Sacramento River Science Partnership (SRSP)
Floodplain Science & Management Symposium

Management Context for Floodplain Science

Brian Ellrott, NMFS
David Guy, NCWA
Evan Sawyer, NMFS
Steve Lindley, SWFSC, NMFS



NOAA FISHERIES

Hoping for a Game Changer: Role of Floodplains in Salmon Recovery

Floodplain Symposium

October 14, 2021

Brian Ellrott

Outline

Central Valley salmon status

Landscape scale stressors and abatement

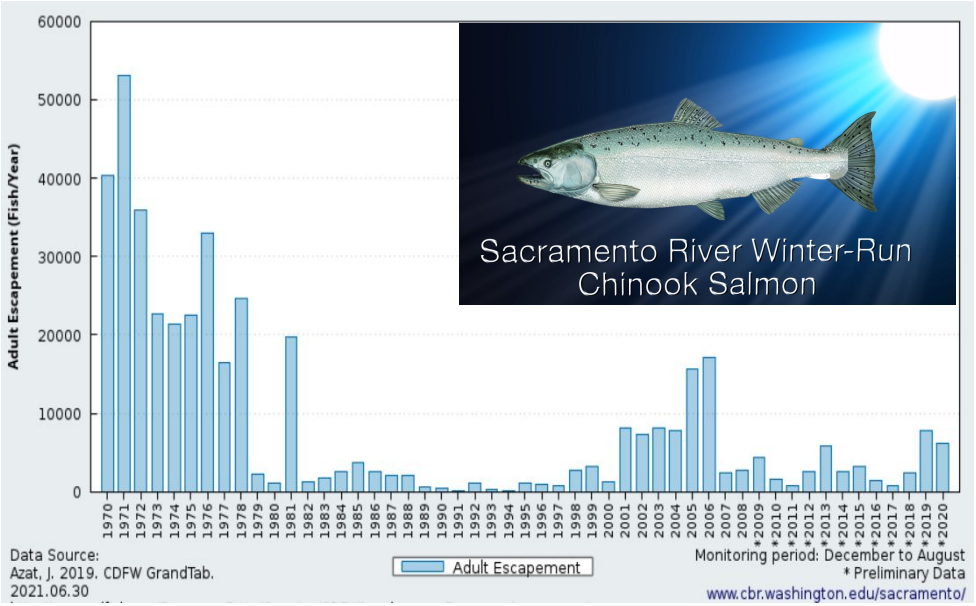
Floodplain White Paper

Management and science uncertainties

NOAA FISHERIES

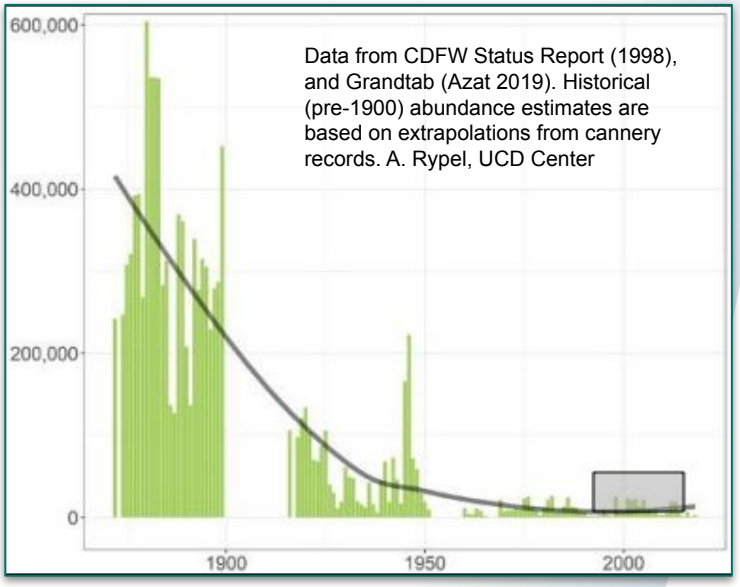
Central Valley Salmon Status

Winter-run



Winter-run	2010 Status Review	2016 Status Review	2021 Status Review
Extinction Risk	Low	Moderate	High

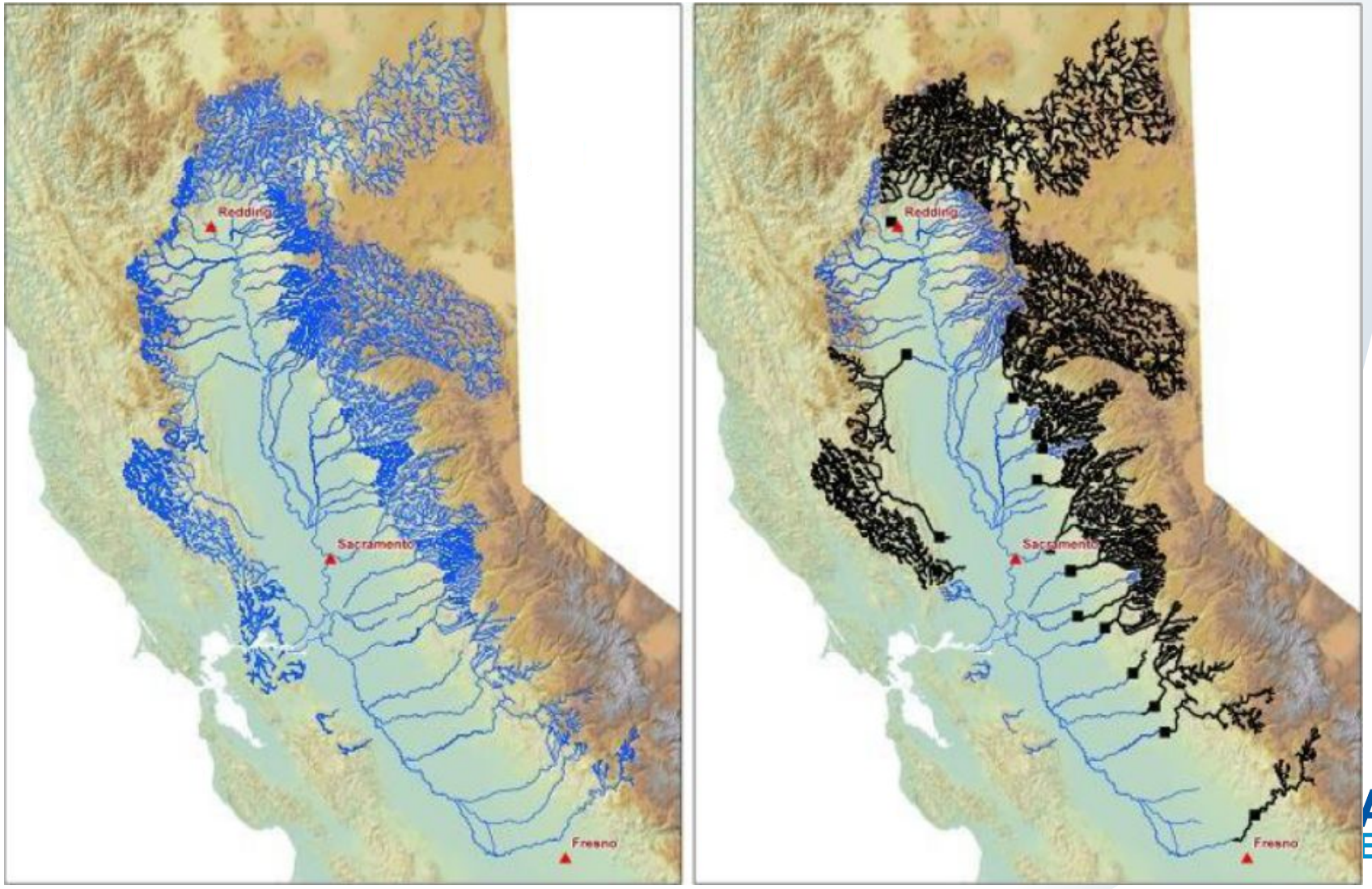
Spring-run



	2010	2015	2020
Mill Creek	High	Moderate	High
Deer Creek	High	Moderate	High
Butte Creek	Low	Low	Low
Battle Creek	High	Moderate	High
Clear Creek	High	Moderate	High
Feather River H	High	High	High

CV Salmon Landscape Scale Stressors

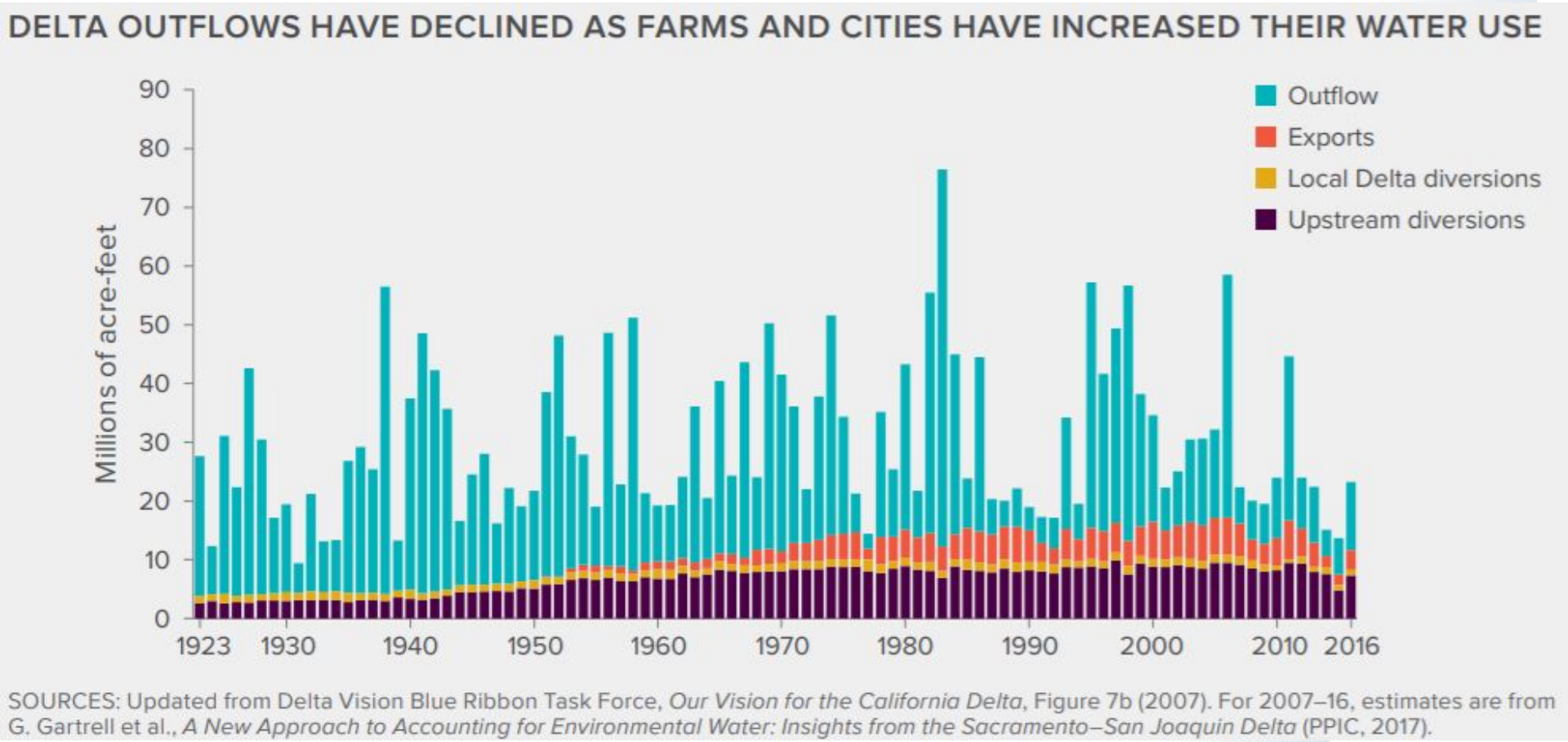
Spawning habitat loss: 90% (Cummins et al. 2008)



CV Salmon Landscape Scale Stressors

Water diversions: January-June flows reduced by 56%

(SWRCB&Cal EPA 2017)

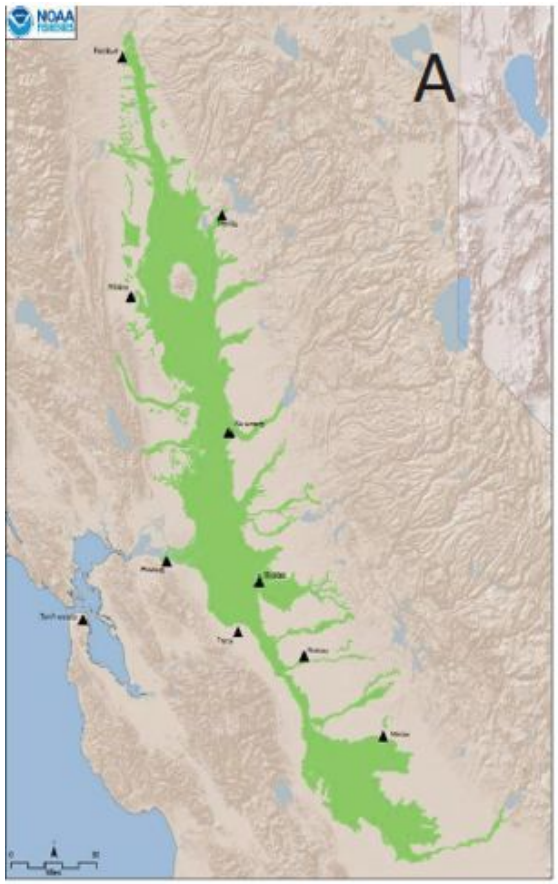


Hanak et al. 2018

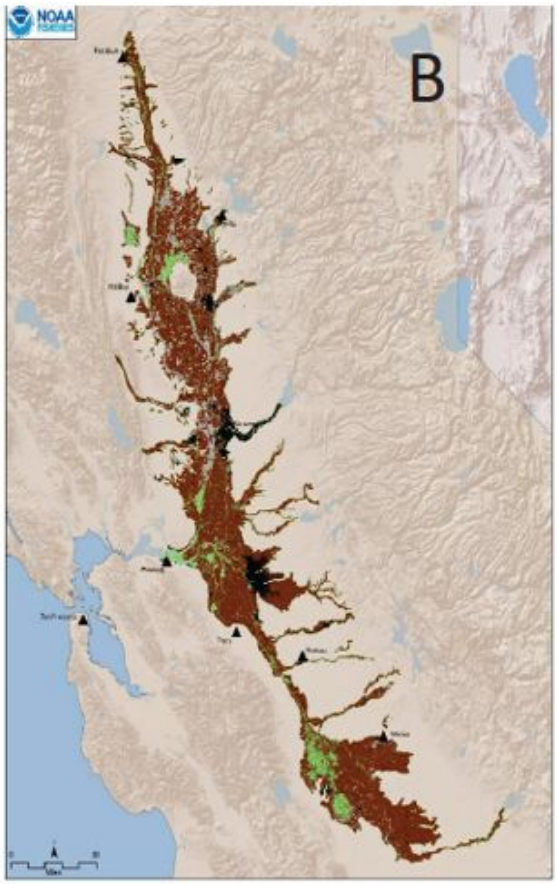
NOAA FISHERIES

CV Salmon Landscape Scale Stressors

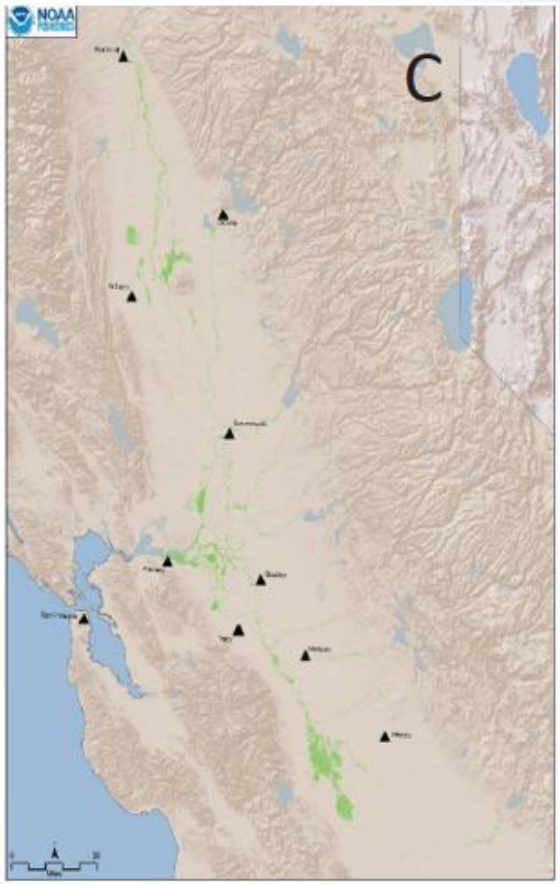
Floodplain rearing habitat loss: 93% (Herbold et al. 2018)



Historical Floodplain
& Wetlands
1.2 Million hectares



Current Agricultural, Fallow,
& Urban Areas
1 million hectares



Current Floodplain Remnants
76,000 hectares (~7% of Historic)
+ 31,000 hectares of Open Water

Stressor Abatement

Spawning and initial rearing habitat expansion

Reintroductions to historical habitat blocked by dams

More opposition than support; limited progress; success unfortunately not imminent

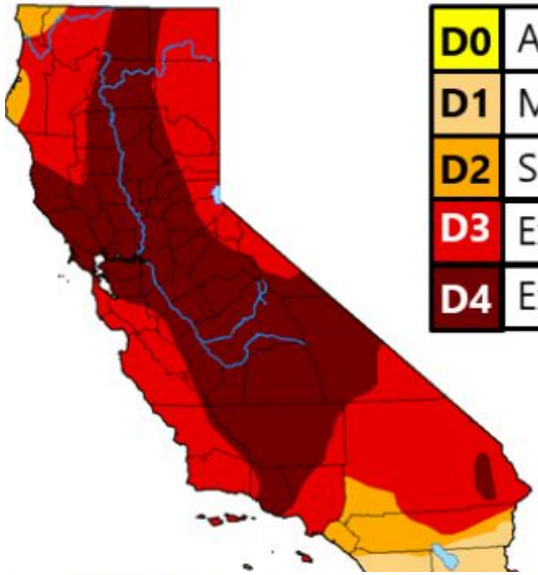
Stressor Abatement

Water management/flow improvement

Decades long challenge, getting more difficult with climate change

Photo by Noah Berger, AP Photo

U.S. Drought Monitor October 2021



D0	Abnormally Dry
D1	Moderate Drought
D2	Severe Drought
D3	Extreme Drought
D4	Exceptional Drought

Biden action puts a hold on Trump administration biological opinions

BY CHARLES WHISNAND cwhisnand@portervillerecorder.com Oct 5, 2021

Stressor Abatement

Floodplain rearing habitat expansion

Floodplain habitat loss is the one landscape scale stressor with immediate potential to alleviate

1. Yolo Bypass Salmonid Habitat Restoration and Fish Passage

2. Several proposals to slow down bypass/rice field water to maximize juvenile salmon growth
   a. CA Rice Commission pilot
   b. Dos Rios (Lumdberg Farms)
   c. Floodprint project (Ecosystem Investment Partners)

NMFS Floodplain White Paper

Purpose: Advance dialogue

-summarize science

-frame active and passive management

-document potential risks

-recommendations for floodplain project development

NMFS Floodplain White Paper

Potential risks of actively slowing down floodplain/bypass water

- Juvenile and adult stranding;
- Predation;
- Disease susceptibility if spring air temperatures cause water temperatures to become too warm; and
- Modified juvenile emigration patterns leading to reduced life history diversity.

NMFS Floodplain White Paper

Recommendation #1

NMFS prefers passively managed floodplain restoration projects that allow volitional passage, are designed and linked to active water operations, and are based on the best available floodplain restoration science.

