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MEETING NOTES

Project Name:	LSJ/DS RFMP	**Date:**	4/23/14
Meeting Subject:	Transitory Storage Meeting	**Project No.:**	
Location:	DWR JOC	**Page:**	1
Notes by:	Jesse Patchett		

Attendees: See Sign-In Sheet

Purpose:
The purpose of this meeting was to share information related to transient storage opportunities and the ways benefits of transient storage could be quantified within the San Joaquin River basin.

Discussion: Introductions were made by attendees, followed by presentations from DWR, USFWS, and the US Bureau of Reclamation relating to their respective work / interest in transitory storage in the San Joaquin River Basin.

DWR Basin Wide Feasibility Study
DWR said they are looking at system-wide needs and benefits as part of their preliminary modeling efforts on transitory storage under the Basin Wide Feasibility Study (BWFS). They are not expecting peak flow reductions for significant storm events (i.e. 100-yr or 200-yr flood events). Rather, transitory storage can be considered as one measure in a collection of other efforts. DWRs target is for flow reductions on a 20-yr to 40-yr storm event. Total acreage of transitory storage is not a targeted outcome of the BWFS. The goals of DWRs analysis include: stage reductions, risk reduction, and ecosystem restoration. Flood risk reduction benefits will be informed via HEC-FDA. Crop damages are accounted for, but long-term economic effects associated with crop damages are not included. Additionally, life safety benefits are included, but are not monetized. Interested parties suggested all the benefits of transitory be considered, not just flood risk reduction benefits.

USFWS
USFWS gave a brief presentation on their interest in transitory storage in the San Joaquin River basin. The Service is interested in taking more water during storm events in a controlled manner for their use on selected areas within the refuges. USFWS stated they have carefully managed wetlands; uncontrolled inundation of the refuges could damage existing infrastructure, increase maintenance associated with additional sediment/silt build-up, introduce invasive weed species, and could potentially impact threatened and endangered species on the refuge. It is for these reasons they are only interested in controlled diversions.

It was noted that this is in-line with farmers' position on the issue of floodplains restoration (i.e. impacts to infrastructure, increased maintenance costs, weeds, etc.). The Service responded by explaining the ecosystem is so artificially impacted at this point from dams, weirs, etc, that re-connecting floodplains on the refuge would be harmful to threatened and endangered species.

US Bureau of Reclamation
The US Bureau of Reclamation gave a presentation on alternatives associated with a portion of the San Joaquin River Restoration program. Each of the alternatives had varying degrees of transitory storage that could be available in the basin, but there were contributing goals to prevent inundation and seepage onto adjacent crop lands.

Following the presentations, each of the three RFMP leads discussed their respective interest in transitory storage and possible transitory storage sites within each region.

The Upper San Joaquin Region indicated there has been a recent trend toward permanent conversion from row crops to tree and vine crops, which has reduced transitory storage opportunities in their area. However, the Upper SJ RFMP team believes that multi-benefit projects are likely the only way they can successfully implement projects, so approximately 20

MEETING NOTES

of the projects in their RFMP have transitory storage opportunities. It was suggested that another possible opportunity for transitory storage may be the strings of gravel pits along the east-side tributaries.

The Mid San Joaquin Region indicated they had about 35,000 ac-ft of transitory storage available in their region via the Three Amigos project, and the Dos Rios / Hidden Valley project. A question was posed on if taking water on their lands was a water rights issue. They were unsure if this was an issue or not.

The Lower San Joaquin Region stated that due to goals of higher levels of flood protection, they currently do not rely on transitory storage projects. Also, because of urbanization, opportunities for multi-benefit features are limited on many projects. There is interest in working with upstream areas (i.e. Mid and Upper SJ) to possibly use benefits from their projects to offset impacts from projects in urban areas like Stockton.

Sign-In Sheet
April 23, 2014
San Joaquin River Transient Storage Workshop

name	Organization/agency	Email	phone
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Roger Churchwell	San Joaquin Area Flood Control Agency (SJAFCA)	Roger.churchwell@stocktongov.com	209-373-8484
Karl Stromayer	US Fish and Wildlife Service (USFWS)	Karl_stromayer@fws.gov	209-826-3508
Jim Giottonini	SJAFCA	Jim.giottonini@stocktongov.com	209-937-8339
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James Gregory	Environmental Science Associates (ESA)	jgregory@esassoc.com	415-262-2338
Betty Andrews	ESA	bandrews@esassoc.com	707-285-0581
Rene Henery	Trout Unlimited	rhenery@tu.org	415-640-0927
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John Carlon	RD2092/River Partners	jcarlon@riverpartners.org	530-894-5401

San Joaquin River Transient Storage Workshop

Wednesday April 23, 1:00 – 4:00pm
3464 El Camino Ave. Sacramento
JOC Annex, DWR 150 AT&T meeting room

The purpose of this meeting is to share information related to transient storage opportunities and the ways we can quantify benefits of transient storage within the San Joaquin River Watershed specifically for consideration in the Basin-Wide Feasibility Study and the SJR Regional Flood Management Plans.

Agenda:

1. 10 mins - Introductions
2. 30 mins - DWR: BWFS and Transitory Storage overview: expectations, approach, modelling, +discussion of characterization of TS benefits
3. 30 mins - USFWS: Refuge Lands constraints/opportunities
4. 30 mins - USBR: SJRRP Implementation Framework update, seepage/storage opportunities, possible flood benefit integration

   Short break (if needed)

5. 15 mins - USJR RFMP and stakeholders: overview and update on other TS opportunities
6. 15 mins - MSJR RFMP and stakeholders: overview and update on 3 amigos, Dos Rios, others
7. 15 mins - LSJR RFMP and stakeholders: TS questions, opportunities, characterization of benefits
8. 20 mins - Group: Discussion on integration and next steps

Note to participants:
Please come prepared to discuss

- Locations of potential transient storage opportunities (where possible), extent, volume
- Flood timing/operational constraints
- Thoughts on how to characterize benefits of transient storage for your needs (such as)
  - Reduced Expected Annual Damages,
  - Increased Expected Annual Habitat,
  - Improved sediment dynamics,
  - Ecosystem benefits,
  - Reduced O&M costs locally or downstream, etc.

San Joaquin River Transient Storage Opportunities

As presented at April 23, 2014 Meeting:

Proponent	Location	Acres	Depth (ft)	Volume (acre feet)
USFWS	San Luis Unit, San Luis NWR	675	3	2,025
USFWS	West Bear Creek Unit, San Luis NWR	394	3	1,182
USFWS	East Bear Creek Unit, San Luis NWR	261	3	783
USFWS	Freitas North Unit, San Luis NWR	541	3	1,623
USFWS	Sno-Bird Unit, Merced NWR	111	3	333
USFWS	3 amigos, San Joaquin River NWR	2,500	10	25,000
SJRRP	Reach 2B and Mendota Pool Bypass	2,151	3	6,453
SJRRP	Reach 3 Seepage Projects	730	3	2,190
SJRRP	Reach 4A Seepage Projects	398	5	1,990
SJRRP	Reach 4B and Eastside Bypass	1,265 – 10,150	3	3,795 – 30,450
River Partners	RD 2092	1,000	10	10,000
DU/TU/AR/USFWS	Three Rivers Ranch	205	3	615
DU/TU/AR/USFWS	Cinnamon Slough / Lonetree - MNWR	900	3	2,700
DU/TU/AR/USFWS	Sunrise Ranch	1,750	3	5,250
	total			**63,939 - 90,594**

Sources:

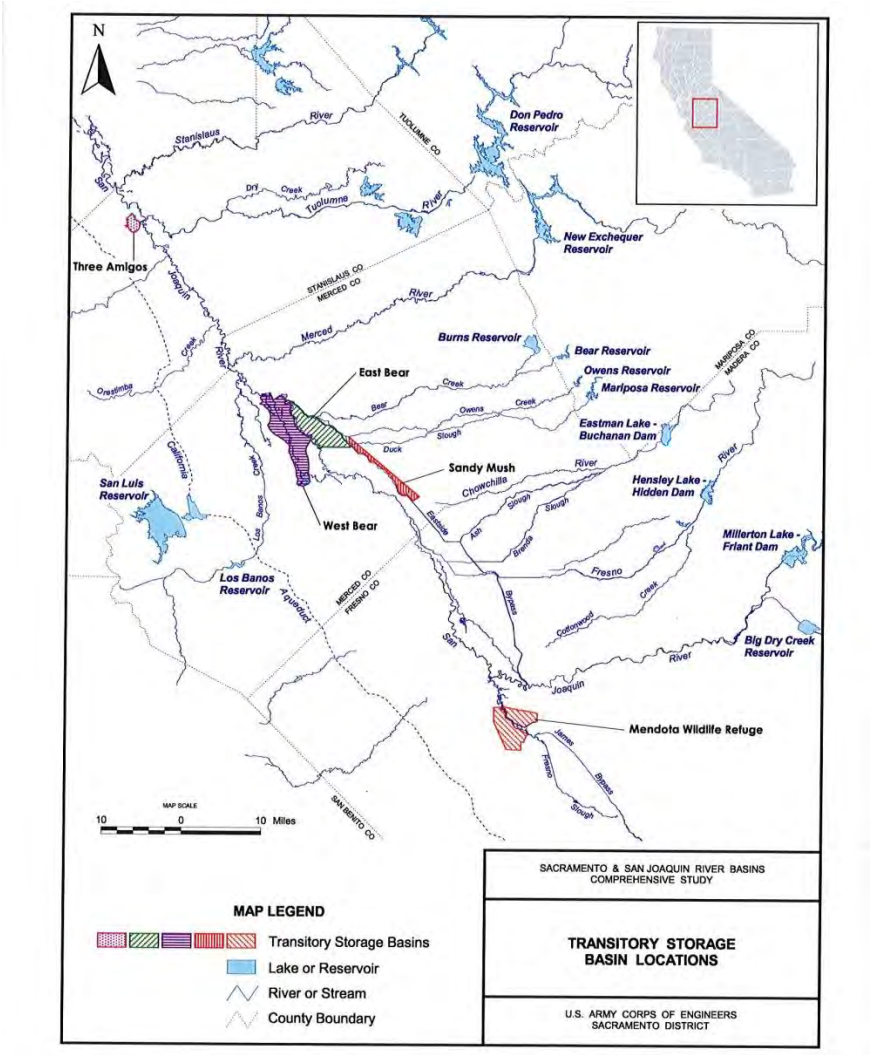
Presentations from USFWS – San Luis NWR Complex, USBR San Joaquin River Restoration Program, River Partners, Trout Unlimited, and Lower- Mid- and Upper-San Joaquin River Regional Flood Management Plan teams

HISTORICAL PERSPECTIVES

2002 Comp Study Opportunities

Landowner	Location	Acres	Depth (ft)	Volume (acre feet)
CDFW	Mendota Wildlife Area – along Fresno slough upstream of Mendota	-	-	21,676
	Sandy Mush – Eastside Mariposa Bypass upstream of El Nido	-	-	20,500
USFWS	West Bear – San Joaquin River upstream of Bear River Confluence	-	-	35,600
	East Bear (Bravel Slough) - Eastside Bypass upstream of Owens Creek confluence	-	-	35,000
USFWS	3 Amigos – San Joaquin River downstream of Tuolumne Confluence	-	-	14,650
		total		**127,426**

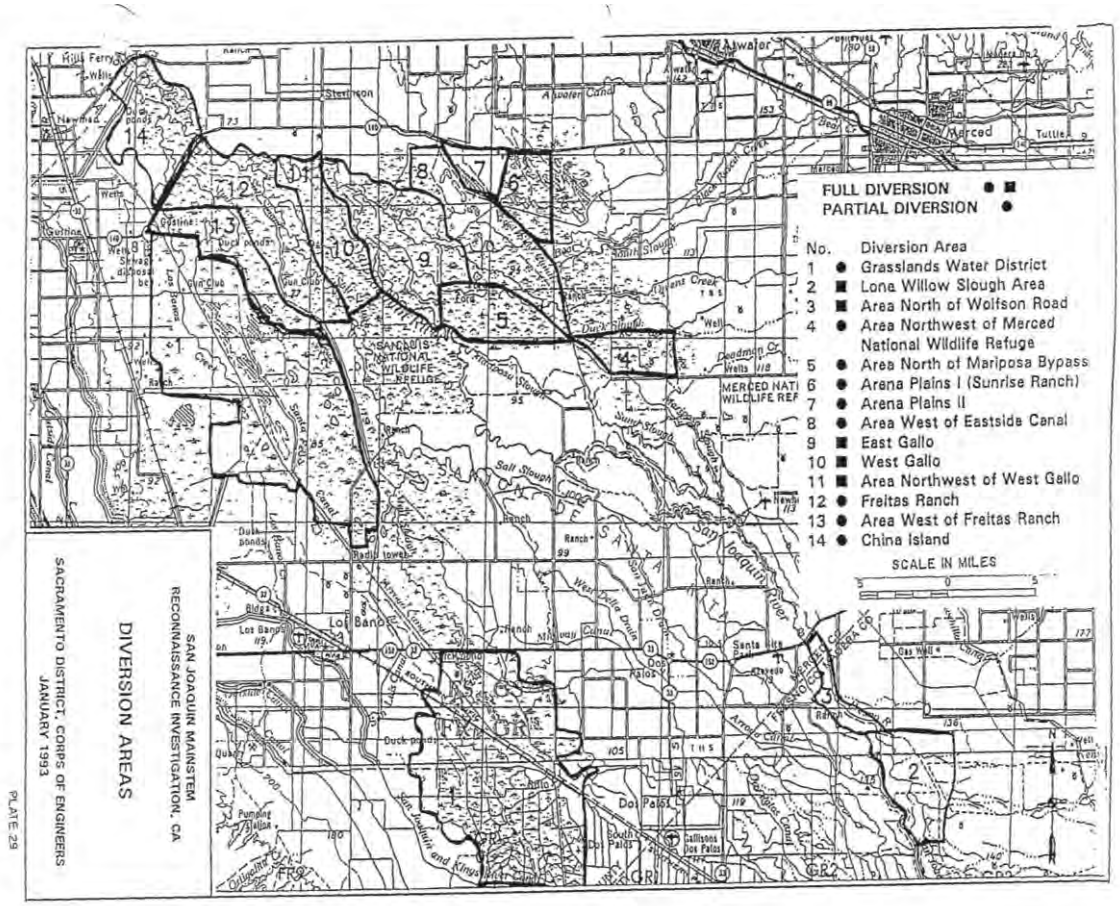
Source: USACE 2002 Sacramento and San Joaquin River Basins, Comprehensive Study, Technical Studies Documentation, Appendix C, Reservoir Operations Modelling, Existing Design Operations, and Re-Operation Analyses, Table VI-2, December 2002.



1993 Reconnaissance Report Opportunities

Landowner	Location	Acres	Depth (ft)	Volume (acre feet)
USFWS	Arena Plains I – Sunrise Ranch	3,070	4	4,980
USFWS	Arena Plains II – West of Sunrise Ranch	1,930	5	7,045
USFWS	Area West of Eastside Canal	7,260	2	620
USFWS	Freitas Ranch	6,780	5	12,720
USFWS	Area West of Freitas Ranch	6,200	2	12,400
USFWS	Area NW of Merced NWR	3,270	5	14,180
USFWS	Area N of Mariposa Bypass	5,250	5	20,430
Private	Grasslands Water District	50,000	2	50,000
Private	Lone Willow Slough Area	3,000	5	7,500
Private	Area N of Wolfsen Road	3,640	5	9,100
Private	East Gallo	8,130	5	36,030
Private	West Gallo	3,340	5	11,120
Private	Area NW of West Gallo	2,320	5	6,980
CDFW	China Island	4,730	5	7,470
		total		**200,575**

Source: USACE, 1993, San Joaquin River Mainstem and Tributaries, California, Reconnaissance Report, Table IV-7 Full Diversion Alternative



Opportunities to divert floodwaters onto San Luis National Wildlife Refuge Complex for wildlife benefits, enhanced floodplain function, and transitory flood storage

Potential Opportunities & Issues

Mission Statements

- The mission of the U. S. Fish & Wildlife Service is: "Working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."
- The mission of the National Wildlife Refuge System is: "To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and there habitats within United States for the benefit of present and future generations of Americans."

Compatibility Determinations

Compatibility determinations are required to ascertain whether proposed or existing uses of national wildlife refuges are compatible with their establishing purposes and the mission of the National Wildlife Refuge System.

Projects Currently Listed

- **San Joaquin River NWR:**
  - Three Amigos

- **Merced NWR:**
  - Enhance infrastructure to divert flood flows onto 1,200 acres of existing wetlands and other refuge lands
  - Modify water intake structures
  - Construct diversions off Eastside Canal onto Sno-Bird Unit

Projects Currently Listed (cont'd.)

