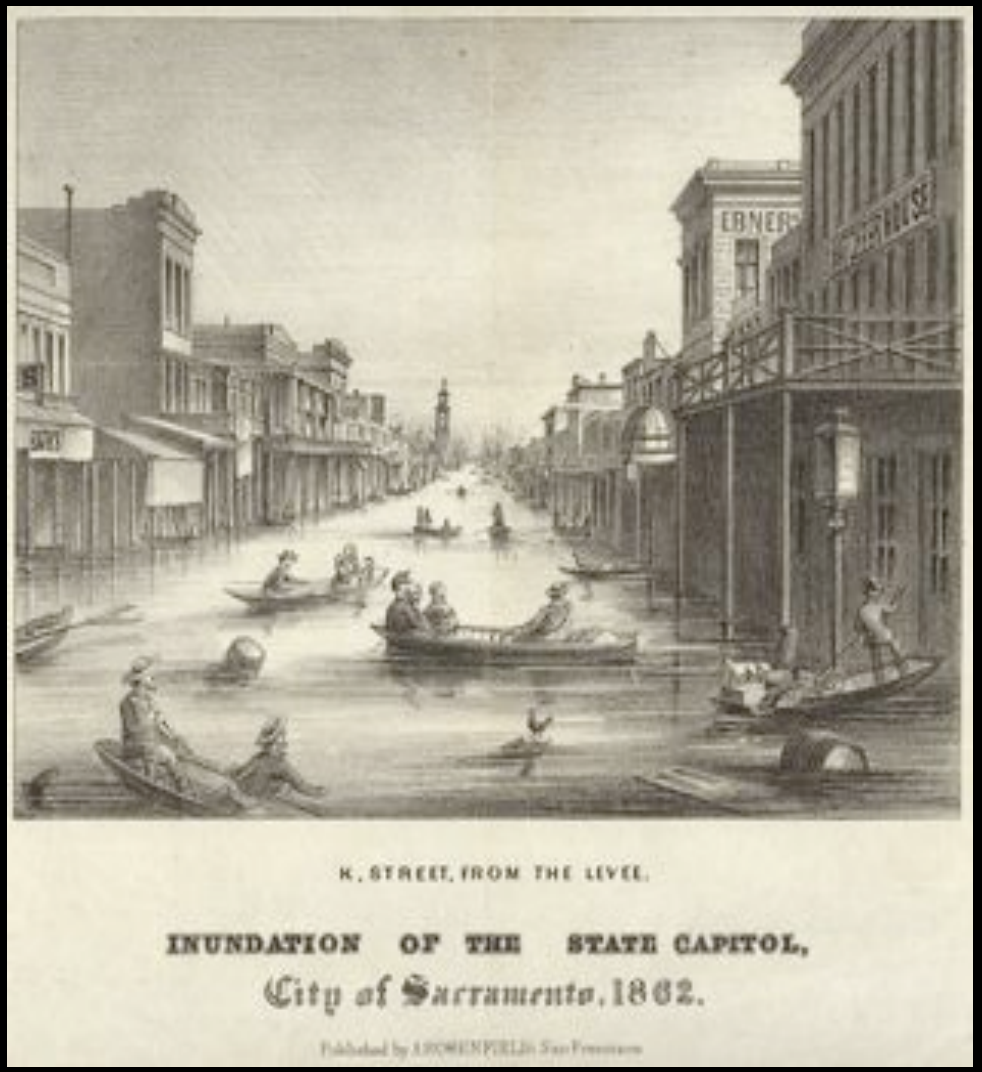
Managing floodplain productivity:

Slow it down, Spread it out, Grow ‘em Up

Jacob Katz – California Trout

Inland Sea



K. STREET, FROM THE LEVEL.

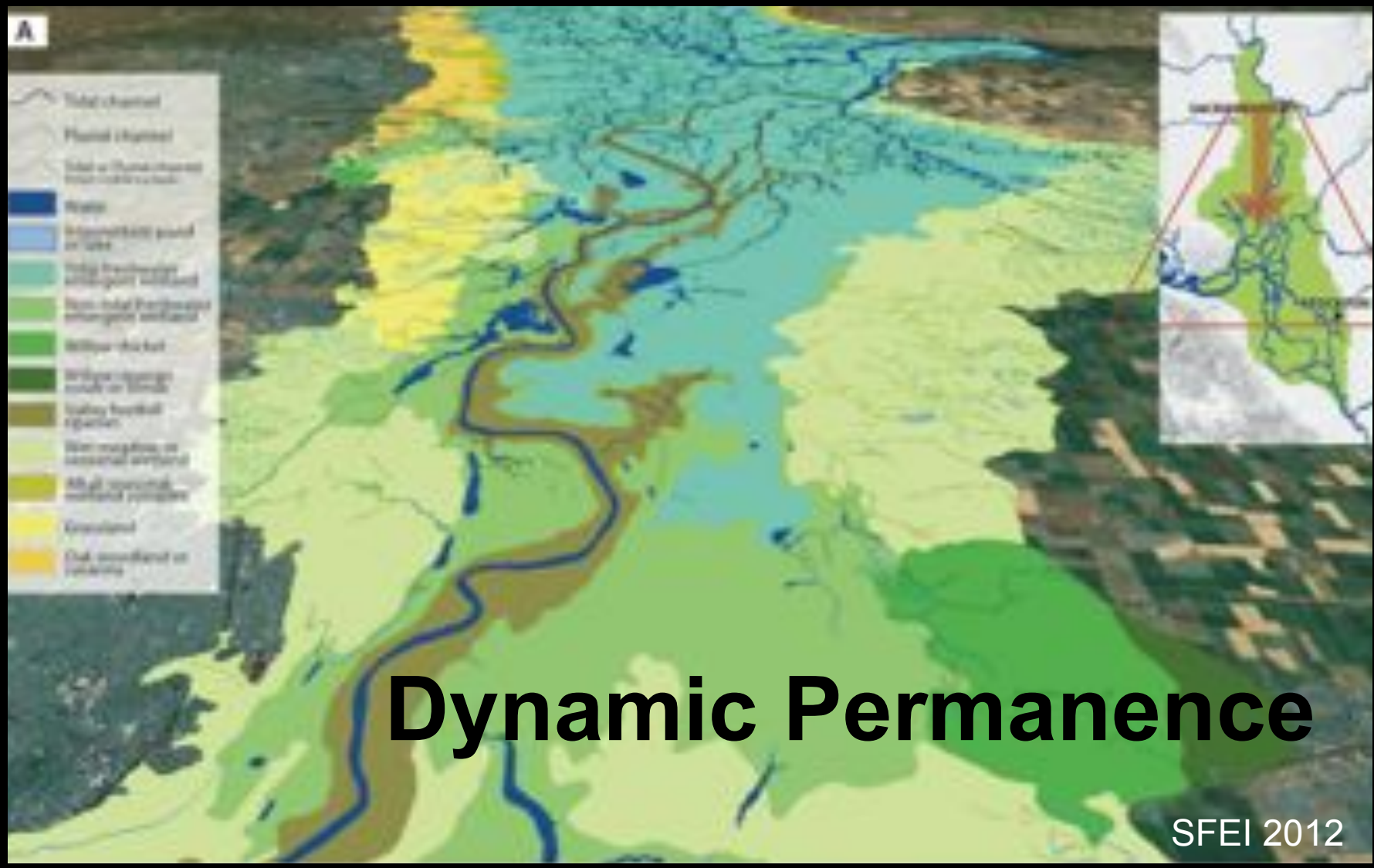
INUNDATION OF THE STATE CAPITOL,

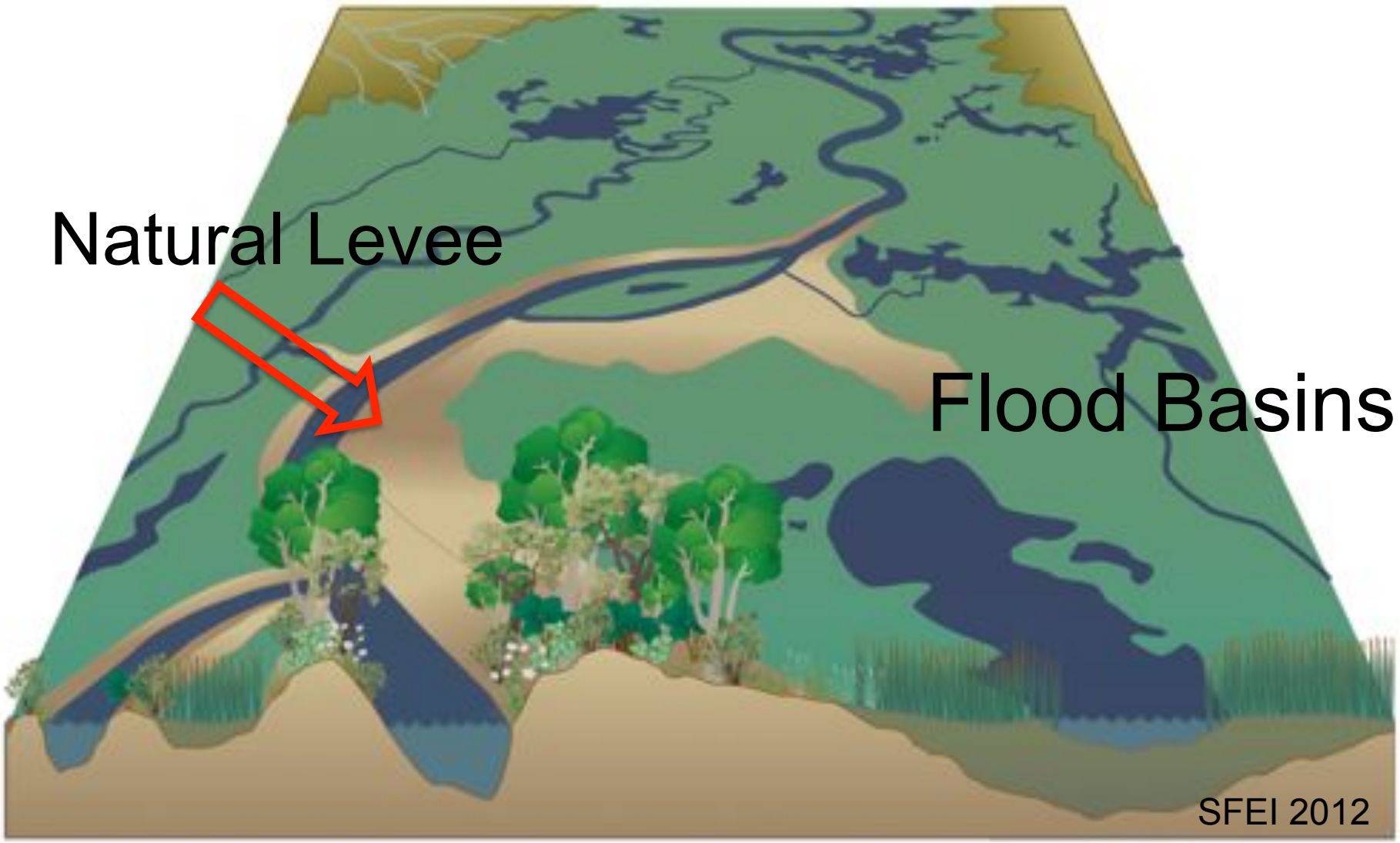
City of Sacramento, 1862.