Fremont Landing Conservation Bank

Bullock Bend Mitigation Bank

NMFS Floodplain White Paper

Recommendation #2

Designs should optimize inundation at a range of flow conditions that correlate to juvenile emigration timing.

NOAA FISHERIES

NMFS Floodplain White Paper

Recommendation #3

Designs should avoid or minimize the potential for reduced adult fish passage, juvenile isolation and predation.

Fremont Weir 2011

Photos provided by Marc Beccio (CDFW)

Fremont Weir 2019

NMFS Floodplain White Paper

Recommendation #4

Innovative approaches that optimize infrastructure should be considered, particularly where landowners require ongoing seasonal agricultural operations to support restoration.

NOAA FISHERIES

NMFS Floodplain White Paper

Recommendation #5

For active management proposals, effects need to be carefully evaluated and minimized through design considerations and monitoring (e.g., stranding potential).

"Several lines of evidence suggest that although the majority of young salmon successfully emigrated from the floodplain, areas with engineered water control structures had comparatively high rates of stranding."

-Sommer et al. 2005

NOAA FISHERIES

NMFS Floodplain White Paper

Recommendation #6

Effectiveness monitoring for floodplain restoration projects

Recommendation #7 An adaptive management program should be established.

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Uncertainties

-Big Notch impact on physical habitat, the aquatic ecosystem, and fish response

-Benefit/risk trade off of infrastructure projects during drier years

-water temperature

-predation

-Benefit/risk trade off in Sutter Bypass during drier years

-Relative survival may be lower in Sutter compared to mainstem (Michel et al. 2021)

Hoping for a Game Changer

Winter-run Chinook salmon endangered for 32 years

Spring-run Chinook salmon threatened for 22 years

Extinction risk is increasing

Climate change

Need a New Way Forward

A New Way Forward for the Sacramento River Basin

Floodplain Habitat Science and Management Symposium

October 13, 2021

California Department of Fish and Wildlife

Contact: Jim Milbury/NOAA/ 562) 980-4006
Clark Blanchard/CDFW/916-651-7824

FOR IMMEDIATE RELEASE
July 22, 2014

Joint Release of Federal Recovery Plan for Salmon and Steelhead and Conservation Strategy for California's Ecosystem Restoration Program

CDFW Announces Funding for High-Priority Conservation Efforts

SACRAMENTO, Calif. – NOAA Fisheries and the California Department of Fish and Wildlife (CDFW) today jointly released two plans to restore populations of salmon and steelhead in California's Central Valley: NOAA Fisheries' Chinook Salmon and Steelhead Recovery Plan and CDFW's Ecosystem Restoration Program (ERP) Conservation Strategy.

Maria Rea, NOAA Fisheries Assistant Regional Administrator

California Department of Fish and Wildlife

Contact: Jim Milbury/NOAA/ 562) 980-4006
Clark Blanchard/CDFW/916-651-7824

FOR IMMEDIATE RELEASE
July 22, 2014

"Establishing clear priority watersheds, fish populations and actions is essential to achieve recovery," said Maria Rea, NOAA Fisheries Assistant Regional Administrator for California's Central Valley Office. "Implementation of this plan will depend on many parties working collaboratively to pool resources, expertise and programs to recover Chinook salmon and steelhead populations that are part of California's natural heritage."

Chuck Bonham, Director of the California Department of Fish and Wildlife

California Department of Fish and Wildlife

Contact: Jim Milbury/NOAA/ 562) 980-4006
Clark Blanchard/CDFW/916-651-7824

FOR IMMEDIATE RELEASE
July 22, 2014

"It is critical we make strategic investments in our natural resources," said Charlton H. Bonham, Director of the California Department of Fish and Wildlife. "The funding of these high-priority restoration projects is not only an example of the coordinated effort between state and federal governments, but an example of California's continued efforts to minimize the effects of drought on fish and wildlife. Central Valley salmon and steelhead deserve nothing less."

David Guy, Northern California Water Association

California Department of Fish and Wildlife

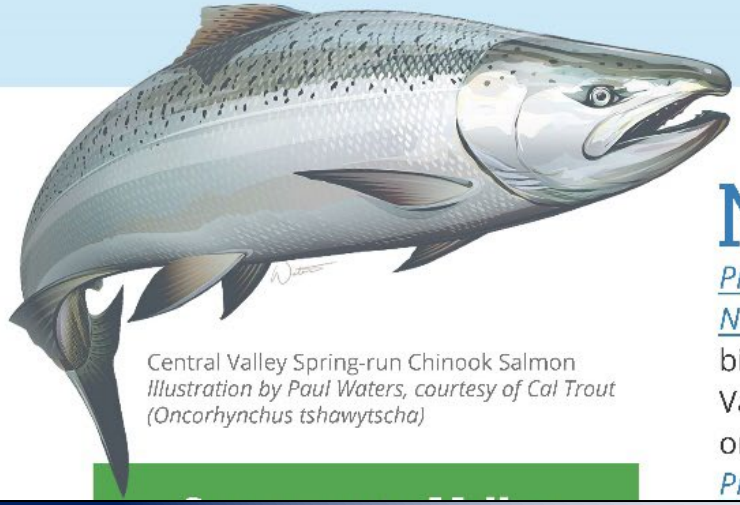
Contact: Jim Milbury/NOAA/ 562) 980-4006
Clark Blanchard/CDFW/916-651-7824

FOR IMMEDIATE RELEASE
July 22, 2014

"The Sacramento Valley joins together a world-renowned mosaic of natural abundance: productive farmlands, meandering rivers that provide habitat and feed salmon and steelhead, wildlife refuges and managed wetlands, and cities and rural communities," said David Guy, President of the Northern California Water Association. "The recovery plan is a positive step forward--through efficient management of the region's water resources, water suppliers throughout the Sacramento Valley will continue to work with our conservation partners to help implement the recovery plan and improve ecological conditions in the Sacramento River for multiple species and habitat values."

Sacramento Valley Salmon Recovery Program

Local water management entities, conservation organizations and state and federal fisheries and water management agencies in 2014 joined together to form the Sacramento Valley Salmon Recovery Program, a collaborative partnership to complete projects and improve science to promote recovery of salmon and other species of fish in the region. These actions are implementing both the National Marine Fisheries Service's Recovery Plan for the Sacramento River and the California Natural Resources Agency's Sacramento Valley Salmon Resiliency Strategy.



Central Valley Spring-run Chinook Salmon
Illustration by Paul Waters, courtesy of Cal Trout
(Oncorhynchus tshawytscha)

Many of these activities were initially presented by Dave Vogel in his 2011 report, *Insights in to the Problems, Progress and Potential Solutions for Sacramento River Basin Native Anadromous Fish Restoration*, which outlined the biological priorities for salmon recovery in the Sacramento Valley. Further science from UC Davis and conservation organizations also guide the priorities (see e.g., *Floodplains: Processes and Management for Ecosystem Services*).

Ridgetop to River Mouth:

A Holistic Approach to Water Management

Healthy Forests

Healthy forests and actively managing our state's headwaters increase water supply reliability, reduce flooding risks, improve water quality, reduce impacts from catastrophic wildfires, increase renewable energy supplies, enhance wildlife habitat, and improve response to climate change and extreme weather events.

Reactivating Floodplains

The Sacramento Valley is fertile ground to reactivate our floodplains in a way that benefits fish, wildlife and people as a new path forward for holistic water management that incorporates best available science and practical know-how of farm and refuge managers.

Sustainable Groundwater Management

Actively managing the region's groundwater resources by utilizing the region's natural infrastructure, such as recharging our groundwater aquifers, will be important in the Sacramento Valley to achieve groundwater sustainability.

Vital Rivers and Streams

Our rivers and creeks are the lifeblood for the region—serving drinking water for our communities, vitalizing our economy and ecosystems, and providing opportunities for recreation and play. They lift our spirits and connect us to the natural world, and each other.

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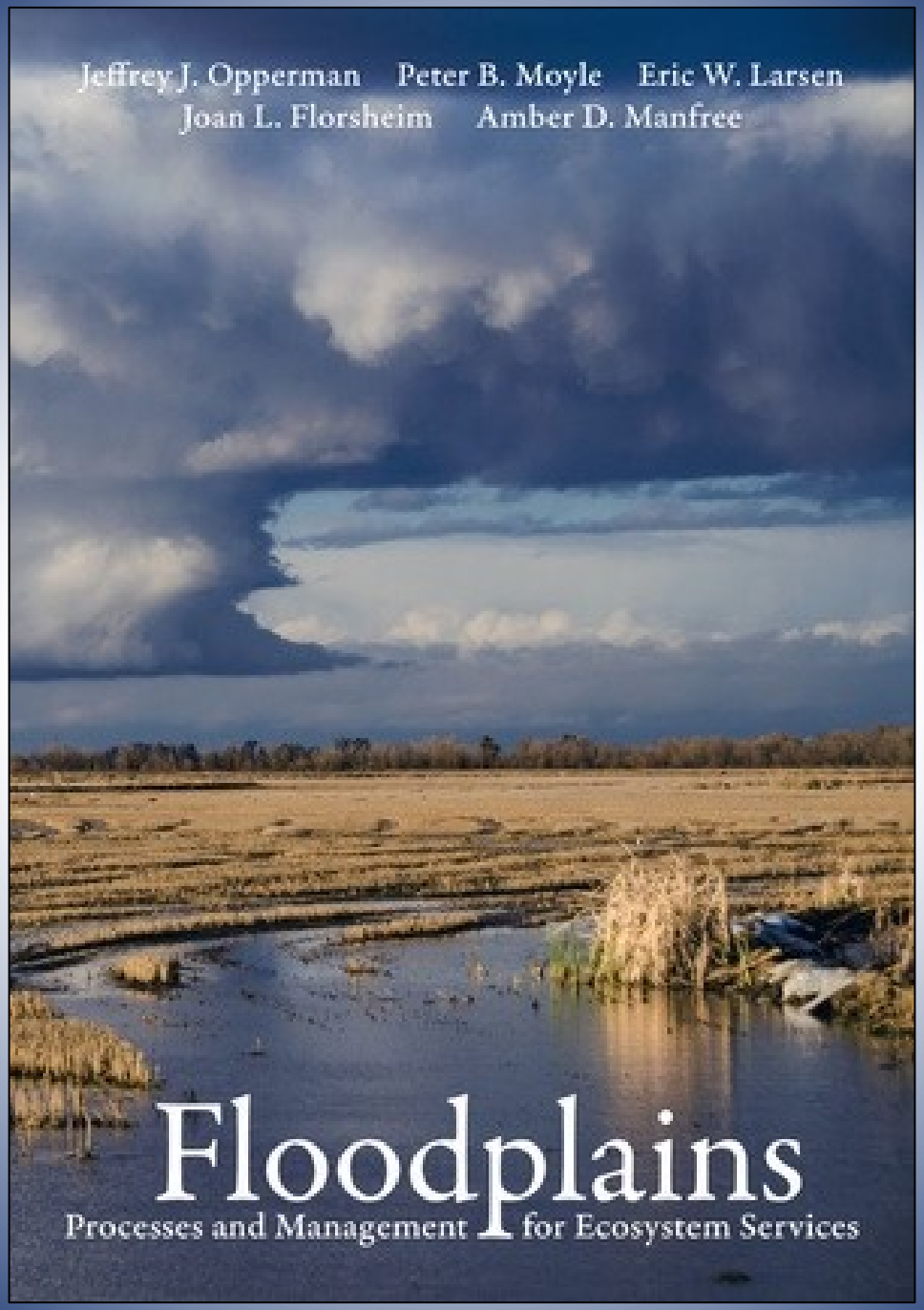
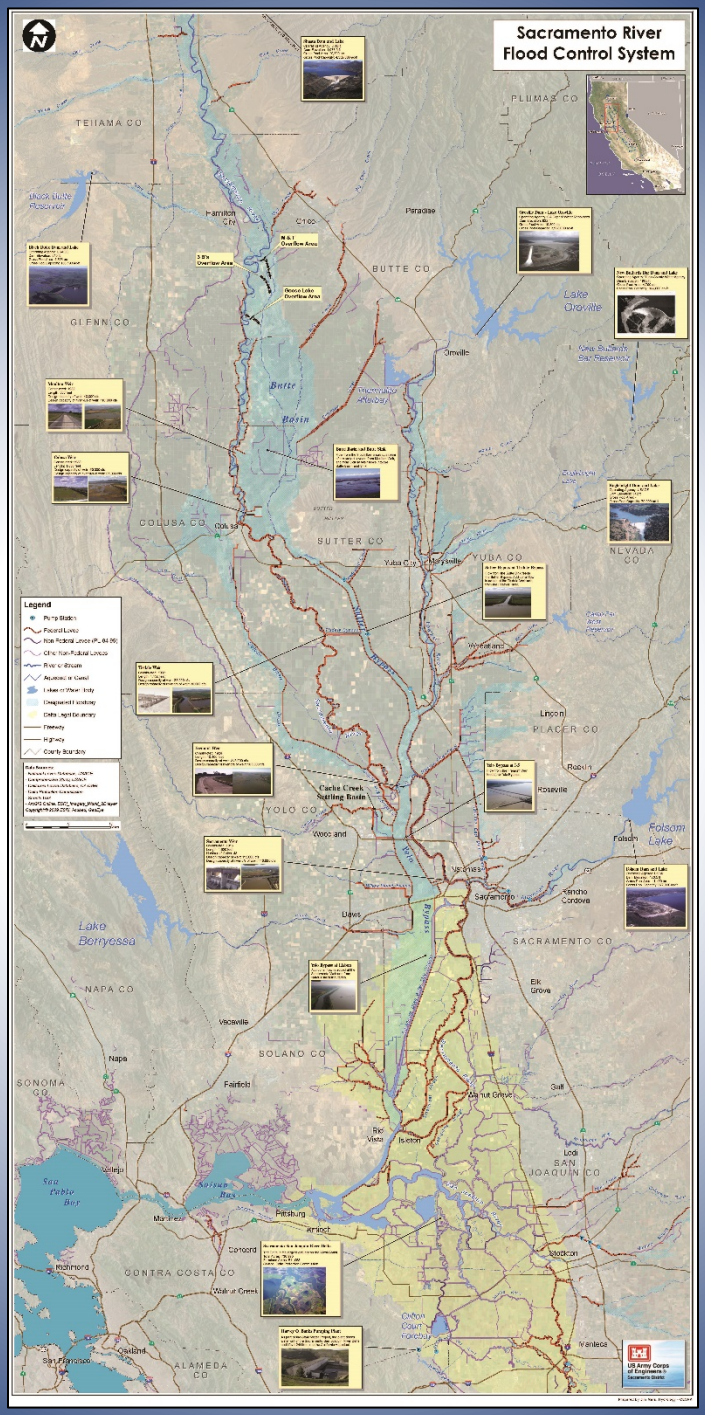
Innovative farm and land management practices contribute to the local economy, the environment and communities. Building adequate soil organic matter leads to improvements in soil structure, stability, and increased moisture and nutrient holding capacity for plant growth and reduced greenhouse gas emissions.

Safe Drinking Water

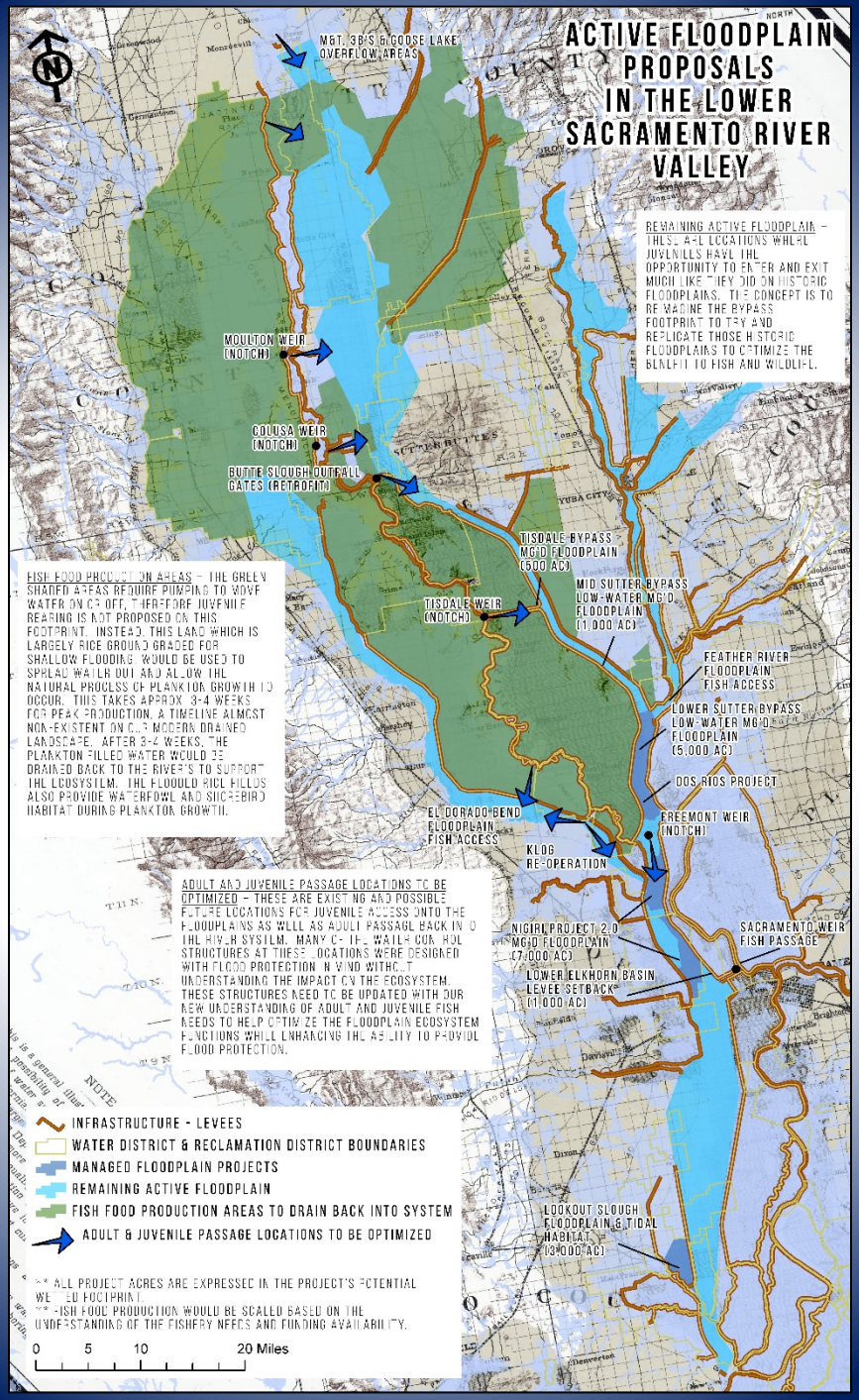
Successful implementation of sustainable drinking water solutions for local communities is essential to ensure access to safe, clean and affordable drinking water for all Californians.


Jeffrey J. Opperman
Peter B. Moyle
Eric W. Larsen
Joan L. Florsheim
Amber D. Manfree
Floodplains
Processes and Management for Ecosystem Services


Sacramento River
Flood Control System
TEHAMA CO
PLUMAS CO
BUTTE CO
GLENN CO
COLUSA CO
SUTTER CO
YUBA CO
NEVADA CO
PLACER CO
YOLO CO
SACRAMENTO CO
NAPA CO
SOLANO CO
SONOMA CO
CONTRA COSTA CO
ALAMEDA CO
SAN JOAQUIN CO
Lake Oroville
Lake Berryessa
Folsom Lake
Oroville
Yuba City
Marysville
Woodland
Davis
Vacaville
Fairfield
Napa
Sacramento
Elk Grove
Rancho Cordova
Roseville
Lincoln
Folsom
Isleton
Antioch
Concord
Richmond
Oakland
San Francisco
Stockton
Lodi
Tracy
Legend
US Army Corps of Engineers
Sacramento District

Reactivating Floodplains in the Sacramento River Basin

How working lands on both sides of the levees are aiding fish and wildlife.

