Monitoring the San Joaquin River

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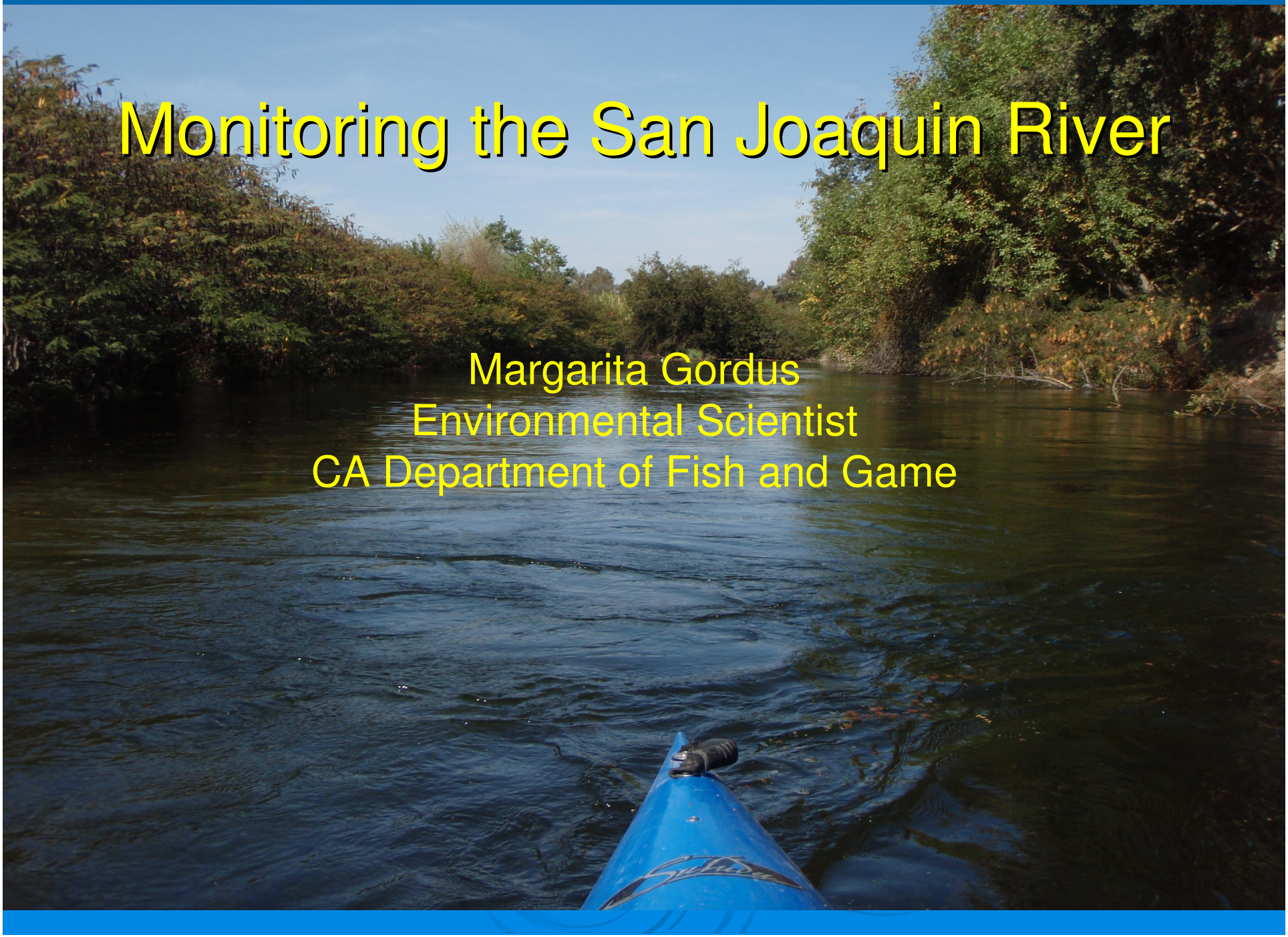
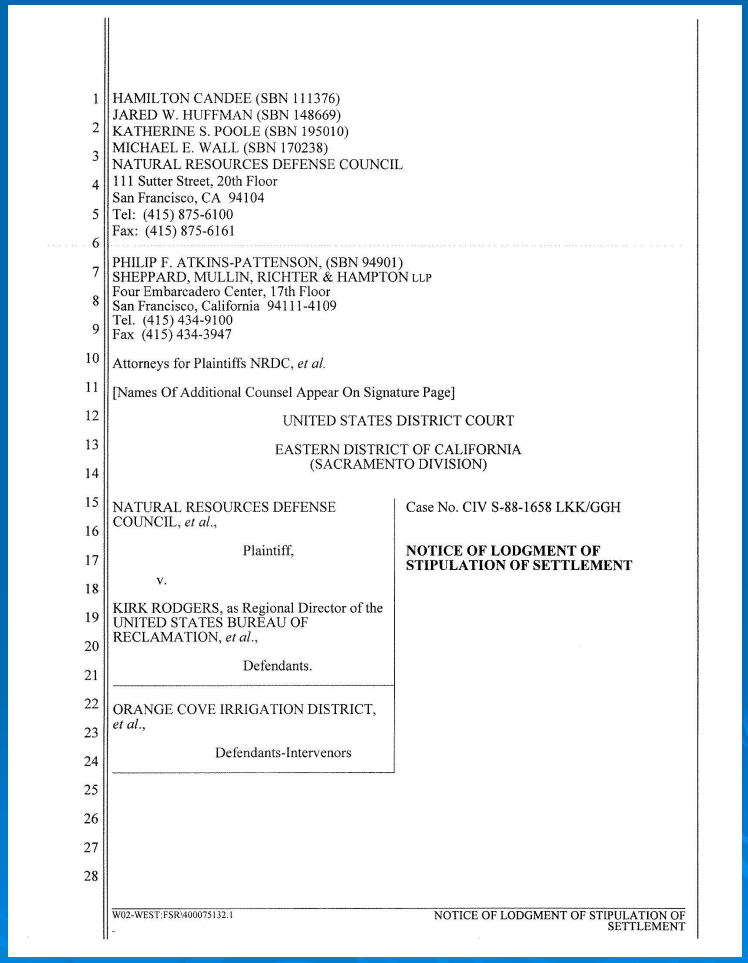


San Joaquin River Settlement

- 1988 - A collation of environmental groups filed a lawsuit against the US Bureau of Reclamation.
  - Known as *NRDC et al. v. Kirk Rodgers et al.*
- September 2006 – Stipulation of Settlement reached
- March 2009 – President Obama signed the San Joaquin Restoration Act.