J street

Flood of 1862

A Shifting Mosaic of Wetland Habitat Types

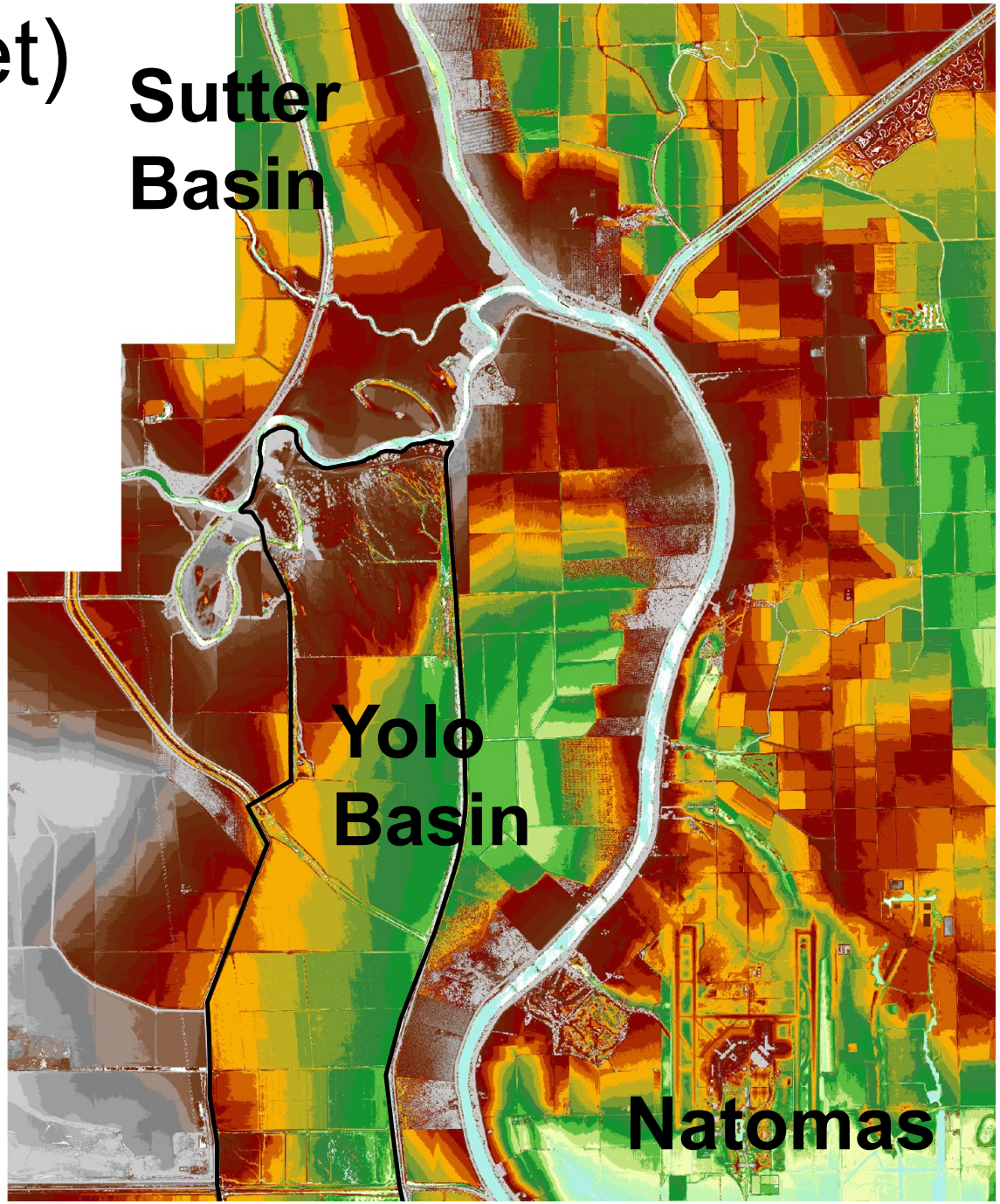




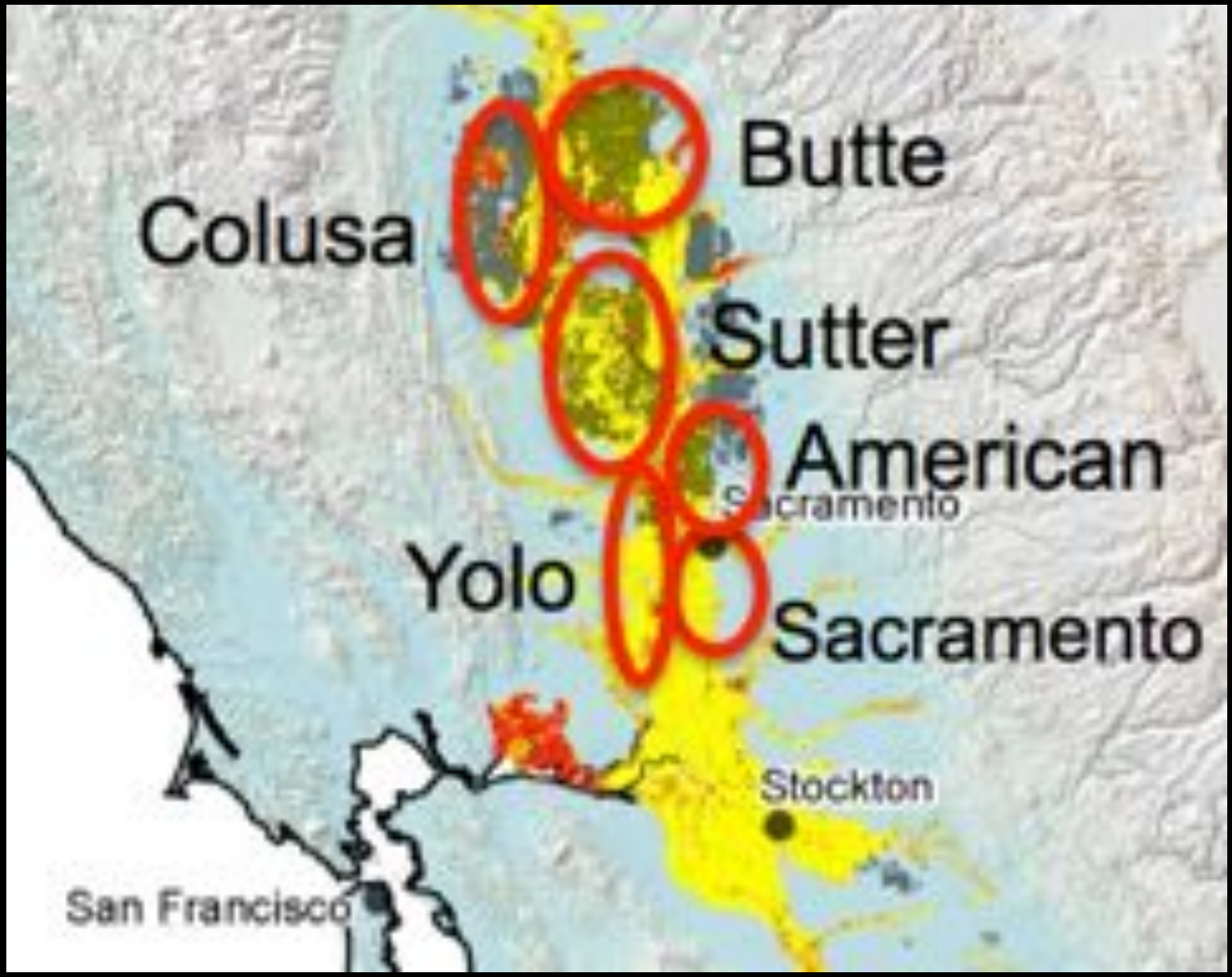
Fluvial Processes

Elevation (feet)

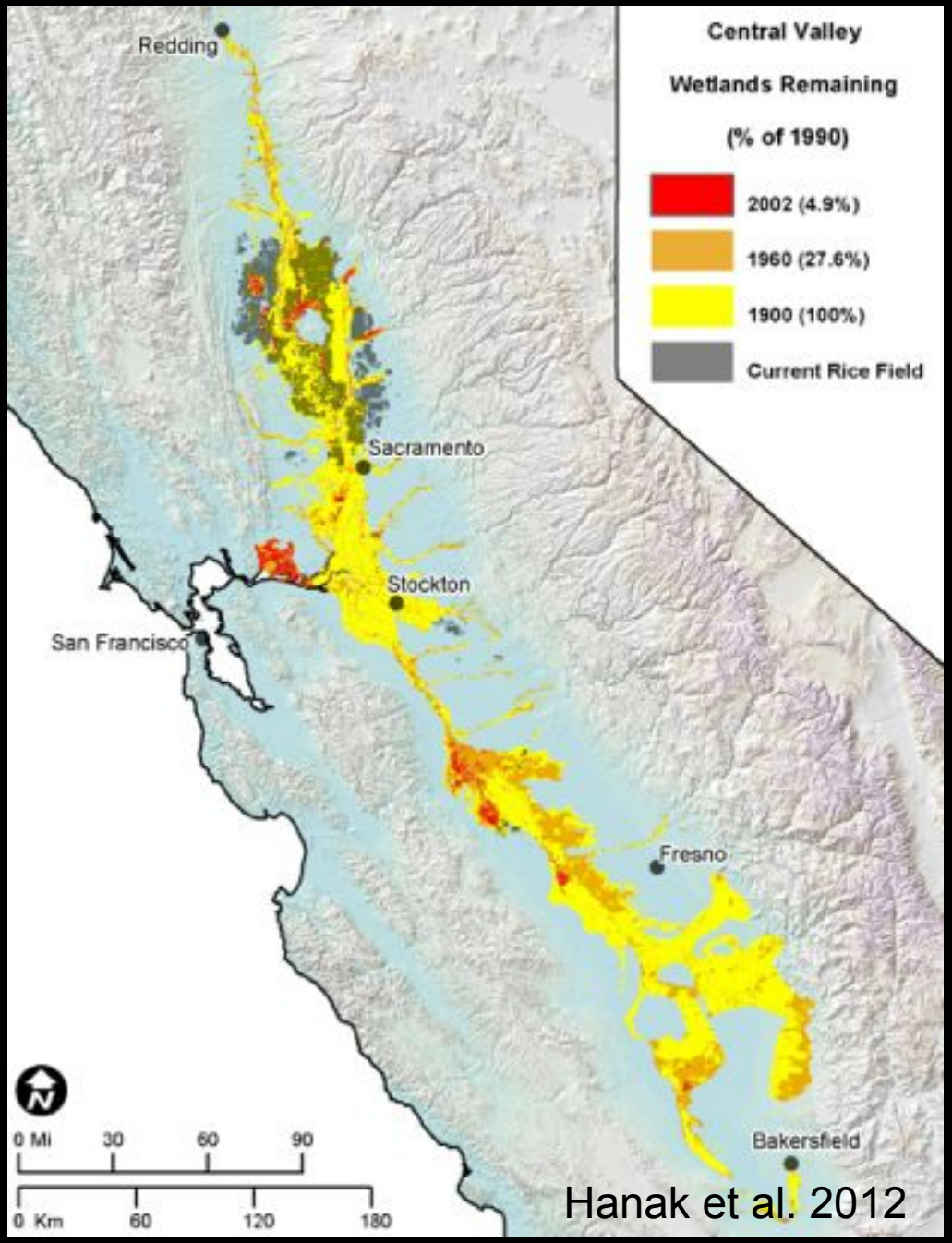
- less than 13
- 13 - 14
- 14 - 15
- 15 - 16
- 16 - 17
- 17 - 18
- 18 - 19
- 19 - 20
- 20 - 21
- 21 - 22
- 22 - 23
- 23 - 24
- 24 - 25
- 25 - 26
- 26 - 27
- 27 - 28
- 28 - 29
- 29 - 30
- 30 - 31