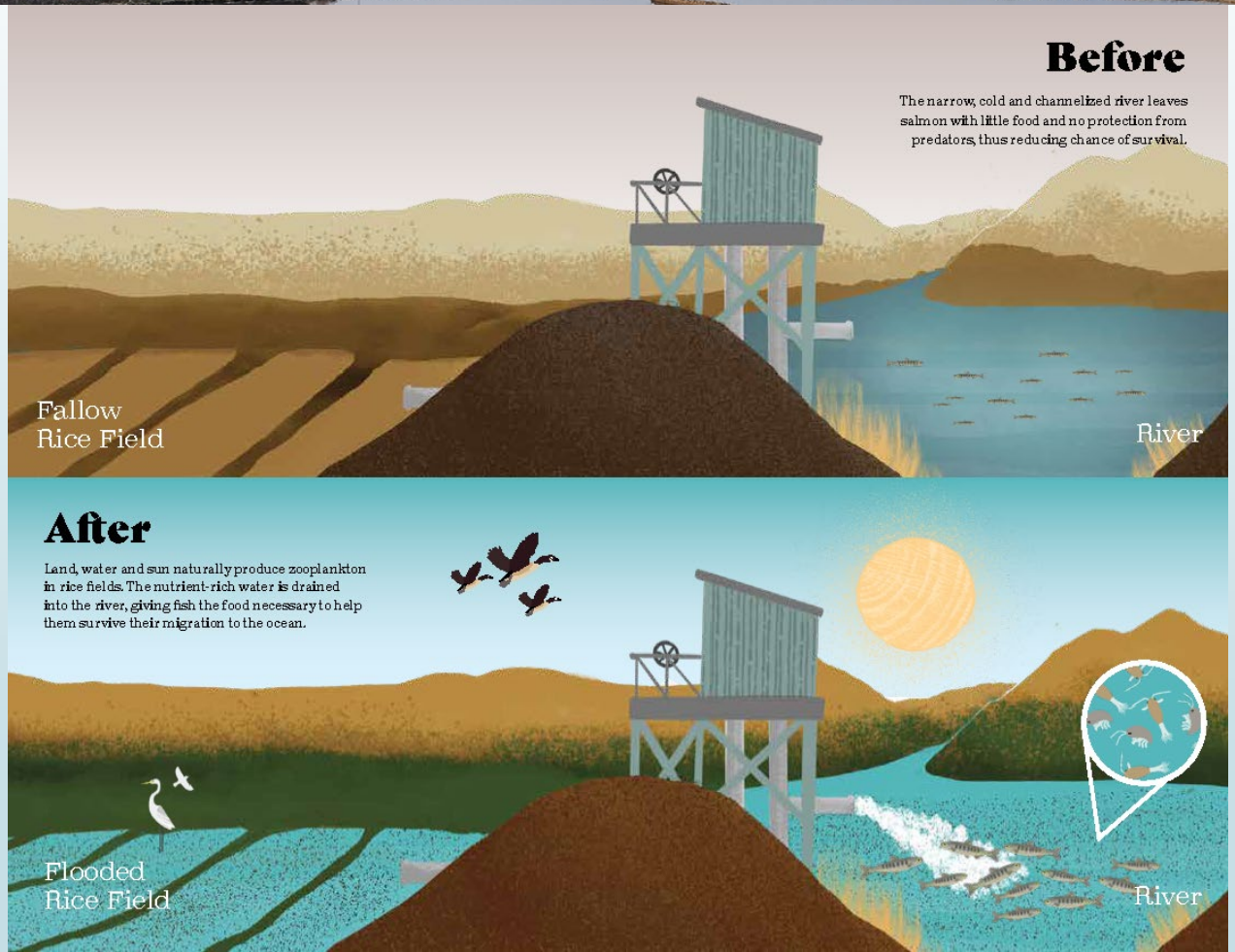

ACTIVE FLOODPLAIN PROPOSALS IN THE LOWER SACRAMENTO RIVER VALLEY
M&T, 3B'S & GOOSE LAKE OVERFLOW AREAS
MOULTON WEIR (NOTCH)
COLUSA WEIR (NOTCH)
BUTTE SLOUGH OUTFALL GATES (RETROFIT)
TISDALE BYPASS MG&D FLOODPLAIN (500 AC)
TISDALE WEIR (NOTCH)
MID SUTTER BYPASS LOW-WATER MG&D FLOODPLAIN (1,000 AC)
FEATHER RIVER FLOODPLAIN FISH ACCESS
LOWER SUTTER BYPASS LOW-WATER MG&D FLOODPLAIN (5,000 AC)
DOS RIOS PROJECT
FREEMONT WEIR (NOTCH)
EL DORADO BEND FLOODPLAIN FISH ACCESS
KLOG RE-OPERATION
NICOLL PROJECT 2.0 MG&D FLOODPLAIN (7,000 AC)
LOWER ELKHORN BASIN LEVEE SETBACK (1,000 AC)
SACRAMENTO WEIR FISH PASSAGE
LOOKOUT SLOUGH FLOODPLAIN & TIDAL HABITAT (3,000 AC)
REMAINING ACTIVE FLOODPLAIN – THESE ARE LOCATIONS WHERE JUVENILLS HAVE THE OPPORTUNITY TO ENTER AND EXIT MUCH LIKE THEY DID ON HISTORIC FLOODPLAINS. THE CONCEPT IS TO RE-IMAGINE THE BYPASS FOOTPRINT TO TRY AND REPLICATE THOSE HISTORIC FLOODPLAINS TO OPTIMIZE THE BENEFIT TO FISH AND WILDLIFE.
FISH FOOD PRODUCTION AREAS – THE GREEN SHADED AREAS REQUIRE PUMPING TO MOVE WATER ON OR OFF, THEREFORE JUVENILE REARING IS NOT PROPOSED ON THIS FOOTPRINT. INSTEAD, THIS LAND WHICH IS LARGELY RICE GROUND GRADED FOR SHALLOW FLOODING, WOULD BE USED TO SPREAD WATER OUT AND ALLOW THE NATURAL PROCESS OF PLANKTON GROWTH TO OCCUR. THIS TAKES APPROX. 3-4 WEEKS FOR PEAK PRODUCTION. A TIMELINE ALMOST NON-EXISTENT ON OUR MODERN DRAINED LANDSCAPE. AFTER 3-4 WEEKS, THE PLANKTON FILLED WATER WOULD BE DRAINED BACK TO THE RIVER'S TO SUPPORT THE ECOSYSTEM. THE FLOODED RICE FIELDS ALSO PROVIDE WATERFOWL AND SHOREBIRD HABITAT DURING PLANKTON GROWTH.
ADULT AND JUVENILE PASSAGE LOCATIONS TO BE OPTIMIZED – THESE ARE EXISTING AND POSSIBLE FUTURE LOCATIONS FOR JUVENILE ACCESS ONTO THE FLOODPLAINS AS WELL AS ADULT PASSAGE BACK IN TO THE RIVER SYSTEM. MANY OF THE WATER CONTROL STRUCTURES AT THESE LOCATIONS WERE DESIGNED WITH FLOOD PROTECTION IN MIND WITHOUT UNDERSTANDING THE IMPACT ON THE ECOSYSTEM. THESE STRUCTURES NEED TO BE UPDATED WITH OUR NEW UNDERSTANDING OF ADULT AND JUVENILE FISH NEEDS TO HELP OPTIMIZE THE FLOODPLAIN ECOSYSTEM FUNCTIONS WHILE ENHANCING THE ABILITY TO PROVIDE FLOOD PROTECTION.
INFRASTRUCTURE - LEVEES
WATER DISTRICT & RECLAMATION DISTRICT BOUNDARIES
MANAGED FLOODPLAIN PROJECTS
REMAINING ACTIVE FLOODPLAIN
FISH FOOD PRODUCTION AREAS TO DRAIN BACK INTO SYSTEM
ADULT & JUVENILE PASSAGE LOCATIONS TO BE OPTIMIZED
** ALL PROJECT ACRES ARE EXPRESSED IN THE PROJECT'S POTENTIAL WETTED FOOTPRINT.
** FISH FOOD PRODUCTION WOULD BE SCALED BASED ON THE UNDERSTANDING OF THE FISHERY NEEDS AND FUNDING AVAILABILITY.
0 5 10 20 Miles

Bypasses and Fish Habitat

Boosting imperiled salmon populations by reimagining how we manage our bypasses year-round

Collaborative efforts among farmers, conservationists, universities, and state and federal agencies are proving that by reactivating our historic floodplains and using our bypasses during key times of the year, we can create high-quality habitat **that produces up to 149 times more food for salmon than the river.** This leads to salmon growing five to twelve times faster, thus increasing their chance of survival on their journey to

Fish Food on Floodplain Farm Fields



Reactivating our Floodplains – A New Way Forward for California

The Nigiri Project
CAL MARSH & FARM VENTURES

Conaway
PRESERVATION GROUP

LUNDBERG
FAMILY FARMS

MONTNA
FARMS

DAVIS RANCHES
SYCAMORE · CALIFORNIA

River Garden Farms

Llano Seco
EST. 1861
CHICO, CA

RECLAMATION DISTRICT
108

DUCKS UNLIMITED

UCDAVIS
CENTER FOR WATERSHED SCIENCES

American Rivers
Rivers Connect Us

Sacramento
River
Forum

CALIFORNIA TROUT
FISH · WATER · PEOPLE

The Nature
Conservancy
Protecting nature. Preserving life.

Point Blue
Conservation science
for a healthy planet.

RIVER
PARTNERS

Sustainable Conservation

TROUT
UNLIMITED

EDF
ENVIRONMENTAL
DEFENSE FUND

NCWA
Northern California Water Association

RECLAMATION DISTRICT NO. 1500
AUGUST 10
SUTTER COUNTY, CA

RCRC

Audubon
CALIFORNIA

California Rice

CALIFORNIA
WATERFOWL

The Floodplain Forward Coalition

1.2021

May 4, 2021

The Honorable Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, DC 20510

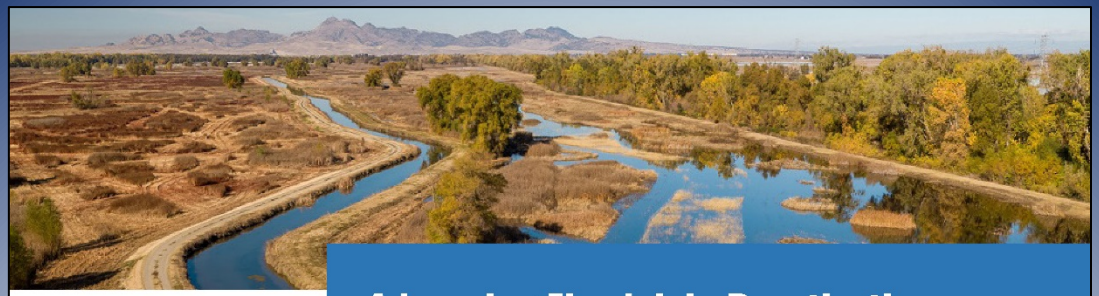
Dear Senator Feinstein:

On behalf of the Floodplain Forward Coalition, we are writing to request your support for a Congressionally Directed Spending allocation in the Fiscal Year 2022 appropriations process to help advance initiatives to reactivate the floodplain in California's Sacramento Valley, which will result in multiple benefits for the region and the State of California.

Investing in Multiple Benefits through Nature-Based Solutions

May 2021

On behalf of the Floodplain Forward Coalition, we urge the Legislature to robustly fund floodplain reactivation and priority projects that address the needs of fish and wildlife as well as water resiliency for California's communities and economy by including in the state's fiscal year 2021-22 budget the "Nature Based Solutions" provisions of Governor Newsom's $5.1 billion Water Resilience and Drought Package and the Senate's "Budget Plan on Drought, Safe Drinking Water, Water Supply Reliability, and Ratepayer Assistance" and "Climate Resilience Package." Our specific funding requests are detailed below.



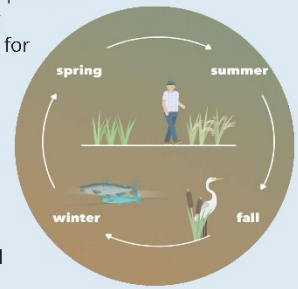
Advancing Floodplain Reactivation in the Sacramento River Basin

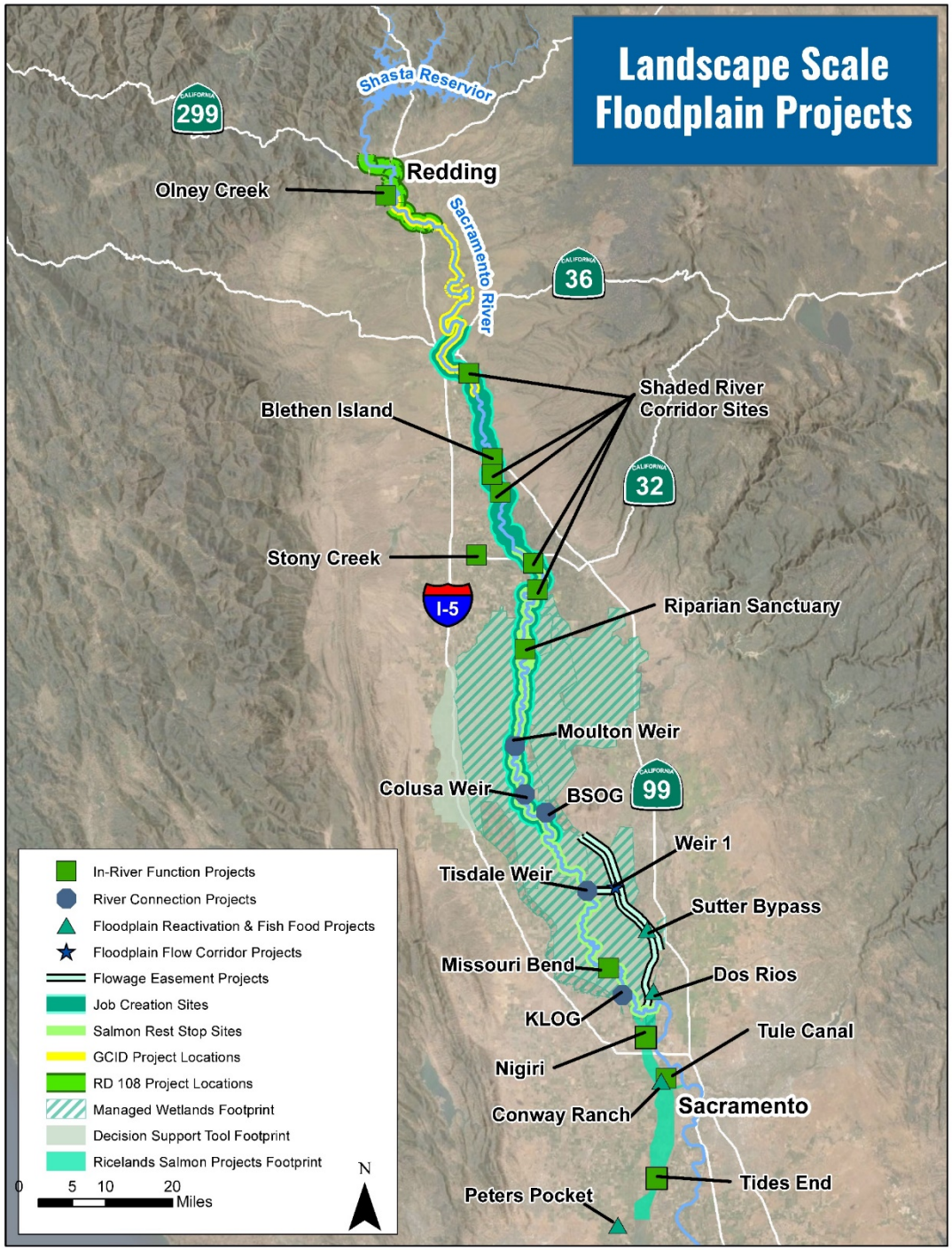
A Portfolio for Fish and Wildlife

Our respective organizations, the *Floodplain Forward Coalition*, are very excited to work with you and our various partners in our collective efforts to reactivate the floodplain in California's Sacramento River Basin, which will result in multiple benefits for the region and the State of California. The *Floodplain Forward* leaders have proposed the following portfolio of projects, which together will help reactivate our floodplains for the benefit of fish, wildlife and people.

Reactivating the Floodplain.

We are all very excited that farmland (primarily ricelands), wildlife refuges, private wetlands (primarily duck hunting lands), the rivers, and flood bypasses can be managed together in innovative ways to mimic the historic floodplains of the Sacramento River Basin to recreate a dynamic fisheries and wildlife conservation landscape that continues to provide flood protection for Sacramento, rural communities and nearby lands. Spreading out and slowing down water moving across this landscape is a nature-based, natural infrastructure solution that mimics natural floodplain processes and provides multiple benefits year-round by allowing farmers to cultivate rice and other crops for humans during the spring and summer, provide food and habitat for a diversity of migratory birds and other wetland-dependent wildlife in the fall and winter; and food for juvenile native fish species in the winter. This holistic water management can bring our ecosystem and farmlands to life through the careful interaction of water, sun and land.




Landscape Scale Floodplain Projects
Shasta Reservior
299
Redding
Olney Creek
Sacramento River
36
Shaded River Corridor Sites
Blethen Island
32
Stony Creek
I-5
Riparian Sanctuary
Moulton Weir
Colusa Weir
BSOG
99
Weir 1
Tisdale Weir
Sutter Bypass
Missouri Bend
Dos Rios
KLOG
Tule Canal
Nigiri
Conway Ranch
Sacramento
Tides End
Peters Pocket
In-River Function Projects
River Connection Projects
Floodplain Reactivation & Fish Food Projects
Floodplain Flow Corridor Projects
Flowage Easement Projects
Job Creation Sites
Salmon Rest Stop Sites
GCID Project Locations
RD 108 Project Locations
Managed Wetlands Footprint
Decision Support Tool Footprint
Ricelands Salmon Projects Footprint
0 5 10 20
Miles
N

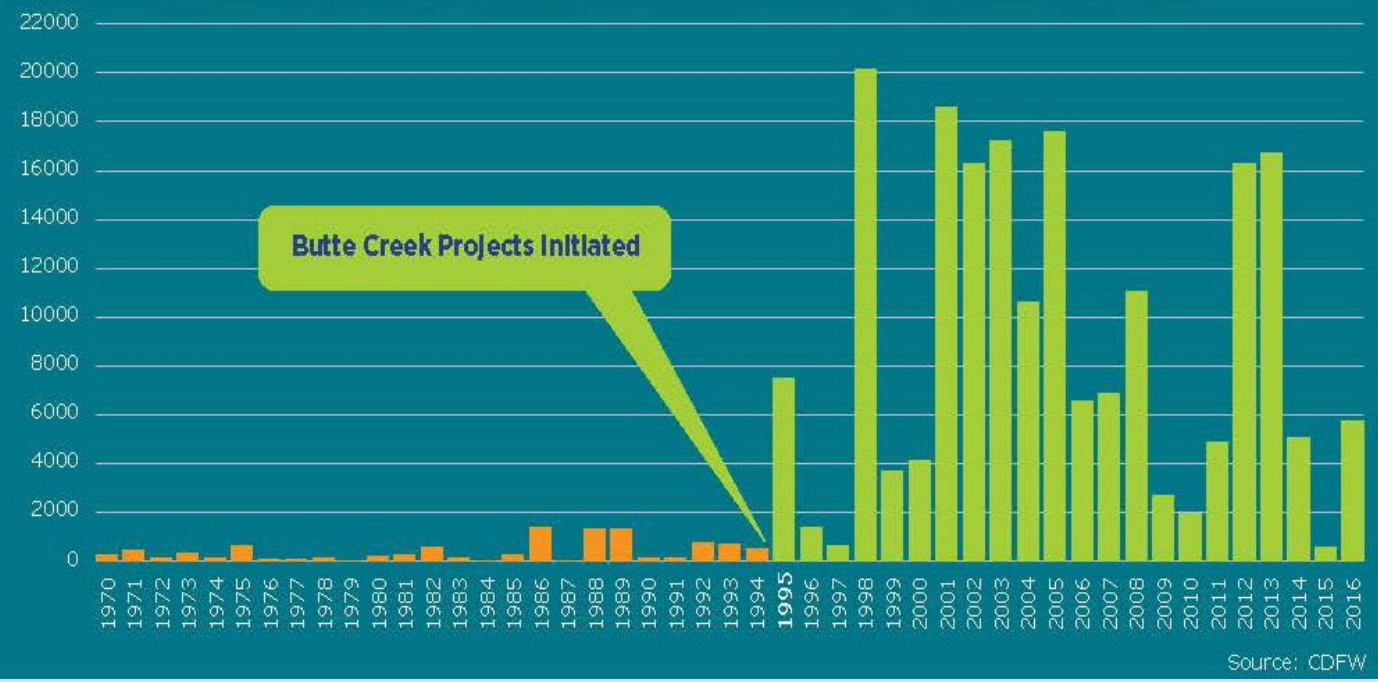
What Have We Learned About Fish and Wildlife?

