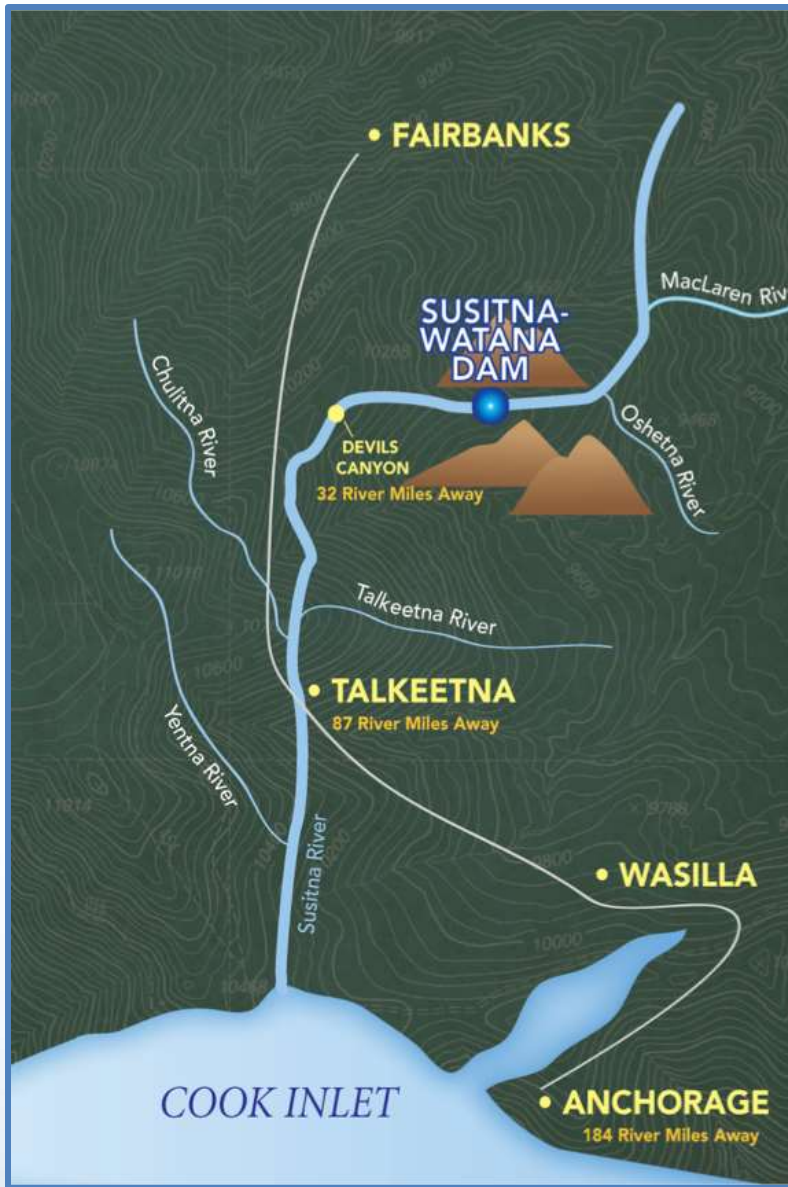


# Technical WorkGroup Meeting

## Riparian Instream Flow Riparian Q1 2013 Report

25-27 March 2013

Prepared by  
R2 Resources, ABR, Inc. and GW  
Scientific



# Road Map for Today's Presentation

- I. Review of Q1 Riparian IFS Tasks
- II. Focus Area Selection Process & Results
- III. Riparian Groundwater / Surface Water Field Design



# I 2013: Primary Q1 and Q2 Tasks

1. Develop detailed outline for critical review of 1980's Susitna River data, and current floodplain and hydro project floodplain vegetation research (RSP Section 8.6.3.1)
2. Focus Area Site Selection (RSP 8.6.3.2)
  - Riparian process domain delineation
3. Riparian groundwater field design and Groundwater / Surface Water Instrument Layout and Installation (RSP 8.6.3.6)

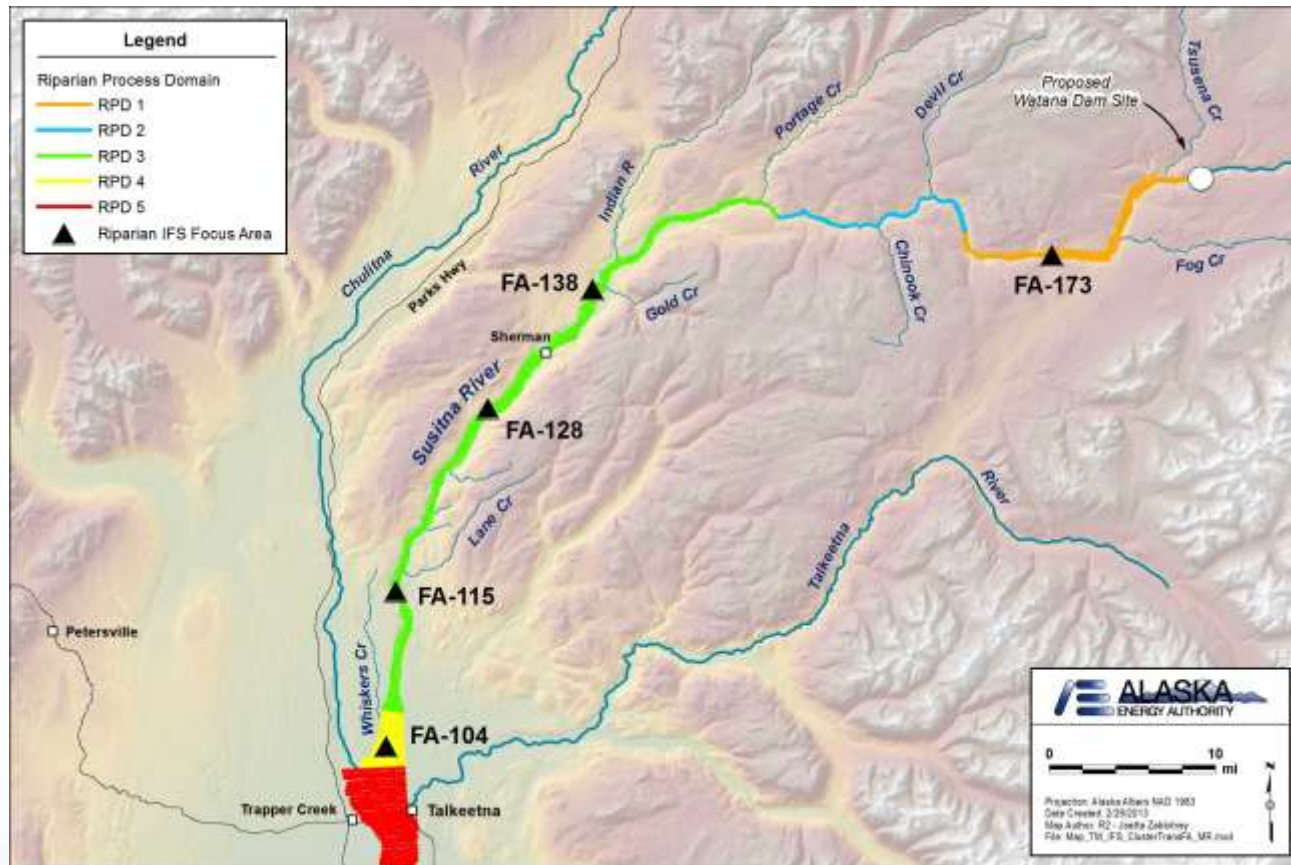


# Review: Riparian Process Domain Framework

- Primary objective to use a quantitative method based upon repeatable geologic and geomorphic variables to delineate similar channel / floodplain river segments.
- Geomorphic variables reflect influence of systematic geologic and geomorphic processes.
  - Valley geometry: channel/floodplain confinement
  - Channel gradient
  - Channel type
- RPDs will be reviewed in Q4 2013 including Ice Processes, Beaver Activity, Channel Migration & Channel Turnover.