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UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA
(SACRAMENTO DIVISION)

NATURAL RESOURCES DEFENSE COUNCIL, *et al.*,

Plaintiff,

v.

KIRK RODGERS, as Regional Director of the UNITED STATES BUREAU OF RECLAMATION, *et al.*,

Defendants.

ORANGE COVE IRRIGATION DISTRICT, *et al.*,

Defendants-Intervenors

Case No. CIV S-88-1658 LKK/GGH

NOTICE OF LODGMENT OF STIPULATION OF SETTLEMENT

W02-WEST:FSR\400075132.1

NOTICE OF LODGMENT OF STIPULATION OF SETTLEMENT

Memorandum of Understanding

Filed: September 13, 2006

- US Department of Interior
- US Department of Commerce
- Natural Resources Defense Council
- Friant Water Users Authority
- California Resources Agency
- Department of Fish and Game
- Department of Water Resources
- California Environmental Protection Agency

Expires on December 31, 2026, unless extended

Two Primary Goals

- **Restoration Goal**: To restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River between Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.
- **Water Management Goal**: To reduce and avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

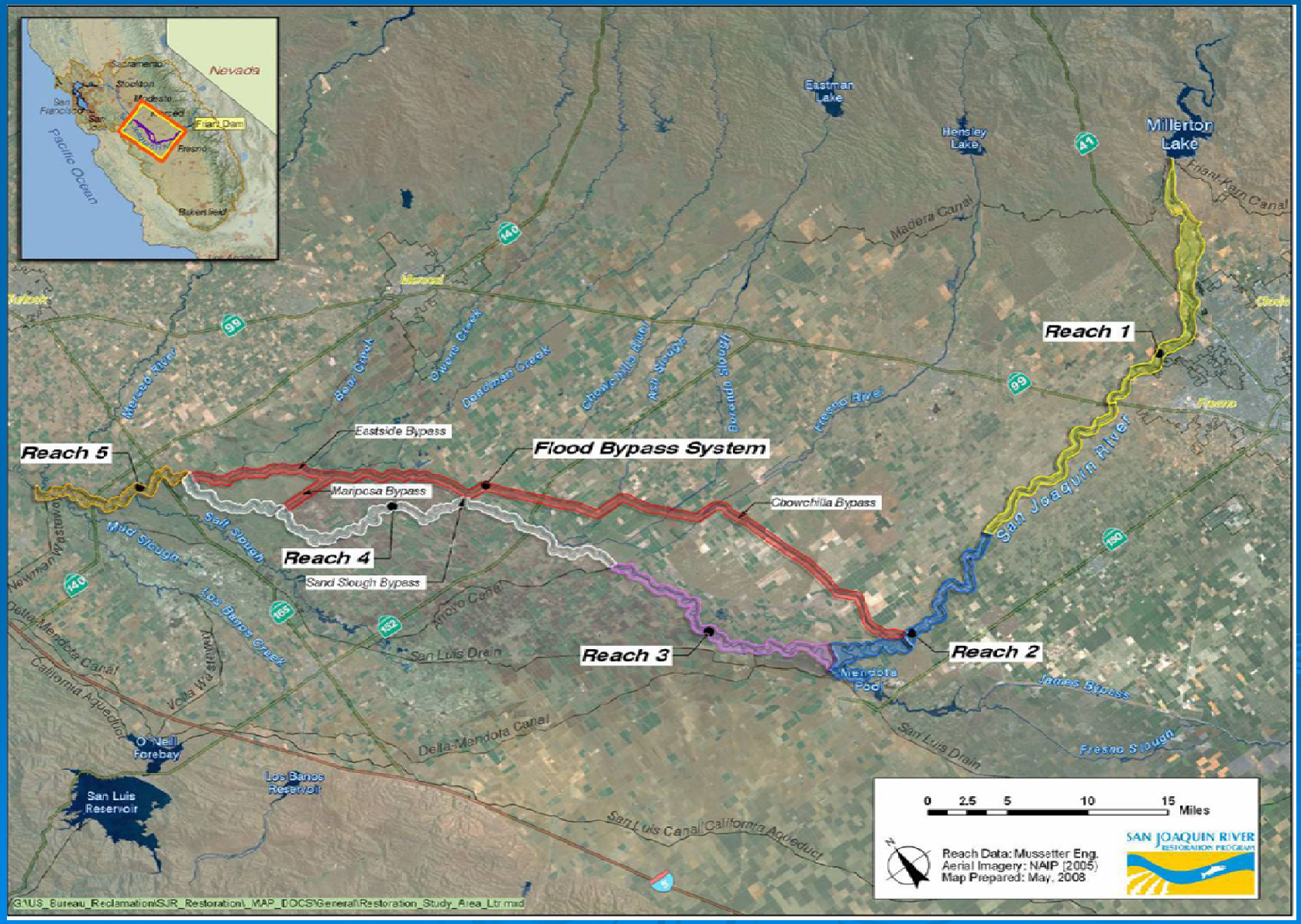
Reintroduction of Salmonids

Spring- and fall-run Chinook salmon shall be reintroduced by December 31, 2012.