- **San Luis NWR:**
  - Modify water intake structures
  - Install lift pumps and restore a wetland swale at East Bear Creek Unit to divert floodwater onto 1,000 acres of wetlands
  - Enhance existing wetland depth and configuration at East Bear Creek Unit to provide additional habitat and flood water storage on 500 acres of wetland basins
  - Restore anabranches of Salt Slough/Freitas Unit
  - Restore wetland slough channel on West Bear Creek Unit for connectivity with San Joaquin River to accommodate flood flows

Changes to Federal Projects for the Purposes of Reducing Maintenance and/or Removing Facilities from the Federal Project

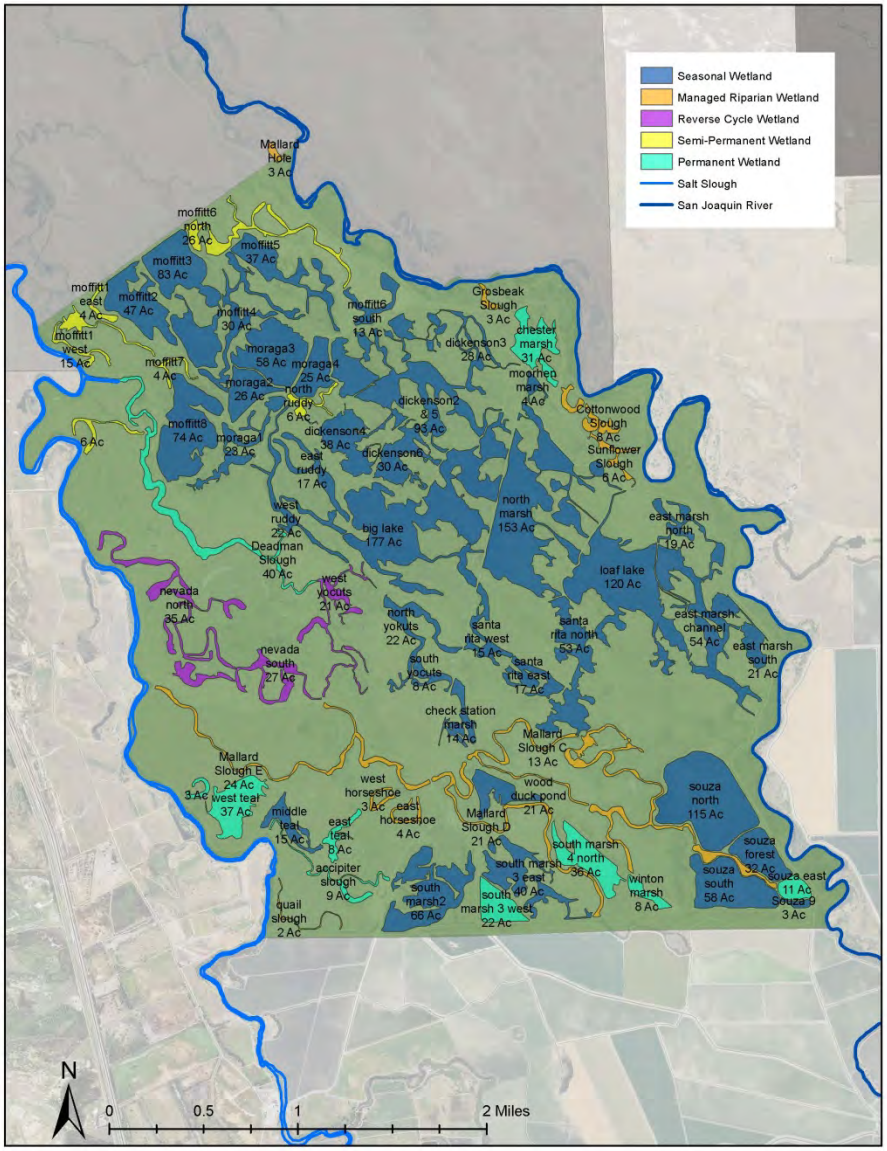
Meegan Nagy, Operations
USACE, Sacramento District

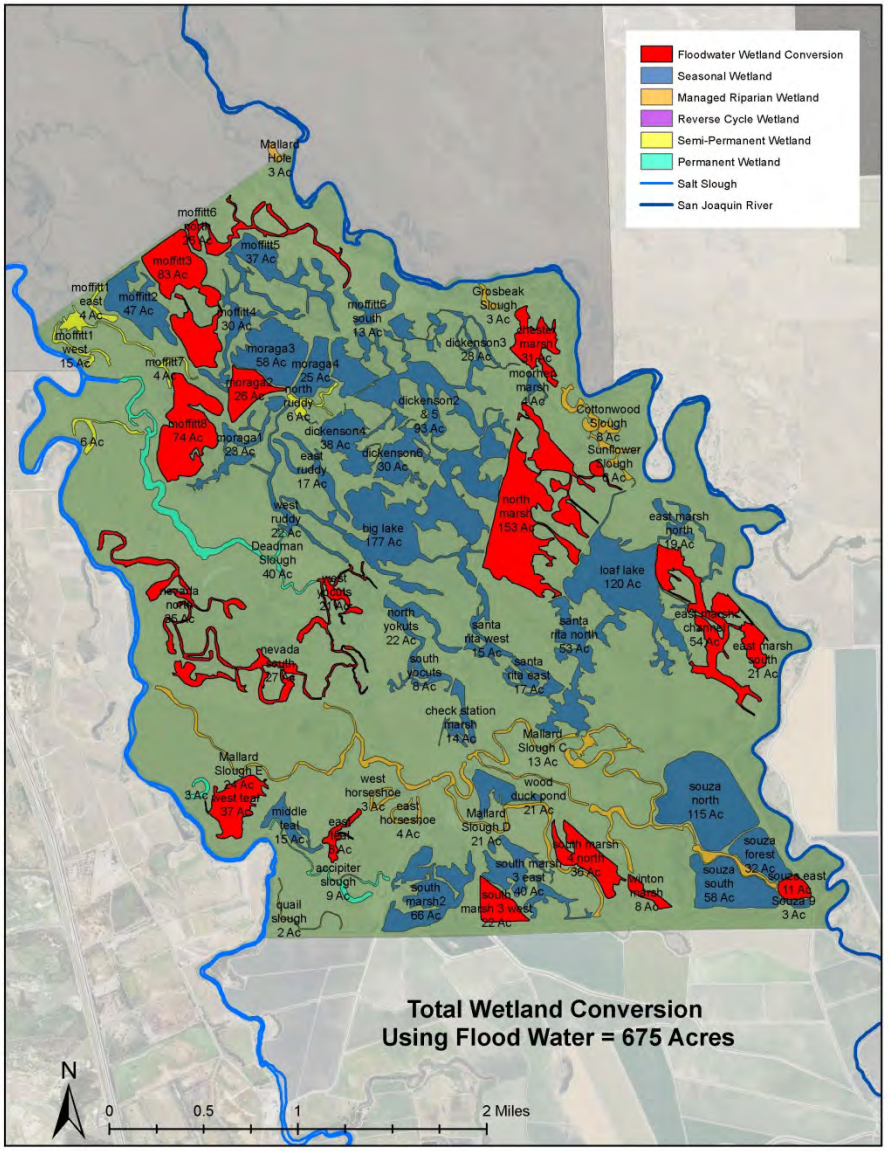
Presentation to CVFPB
26 April 2013

US Army Corps of Engineers
BUILDING STRONG®

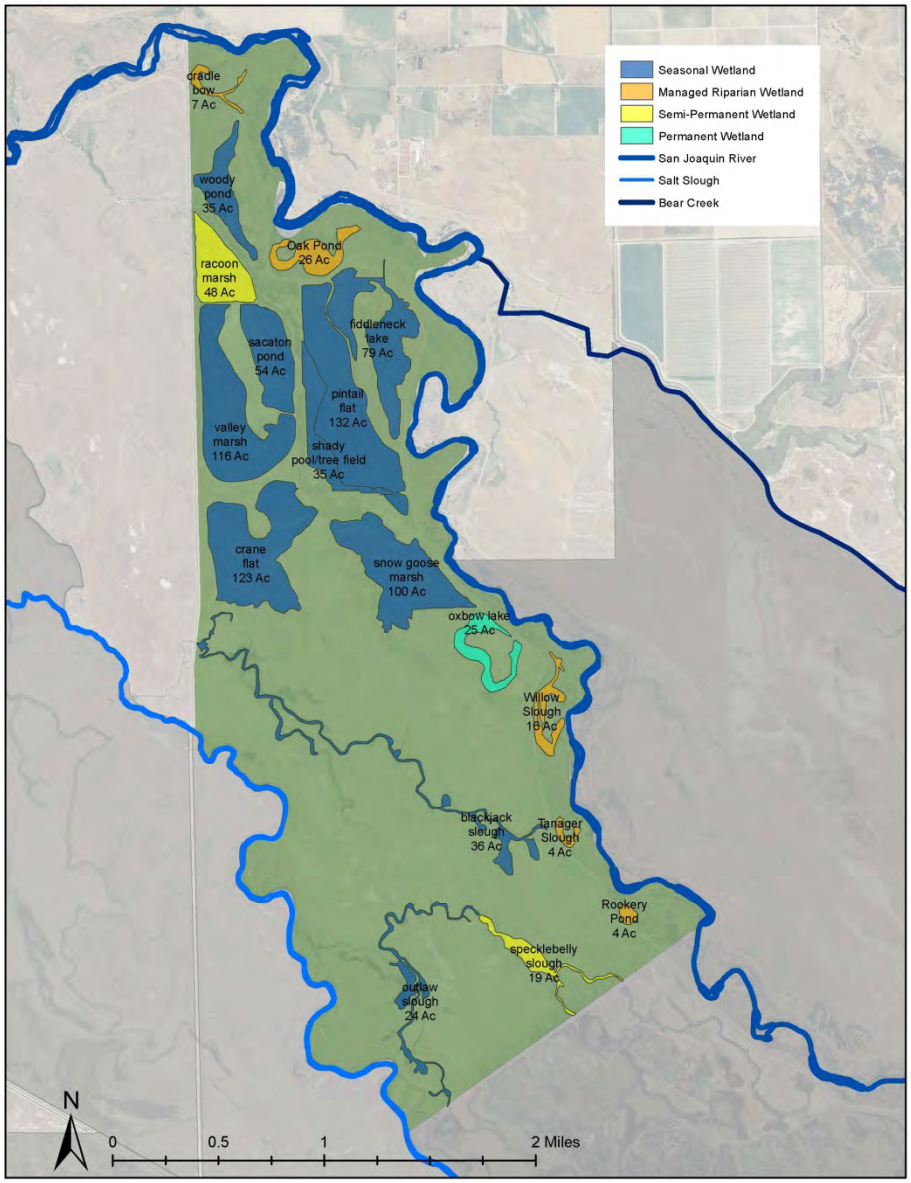
Rehabilitation and Inspection Program, Non-Structural Alternative Project

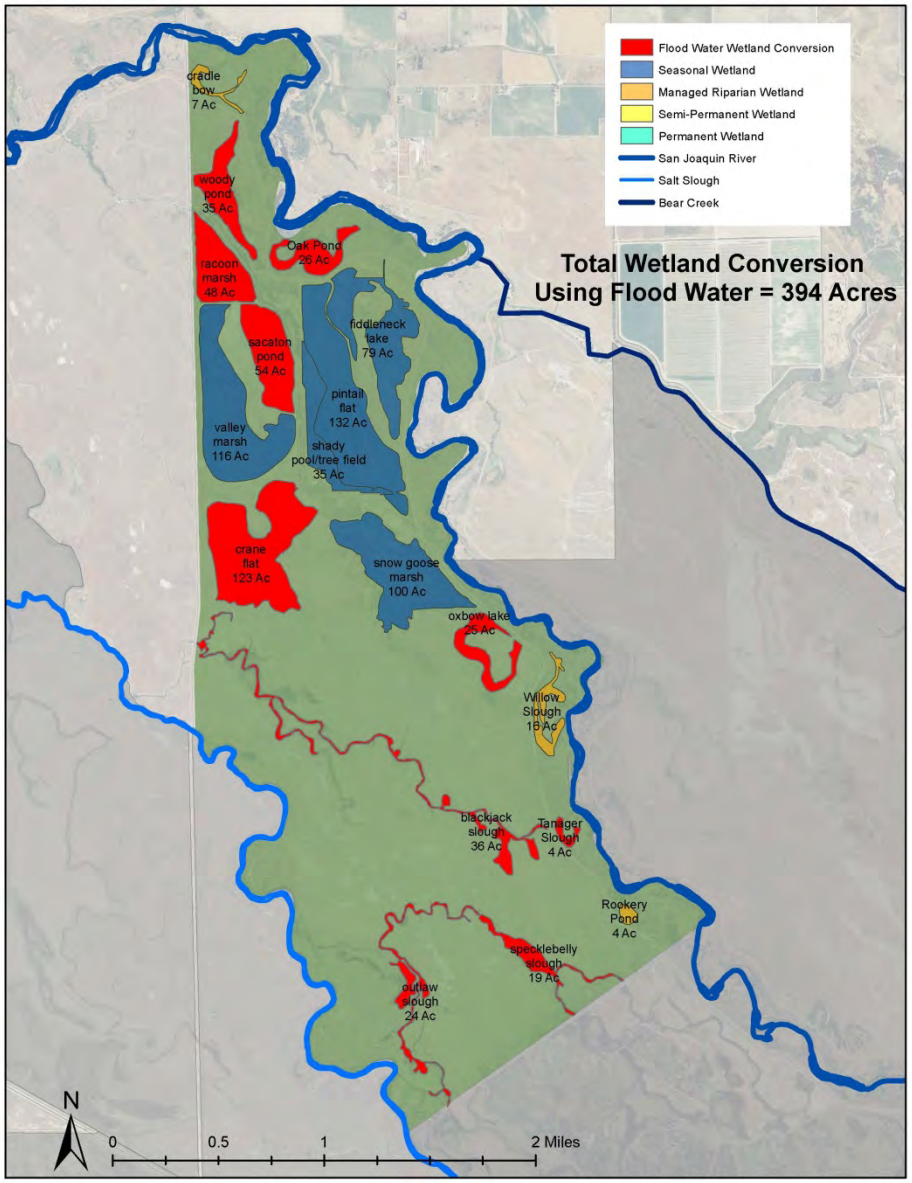
- Project sponsors may request rehabilitation projects, resulting from flood damages, be non-structural (NS) in lieu of structural repairs.
- A NS rehabilitation project's purpose is to reduce future flood damages and flood repair costs, and can reduce maintenance requirements.
- Does not remove the rehabilitation project from the Authorized Project.
- System must be in Active status to be eligible
- Examples: floodplain restoration
- Specific Example: Three Amigos





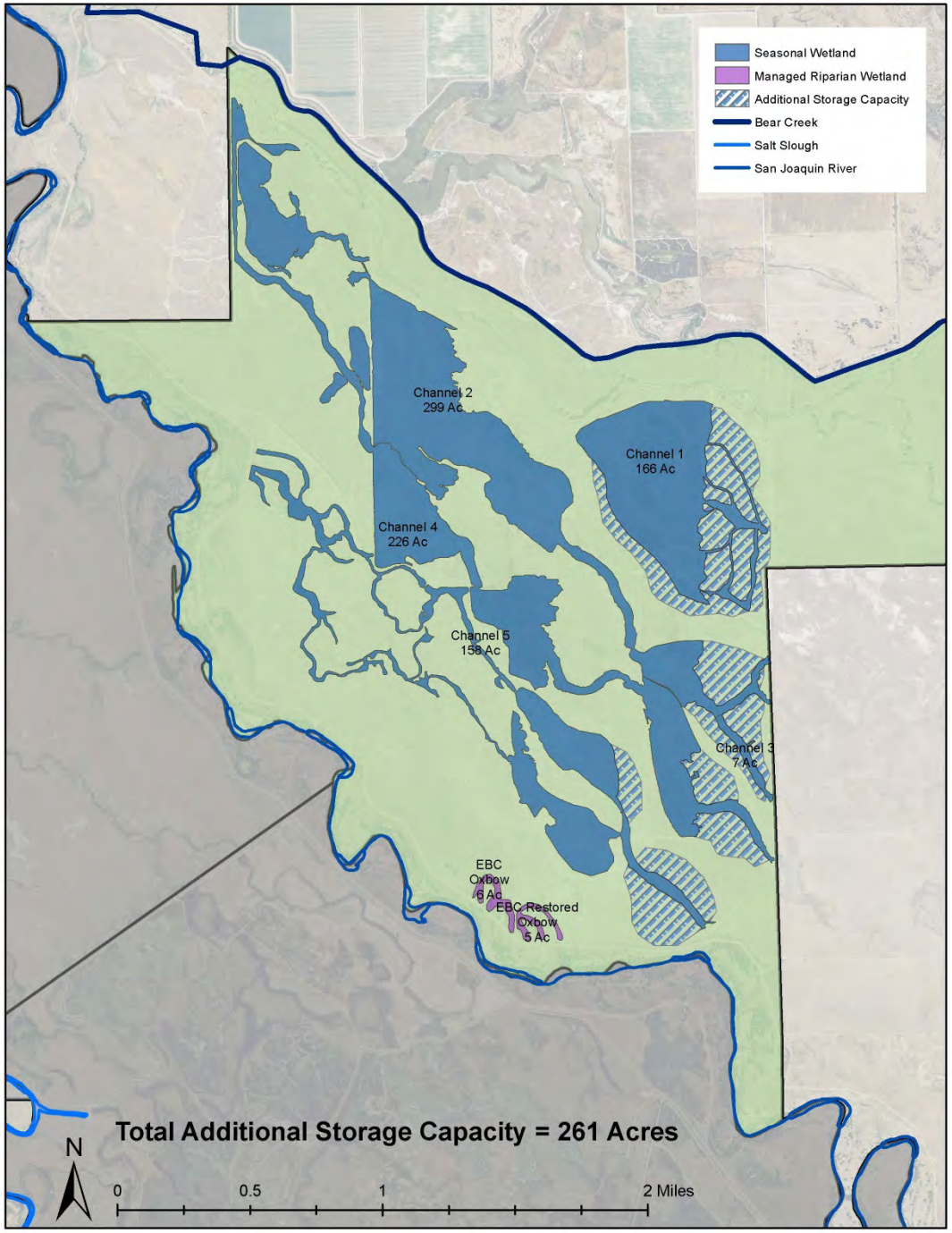
San Luis Unit, San Luis National Wildlife Refuge

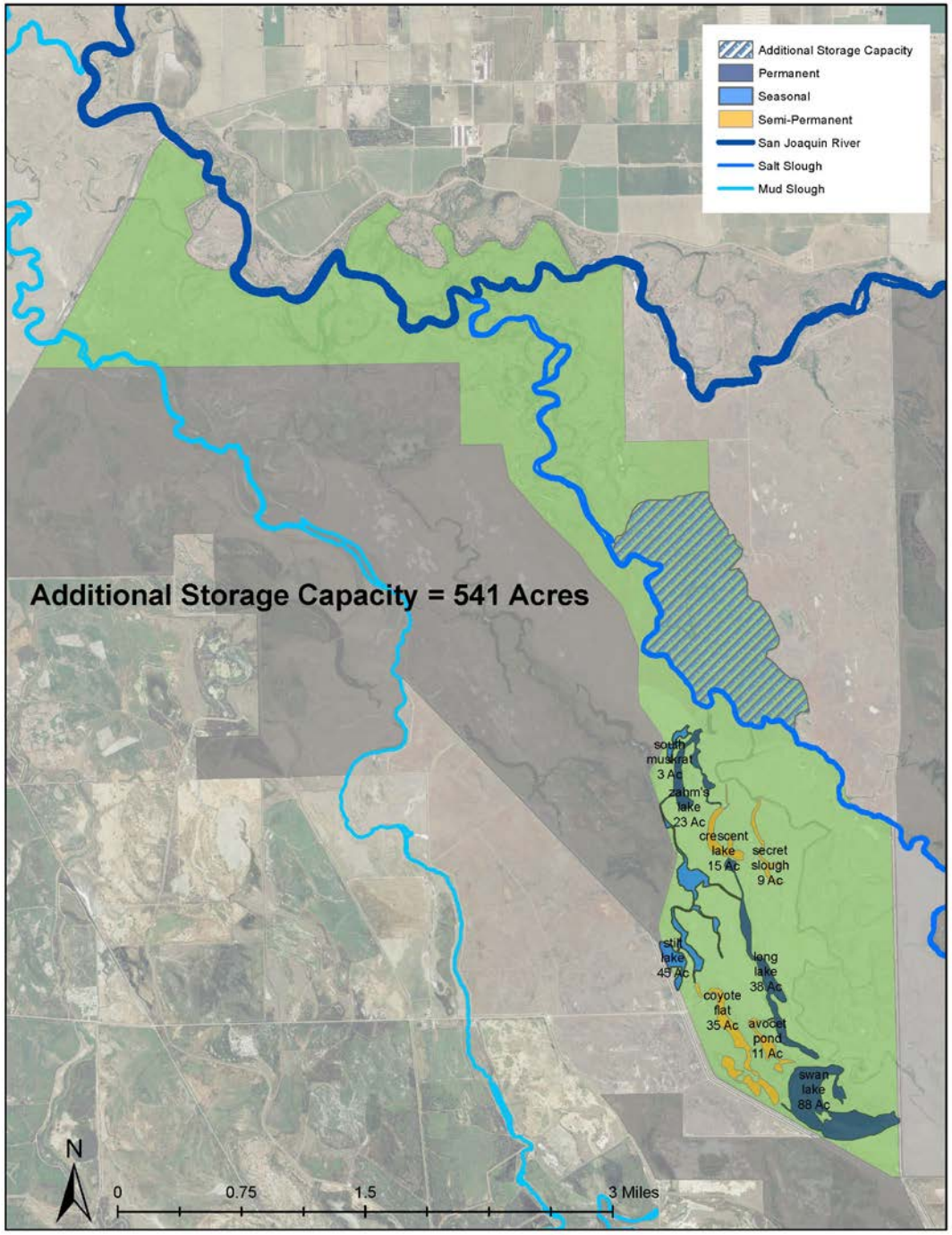




West Bear Creek Unit, San Luis National Wildlife Refuge

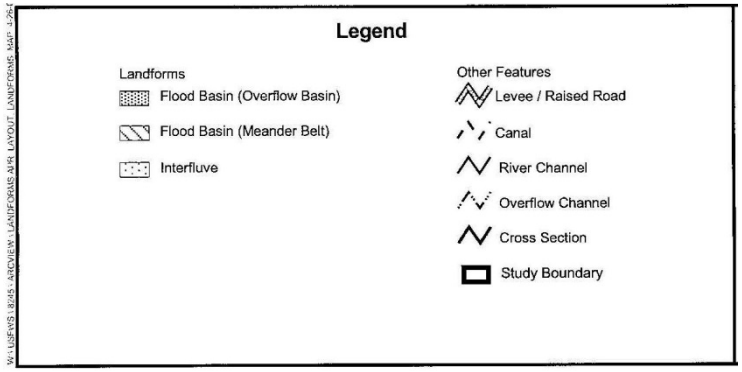
East Bear Creek Unit,
San Luis National Wildlife Refuge