Waterfowl and the Pacific Flyway

BUTTE CREEK SALMON RECOVERY

A Lesson in Functional Flows

BUTTE CREEK SPRING-RUN CHINOOK SALMON POPULATION ESTIMATES



Western Canal Water District

GORRILL RANCH
DURHAM, CA
Est. 1918

NCWA
Northern California Water Association

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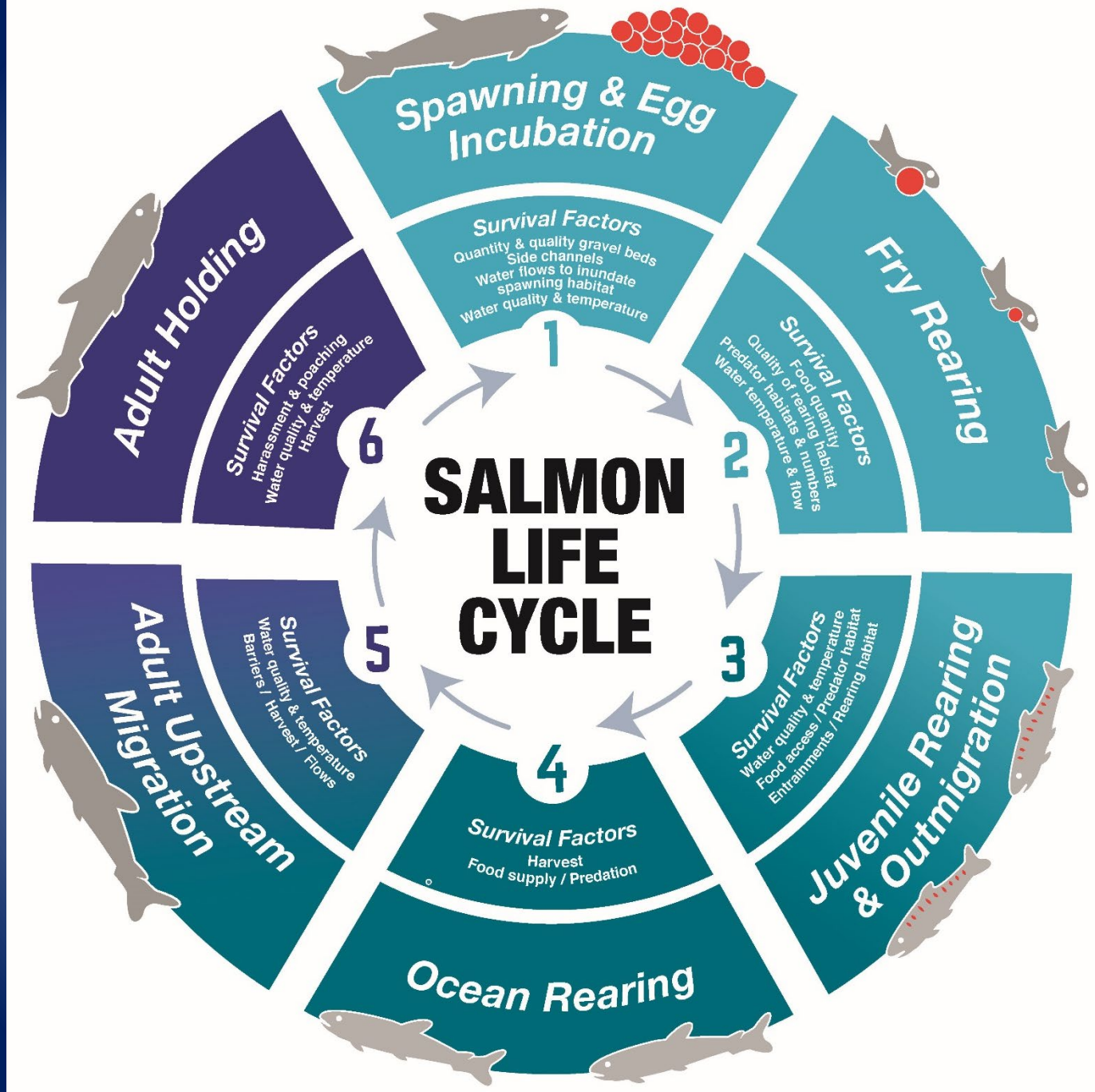
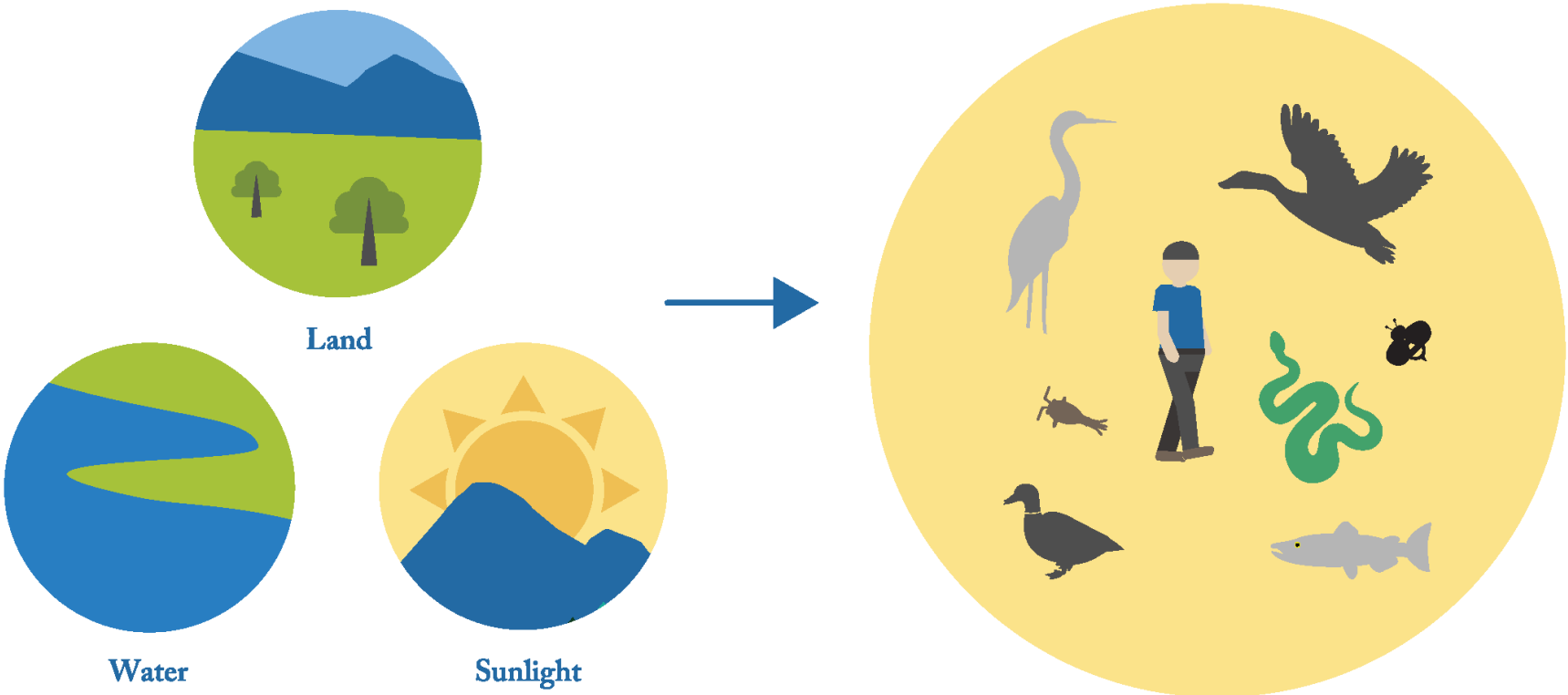

SALMON LIFE CYCLE
1
Spawning & Egg Incubation
Survival Factors
Quantity & quality gravel beds
Side channels
Water flows to inundate spawning habitat
Water quality & temperature
2
Fry Rearing
Survival Factors
Food quantity
Quality of rearing habitat
Predator habitats & numbers
Water temperature & flow
3
Juvenile Rearing & Outmigration
Survival Factors
Water quality & temperature
Food access / Predator habitat
Entrainments / Rearing habitat
4
Ocean Rearing
Survival Factors
Harvest
Food supply / Predation
5
Adult Upstream Migration
Survival Factors
Water quality & temperature
Barriers / Harvest / Flows
6
Adult Holding
Survival Factors
Harassment & poaching
Water quality & temperature
Harvest

Three Ingredients to a Bountiful Life:

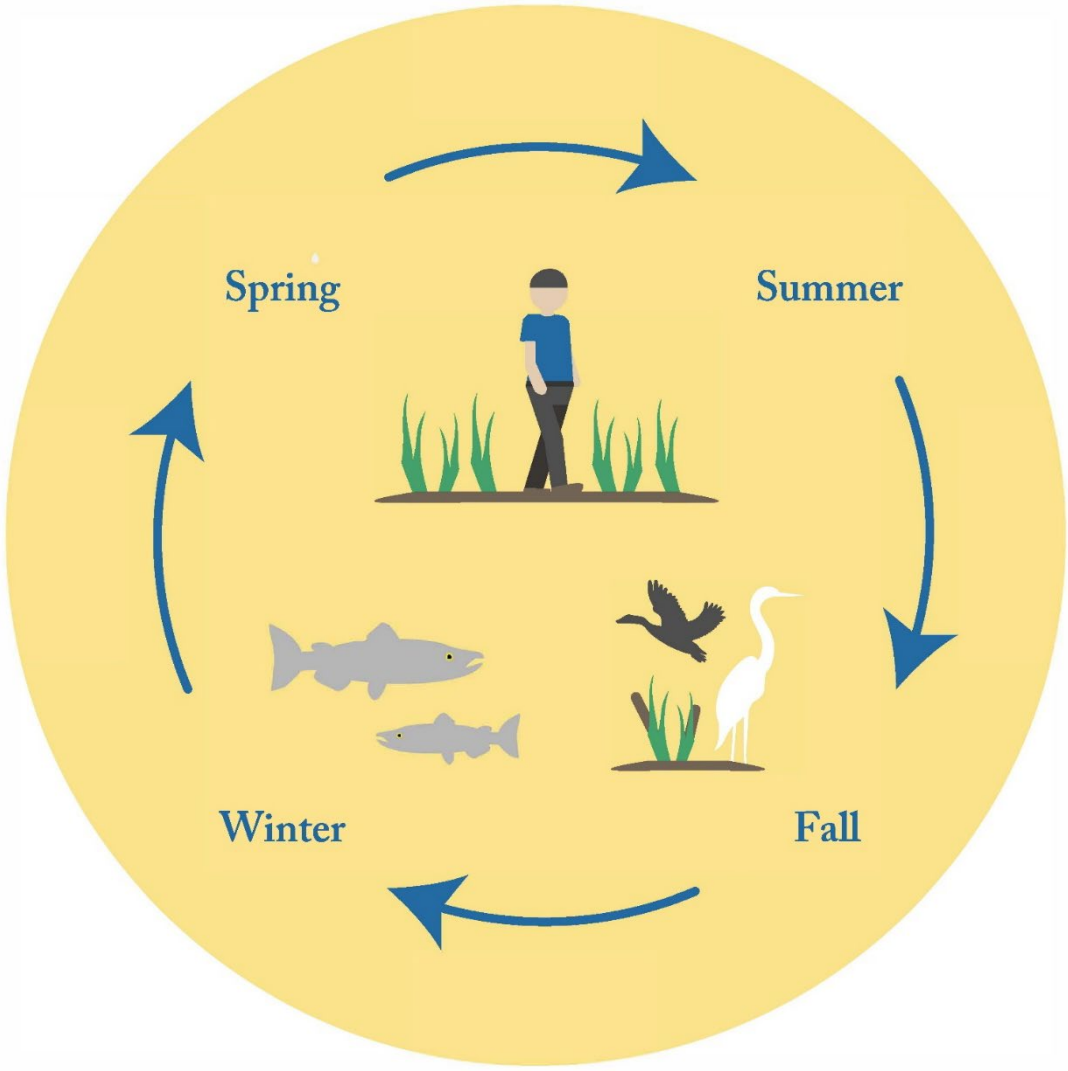
Marrying Land, Sunlight and Water



The combination of water, land and sunlight has proven throughout time to be the equation for proper life support and healthy population numbers for all species. The Sacramento Valley landscape is a perfect testament to what is possible when all three work in harmony.

Serving Multiple Benefits Year Round

We Can Support People, Fish, Birds and Wildlife Through Science-Based Management Practices.



Farming and Conservation

NCWA
Northern California Water Association

How Leading Landowners are using Scientific Solutions for Fish and Wildlife Management

LUNDBERG FAMILY FARMS · Conaway PRESERVATION GROUP · MONTNA FARMS · River Garden Farms · 100 GORRILL RANCH · The Nigiri Project · California Rice

"Projects like Butte Creek remain dear to our family's hearts. To see the rebound in the salmon population showcases what is possible when we all come together."

— Corrie Davis
Gorrill Ranch

"By flooding the fields, farmers across the valley floor are able to recreate a historic wetland habitat. The reemergence of the great Pacific Flyway demonstrates what is possible for all species."

— Bryce Lundberg
Lundberg Family Farms

"There were those who said we'd have to choose farmers over conservation or vice versa. We've had the opportunity to showcase that we could use our water to grow rice and benefit wildlife the year-round."

— Mary Wells
Land owner in Williams and Maxwell

"We can't wait around to see the extinction of native species. We need diverse habitat and farm fields in the valley can now provide the floodplains these birds, fish and insects need to thrive."

— Fritz Durst
Tule Farms

"We believe we can play an important role in helping salmon in various times of their lifecycle. All it takes is collaboration instead of infighting, and it is through focused coalitions that we can truly make a difference."

— Roger Cornwell
River Garden Farms

Discover true and unique stories of conservation at **norcalwater.org/stories**

NCWA

"Water, food and land are the three main ingredients that boost bird populations, and farm fields can ensure bird species continue to thrive."

— **Meghan Hertel**, *California Audubon*

"By integrating a working knowledge of natural process into the management of natural resources like rivers and farm land, we are demonstrating that it is possible to balance the needs of people and wildlife, even in the middle of one of the world's most productive agricultural landscapes."

— **Jacob Katz,** *California Trout*

"Figuring out smart ways to create functional habitat on working lands that result in measurable benefits for wildlife is key to developing resilient river systems that also meet human needs for drinking water and irrigation."

— **Ann Hayden,** *Environmental Defense Fund*

"We are heavily reliant on agricultural lands for waterfowl habitat, which means it is more critical than ever that we work in partnership with farmers to ensure a balance for crops and wildlife."

— **Virginia Getz,** *Ducks Unlimited*

"Through the SLEWS program, farmers get to see their land and resources used in a way that benefits their lands and native wildlife. It's a win-win."

— **Mary Kimball,** *Center for Land-Based Learning*

"If we can demonstrate strong collaboration and show the results of successful projects, we can enact change across the entire state."

— **Julie Rentner,** *River Partners*

"When we work together with farmers, ranchers and other local interests to find a common vision, we can achieve incredible results."

— **Amy Merrill,** *American Rivers*

"Recent scientific discoveries have created exciting opportunities to integrate agricultural water supplies with waterfowl habitat and fish needs."

— **Jeff Volberg,** *California Waterfowl*

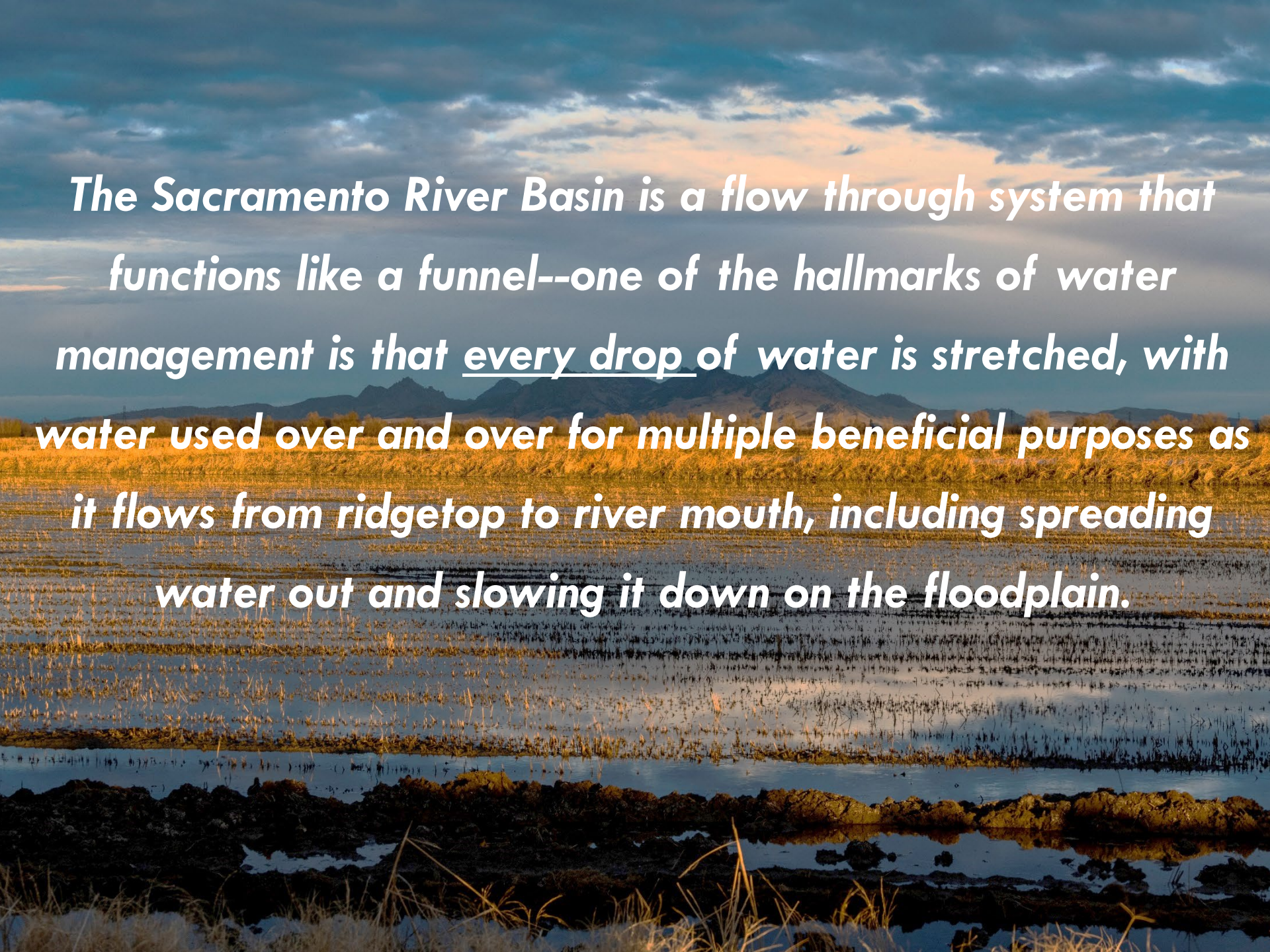
Discover true and unique stories of conservation at **norcalwater.org/stories**