# Riparian Process Domains and Riparian IFS Focus Areas



# Small Riparian IFS Technical Work Group Meeting

- Webinar held February 21, 2013
- Goal: collectively agree upon 2013 riparian vegetation sampling approach, including Middle River Focus Areas selection and Lower River Riparian Field Design
- Attending: Robert Henszey, USFWS; Chiska Derr, NMFS; Aaron Wells, ABR; Kevin Fetherston, R2; Kate Knox, R2; Alice Shelly, R2



# Proposed Riparian IFS Focus Areas

Excerpt From  
RSP Table 8.6-6

Focus Area ID	Common Name	Description	Geomorphic Reach	Location (PRM)		Area Length (mi)
				Upstream	Downstream	
Focus Area-184	Watana Dam	Area approximately 1.4 miles downstream of dam site	MR-1	185.7	184.7	1.0
Focus Area-173	Stephan Lake, Complex Channel	Wide channel near Stephan Lake with complex of side channels	MR-2	175.4	173.6	1.8
Focus Area-171	Stephan Lake, Simple Channel	Area with single side channel and vegetated island near Stephan Lake	MR-2	173.0	171.6	1.4
Focus Area-151	Portage Creek	Single channel area at Portage Creek confluence	MR-5	152.3	151.8	0.5
Focus Area-144	Side Channel 21	Side channel and side slough complex approximately 2.3 miles upstream Indian River	MR-6	145.7	144.4	1.3
Focus Area-141	Indian River	Area covering Indian River and upstream channel complex	MR-6	143.4	141.8	1.6
Focus Area-138	Gold Creek	Channel complex including Side Channel 11 and Slough 11	MR-6	140.0	138.7	1.3
Focus Area-128	Skull Creek Complex	Channel complex including Slough 8A and Skull Creek side channel	MR-6	129.7	128.1	1.6
Focus Area-115	Lane Creek	Area 0.6 miles downstream of Lane Creek, including Upland Slough 6A	MR-7	116.5	115.3	1.2
Focus Area-104	Whiskers Slough	Whiskers Slough Complex	MR-8	106.0	104.8	1.2



# Proposed Riparian IFS Focus Areas

Middle River Riparian Process Domain	Location (PRM)		Associated Riparian-IFS Focus Areas			
	Upstream	Downstream	Focus Area ID	Common Name	Location (PRM)	
					Upstream	Downstream
RPD1	187	168.25	Focus Area-173	Stephan Lake, Complex Channel	175.4	173.6
RPD2	168	153.75	None	N/A	N/A	N/A
RPD3	153.5	108	Focus Area-138	Gold Creek	140	138.7
			Focus Area-128	Skull Creek Complex	129.7	128.1
			Focus Area-115	Lane Creek	116.5	115.3
RPD4	107.75	104	Focus Area-104	Whiskers Slough Complex	106	104.8



# Rationale for Riparian IFS Focus Area Selection

Focus Area ID	Common Name	Riparian IFS	Riparian IFS Selection Rationale
Focus Area-184	Watana Dam		Not-selected. Floodplain vegetation occurs on only a few mid-channel island bars. Non-focus area vegetation sampling will be conducted in these areas.
Focus Area-173	Stephan Lake, Complex Channel	X	Focus Area captures the diversity of floodplain vegetation types in the upper moderately confined riparian process domain from the dam site to Devils Canyon.
Focus Area-171	Stephan Lake, Simple Channel		Not-selected. Approximately 0.5 miles south of FA-173. Similar vegetation types but less floodplain terrain complexity.
Focus Area-151	Portage Creek		Not-selected. Steep valley walls immediately adjacent to channel. Floodplain vegetation is minimal.
Focus Area-144	Side Channel 21		Not-selected. Process domain representative vegetation, however, lacking in off-channel water body and wetland complexity.
Focus Area-141	Indian River		Not selected. Very limited floodplain area.
Focus Area-138	Gold Creek	X	Representative floodplain vegetation types and river right beaver dam wetland complex.
Focus Area-128	Skull Creek Complex	X	Representative floodplain vegetation types and complex off-channel water bodies and associated wetlands.
Focus Area-115	Lane Creek	X	Representative floodplain vegetation types and off-channel water bodies associated with beaver dam wetland complex.
Focus Area-104	Whiskers Slough	X	Transition riparian process domain between, Three Rivers confluence and moderately confined riparian process domain. Representative floodplain vegetation types and off-channel water bodies and associated beaver dam wetland complexes.






Photo Date: August 12, 2011  
16,700 cfs at Gold Creek Gage

# Stephans Slough Complex (PRM 173.6-175.4)



## Legend

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



0 1,000 Feet

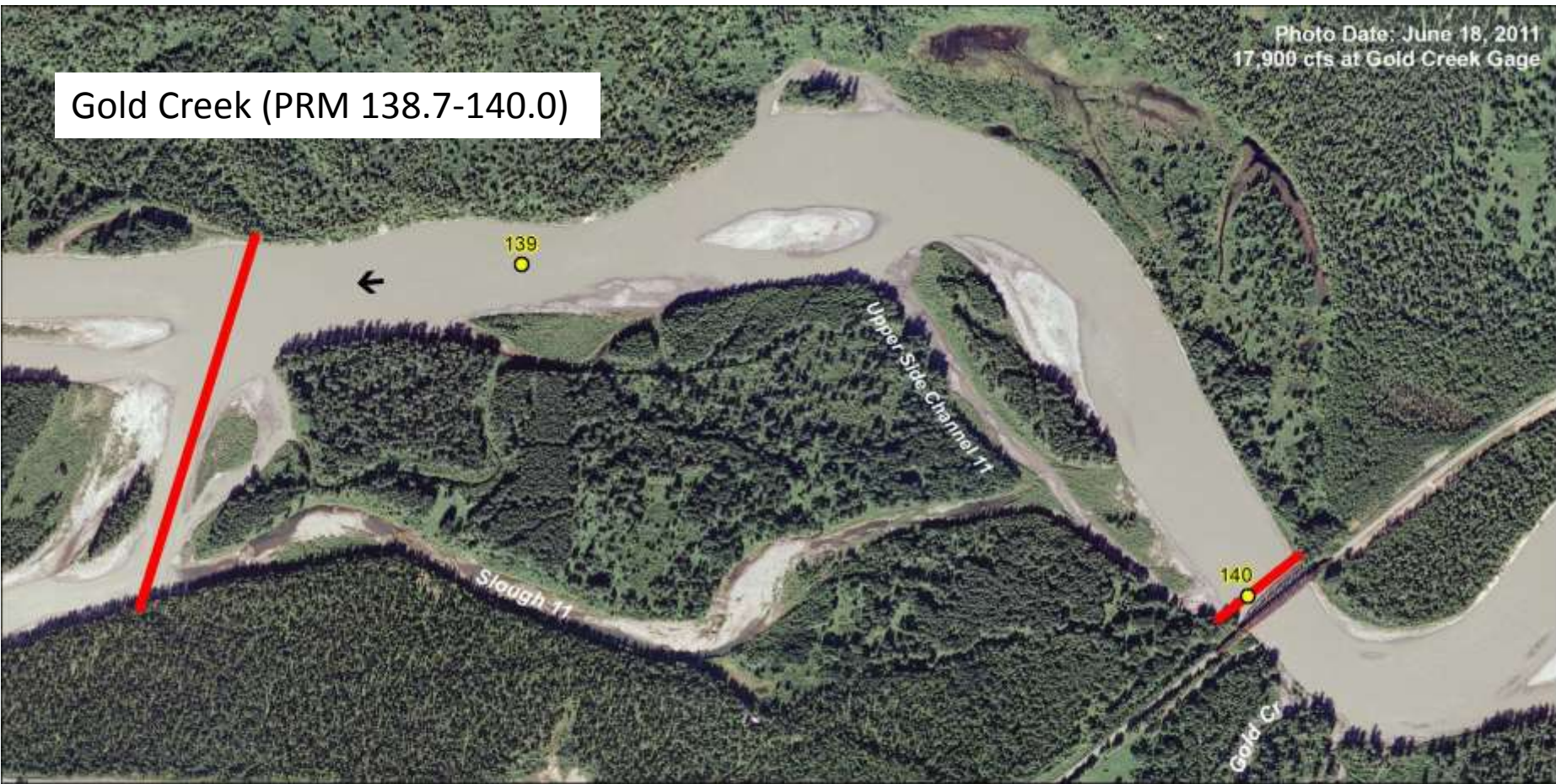
Projection: Alaska Albers NAD 1983  
Date Created: 11/27/2012  
Map Author: R2 - Joetta Zablontney  
File: Map\_RSP\_IFS\_FocusAreas\_MR.mxd



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

Photo Date: June 18, 2011  
17,900 cfs at Gold Creek Gage

# Gold Creek (PRM 138.7-140.0)



## Legend

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



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

Projection: Alaska Albers NAD 1983  
Date Created: 11/27/2012  
Map Author: R2 - Joetta Zabltney  
File: Map\_RSP\_IFS\_FocusAreas\_MR.mxd