Sac Valley Flood Basins



13,000 miles of levees

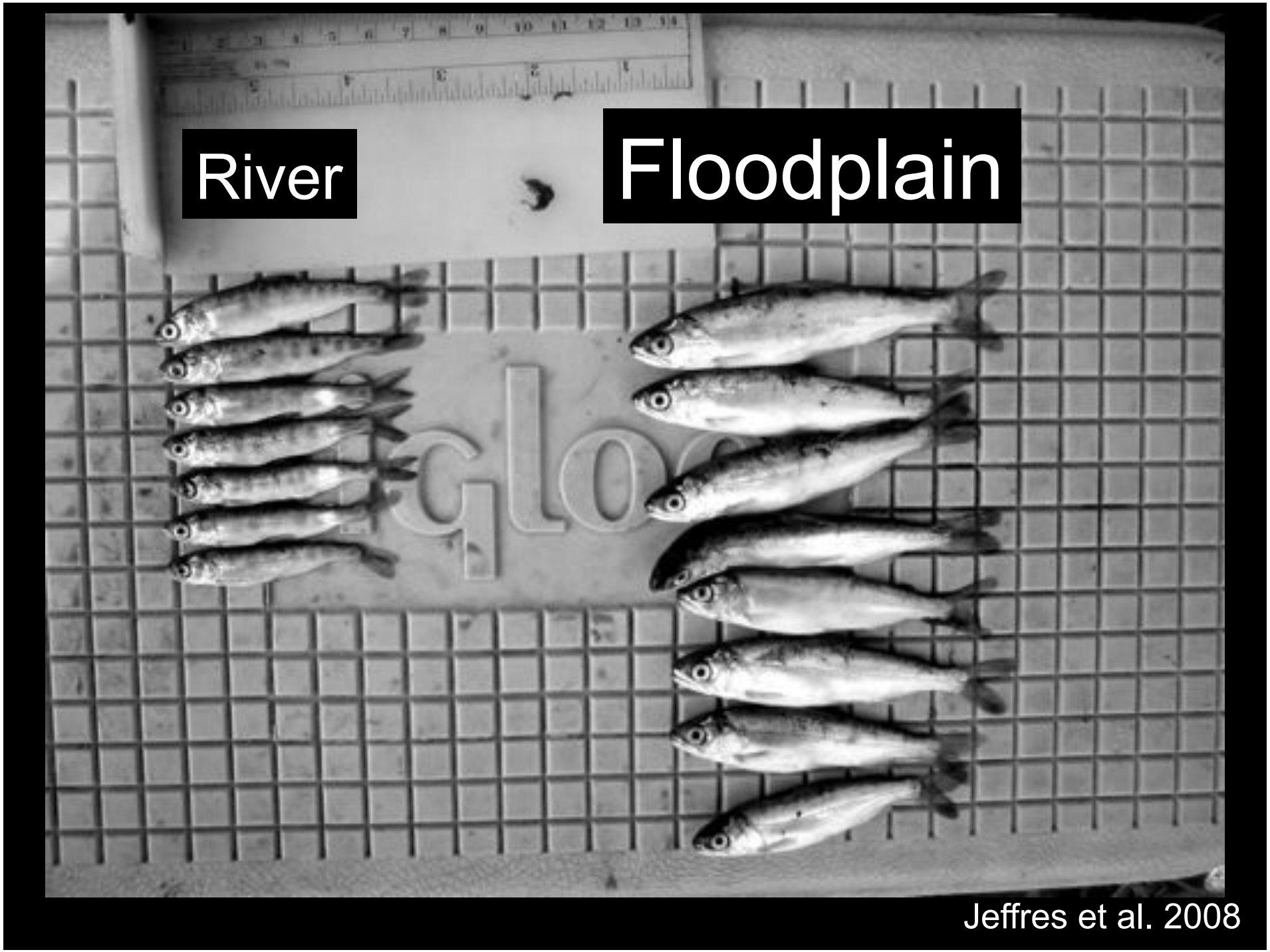


Central Valley Floodplain reduced by more than 95%

Rearing Habitat lost

Cosumnes River 2008

No Dams = Floods with winter rain events = inundates floodplain



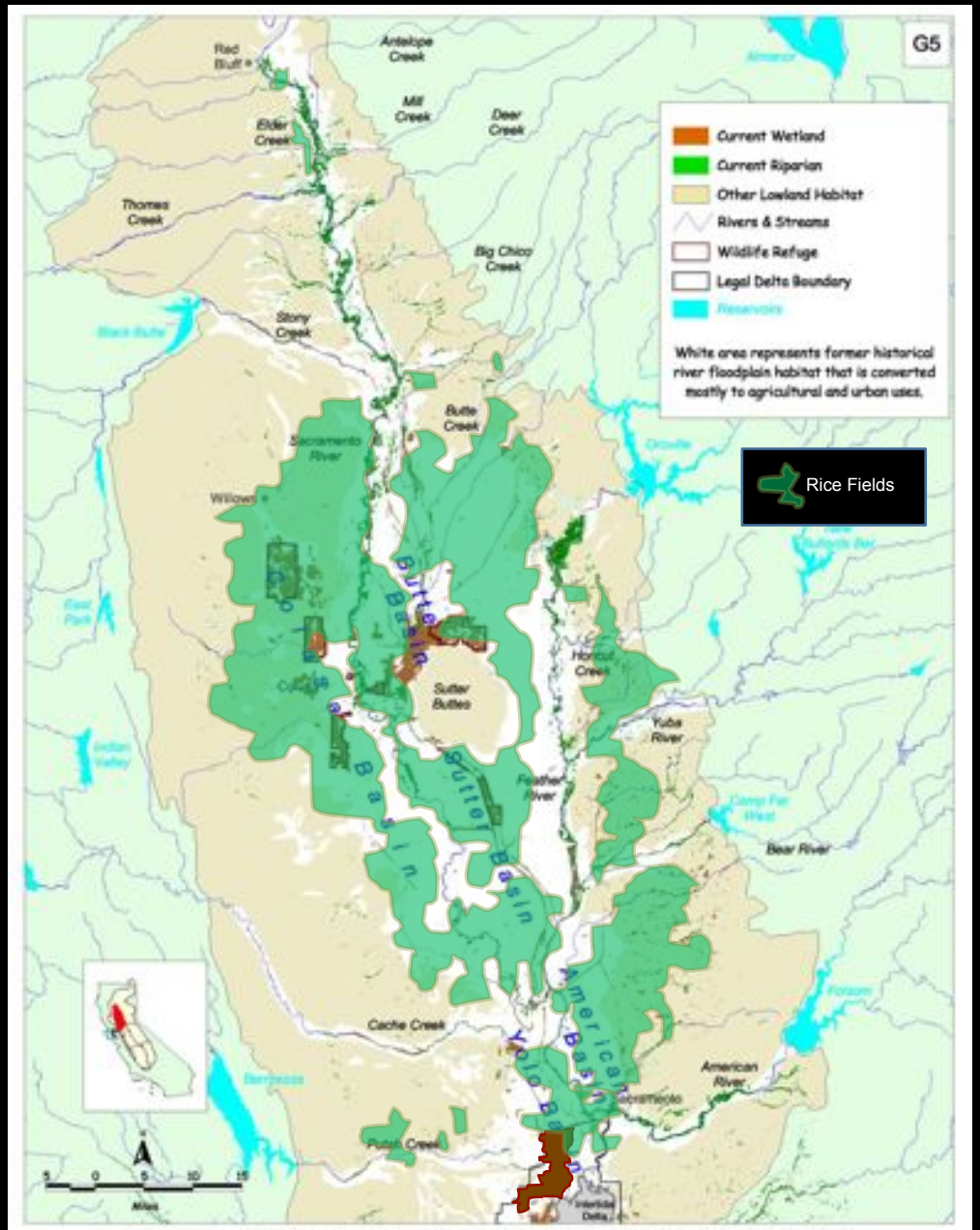
Jeffres et al. 2008

Historic:

Fall run Chinook evolved rearing on floodplains

TODAY:

- 95% of floodplains lost
- drained and converted to rice.
- In California 550,000 acres of rice is farmed annually.
- Now, many of the rice fields are managed for migrating birds during winter months.