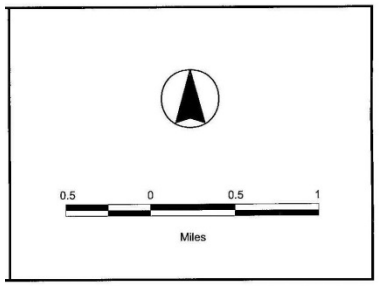


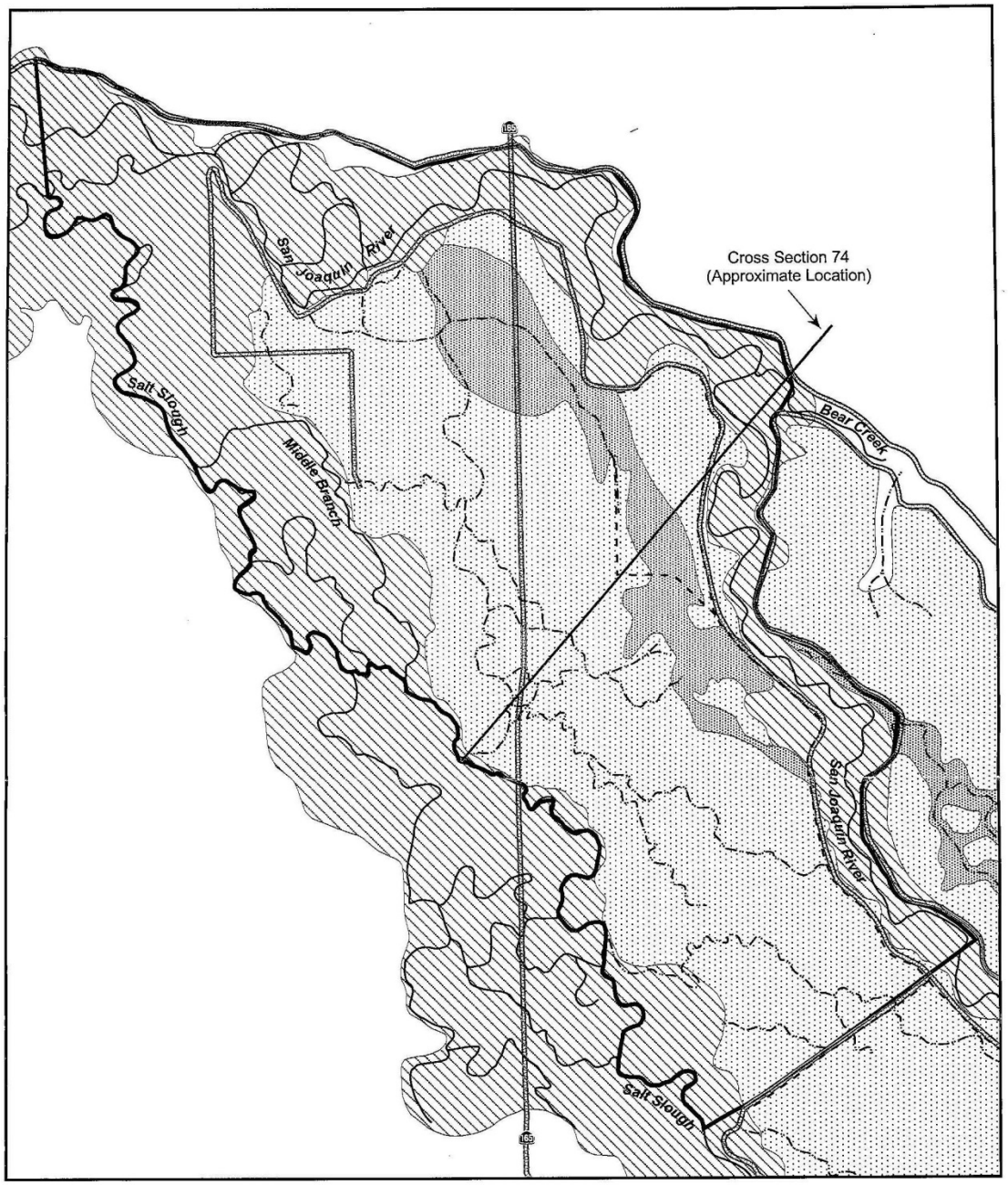


Freitas North Unit,
San Luis National Wildlife Refuge

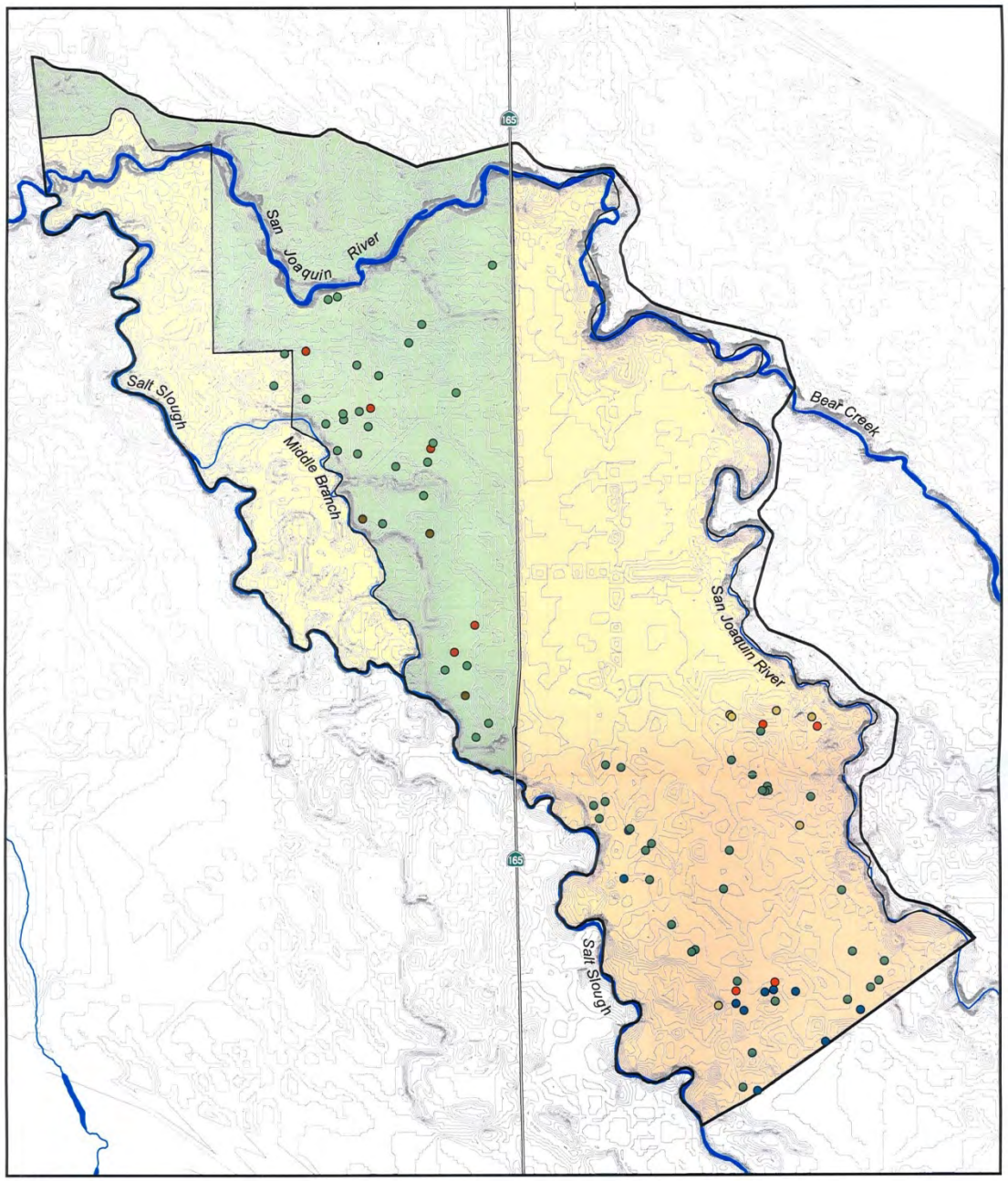
Landforms on West Bear Creek and Adjacent Refuge Units







Locations of Special Status Invertebrate Occurrences



Legend

Special-Status Invertebrates
- Fairy Shrimp (Branchinecta sp.)
- Vernal Pool Tadpole Shrimp (Lepidurus packardi)
- Fairy Shrimp (Branchinecta sp.) and Vernal Pool Tadpole Shrimp (Lepidurus packardi)
- Vernal Pool Fairy Shrimp (Branchinecta lynchi)
- Vernal Pool Fairy Shrimp (Branchinecta lynchi) and Vernal Pool Tadpole Shrimp (Lepidurus packardi)
- Unidentified Anostraca and Vernal Pool Tadpole Shrimp (Lepidurus packardi)

Units
- Great Valley Grasslands State Park
- Freitas Unit, San Luis NWR
- West Bear Creek Unit, San Luis NWR
- Study Boundary

Other Features
- 1-Foot-Elevation Contours
- Major Roads
- Hydrologic Features

Source: Ayres Associates, California Department of Fish and Game, Hoopes et al. 1996

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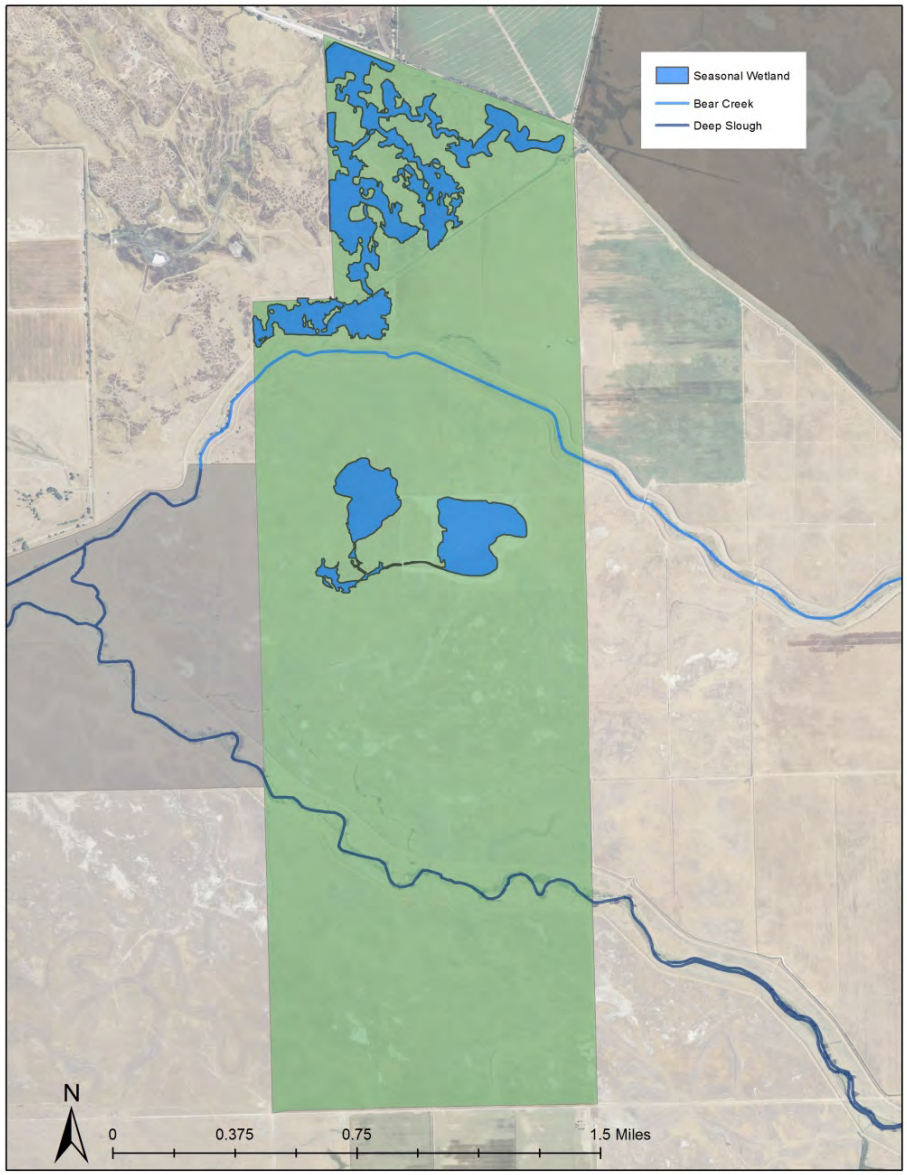
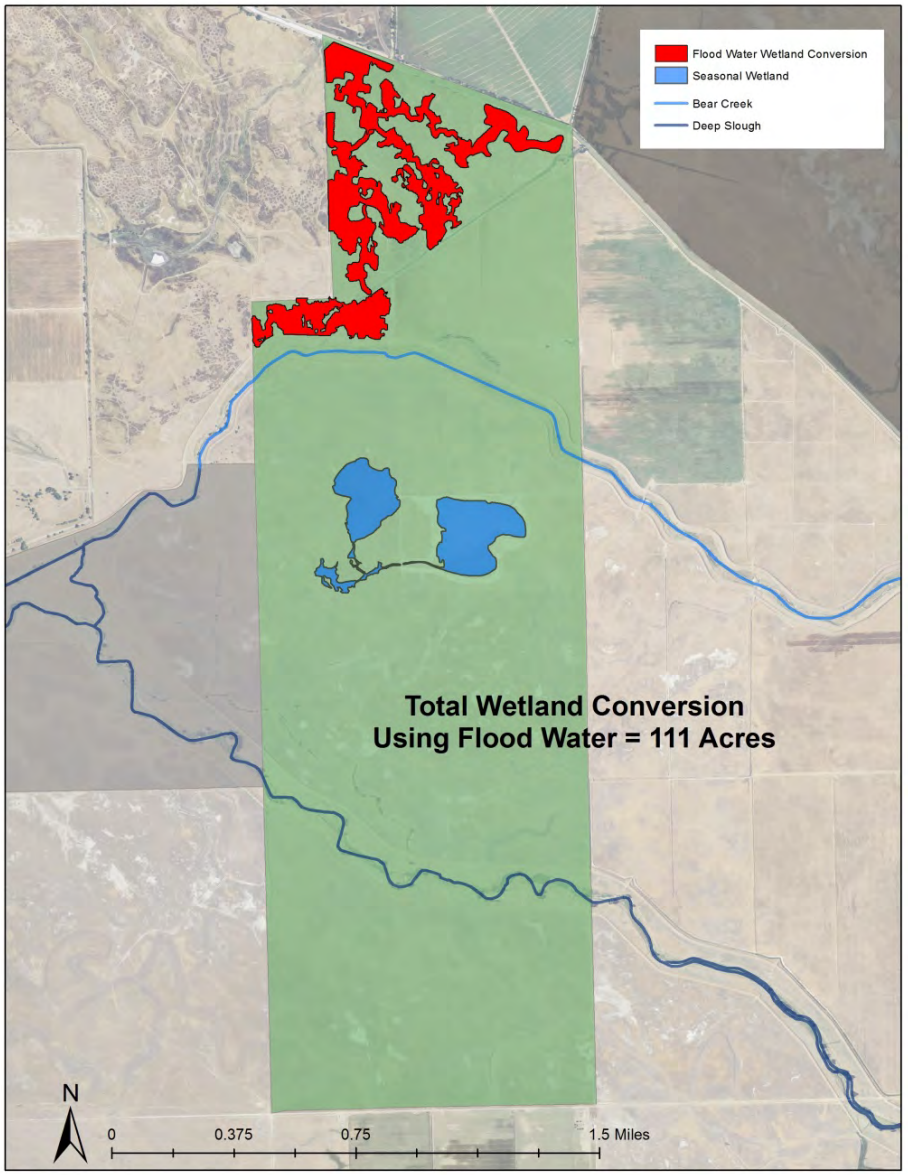




Sno-Bird Unit, Merced National Wildlife Refuge

Potential Issues:

- Vernal Pools
- Refuge Infrastructure
- Refuge Habitat
- Sensitive Species & Trust Resources

Vernal Pools – Issues:

- Vernal pools and alkali sinks could be impacted by siltation and/or invasive species. These biotic communities did evolve with flooding – however the frequency of flooding is thought to have been very infrequent.

Vernal Pools – Actions Needed:

- Research literature and expert opinion regarding vernal pool ecology; particularly, vernal pool integrity under differing flood regimes. Model flood elevations and assess to what degree vernal pools would be flooded under different scenarios.

Refuge Infrastructure – Issues:

- The water conveyance system is highly artificial and very extensive (over 170 miles of roads, 40 miles of water delivery canals, 280 water control structures, 80 miles of dikes). Inundation of this infrastructure could cause damage and incur a serious, costly, labor-intensive maintenance burden to repair.

- In addition, deposition of silt and debris could cause a heavy maintenance burden.

Refuge Infrastructure – Actions needed:

- Estimate what sort of damage might occur: e.g., washing out of water control structures and wetland basins; siltation of water delivery canals and drainage ditches; erosion of roads and berms; loss of gravel; and deposition of silt, wrack, and garbage.

- Estimate flood damage repair costs under different flooding scenarios.

Refuge Habitat – Issues:

- Flooding that exposes bare soil or deposits silt sets up for invasive weed establishment. Flooding can intensify what is already a very heavy maintenance burden – combatting invasive weeds.

- If water remains high too long, it can damage habitats by killing plants that vary in ability to withstand flooding. Of special concern is remnant or restored riparian habitat, and native grasslands.