Photo Date: July 21, 2011  
18,300 cfs at Gold Creek Gage

# Skull Creek /Slough 8a (PRM 128.1-129.7)



## Legend

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



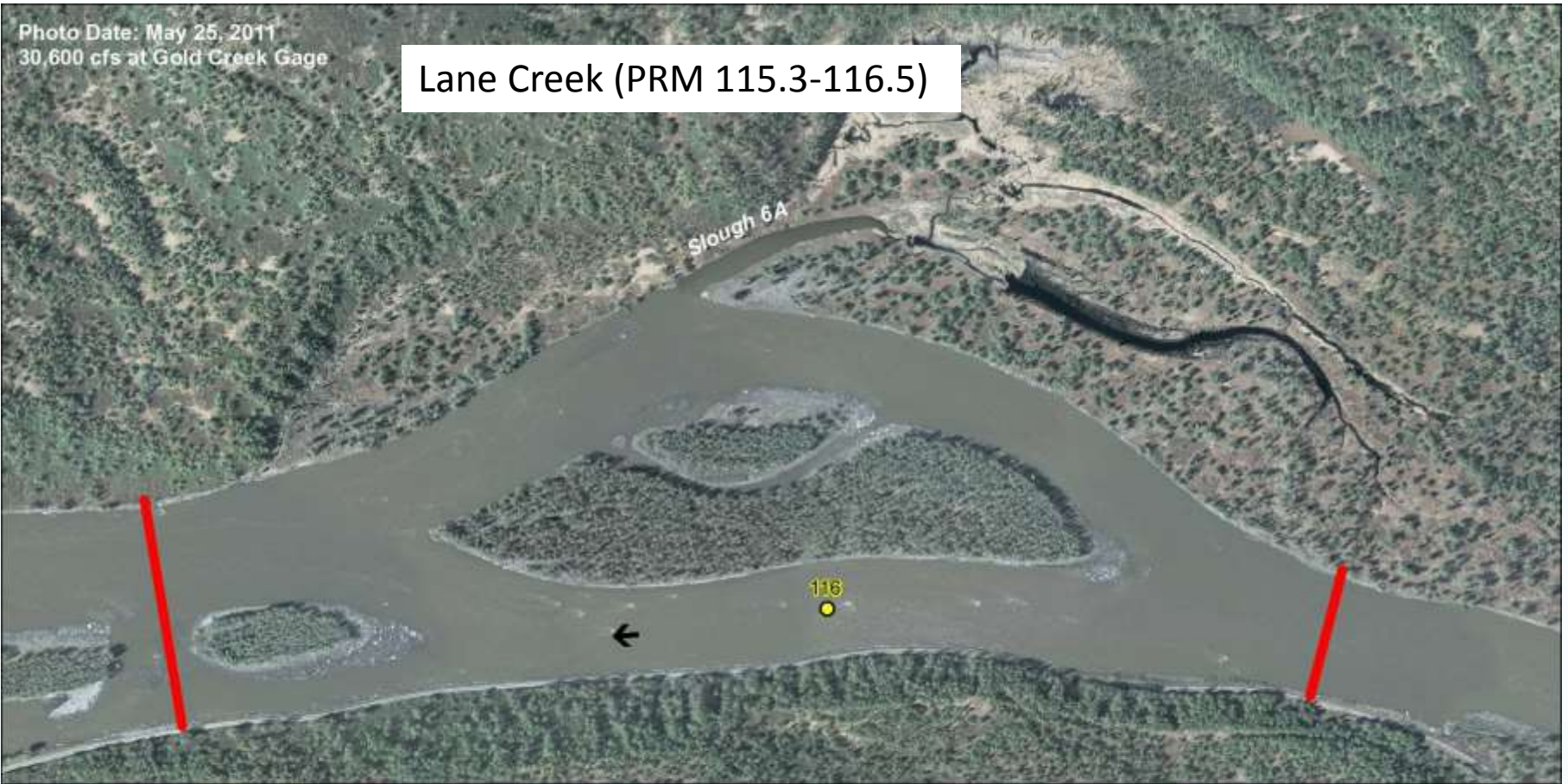
Projection: Alaska Albers NAD 1983  
Date Created: 11/27/2012  
Map Author: R2 - Joetta Zabolney  
File: Map\_RSP\_IFS\_FocusAreas\_MR.mxd






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

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

# Lane Creek (PRM 115.3-116.5)



### Legend

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



Projection: Alaska Albers NAD 1983  
Date Created: 11/27/2012  
Map Author: R2 - Joetta Zabloney  
File: Map\_RSP\_IFS\_FocusAreas\_MR.mxd

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



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

# Whiskers Slough (PRM 104.8-106)



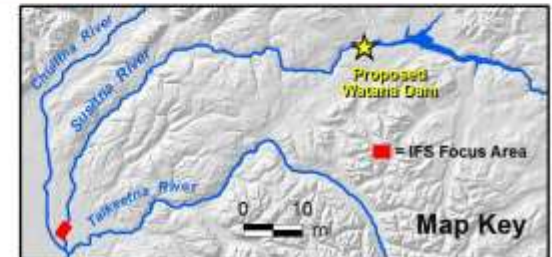
### Legend

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



Projection: Alaska Albers NAD 1983  
Date Created: 11/27/2012  
Map Author: R2 - Joetta Zabolney  
File: Map\_RSP\_IFS\_FocusAreas\_MR.mxd

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



# Viereck Level III Plant Communities in Focus Areas relative to RPD1

The sum of lengths  
(line-intercept  
sampling method;  
length in meters) for  
each cover type are  
reported in  
parentheses.

Plant Community	RPD1 (PRM 168.25- 187)	FA-184 Watana Dam	FA-173 Stephan Lake Complex	FA-171 Stephan Lake Simple
Closed Conifer Forest	Yes (3625.5)	No	Yes (44.4)	Yes (134)
Open Conifer Forest	Yes (7080.3)	Yes (69.9)	Yes (407.9)	Yes (111)
Conifer Woodland	Yes (849.7)	Yes (105.4)	No	No
Closed Mixed Forest	Yes (2912)	Yes (81.1)	Yes (268.3)	Yes (314.1)
Open Mixed Forest	Yes (5567.7)	Yes (134.7)	Yes (746)	Yes (715.4)
Mixed Woodland	Yes (250.8)	No	Yes (77.7)	Yes (35.9)
Closed Broadleaf Forest	Yes (250.7)	Yes (8.5)	Yes (81.5)	No
Open Broadleaf Forest	Yes (329.4)	No	Yes (156.8)	Yes (13.1)
Broadleaf Woodland	Yes (31.3)	No	No	No
Closed Alder/Willow Shrub	Yes (750.9)	Yes (28.4)	Yes (246.9)	Yes (24.8)
Open Alder/Willow Shrub	Yes (585.6)	Yes (35)	Yes (155.5)	Yes (47)
Herbaceous	Yes (470.8)	No	Yes (47.4)	No
Partially Vegetated	Yes (228.4)	Yes (27.7)	Yes (119.7)	Yes (25.4)
Non-vegetation cover types <sup>1</sup>	Yes (16012.4)	Yes (810.8)	Yes (1857.3)	Yes (1164.2)
Total Transect Length	38945.4	1301.6	4209.4	2585.0
# of Plant Communities	13	8	11	9
% Plant Communities overlap with RPD1	100%	62%	85%	69%

# Viereck Level III Plant Communities in Focus Areas relative to RPD3

The sum of lengths (line-intercept sampling method; length in meters) for each cover type are reported in parentheses.

Plant Community	RPD3 (PRM 108-153.5)	FA-151 Portage Creek	FA-144 Side Channel 21	FA-141 Indian River	FA-138 4Gold Creek	FA-128 Skull Creek Complex	FA-115 Lane Creek
Closed Conifer Forest	No	No	No	No	No	No	No
Open Conifer Forest	Yes (1243.9)	No	No	No	No	No	No
Conifer Woodland	Yes (307.6)	No	No	No	No	No	No
Closed Mixed Forest	Yes (5325.2)	No	Yes (20.8)	No	No	No	No
Open Mixed Forest	Yes (15444.3)	Yes (40.1)	Yes (30.4)	Yes (490.5)	Yes (257.6)	Yes (7.6)	Yes (322.6)
Mixed Woodland	Yes (6053.8)	No	Yes (125.5)	Yes (215.4)	Yes (73.7)	Yes (816.8)	Yes (233)
Closed Broadleaf Forest	Yes (10657.8)	No	Yes (645.7)	Yes (328)	Yes (1230)	Yes (307.9)	Yes (263)
Open Broadleaf Forest	Yes (17955.5)	Yes (9.5)	Yes (403.1)	Yes (140)	Yes (1271.9)	Yes (2240.5)	Yes (674.6)
Broadleaf Woodland	Yes (3480.4)	Yes (31.2)	No	No	No	Yes (61.9)	Yes (197.1)
Closed Alder/Willow Shrub	Yes (6008.8)	Yes (24)	Yes (232.9)	Yes (34.9)	Yes (439.5)	Yes (268.8)	Yes (21.5)
Open Alder/Willow Shrub	Yes (6188.6)	No	Yes (327.1)	Yes (330.9)	Yes (223.3)	Yes (307.1)	Yes (61.2)
Herbaceous	Yes (4138.2)	No	No	No	Yes (234.9)	Yes (21.3)	Yes (183.5)
Partially Vegetated	Yes (677)	No	Yes (10.6)	Yes (48.9)	Yes (50.9)	No	No
Non-vegetation cover types <sup>1</sup>	Yes (65375.2)	Yes (456)	Yes (2808.3)	Yes (2360.6)	Yes (1944.8)	Yes (3313.2)	Yes (2553.4)
<b>Total Transect Length</b>	<b>142856</b>	<b>561</b>	<b>4604</b>	<b>3949</b>	<b>5727</b>	<b>7345</b>	<b>4510</b>
<b># of Plant Communities</b>	<b>12</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>8</b>
<b>% Plant Communities overlap with RPD3</b>	<b>100%</b>	<b>33%</b>	<b>75%</b>	<b>58%</b>	<b>67%</b>	<b>67%</b>	<b>67%</b>