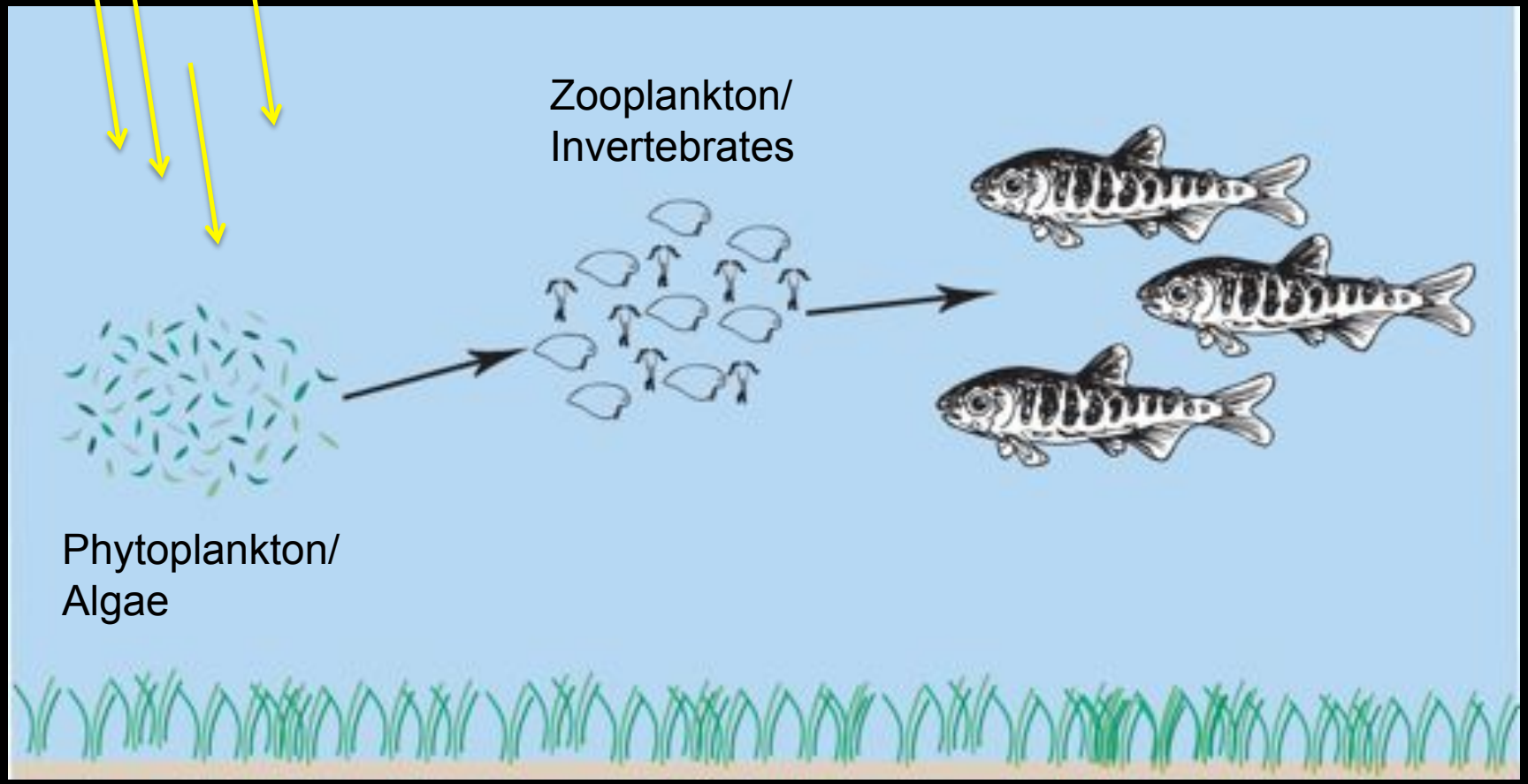
Sacramento Valley Current River Floodplain Ecosystem

We are never going back
American/ Natomas Basin
Yolo Basin
Sacramento Basin
© aerialarchives.com

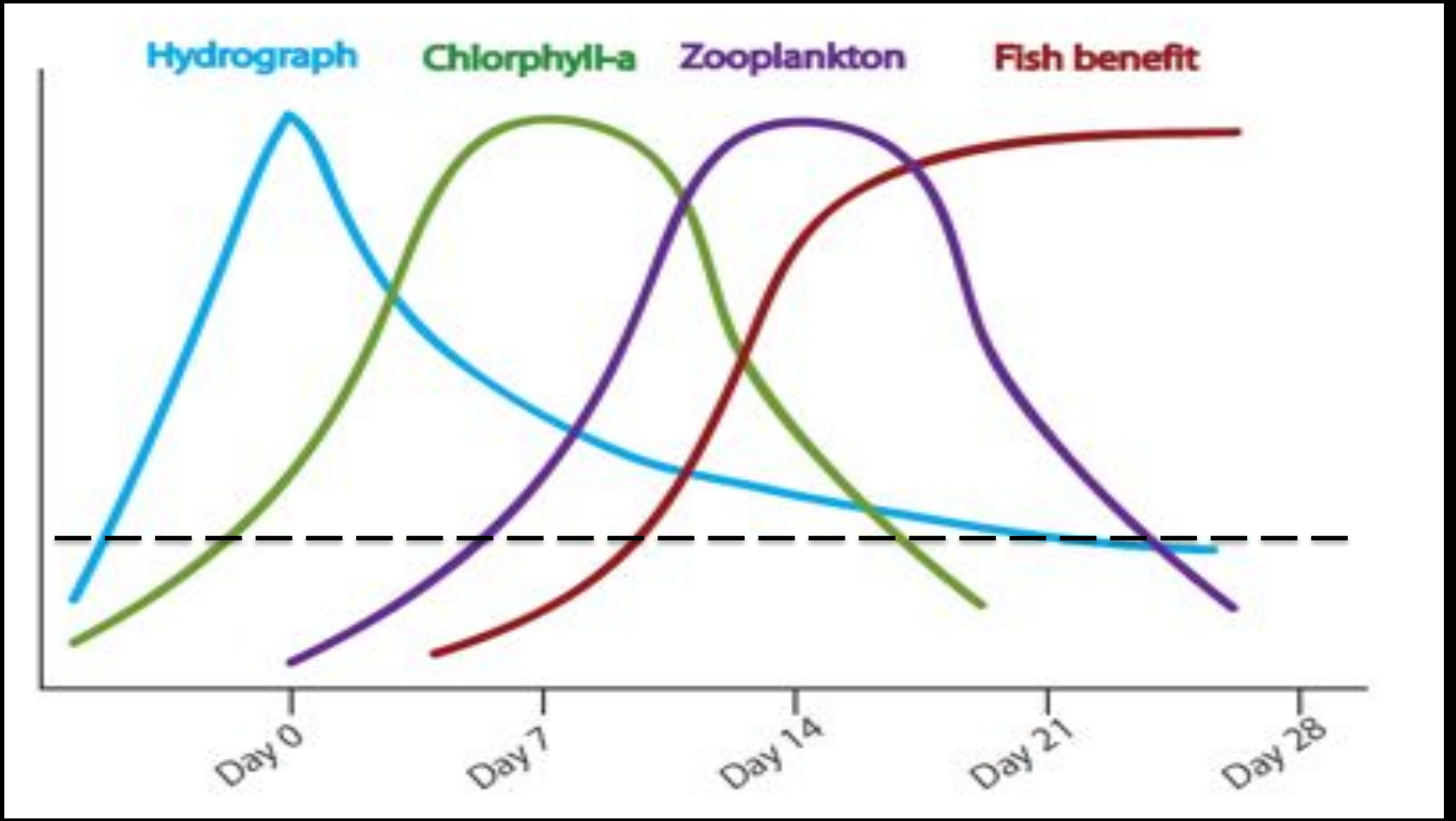
But We Must Look Back
In Order
to Build a Better Future

Process- Based Solutions
We must have a
working understanding
of natural systems
in order to build
a Central Valley that works
for People, Fish and
Wildlife

Floodplain Food Web



Timing, Duration, Magnitude



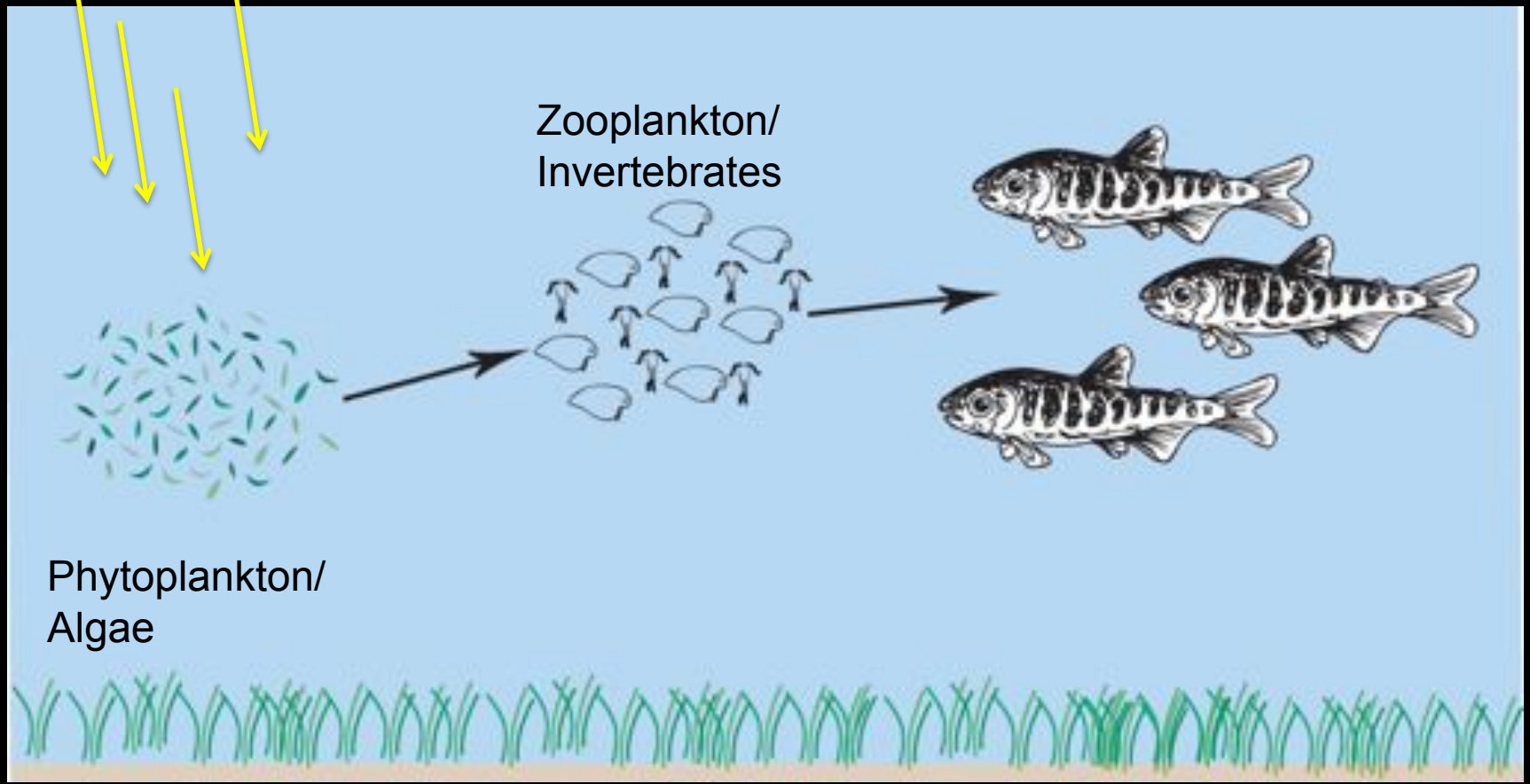
More Photic Zone!
Inundated Floodplain
River Channel
Bright idea!