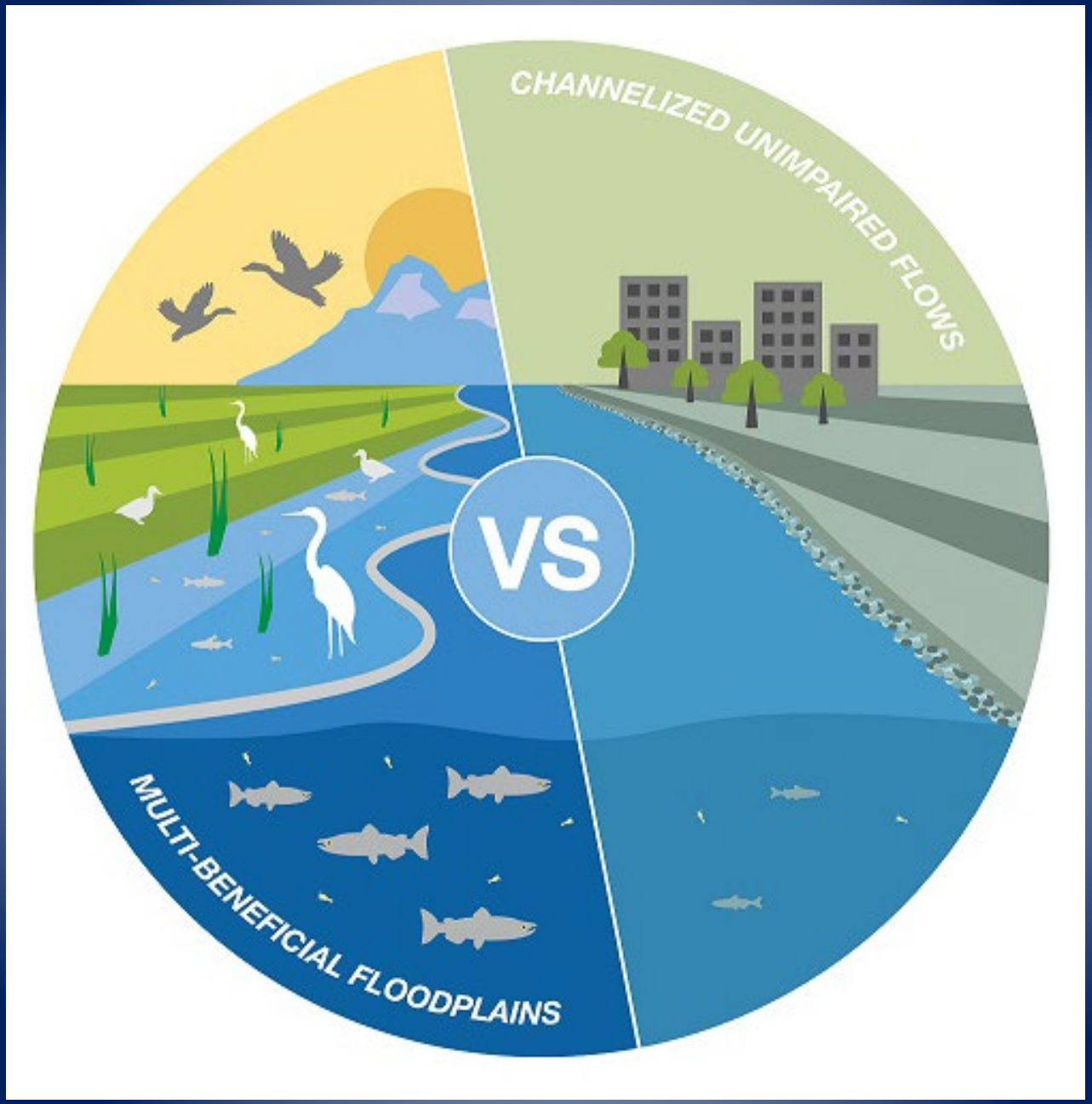
NCWA

Nature-Based Solutions: Enlisting Natural and Working Lands in the Sacramento River Basin in the Fight against Climate Change

May 2021

Water resources managers in the Sacramento River Basin are engaged in a comprehensive effort to help manage the regions' water and land resources from the ridgetop all the way down the watershed to the river mouth using nature-based solutions that provide multiple benefits and water supply reliability for cities, farms, fish, birds and other wildlife, hydropower production, and recreation. These efforts will help protect and restore our biodiversity through forest management, floodplain reactivation, sustainable groundwater

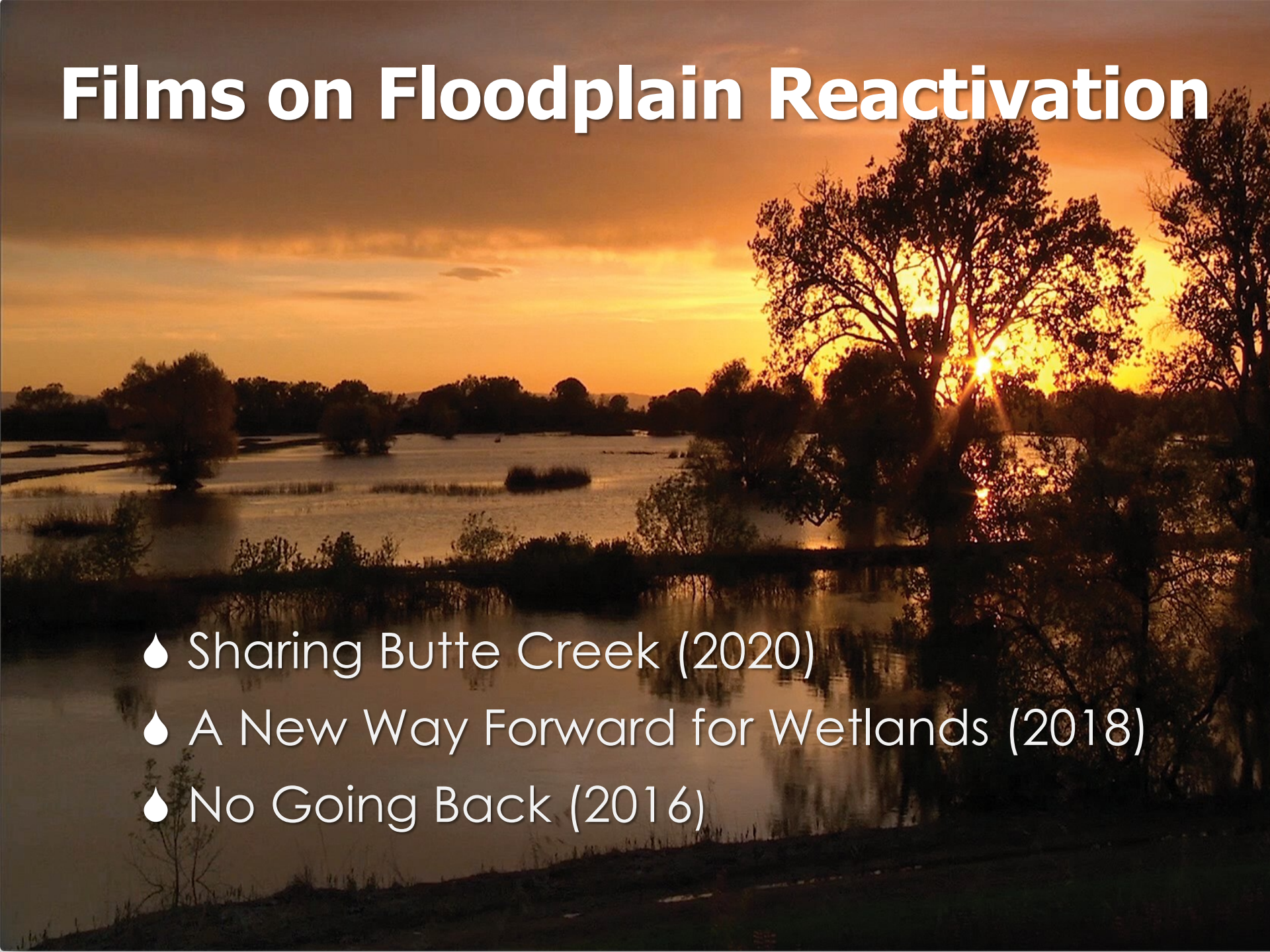

The Sacramento River Basin is a flow through system that functions like a funnel--one of the hallmarks of water management is that every drop of water is stretched, with water used over and over for multiple beneficial purposes as it flows from ridgetop to river mouth, including spreading water out and slowing it down on the floodplain.


CHANNELIZED UNIMPAIRED FLOWS
VS
MULTI-BENEFICIAL FLOODPLAINS

Same Water. Better Results

Putting water on the historical floodplain and allowing fish and birds more residence time on these lands improves their health and chances of survival. With more access to food and rearing habitat, native and migrating bird populations have soared in the past several decades. In addition, recent studies reveal juvenile salmon that feed on the floodplains are stronger and healthier when they are ready to migrate, thus improving their chances of reaching the Pacific Ocean.

Films on Floodplain Reactivation



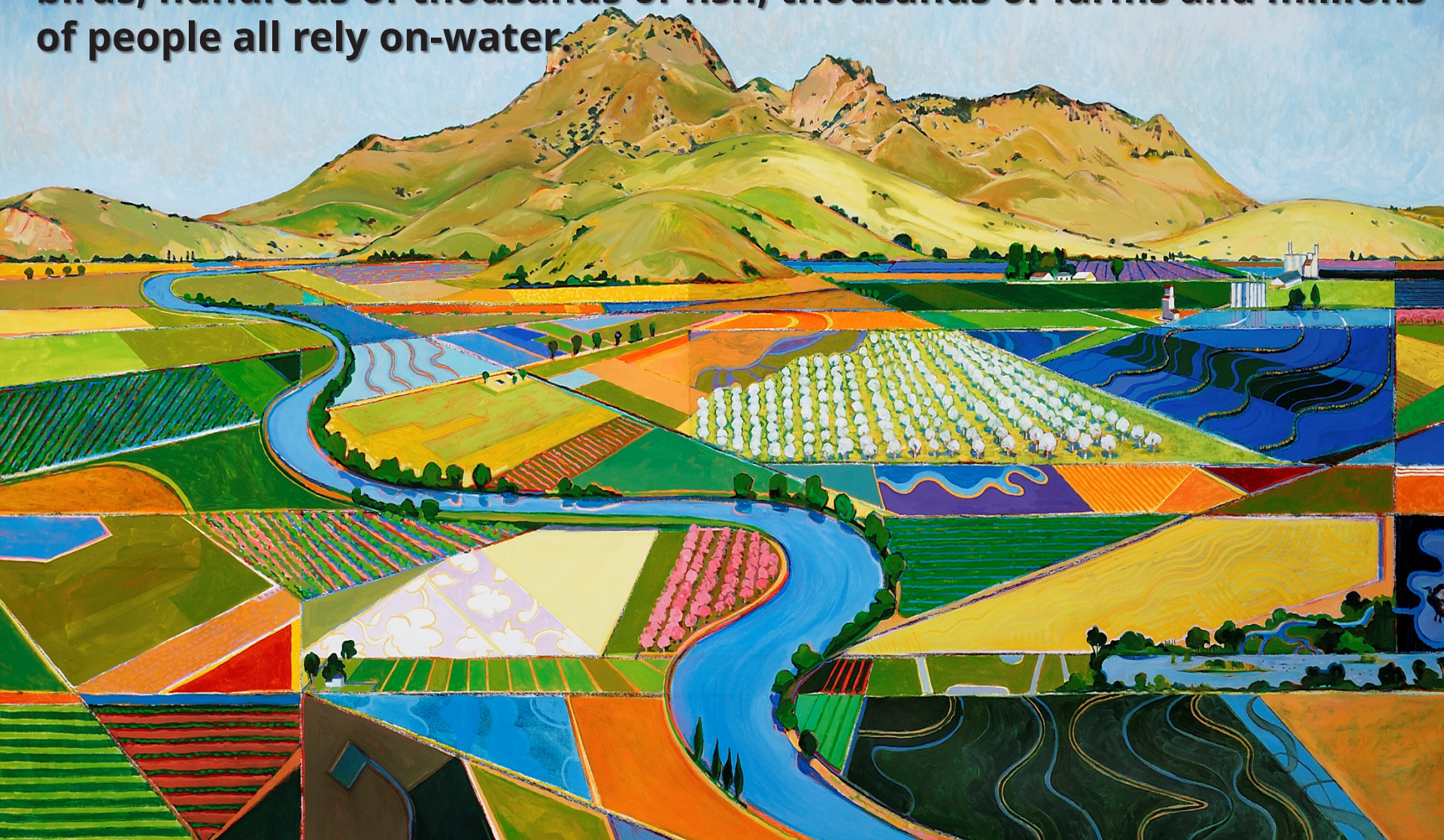
- Sharing Butte Creek (2020)
- A New Way Forward for Wetlands (2018)
- No Going Back (2016)

Like a human fingerprint, California's Sacramento Valley is truly unique. Nourishment and sustenance from the fields, habitats for fish and wildlife, recreation and an exceptionally high quality of life—the Sacramento Valley is home to all of this, and more. Only through the careful management of the region's water resources will the Sacramento Valley be able to continue to provide what's essential to California's future success and prosperity.

NCWA
Northern California Water Association

#SourcingOurSustainableFuture:

The Sacramento Valley is sourcing our sustainable future through responsible management of the essential resource that millions of birds, hundreds of thousands of fish, thousands of farms and millions of people all rely on-water.



Regulatory and Management Considerations:

risks, benefits, and tools

Evan Sawyer

October 14, 2021

California Central Valley Office of the National Marine Fisheries Service
Presentation to 2021 Floodplain Science & Management Symposium

Overview:

- ❑ Regulatory requirements and limitations
- ❑ Our ESA consultation process
- ❑ How we consider the benefits and minimize the risks
- ❑ How we consider the weight of evidence and uncertainty
- ❑ How we address uncertainty
- ❑ Opportunities for efficient permitting

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Regulatory requirements:

- Endangered Species Act (ESA) mandate:
  - Section 4: Determination of endangered species and threatened species
    - Assessing the status of species and listing species at risk as threatened and endangered
    - Designating Critical Habitat
    - Recovery planning for listed species
  - Section 7: Interagency Cooperation
    - Consulting on Federal Actions
- Magnuson Stevens Fishery Conservation and Management Act requirements too!

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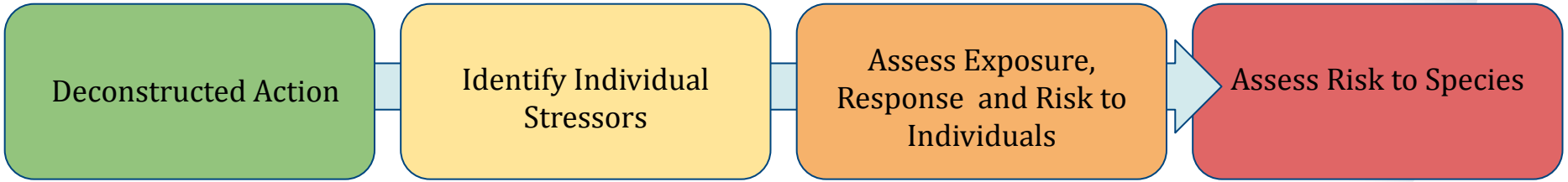
Consultation Process:

Section 7 of the ESA

- Federal Agency Actions and Consultations (16 U.S.C. 1536)
- Key steps in the consultation process:
  - Deconstruct the Action
  - Identify 'Stressors'
  - Assess the Exposure, Response and Risk to Individuals
  - Integration and Synthesis, and Jeopardy analysis



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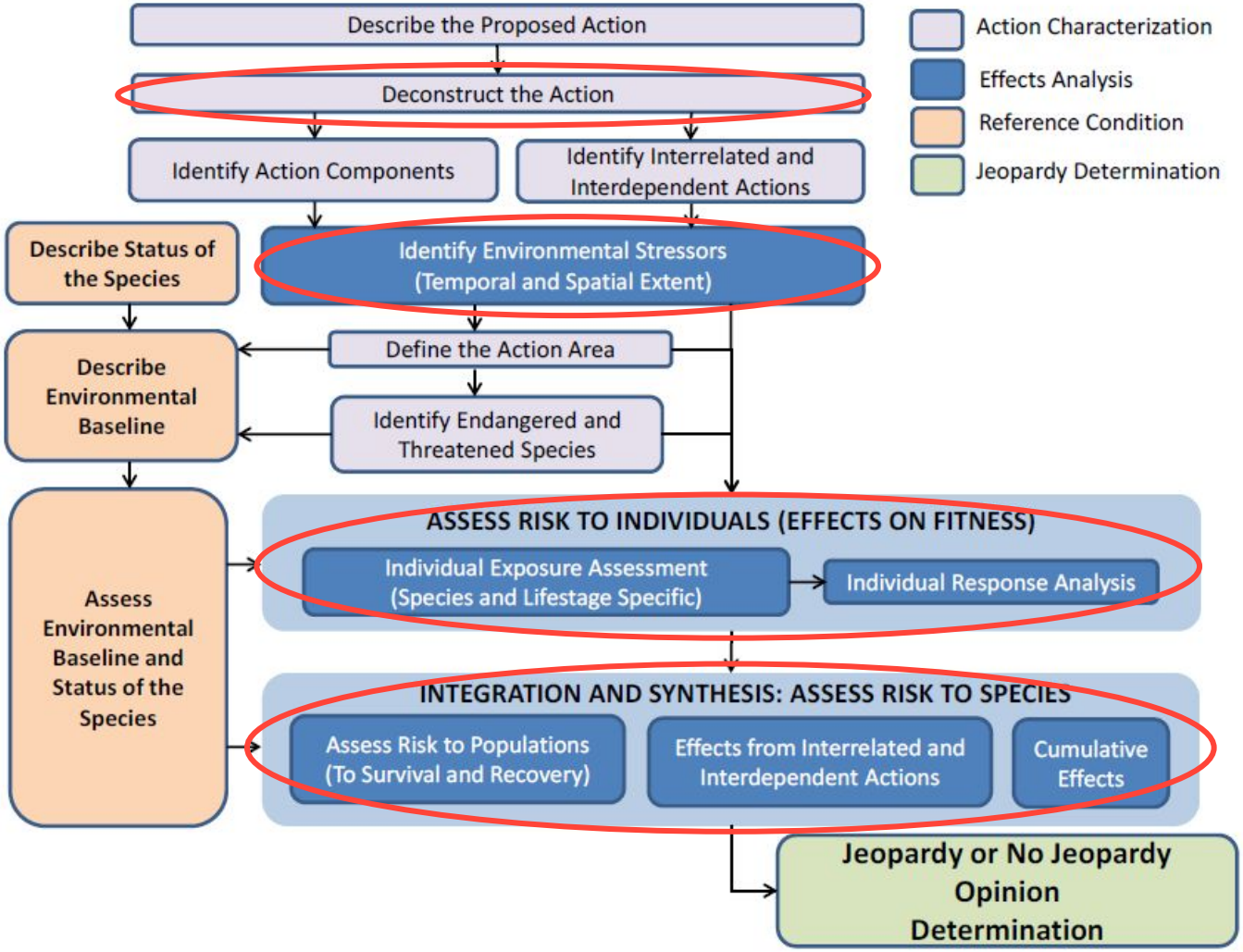

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Acknowledging Uncertainty:

Statutory requirement to use the best scientific and commercial data available in determining the effects of an action.