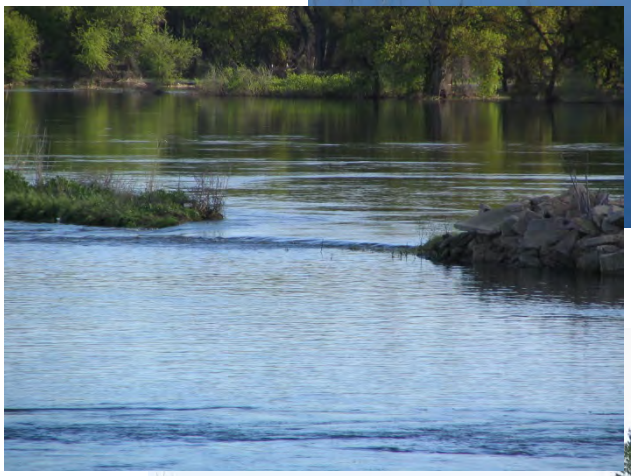
Sensitive Species – Issues:

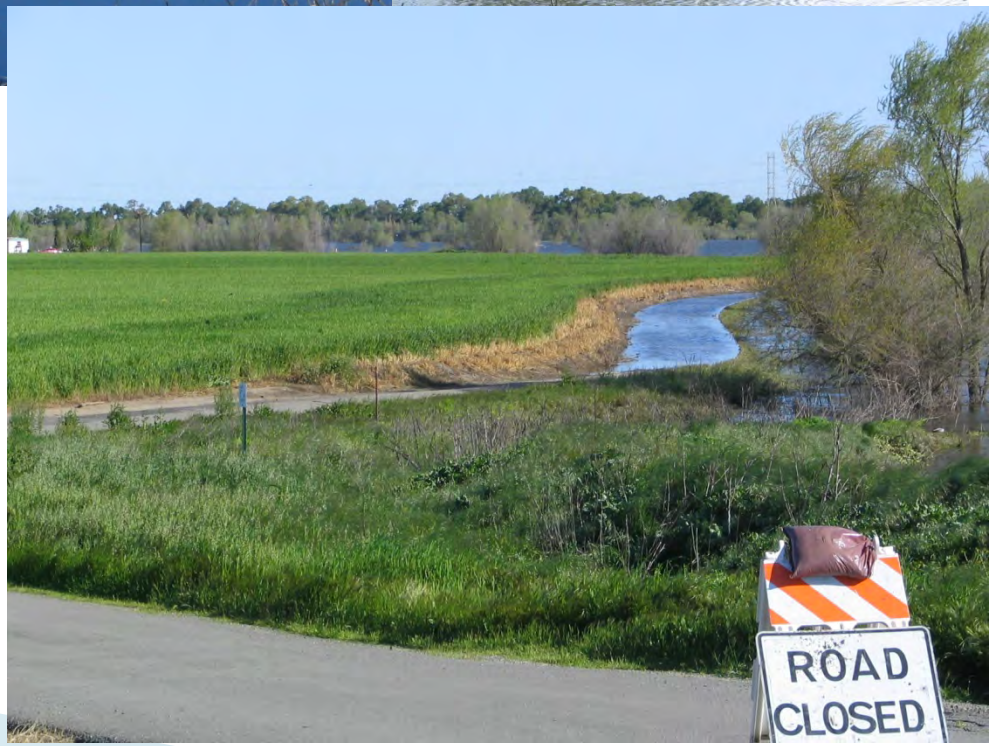
- Vernal pools and riparian woodlands, in particular, are home to T&E species.

- Wildlife may be heavily impacted and some species present are threatened or endangered; such as riparian brush rabbit, vernal pool species, & valley elderberry long-horned beetle.

Sensitive Species – Actions Needed:

- Assess potential impacts to T&E species.
- Determine benefits of floodwater to FWS trust resources.
- Comply with all relevant regulatory requirements of ESA, if purposefully diverted floodwaters might result in a take of endangered species.
- Implement actions to benefit trust resources.
- Design, fund, and implement any mitigation requirements. Potentially:
  - Build flood refugia for riparian brush rabbits and other species
  - Plant elderberry on high ground and inoculate with VELB
  - Restore additional habitats
  - Many other options




ROAD
CLOSED

SAN JOAQUIN RIVER RESTORATION PROGRAM

Upper San Joaquin River Floodplain Opportunities

San Joaquin River Transient Storage Workshop

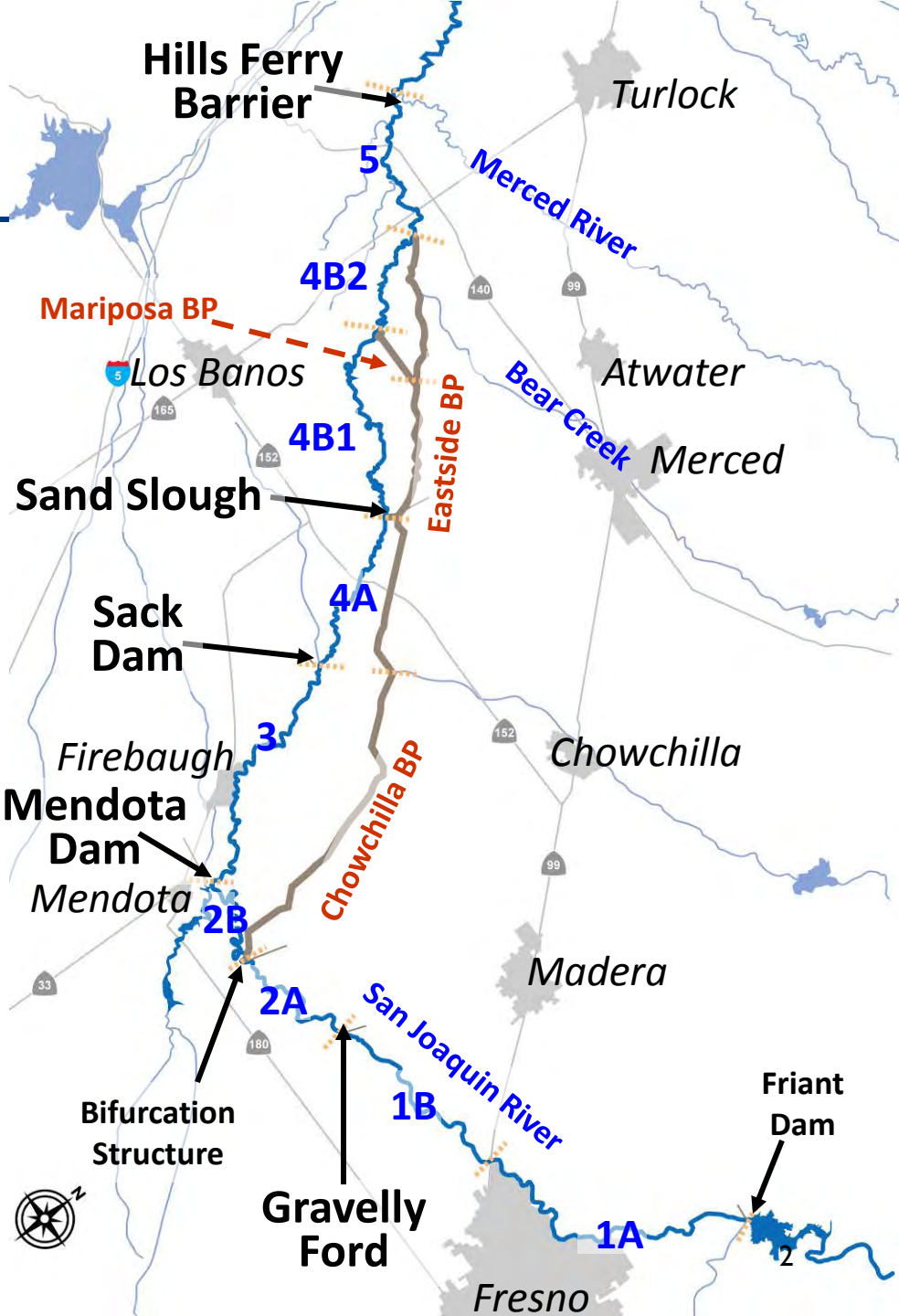
April 23, 2014

Preliminary draft – subject to change

SAN JOAQUIN RIVER RESTORATION PROGRAM

Upper SJR

- Surface ponding in Reaches 3 and 4A during flood flows
- Urban Areas (Firebaugh, Mendota)
- Levees protecting 10,000 people on west side of Reach 3



Preliminary draft – subject to change

SAN JOAQUIN RIVER RESTORATION PROGRAM

Settlement Goals

- Restoration Goal
  - To restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below 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 or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

SAN JOAQUIN RIVER RESTORATION PROGRAM

Restoration Goal Activities

- Improve channel/structures to convey flows and improve habitat
  - Reach 2B – working on Draft EIS/R
  - Reach 4B – working on Alternatives Evaluation & Project Description
  - Arroyo Canal/Sack Dam – Final EA/IS published in May 2013
- Public Law 111-11: mitigation measures for… material adverse impacts to third parties from groundwater seepage

San Joaquin River Restoration Program

Projects with possible flood benefits:

- Reach 2B and Mendota Pool Bypass Project
- Reach 3 Groundwater Seepage Projects
- Reach 4A Groundwater Seepage Projects
- Reach 4B and Eastside Bypass Project

REACH 2B & MENDOTA POOL BYPASS PROJECT

Reach 2B Project Alternatives
Reach 2B Settlement Agreement

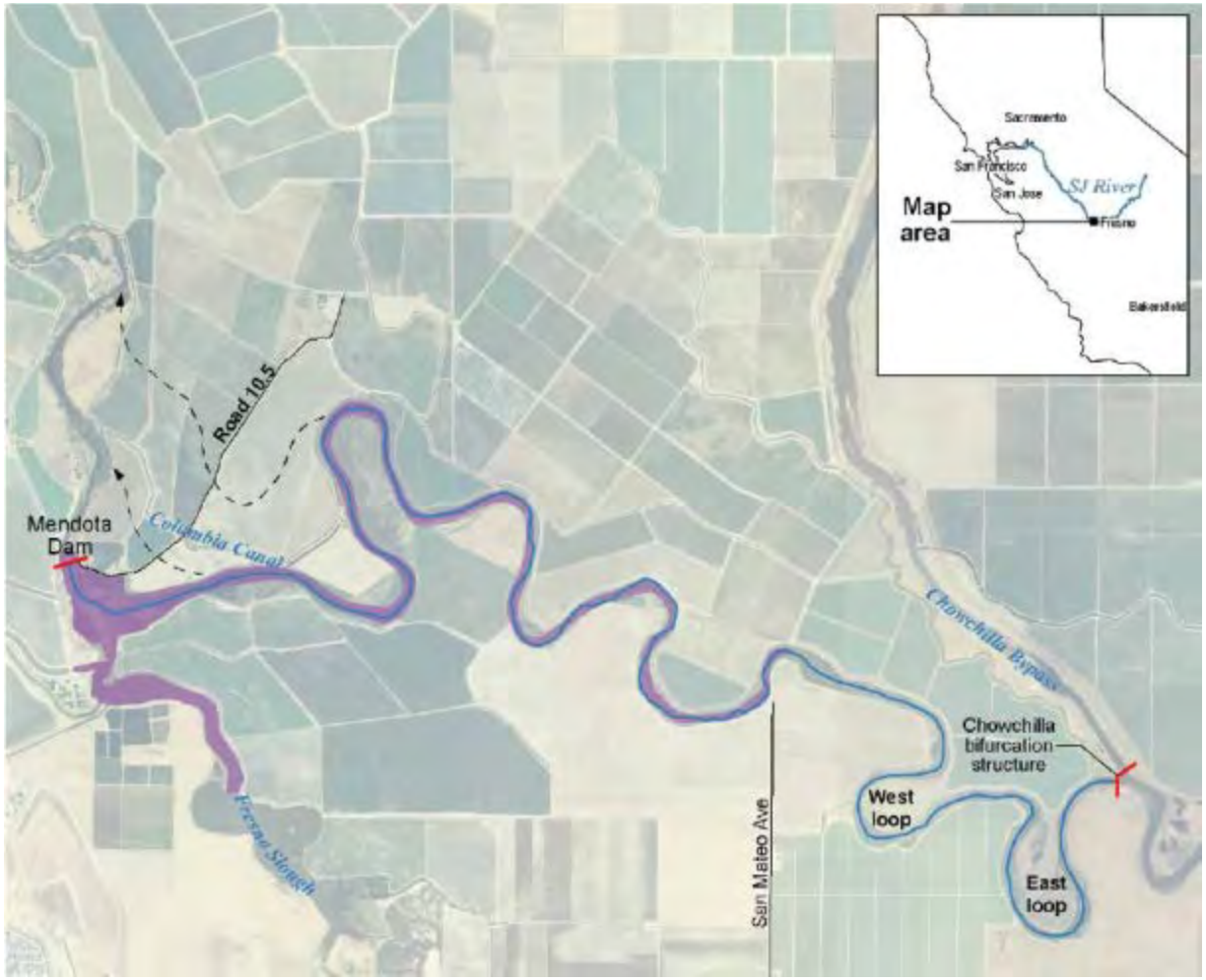
Paragraph 11(a)

- (1) Creation of a bypass channel around Mendota Pool to ensure conveyance of at least 4,500 cfs from Reach 2B downstream to Reach 3. This improvement requires construction of a structure capable of directing flow down the bypass and allowing the Secretary to make deliveries of San Joaquin River water into Mendota Pool when necessary

- (2) Modifications in channel capacity (incorporating new floodplain and related riparian habitat) to ensure conveyance of at least 4,500 cfs in Reach 2B between the Chowchilla Bifurcation Structure and the new Mendota Pool bypass channel

Reach 2B Project Alternatives

Existing Conditions

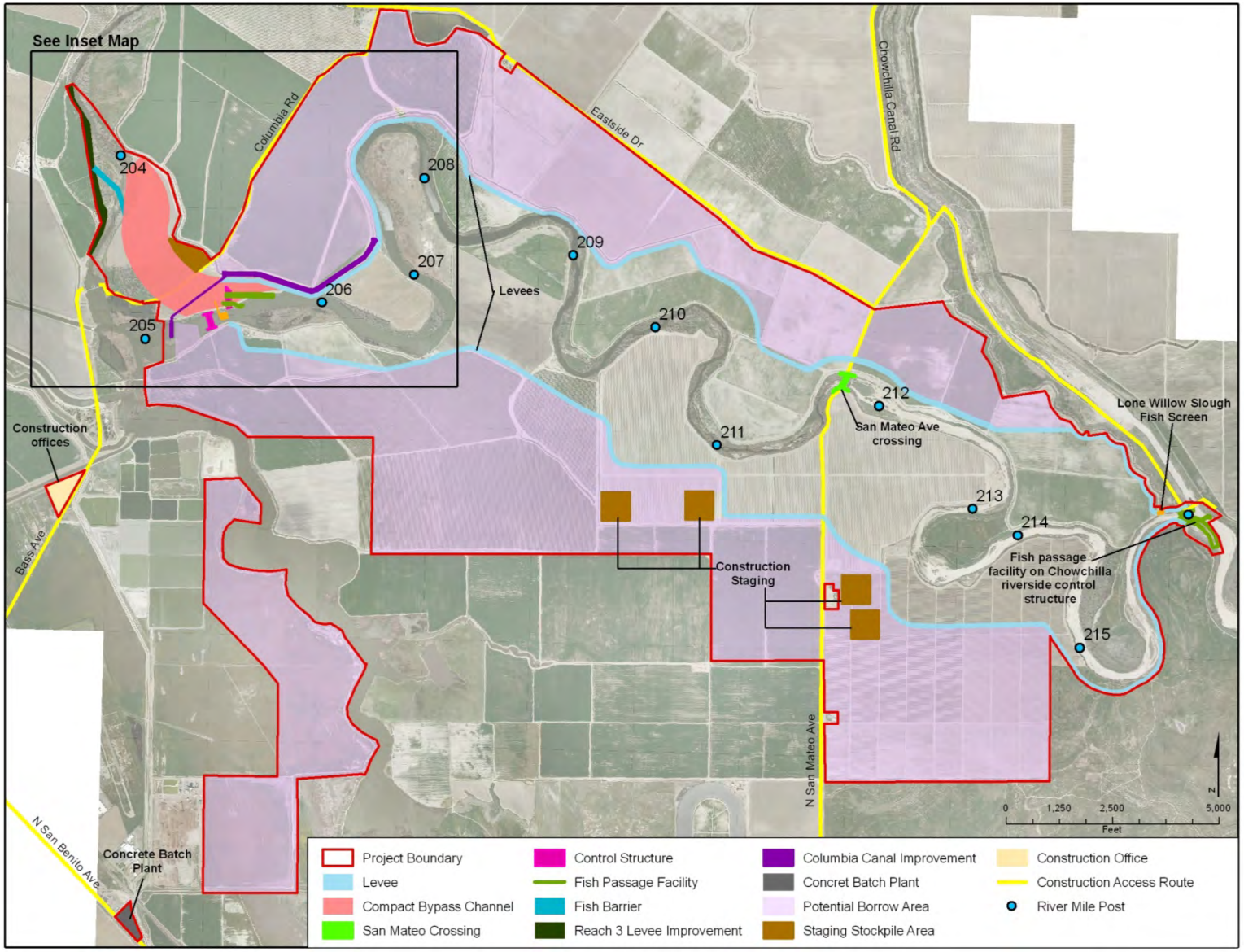


1. Existing Structures
   - Chowchilla Bifurcation
   - San Mateo Crossing
   - Mendota Dam
   - Water Supply Infrastructure
2. Existing Conditions
   - Limited capacity (1,300 cfs – 2,500 cfs)
   - Pool backs up to San Mateo Ave.
   - Shallow Groundwater
3. Settlement Requirements
   - Pool Bypass
   - Channel/Floodplain capacity up to 4,500 cfs
   - Floodplain & related habitat
   - Pool Deliveries