Mimicking Natural Process to Restore Ecological Function

Restored Floodplains

Managed Ag Floodplains

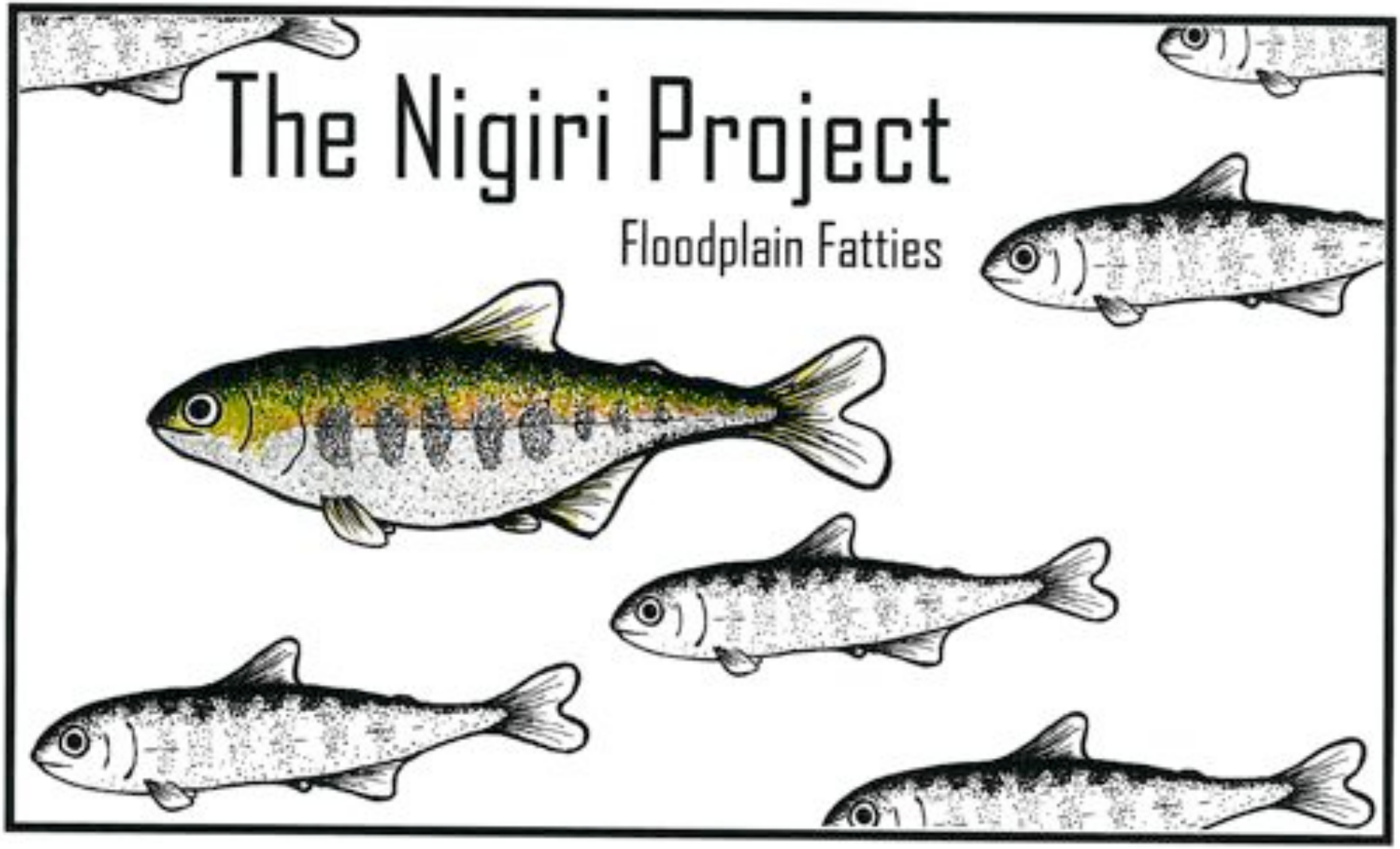
Mimicking Natural Process to Restore Ecological Function



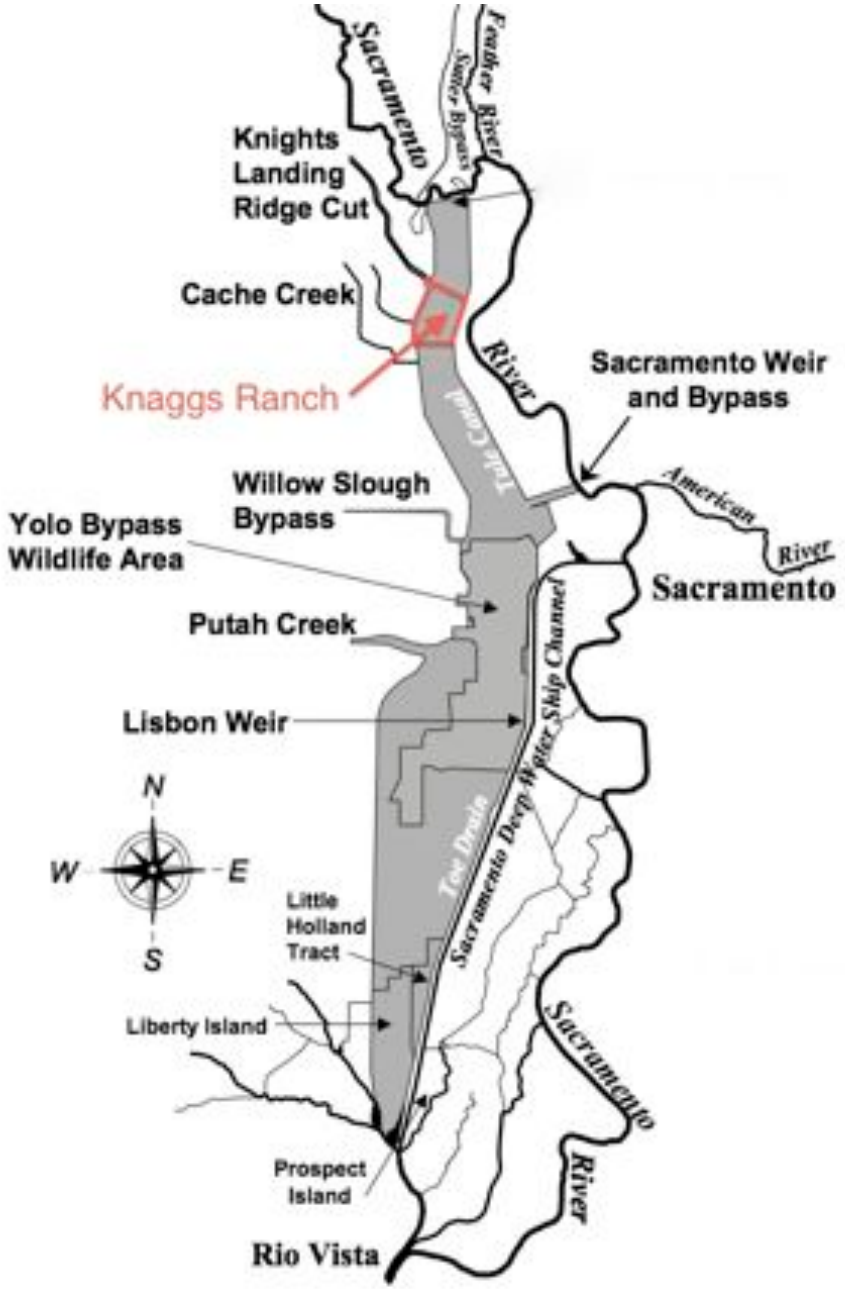
Mimicking natural floodplain processes in post-harvest floodplain rice fields