- Congress' intent [1]
- "Institutionalized Caution"[2]
- VSP Framework (McElhany et al. 2000)

[1] Conner v. Burford, 848 F.2d 1441, 1454 (9th Cir. 1988), referencing H.R. Conf. Rep. No. 96-697, 96th Cong., 1st Sess. 12, reprinted in 1979 U.S. Code Cong. & Admin. News 2572, 2576.

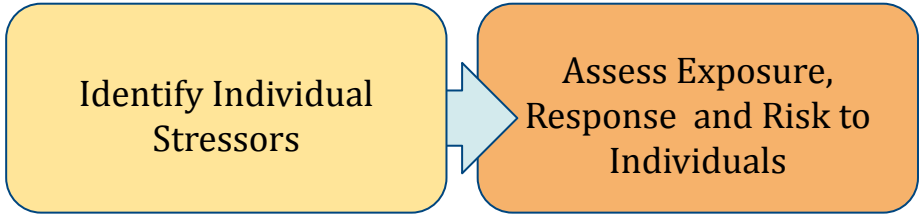
[2] Tennessee Valley Authority v. Hill, 437 U.S. 153, 194 (1978)

Balancing the Risks and Benefits:

NMFS White Paper considerations:

- Considering Beneficial 'Stressors'
  2. Designs should optimize inundation at a range of flow conditions that correlate to juvenile emigration timing.

  4. Innovative approaches that optimize infrastructure should be considered, particularly where landowners require ongoing seasonal agricultural operations to support restoration.



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Fremont Weir Notch Operations from November 1- March 15:

Typical Gate Operations

32 feet of Elevation

- smaller gates remain in last position prior to over toping
- In most instances this will be closed

Ramp Down

- smaller gates remain in last position prior to over topping
- In most instances this will be closed

Elevation Drops below 14 feet

- All gates close

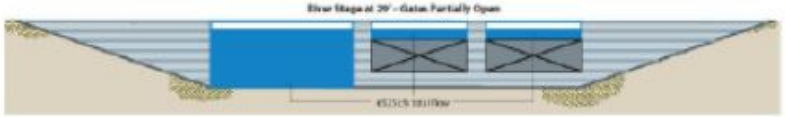
27.5 feet Elevation

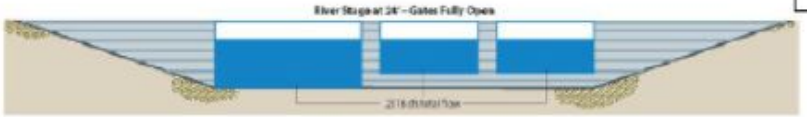
- Flow through the notch reaches 6,000 cfs
- Two smaller gates start to close such that 6,000 cfs will not be exceeded

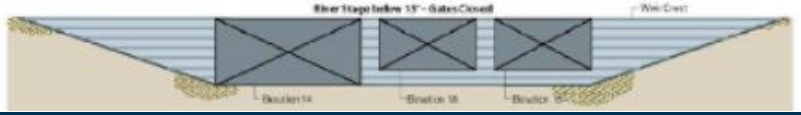
Flow will increase with river elevation until it reaches 6,000cfs

Sacramento River reaches 15 feet in elevation

- all gates open
- roughly 130 cfs enters the gated notch







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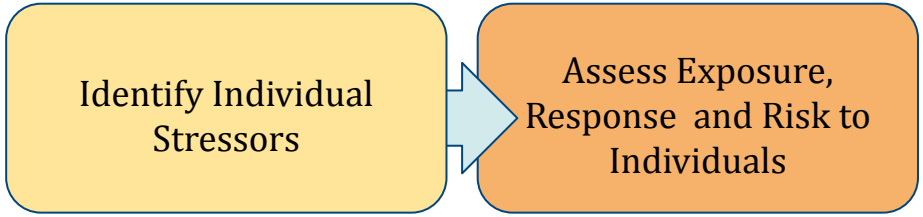
Balancing the Risks and Benefits:

NMFS White Paper considerations:

- Minimizing Adverse 'Stressors'

3. Designs should avoid or minimize the potential for reduced adult fish passage, juvenile isolation and predation.

5. For active management proposals, effects need to be carefully evaluated and minimized through design considerations and monitoring (e.g., stranding potential).



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Balancing the Risks and Benefits:

Potential Floodplain Risk:

- ❑ Juvenile and adult stranding;
- ❑ Predation at structures;
- ❑ Disease susceptibility caused warmer water temperatures; and
- ❑ Unnatural emigration patterns.

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Balancing the Risks and Benefits:

Assessing the Risk to the "Species"

- Stepwise process of a "Jeopardy" analysis:

1. Would exposure to an Action's effects on the environment be sufficient to change the fitness of an individual?

2. Would changes in the fitness of these individuals be sufficient to change the extinction risk of the populations those individuals represent given the population's base condition (i.e. the environmental baseline)?

3. Would changes in the extinction risk of those populations be sufficient to change the extinction risk of the species those populations comprise, given the species' status?

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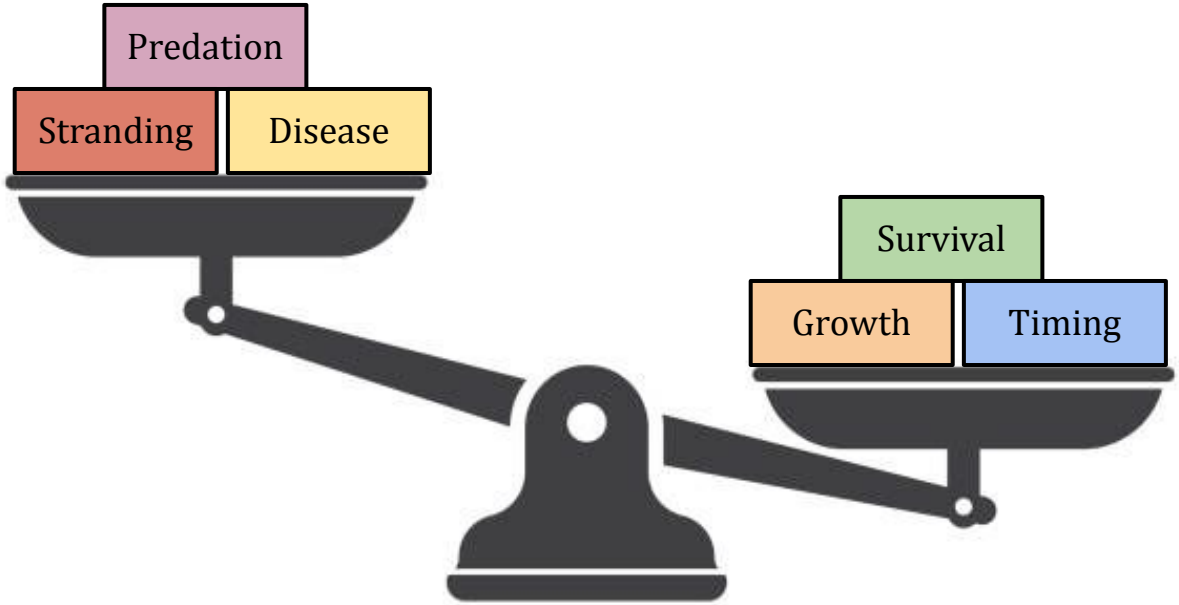
Weight of Evidence:



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Reducing Uncertainty:

NMFS White Paper considerations:

- Dealing with uncertainty,
  1. NMFS prefers passively managed floodplain restoration projects that allow volitional passage, are designed and linked to active water operations, and are based on the best available floodplain restoration science.

  6. Effectiveness monitoring for floodplain restoration projects is especially important, allowing for adaptive management, should significant positive or negative effects occur.

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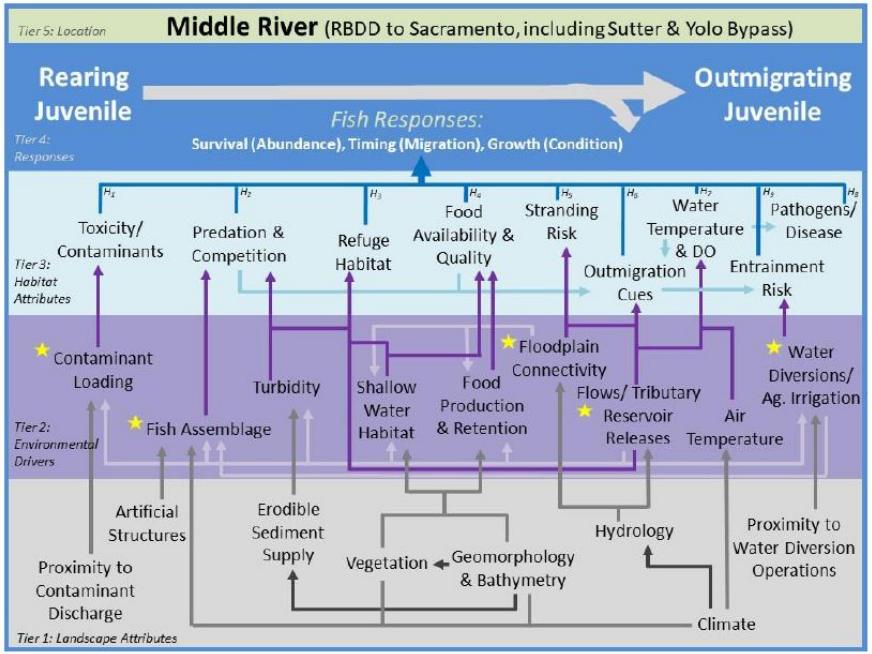
Reducing Uncertainty (cont.):

NMFS White Paper considerations,

7. An adaptive management program should be established that accomplishes the following:



*(Windell et al. 2017)

a. defines measurable criteria,
b. system-wide context,
c. scientific peer review,
d. links actions and monitoring to life cycle models and other decision support tools,
e. address key uncertainties (active AM),
f. responds to program results (passive AM).

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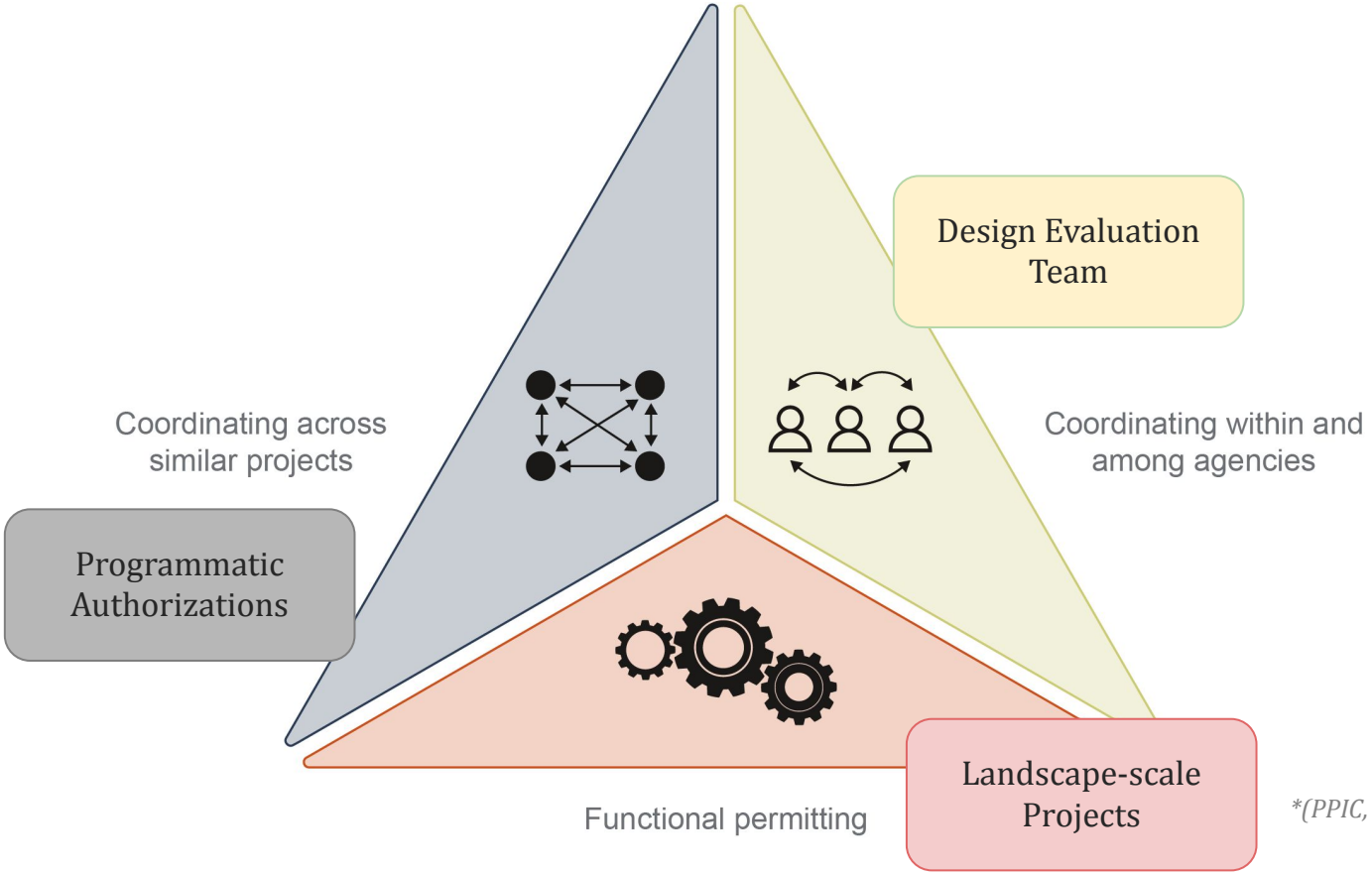
Providing Efficient Permitting:



*(PPIC, Aug 2021)

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Questions?

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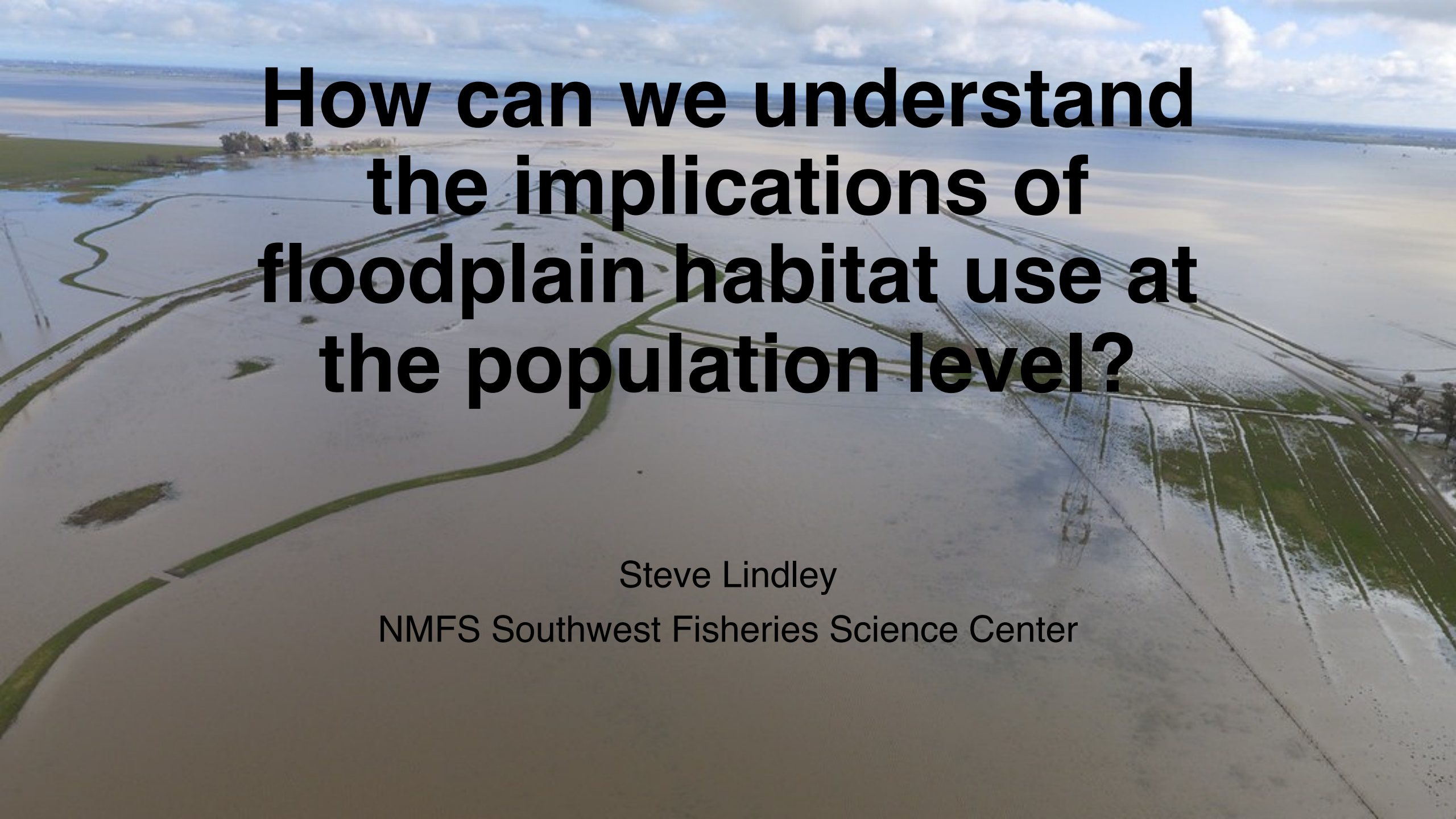
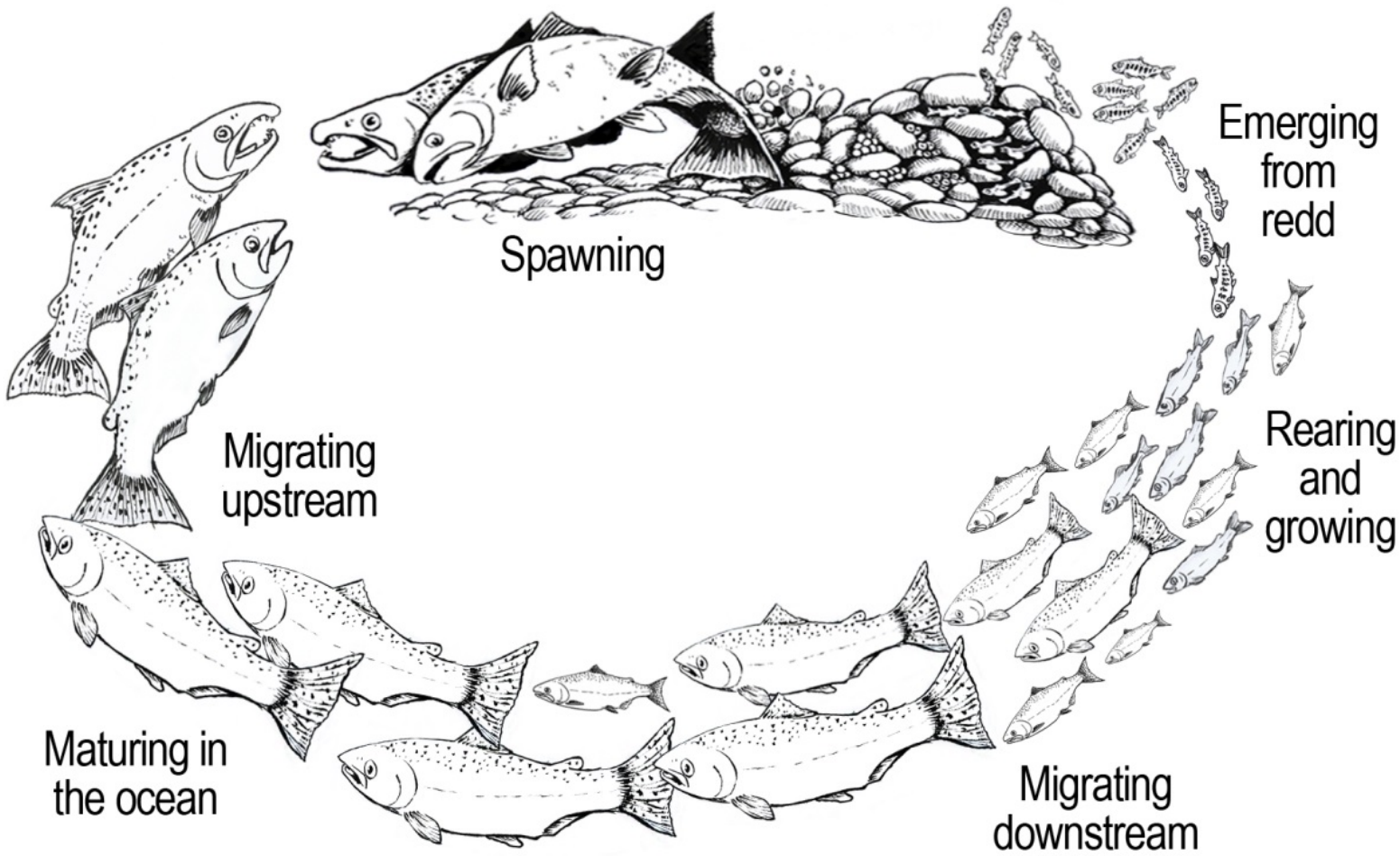