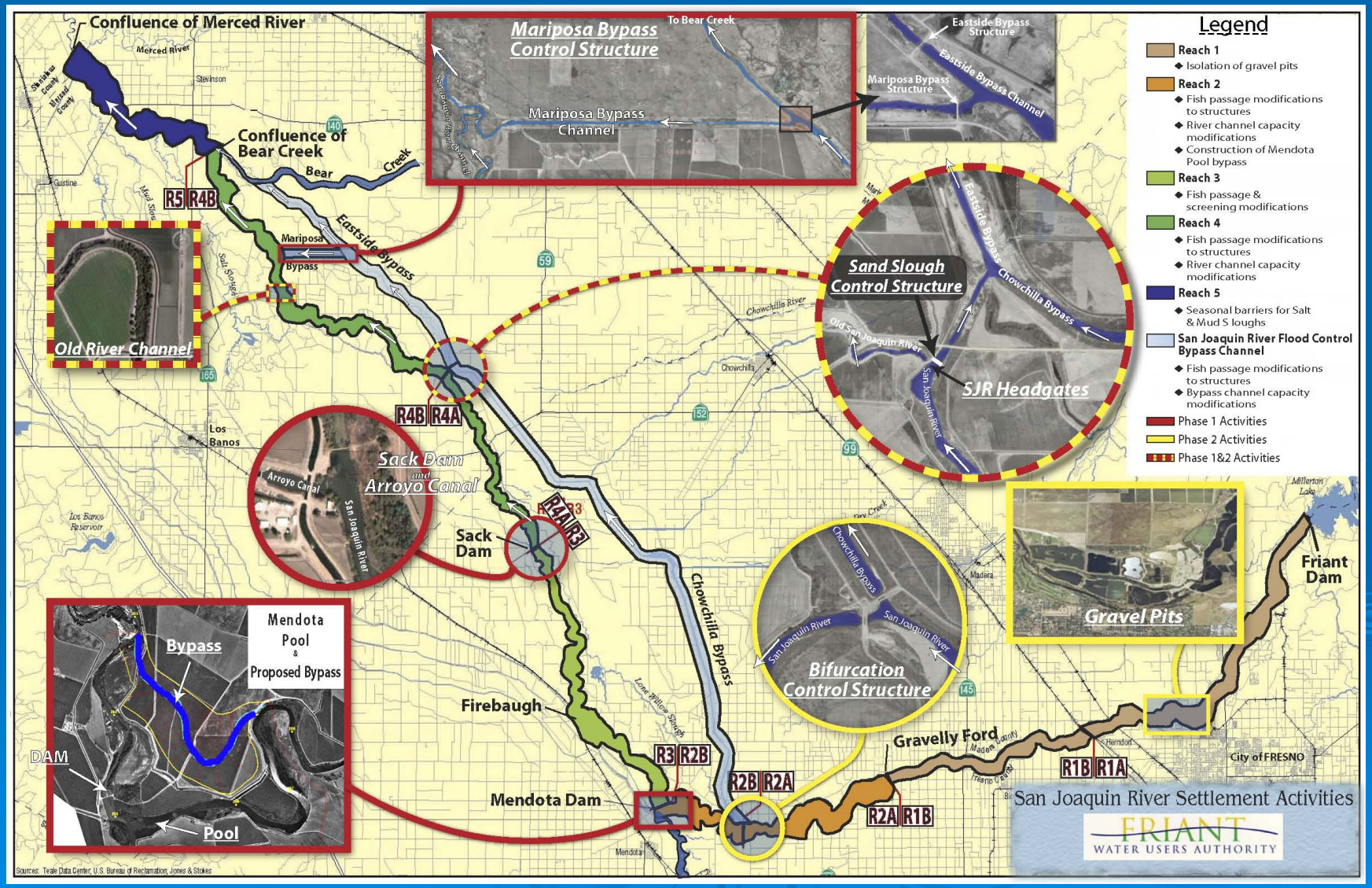
(Spring- and fall-run Chinook salmon shall be reintroduced at the earliest practical date)

- "In the event that competition, inadequate spatial or temporal segregation or other factors beyond control make achieving restoration infeasible, priority shall be given to restoring self-sustaining populations of wild spring-run Chinook salmon." [paraphrased]

