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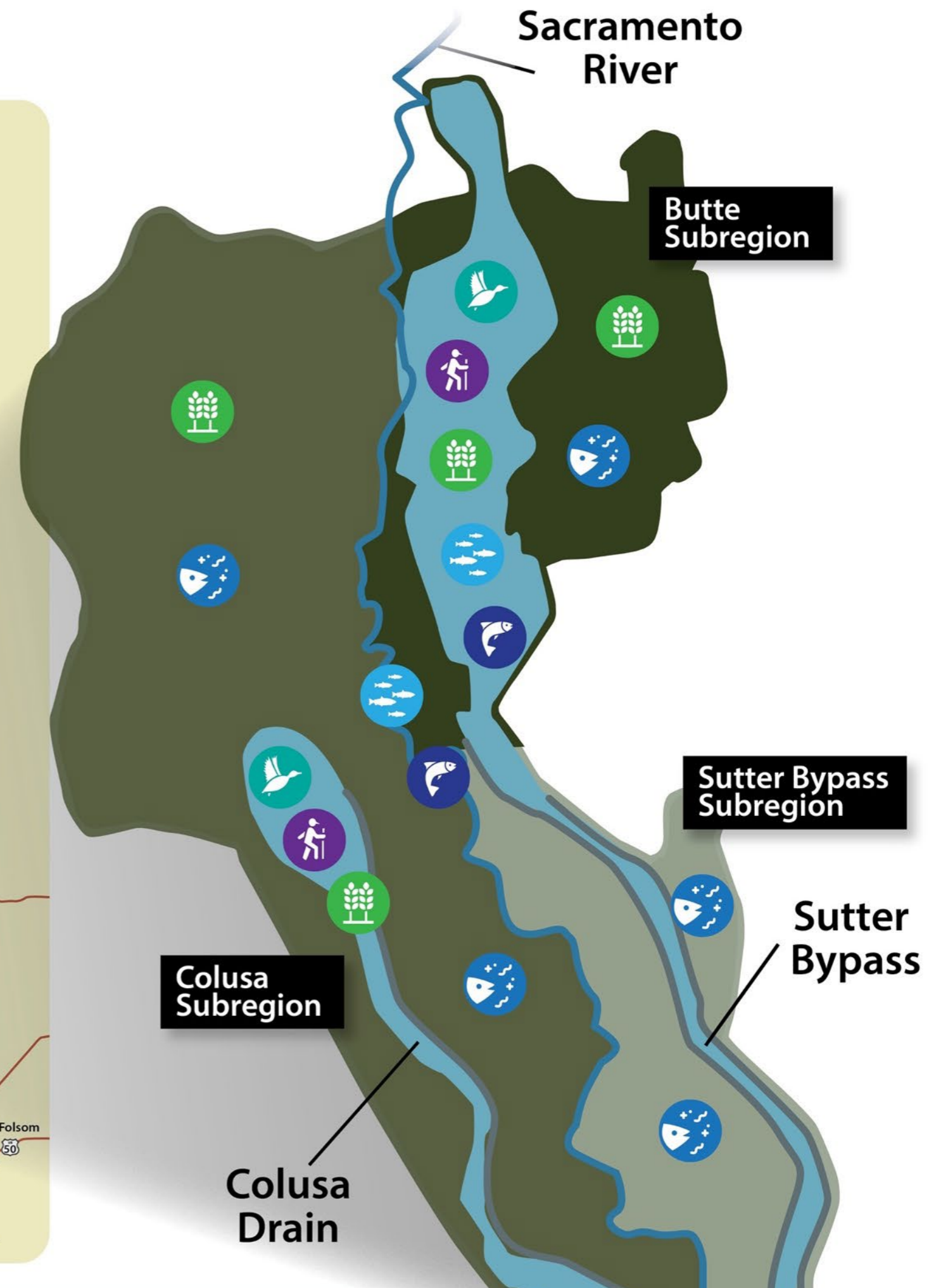
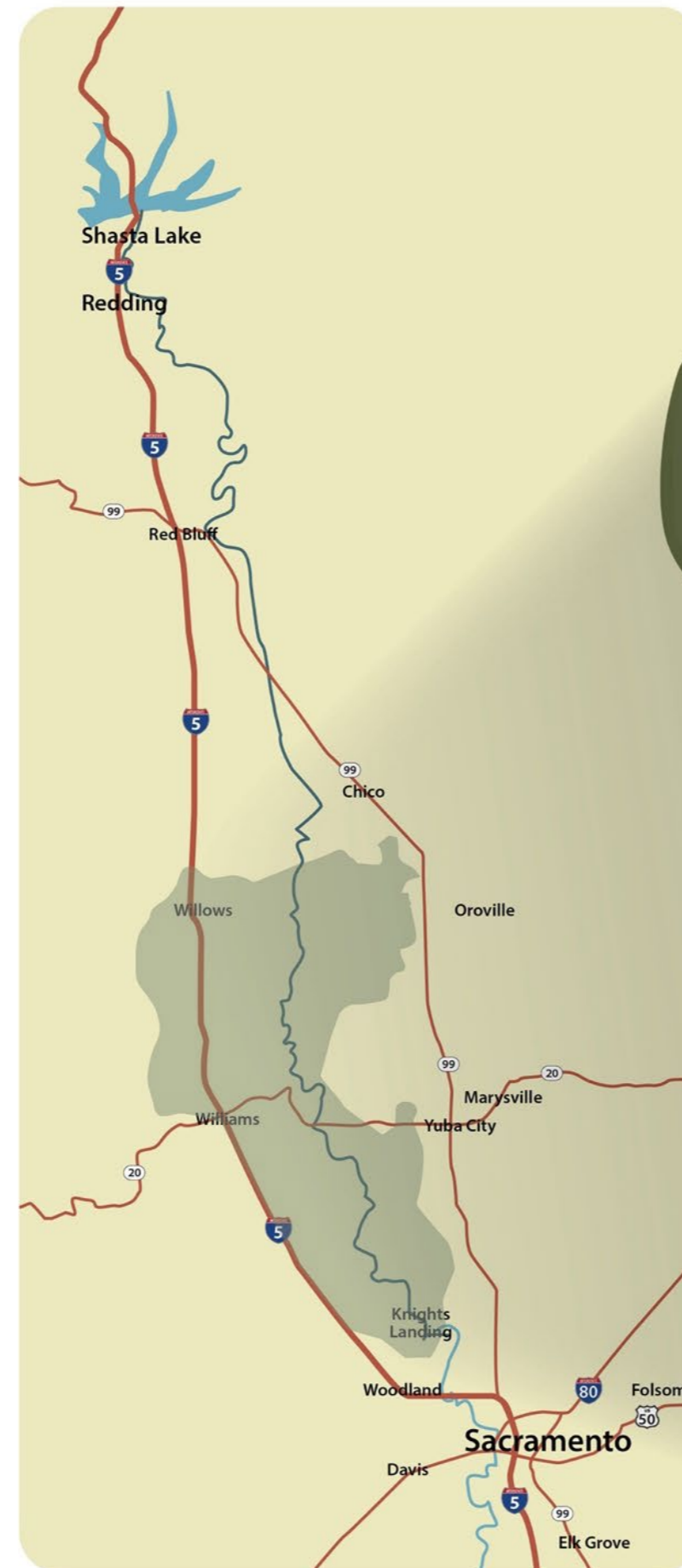
# FLOODPLAINS REIMAGINED