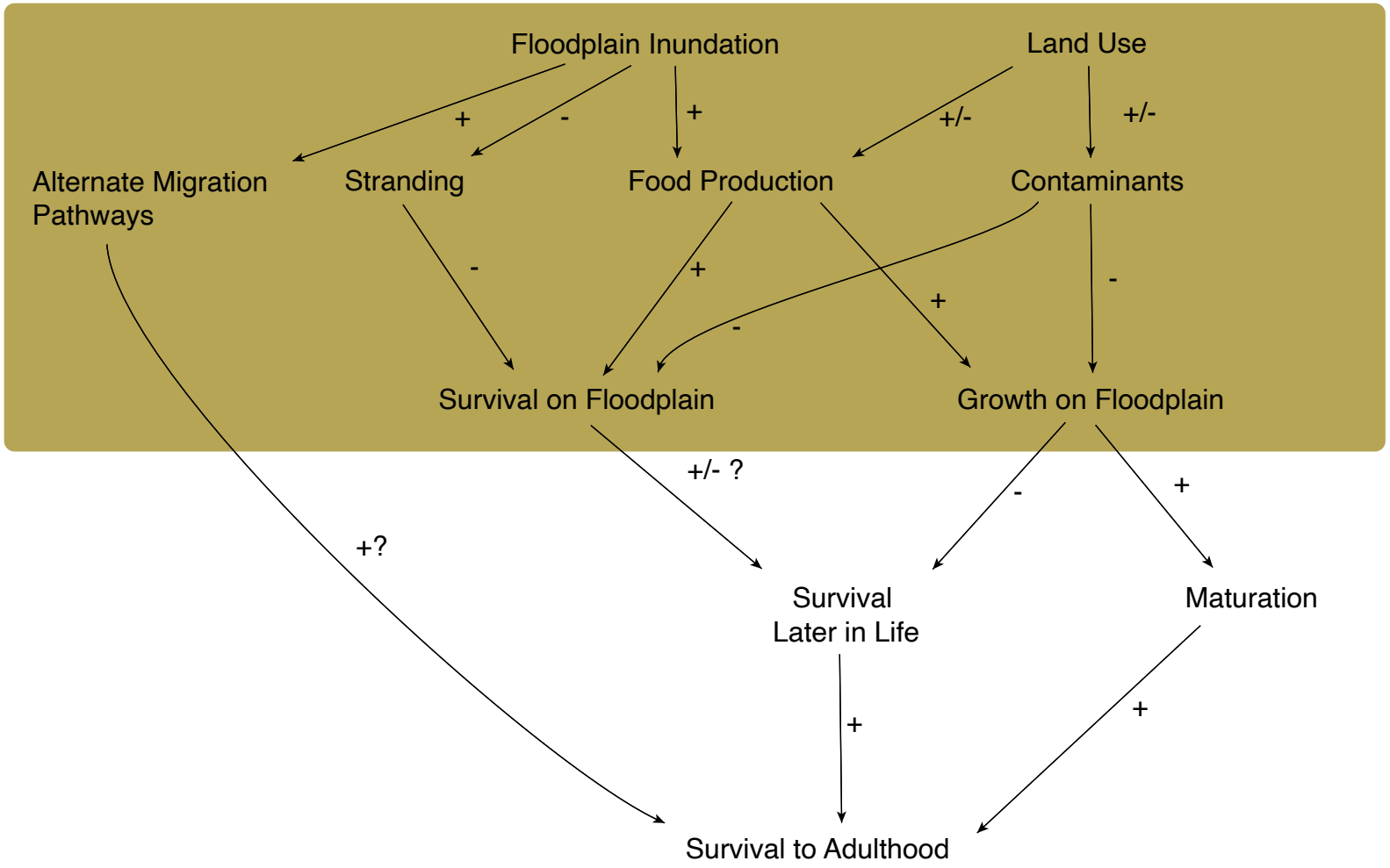
How can we understand the implications of floodplain habitat use at the population level?

Steve Lindley

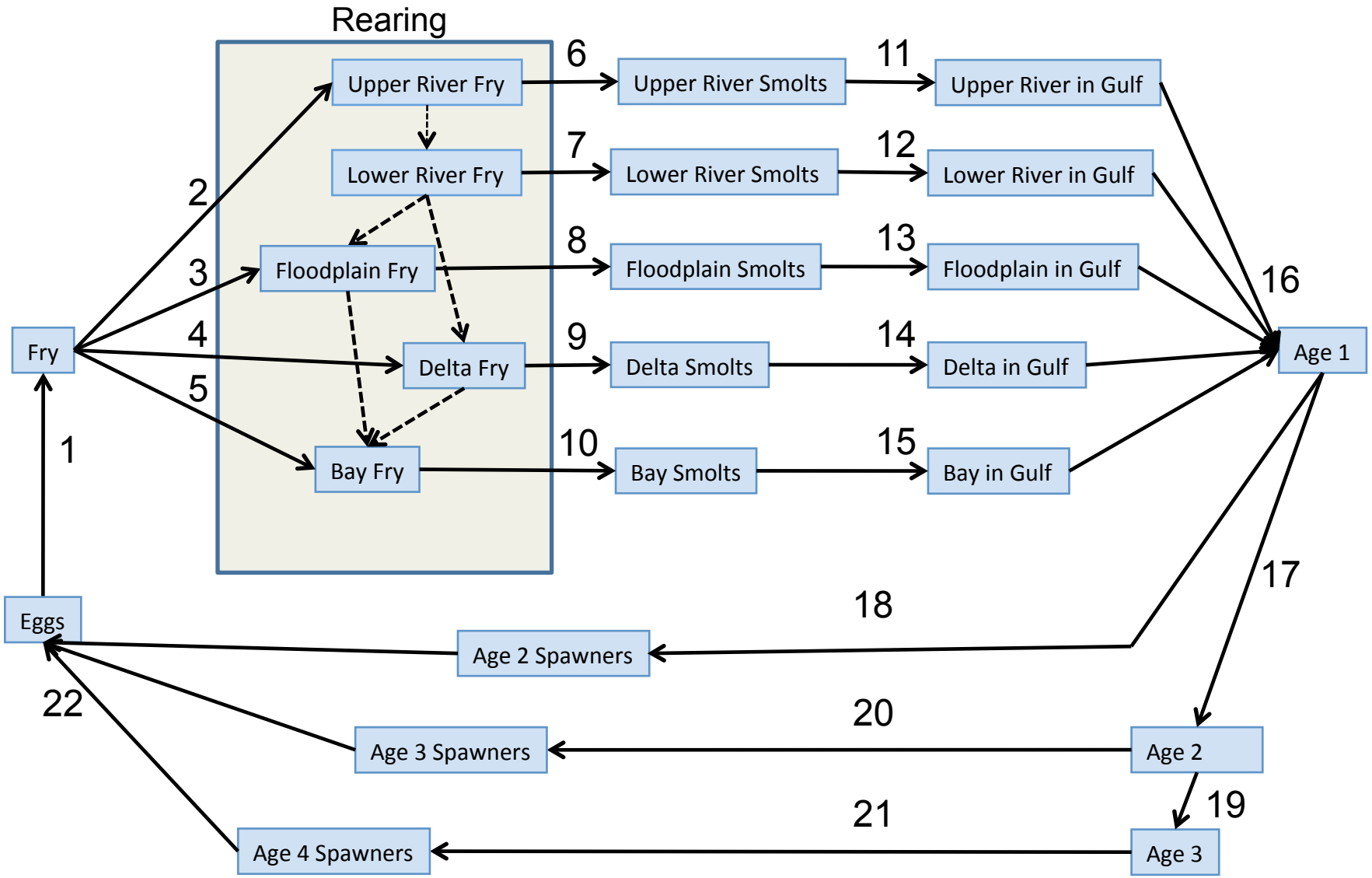
NMFS Southwest Fisheries Science Center


Spawning
Emerging from redd
Rearing and growing
Migrating downstream
Maturing in the ocean
Migrating upstream

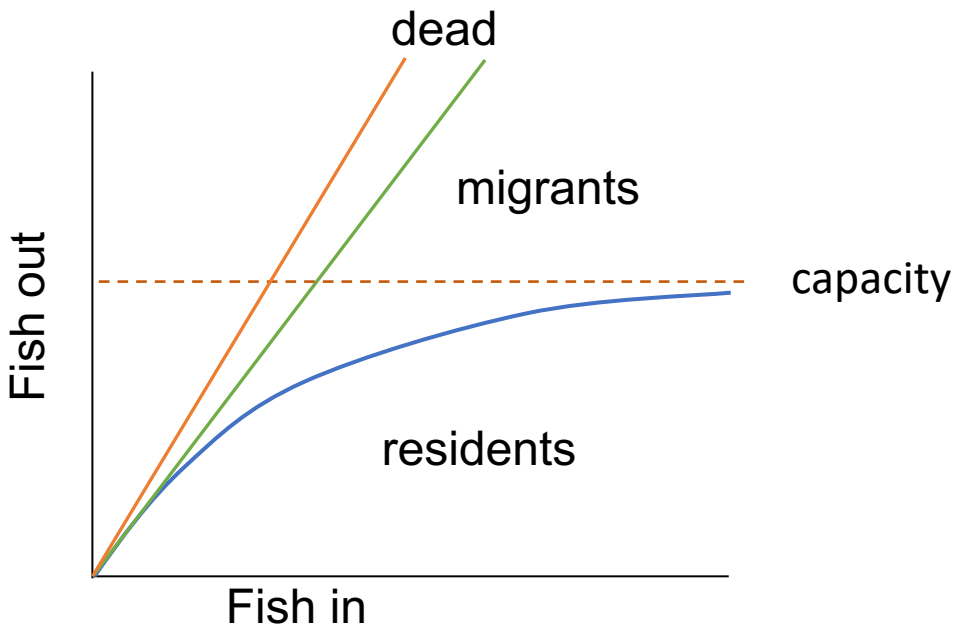
A conceptual model of how floodplain inundation affects salmon productivity



The winter-run Chinook LCM



Density dependent migration

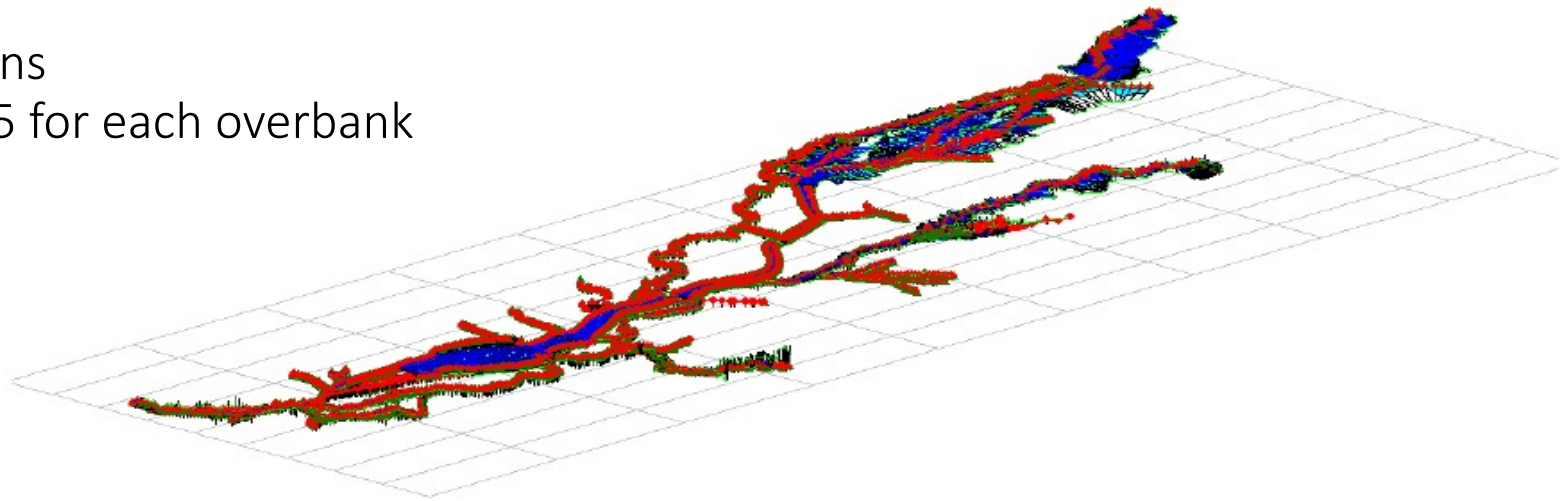


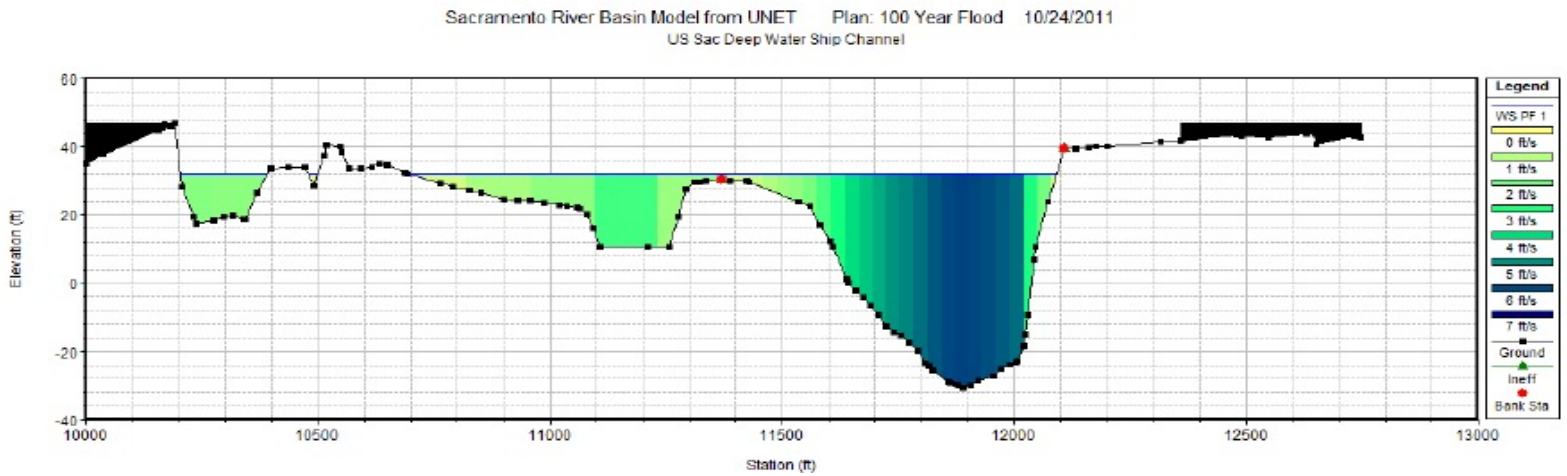
Maximum number of fish that the habitat can support

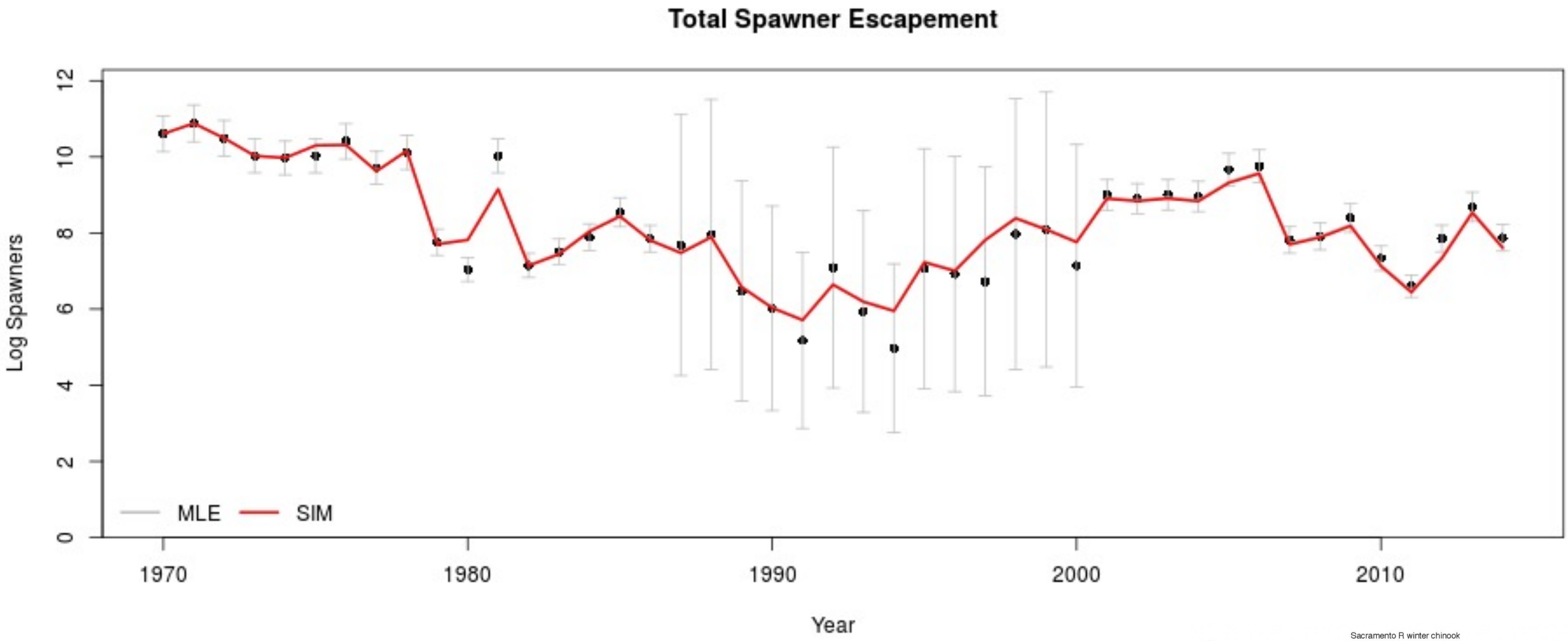
Assume “excess” capacity migrates downstream

