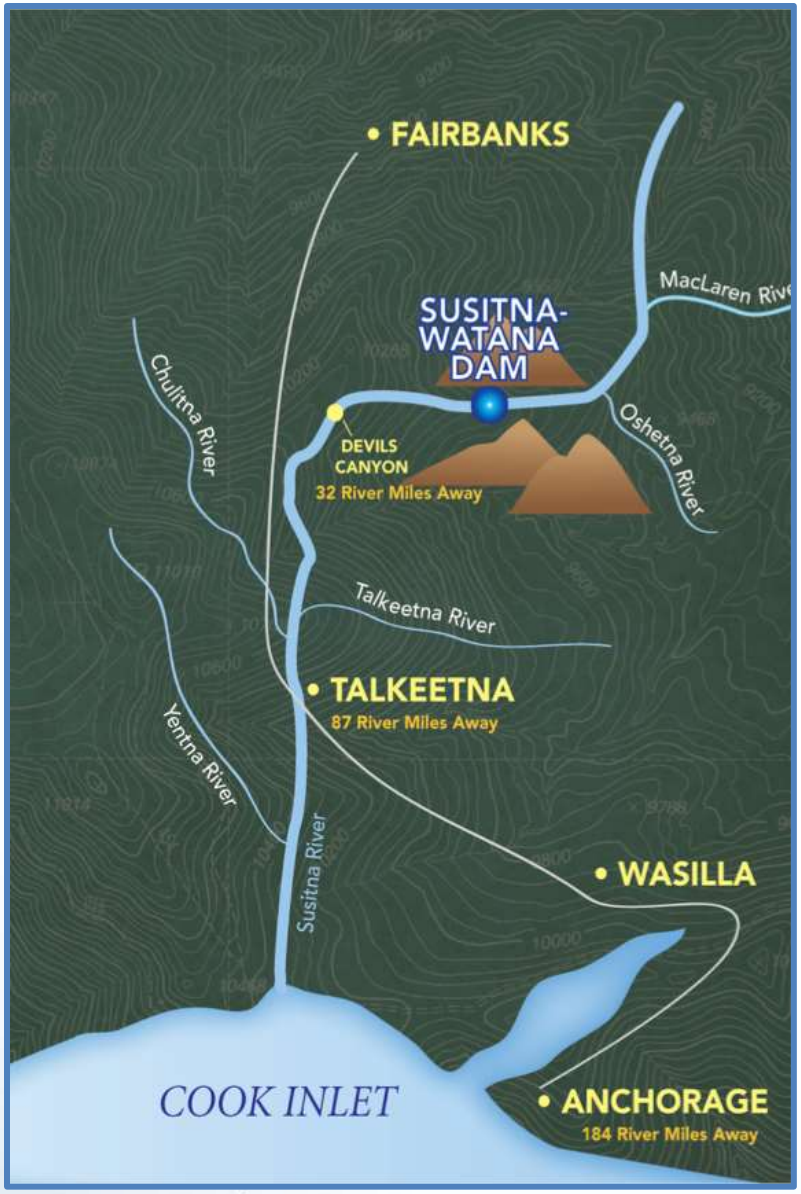

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Technical Workgroup Meeting

Q4 2013 TWG

Fish and Aquatics Instream Flow Study (FA-IFS)

December 3, 2013

Prepared by

R2 Resource Consultants

8.5 FA-IFS: Presentation Overview

- Review of Schedule and Q4 Activities and Planned 2014 Q1 Activities
- Hydrology and Hydraulic Flow Routing
- Tributary Streamflow Gaging
- Representative Years
- HSC/HSI Data Collection
- IFS Winter Studies
- Lower River Studies
- Study Integration and Modeling
- Other Topics

Review of Schedule: Fish and Aquatics Instream Flow Study

Activity	2012				2013				2014				2015	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Review of 1980s Data and Information														
Study Area Selection (Focus and Supplemental Areas)														
Compile aquatic habitat (RSP Sec 9.09) and geomorphology (Sec 6.5) characterization study results														
Identify proposed Focus Areas														
Refine Focus Areas and identify supplementary area if needed for any underrepresented habitats														
TWG confirmation of 2013 areas														
Review available data and modify or add Focus Areas and supplementary sampling areas														
TWG review of proposed area weighting factors to extrapolate modeled to non-modeled areas														
TWG meeting on area weighting														

Planned Activity
Follow-up Activity
Initial Study Report
Updated Study Report

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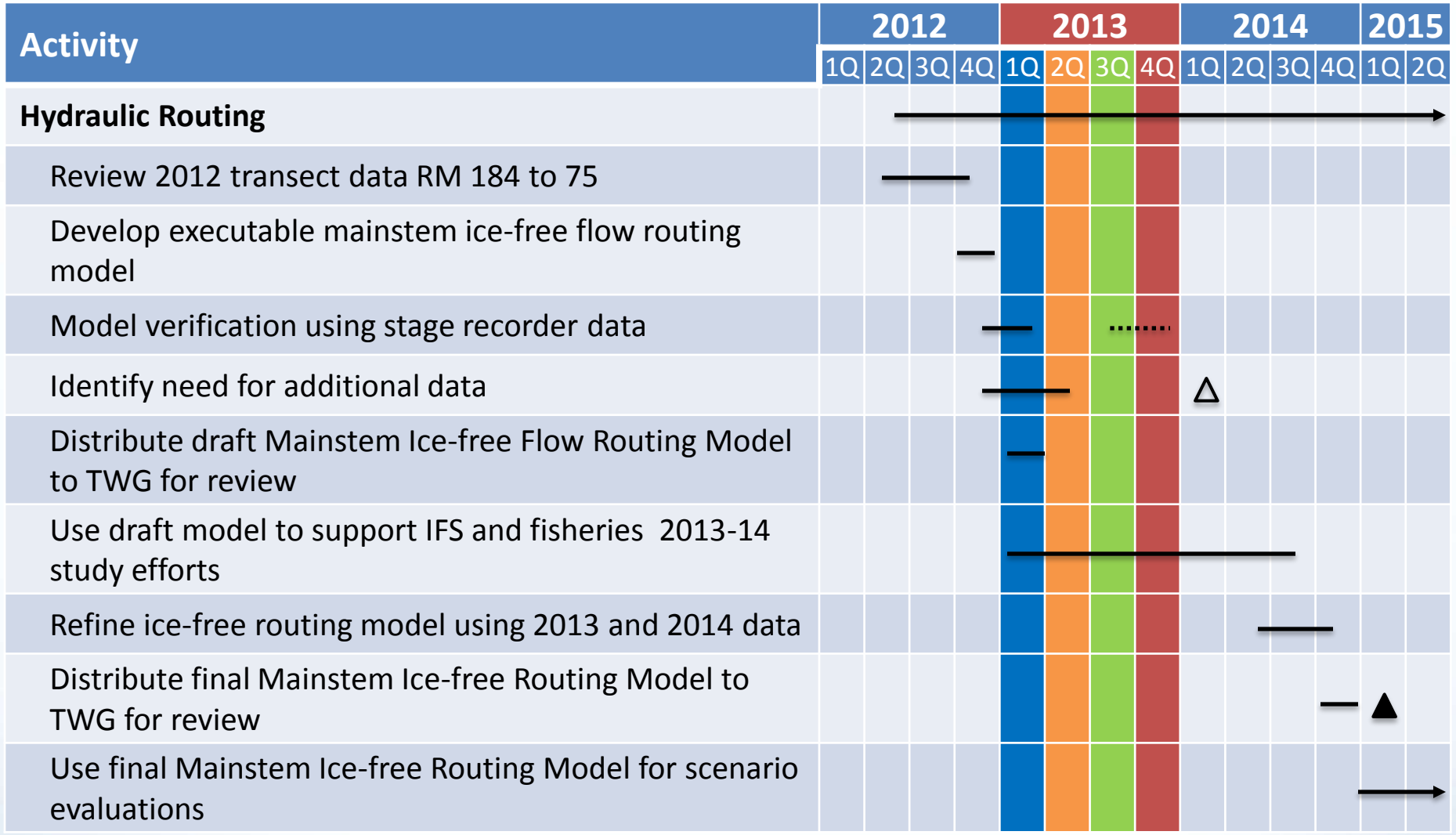
Fish and Aquatics Instream Flow Study Schedule (cont.)



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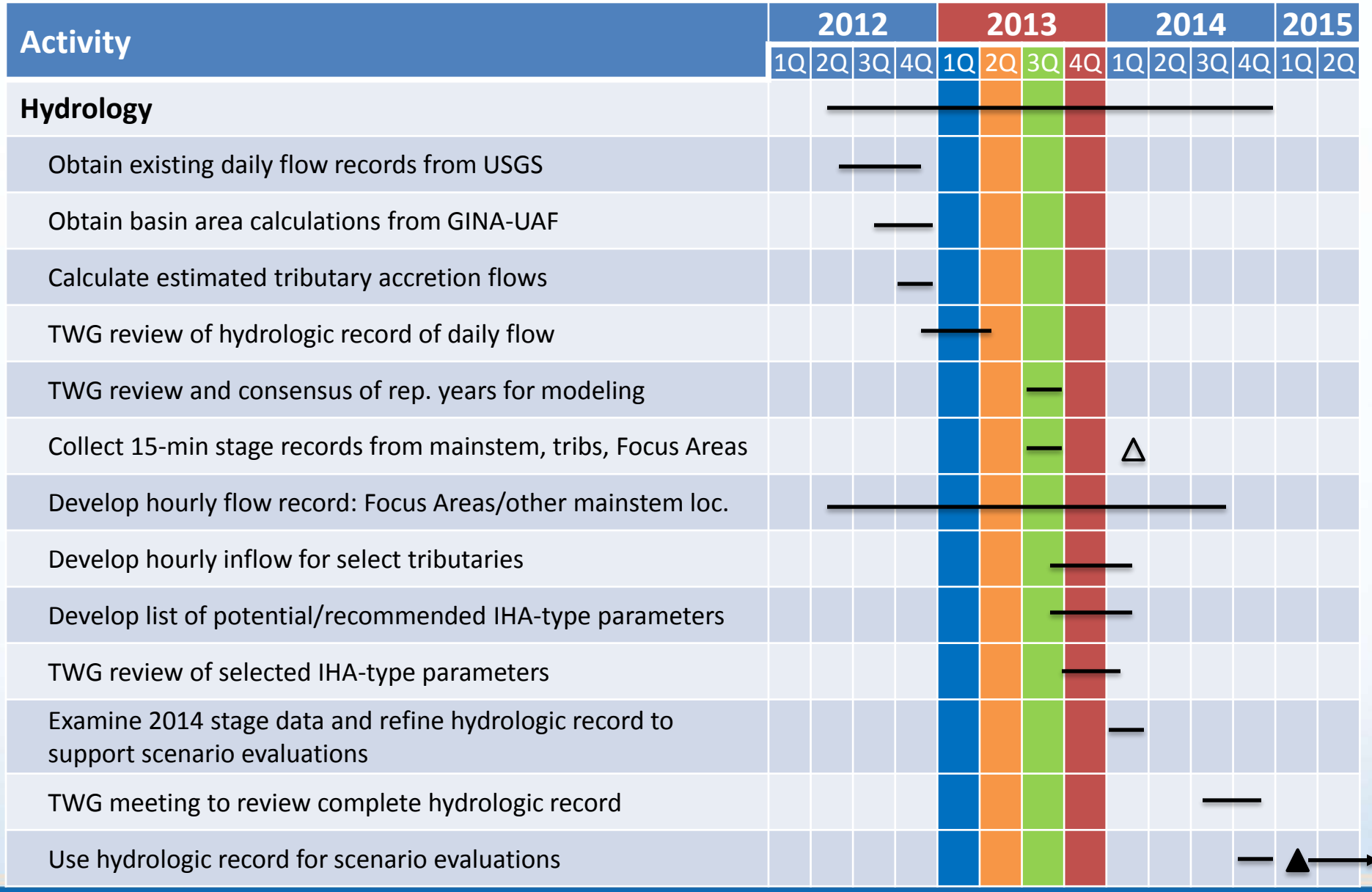
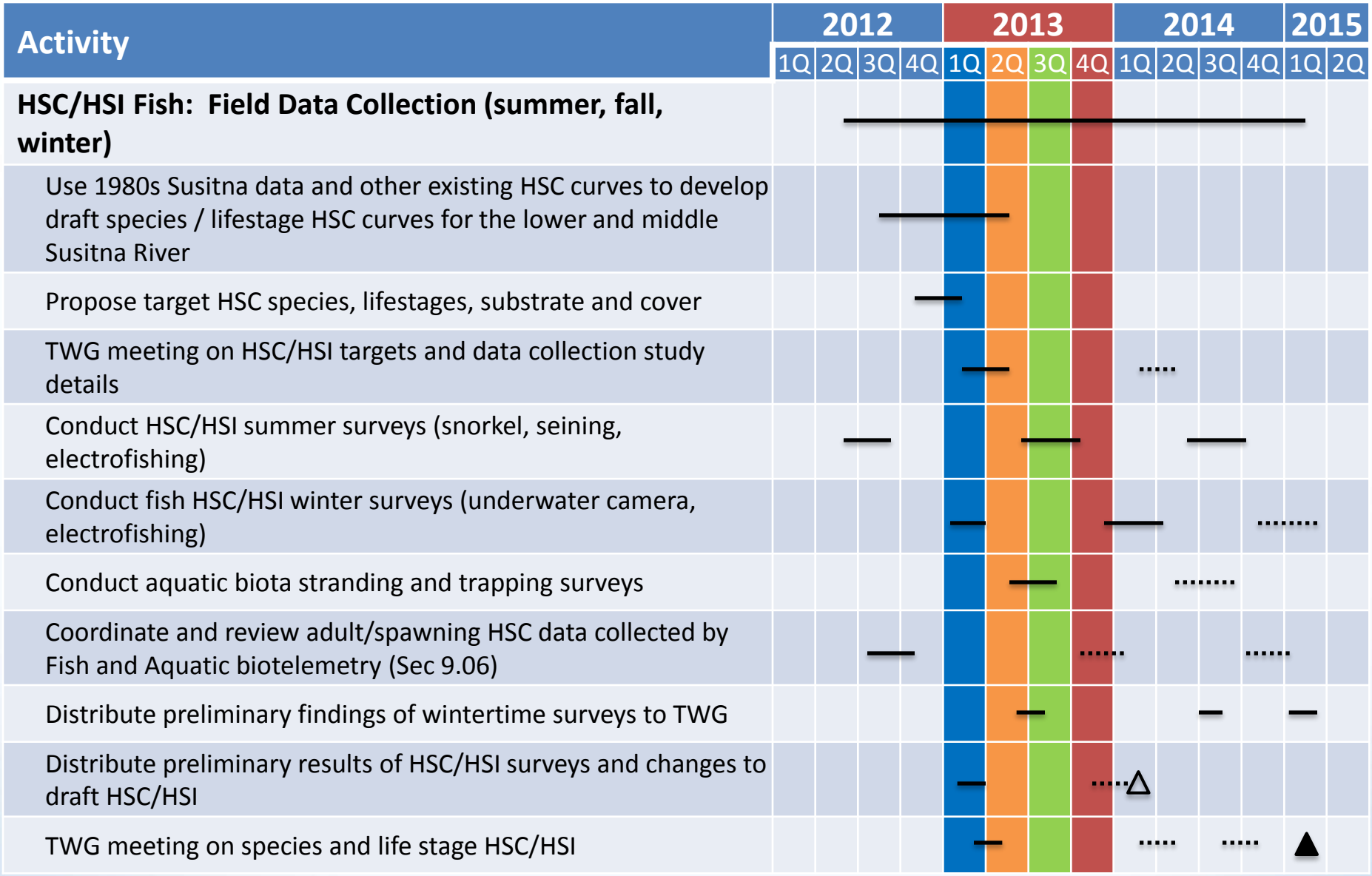
Fish and Aquatics Instream Flow Study Schedule (cont.)



Fish and Aquatics Instream Flow Study Schedule (cont.)



Fish and Aquatics Instream Flow Study Schedule (cont.)

Activity	2012				2013				2014				2015	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Periodicity														
Review draft species and lifestage periodicity data developed under Fish Distribution and Abundance (Sec 9.06)														
Identify specific HSC/HSI periodicity data needs														
Distribute HSC/HSI periodicity to TWG														
TWG meeting on HSC/HSI periodicity used to model scenarios														
Review/discuss implementation details of biological cue study														
Distribute initial study results to TWG														
Report on flow-dependent biological cues														

Planned Activity
Initial Study Report
Follow-up Activity
Updated Study Report

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Fish and Aquatics Instream Flow Study Schedule (cont.)

Activity	2012				2013				2014				2015	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
Model Selection by habitat type (2-D, 1-D, etc.)														
Propose habitat models for Focus Areas and supplemental area														
TWG review and meeting on habitat model selection														

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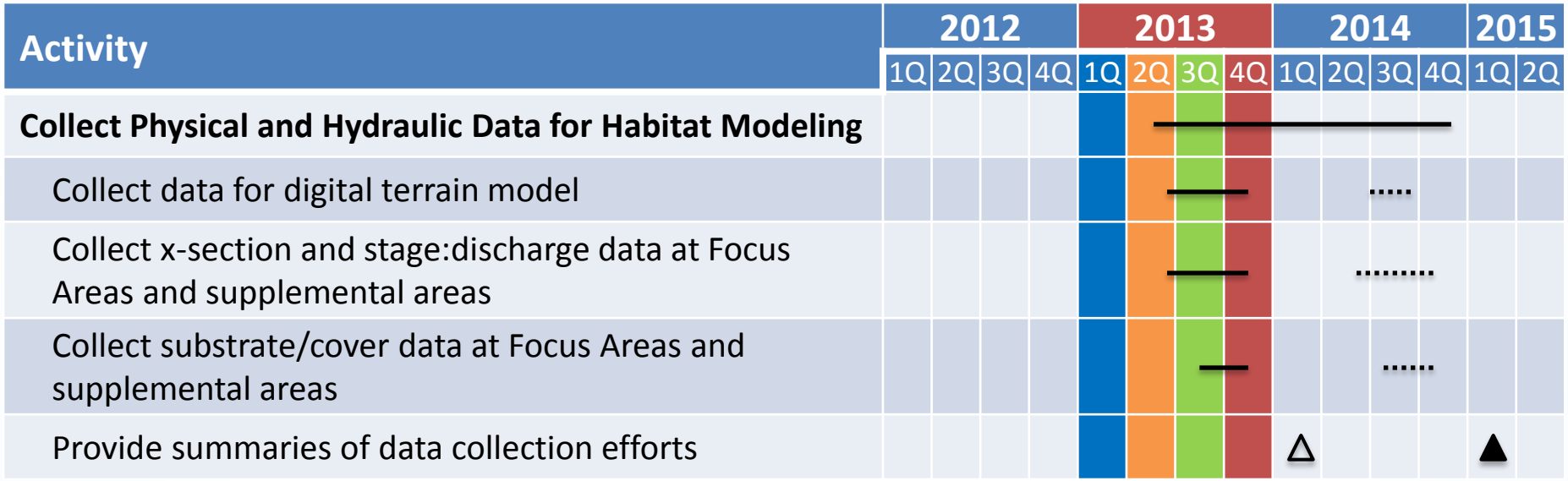
Fish and Aquatics Instream Flow Study Schedule (cont.)



