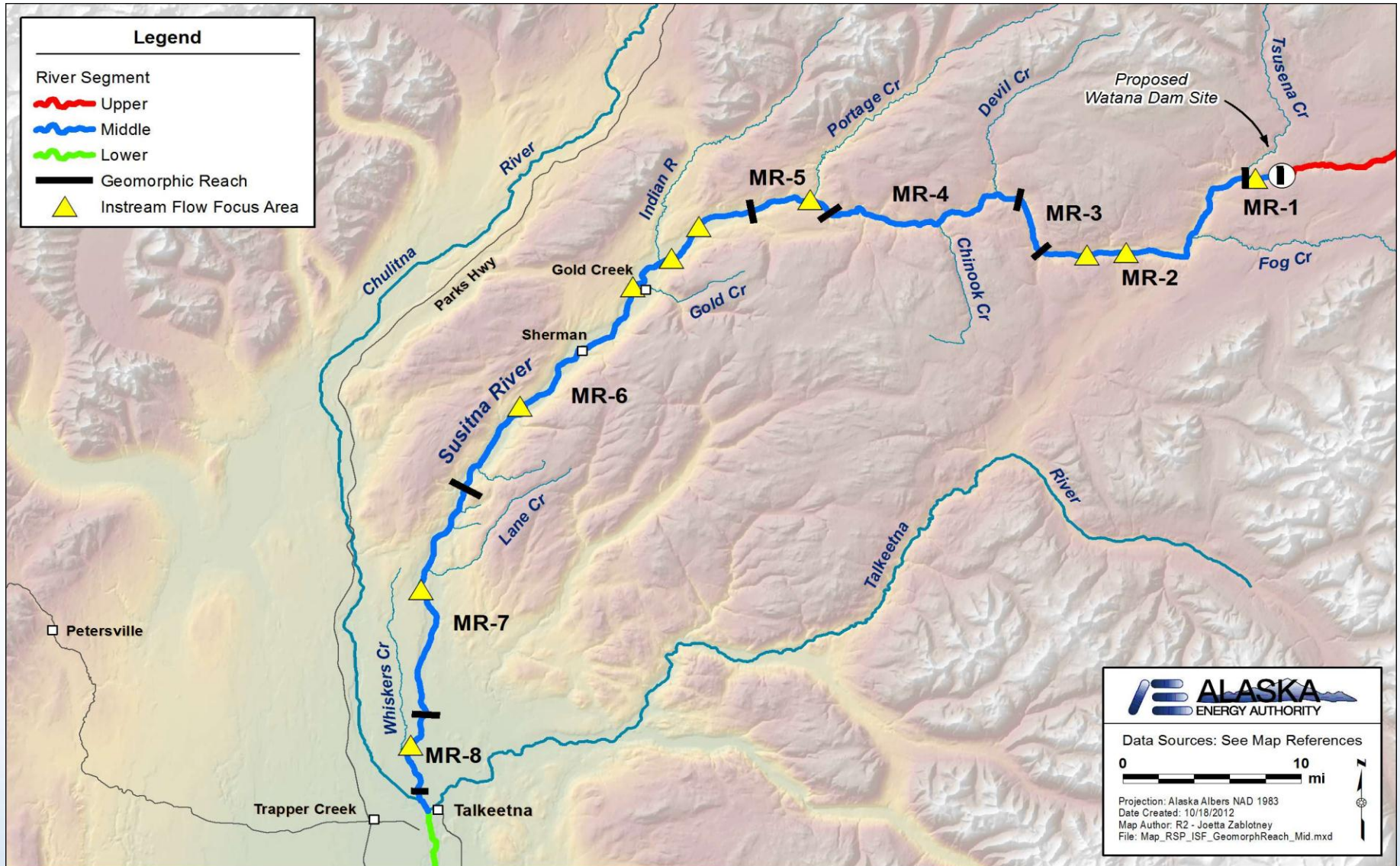


# Ice & Sediment

## Field Observations October 10-13, 2012



# Field Observations October 10-13, 2012






# Focus Area 2: RM 171-172

Photo Date: August 12, 2011  
\_\_\_\_\_ cfs at Gold Creek Gage



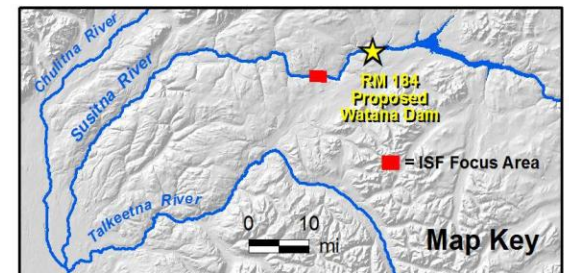
## Legend

-  Instream Flow Focus Area (Upper and Lower Extent)
-  Flow Arrow
-  River Mile Index (1981)