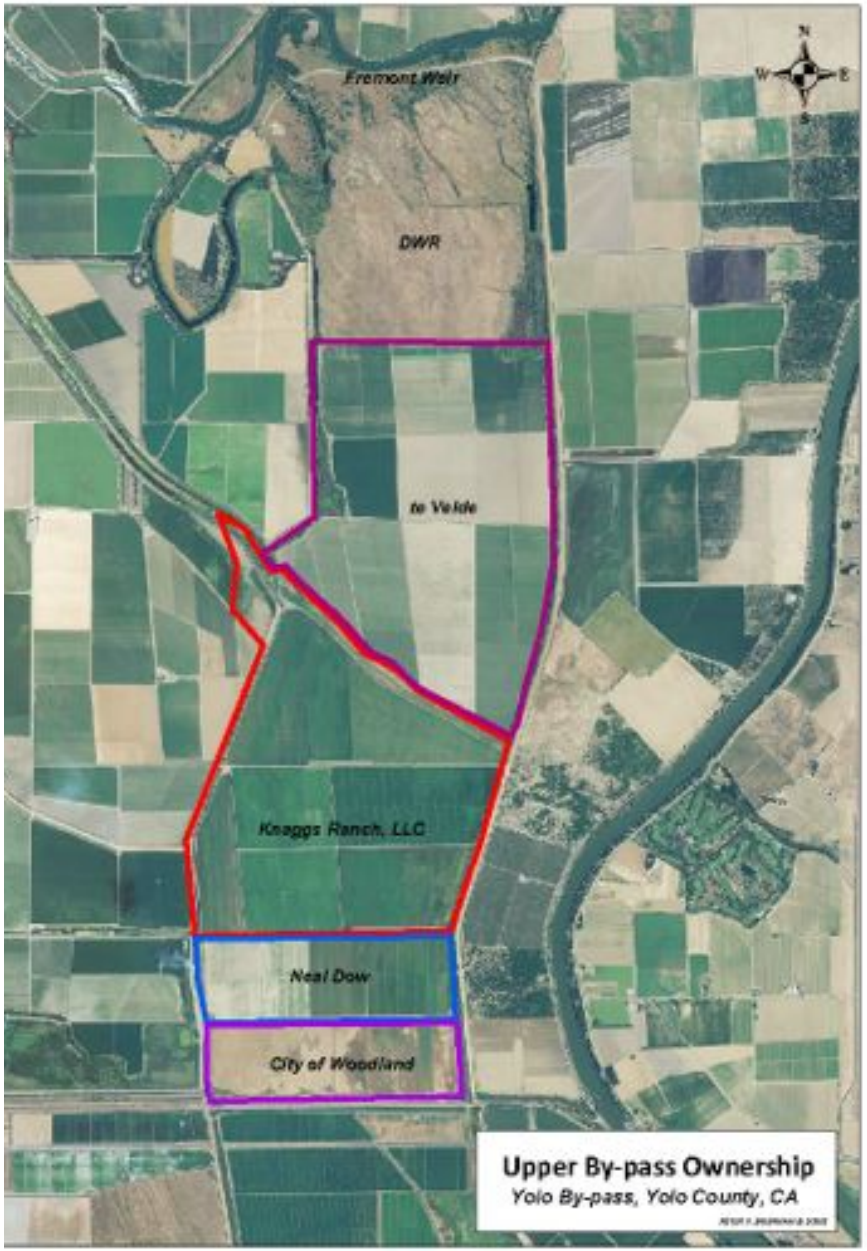
The Nigiri Project

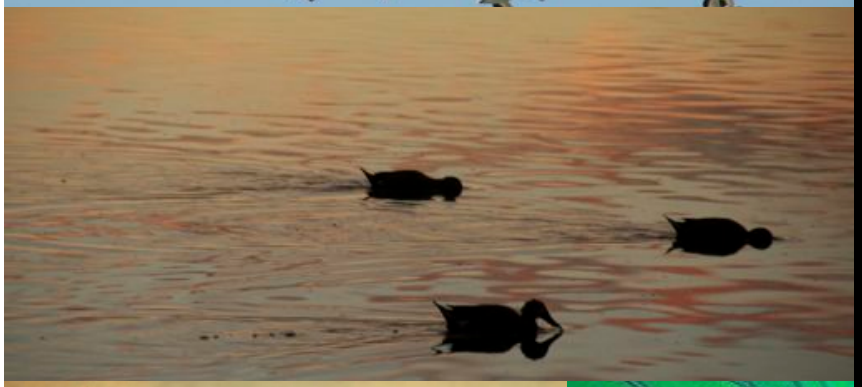
Floodplain Fatties

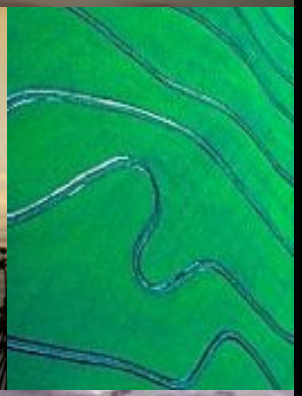


Knaggs Ranch on Yolo Bypass









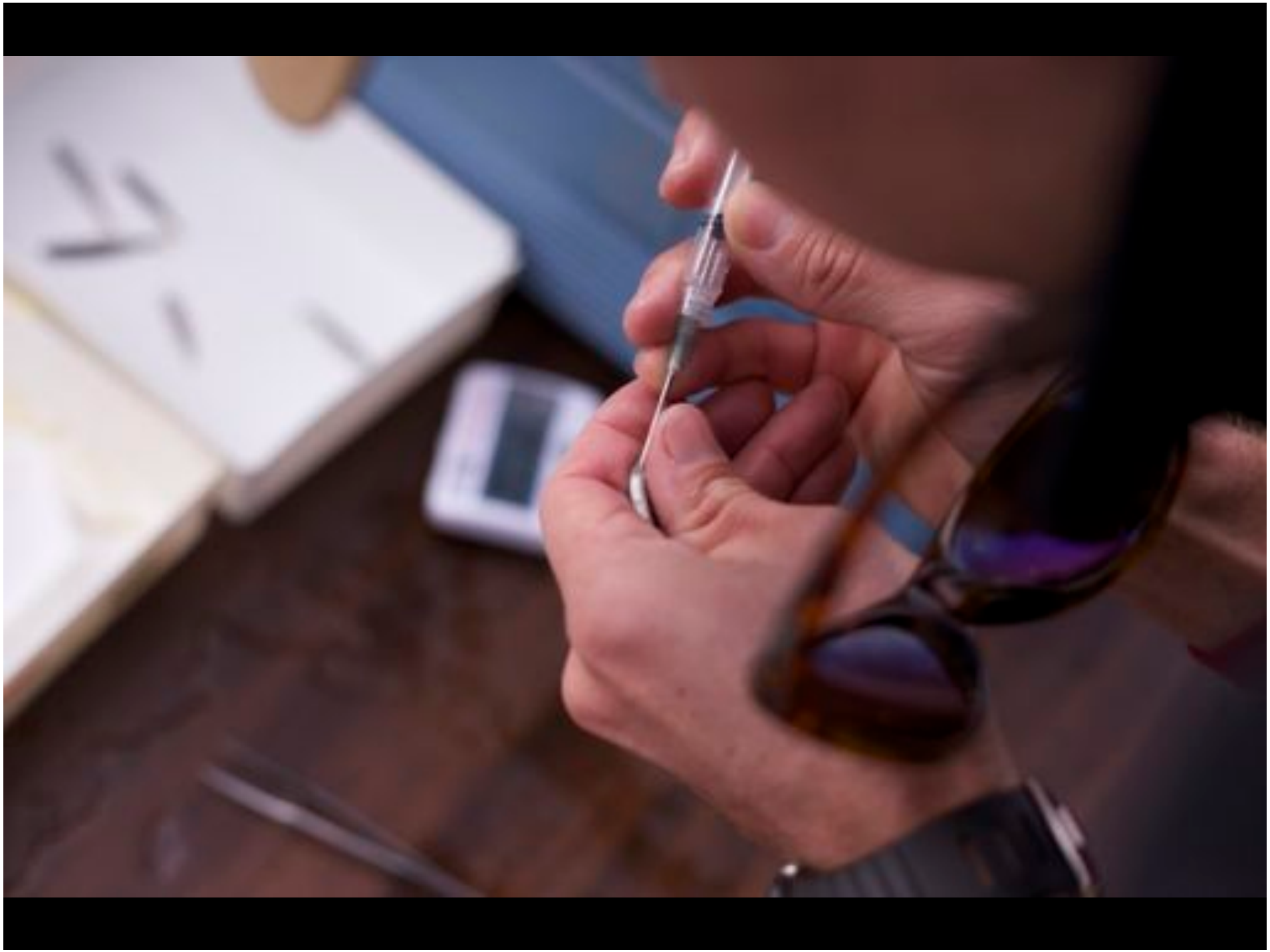
Managed floodplain for multiple uses:

- Flood protection
- Agriculture
- Fish habitat
- Waterbird habitat
- Aquifer recharge

Post Harvest - November

Carson Jeffres

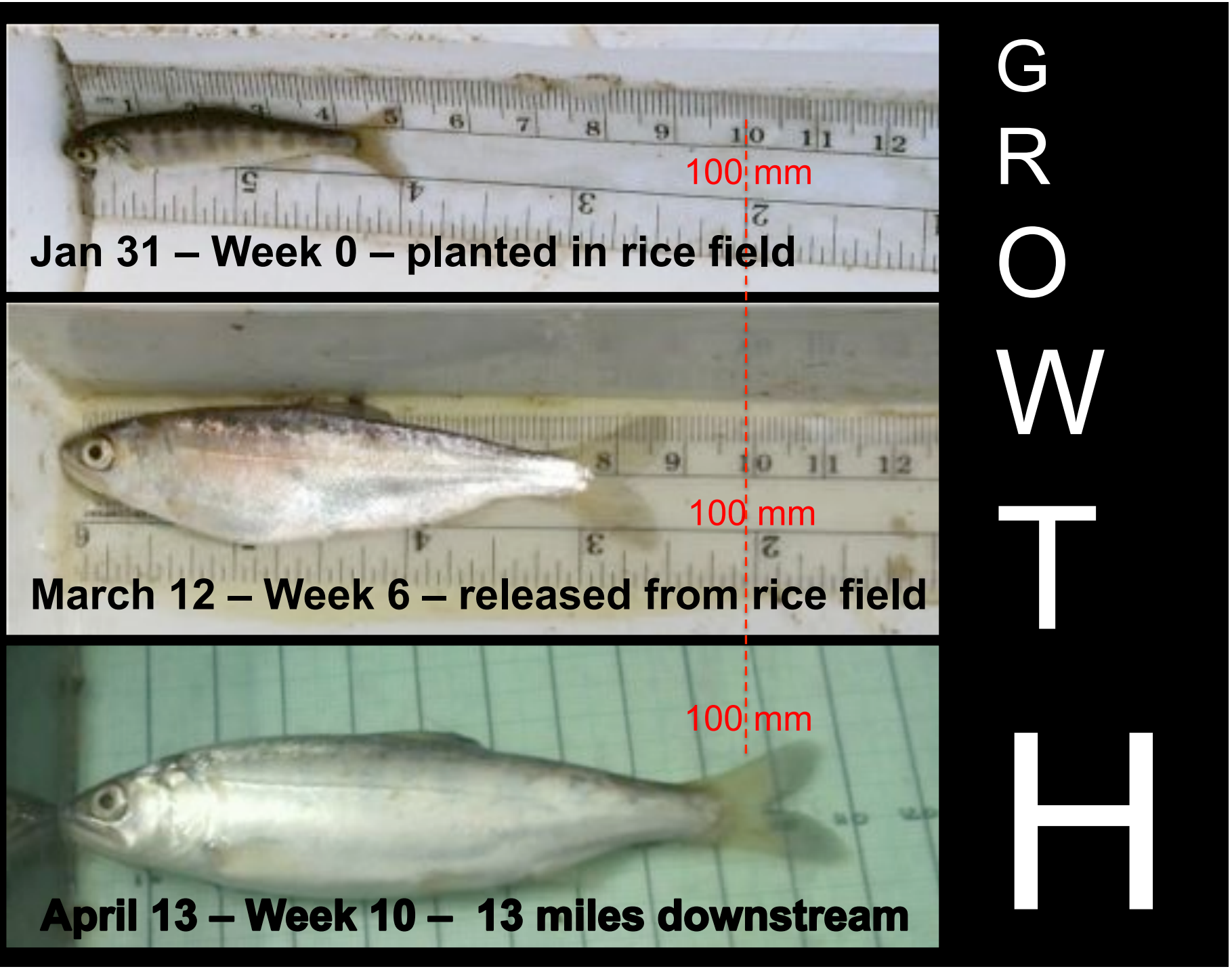
Passive integrated transponder (PIT tags)