Planned Activity
Follow-up Activity
Initial Study Report
Updated Study Report

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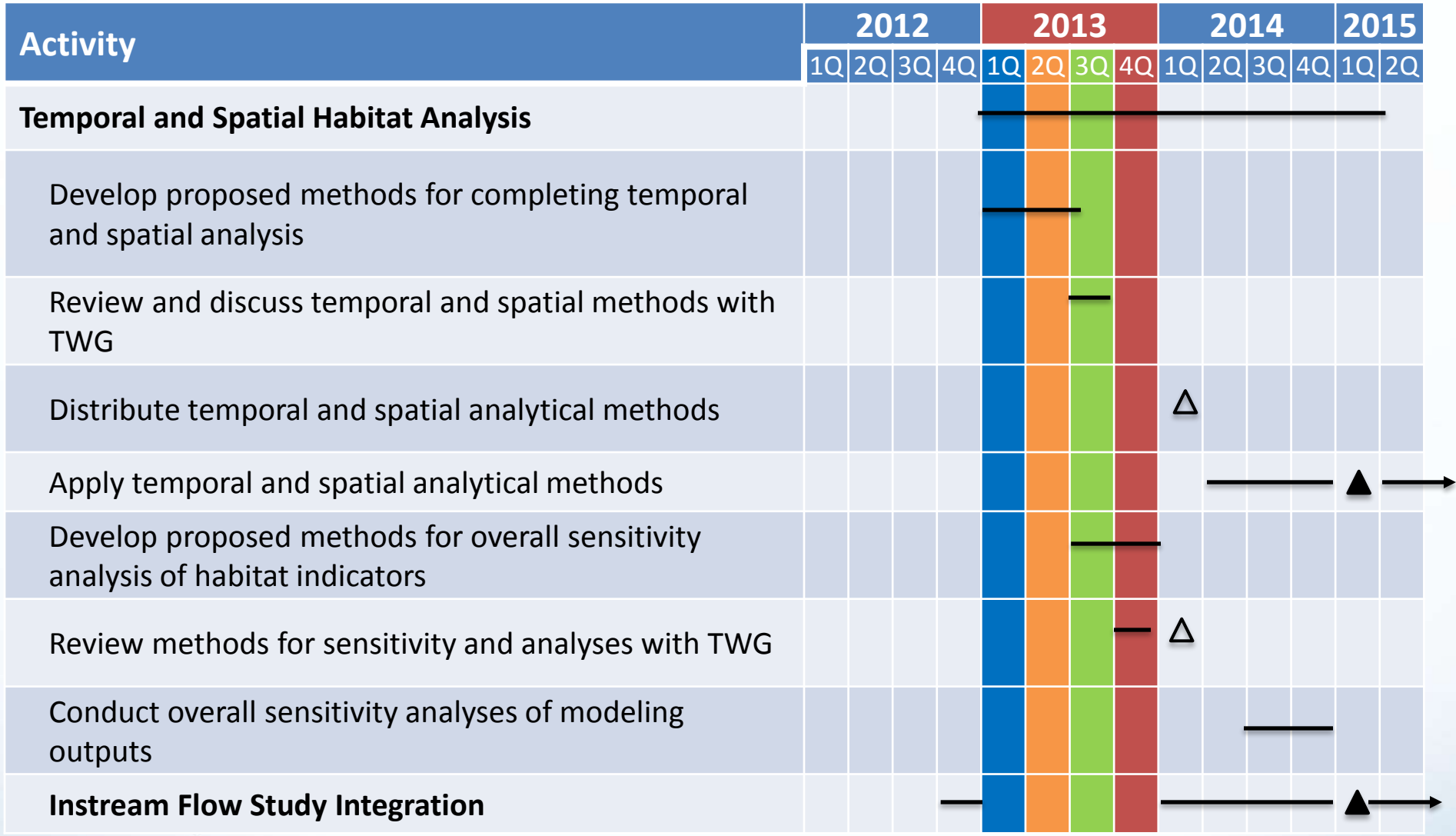
Fish and Aquatics Instream Flow Study Schedule (cont.)



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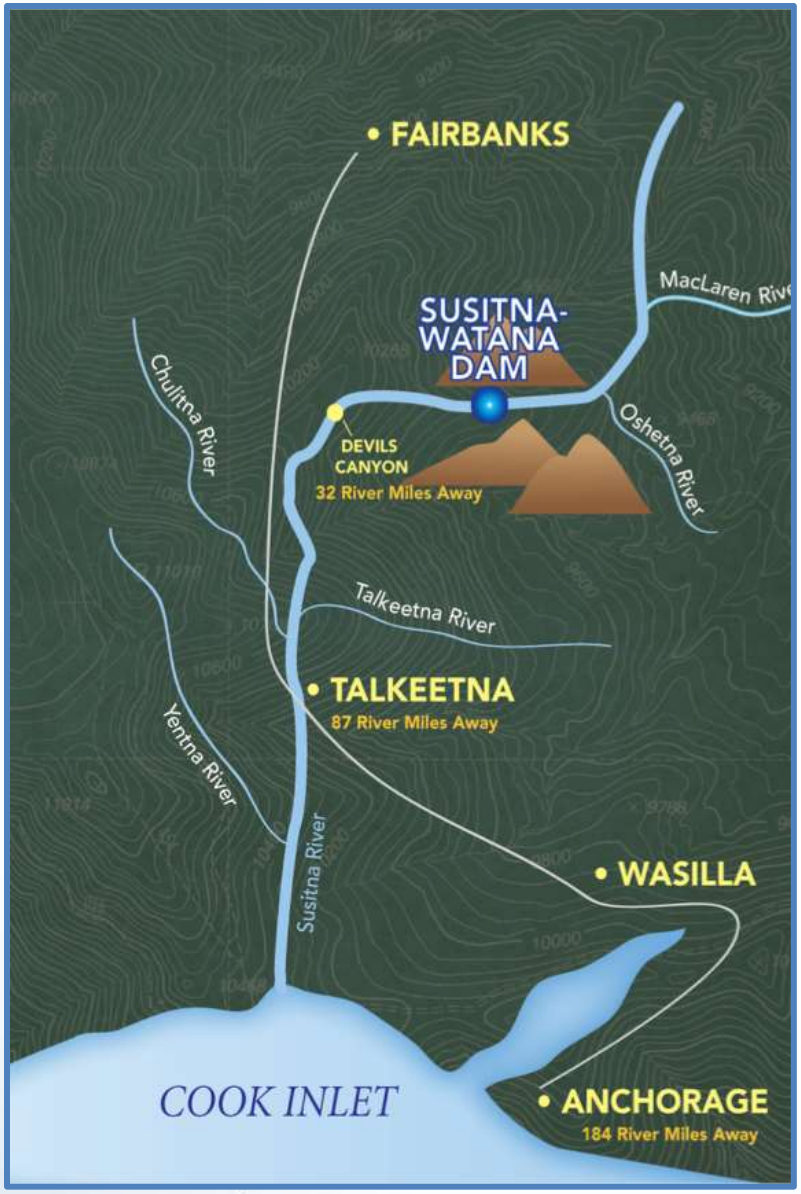

Open Water HEC-RAS Flow Routing Model

Prepared by:

R2 Resource Consultants,
GW Scientific,
Brailey Hydrologic,
and Geovera

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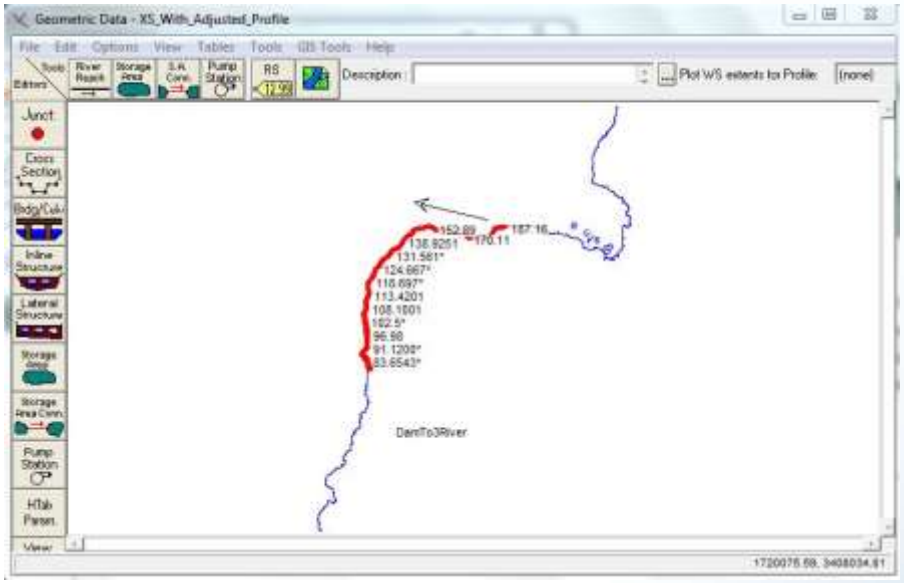
Open Water Flow Routing Model
Version 2 Changes

- **Extent**
- **Number of Cross Sections**
- **Tributary Gage Data**
- **Diurnal Fluctuations**



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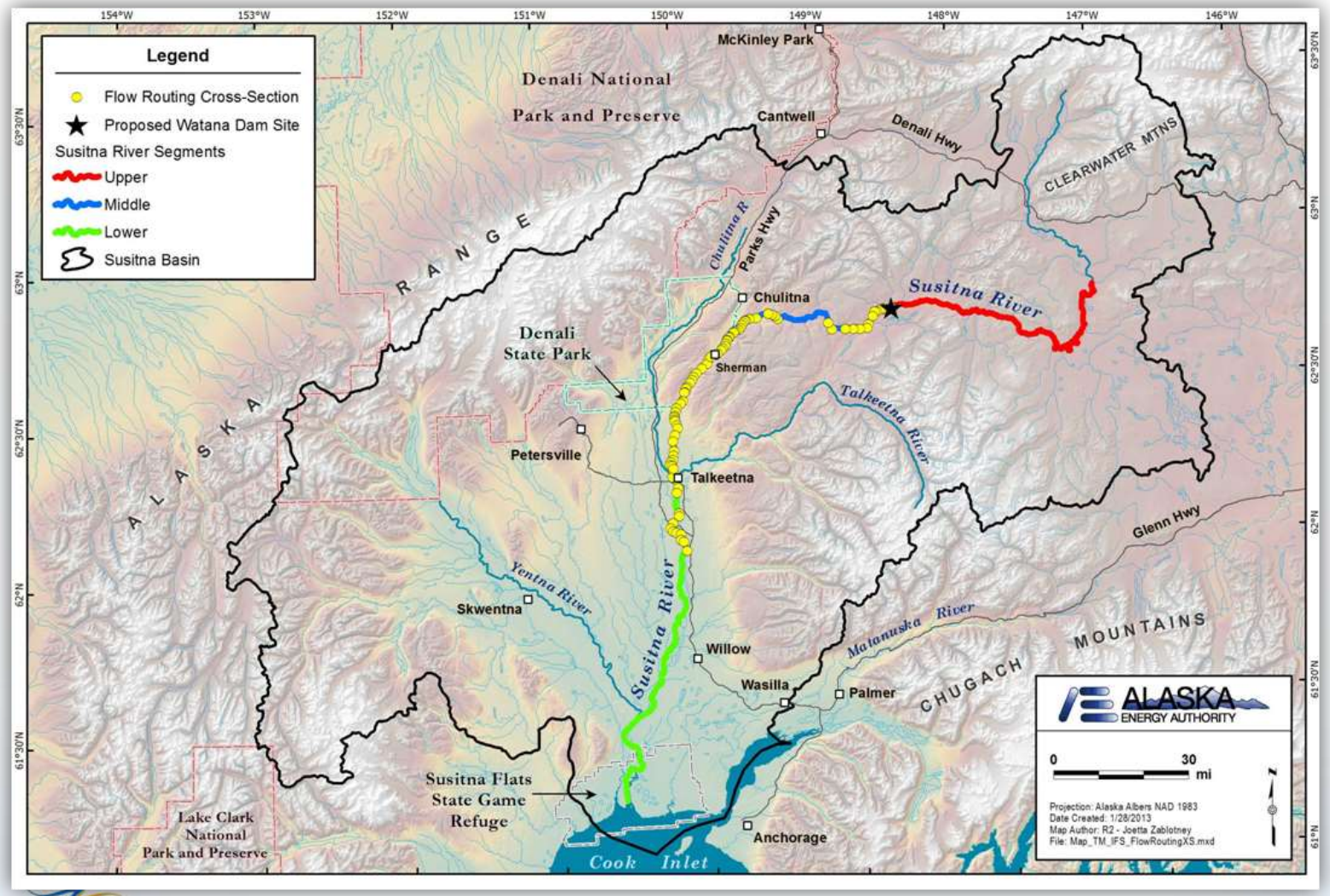
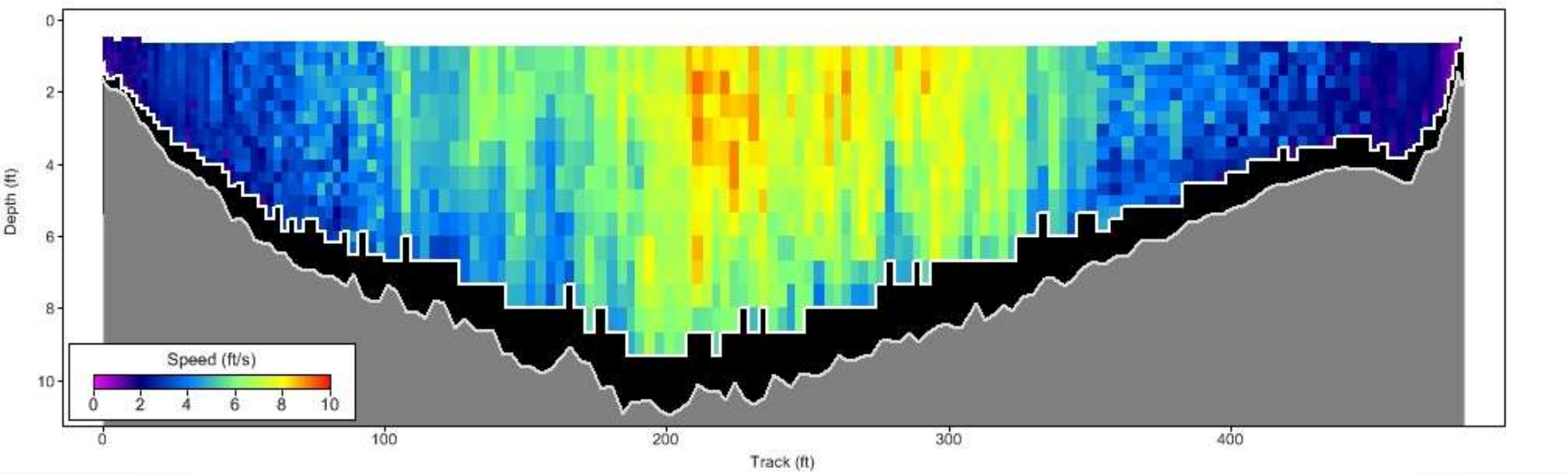
Extent: Model will extend from PRM 29.9 to 187.2 (proposed dam site)



Cross Sections

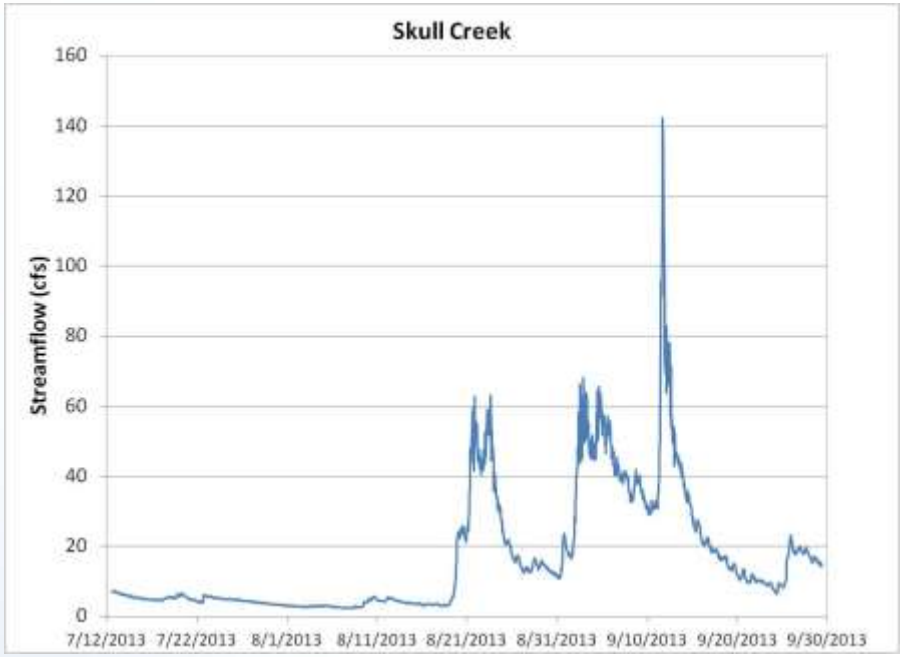
Version 1 contained 88 cross sections

Version 2 will contain approximately 180 cross sections



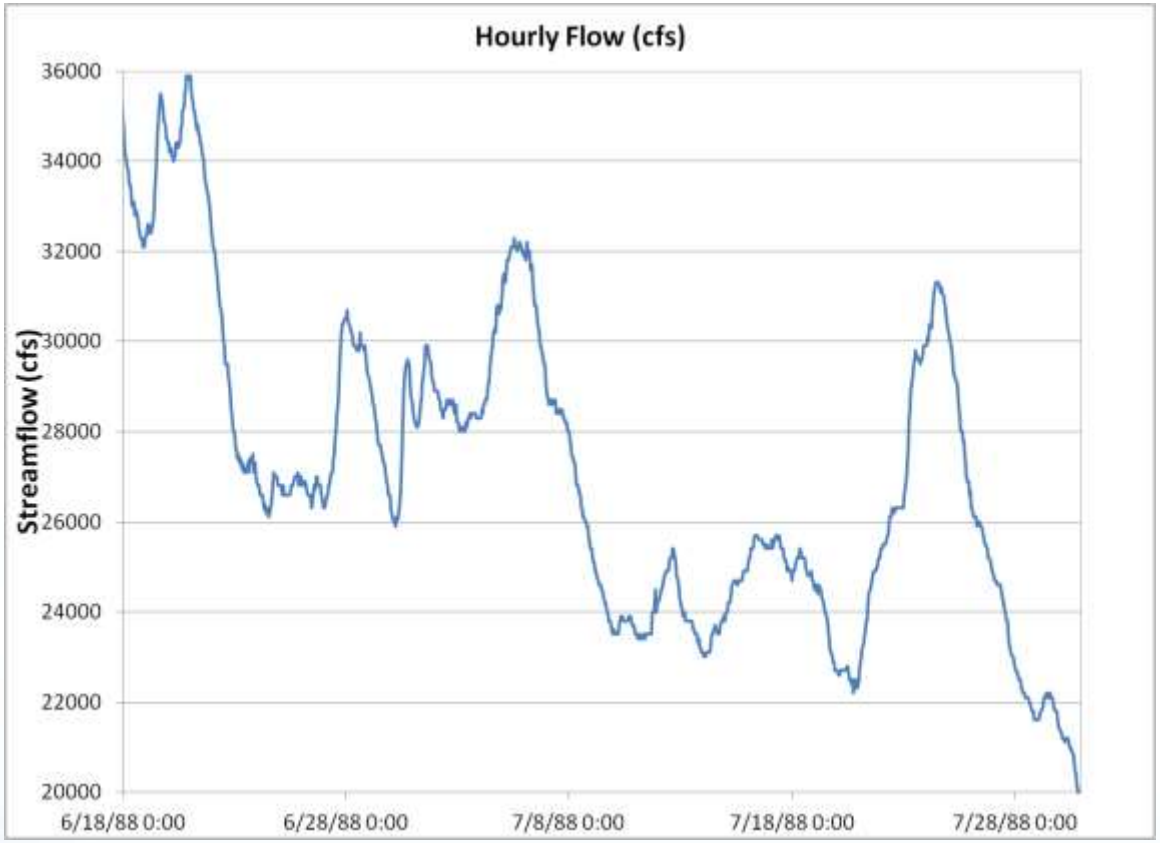
Tributary Gage Data

Measured tributary gage data will be used to synthesize historical tributary flows