Data Sources: See Map References  
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project

Projection: Alaska Albers NAD 1983  
Date Created: 10/17/2012  
Map Author: R2 - Joetta Zabolney  
File: Map\_PSP\_ISF\_FocusAreas.mxd



# Ice Effects: Tree Scar and Floodplain Boulder Deposition (Focus Area 2)





# Tree Ice Disturbance Focus Area 2



# Floodplain Soil Ice Disturbance Focus Area 2



# River Ice Floodplain Gravel Deposition

## Focus Area 2



# Floodplain Formation: Sand Deposition

## September 2012 Flood



# Peak Flows: Sediment Deposition and Floodplain Formation (Focus Area 2)



# River Ice Floodplain Gravel Deposition Braided Reach Below Talkeetna



RISF-5 Characterize the role of sediment deposition in the formation of floodplain and riparian soils, and then predict potential plant community change resulting from Project operations.

**USFWS Comment:** The proposed soil sampling techniques are included in Section 6.6.4.3.1.5, but based on these techniques it is unclear how the USFWS requested objective to characterize the role of sediment deposition in the formation of floodplain and riparian soils, and how sediment deposition affects the rate and trajectory of plant community succession.

Source: Robert Henszey, USFWS, 9/11/2012 email



# RISF-5 Characterize the role of sediment deposition

**USFWS Comment:** This objective should investigate the rate of deposition, depth of sediment, and soil profile development required for natural floodplain plant community succession, and then use the predicted sediment deposition characteristic from the Fluvial Geomorphology Study to predict the effects of Project operation on floodplain plant communities...

Source: Robert Henszey, USFWS, 9/11/2012 email





# RISF-5 Characterize the role of sediment deposition

AEA Response: The characterization of the role of sediment deposition in the formation of soils will be conducted in three ways:

1. Sediment rates will be determined throughout the project area by dating floodplain sediments to determine rates of sedimentation,



# RISF-5 Characterize the role of sediment deposition

## AEA Response:

2. sediment dating techniques will include dendrochronology (tree age of alluvial surface), and sediment isotopic analyses (Cs137, Pd210), and soil stratigraphic descriptions and vertical profile measurement.
3. Probabilistic models will be developed characterizing the relationship between plant community successional stage, soil type and sediment depositional history.



# Fluvial Sediment Dating

- Focus areas & entire Project Area in a stratified, random sampling design.
- Methods:
  - Floodplain soil trenches excavated from the surface to gravel / cobble layer (historic channel bed)
  - soil stratigraphy will be described & grain size sieve analysis conducted on the entire sediment profile.
- Direct dating of fluvial sediments using isotopic techniques:  $^{137}\text{Cs}$  and  $^{210}\text{Pb}$  measurements
- Dendrochronologic techniques to age trees and current floodplain surfaces at each soil pit
- *Multiple dating techniques to characterize sediment deposition rates*

# RISF-5 Characterize the role of sediment deposition

## AEA Response:

The fluvial geomorphology 2-D sediment transport models will be used to predict the effects of Project operations on sediment transport and depositional patterns. See Fluvial Geomorphology RSP for methods.

The rate of deposition, depth of sediment, and soil profile development required for natural floodplain plant community succession will be characterized, and then the predicted sediment deposition characteristics from the Fluvial Geomorphology Study to predict the effects of Project operation on floodplain plant communities.

RISF-6 Characterize the water-level regime required to maintain floodplain and riparian plant communities, and then predict potential plant community change resulting from Project operations.

**USFWS Comment:**

The methods for groundwater belong in the Groundwater PSP, and not in this PSP for reasons discussed above.  
Source: Robert Henszey, USFWS, 9/11/2012 email

RISF-6 Characterize the water-level regime required to maintain floodplain and riparian plant communities, and then predict potential plant community change resulting from Project operations.

AEA Response:

Groundwater methods will be moved from the Riparian PSP to the Groundwater RSP.



# Riparian Instream Flow Study Schedule

Activity	2012				2013				2014				2015	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Refine and Finalize Study Plan		—	—	—										
Focus Area Study Site Selection			—	—	—									
Review of 1980s Data, Hydro Project Studies and Un-impacted Floodplain Research. Tech Memorandum.		—	—	—	—	—	—	—						
Finalize Riparian Groundwater / Surface Water Field Design					—									
Implement Riparian Groundwater / Surface Water Installation & Sampling						—	—	—	—	—	—	—		
Riparian Vegetation: Field data collection		—				—				—				
Seed dispersal study		—				—				—				
Tree ice scar mapping		—				—				—				
Focus area vegetation mapping and sampling		—				—				—				
Dendrochronology sampling		—				—				—				
Soil sampling		—				—				—				
Sediment Dating: Sampling & Analysis						—	—	—		—	—	—		