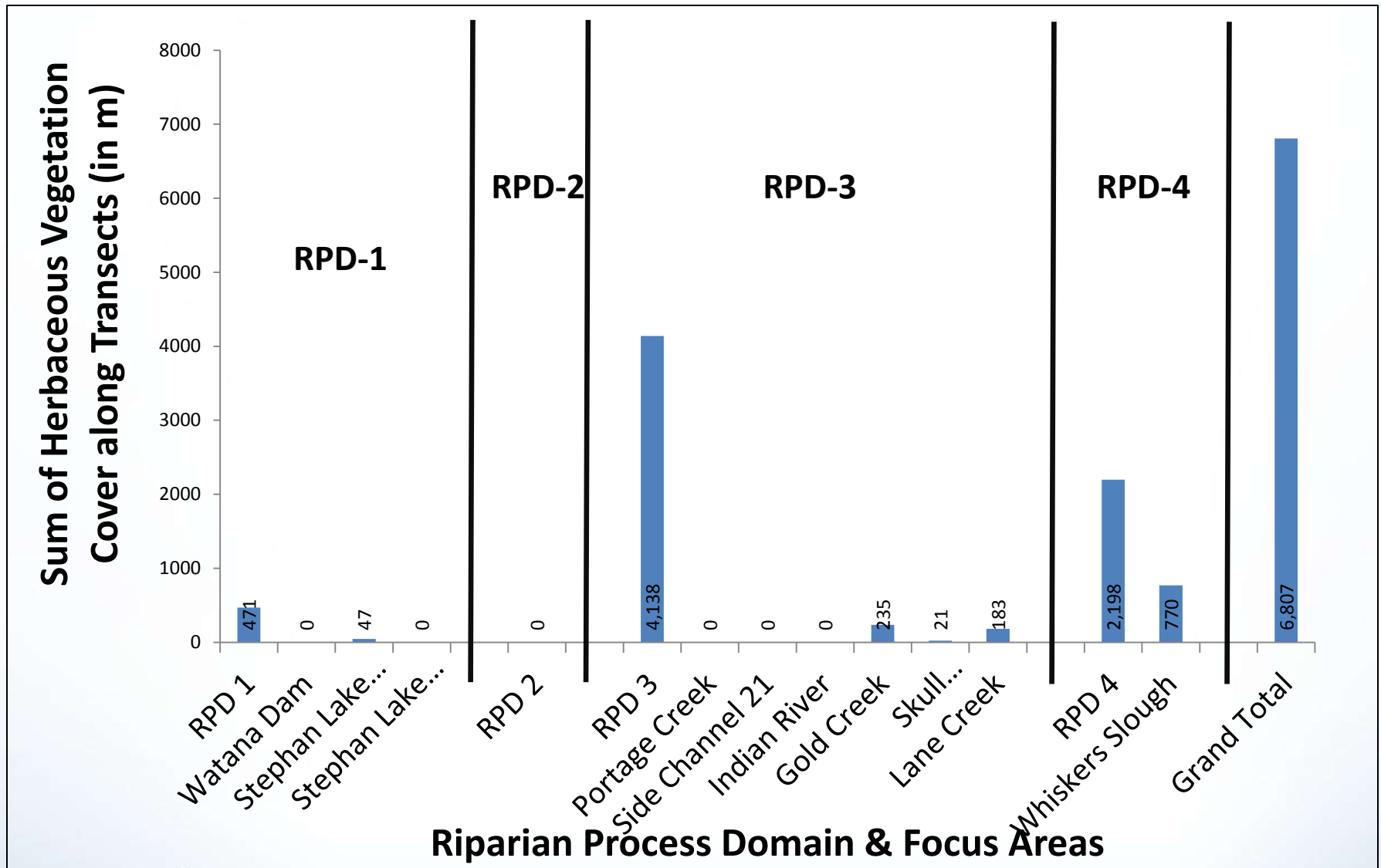
# Viereck Level III Plant Communities in Focus

## Areas relative to RPD4

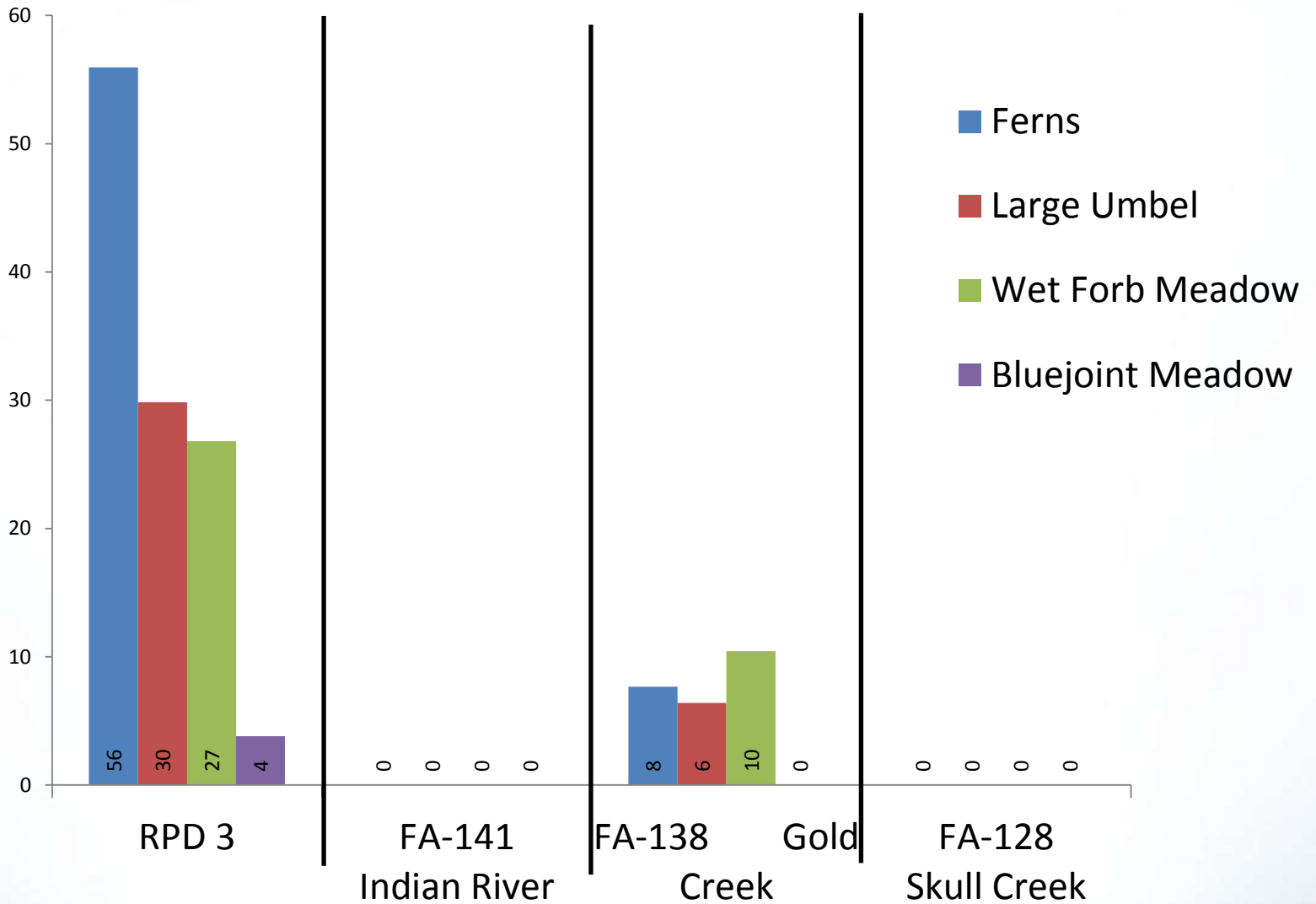
The sum of lengths (line-intercept sampling method; length in meters) for each cover type are reported in parentheses.