Diurnal Fluctuations

Version 2 will include measured diurnal fluctuations for gages where it is available

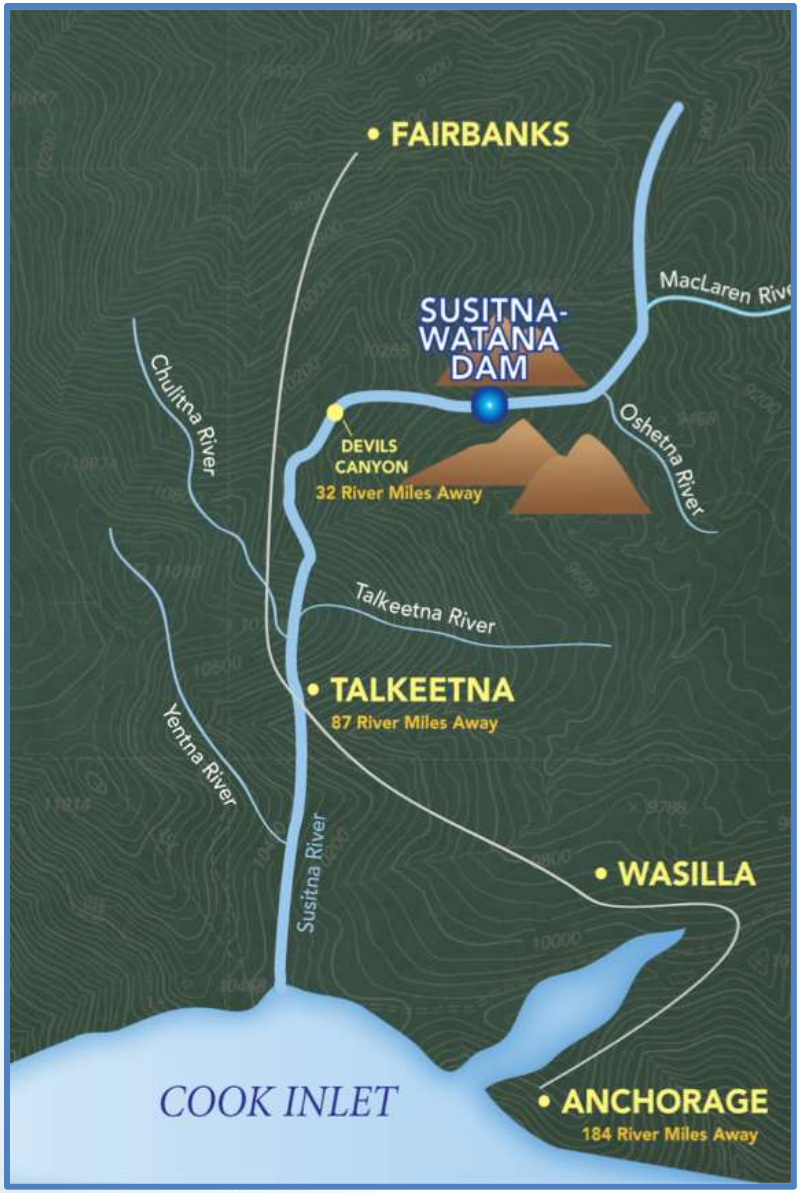


Flow Routing Model Development Schedule

- Version 1 – January 2013
  - From PRM 80.0 to PRM 187.2
  - Hourly downstream accretion flows without diurnal fluctuations
  - Cross-sections do not extend into floodplain
- Version 2 – January 2014
  - From PRM 29.9 to PRM 187.2
  - Hourly downstream accretion flows with partial diurnal fluctuation coverage based on available historical hourly flows
  - Cross-sections do not extend into floodplain
- Version 3 – January 2015
  - From PRM 29.9 to PRM 187.2
  - Hourly downstream accretion flows with complete coverage of diurnal fluctuations
  - Cross-sections extended into floodplain

Hydrology-Related Variances

- Open Water Flow Routing Model & Hydrologic Data Analysis
  - RSP indicated continuous mainstem stage recorders would be maintained during 2013
  - Identified 8 of the 13 gages as priority for maintenance in 2013
- Tributary Streamflow Gaging
  - None
- Selection of Representative Years
  - RSP indicated TWG review of representative years in Q3 2013
  - Process discussed at December 13-15 IFS modelers meeting and Q4 2013 TWG meeting
  - Representative years will be proposed in ISR



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Technical Workgroup Meeting

Q4 2013 TWG

Tributary Streamflow Gaging

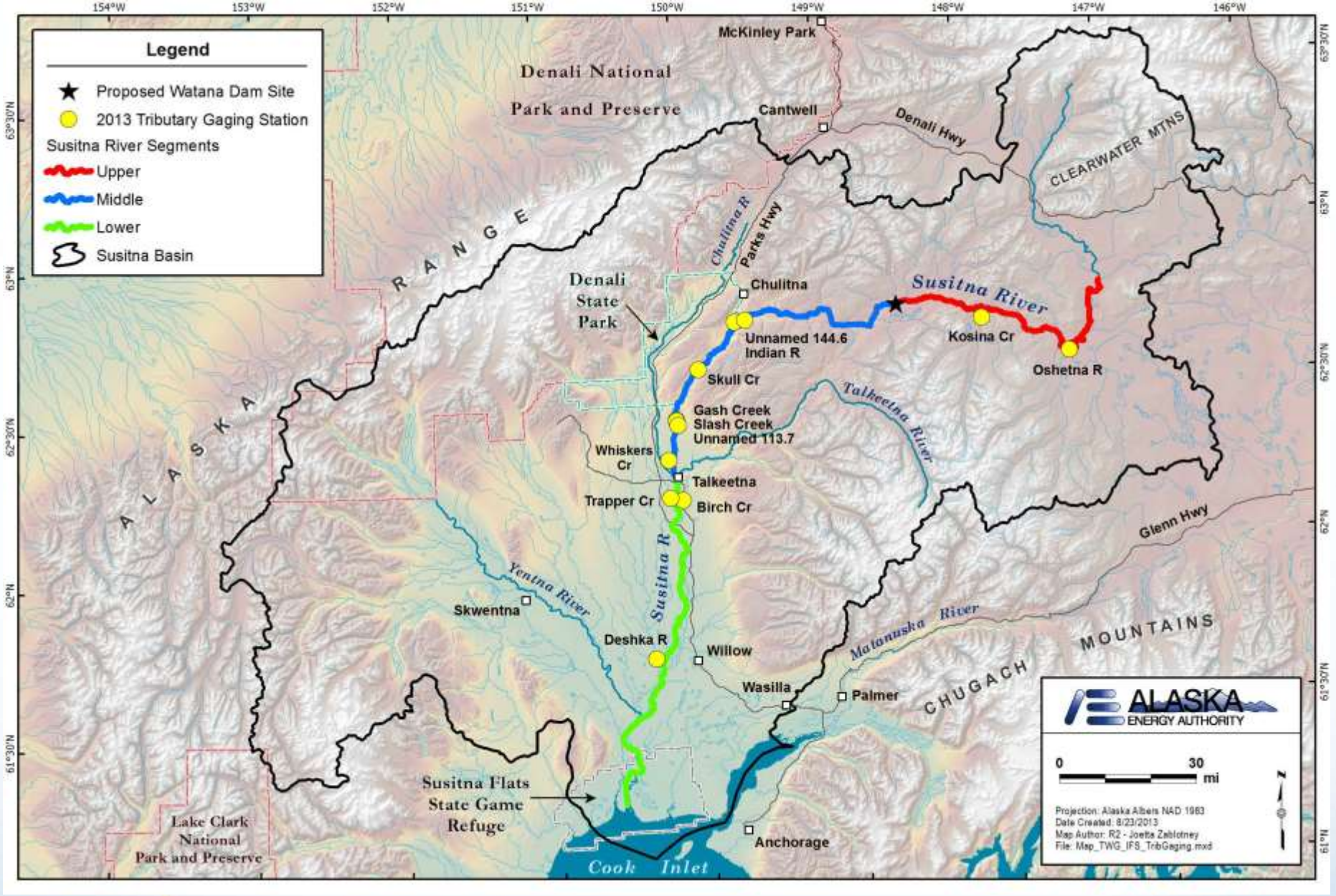
December 3, 2013

Prepared by

R2 Resource Consultants

Tributary Streamflow Gaging Recap: Data Collected in 2013

- *Installation of Continuous Pressure Transducers (& Duplicates) at 10 Sites*
- *Spot Measurements at Two Sites*
  - *Unnamed Tributary @ PRM 144.6, Slash Creek*
- *Installation of barometric pressure transducers at four sites*
  - *Kosina Creek, Indian River, Whiskers Creek, Deshka River*



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Tributary Streamflow Gaging 2013 Field Visits

- *3 Field Visits*
  - *Installation and Q measurement (June/July)*
  - *Data download and Q measurement August 6th-10th*
  - *Data download and Q measurement September 26th-30th*

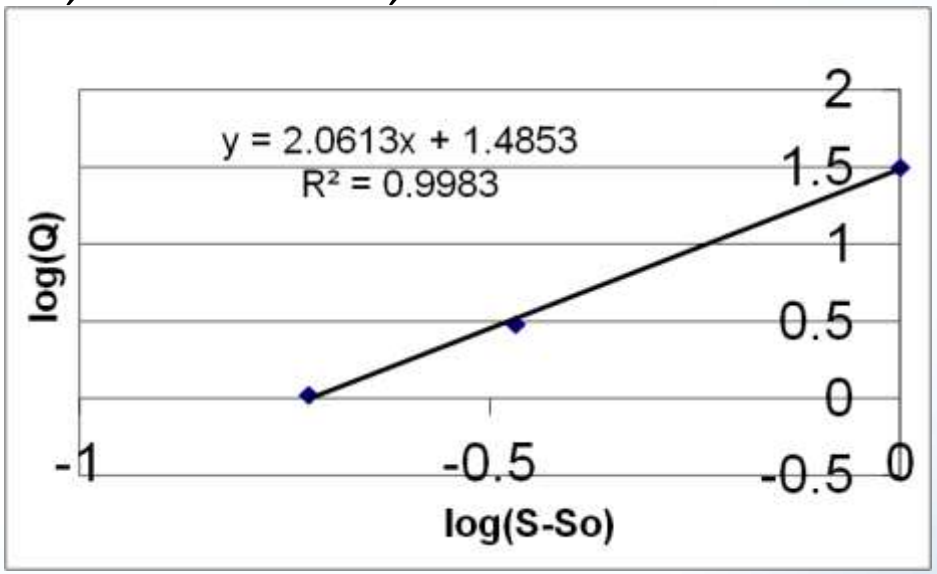
Tributary Streamflow Gaging QA/QC

- *QC1 – Review of data in field* ✓
- *QC2 – Review of data during data entry* ✓
- *QC3 – Review by senior level engineer* ✓

✓*Complete*

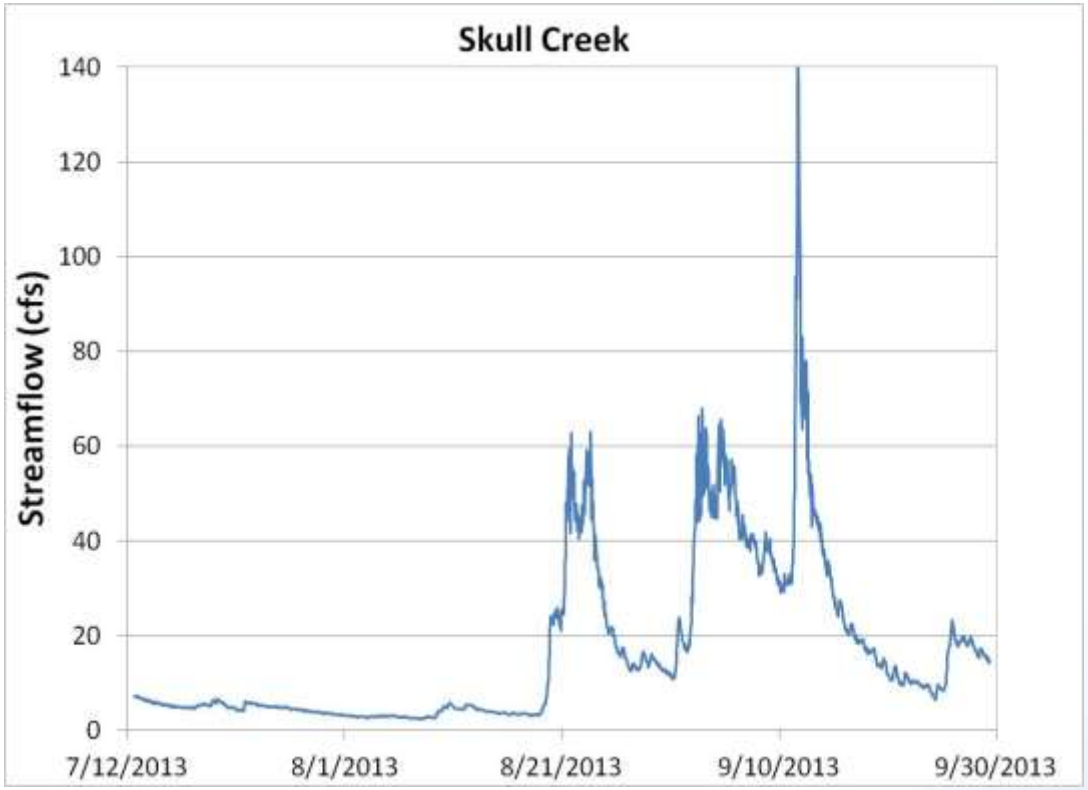
Rating Curve Analysis

- *Initial Curves developed for 6 sites*
  - Trapper Creek, Birch Creek, Indian River, Skull Creek, Whiskers Creek, Unnamed Tributary 113.9
- *Initial Curves pending further data collection*
  - *Only 2 data points for Kosina Creek, Oshetna River, & Deshka River*
  - *Hydraulic control movement on Gash Creek*



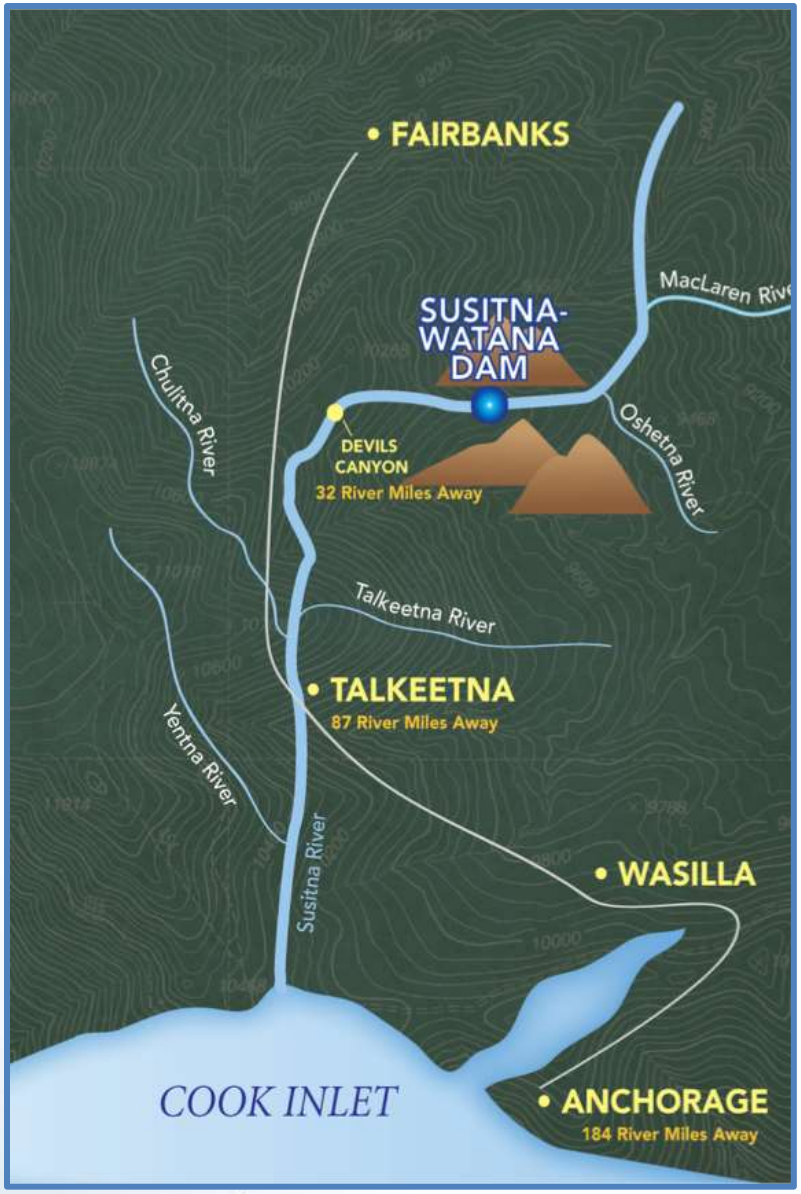
Hourly Flow Records

- *Hourly flow records developed from pressure transducer data and rating curves*
- *Hourly records provided to other studies*



Tributary Streamflow Gaging Next Steps 2014

- *Continue monitoring in 2014 at same sites plus 5 additional sites*
  - Fog Creek, Unnamed Tributary @ 173.8, Portage Creek, Sheep Creek, and Caswell Creek
- *Conduct 4 field visits*
  - *Once per month June-Sept*



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Technical Workgroup Meeting

Q4 2013 TWG

Representative Years

December 3, 2013

Prepared by:

R2 Resource Consultants
and
Tetra Tech

Rationale for Representative Years

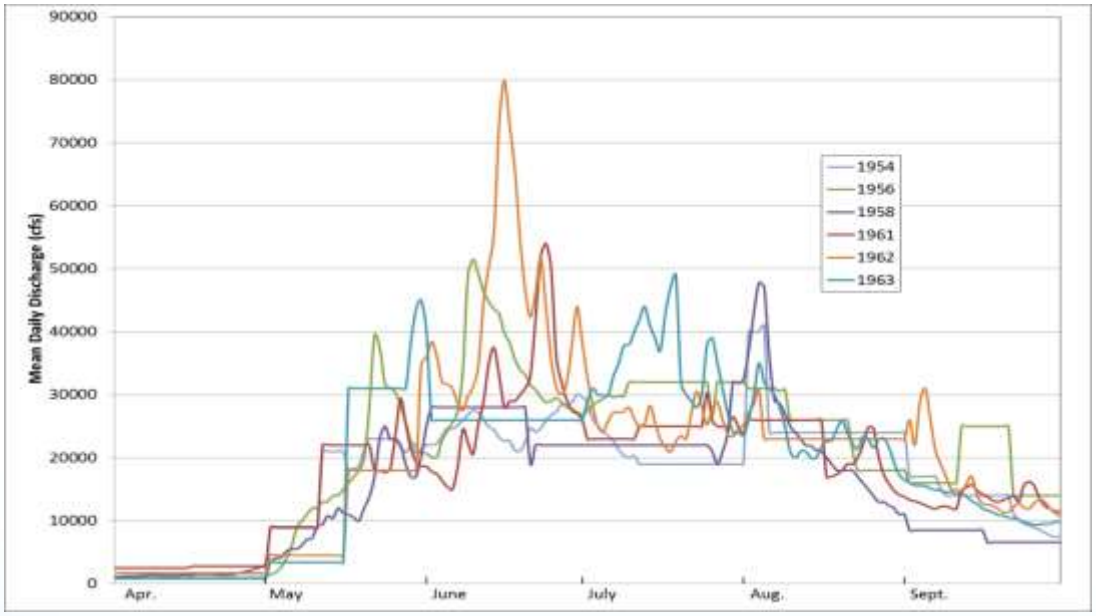
- Operations modeling will use 61-year record
- Representative years selected to simplify modeling and evaluations of Project effects
- Selected years should represent the range of conditions
- Extreme years/seasons used to supplement analyses of representative years

Dry, Average, and Wet Conditions During Periods of Cool and Warm Pacific Decadal Oscillation

- Selection of years based on the analysis of flow records at the USGS gage at Gold Creek
- Initial analysis conducted by Tetra Tech with a focus on sediment transport
- Subsequent analysis conducted by R2 with a focus on aquatic habitat conditions
- Additional review to be conducted by ice processes and other study IFS-related study leads

Review of Flow Records at Gold Creek Performed by Tetra Tech

Flow records included 6 years when daily flows were approximated by a monthly average, and 5 years of synthesized flows. If these years are excluded, then there is a remainder of 50 years from the initial 61-year period of record.