Opportunities & Constraints

Advisory Committee/ March 18, 2023

# GEOGRAPHIC SCOPE

- Butte Basin
- Colusa Basin
- Sutter Bypass

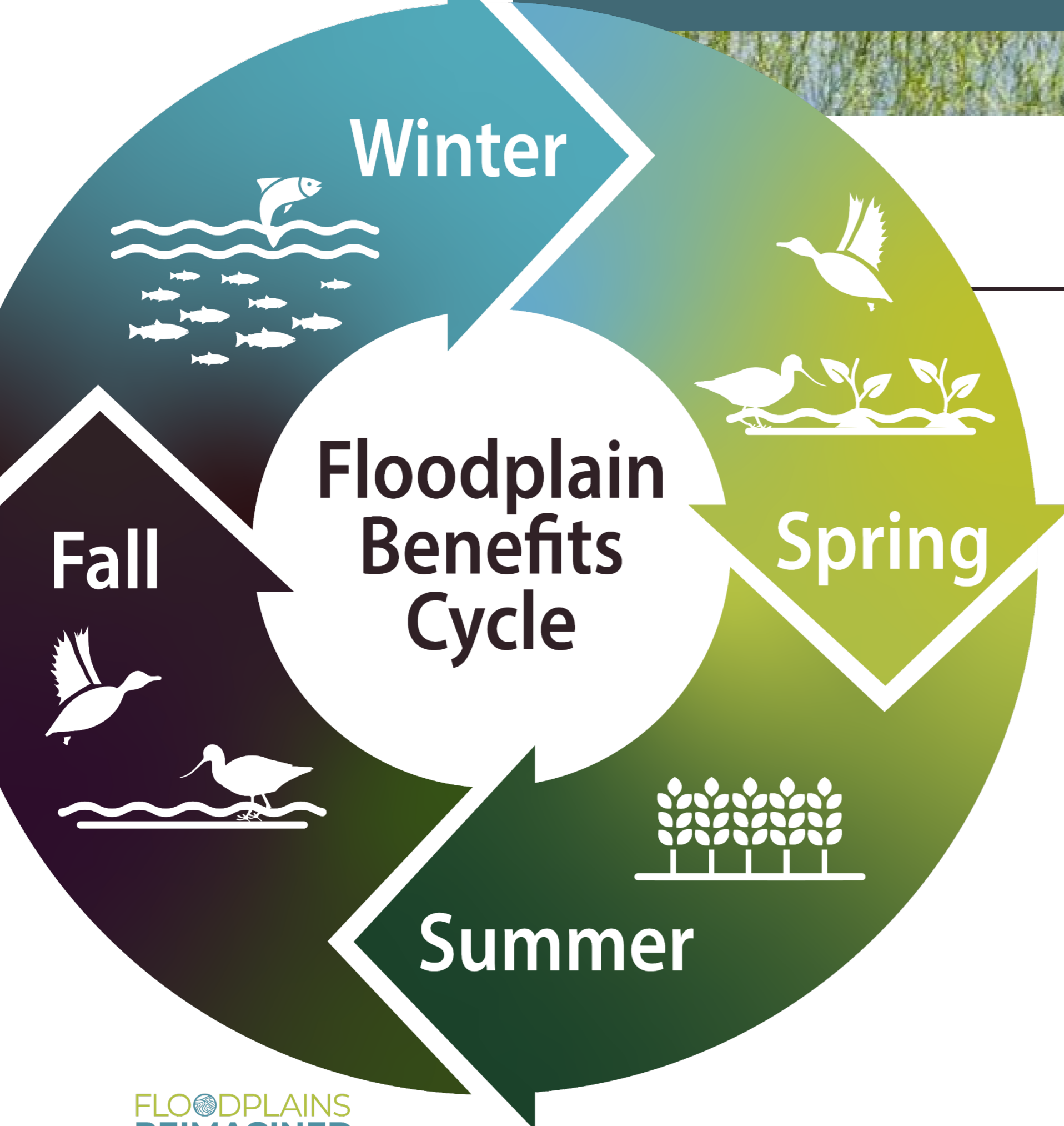


# Principles

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- Voluntary, locally-driven program that serves as a hub for all floodplain related efforts in the region to ensure efficiency and promote coordinated actions.
- Shared understanding of each other's interests, joint investigation, and collaborative generation of options and evaluation.
- Mutual respect and appreciation cultivated between sovereign tribal entities, private landowners, government and non-government representatives.
- Respect and work within existing land ownership and uses; indigenous land stewardship and cultural resources; and flood management functions, including operations and maintenance.





## Priorities

Floodplain functional connectivity complements the multiple priorities including:

- floodplain connectivity
- floodplain wildlife
- ecosystem health
- water supply
- flood control
- agriculture
- water quality
- indigenous cultural values
- economic prosperity
- recreation
- community way of life
- carbon as a greenhouse gas
- collaboration
- urgency
- resiliency and flexibility



# Objectives – limitations and respect

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- Limit actions to voluntary measures.
- Do no harm to existing property and water rights.
- Respect flood management functions, including operations and maintenance so that scenarios are flood management neutral or flood positive.
- Maintain or improve recreational hunting opportunities for duck and goose clubs.
- Minimize costs of projects.



# Objectives - improvements

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- Increase hydrologic connectivity between the FR geographic area and the Sacramento and Feather rivers to provide access onto and off-of the floodplain for juvenile salmon.
- Improve long-term, independently sustainable holistic floodplain connectivity.
- Increase the frequency, duration, and spatial extent of inundation within the FR geographic areas to stimulate production of invertebrates to provide habitats for rearing when juvenile salmon are migrating through the area.
- Improve accessibility for indigenous peoples to grounds for ceremony, as well as the gathering of traditional vegetation and wildlife during desired seasons.
- Increase resiliency and flexibility under uncertain future climate and economic scenarios.
- Improve groundwater supply reliability and maintain groundwater supply by diversifying and coordinating regional water supply management.



# Opportunities and Constraints

# OPPORTUNITIES & CONSTRAINTS

Opportunities include