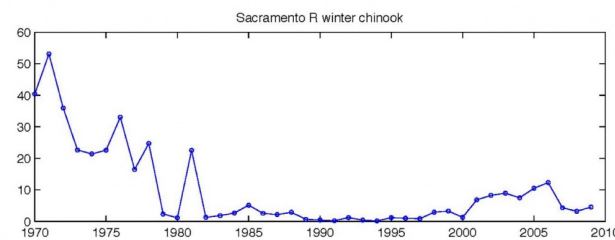
Characterizing floodplains in the LCM

HEC-RAS cross sections
10 slices in channel, 5 for each overbank

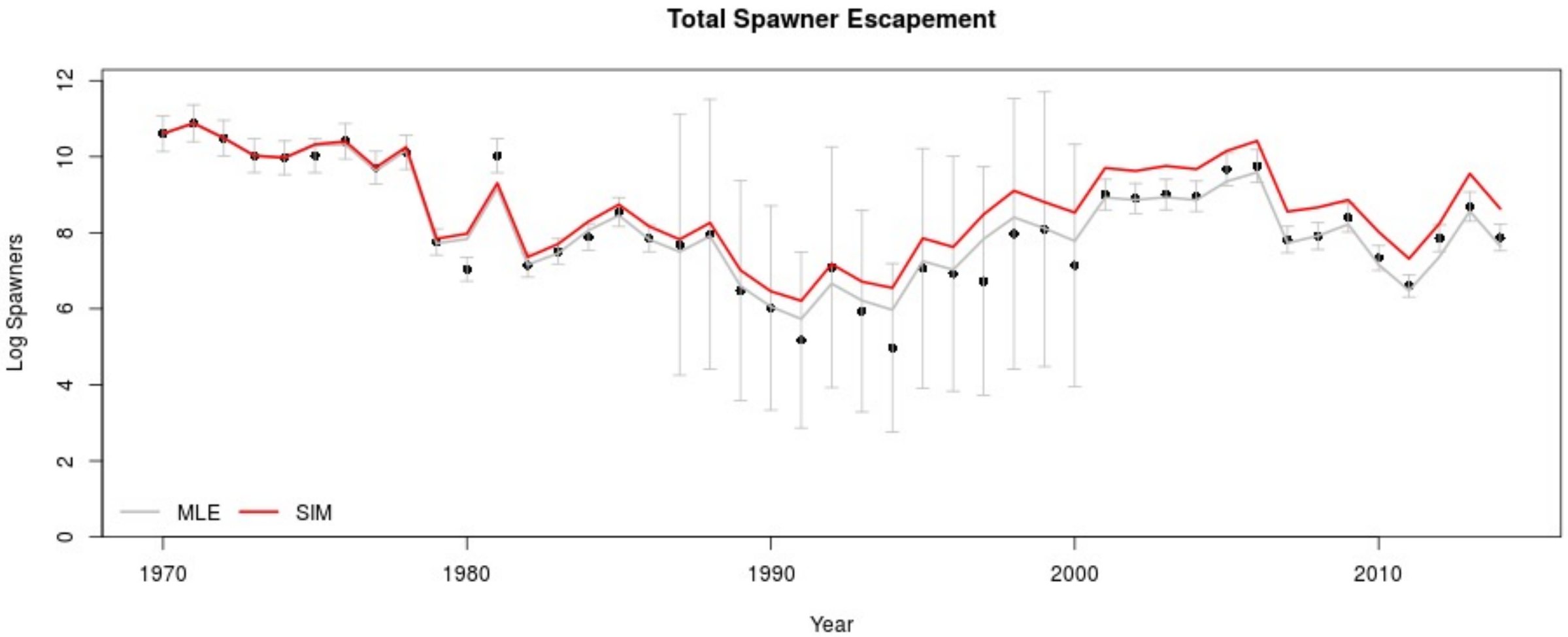


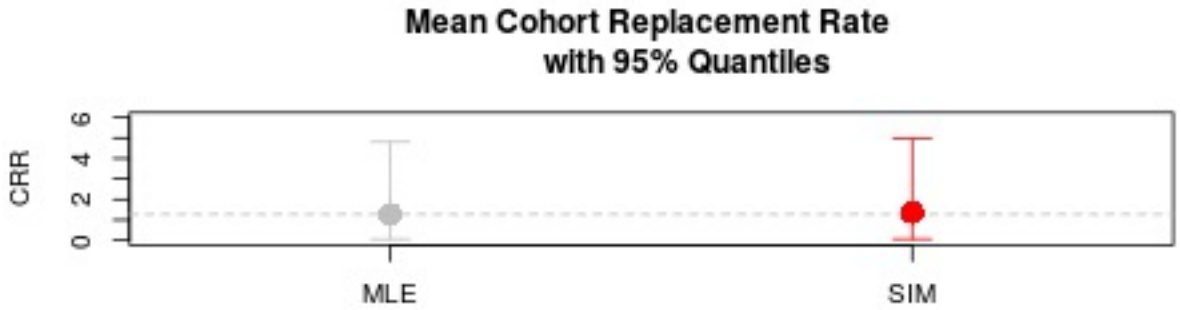


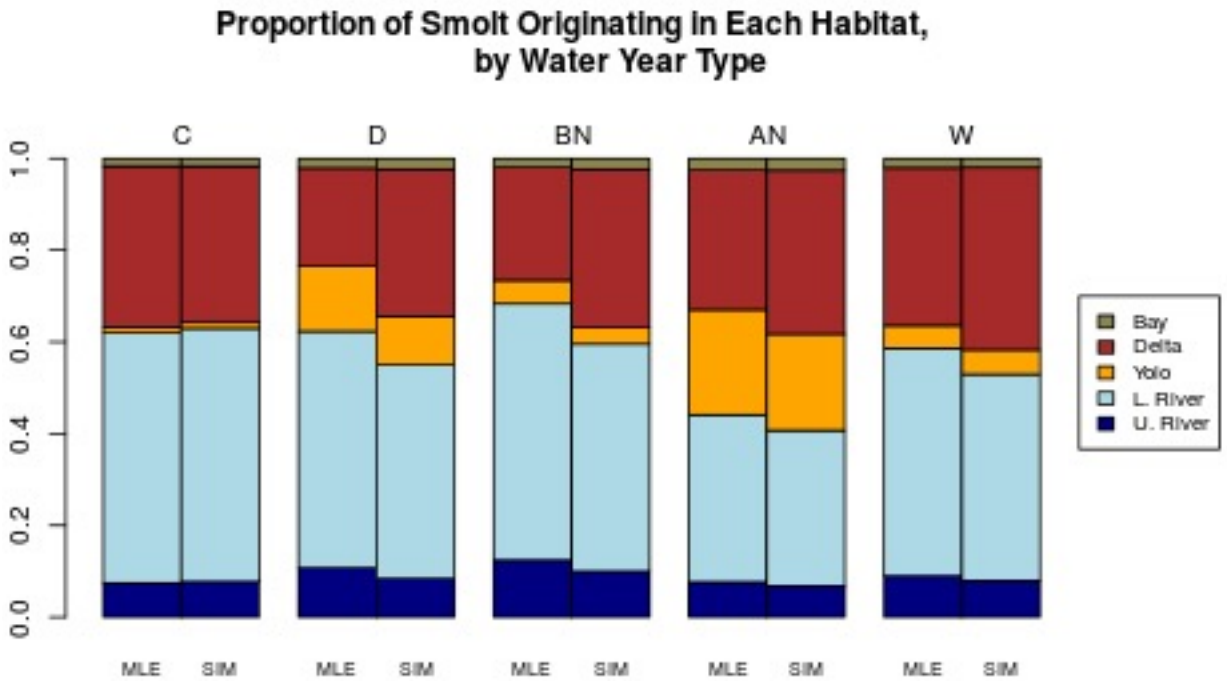

Total Spawner Escapement
Log Spawners
0
2
4
6
8
10
12
MLE
SIM
1970
1980
1990
2000
2010
Year

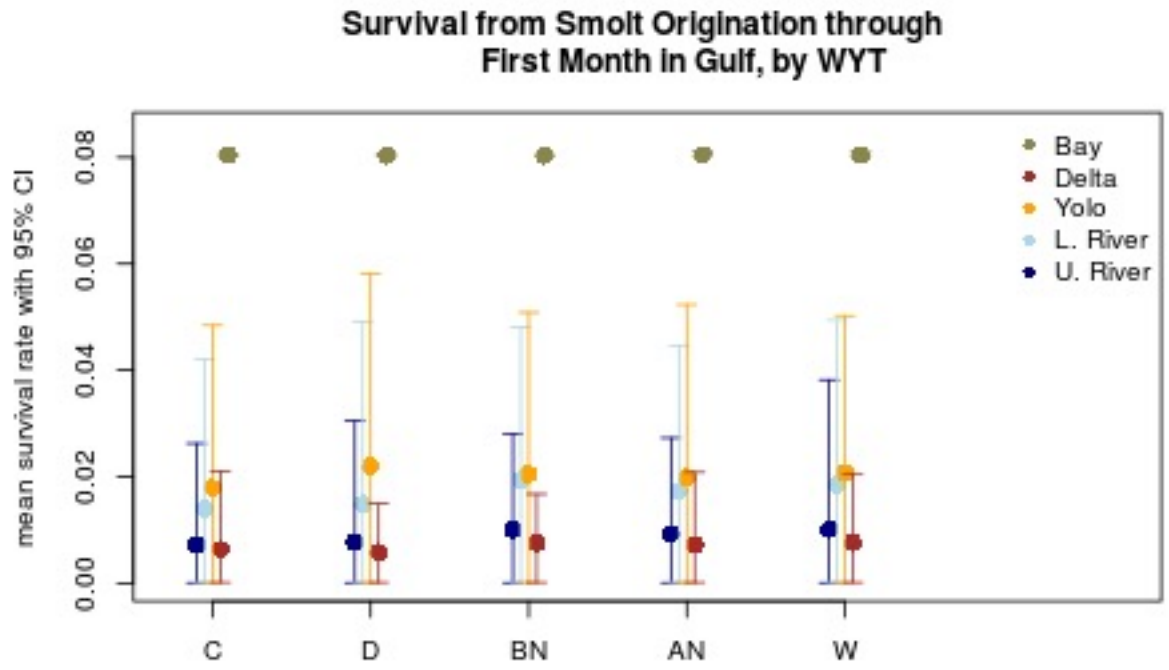

Sacramento R winter chinook
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
2010

Increase early marine survival 10%

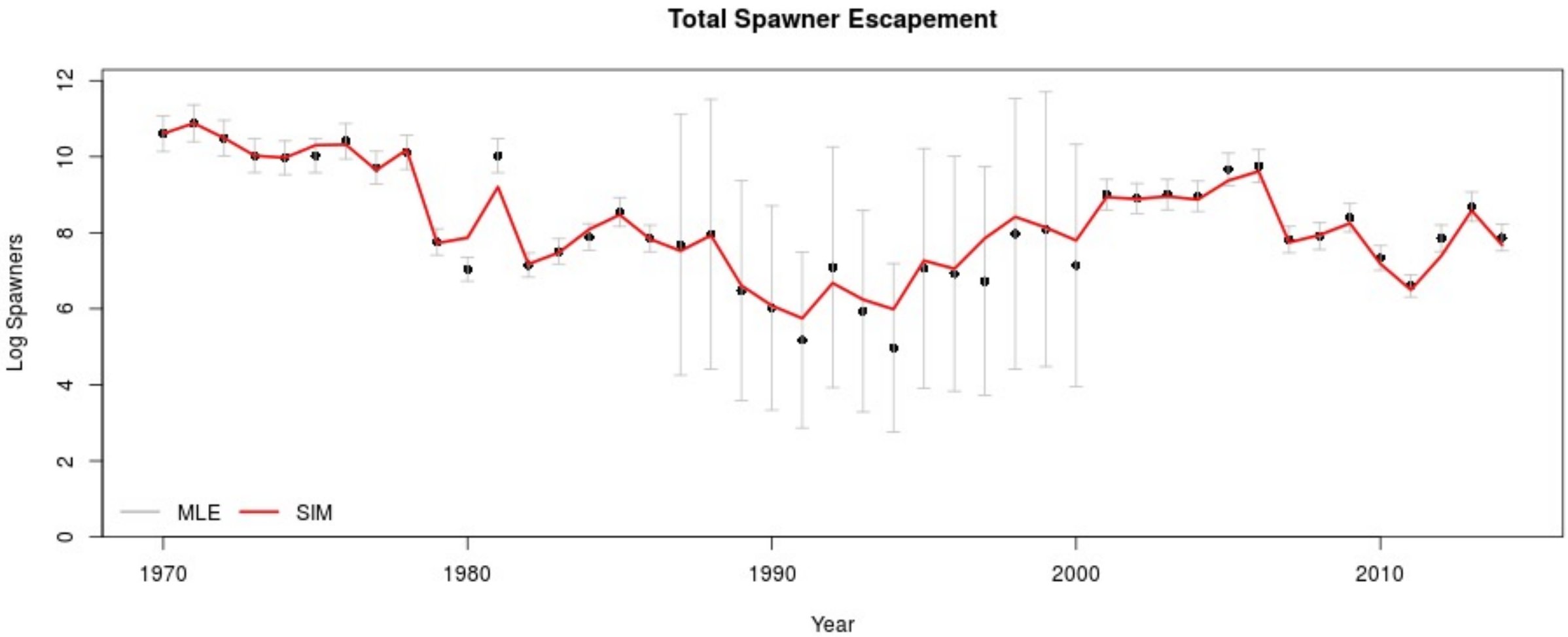



Mean Cohort Replacement Rate
with 95% Quantiles
CRR
0
2
4
6
MLE
SIM

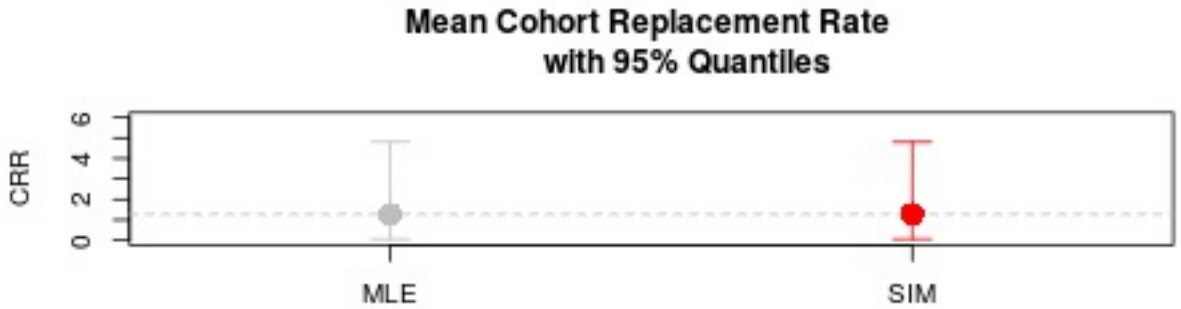

Proportion of Smolt Originating in Each Habitat,
by Water Year Type
C
D
BN
AN
W
0.0
0.2
0.4
0.6
0.8
1.0
MLE
SIM
Bay
Delta
Yolo
L. River
U. River

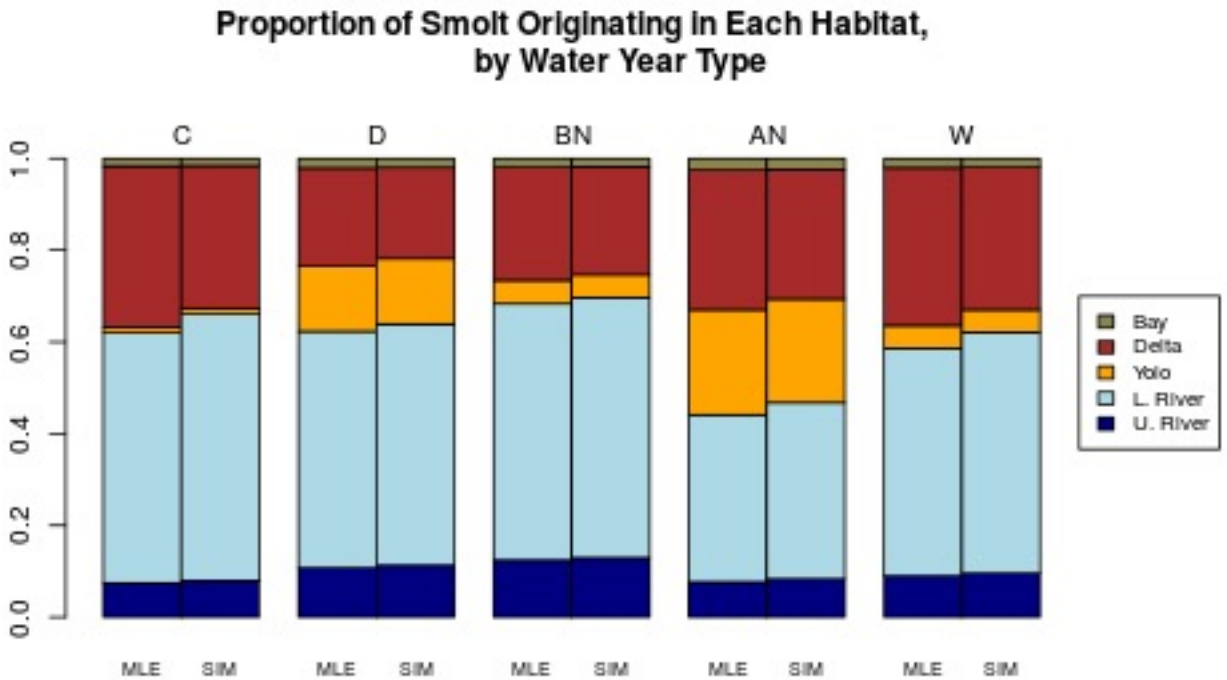

Survival from Smolt Origination through
First Month in Gulf, by WYT
mean survival rate with 95% CI
0.00
0.02
0.04
0.06
0.08
C
D
BN
AN
W
Bay
Delta
Yolo
L. River
U. River

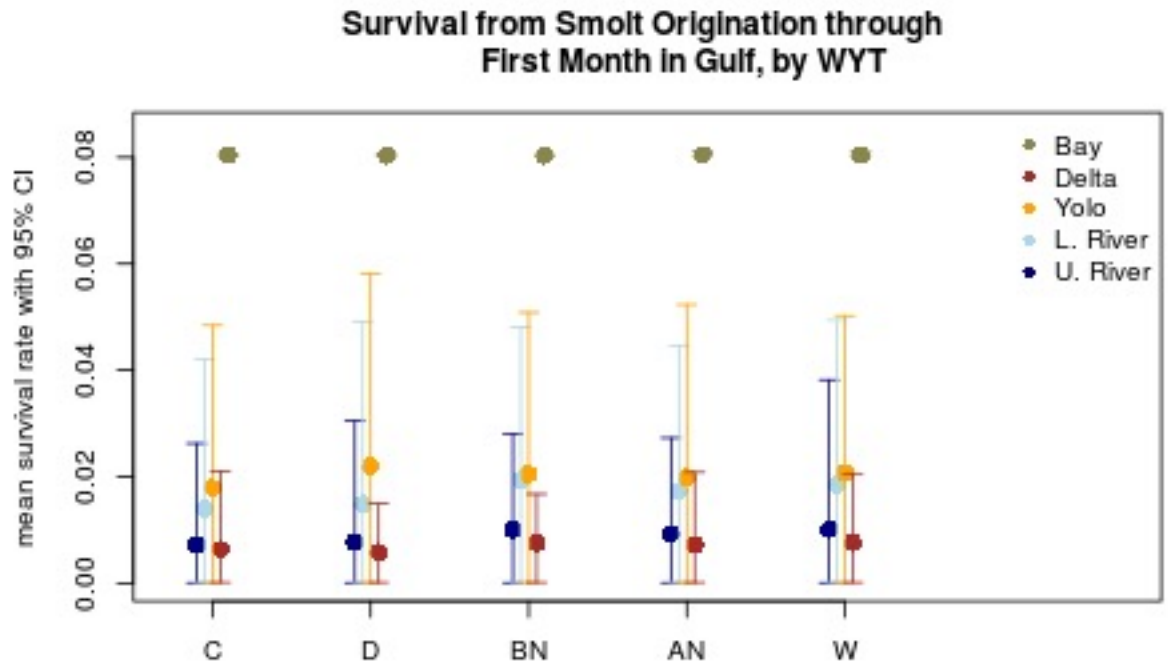
Increase capacity of river and Yolo Bypass by 20%



Increase capacity of river and Yolo Bypass by 20%







A conceptual model of how floodplain inundation affects salmon productivity