Plant Community	RPD4 (PRM 104-107.75)	FA-104 Whiskers Slough
Closed Conifer Forest	No	No
Open Conifer Forest	Yes (557.3)	Yes (71.5)
Conifer Woodland	Yes (87)	No
Closed Mixed Forest	Yes (5285.1)	Yes (109.6)
Open Mixed Forest	Yes (20752.7)	Yes (10185.8)
Mixed Woodland	Yes (2727.7)	Yes (820)
Closed Broadleaf Forest	Yes (2776.5)	Yes (994.1)
Open Broadleaf Forest	Yes (1328.1)	Yes (831.1)
Broadleaf Woodland	Yes (607.7)	Yes (180.5)
Closed Alder/Willow Shrub	Yes (320.5)	Yes (313.6)
Open Alder/Willow Shrub	Yes (508.9)	Yes (185.3)
Herbaceous	Yes (2198.3)	Yes (770.3)
Partially Vegetated	Yes (290.3)	Yes (100)
Non-vegetation cover types <sup>1</sup>	Yes (7020.7)	Yes (2848.1)
<b>Total Transect Length</b>	<b>44461</b>	<b>17410</b>
<b># of Plant Communities</b>	<b>12</b>	<b>11</b>
<b>% Plant Communities overlap with RPD4</b>	<b>100%</b>	<b>92%</b>

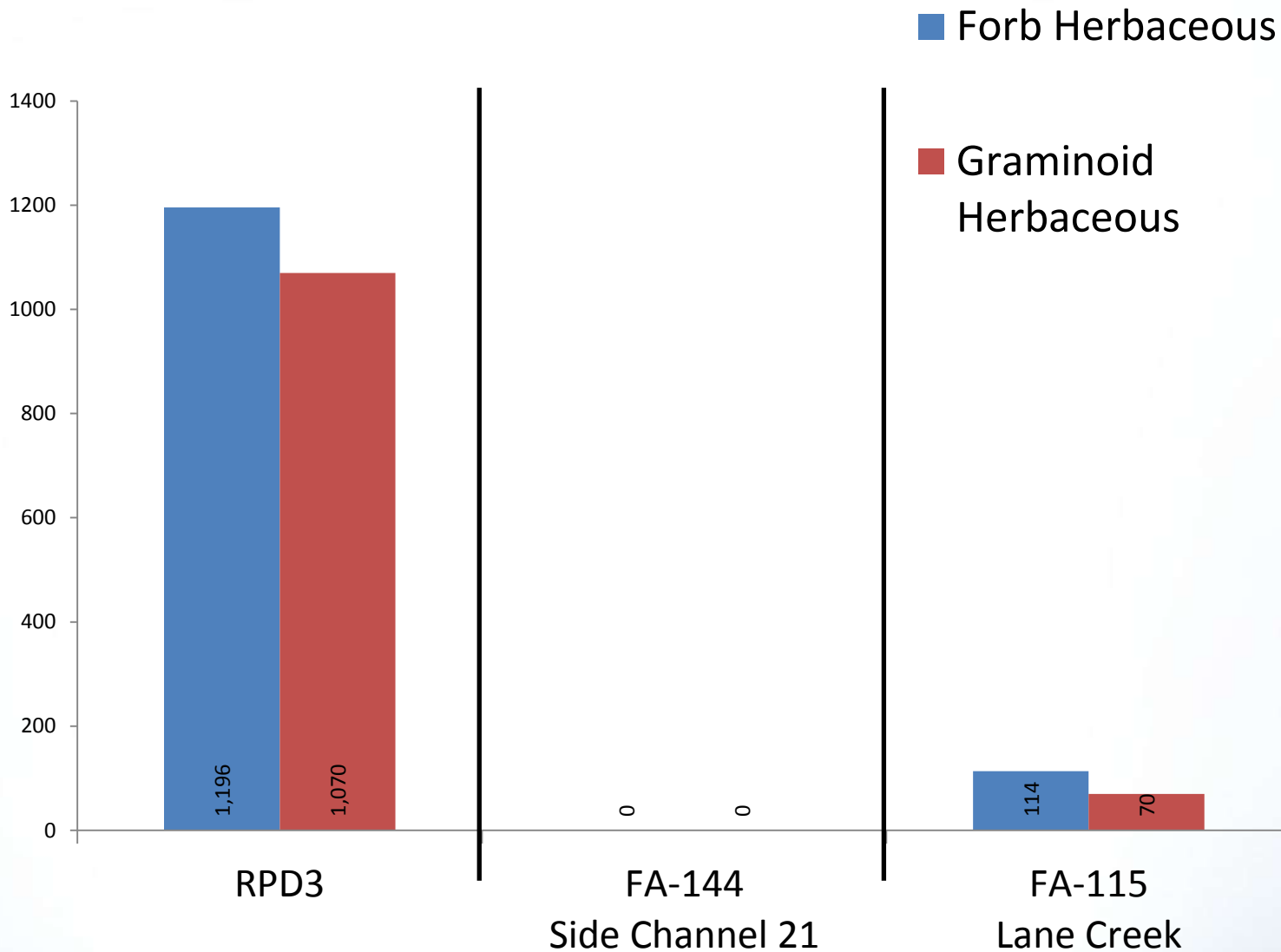
# Herbaceous Vegetation Sampling



# Herbaceous Level II Cover Type Area (acres)



**Herbaceous Level II  
Length along Transects Cover Types  
(in meters)**

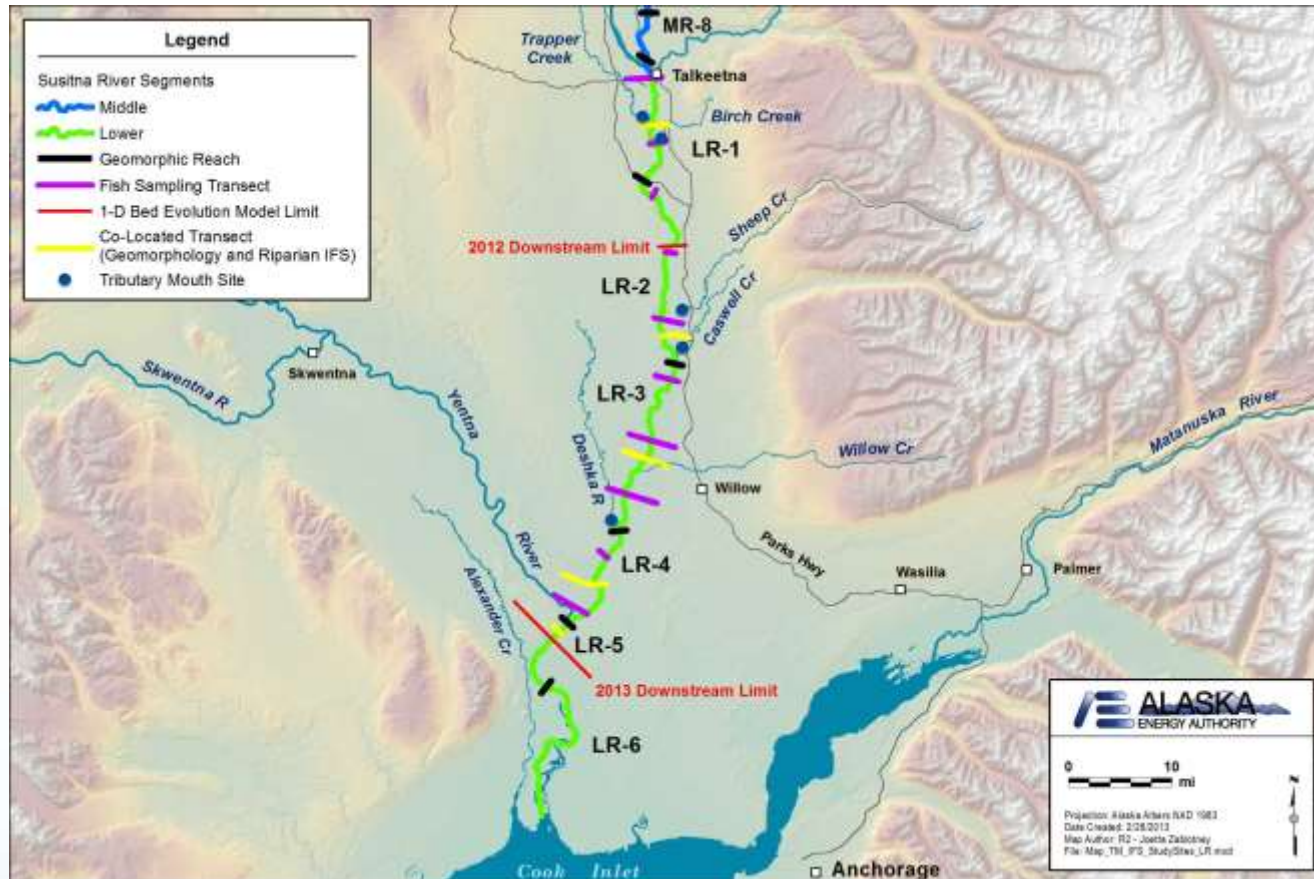


# Non-Focus Area Sampling Locations “Satellite Plots”

- Additional sampling will be completed outside Focus Areas throughout each Riparian Process Domain to gather additional sample plots for FA under represented herbaceous plant communities.