- **Potential types of actions**

that could be considered for modeling, analysis, and discussion of willingness.

Constraints include:

- **Hard boundaries**
- **Soft considerations**

to take into account when developing action types to meet multiple objectives.

Some constraints could be addressed through tradeoffs or mitigation.







# Opportunities & Constraints

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## Today's Objectives

- Reflect collected summary of opportunities and constraints
  - Focus on constraints
    - Opportunities will be explored in further detail in the March 30 Ad Hoc Group on Scenario Development
- Advisory Committee Breakout Groups
  - Additions, omissions, and comments

## Uses

- Inform list of actions for modeling
- Inform scenario development
- Inform discussion about willingness and tradeoffs
- Inform technical assistance pilot projects and studies
- Inform areas of uncertainty
- Inform the Opportunities & Constraints Technical Memo as part of the Feasibility Report

# Sources

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## Related Efforts

- Sutter & Tisdale Bypasses Multi-Benefit Mgt Plan
- Tisdale Weir Rehabilitation and Fish Passage Project
- Lwr. Sutter Bypass Anadromous Fish Habitat Enhancement Report
- Lower Butte Creek Project, Phase III Report
- Butte Sutter Bypass Coordinated Operations Group
- Butte Slough Outfall Gates Rehabilitation Project
- Mid and Upper Sacramento River Regional Flood Management Plan
- Yolo Bypass Big Notch Project
- Voluntary Agreements Scientific Basis
- Cal Rice Commission Fish Studies

## Floodplains Reimagined

- Interviews
- Advisory Committee Meetings
  - Priorities & Objectives
  - Opportunities & Constraints
  - Risks and Solutions
  - Preliminary Concepts
- Ad-Hoc Group Meetings
  - Salmon Ad-Hoc Group
  - Bird Ad-Hoc Group
  - Landowner Ad-Hoc Group
- Steering Committee Meetings



# Opportunities



# Opportunity Types

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## Infrastructure

- River Connections
- Floodplain Infrastructure
- Land Management
- In-River Restoration

## Enhancement Activities

- Fish passage
- Ancillary Infrastructure
- Roads
- Vegetation and Land
- Operations and Maintenance

## Regulatory

- Programmatic and permitting assurances to protect landowners from take
- Safe harbor agreements systemwide and transparent
- Programmatic take coverage through Section 7 consultation

## Economic

- Financial incentive programs
- Technical Assistance to landowners and operators
- Cost analysis

## RIVER CONNECTIONS

- Notch overflow and flood weirs
- Modify outfall gates
- Modify existing or add new diversions
- With or without fish screens



Fremont Weir Adult Fish Passage (credit: DWR)