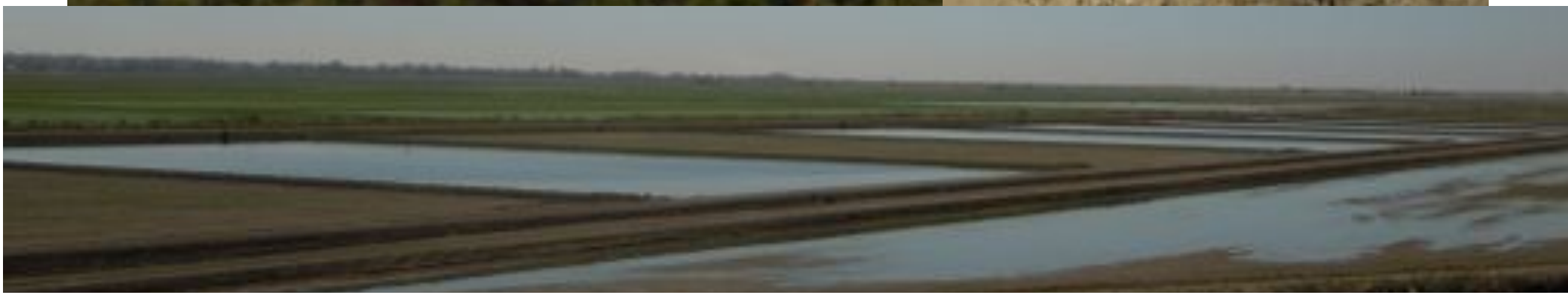


Fish measured every 2 weeks

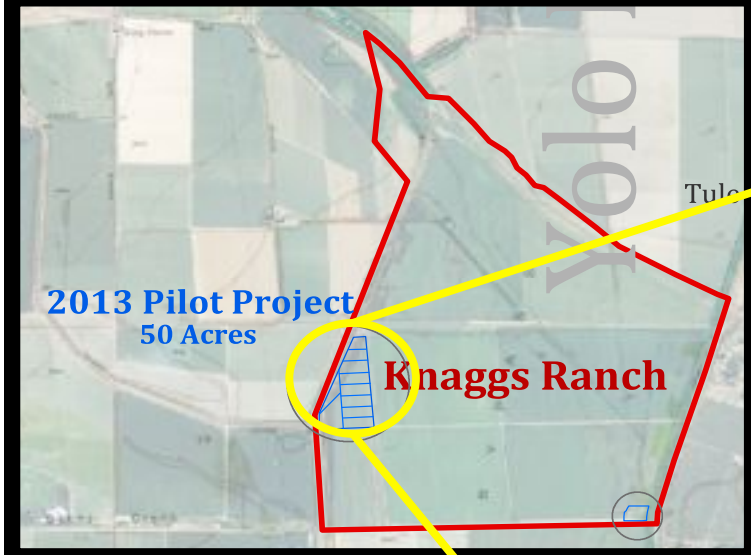
After 6 weeks field drained

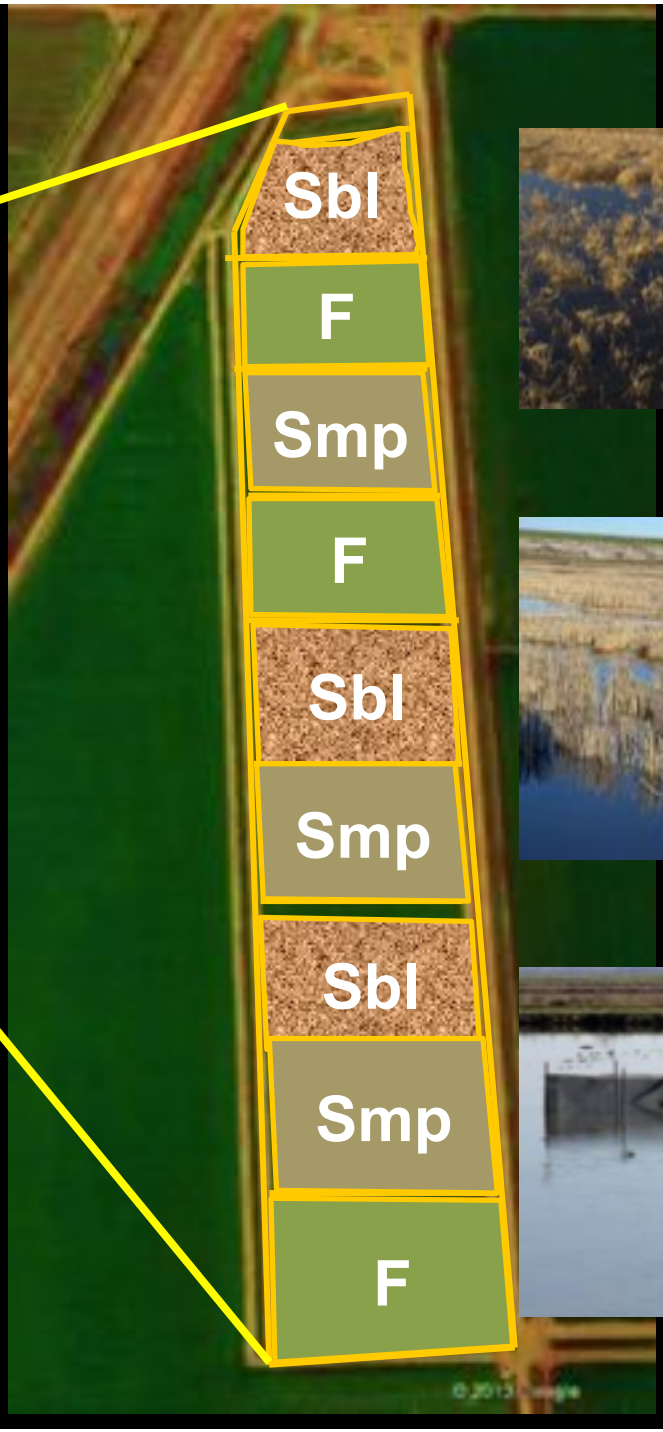
Fish measured and tags read


100 mm
Jan 31 – Week 0 – planted in rice field
100 mm
March 12 – Week 6 – released from rice field
100 mm
April 13 – Week 10 – 13 miles downstream
GROWTH



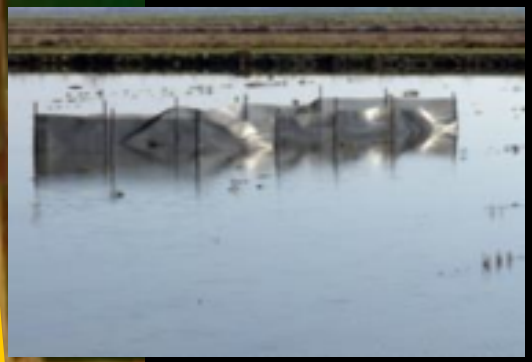
Nine 2-acre fields
Farm practices?





Fallow

Stubble



Stomped

2013: Feb 18 – Apr 4

42,000 hatchery fish

Day 0 Day 38

3/19

53 mm

1.5 g

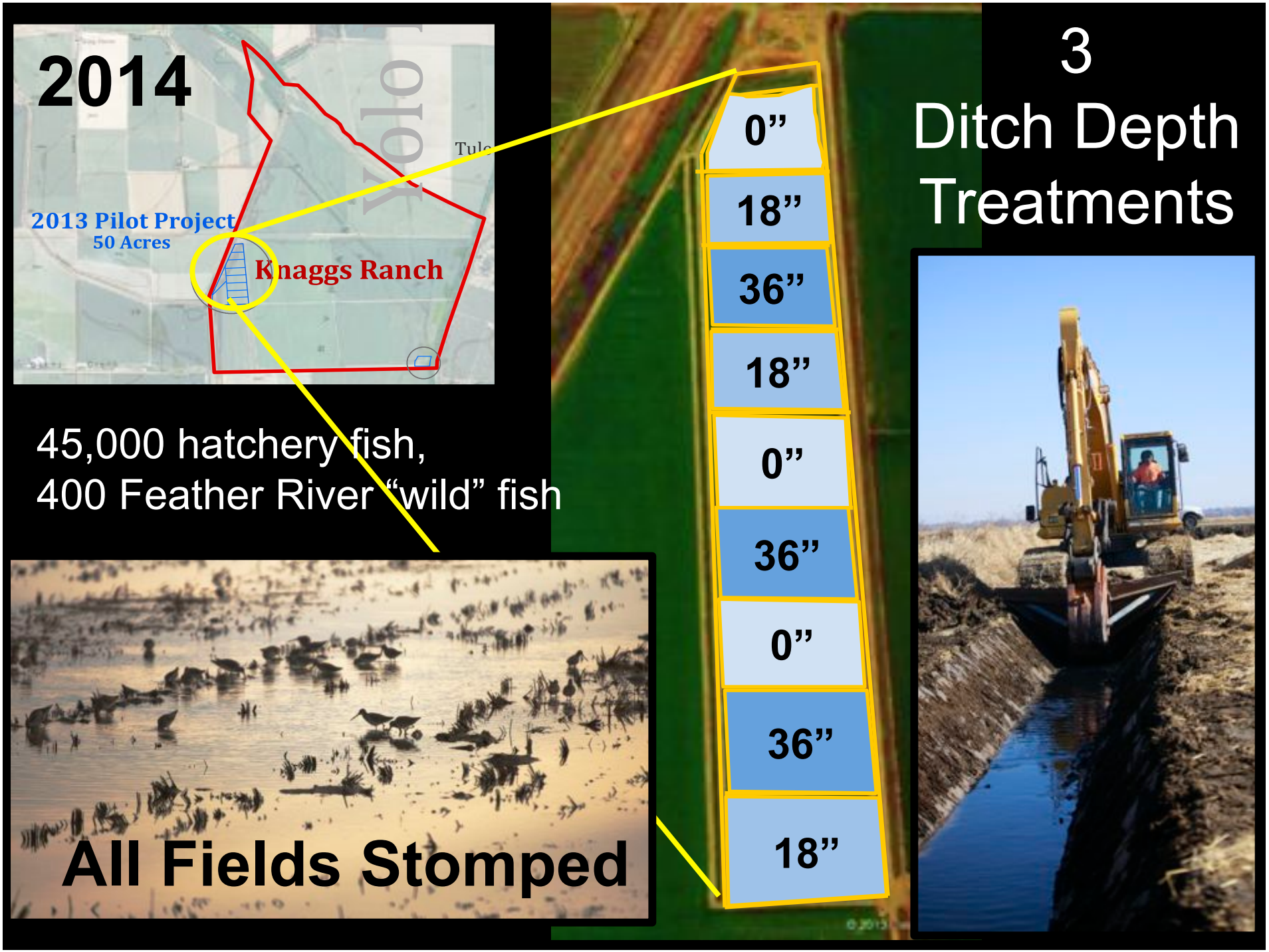
4/27

90 mm

9.4 g

0.94 mm/d

0.18 g/d


2014
2013 Pilot Project
50 Acres
Knaggs Ranch
45,000 hatchery fish,
400 Feather River "wild" fish
All Fields Stomped
0"
18"
36"
18"
0"
36"
0"
36"
18"
3
Ditch Depth
Treatments

2014

Similar Growth
(1 mm/day)

Better
Survival

(Approx. 60%)

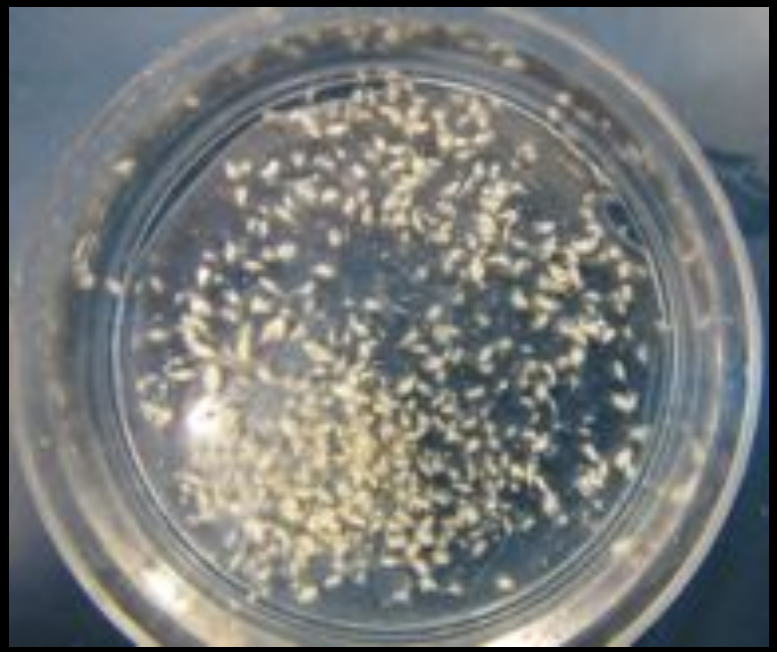
Slow it down!