Compact Bypass with Wide Floodplain and Bifurcation Structure

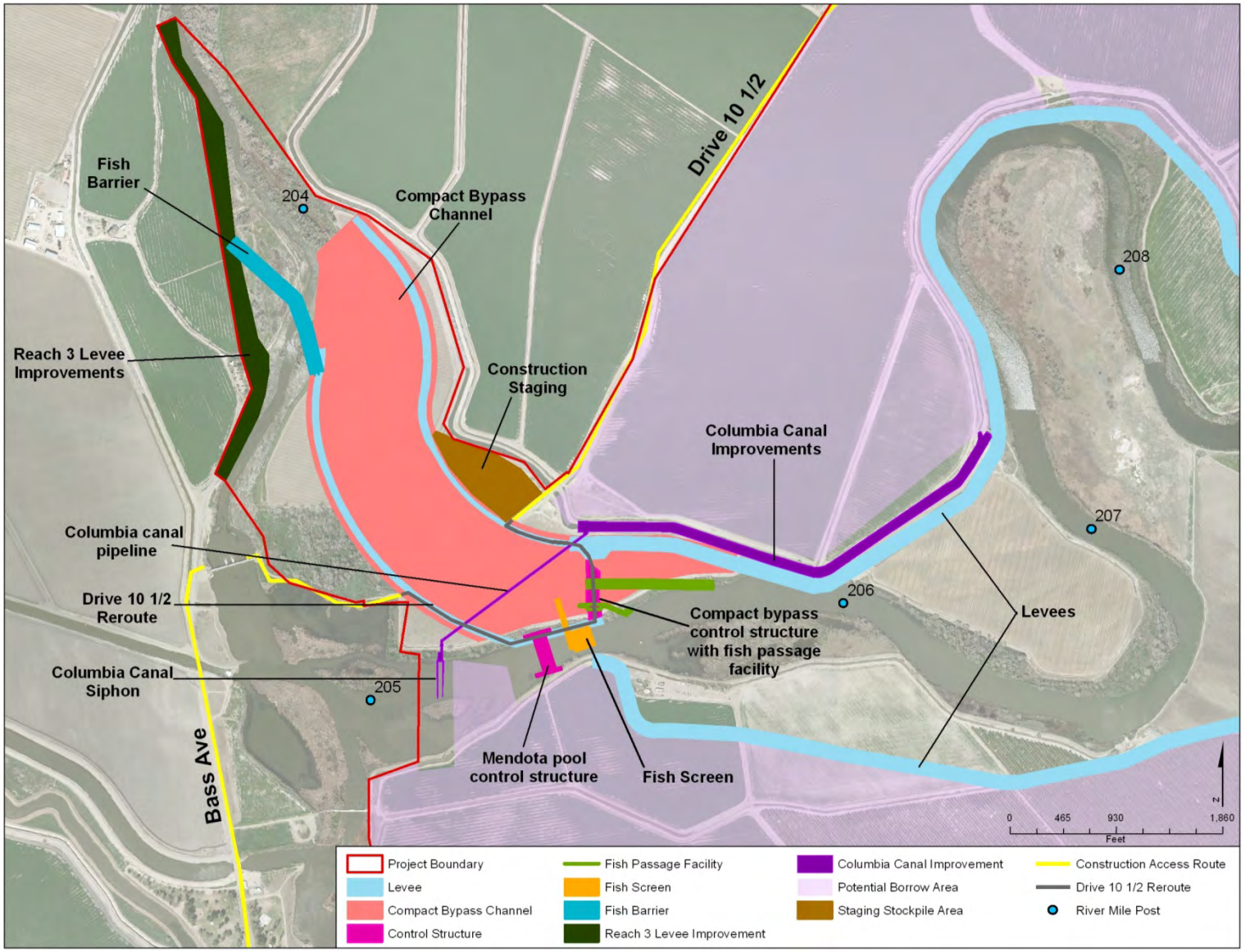
- Compact Bypass
  - New channel and structures to convey up to 4,500 cfs of Restoration Flows around Mendota Pool
- Wide Floodplain
  - Floodplain habitat approx. 4,200 feet wide on average
- Bifurcation Structure
  - Mendota Pool control structure to convey up to 2,500 cfs from Reach 2B to Mendota Pool
- Other
  - Fish passage facility at Compact bypass control structure
  - Fish passage facility at Chowchilla riverside control structure

Compact Bypass with Wide Floodplain and Bifurcation Structure



SAN JOAQUIN RIVER RESTORATION PROGRAM

Compact Bypass with Wide Floodplain and Bifurcation Structure

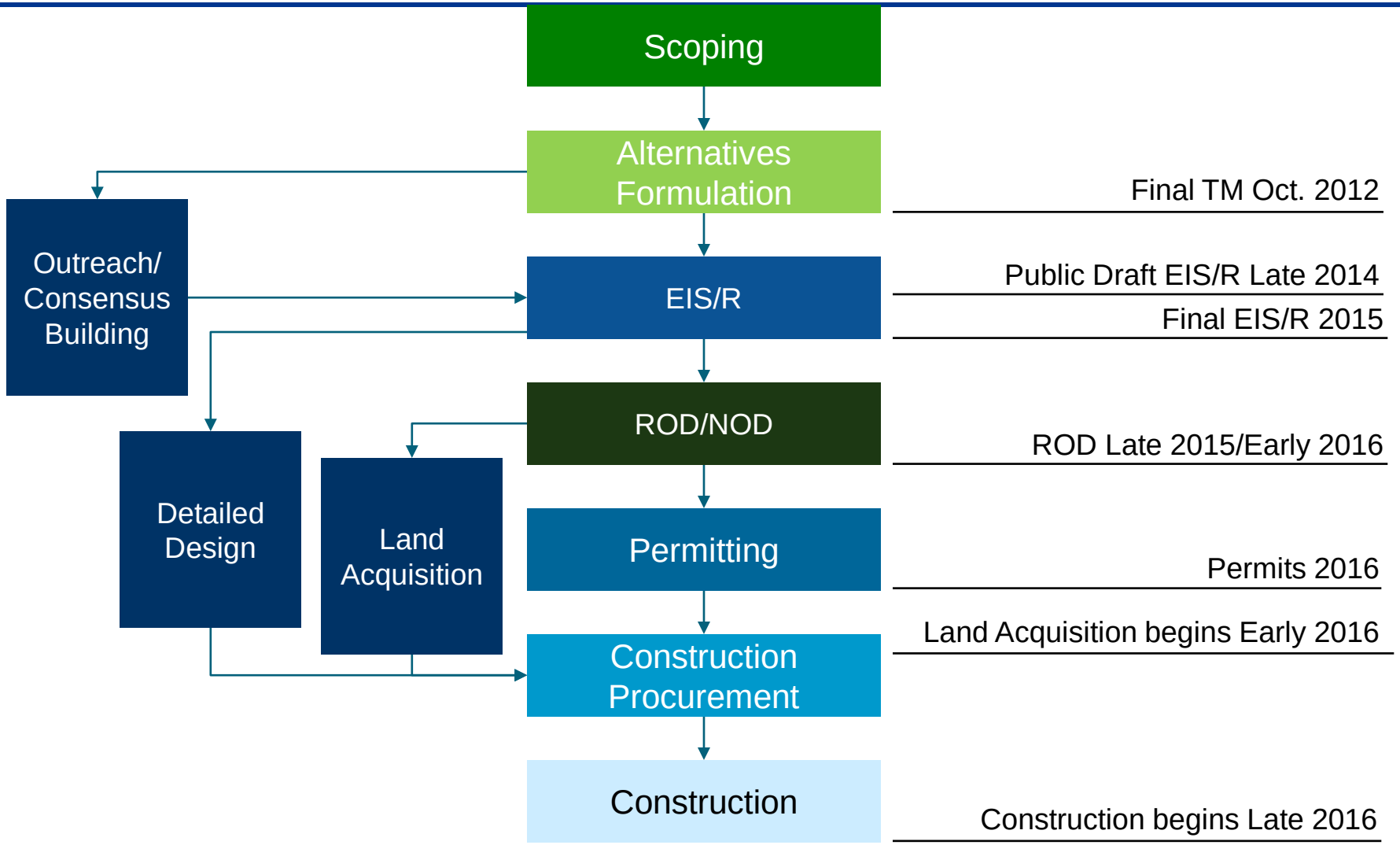


Reach 2B Project Alternatives
Floodplain Habitat

Reach 2B Project Alternative	Total Floodplain & Channel (acres)	
	at 2,500 cfs	at 4,500 cfs
Compact Bypass with Narrow Floodplain and South Canal	1,396	1,659
Compact Bypass with Wide Floodplain and Bifurcation Structure	1,686	2,151
Fresno Slough Dam with Narrow Floodplain and Short Canal	1,226	1,589
Fresno Slough Dam with Wide Floodplain and North Canal	1,511	2,153

Reach 2B Project Update

Project Process and Schedule



SAN JOAQUIN RIVER RESTORATION PROGRAM

Reach 2B Next Steps

- Public Draft EIS/R - end of 2014 / early 2015
- Ongoing Design
- Outreach to refine levee alignments
- 1D (HEC-RAS) and 2D (SRH-2D) hydraulic models developed
- Contracting for appraisals starting now, to purchase in early 2016

REACH 3

SJRRP Seepage Management

Public Law 111-11

"The Secretary shall reduce Interim Flows to the extent necessary to address any material adverse impacts to third parties from groundwater seepage caused by such flows that the Secretary identifies…"

"Secretary shall prepare… an evaluation of mitigation measures for those impacts that are determined to be significant"

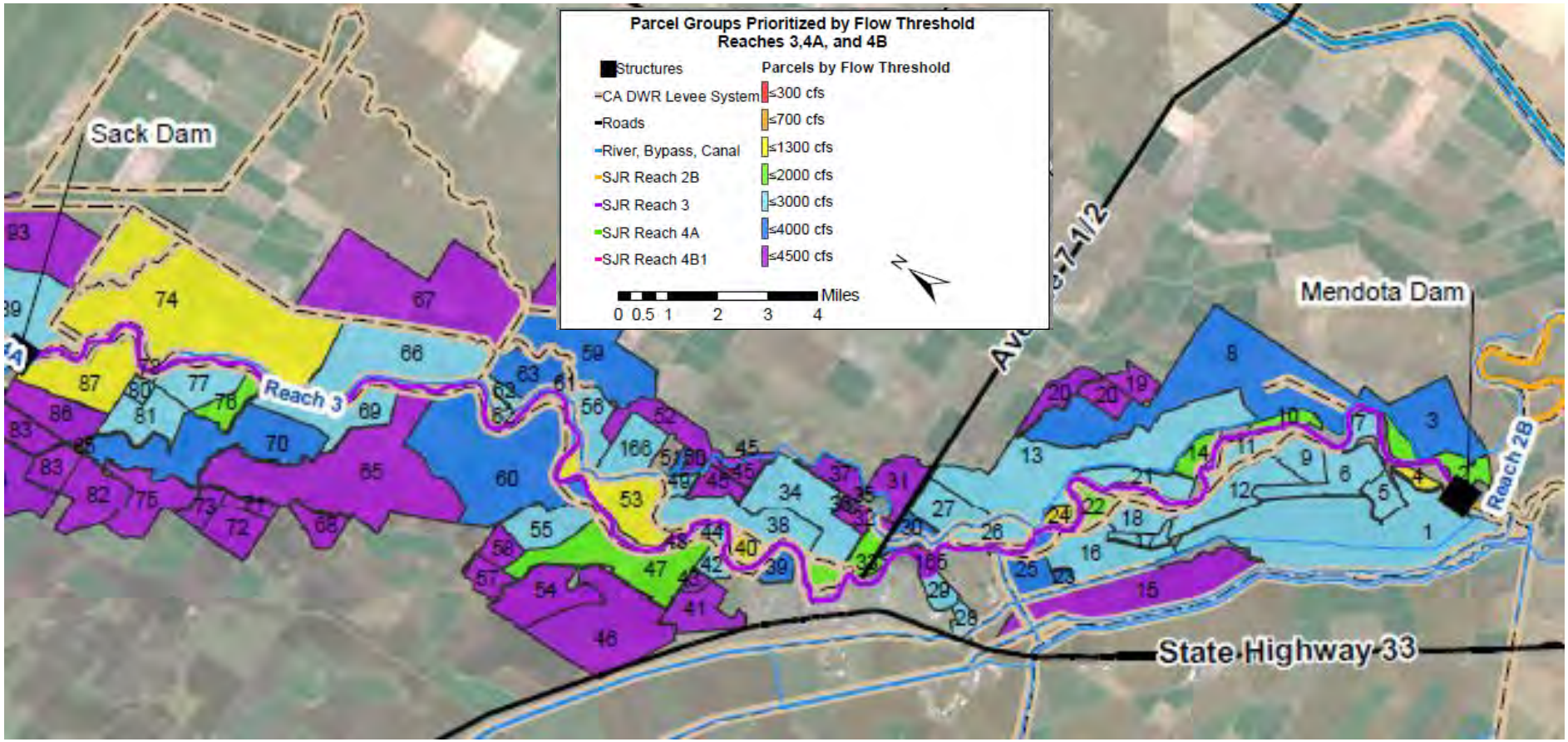
SJRRP Seepage Management

Seepage Management Plan

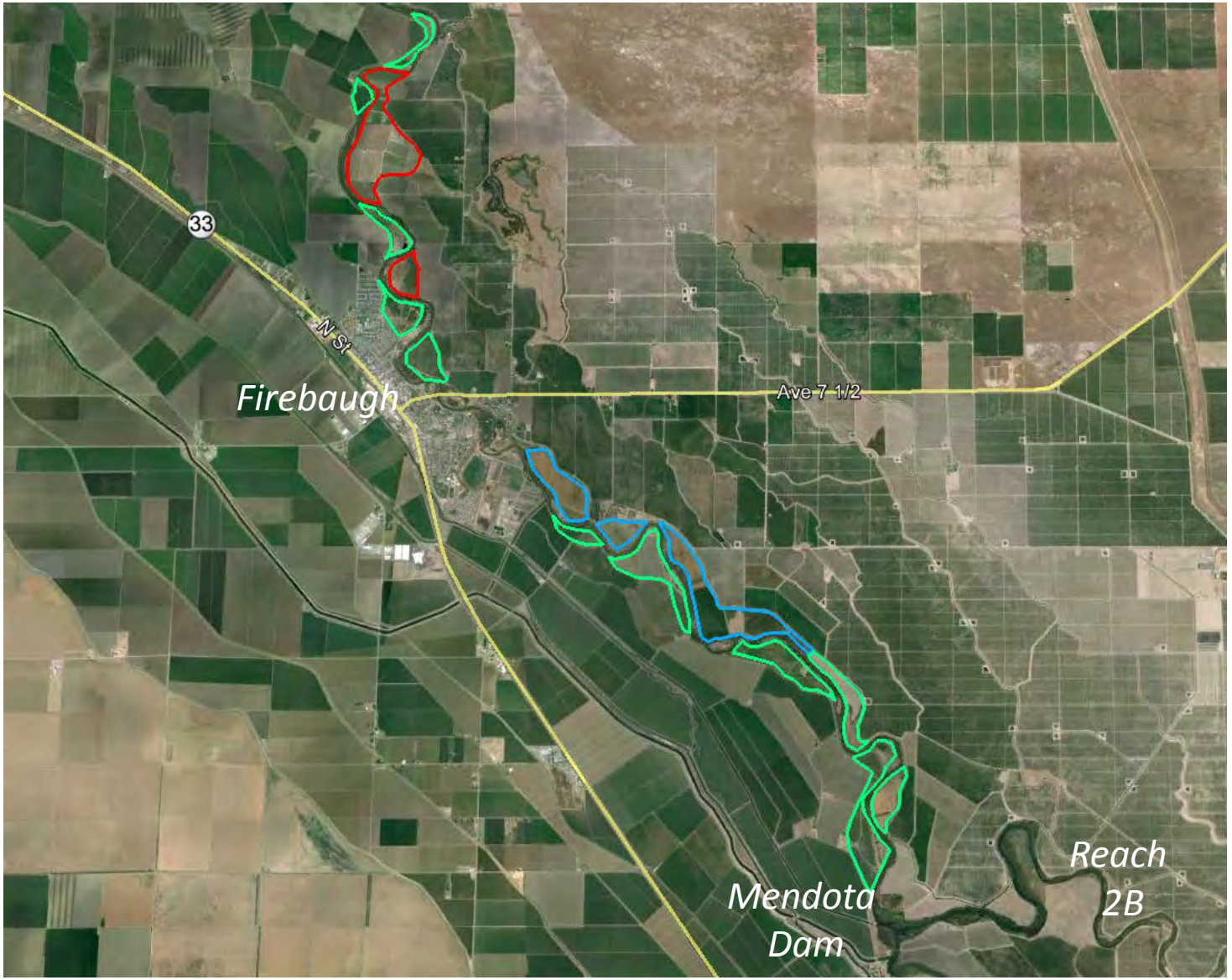
- Holds flows low based on groundwater level thresholds
- Priority locations for seepage projects
- Seepage Project Types: interceptor lines, slurry walls, drainage ditches, shallow groundwater pumping, easements, acquisition