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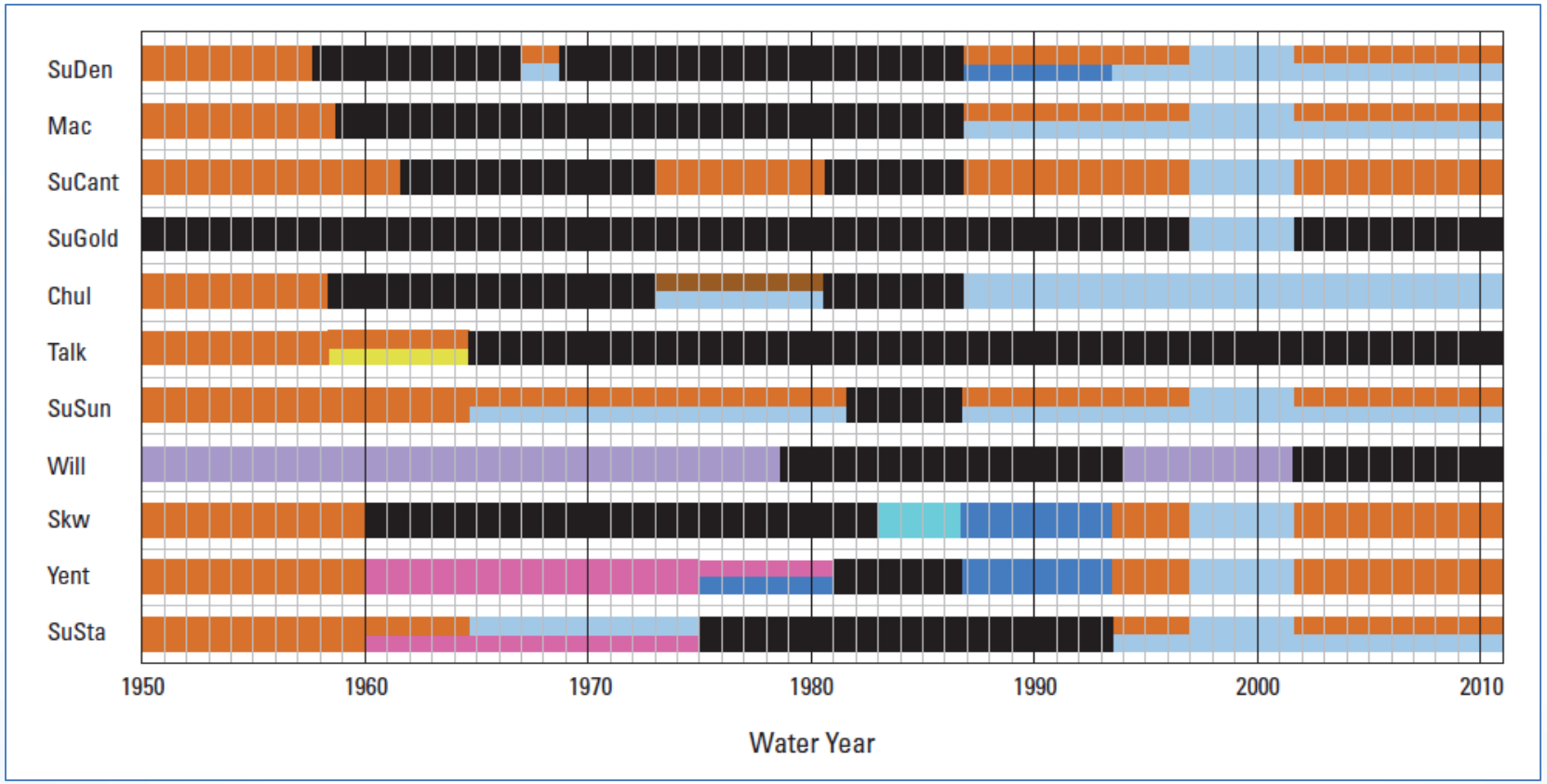
Evaluated a 50 year record

1950-1953, 1955, 1957, 1959-1960, 1964-1966, 2002-2010



Gage data in black - Other colors are USGS record extension

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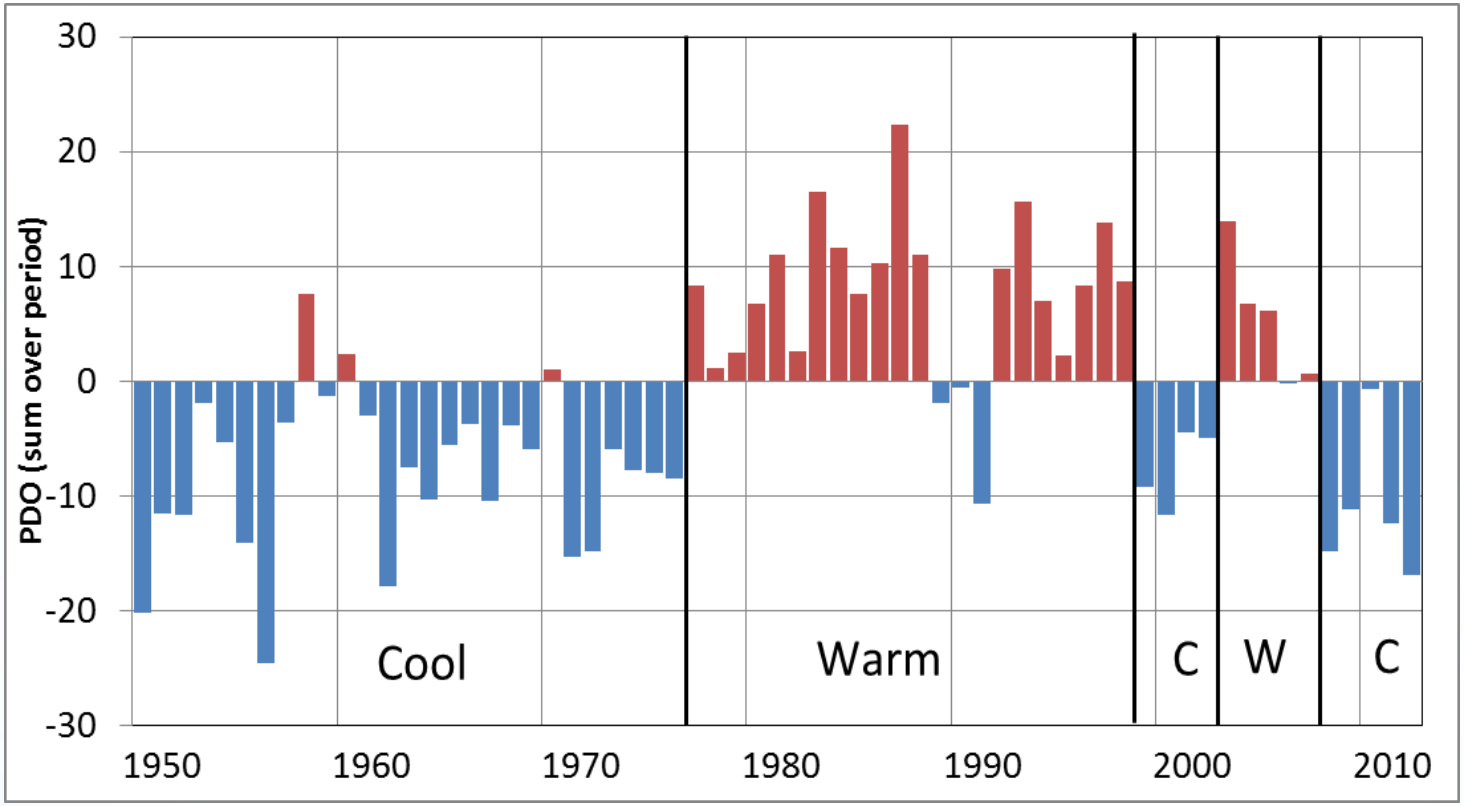
50-year Record

- Selected because it excludes years with monthly average flows, and years with synthesized flows
- Representative years selected from this period will be included in the 61-year period used for operations modeling

Pacific Decadal Oscillation: Defined by Water Year
(source:Tetra Tech)



Assume PDO is Correlated with Streamflow

1) Use PDO grouping from previous figure
2) Rank years based on annual flow volume
3) Select candidate years
   - Exclude dry/average years with extreme peaks
   - Exclude wet/dry extremes
   - Rank based on summer flows
4) Compare statistics

Evaluated 12 Years

- 2 Dry/Cool years
- 2 Dry/Warm years
- 2 Avg/Cool years
- 2 Avg/Warm years
- 2 Wet/Cool years
- 2 Wet/Warm years

Dry, Average, & Wet Years

	Percent time equalled or Exceeded		
Discharge, cfs	Dry Years	Average Years	Wet Years
5,000	39-48	42-50	42-51
10,000	33-35	33-44	37-40
15,000	22-27	26-36	27-33
20,000	12-14	18-23	21-29
25,000	0-6	7-16	14-20
30,000	0-1	2-7	5-12
35,000	0	0.3-4	3-9
40,000	0	0	2-6
50,000	0	0	0-2
60,000	0	0	0-.7

Statistical Analysis of Pacific Decadal Oscillation

- Evaluated gaged flows between PDO conditions
- Results were the same
  - Using different statistical methods
  - Regardless of method for segmenting PDO
- Results
  - PDO does not significantly affect summertime (May-Sep) flow conditions
  - Wintertime warm PDO has consistently higher flows than cool PDO
  - Similar to what was found in the Yukon River Basin (Brabets & Walvoord 2009)

Initial Wintertime Analysis

- Compared more recent PDO conditions (i.e., 1989-2012) and found no statistical difference in wintertime flows
- Compared gage measurements associated with ice cover pre & post 1977 and found flows are higher post 1977 which corresponds with a higher number of warm PDO years
- Oct-Apr flows have increased, but it may not necessarily be associated with PDO

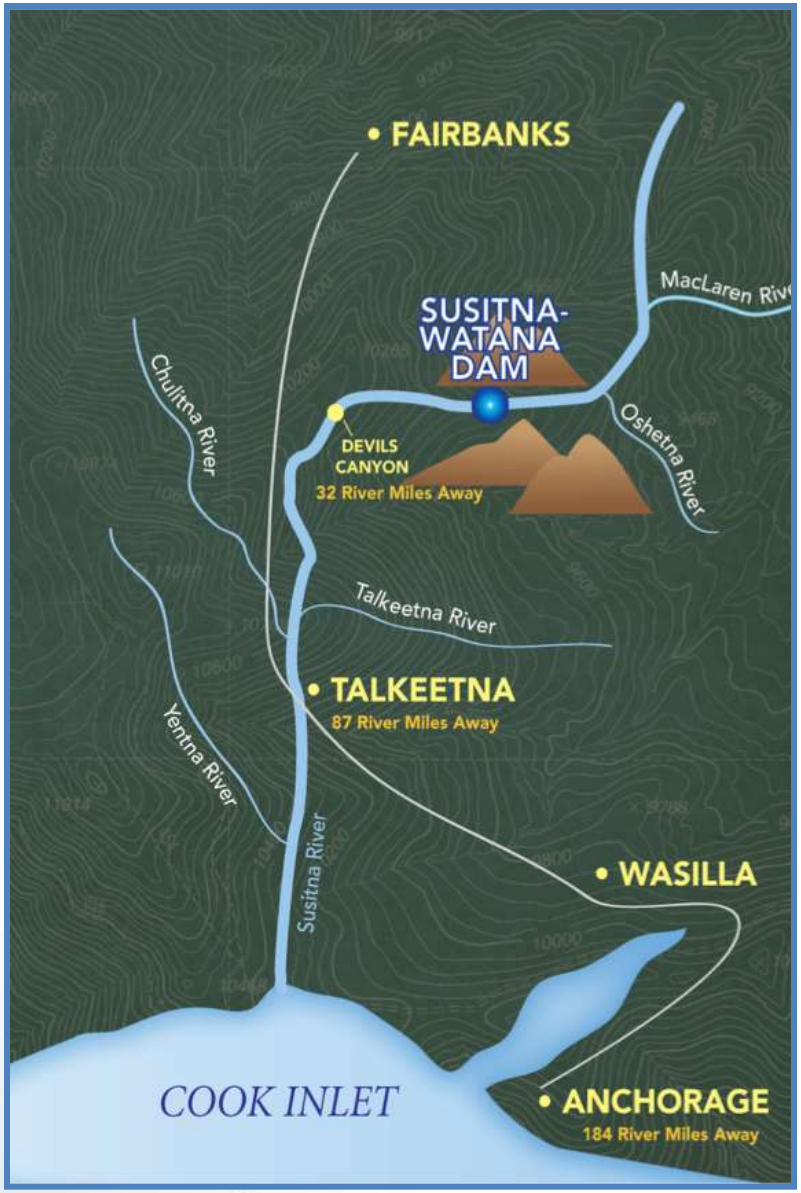
	Pre-1977	Post-1977
N	40	24
Mean (cfs)	1202	1705
Min (cfs)	679	1070
Max (cfs)	2530	2380
Sdev (cfs)	408	353
Z	4.6	4.6
Beta	2.00E-05	2.00E-05

Representative Years from a Habitat Perspective

- Assumed the same 50-year record
- Evaluated gaged flows on an average monthly basis
- 1st Approach – 12 month frequency analysis:
  Ranked the 50 years by month and determined the years with the greatest number of months characterized as dry, average, or wet conditions.
- 2nd Approach – 5 month frequency analysis:
  Performed a similar analysis for summer months only (i.e., May – Sep) since there is little variability from year to year during winter months

Next Steps

- Representative years to be evaluated by ice processes and other IFS-related study leads
- Integrate approaches and develop recommendation of specific representative years
- Operations modeling to use available record to develop output (i.e., hourly dam releases)



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Technical Workgroup Meeting

Q4 2013 TWG

IFS-Fish Biological Cues Evaluation

(RSP 8.5.4.5.1.3)

3 December 2013

Prepared by

R2 Resource Consultants

Biological Cues Evaluation

- Identify and evaluate candidate drainages with “suitable data” sets (hydrology and adult escapement/count data):
  - Selected Taku and Stikine rivers (based on ADF&G discussion)
  - Obtained data from Philip Richards (ADF&G)
- Identified appropriate hydrologic metrics
- Statistical Analysis completed

Biological Cues Evaluation

- Biological Response Variables:

Description	Years of Data	
	Taku River	Stikine River
Production Indicators		
Total returns resulting from spawning during brood year	20	29
Returns per spawner	16	21
Smolts per spawner from brood year	16	10
Returns per smolt (smolt to adult returns)	13	4
Run Timing Indicators		
Median Julian day of run	26	18
Number of days from 10th to 90th percentile of run	26	18

Biological Cues Evaluation

- Hydrologic/Environmental "predictors" for production indicators:

Description	Period	Lag
Peak flow during incubation period	Sept - March	BY
7-day minimum flow during incubation period	Sept – March	BY
Winter-rearing peak flow	Oct – March	BY+1
Winter-rearing mean flow	Oct – March	BY+1
Winter-rearing 7-day minimum flow	Jan – March	BY+2
Summer-rearing 7-day minimum flow	Aug – Sept	BY+1
Outmigration mean flow	May – July	BY+2
Early ocean-rearing mean flow	May - Sept	BY+2
Early ocean-rearing Pacific Decadal Oscillation index	May – Sept	BY+2
Range of flows during returns	Upstream migration duration (varies)	BY
Spawning maximum daily Increase	July – Sept	BY
Spawning maximum daily decrease	July – Sept	BY
Trapping maximum daily decrease	June - Oct	BY+1

Biological Cues Evaluation

- Hydrologic/Environmental “predictors” for run timing indicators:

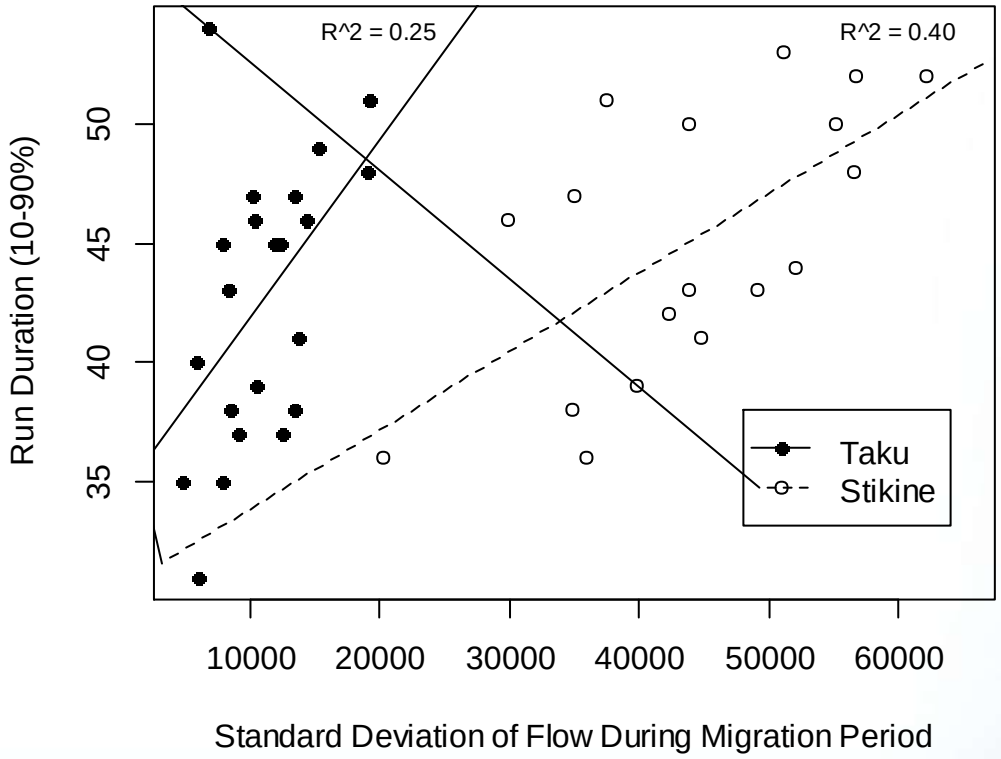
Description
Median Run Timing
Julian day of maximum flow
Julian day with highest increase over previous day
Run Duration
Mean flow during migration period
Range of flows during migration period
Standard deviation of flows during migration period