# Lower River Sampling Strategy - 2013



# Lower River Sampling Strategy - 2013

First, utilize geomorphic river segment classification in lieu of cluster analysis.

Second, select, with geomorphology lead, representative cross floodplain transects for each segment.

- Additional floodplain terrain surveys to be conducted in 2013.



# Lower River Sampling Locations - 2013

Lower River Geomorphic Reach	Location (PRM)		Riparian Transect	Riparian Transect Location (PRM)
	Upstream	Downstream		
LR-1	102.4	87.9	RIP LR-1	95.0
LR-2	87.9	65.6	RIP LR-2	69.0
LR-3	65.6	44.6	RIP LR-3	53.5
LR-4	44.6	32.3	RIP LR-4	38.2
LR-5	32.3	23.5	RIP LR-5	30.8
LR-6	23.5	3.3	N/A	N/A





# 2013 Lower River Riparian Vegetation

## Sampling to Include:

- Coordination between R-IFS, Riparian Vegetation Study, Geomorphology Study, and Groundwater Study and Agency Leads
- Sampling and characterization of diversity of floodplain vegetation types
- Cover broad spatial scope of the Lower River
- Utilization of Geomorphology Study 1-D sediment transport and flow routing modeling transects
- Selective installation of groundwater wells at each transect.

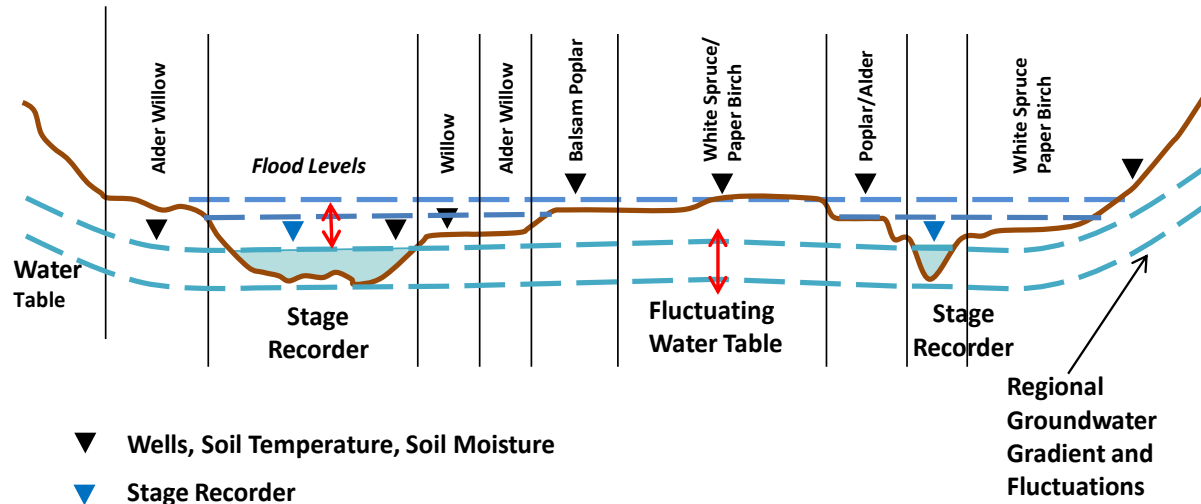


# III Groundwater / Surface Water Field Operations 2013

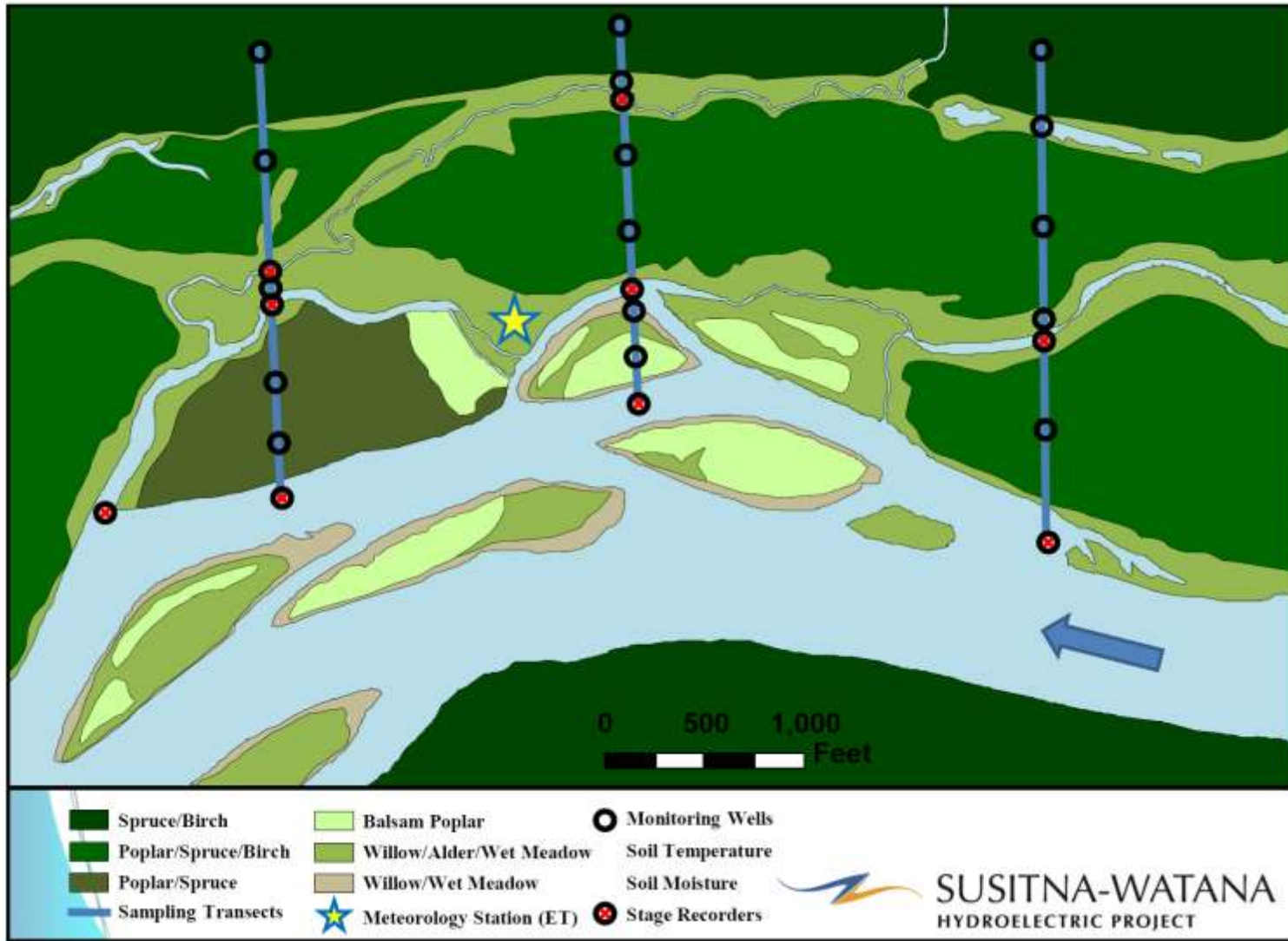
- Field installation of groundwater wells & water level recorders
- Installation of meteorological stations
- Installation of tree/shrub sap-flow probes
- Set-up of data loggers & instrumentation
- Hand measurements of leaf transpiration
- Root zone measurements