SAN JOAQUIN RIVER RESTORATION PROGRAM

Reach 3 Seepage Projects

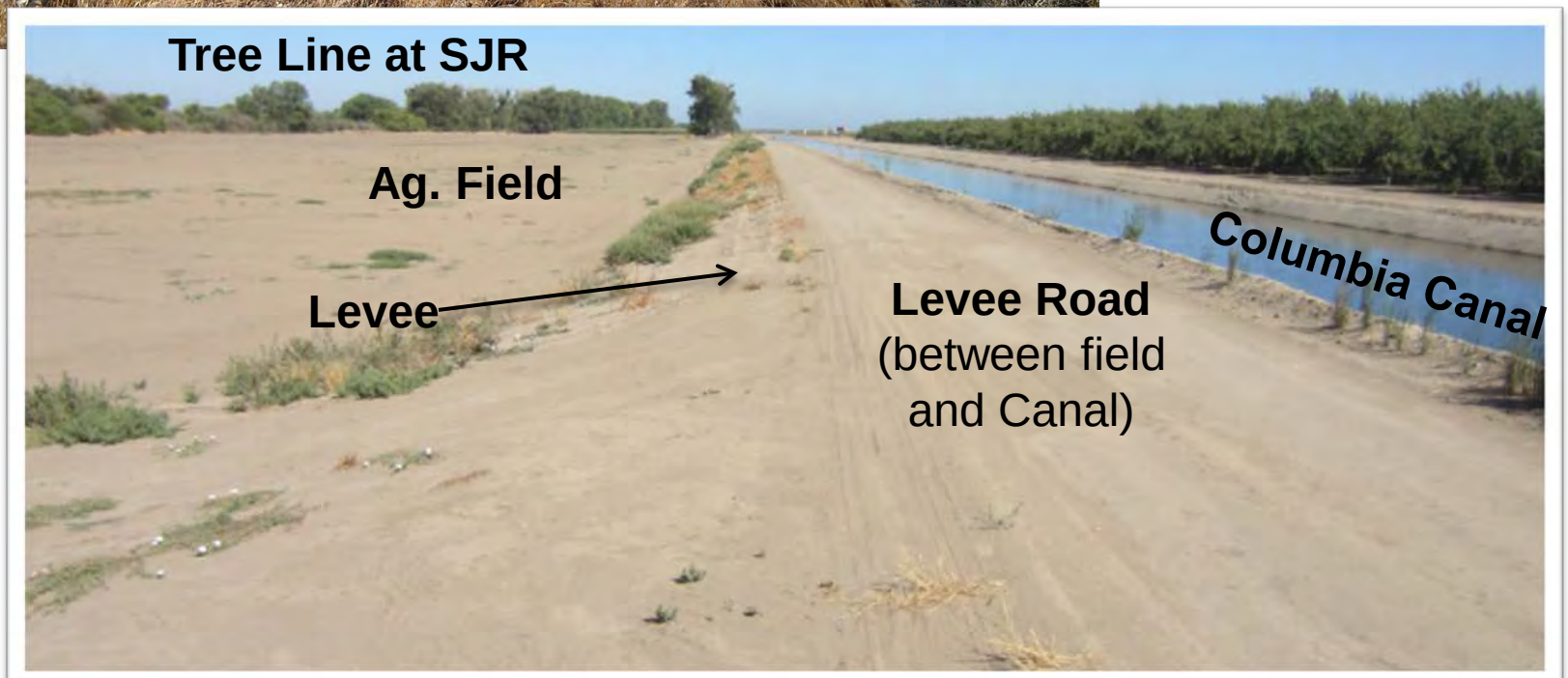


Reach 3 Within-Canal Areas



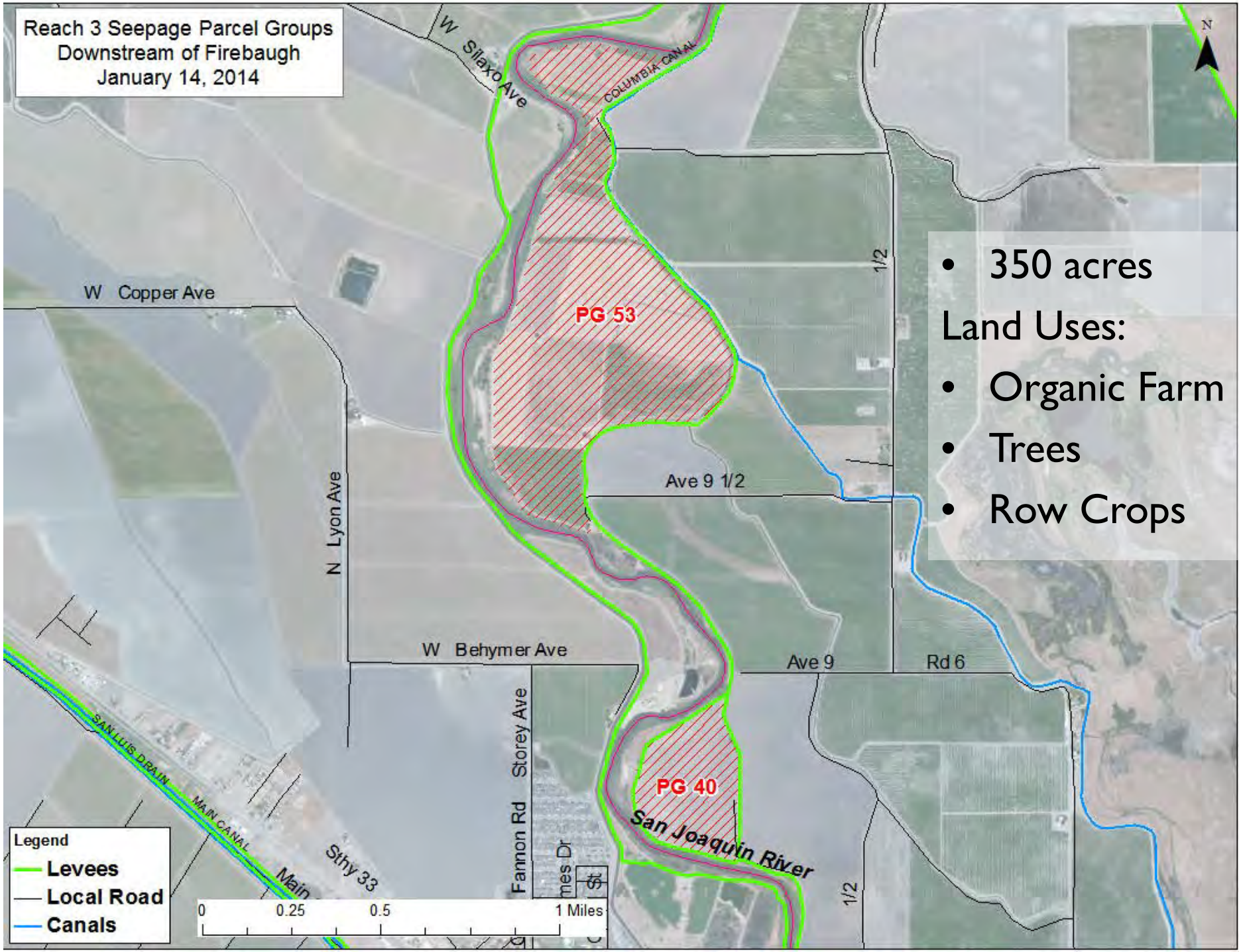
Reach 3 Within-Canal Areas

- Between Columbia Canal and the SJR
- Short Levees

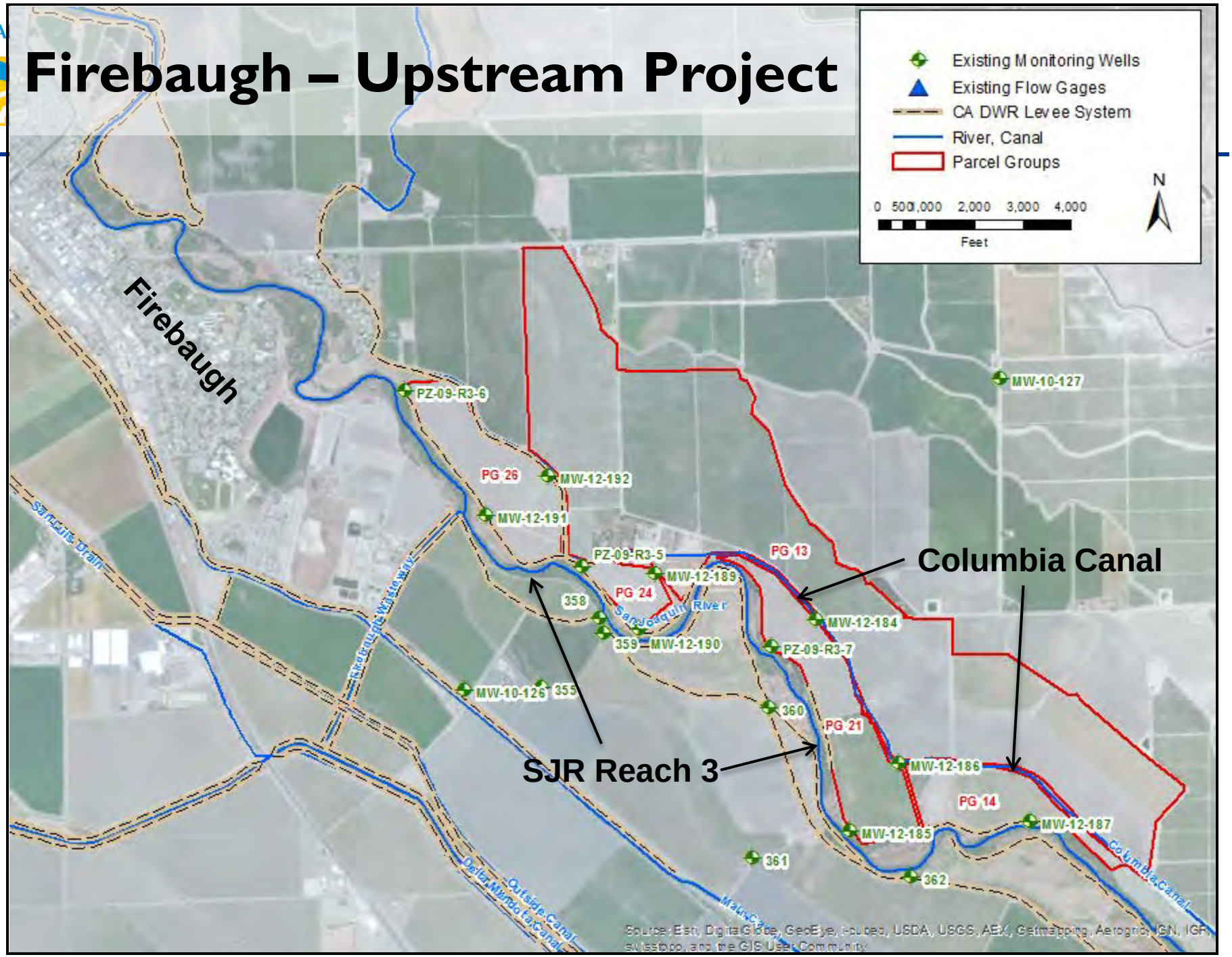

Tree Line at SJR
Ag. Field
Levee
Levee Road
(between field
and Canal)
Columbia Canal

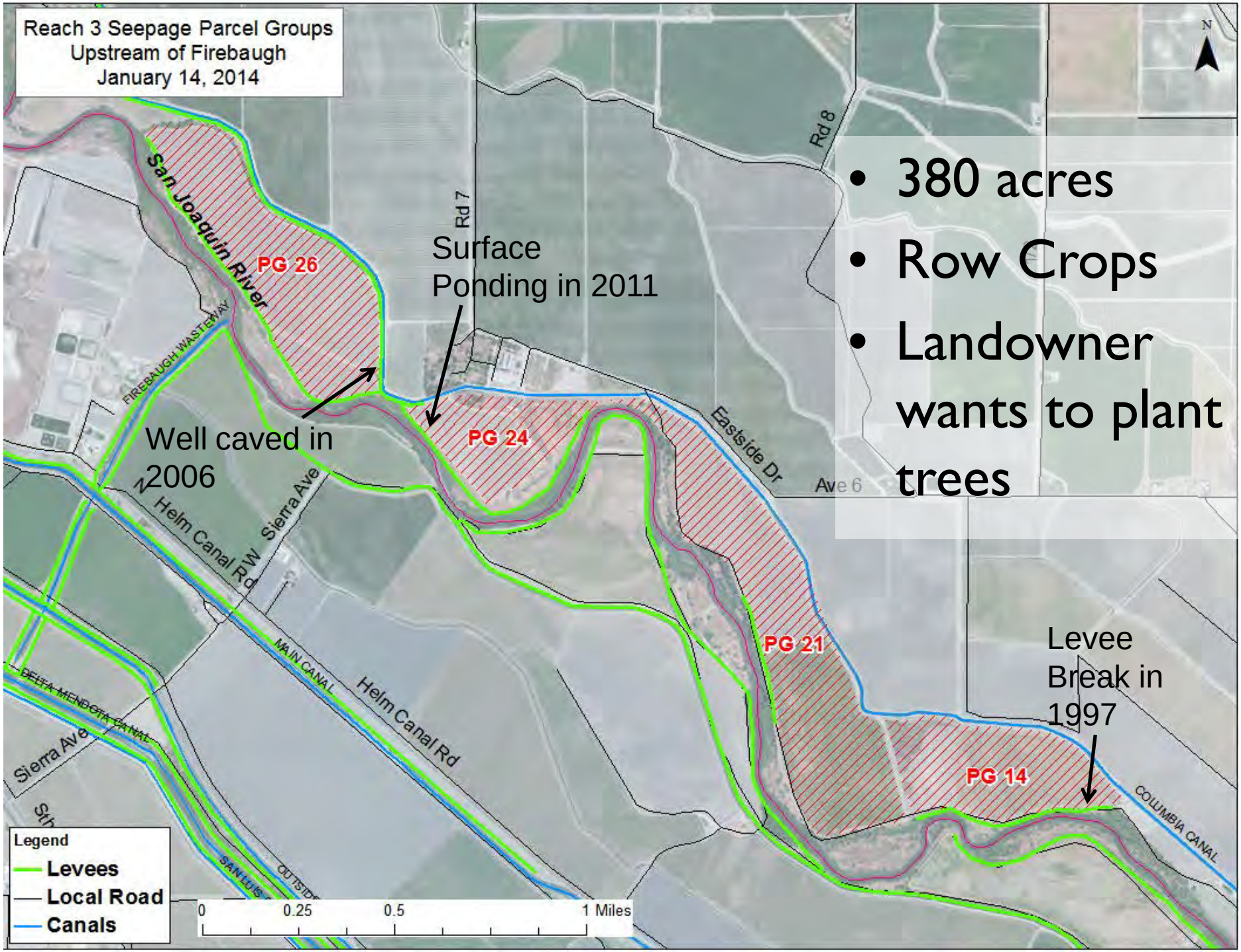
SAN JOAQUIN RIVER
RESTORATION PROGRAM

Firebaugh – Downstream Project


Reach 3 Seepage Parcel Groups
Downstream of Firebaugh
January 14, 2014
W Siaxo Ave
COLUMBIA CANAL
PG 53
W Copper Ave
1/2
N Lyon Ave
Ave 9 1/2
W Behymer Ave
Ave 9
Rd 6
Storey Ave
Fannon Rd
PG 40
San Joaquin River
SAN LUIS DRAIN
MAIN CANAL
Main
Sthy 33
1/2
N
• 350 acres
Land Uses:
• Organic Farm
• Trees
• Row Crops
Legend
Levees
Local Road
Canals
0
0.25
0.5
1 Miles

Firebaugh – Upstream Project





- 380 acres
- Row Crops
- Landowner wants to plant trees

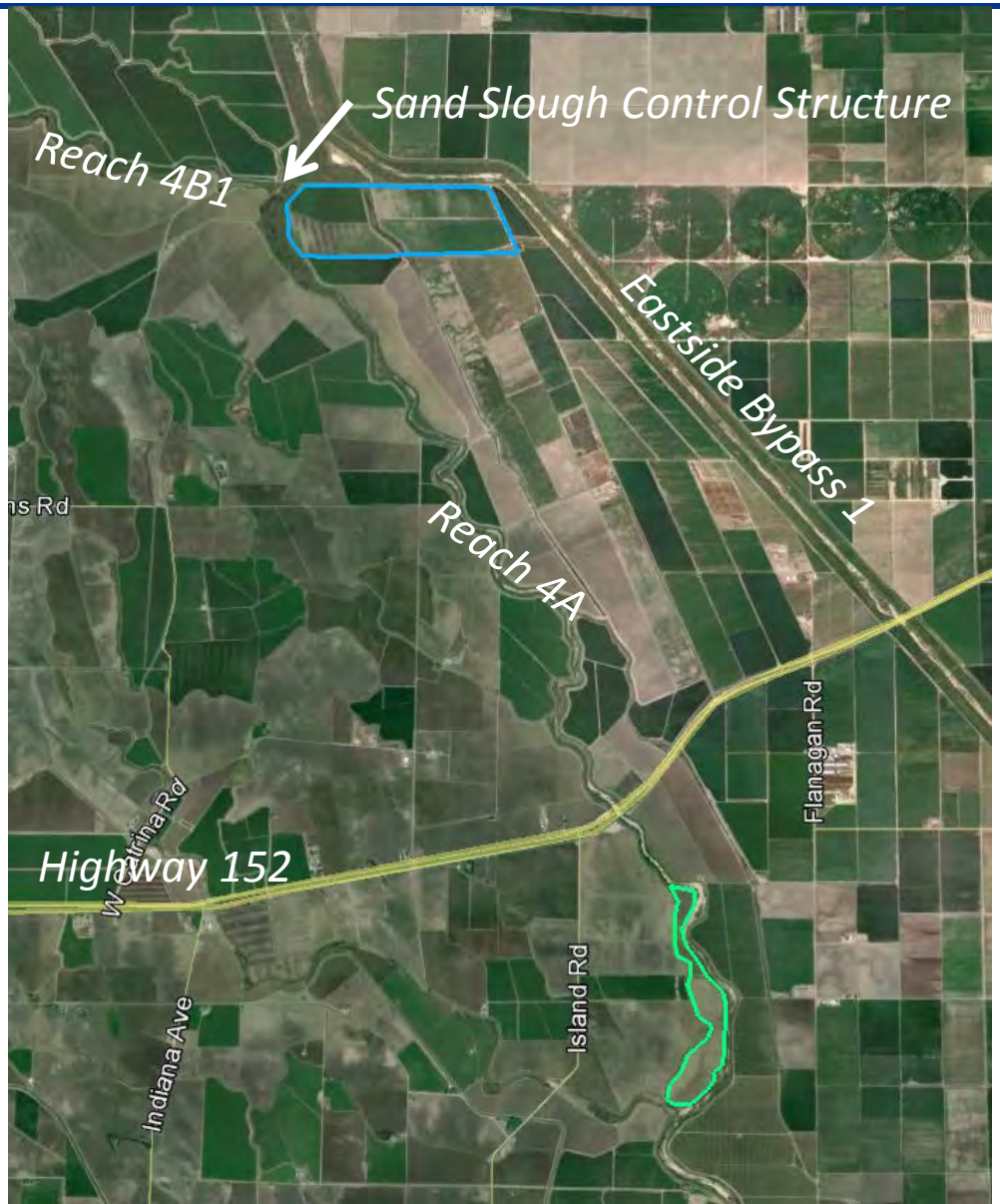
Reach 3 Projects Next Steps

- Continued SJRRP seepage efforts
- Appraisals anticipated early 2015
- Part of SJRRP Floodplain Plan – hydraulic modeling

- Possible state, non-profit partners?
- Further analysis of flood benefits?

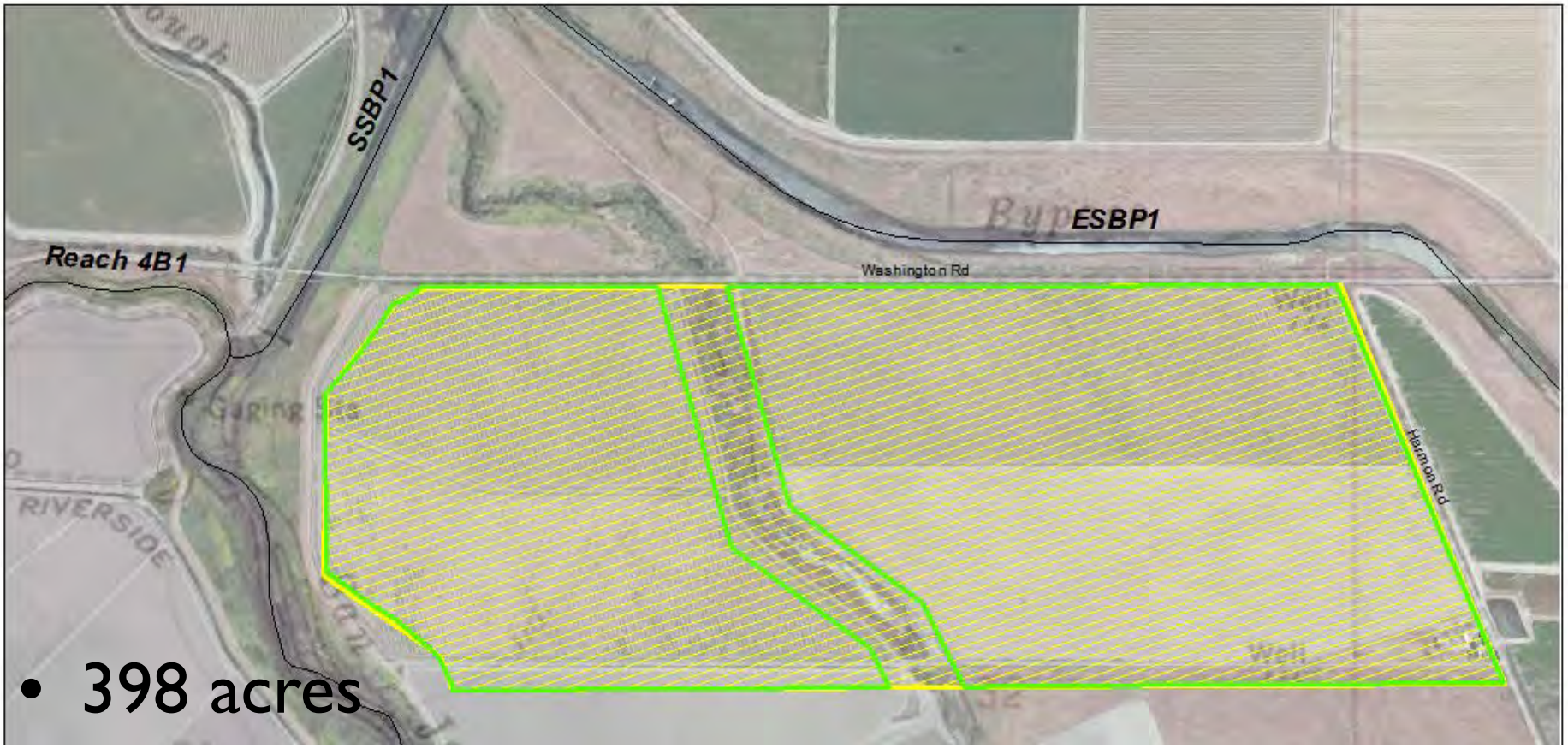
REACH 4A

Reach 4A Opportunities



SAN JOAQUIN RIVER RESTORATION PROGRAM

Reach 4A Seepage Projects



- 398 acres
- Row Crops
- Appraisal completed

SAN JOAQUIN RIVER RESTORATION PROGRAM

Reach 4A Projects Next Steps

- Appraisal completed
- Negotiation ongoing
- Will be part of SJRRP Floodplain Plan – hydraulic modeling

- Possible state, non-profit partners?
- Further analysis of flood benefits?