# FLOODPLAIN INFRASTRUCTURE

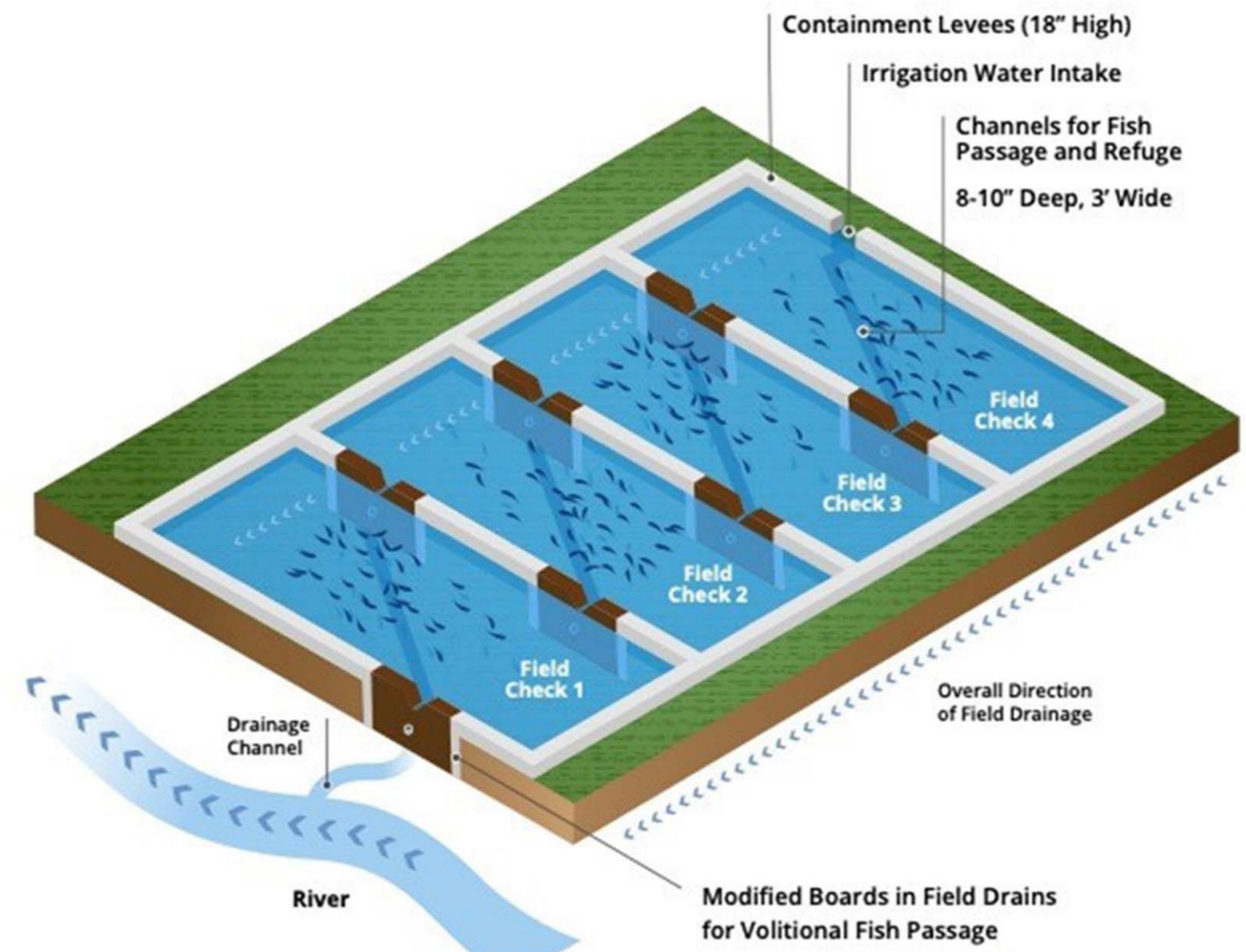
- Modify water management
- Improve fish passage
- Juvenile rearing
- Fish food
- Recharge
- Fish friendly passage
- Fish screens



Gorrill Fish Screen and Ladder Project (credit: Gorrill Ranch)

# LAND MANAGEMENT

- Fish food production
- Rear juveniles on field unit
  - Manage water, debris, barriers, fish passage, ingress and egress on the field unit



Juvenile salmon rearing (credit: CA Rice Commission)

# IN-RIVER RESTORATION [NEW]

- Restoration of riparian corridor and floodplain
- Reduction of areas of potential stranding
- Restoration of rip rap



Gorrill Fish Screen and Ladder Project (credit: Gorrill Ranch)