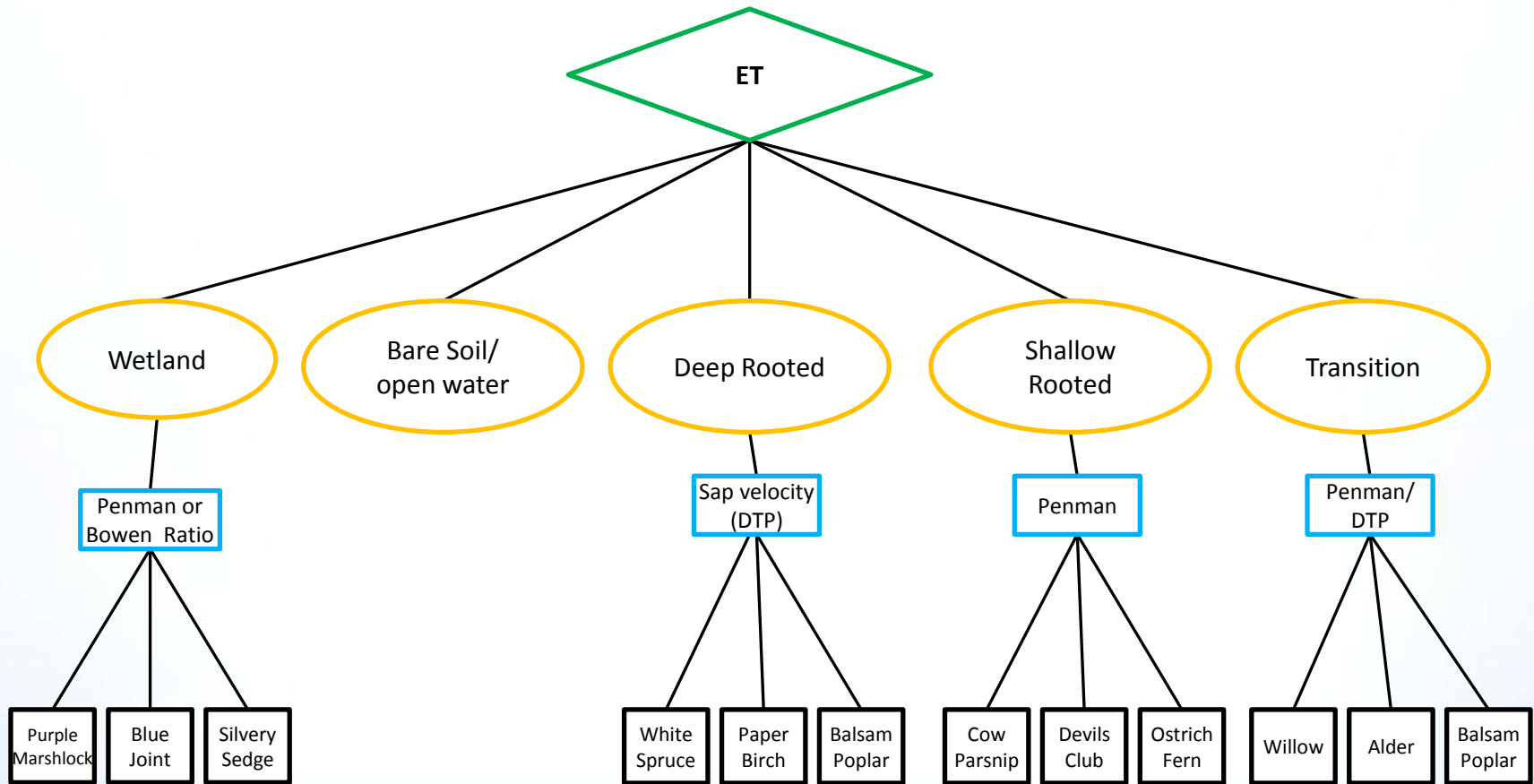
# Groundwater/Surface Water Interactions Modeling