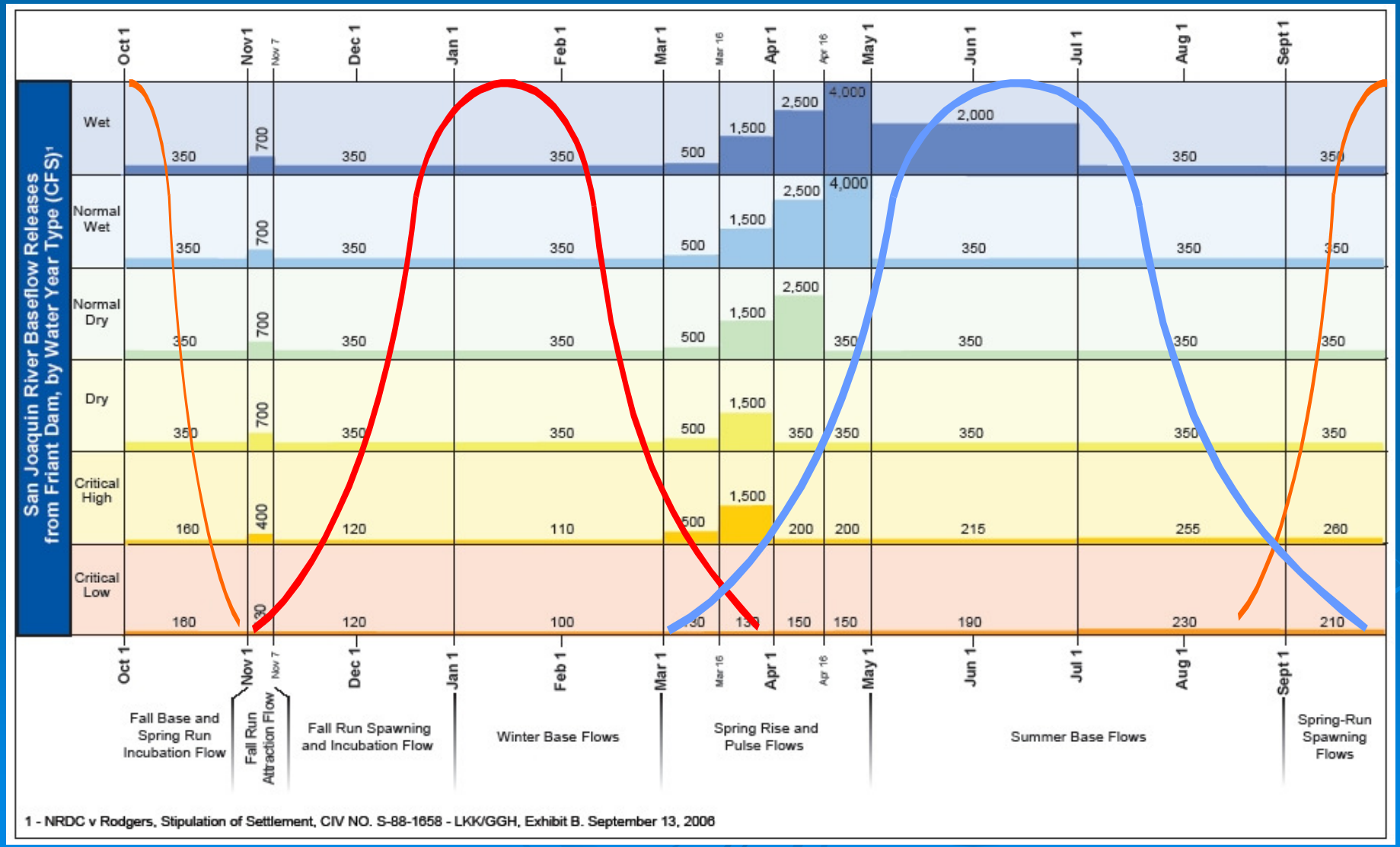
Restoration Area



Necessary Improvements



Flow Types

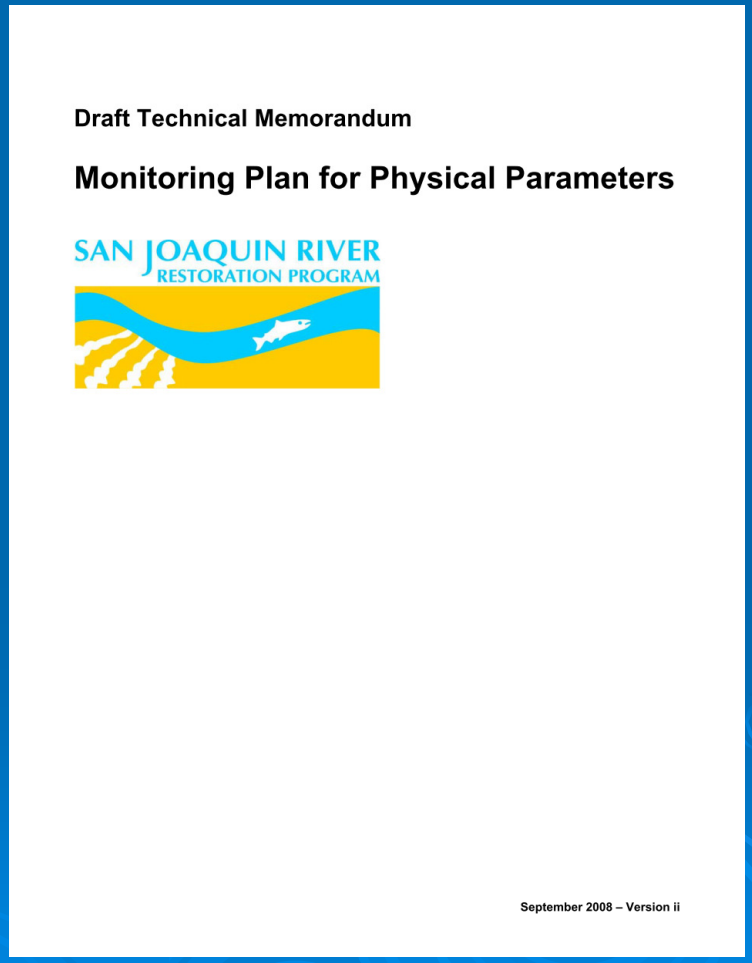

Migration
Spawning
Emergence
San Joaquin River Baseflow Releases from Friant Dam, by Water Year Type (CFS)[1]
Wet
Normal Wet
Normal Dry
Dry
Critical High
Critical Low
Oct 1
Nov 1
Nov 7
Dec 1
Jan 1
Feb 1
Mar 1
Mar 16
Apr 1
Apr 16
May 1
Jun 1
Jul 1
Aug 1
Sept 1
Fall Base and Spring Run Incubation Flow
Fall Run Attraction Flow
Fall Run Spawning and Incubation Flow
Winter Base Flows
Spring Rise and Pulse Flows
Summer Base Flows
Spring-Run Spawning Flows
1 - NRDC v Rodgers, Stipulation of Settlement, CIV NO. S-88-1658 - LKK/GGH, Exhibit B. September 13, 2006

Summary targets for establishing a fishery

- Channel capacity = 4,500 cfs (collectively achieved by 2016)
- Interim flows will commence by October 1, 2009
- Full restoration flows should be achieved by January 1, 2014
- Reintroduction of fall-run and spring-run Chinook salmon by December 31, 2012
- All of the Restoration Goals shall be achieved by December 31, 2025

Monitoring – Physical Parameters

- Flow Monitoring
- River Losses Monitoring
- Bank Seepage Monitoring
- Sediment Transport Monitoring
- Water Quality Monitoring



Water Quality Monitoring

- Real-time monitoring (YSI 6600 sonde)
  - Continuous measurements every 15 minutes (temperature, salinity, ph, DO, turbidity, chlorophyll).
- Laboratory Analysis
  - Autosamplers – composite samples (8 subsamples taken per day)
  - Grab samples – to be determined by fisheries scientist
- Biological Parameter Surveys (Hydrolab)
  - Habitat, fish community, macroinvertebrate, spawning gravel assessment, etc.