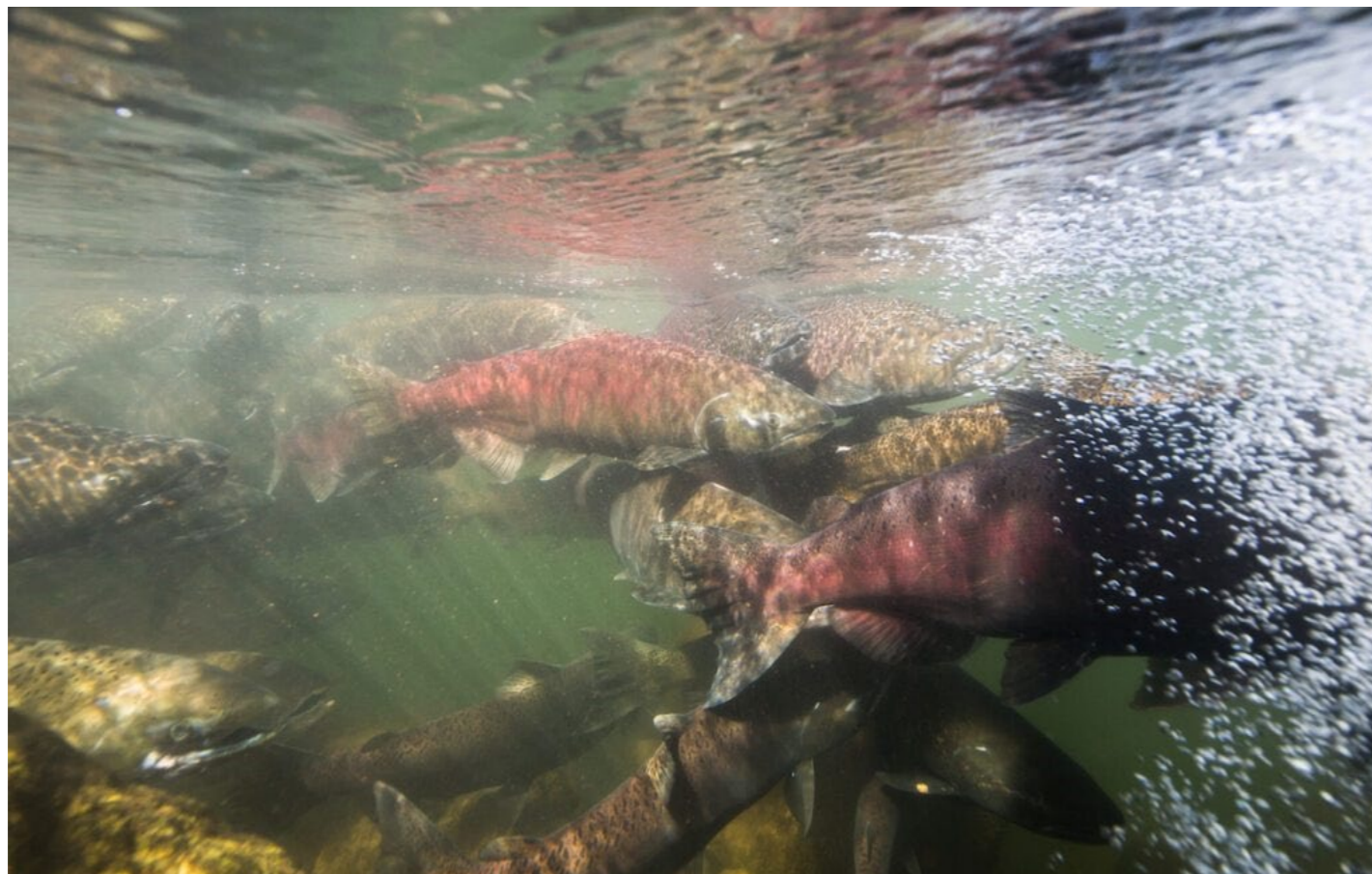
Juvenile salmon rearing (credit: CA Rice Commission)



# Enhancement Activities

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- Fish
  - Fish Passage
  - Fish Monitoring of stranding conditions
  - Population models



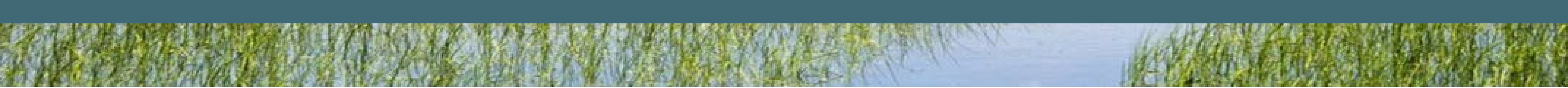
- Adaptive Management
  - Invite Tribes to monitor cultural sites during construction
  - Proactive coordinated operations and partnerships to adapt
  - Management Plans for duck clubs for significant inflows

# Enhancement Activities - Infrastructure

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- Large Infrastructure
  - Weir designs that allow real-time adjustment
  - Operable gates for discharge control
  - Design for flexibility under range of flows
- Flow Measurements and Gauging
- Roads
  - Updated and elevated walkways and roads
  - Bigger culverts under roads and reinforce against erosion





# Enhancement Actions - On-Field Infrastructure

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- Updated infrastructure for higher flows
- Checks running in direction to avoid wave wash
- Large stop boxes to handle higher water
- Identifying at risk properties and proactively address infrastructure reinforcement
- Improved field drainage and conveyance
- Improved ditches for fish ingress and egress to reduce stranding

# Enhancement Activities - Vegetation and Land

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- Tribes collection and cultivation of ceremonial plants complementary to in-river restoration
- Prevention and removal of aquatic invasive vegetation
- Land and floodplain lowering or raising
- Shaded riverine aquatic habitat





# Constraints and Considerations



# Constraints and Considerations

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## Existing Land Use

- Voluntary and willing landowners and managers
- Respect and work within:
  - **existing land ownership** and uses;
  - **indigenous land stewardship** and cultural resources; and
  - **flood management** functions, including operations and maintenance.

## Biological

- Fisheries
- Wildlife

## Regulatory and Economic

- Water Rights
- Regulations and Permitting
- Operations and Maintenance
- Management Area Mandates
- Burial Sites
- Emergency Access

## Infrastructure and Physical

- Inflows from Sacramento, Butte, Feather
- Geomorphology of the Basin
- Engineering of Infrastructure and Control
- Operations and Maintenance Needs and Costs



# Constraints & Considerations – Existing Land Use

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## Ag and Managed Wetland

- Timing for ag production
- Road access
- Road integrity and erosion
- Sediment deposition and erosion
- Field damage due to oversaturation

## Private Wetlands and Restoration Sites

- Avoid negative impacts to restoration sites
- Avoid flooding damage to wetland infrastructure and easements for fish and migratory birds