Biological Cues Evaluation

- Screened for potential correlations, then linear regressions with transformed variables if necessary
- Results: few correlations
- Caveats: Taku and Stikine rivers in different region from Susitna; consistent relationship for the two river systems may be most relevant.
- Only one relationship was consistent for the two River systems
- Full analysis details in ISR appendix

Biological Cues Evaluation

- Duration of run increases with variability of flow during migration period



Biological Cues-Other Results

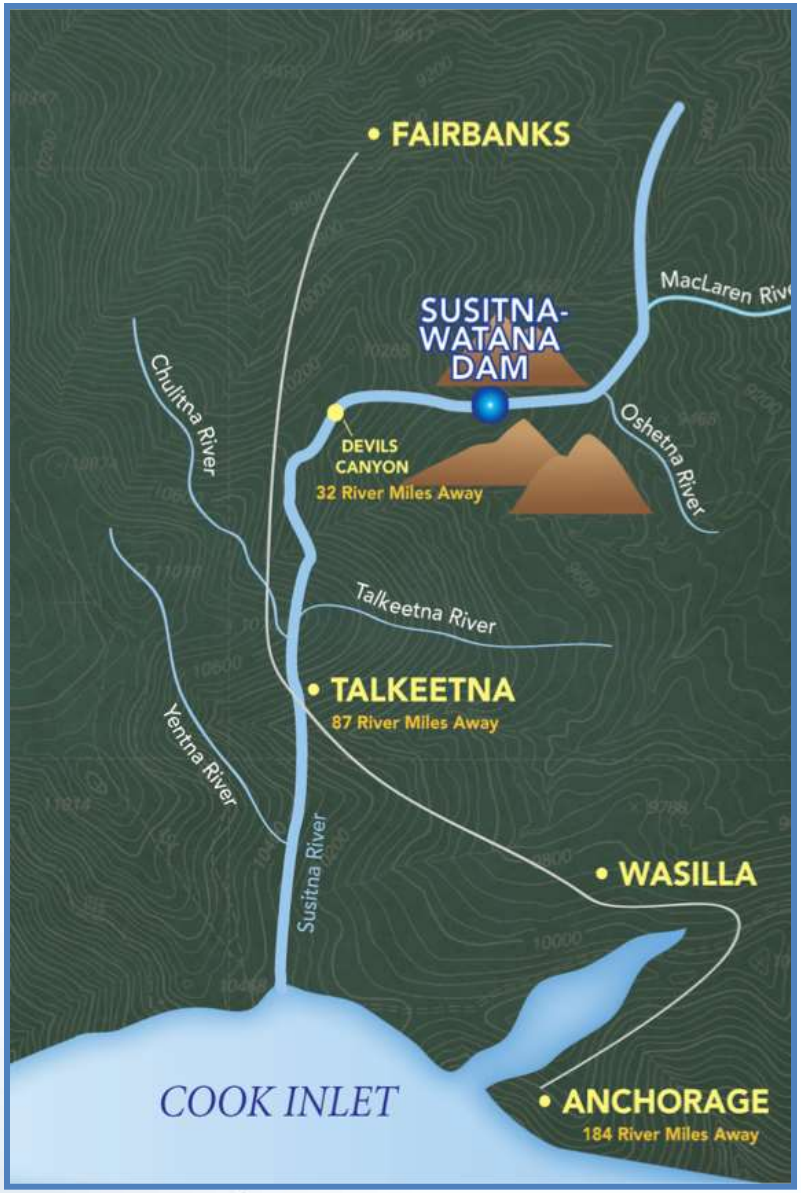
- Taku Only
  - Returns per spawner
    - Increases with flow range during migration
    - Increases with peak flow during winter rearing, but only if there was high trapping potential during the previous summer.
  - Smolts per spawner
    - Increases with minimum flow during summer rearing period

Biological Cues-Other Results

- Stikine Only
  - Total Returns
    - Increases with higher minimum flow during winter rearing
    - Decreases with PDO during early ocean rearing
  - Smolts per spawner
    - Decreases with size of flow drops during spawning
  - Run timing
    - Run is earlier when there are late high flows

Biocues Study Variance

- RSP indicated Deshka River Chinook salmon and Yentna River sockeye salmon datasets would be examined for flow-dependent biological cues.
- Mainly due to lack of the necessary data, the Deshka River and the Yentna River were not used for this study. Through further discussions with ADF&G, the Taku River and Stikine River Chinook salmon stocks were selected.



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Technical Workgroup Meeting

Q4 2013 TWG

Update on HSC/HSI Curve Development

(RSP 8.5.4.5)

3 December 2013

Prepared by

R2 Resource Consultants

Habitat Suitability Criteria Development – Presentation Overview

- **Data Entry and Quality Control Checks**
- **Summary of HSC/HSI *Data Collection and Findings***
- ***Example Histogram Plots of 2013 HSC Data***
- ***Summary of Winter Studies Findings***
- ***Variances from 2013 Study Plan***
- ***Q1 2014 Proposed Work***

2013 HSC Study

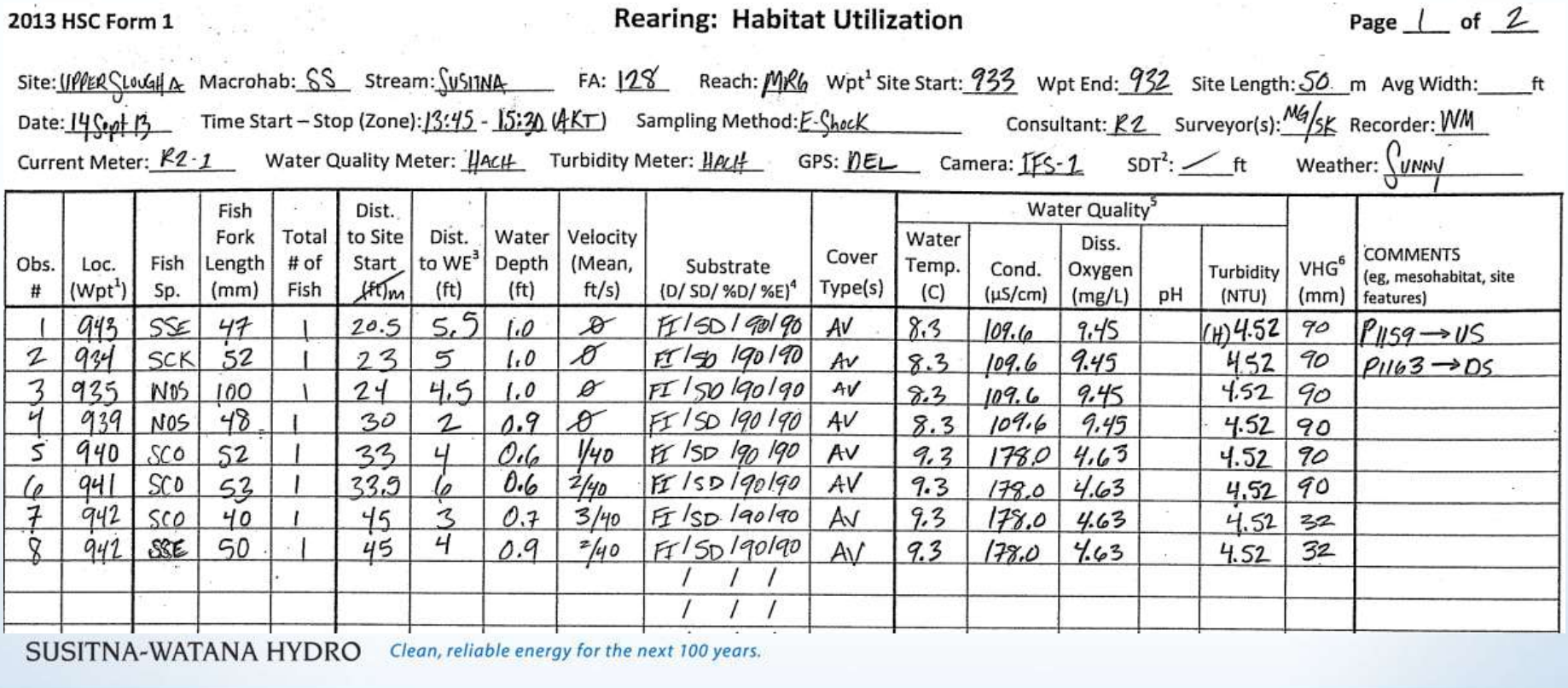
- Q4 2013 Activities:
  1. Completed data entry for September data collection efforts
  2. Performed final QC checks on all 2013 data
  3. Sorted and analyzed data based on geomorphic reach, FA, macrohabitat type, fish species and life stage
  4. Developed histogram plots for comparison to 1980's, 2012, and 2013 findings
  5. Review HSC data for patterns in microhabitat use based on water quality (temp., D.O., conductivity, turbidity) and groundwater upwelling
  6. Produced results of 2013 Winter HSC/HSI surveys
  7. Refine process for development of Univariate and Multivariate HSC curve
  8. Review field data from Early Life History and Fish Distribution and Abundance studies for refinement of species and life stage periodicity
  9. Identify data gaps for recommended 2014 activities
  10. Draft Sections of Initial Study Report

HSC Data Collection Summary

- Collect microhabitat data for both occupied (utilization) and unoccupied (availability) areas:
  - ✓ Measurements collected at all FA sites d/s Portage Creek, expanded to outside FA
  - ✓ Sites selected based on stratified random sampling
  - ✓ 50m and 100m sampling reaches
  - ✓ Snorkel, seining, electrofishing, and pedestrian surveys
  - ✓ Collected depth, velocity, substrate, cover and water quality data (temp., D.O., conductivity, turbidity, groundwater upwelling)

2013 HSC Data Entry and Review

- QC 1 – Conducted in the field (completed)
- QC 2 – Data entry and review (completed)
- QC 3 – Senior review & preliminary analysis (ongoing)



2013 HSC Form 1 — Rearing: Habitat Utilization — Page 1 of 2

Site: UPPER SLOUGH A Macrohab: SS Stream: SUSITNA FA: 128 Reach: MR6 Wpt[1] Site Start: 933 Wpt End: 932 Site Length: 50 m Avg Width: ____ ft

Date: 14 Sept 13 Time Start – Stop (Zone): 13:45 - 15:30 (AKT) Sampling Method: E-Shock Consultant: R2 Surveyor(s): MG/SK Recorder: WM

Current Meter: R2-1 Water Quality Meter: HACH Turbidity Meter: HACH GPS: DEL Camera: IFS-1 SDT[2]: ✓ ft Weather: SUNNY

Obs. #	Loc. (Wpt[1])	Fish Sp.	Fish Fork Length (mm)	Total # of Fish	Dist. to Site Start (ft)m	Dist. to WE[3] (ft)	Water Depth (ft)	Velocity (Mean, ft/s)	Substrate (D/ SD/ %D/ %E)[4]	Cover Type(s)	Water Quality[5] Water Temp. (C)	Cond. (µS/cm)	Diss. Oxygen (mg/L)	pH	Turbidity (NTU)	VHG[6] (mm)	COMMENTS (eg, mesohabitat, site features)
1	943	SSE	47	1	20.5	5.5	1.0	Ø	FI/SD/90/90	AV	8.3	109.6	9.45		(H)4.52	90	P1159 → US
2	934	SCK	52	1	23	5	1.0	Ø	FI/SD/90/90	AV	8.3	109.6	9.45		4.52	90	P1163 → DS
3	935	NOS	100	1	24	4.5	1.0	Ø	FI/SD/90/90	AV	8.3	109.6	9.45		4.52	90	
4	939	NOS	48	1	30	2	0.9	Ø	FI/SD/90/90	AV	8.3	109.6	9.45		4.52	90	
5	940	SCO	52	1	33	4	0.6	1/40	FI/SD/90/90	AV	9.3	178.0	4.63		4.52	90	
6	941	SCO	53	1	33.9	6	0.6	2/40	FI/SD/90/90	AV	9.3	178.0	4.63		4.52	90	
7	942	SCO	40	1	45	3	0.7	3/40	FI/SD/90/90	AV	9.3	178.0	4.63		4.52	32	
8	942	SSE	50	1	45	4	0.9	2/40	FI/SD/90/90	AV	9.3	178.0	4.63		4.52	32	
									/ / /								
									/ / /								

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2013 HSC Data Entry and Review

2013 HSC Form 3 — **Habitat Availability** — Page 2 of 2

Site: UPPER SLOUGH A — Focus Area: FA-128 — Consultant: R2 — Crew: MG/SK/WM — Date: 14 Sept 13

TR #	TR Station[1] (m)	Random Start Position (%)	TR Width (ft)	Meas. Station (ft)	Fish Utiliz. (Y / N)	Water Depth (ft)	Velocity (Mean, ft/s)	Substrate (D/ SD/ %D/ %E)[2]	Cover Type	Water Quality[3]					VHG[4] (mm)	COMMENTS (eg, mesohabitat, site features)
										Water Temp. (C)	Cond. (µS/cm)	Diss. Oxygen (mg/L)	pH	Turbidity (NTU)		
1	5	80	4	1.0	N	0.4	9/41	SD/SI/60/100	AV	8.3	111.4	9.43		4.52	20	
1	5	80	4	2.3	N	0.6	18/41	SD/SI/60/100	AV							
1	5	80	4	3.6	N	0.4	9/41	FI/SD/60/100	AV							
2	15	10	7	0.2	N	0.3	0	FI/SD/80/90	AV							
2	15	10	7	2.5	N	0.5	2/40	FI/SD/80/90	AV							
2	15	10	7	4.8	N	0.3	2/40	FI/SD/80/90	AV							
3	25	30	17	1.7	N	1.0	0	FI/SD/80/90	AV	8.3	109.6	9.45			90*	*Silt
3	25	30	17	6.3	N	1.3	0	FI/SD/90/90	AV							
3	25	30	17	11.9	N	1.0	1/40	FI/SD/90/90	AV/OV							
4	35	60	17	3.4	N	0.4	0	FI/SD/90/90	AV							
4	35	60	17	9.0	N	0.75	1/40	FI/SD/90/90	AV							
4	35	60	17	14.6	N	0.6	4/43	FI/SD/90/90	AV/OV							
5	45	40	14	1.9	N	0.4	0	FI/SD/90/90	AV	8.2	102.0	9.71			32	
5	45	40	14	6.5	N	1.0	3/43	FI/SD/90/90	AV							
5	45	40	14	10.1	N	0.9	3/41	FI/SD/90/90	N							

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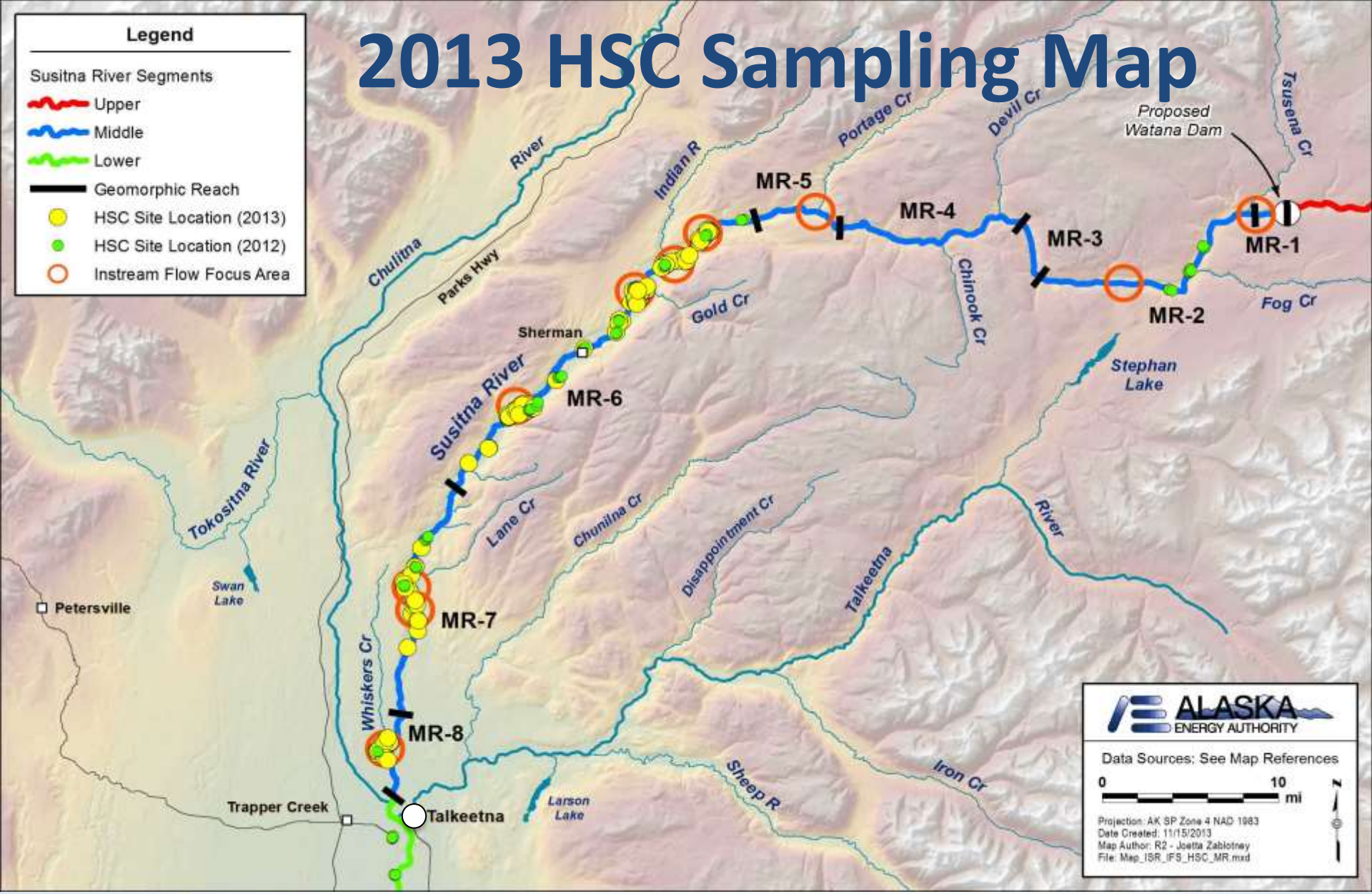
2013 HSC Sampling Update

- Concentrated sampling in Middle River FAs d/s of Portage Cr.
- Used stratified, random sampling approach
- Completed seven sampling sessions
- Collected both utilization and availability HSC data
- Total of 207 sampling events:
  - 170 - 50m (off-channel areas)
  - 31 - 100m (mainstem)
  - 6 - 25m-70m (off-channel areas)
- Total sample length = 11,970m (39,261 ft)
- Number of utilization measurements = 1,543
- Number of availability measurements = 3,246