- Interim flows started on October 1, 2009.
  - Collect relevant data concerning:
    - Flows
    - Temperature
    - Water Quality
    - Seepage losses
    - Habitat Inventory
    - Recirculation, recapture, and reuse
    - Sediment load
  - Installation of additional gauging stations
  - Division of Water Rights – Order WR 2009-0058-DWR

Interim Flow Water Quality Monitoring

- TSS
- Nutrients
  - TN, NH4, NO2, NO3 TKN, TP, PO4, chlorophyll
- TOC/DOC
- Bacteria
  - Fecal coliform and E. coli
- Trace elements
  - Cations, anions, total TE
- Pesticides
  - water column pre-release
  - post-release
- Bed Sediment
  - TOC, trace elements, organochlorine, pyrethroid, toxicity

Baseline Analyses Required 1-week prior to Fall 2009 Interim Releases

Monitoring Site	Reach	TSS	Nutrients	TOC/DOC	Bacteria	Trace Elements	Pesticides	Bed Sediment
Millerton Lake	1A	1	1	1	1	1	1	
SJR just below Friant Dam	1A	1	1	1	1	1	1	1
SJR near HWY 99	1A	1	1	1	1	1	1	1
SJR at Gravelly Ford	2A	1	1	1	1	1	1	1
SJR below Bifurcation	2B	1	1	1	1	1	1	
SJR near Mendota	3	1	1	1	1	1	1	1
SJR below Sack Dam	4A	1	1	1	1	1	1	
SJR at Hills Ferry	5	1	1	1	1	1	1	

Analyses Required as Released Water Moves Progressively Downstream (Note variable sampling frequency).

Monitoring Site	Reach	TSS	Nutrients	TOC/DOC	Bacteria	Major Trace Elements	Pesticides	Bed Sediment
Millerton Lake	1A	W						
SJR just below Friant Dam	1A	W	W	W	W	W	W	1P
SJR near HWY 99	1A	W	W	W	W	W	W	1P
SJR at Gravelly Ford	2A	W	W	W	W	W	W	1P
SJR below Bifurcation	2B	W						
SJR near Mendota	3	W	W	W	W	W	W	1P
SJR below Sack Dam	4A	W						
SJR at Fremont Ford	5	W						
SJR at Crows Landing	5	W						

Sampling frequency:
Water: Twice weekly, October 1 – 14, 2009; weekly, October 15 – November 20, 2009
Sediment: Once following interim flows (December 2009)

Interim Flow Water Quality Monitoring

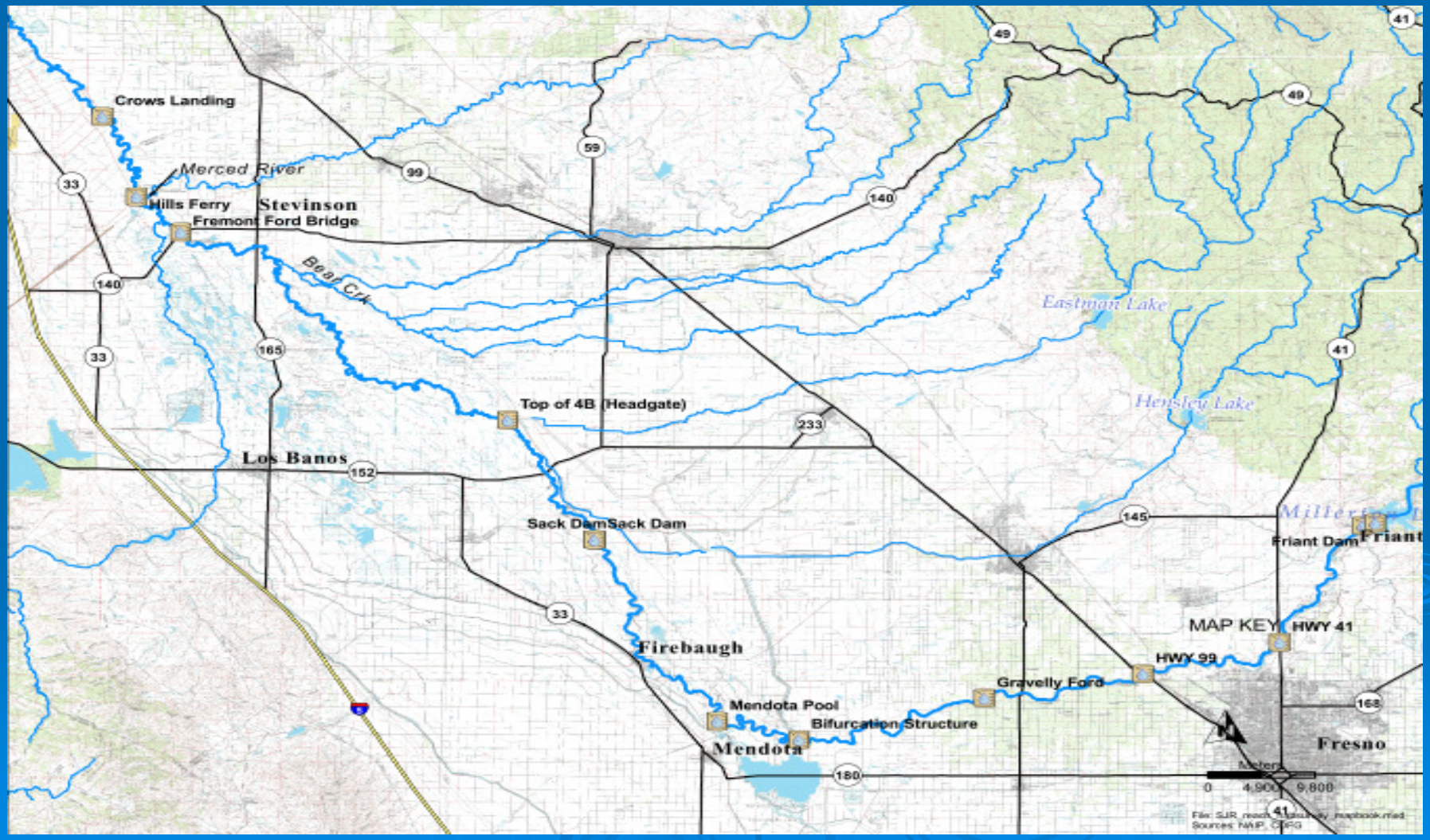
Table 3. Real-time data to support Fall 2009 Interim Releases