# Constraints and Considerations – Existing Land Use

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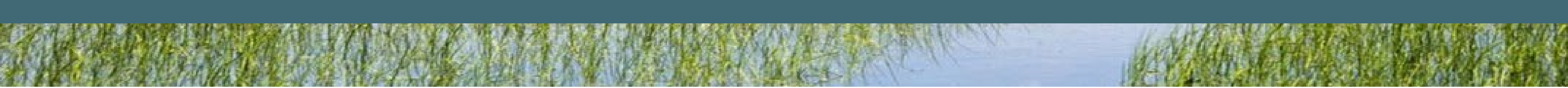
## Hunting Compatibility

- Timing, Depth, Rate, and Duration affecting Opportunity Days
  - Shoot level - depth
  - Frequency and timing of exceeding targeted inundation levels
  - Rate of inflow and drainage
  - Duration of inundation effects on hunting season opportunity days
- Prey
  - Prey density
  - Species diversity



- Infrastructure
  - Roads
  - Effects on infrastructure and boards
- Land and Vegetation Management
- Off-season vegetation management





# Constraints & Considerations – Physical and Infrastructure

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## Infrastructure Operations

- Integrity of infrastructure
- Long-term maintenance costs including staffing and resources
- Ability to meet operations and maintenance goals

## Cultural Sites

- Avoid inundation of burial sites and other sacred cultural sites identified by Tribes

## Road Access

- Avoid limitations to emergency access to people in the region
- Avoid limiting access and related economic costs – ag, hunting, and financial incentive programs
- Avoid road failure



# Constraints and Considerations – Ecological and Biological

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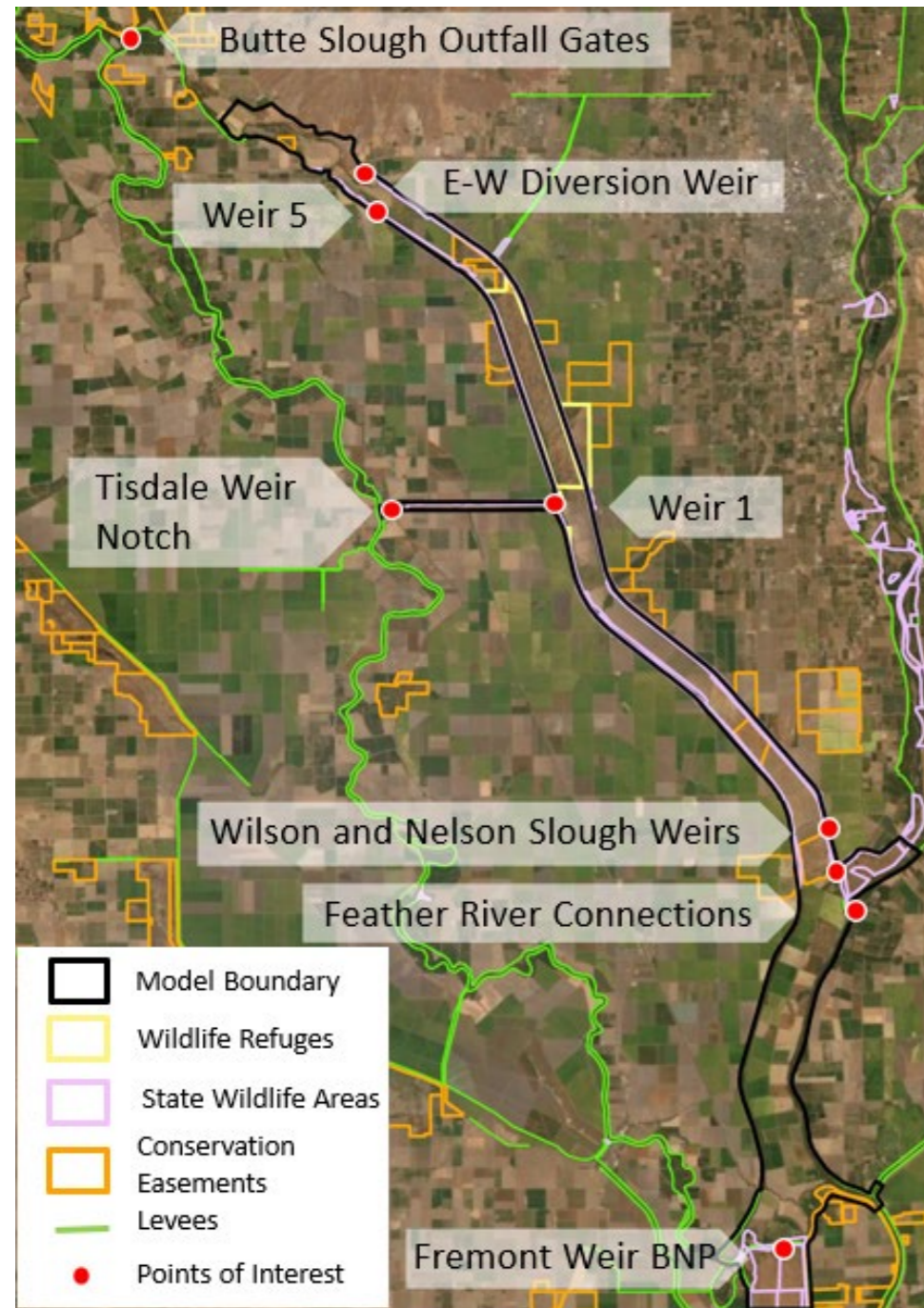
## Wildlife Compatibility

- Habitat suitability for shorebirds, cranes, and other bird species
- Timing for habitat availability. Fall and spring inundation levels.