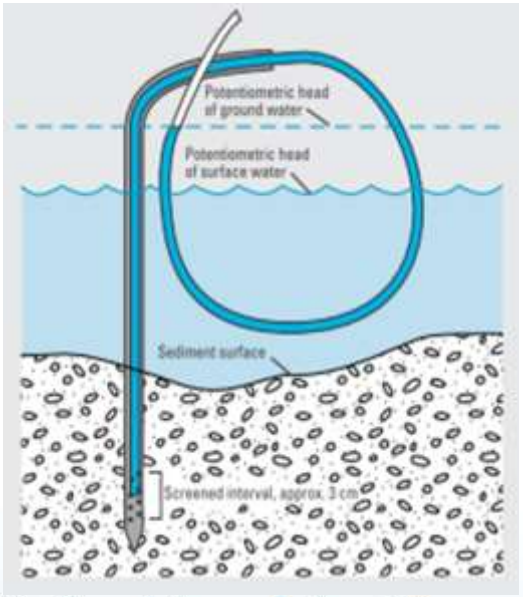
2013 HSC Sampling Map



2013 HSI Sampling Update

HSI Measurements Collected for each of the 207 sample events:

- Minimum of three measurements of each parameter
  - Temperature, D.O., conductivity, and VHG
  - Turbidity 1-3 samples depending on variability



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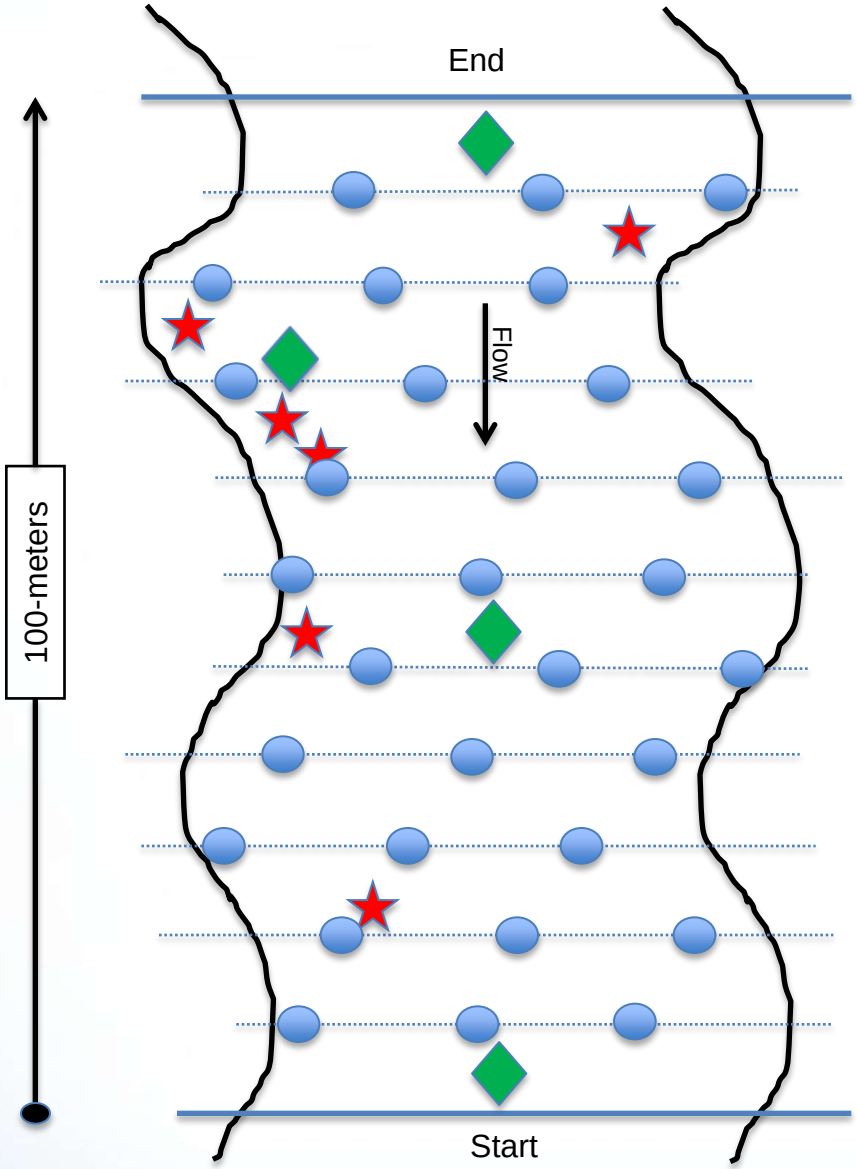


Red Stars - Utilization Measurements

- Depth
- Velocity
- Substrate
- % Embeddedness
- Cover
- Distance from Start
- Distance from water's edge

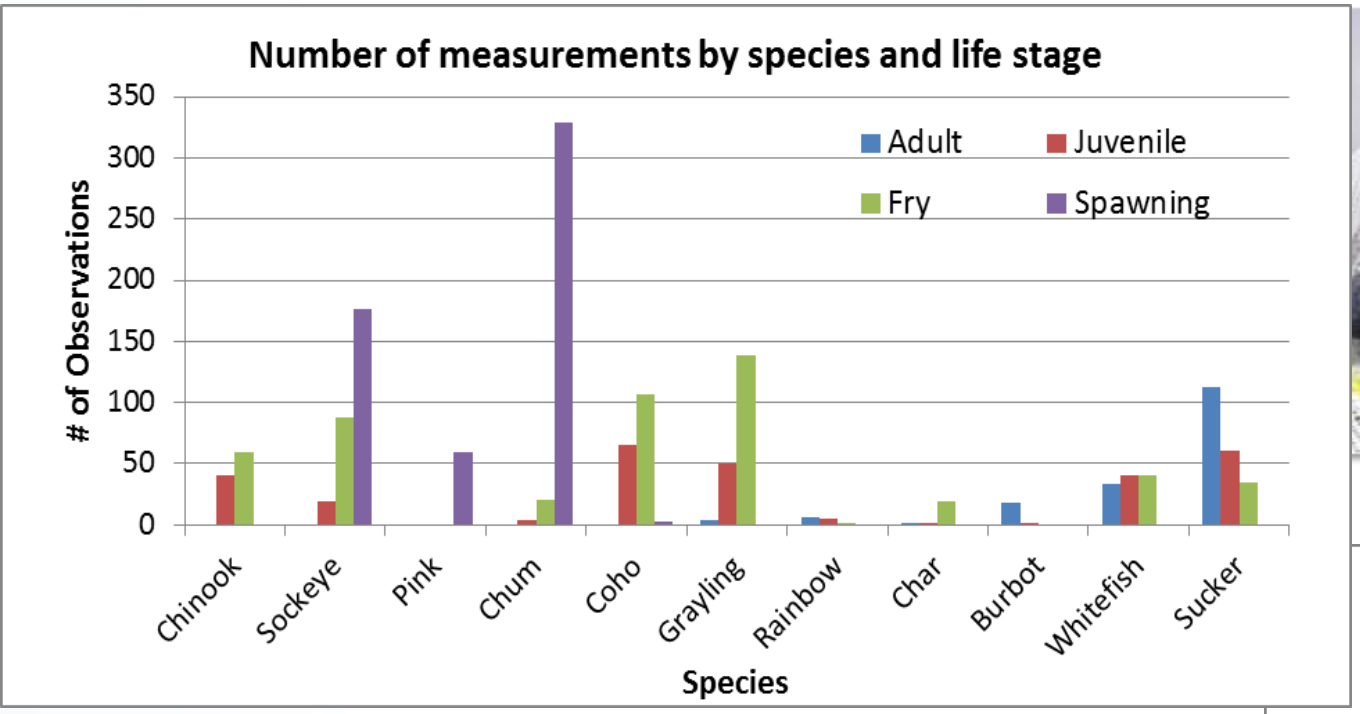
Blue Dots - Availability Measurements

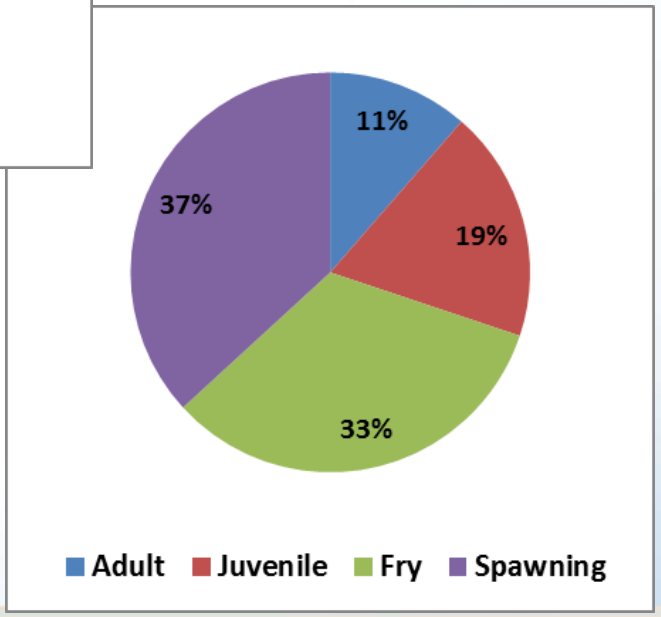
- Depth
- Velocity
- Substrate
- % Embeddedness
- Cover

Green Diamond - Water Qual. & VHG

- Temperature
- Dissolved Oxygen
- Conductivity
- Turbidity
- Vertical Hydraulic Gradient

2013 HSC Sampling Update





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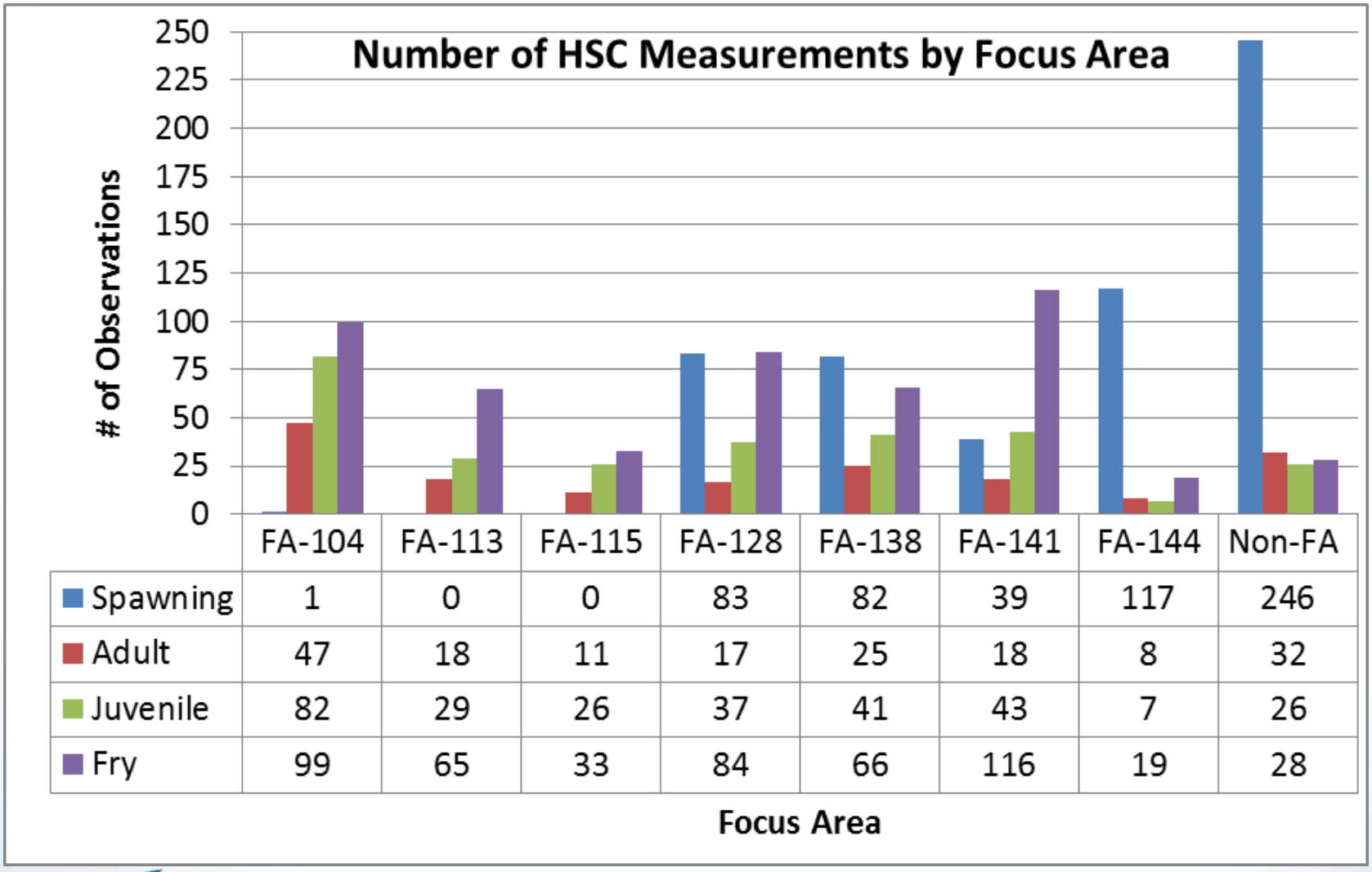
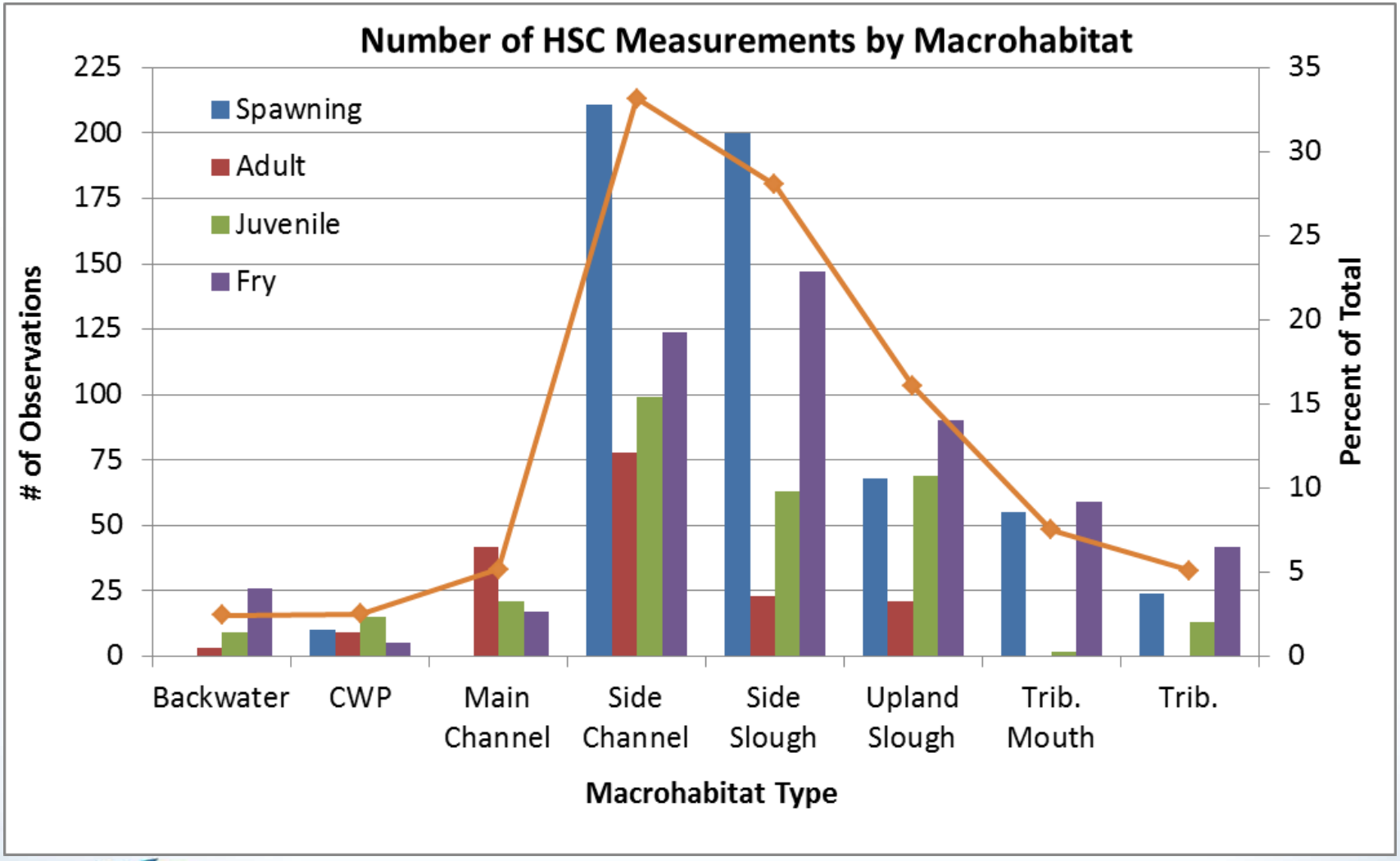
2013 HSC Sampling Update



	FA-104	FA-113	FA-115	FA-128	FA-138	FA-141	FA-144	Non-FA
Spawning	1	0	0	83	82	39	117	246
Adult	47	18	11	17	25	18	8	32
Juvenile	82	29	26	37	41	43	7	26
Fry	99	65	33	84	66	116	19	28

2013 HSC Sampling Update



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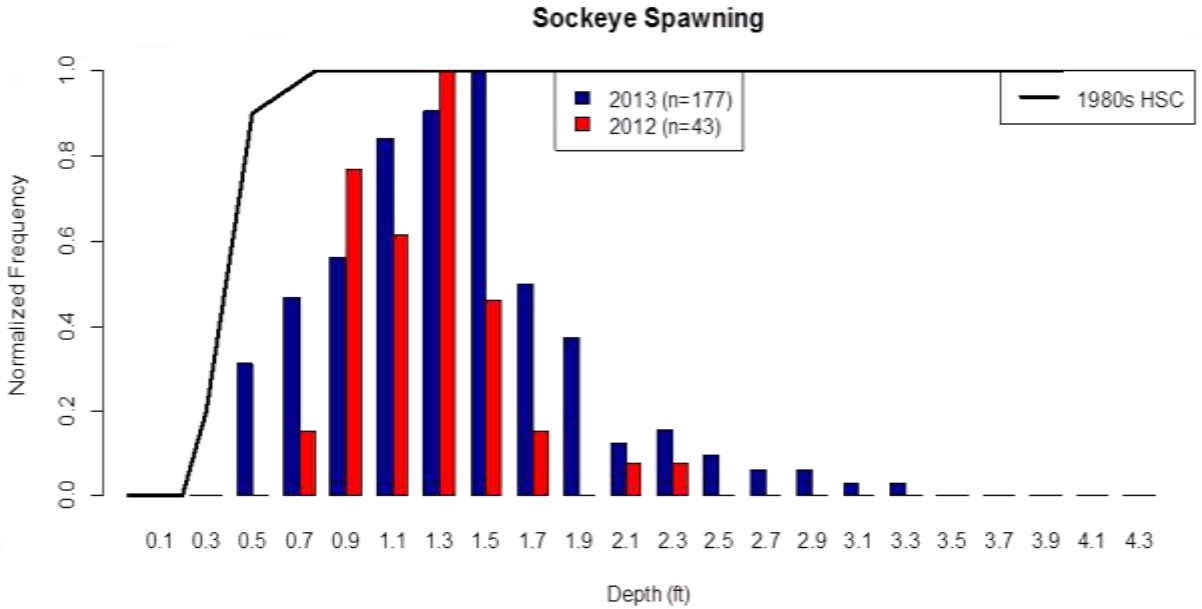
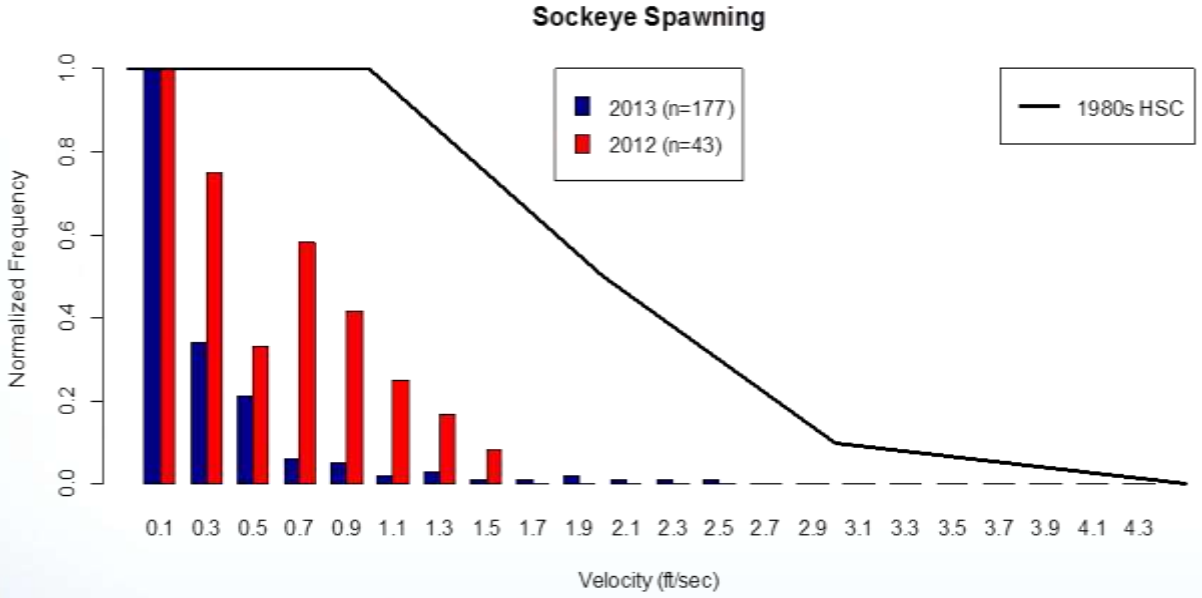