Monitoring Site	Reach	CDEC	Flow	Temperature	pH	Dissolved Oxygen	Chlorophyll	Turbidity	EC
Millerton Lake	1A	MIL	C						
SJR just below Friant Dam	1A	P	C	C	C	C	P	C	C
SJR at HWY 41	1A	H41	C						
SJR near HWY 99	1A	DNB	C	P	P	P	P	P	P
SJR at Gravelly Ford	2A	GRF	C	C	C	C	P	C	C
SJR below Bifurcation	2B	SJB	C	C	C	C	P	C	C
SJR near Mendota	3	MEN	C						
SJR below Sack Dam	4A	P	P	P	P	P	P	P	P
SJR at Fremont Ford	5	FFB	C	C					C
SJR at Hills Ferry	5	P	C	C	P	P	P	P	C
SJR at Crows Landing	5	SCL	C	C					C

C=continuous monitoring using YSI 6600 multiparameter sondes
P=pending installation of sondes
Blank cells: Equipment will not be available for Fall 2009 Interim Flows

- Real-time monitoring stations

Water Quality Monitoring Sites



Monitoring – Biological Parameters

- Implemented
  - Habitat Inventory
  - Temperature Monitoring
- Future Proposed Studies
  - Macroinvertebrate
  - Water Quality
  - Fish Community Assessment
  - Predation Studies
  - Entrainment/Passage
  - Reintroduction Strategies
  - Recreation Impacts and Opportunities
  - Public Outreach

Habitat

- Can instream habitat be modified and managed to support all life history requirements for Chinook salmon and other fish?

Objectives:

Inventory existing habitat, develop an understanding of how instream habitat responds to flows, document habitat changes through time and inform and measure success of habitat restoration actions

- **Macrohabitat** – Measure spatial extent and distribution of habitat classification units

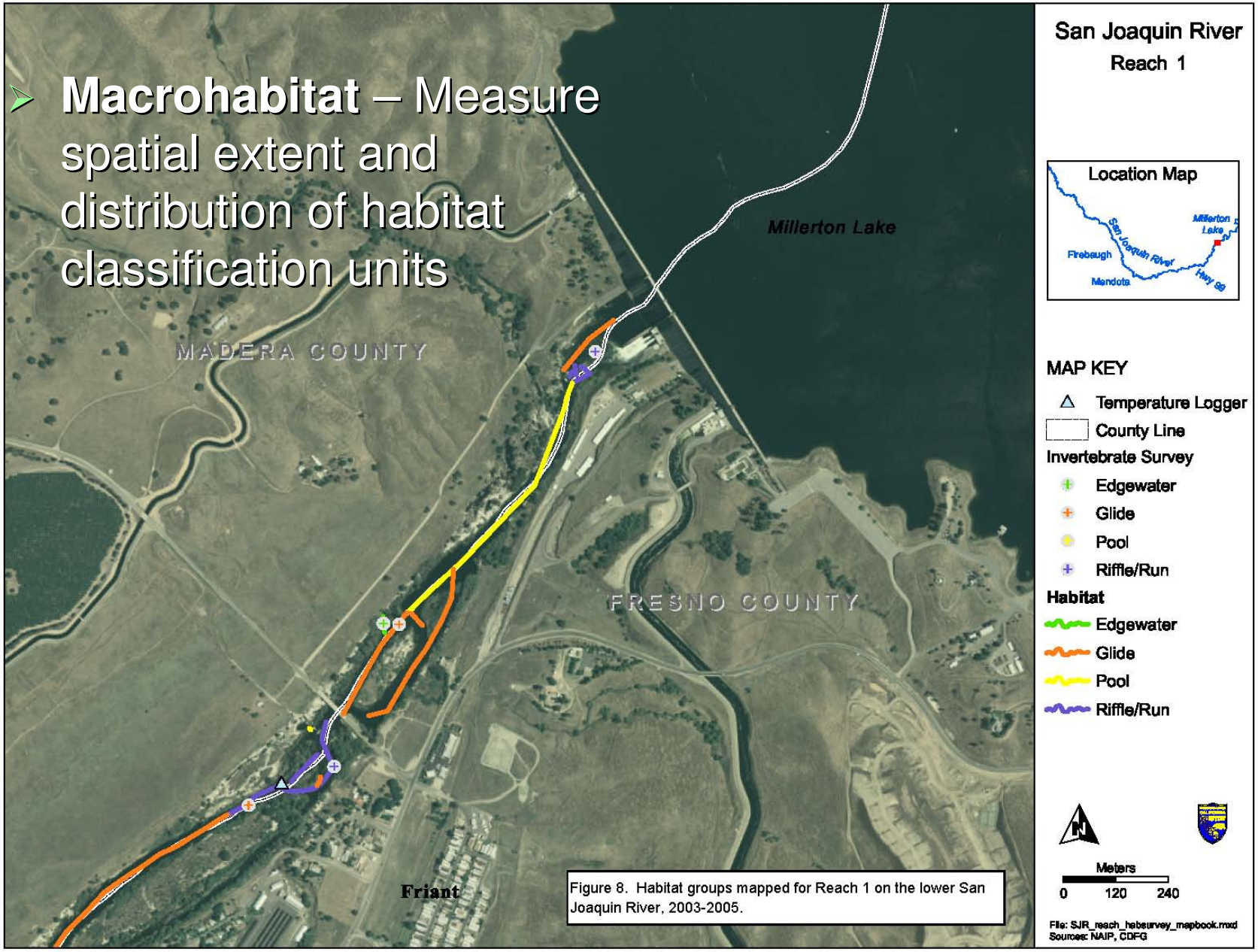
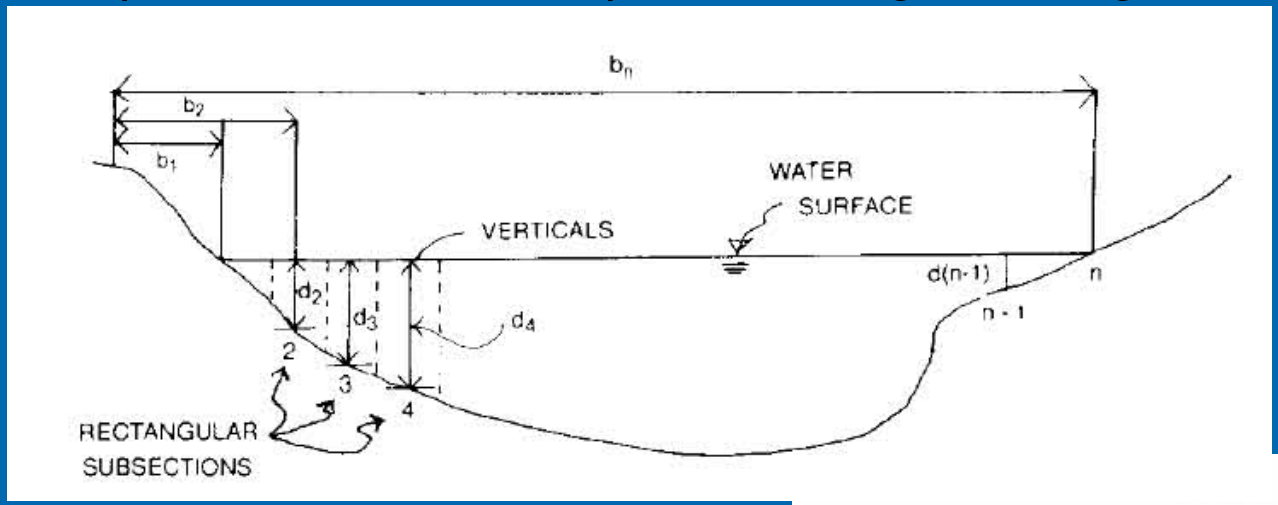
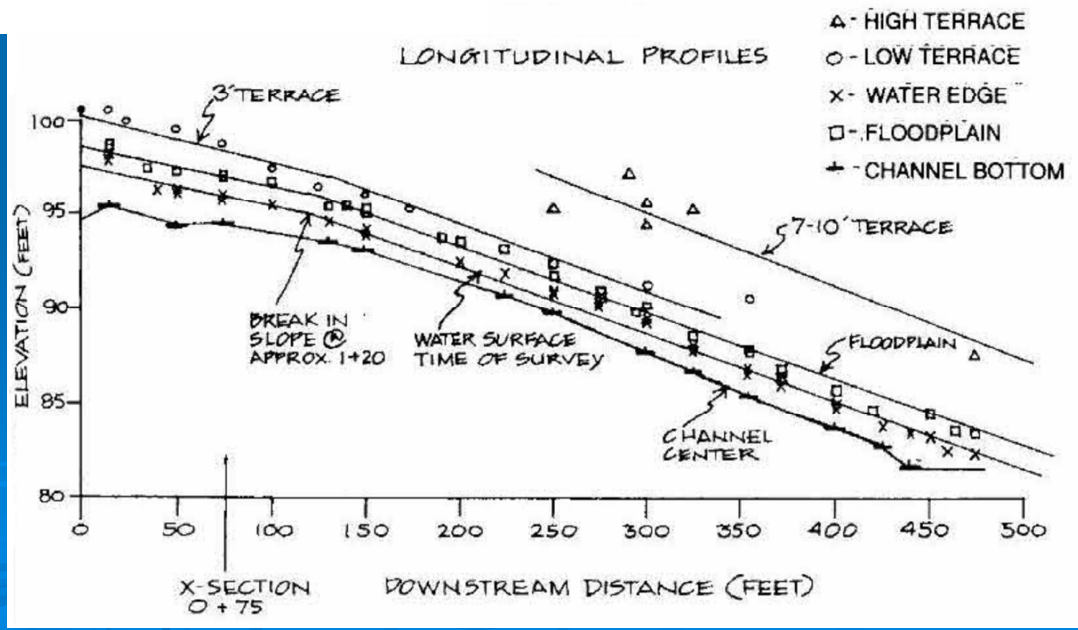