## Fisheries

- Addition of infrastructure and management is detrimental to fish or reworking the current managed system is beneficial to fish (divergence)
- Increased complexity of management – potential unintended consequences or current management has wrought unintended consequences and improvements can be made to benefit fisheries
- Potential increase in stranding sites due to sediment transport deposition and scour

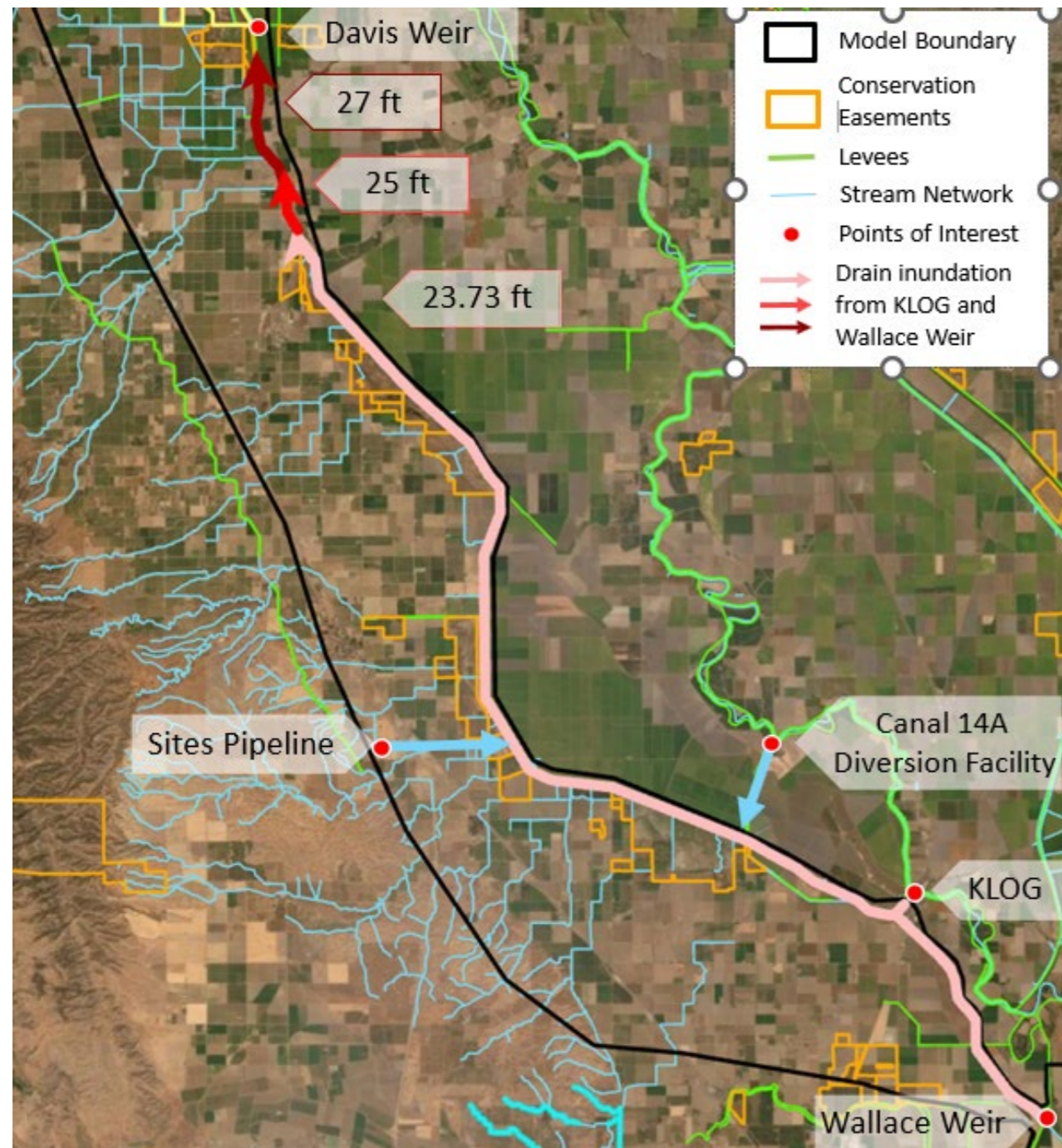
# Sutter Bypass Subregion – Subregional Considerations



## Constraints and Considerations

- Sediment deposition from Feather River (LSBR)
- Flood freeboard levels are sensitive to amount, location, and type of riparian habitat in Lower Sutter Bypass (LSBR)
- Fisheries
  - Fish passage in the Lower Sutter Bypass (LSBR)
  - Entrainment into unscreened diversions
  - Exposure to predation
  - Adult stranding
  - Exposure to too warmer water temps
- Ag and Managed Wetland Compatibility
  - High salinity groundwater