Sockeye Spawning
2013 (n=177)
2012 (n=43)
1980s HSC
Normalized Frequency
0.0
0.2
0.4
0.6
0.8
1.0
0.1 0.3 0.5 0.7 0.9 1.1 1.3 1.5 1.7 1.9 2.1 2.3 2.5 2.7 2.9 3.1 3.3 3.5 3.7 3.9 4.1 4.3
Depth (ft)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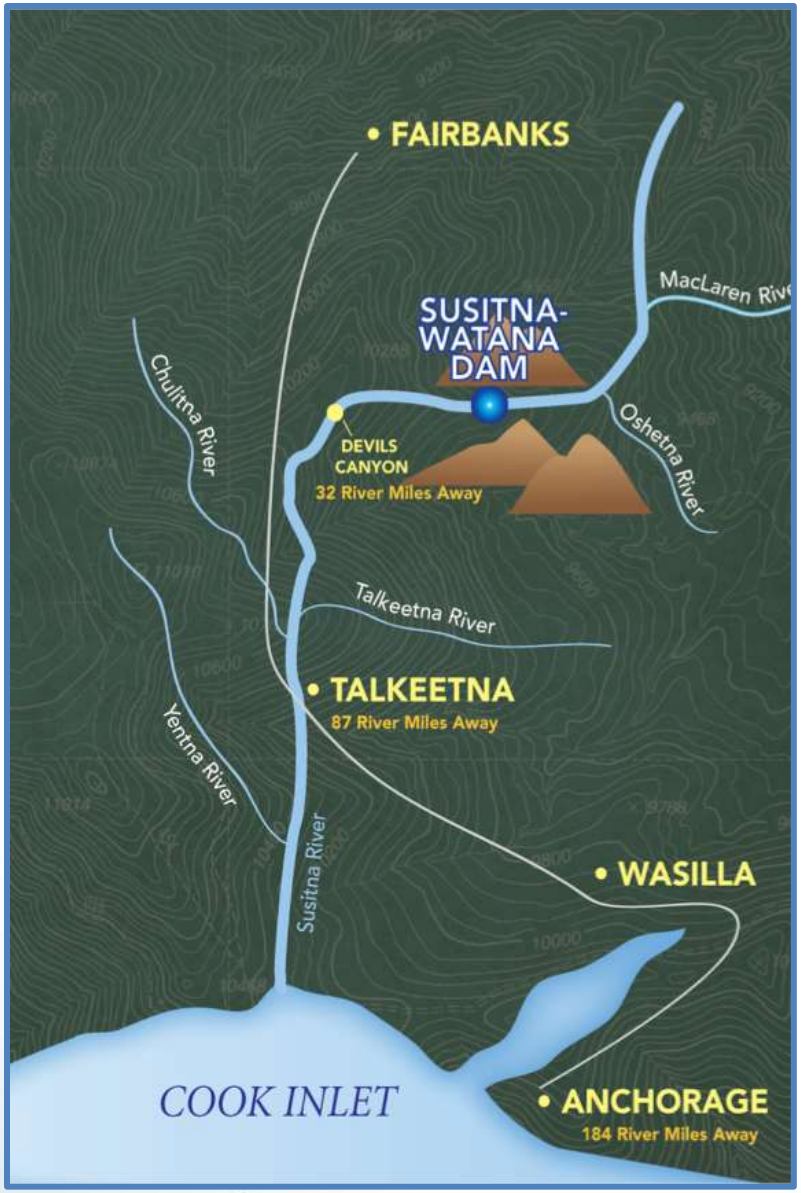
Velocity (ft/sec)



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Technical Workgroup Meeting

Q4 2013 TWG

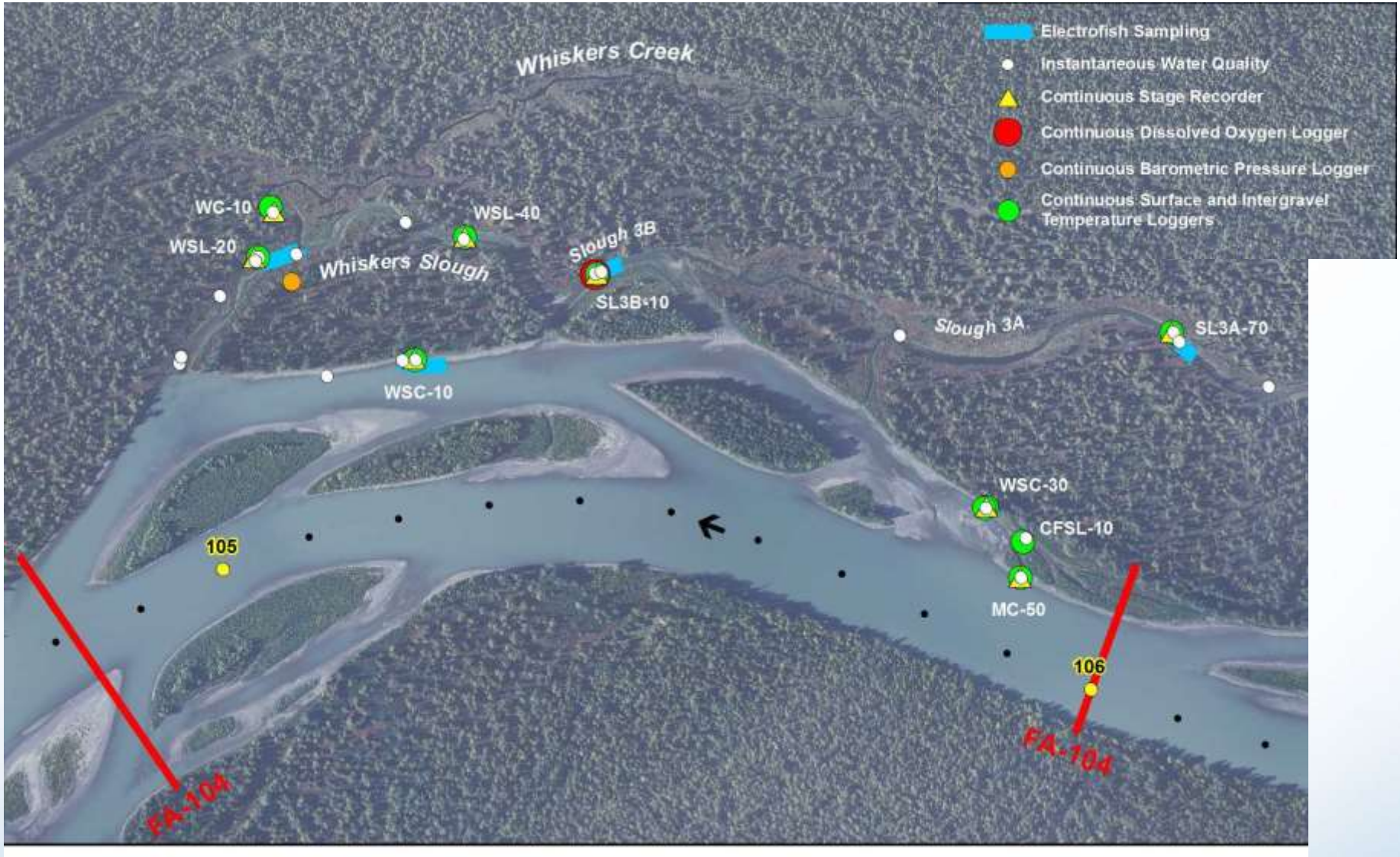
Winter Studies

3 December 2013

Winter Studies – Q4 2013 Update

- *2012-2013 Analysis and Results:*
  - *Updates at March, June, Sept 2013 TWG meetings*
  - *To be completed during Q4 2013*
- *2013-2014 Study:*
  - *Coordination among IFS, Fish, Groundwater, Ice, Hydrology, Geomorphology, Water Quality*
  - *Instruments installed Sept 2013 (Temperature, dissolved oxygen and water level monitoring):*
    - *FA-104 (Whiskers Slough)*
    - *FA-128 (Slough 8A)*
    - *FA-138 (Gold Creek)*

Winter Studies – Results: FA-104 (Whiskers Slough)



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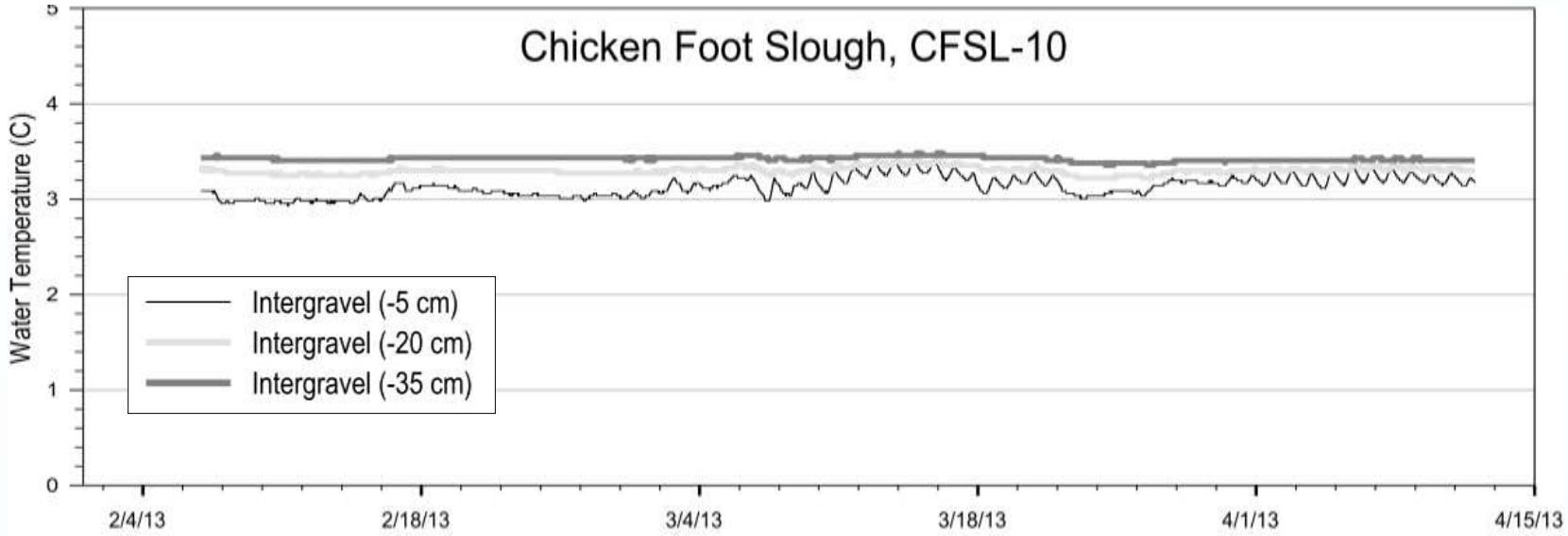
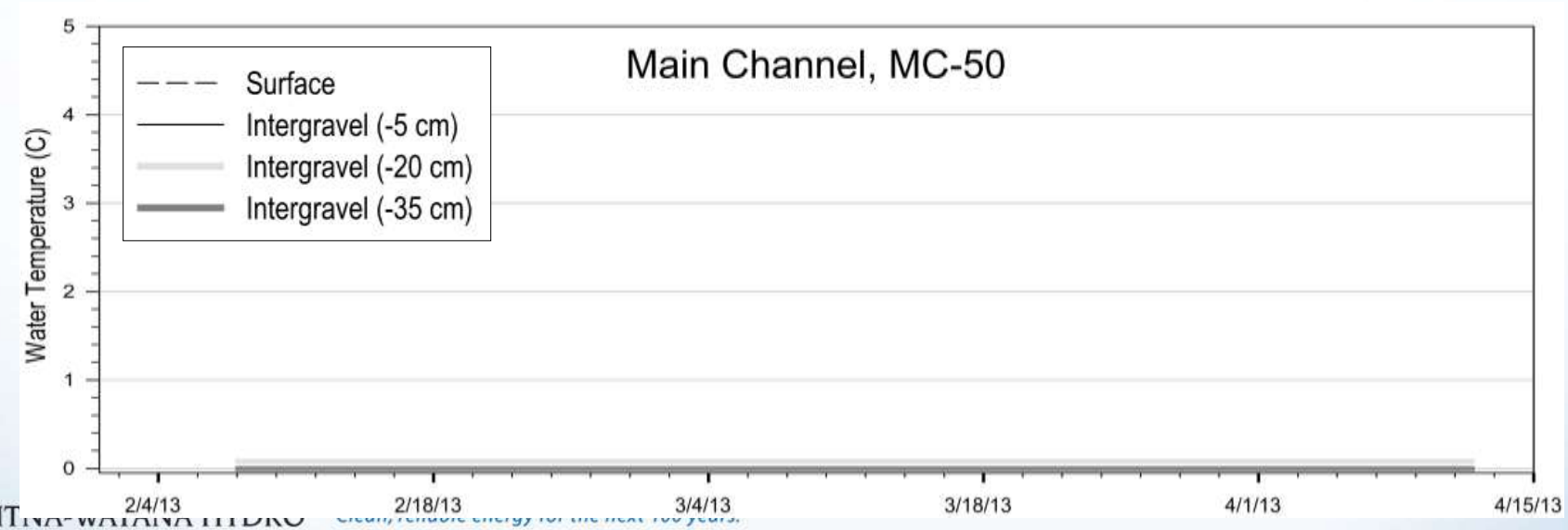
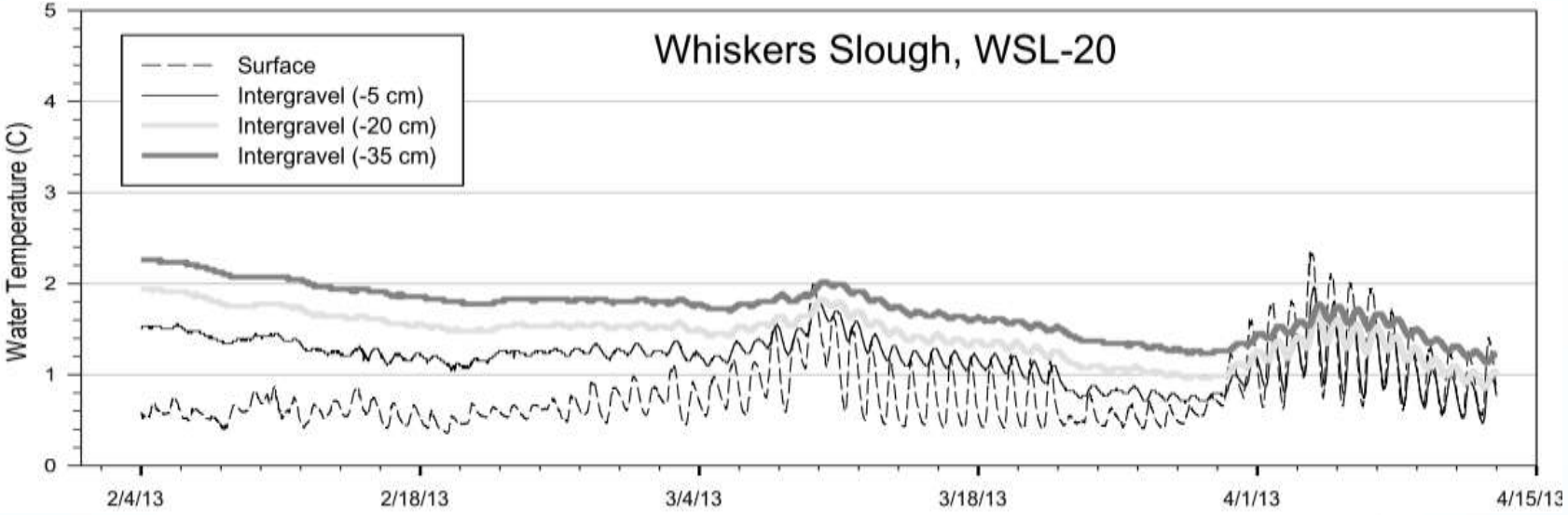
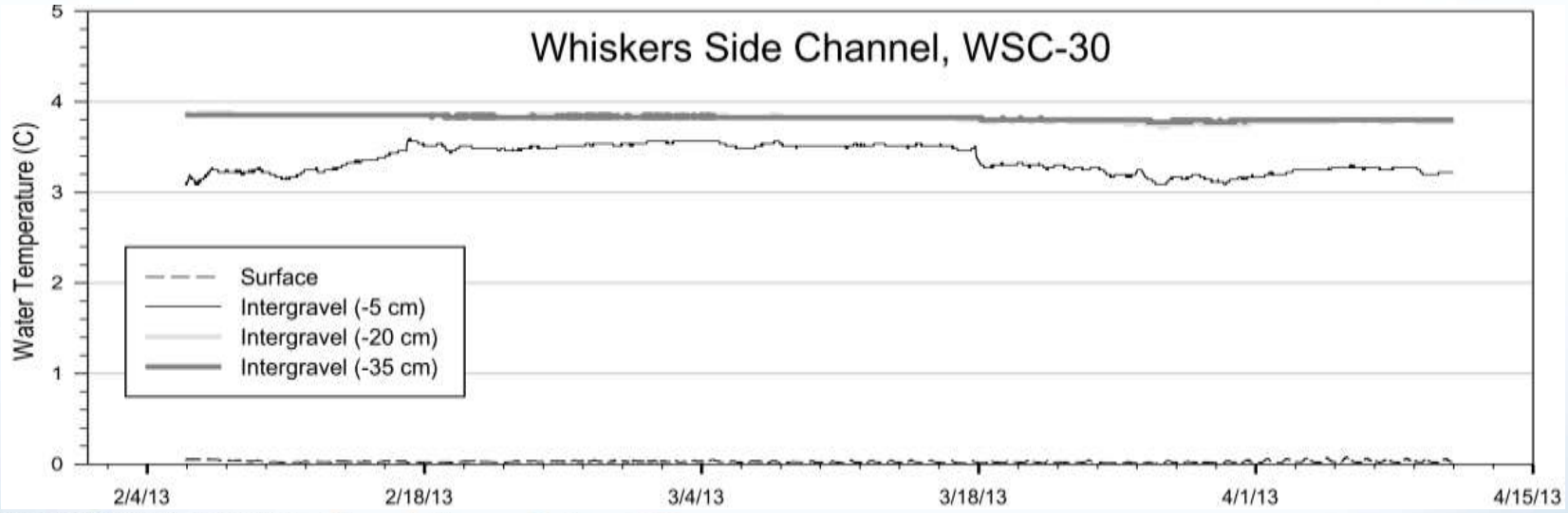
Results – Temperature