Figure 8. Habitat groups mapped for Reach 1 on the lower San Joaquin River, 2003-2005.

Microhabitat – Detailed measurements of physical characteristics for subsample units with monumented reference sites that will document responses to flow and specific changes through time





Source: USDA, Stream Channel Reference Sites, 1994

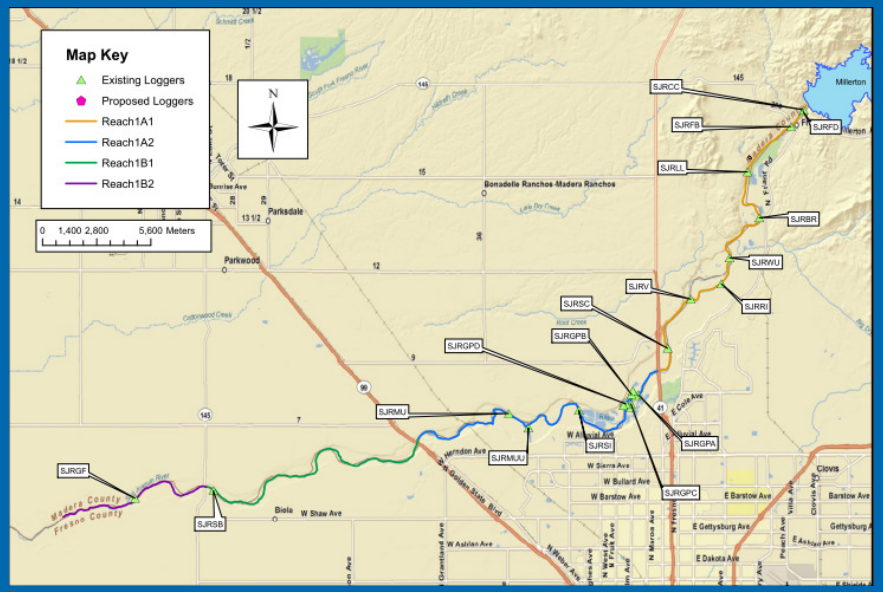
Temperature

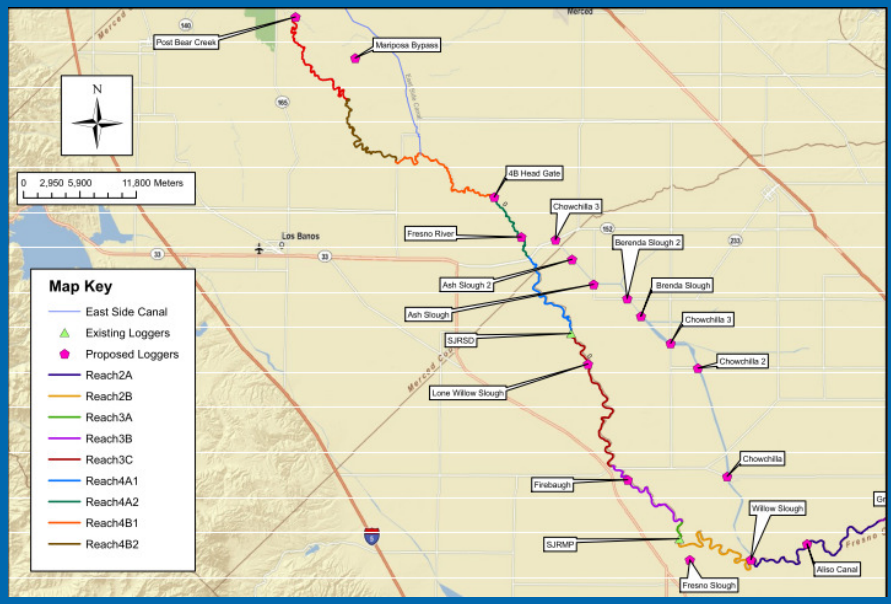
- Are instream temperatures adequate to support all life-history needs for spring and fall-run Chinook salmon through the entire restoration area?
- Are instream temperatures favorably affected by vegetation, subsurface flows, etc.?
- Are instream temperatures adversely affected by tributary and return flows, mining pits, etc.?

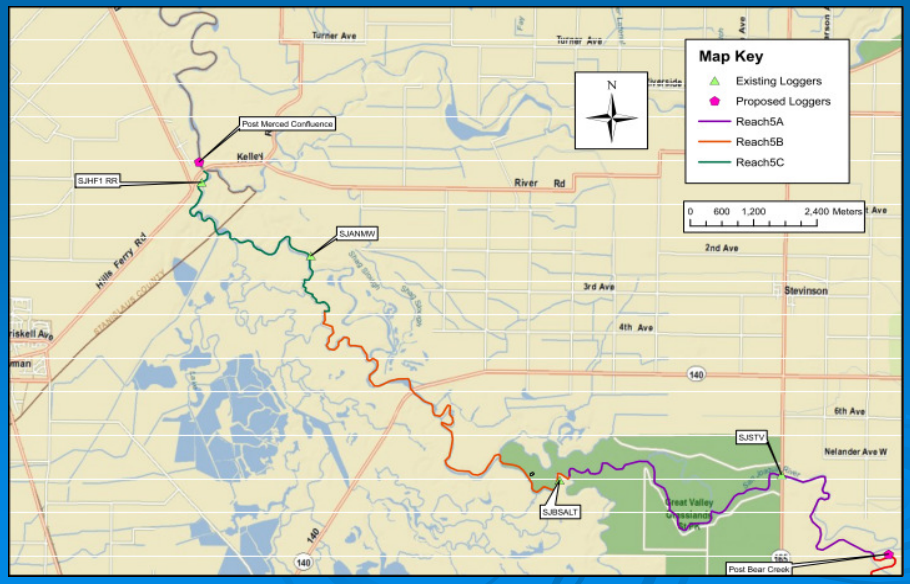
Objectives:

Measure instream temperatures as they relate to flow and other environmental conditions (including off-stream mining pit influence)

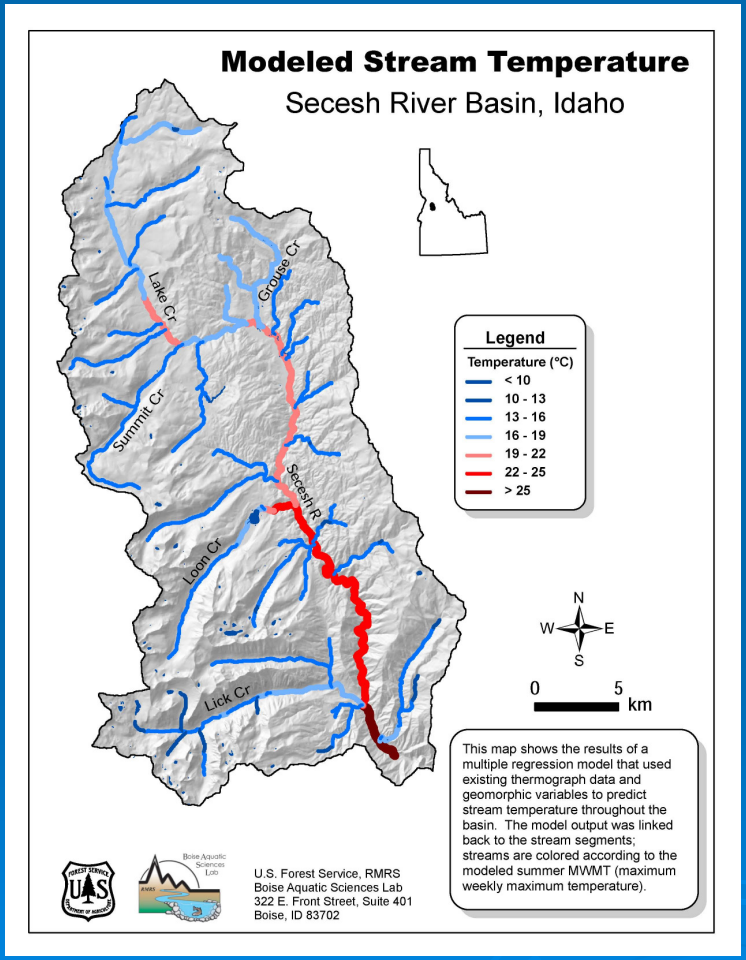
Current & Proposed Locations







Temperature



Thank You

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www.fwua.org/settlement/settelment