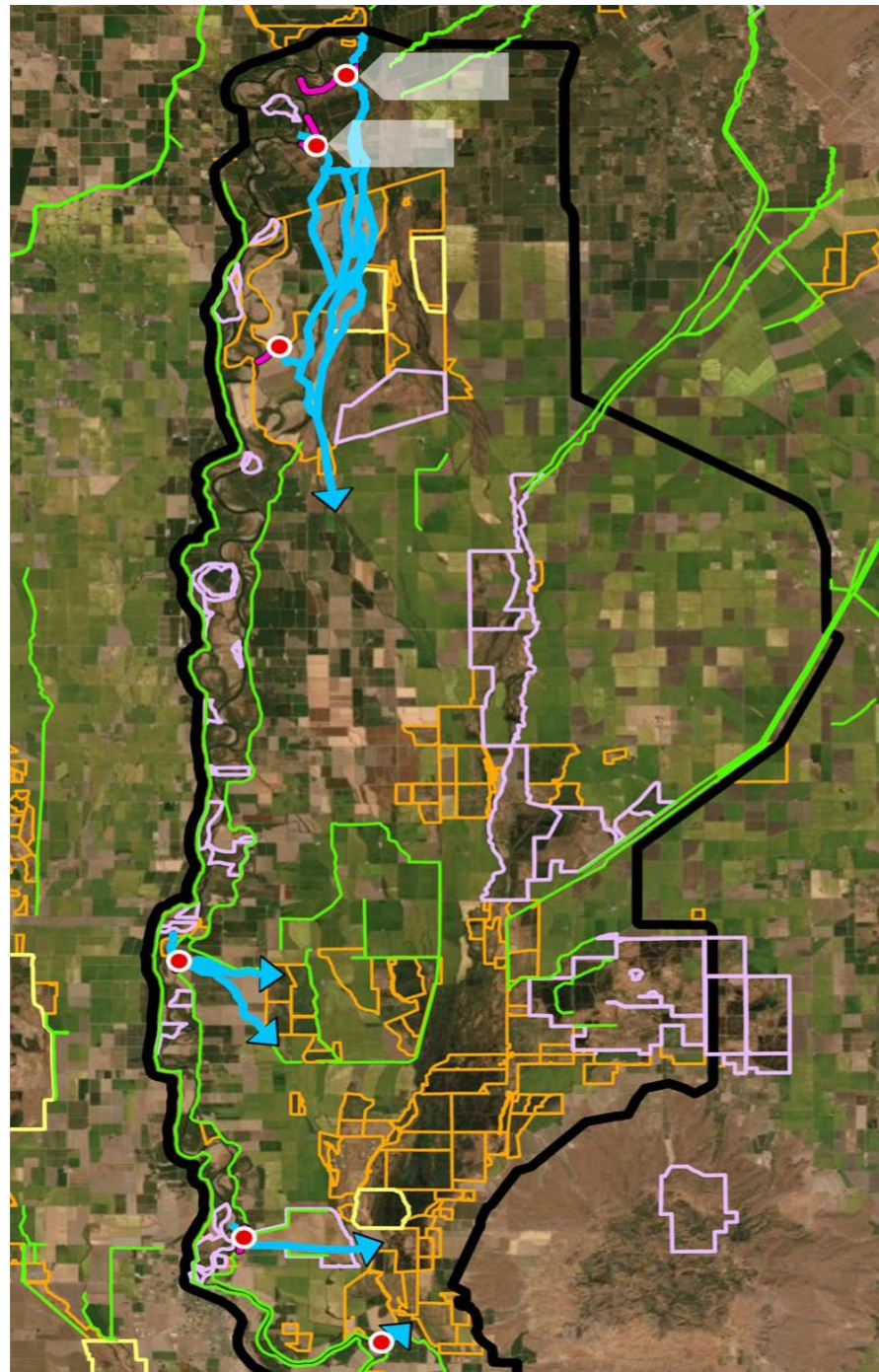
# Colusa Basin Subregion – Subregional Considerations



## Constraints and Considerations

- Ag and Managed Wetland Compatibility
- Compatibility with Managed Wetlands
  - Sutter Wildlife Refuge to manage for birds
- Fisheries
  - Adequacy of Water Quality (divergence)
  - Adult stranding

# Butte Basin Subregion – Subregional Considerations



## Constraints and Considerations

- Hunting Compatibility
  - Road access and potential failure – esp. related to Moulton Weir
  - Flow Rate Consideration
  - Ag and Managed Wetland Compatibility
  - Keep adjacent lands dry esp. Orchards, amount of overflow from the river (it's a high point) so there is backwater. Timing/season/crop is important – change in inundation patterns in modeling.
  - Cold gw temp. - neg. impacts on birds and ag, river instead of gw?
- Salmon Compatibility
  - Spring field drainage false attraction flows
  - Time on floodplain for rearing and where on the floodplain
  - Complexity in habitat?



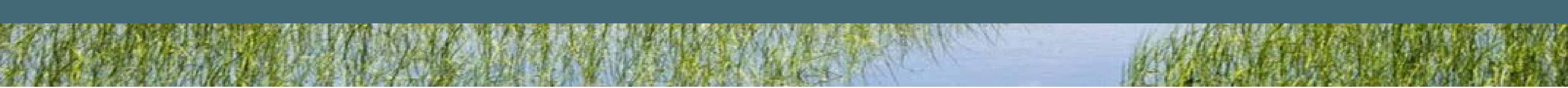
# Areas of Uncertainty



# Areas of Uncertainty

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- Flow Measurements in Butte Creek
- Sediment Transport through modified weirs and with increased inundation depth, timing, and frequency.



# Areas of Uncertainty – Diverging Viewpoints

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- Salmon Benefits and Risk
  - Risk tolerance of adult salmon of entrainment and stranding
  - Meaningful benefits to wild juvenile salmon rearing on managed ricefields.
  - Meaningful benefits to juvenile salmon survival and growth rates on managed ricefields vs. natural floodplain habitats.
  - Risk of predation, importance of habitat complexity, and access between these habitat types.



# Suggested Research & Analysis – Dec. 2022

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- Acceptable level of management for landowners
  - Pulling boards, maintaining holes in boards for juvenile fish passage and maintaining field barriers to prohibit fish from undesired water pathways.
- Assessment of properties and solutions for their ancillary infrastructure and needs
- Study of cost of erosion to landowners
- Study of systems that function well. Suggestion that Butte Sink be a model
- Water quality monitoring
- Analysis of inundation related to opportunities – this is part of Floodplains Reimagined