Results – Temperature





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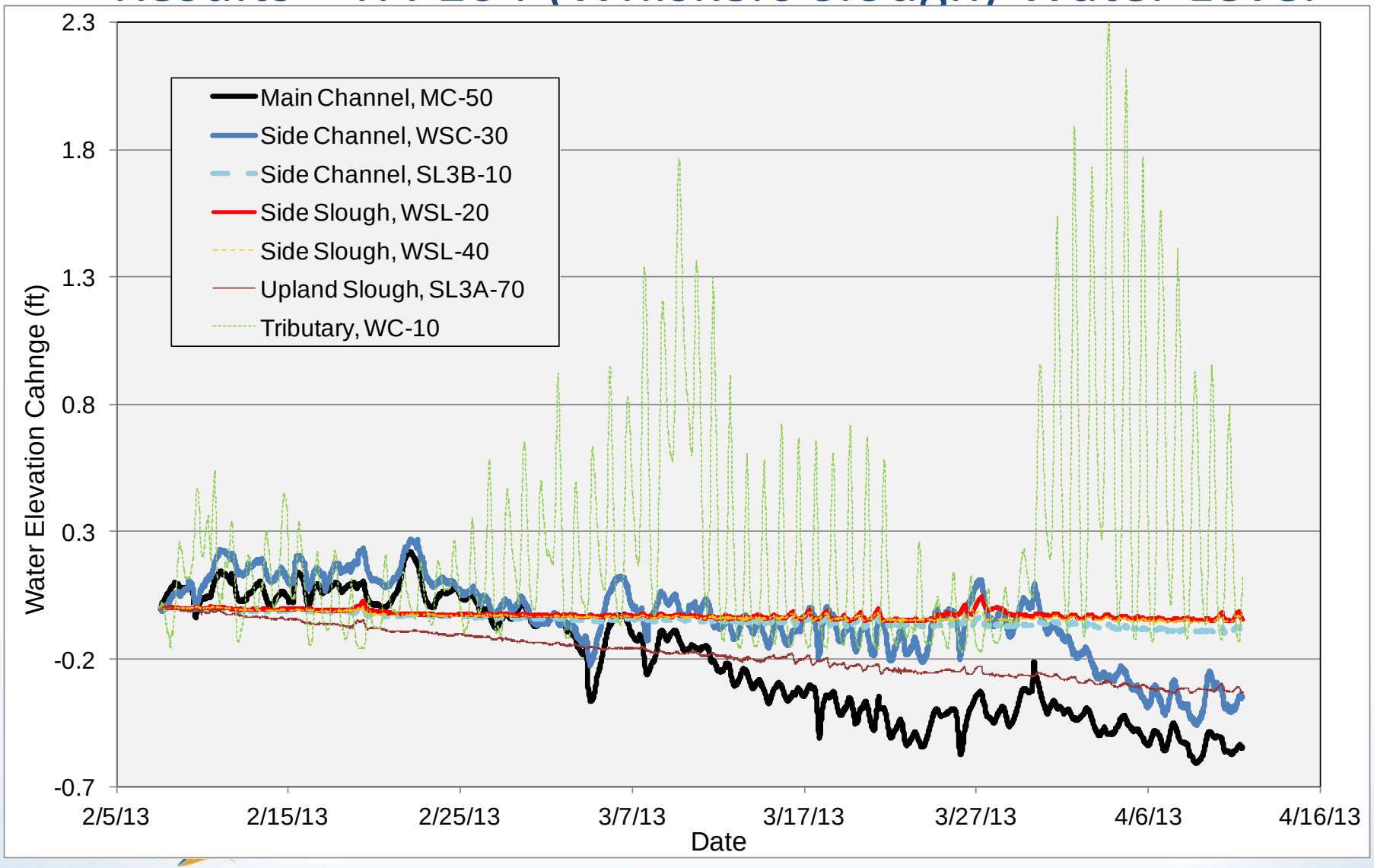
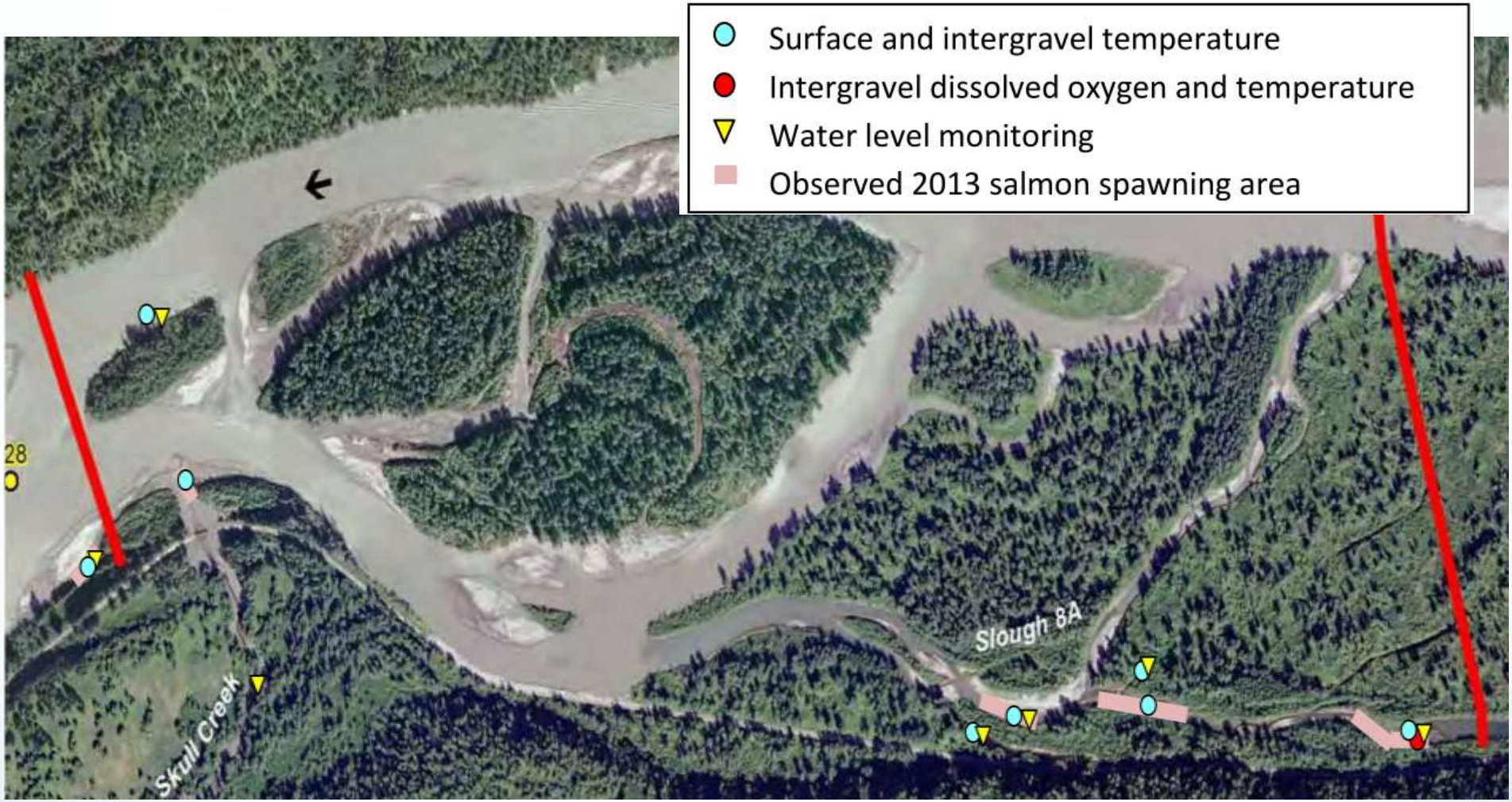
Results – FA-104 (Whiskers Slough) Water Level



Winter Studies – Next Steps

- *2013-2014 Study*
  - *Sampling at Three Primary Focus Areas:*
    - *FA-104 (Whiskers Slough)*
    - *FA-128 (Slough 8A)*
    - *FA-138 (Gold Creek))*
  - *Sampling at additional sites based on fish distribution, weather, access*
  - *Four trips: January, February, March and April 2014*
  - *HSI: Water quality and water level instruments installed Sept 2013; monitor thru Winter 2014*
  - *HSC: Record fish habitat use and behavior via capture and underwater observation methods*

2014 Study – FA-128 (Gold Creek) Instruments

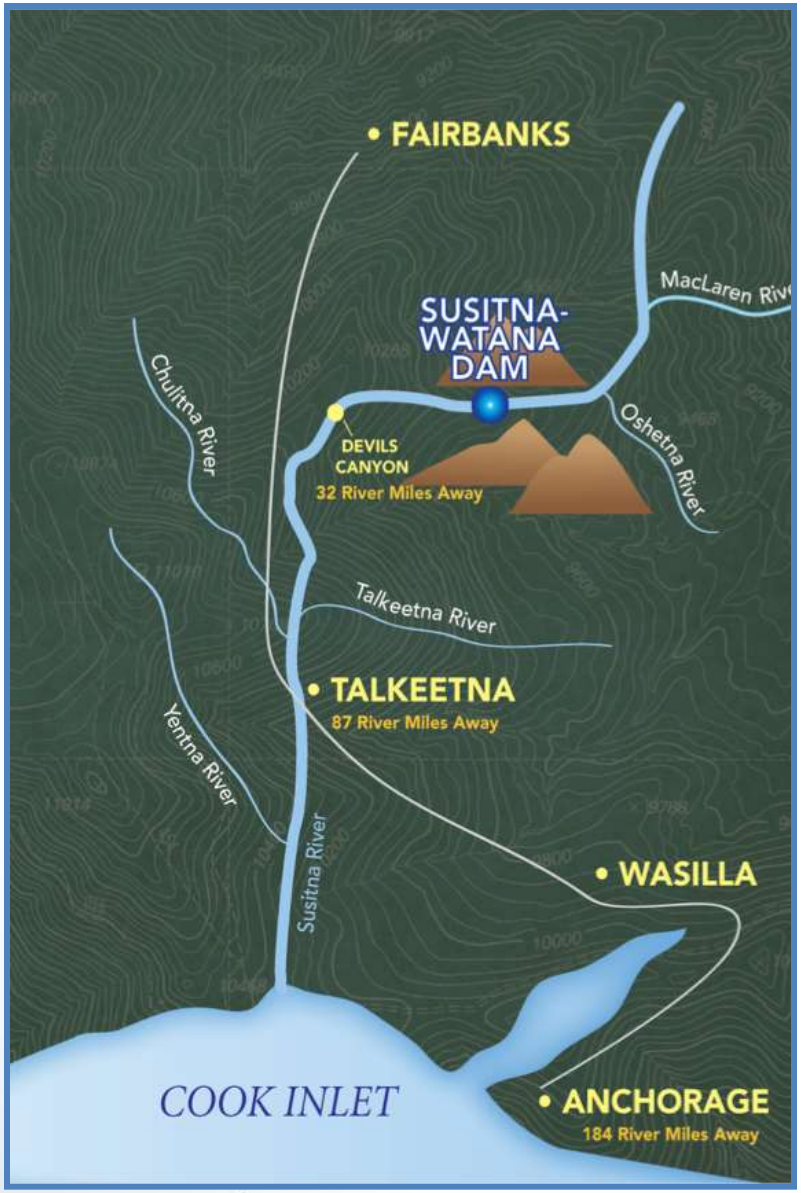


2013 HSC Study – Variances

- No HSC sampling in Lower River Segment
  - Concentrated efforts within Middle River Segment
  - Limited macrohabitat mapping for stratified, random sampling approach
  - Proposed for 2014
- No HSC sampling in three upstream most Focus Areas
  - Access issues
  - Proposed for 2014
- No Formal Stranding and Trapping Surveys
  - RSP indicated opportunistic sampling based on specific flow events
  - Observations by IFS substrate survey crews during September 2013
    - Susitna River at Gold Creek dropped from 31,400 cfs on 09/13 to 12,300 cfs on 09/24
    - Substrate field effort 09/16 to 09/24 (17,400 cfs to 12,300 cfs)

2013 HSC Study – Next Steps

- Q4 2013 & Q1 2014 Activities:
  1. Review HSC data for patterns in microhabitat use based on water quality (temp., D.O., conductivity, turbidity) and groundwater upwelling
  2. Evaluate relationships between other HSI parameters and fish habitat use (e.g., macronutrients, pH, dissolved organic carbon, alkalinity, Chlorophyll-a)
  3. Produced results of 2013 Winter HSC/HSI surveys
  4. Conduct 2014 Winter HSC/HSI surveys
  5. Review field data from Early Life History and Fish Distribution and Abundance studies for refinement of species and life stage periodicity
  6. Identify data gaps for recommended 2014 activities
  7. Produce Initial Study Report
  8. Produce Proof of Concept for HSC/HSI Preference Curve Development
  9. Planning for 2014 HSC/HSI surveys



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Technical Workgroup Meeting

Q4 2013 TWG

IFS-Fish Lower River Studies Update

3 December 2013

Lower River Fish Habitat Study – Q4 2013 Update

- Field Tasks
  - No field data collection tasks scheduled in Q4
- Data and Modeling Tasks
  - QC3 of field data complete for PRM 93-97 sites,
  - Data integration for model input complete
  - Calibration of Birch Creek data completed
  - Calibration of remaining sites ongoing
- ISR Tasks
  - Include details on model calibration of draft wetted area versus flow relationships at Birch Creek site

Lower River Fish Habitat IFS Study – 2014 Field Tasks

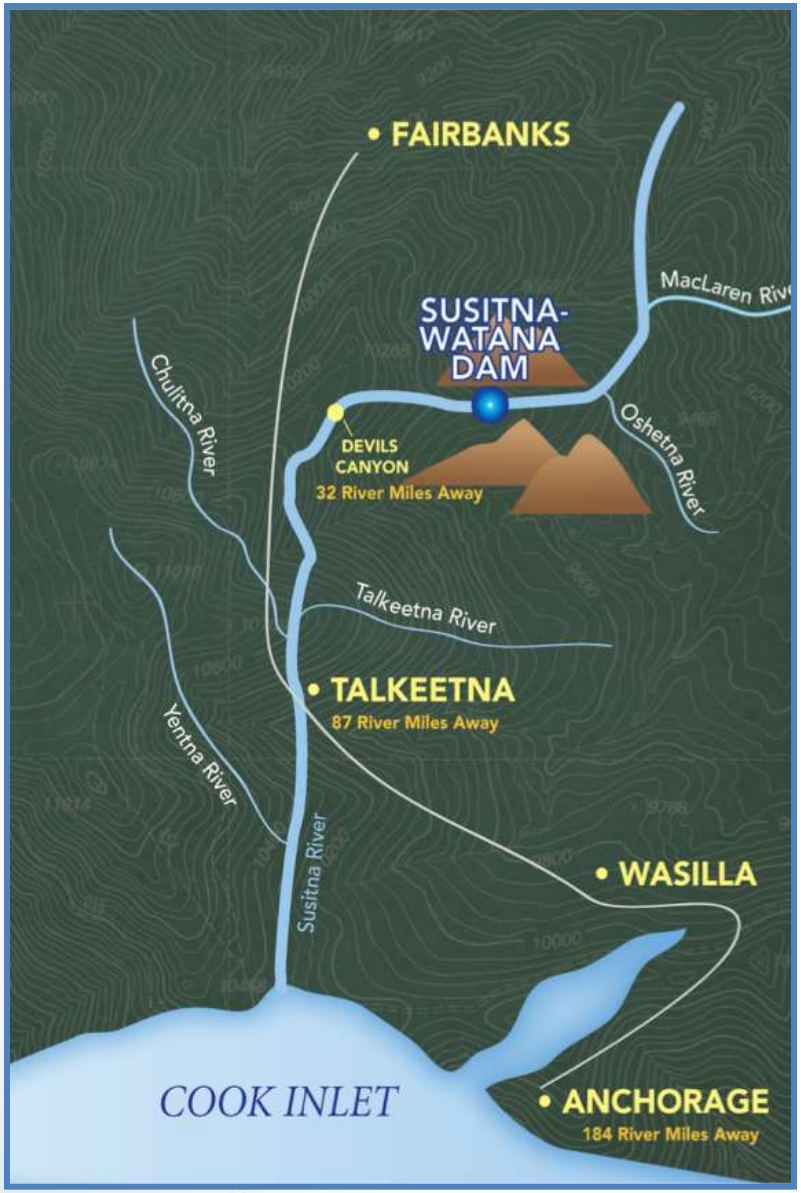
- Establish 1-D habitat transects in the vicinity of Sheep Creek and Caswell Creek (PRM 66 to PRM 71)
- Collect full velocity profiles at one discharge and WSE at two additional discharges
- Target data collection at each of high, moderate and low flow conditions

Lower River Fish Habitat IFS Study – 2014 Data and Modeling Tasks

- Proof of Concept – April 2014
  - Complete model calibration and draft simulations for PRM 93-97 sites using available data for flow routing and HSC/HSI
  - Model set-up and analysis for Deshka River
- QC of 2014 field data (Q3/Q4)
- Finalize modeling using Version 2 flow routing, HSC/HSI and calibrated models (Q4)

Lower River Fish Habitat Study – 2013 Cumulative Variances

- Field Tasks
  - No variances for Lower River field tasks
  - 2 of 15 transects at PRM 96 site lost to erosional processes between June and September
    - Site will be modeled with remaining transects and transect weighting adjusted to represent targeted habitat conditions
- Data and Modeling Tasks
  - No variances for model development



Study Integration and Modeling Update

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2D Fish Habitat Modeling

- Continued development of modeling framework for 2D models – Visual Basic model, GIS spatial analysis model – examples presented during November 13-15 meetings
- Coordinated with other physical process disciplines for model inputs
- Continued refinement of model metrics and biological questions specific to the middle river focus areas.

2D Fish Habitat Modeling

- Substrate and cover data collected in seven focus areas.
- Coordinated substrate and cover data entry.
- Conducted preliminary test of habitat model output.
- Continuing refinements to habitat model
- Developed work flow for proof of concept modeling to be presented in April 2014

Riverine Modeling and Study Integration

- Internal Model Integration – Ongoing
  - Modeling Meeting – August 30 (completed)
  - Modeling Meeting – October 10 (completed)
- IFS-TT Riverine Model and Study Integration Meeting – November 13-15th
  - Completed