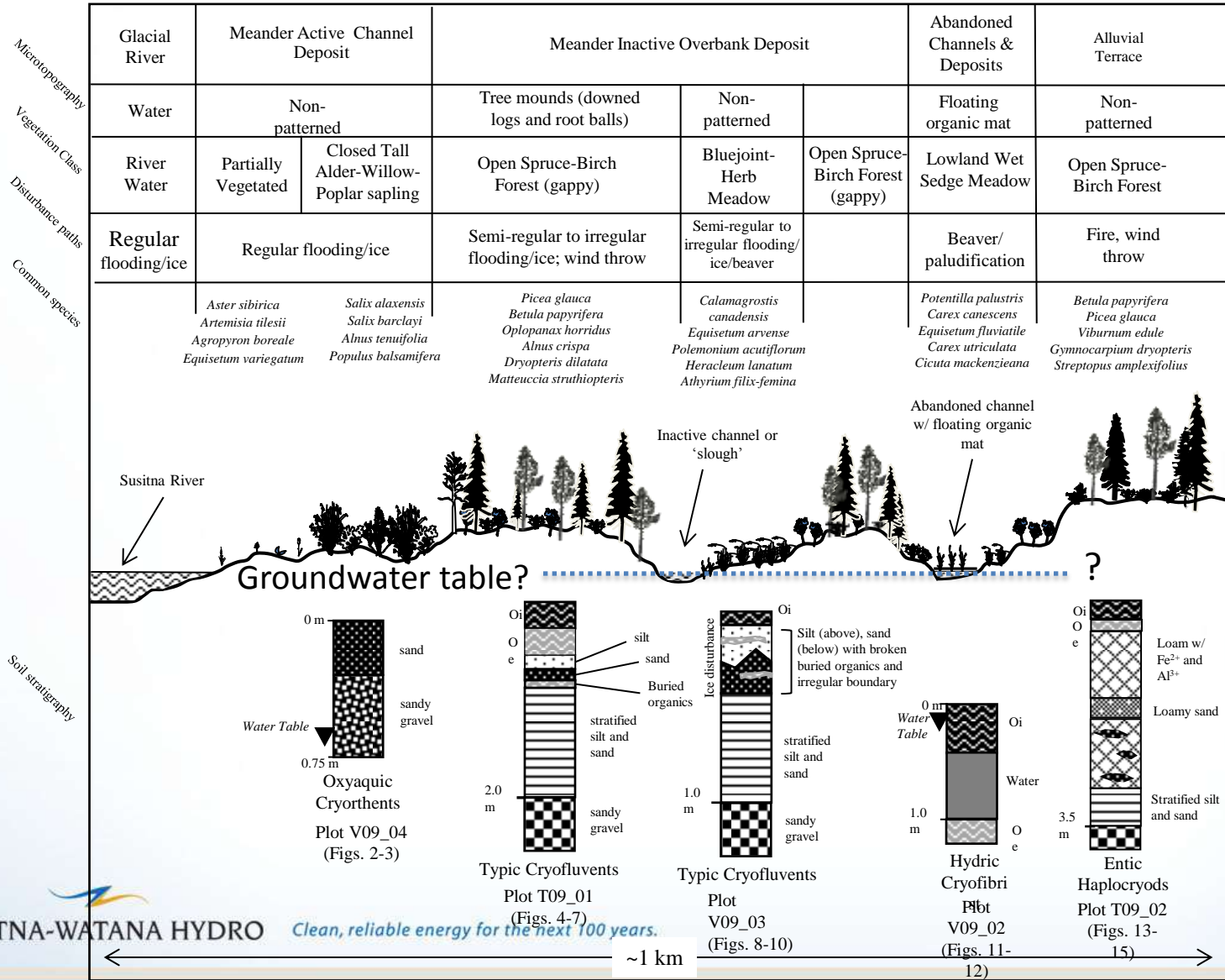
# Conceptual Focus Area Layout



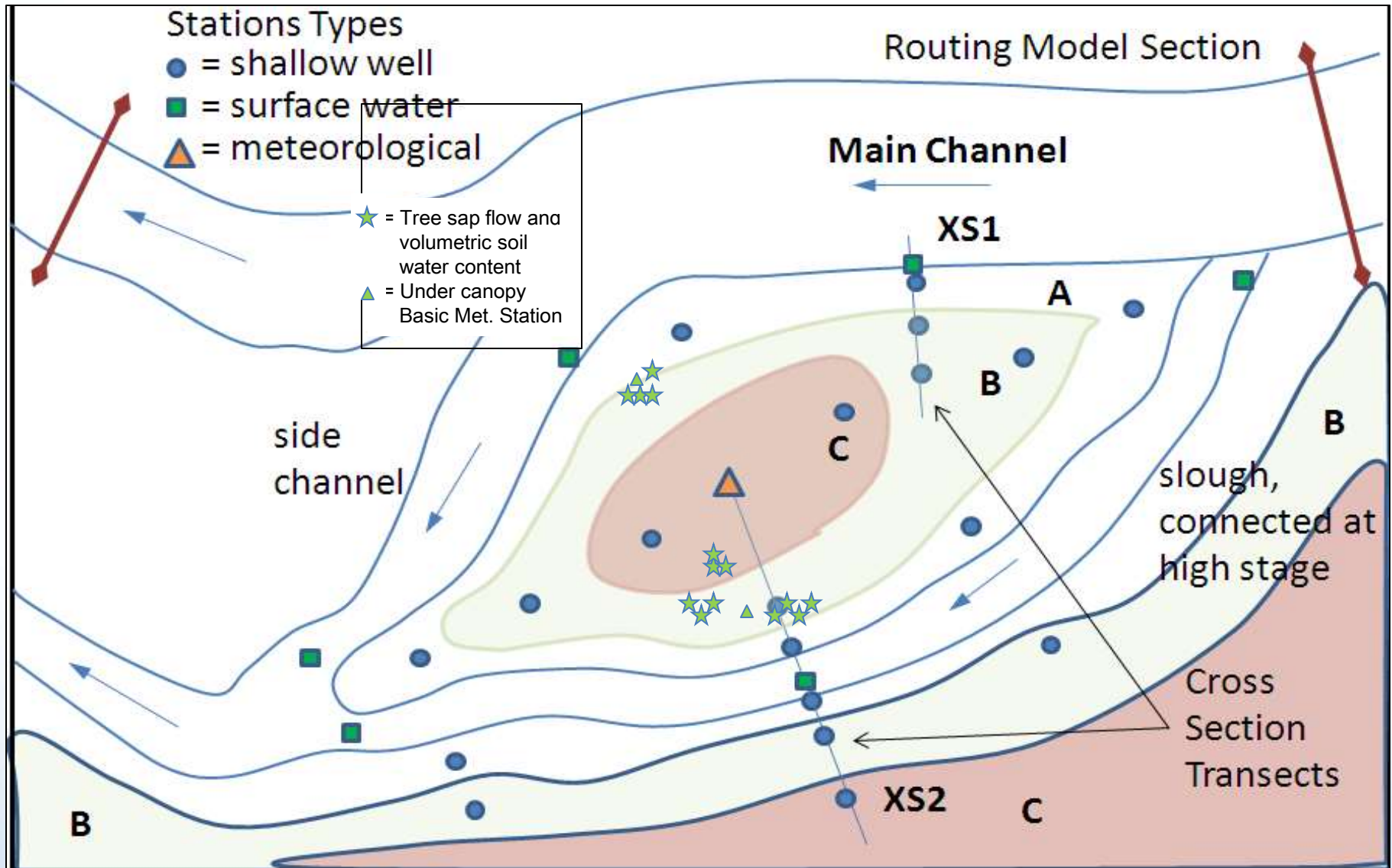
# Plant Functional Groups to Quantify Evapotranspiration Rate



# Toposequences – TYPICAL FLOODPLAIN CROSS SECTION



# Conceptual Groundwater/Surface Field Operations



# Groundwater / Surface water Study Design–Parameters to be Measured

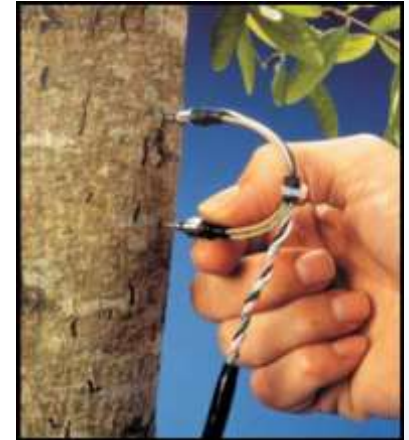
- Groundwater elevations
- Surface water stage heights
- Soil volumetric water content
- Soil temperature
- Evapotranspiration





# Evapotranspiration Study Trees & Shrubs

- Sap flow velocity will be calculated using Grainer's Thermal Dissipation Probe (TDP) methods using Dynamax Inc. TDP sap flow probes
- Sap velocity is converted to volumetric flow rate (direct measurement of tree transpiration)



**TDP Sap Flow  
sensor** (Dynamax,  
Houston, TX)

# Evapotranspiration Study

## Herbaceous Species

- Stomatal Conductance will be measured using a steady-state porometer from Decagon Devices.
- Porometer measurements will give insight to the relative density of stomata per leaf and degree of openness of stomata
- Think of stomata like a hose. The larger the nozzle, the greater the rate of potential water loss.



SC-1 Porometer  
(Decagon, Pullman, WA)

# Evapotranspiration Study Approach

## Measureable components to the Penman/Monteith approach:

- Temperature
- Wind speed
- Relative humidity
- Solar radiation
- Leaf area
- Stomatal conductance

$$\lambda ET = \frac{\Delta(R_n - G) + \rho_a c_p \frac{(e_s - e_a)}{r_a}}{\Delta + \gamma \left(1 + \frac{r_s}{r_a}\right)}$$



# Evapotranspiration Study

## High Transpiration

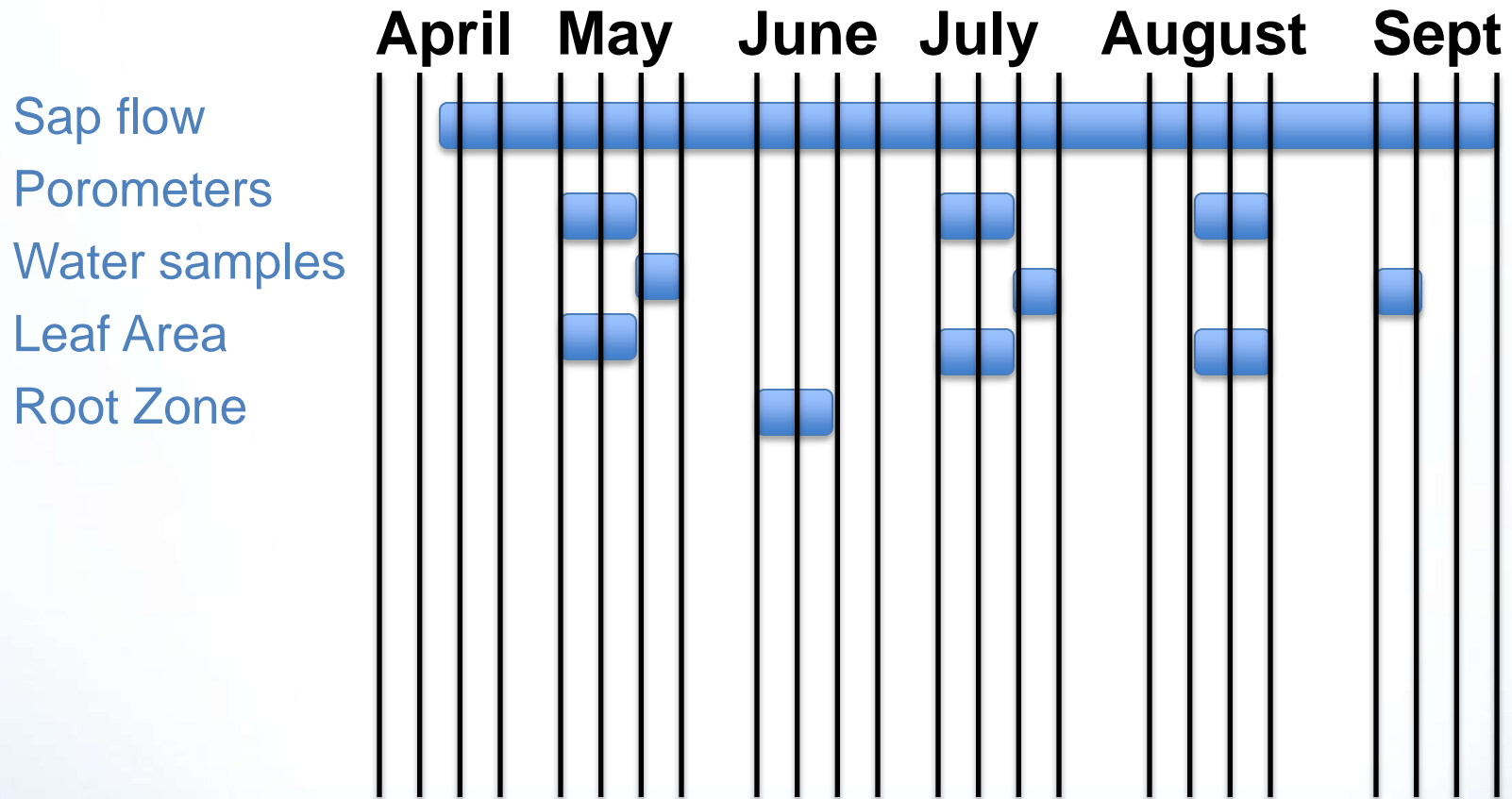
- Temperature +
- Wind Speed +
- Humidity –
- Solar Radiation +
- Leaf Area +
- Stomatal Conductance +

## Low Transpiration

- Temperature -
- Wind Speed -
- Humidity +
- Solar Radiation –
- Leaf Area -
- Stomatal Conductance -

Note: not all parameters have to decrease to have low ET, only a few

# Preliminary 2013 Field Schedule



# Field Schedule Uncertainties

May ice breakup flooding could considerably change early season operations schedule