REACH 4B & EASTSIDE BYPASS PROJECT

Reach 4B Project

Paragraph 11 Settlement Requirements:

- Convey at least 475 cfs through Reach 4B of San Joaquin River
- Modify Reach 4B headgate to ensure fish passage and flows
- Conveyance of 4,500 cfs through Reach 4B unless the Secretary determines otherwise
- Modifications to the Sand Slough Control Structure to route 4,500 cfs
- Eastside and Mariposa Bypasses:
  - Modify Sand Slough Control Structure and Eastside and Mariposa Bypass structures to ensure fish passage
  - Modify Eastside and Mariposa Bypass channels to establish a low-flow channel for anadromous fish migration

SAN JOAQUIN RIVER RESTORATION PROGRAM

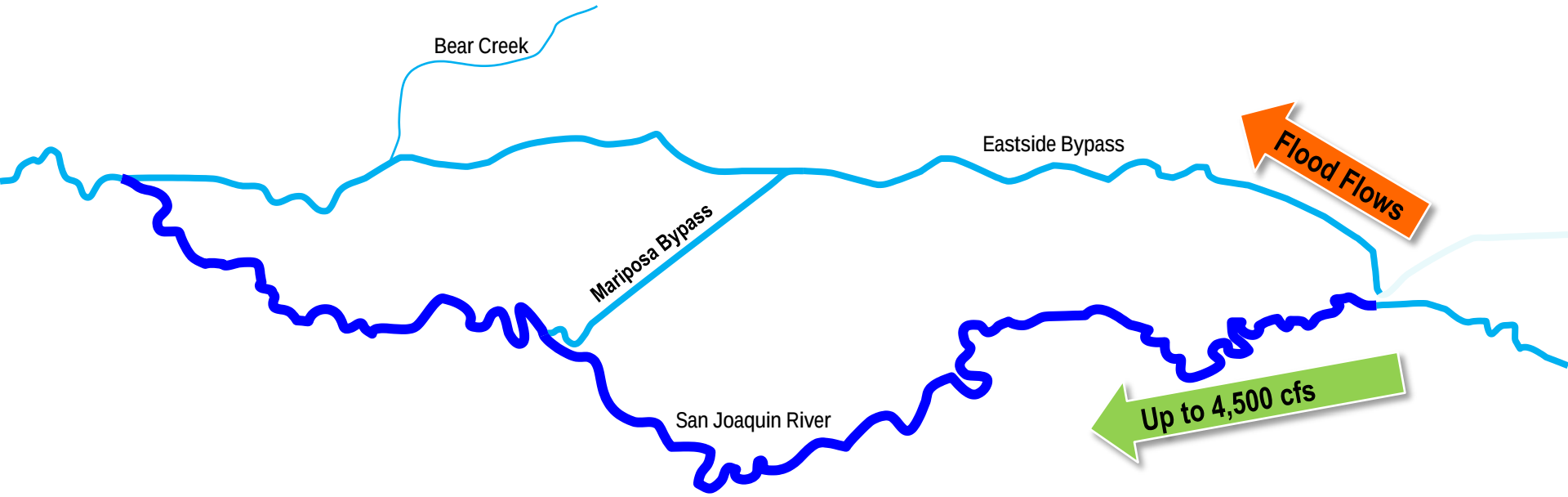
Reach 4B Initial Alternatives

Channel/ Structure	Initial Alternative 1 Main Channel Restoration	Initial Alternative 2 Bypass Restoration	Initial Alternative 3 Bypass All Pulse Flows	Initial Alternative 4 Split Pulse Flows and Restore Both
San Joaquin River Flows	Up to 4,500 cfs (all Restoration Flows)	At least 475 cfs of Flood Flows	Restoration Flows of at least 475 cfs	Base and fall pulse flows; some spring pulse flows
Bypass System Flows	Flood flows greater than 4,500 cfs	All flows up to capacity	Flow greater than 475 cfs	Flow greater than Reach 4B capacity
Fish Routing	SJR	Eastside Bypass Reach 2, Mariposa Bypass	SJR, Eastside Bypass Reaches 2 and 3	SJR, Eastside Bypass Reach 2, Mariposa Bypass
Habitat	SJR	Bypass	SJR and Bypass	SJR and Bypass
Reach 4B Headgates	Remove Headgate	Simple Gate	Construct gates and roughened channel fishway	Construct gates and roughened channel fishway
Eastside Bypass Control Structure	No Change	No Change	Fish Passage	No Change
Mariposa Bypass Control Structure	No Change	Notch Center Bays	No Change	Notch Center Bays
Mariposa Drop Structure	No Change	Remove Drop Structure	No Change	Fish Passage
Levee Alignment Options	B, C, D	A	A	A, B, C

Initial Alternative 1

Main Channel Restoration

- Restoration flows and fish into San Joaquin River
- Flood flows into Bypasses

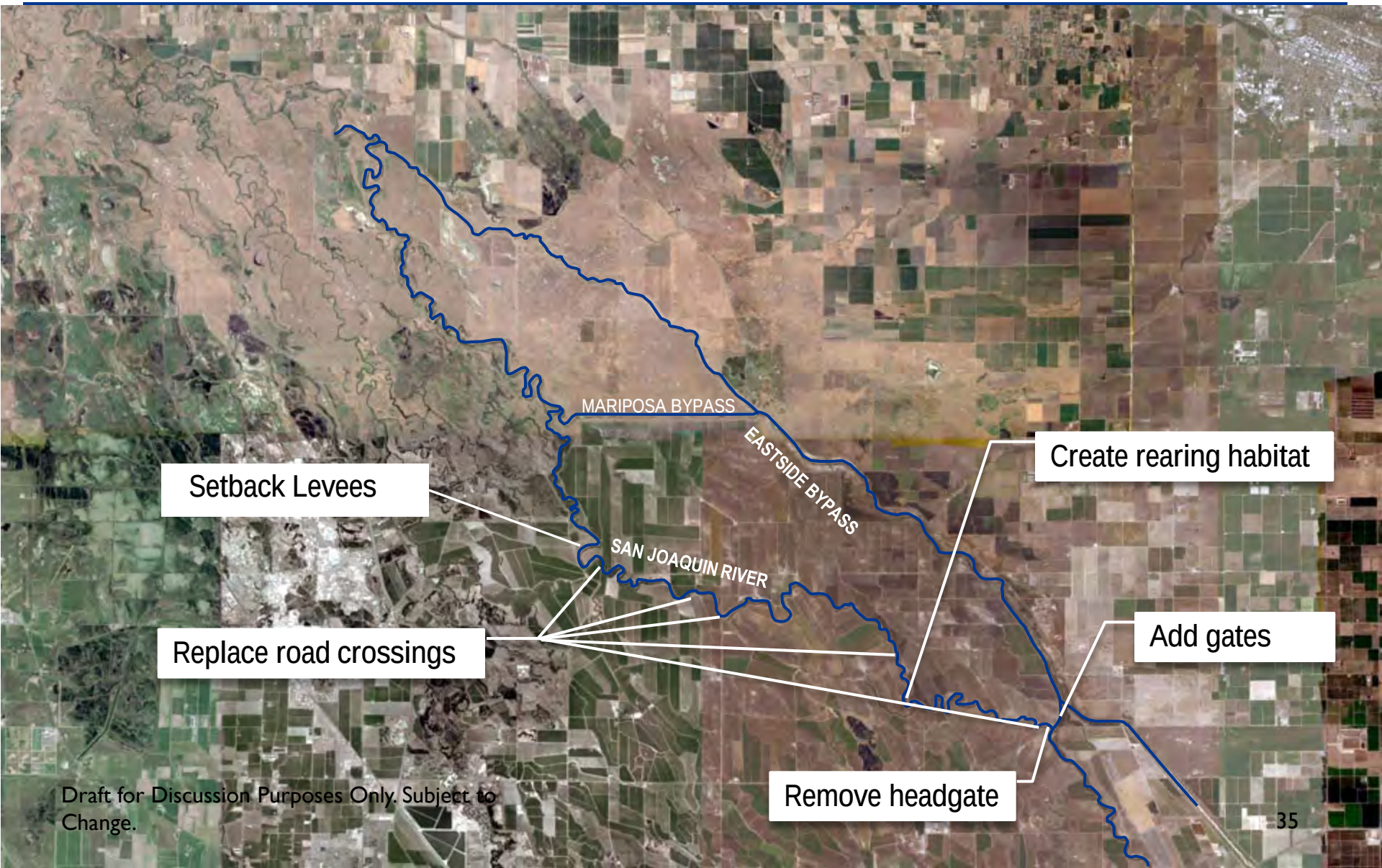


Draft for Discussion Purposes Only. Subject to Change.

Flood Flows | Restoration Flows | Fish Route

SAN JOAQUIN RIVER RESTORATION PROGRAM

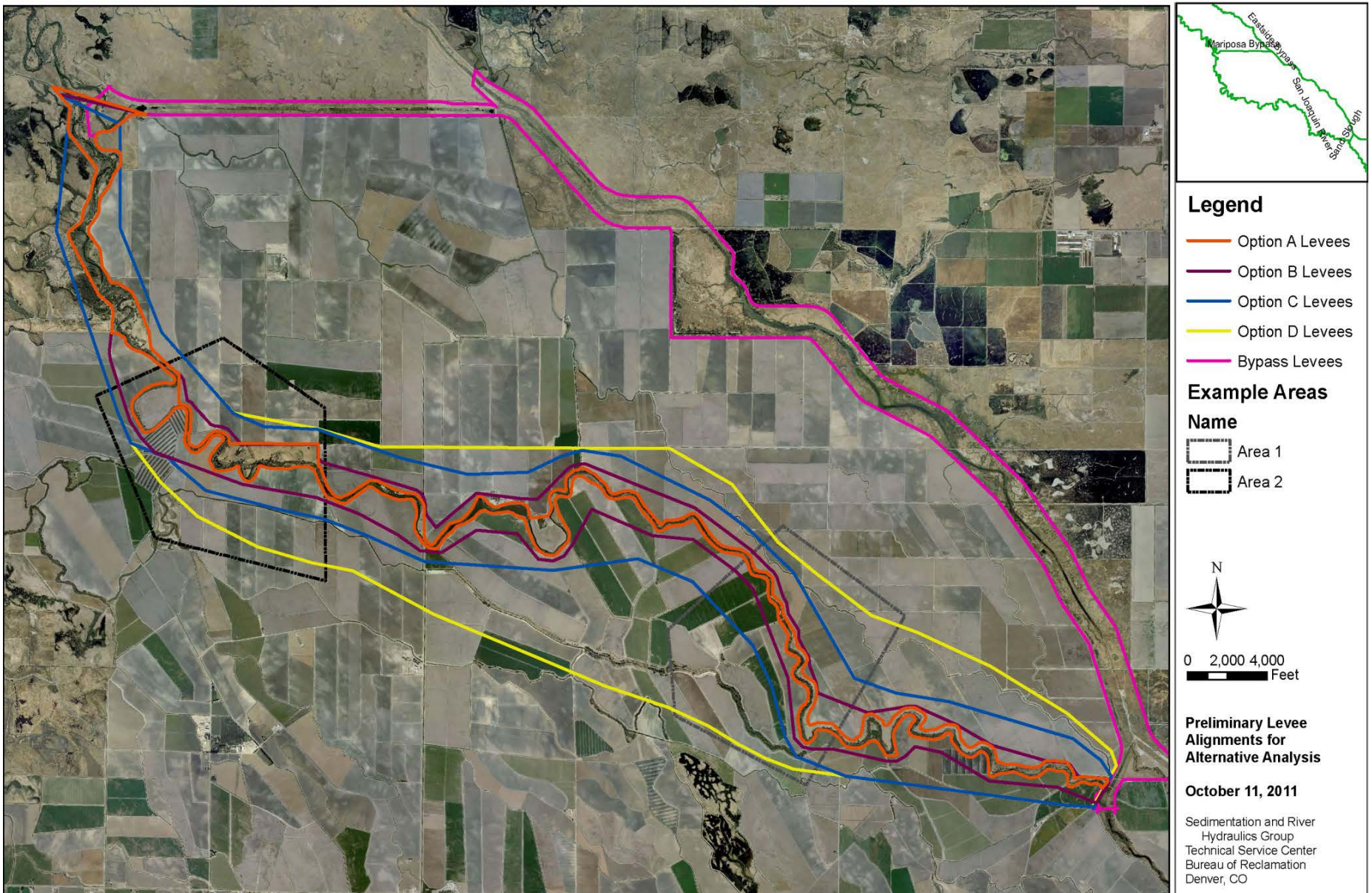
Initial Alternative 1



Draft for Discussion Purposes Only. Subject to Change.

SAN JOAQUIN RIVER RESTORATION PROGRAM

INITIAL ALTERNATIVE I



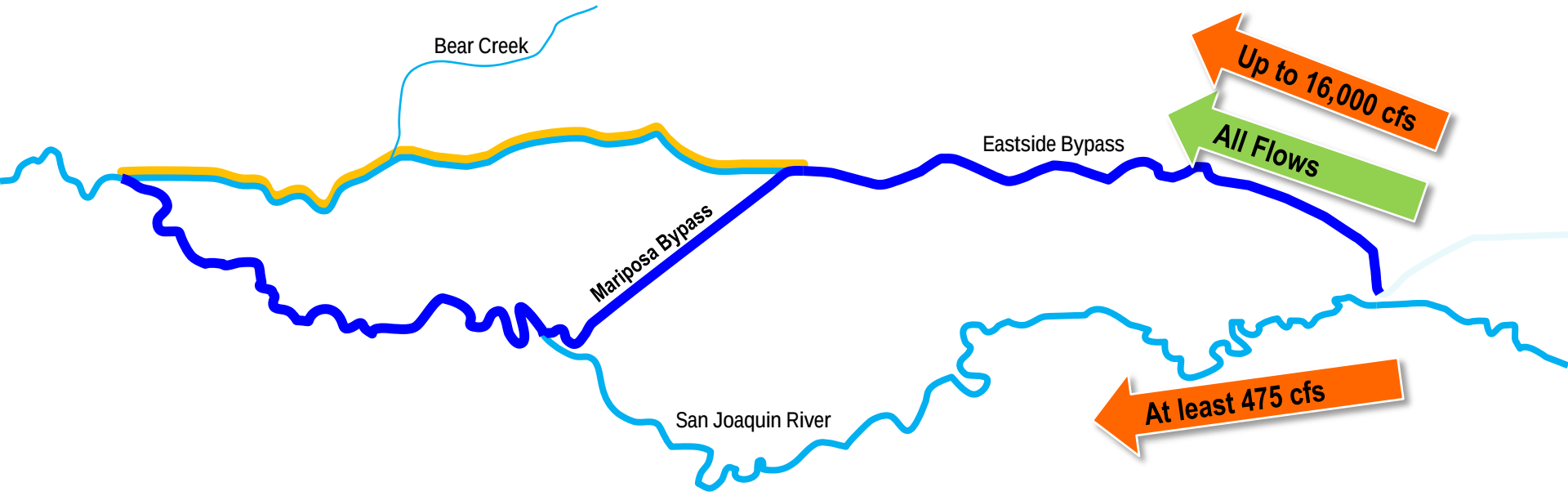
Reach 4B1 Alignments

Levee Alignment Options	Initial Alternatives				Levee Length		Capacity (cfs)	Approx. Width Between Levees (ft)
	1	2	3	4	Left Side (ft)	Right Side (ft)		
Option A		✓	✓	✓	102,000	90,200	1,500 cfs	250-400
Option B	✓			✓	77,800	76,400	4,500 cfs	1,300 to 2,000
Option C	✓			✓	72,800	66,300	4,500 cfs	3,500 to 5,500
Option D	✓				70,200	65,100	4,500 cfs	1-2 miles wide at widest part

Initial Alternative 2

Bypass Restoration

- Restoration and flood flows into Bypasses
- San Joaquin River channel used for flood capacity only

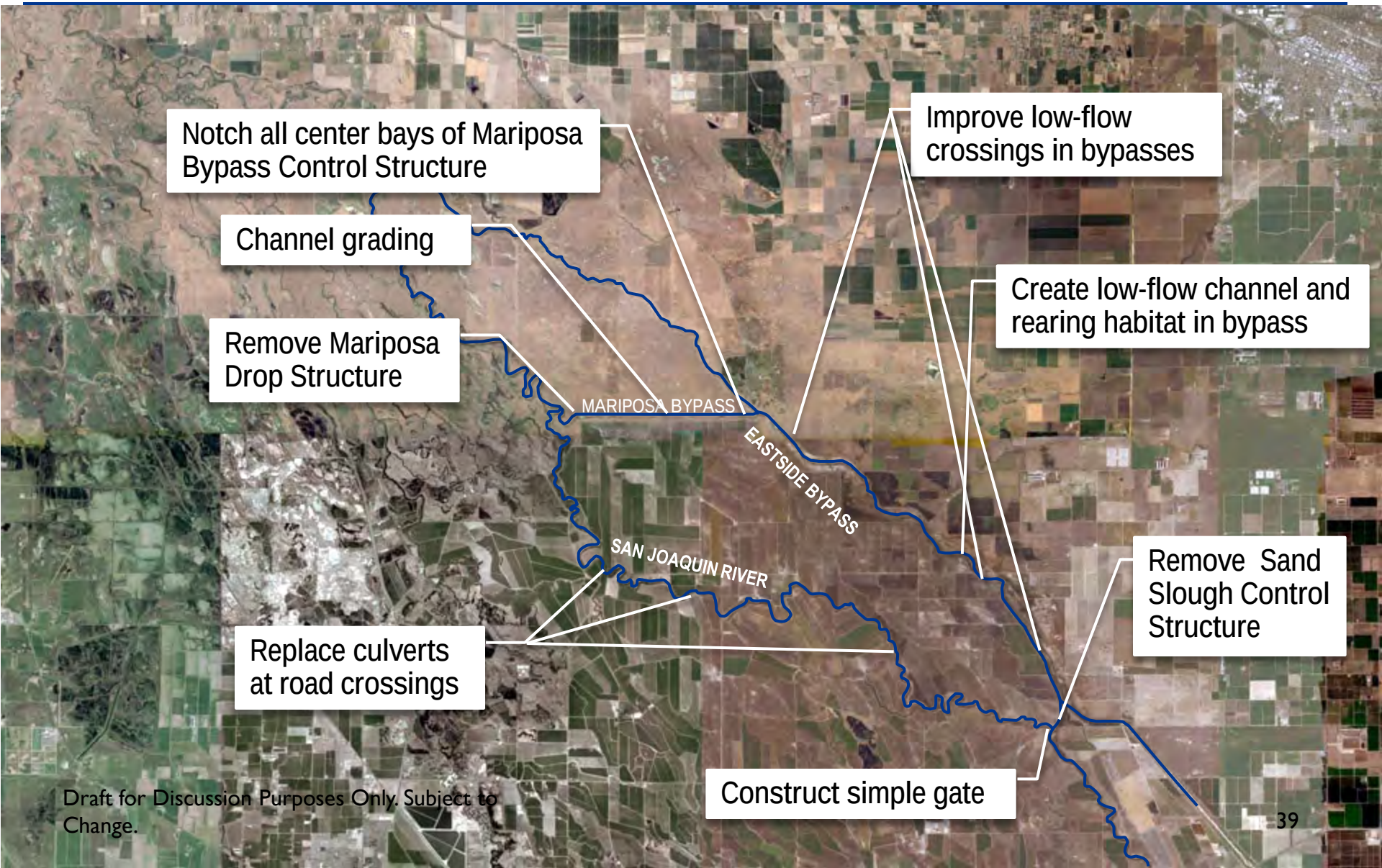


Draft for Discussion Purposes Only. Subject to Change.

Flood Flows | Restoration Flows | Fish Route | Juveniles Route Under High Flow Flood Events

SAN JOAQUIN RIVER RESTORATION PROGRAM

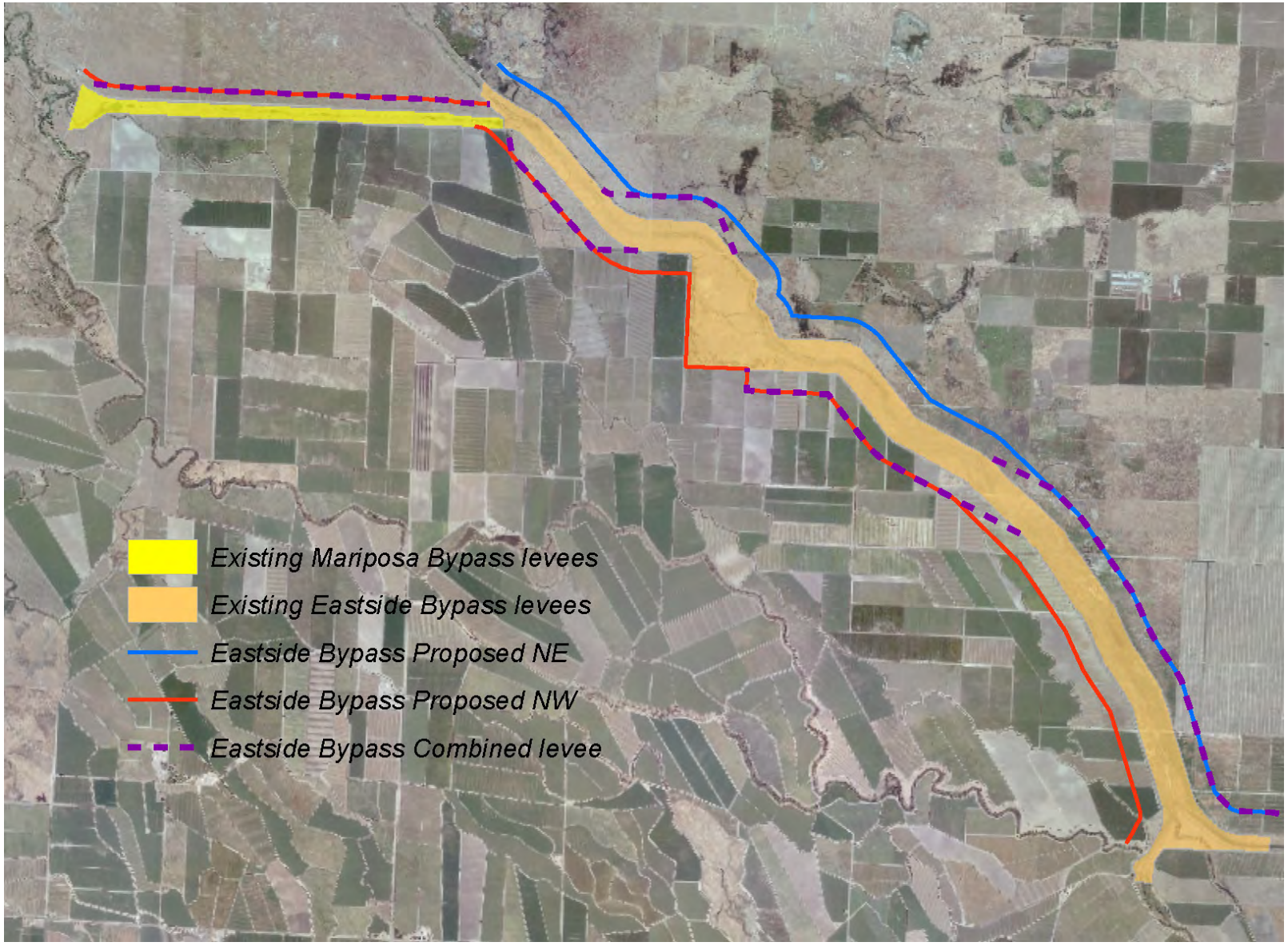
Initial Alternative 2



Draft for Discussion Purposes Only. Subject to Change.

SAN JOAQUIN RIVER RESTORATION PROGRAM

Initial Alternative 2 Setback Levees



SAN JOAQUIN RIVER RESTORATION PROGRAM

Reach 4B Next Steps

- Contracting for EIS/R
- Draft EIS/R may be in 2016
- Construction not until 2025

- 1D (HEC-RAS) and 2D (SRH-2D) hydraulic models developed

SAN JOAQUIN RIVER RESTORATION PROGRAM

SJRRP Modeling

- 1D (HEC-RAS) low flow models of all reaches and bypasses
- 2D (SRH-2D) models of all reaches except Reach 5 and Chowchilla Bypass / ESB Section 1, relatively coarse grid for habitat analysis
- All based on 2008 LiDAR and 2010/2011 bathymetry
- Will be flying LiDAR and re-doing bathymetry in fall 2014 to inform 2B design

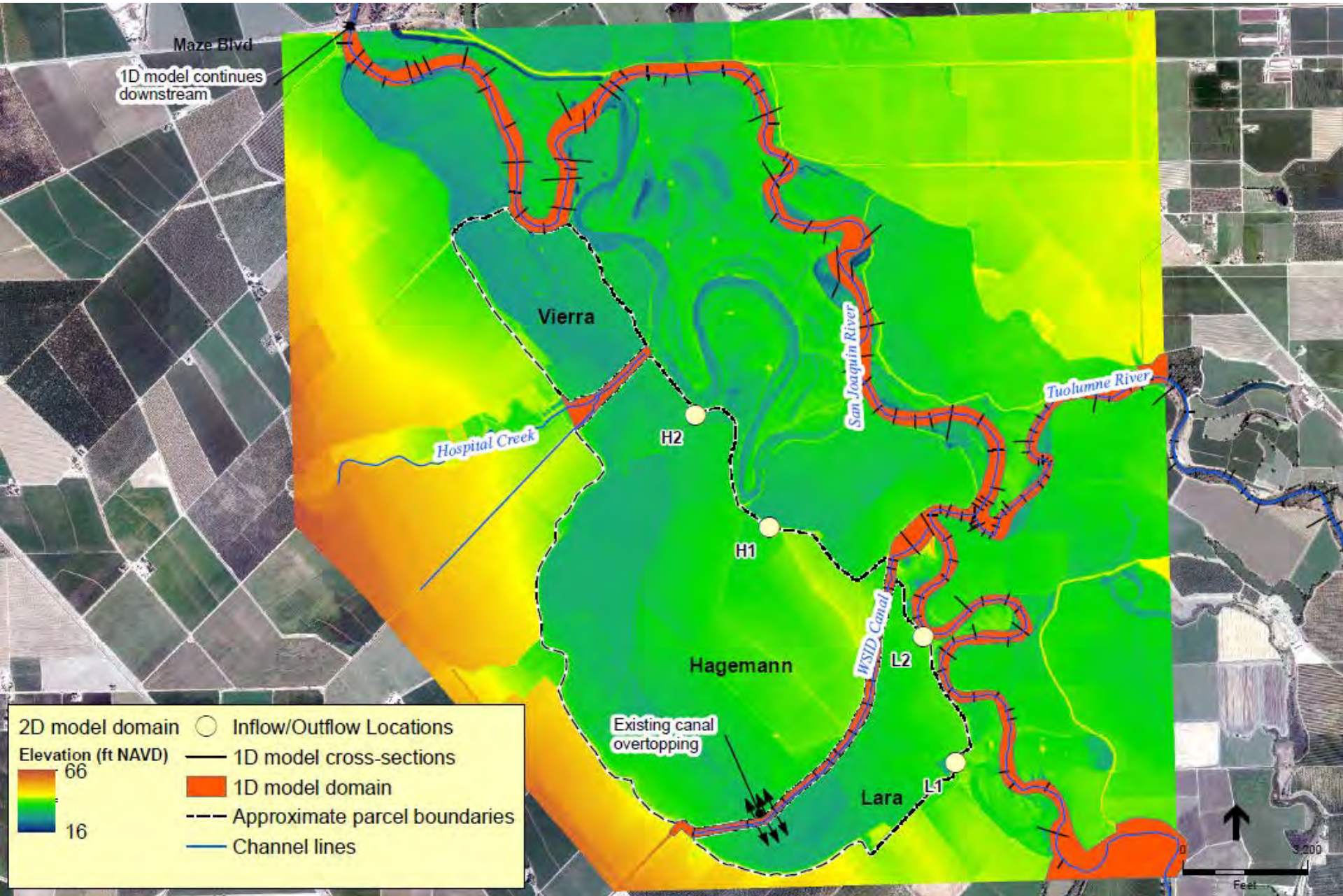
Questions?

Katrina Harrison

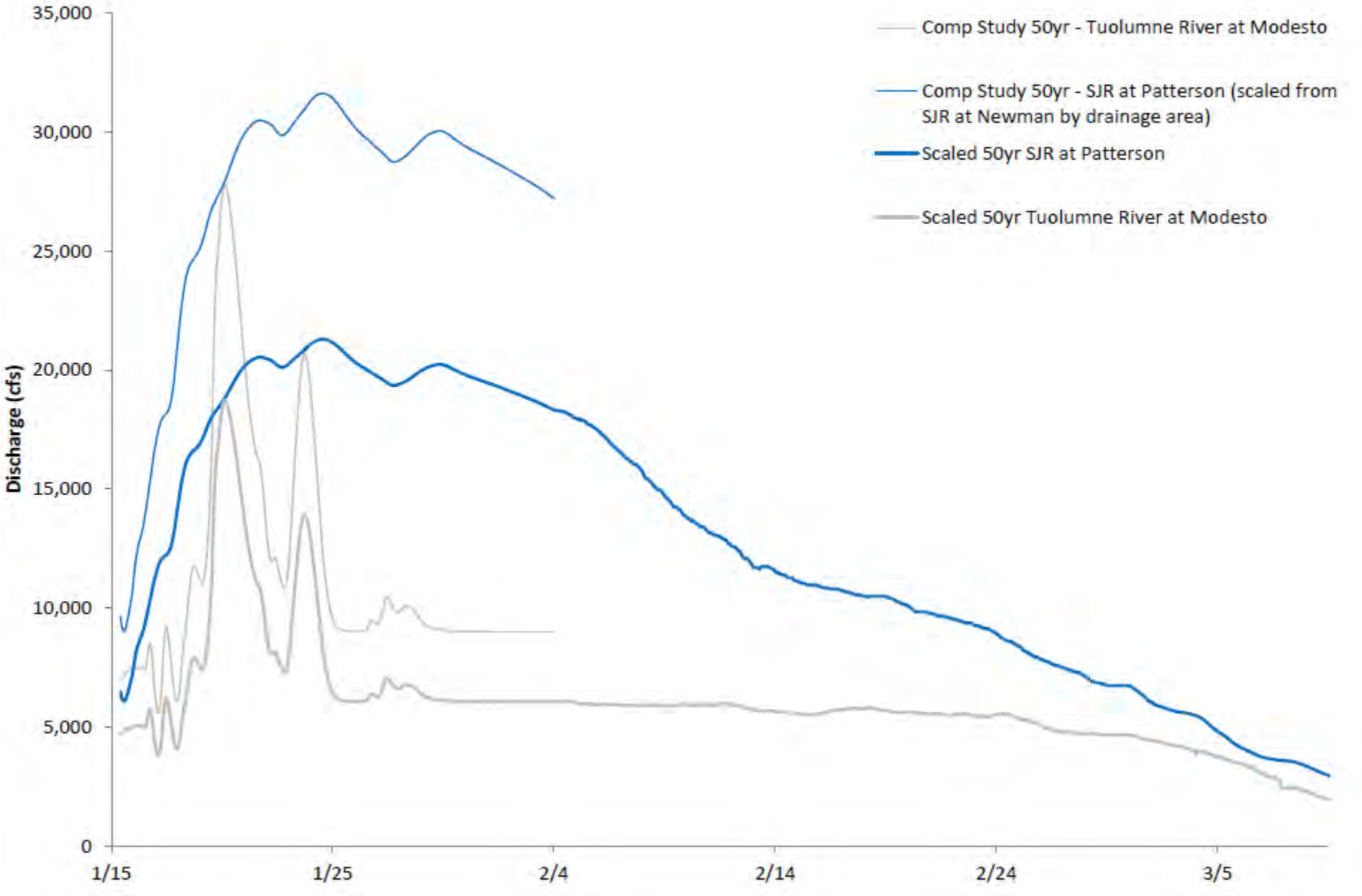
San Joaquin River Restoration Program

kharrison@usbr.gov

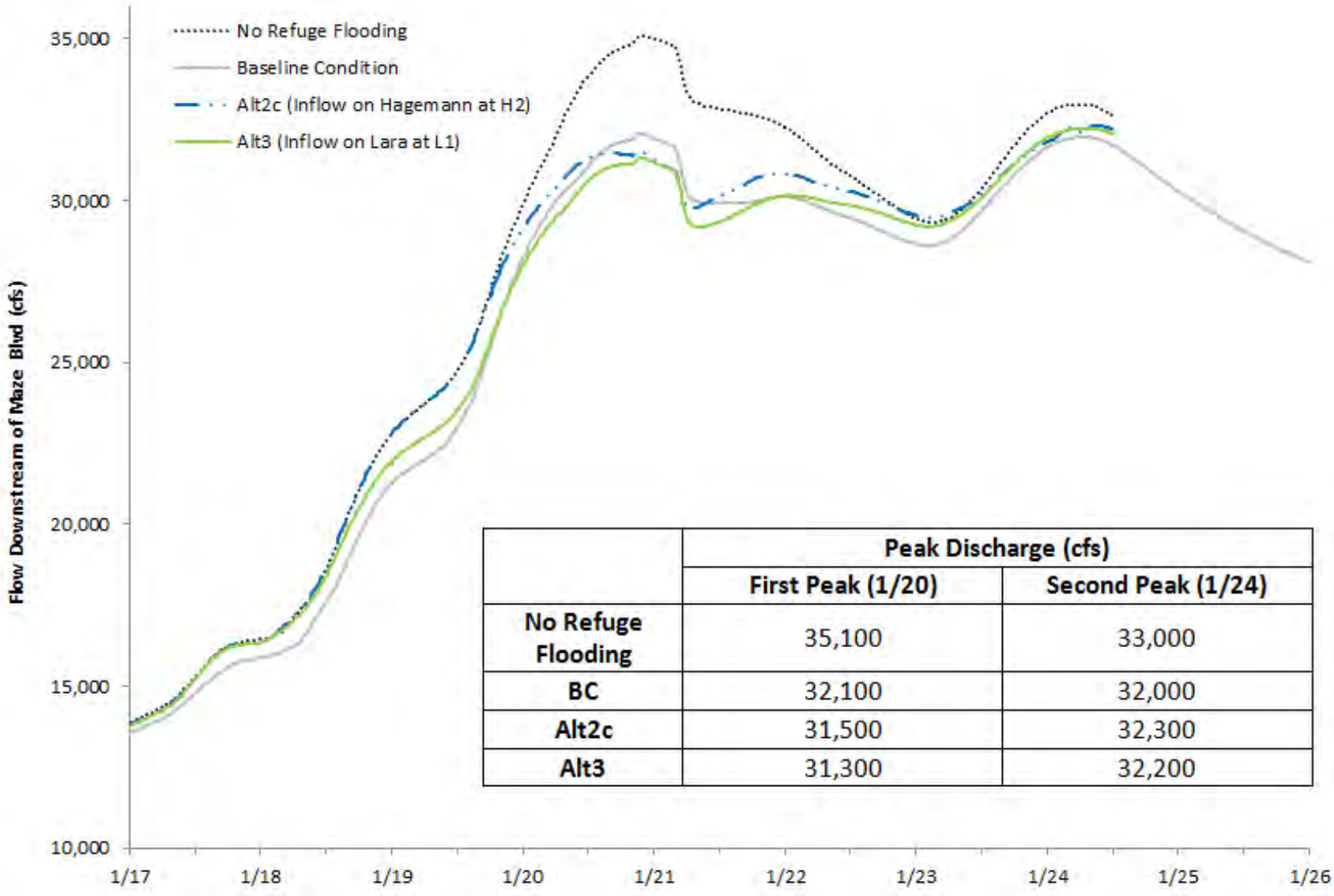
Ecosystem Restoration and Floodwater Attenuation at the SJRNWR



Hydrology


Comp Study 50yr - Tuolumne River at Modesto
Comp Study 50yr - SJR at Patterson (scaled from SJR at Newman by drainage area)
Scaled 50yr SJR at Patterson
Scaled 50yr Tuolumne River at Modesto
Discharge (cfs)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/15
1/25
2/4
2/14
2/24
3/5

Preliminary Hydrodynamic Modeling Results



	Peak Discharge (cfs)	
	First Peak (1/20)	Second Peak (1/24)
No Refuge Flooding	35,100	33,000
BC	32,100	32,000
Alt2c	31,500	32,300
Alt3	31,300	32,200