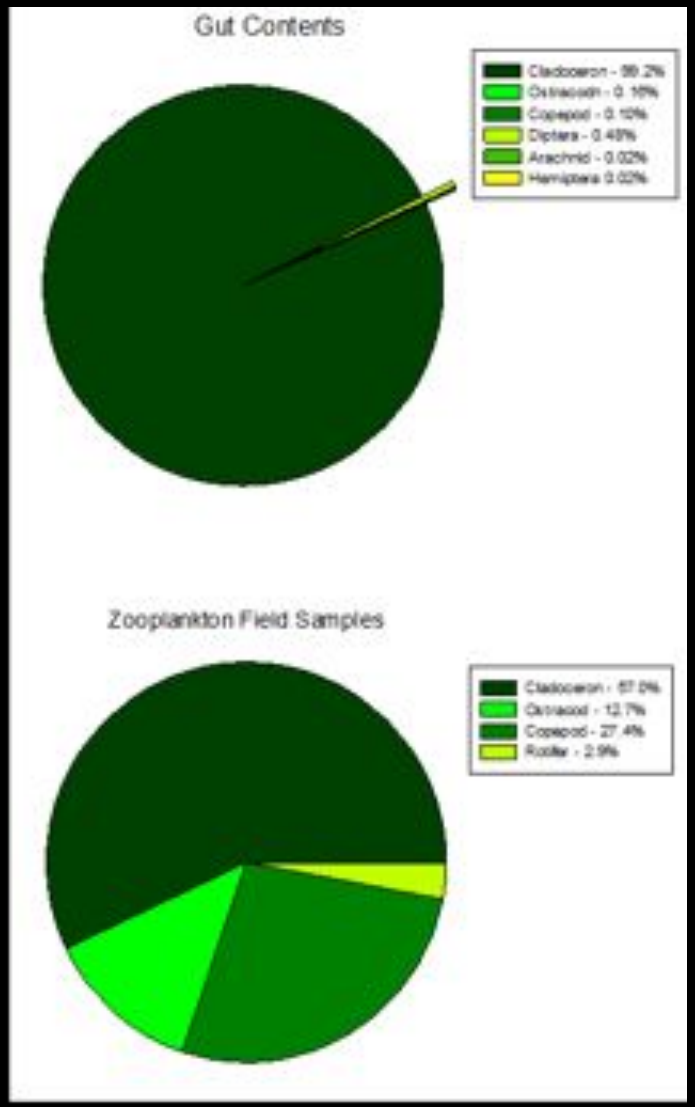
Spread it out!

Grow them up!

Knaggs Gut Contents

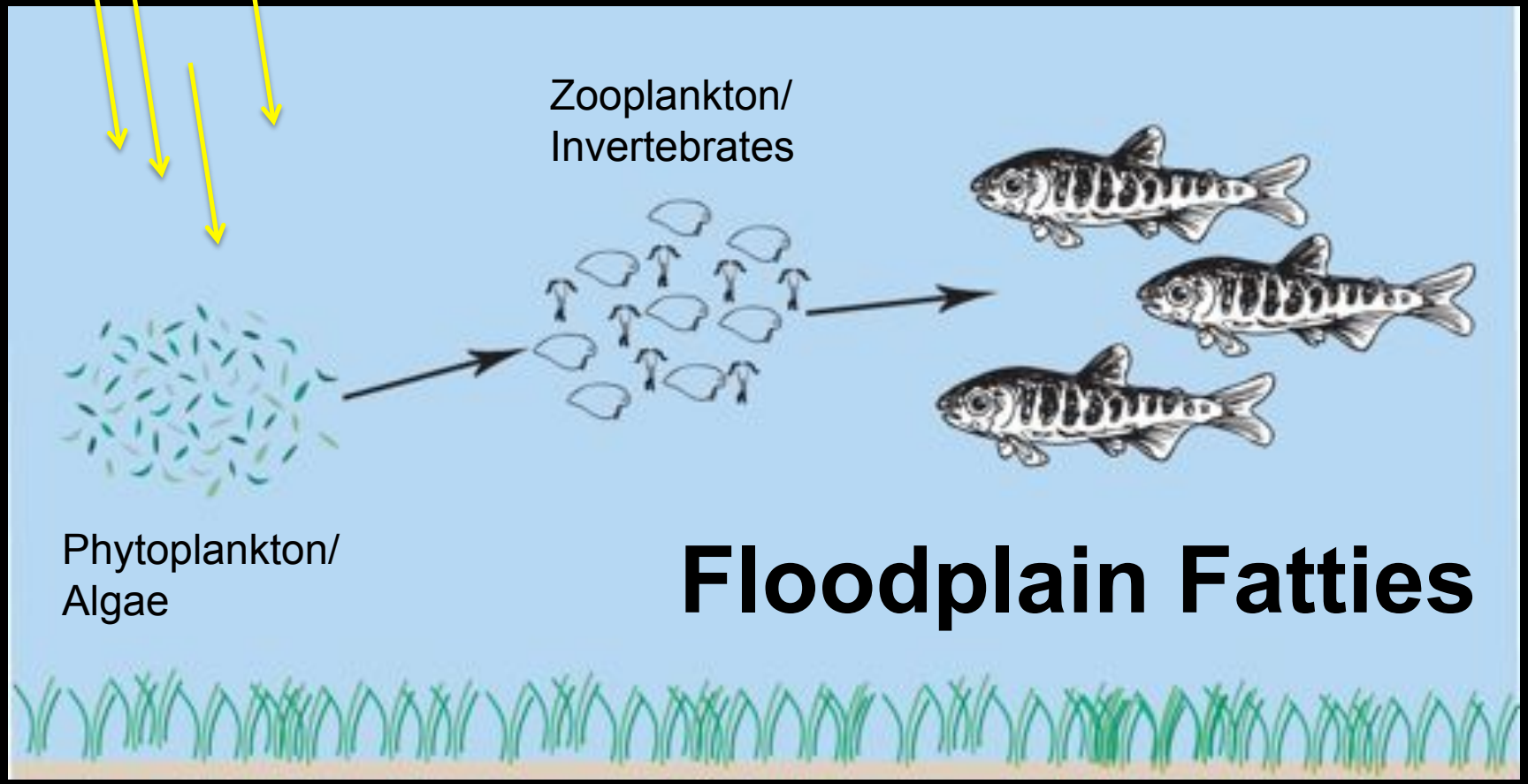
- Contents from a single 79mm salmon
  - ~460 individual cladocerons

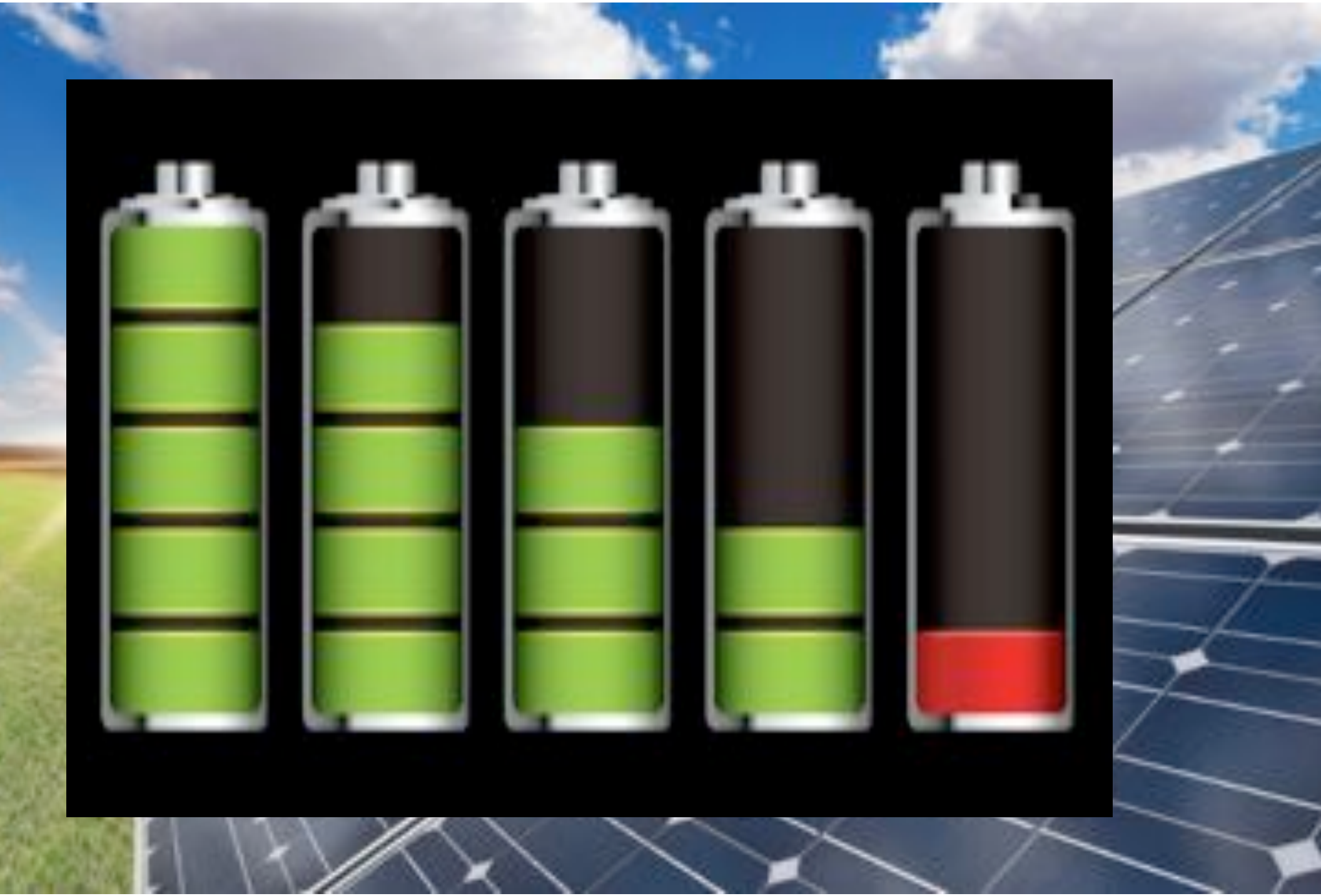




2015
6 Managed ag floodplains
Different Locations
But Same story

Mimicking Hydrologic Process To restore Ecological Function





Fish Gotta Eat Too!

Process–Based Solutions:

Only landscape-level riverine processes
can create and maintain
the diverse mosaic of habitat types
needed for the full lifehistory expression
on which resilient,
self-sustaining
populations of wild fish depend

Landscape
Scale
Connectivity

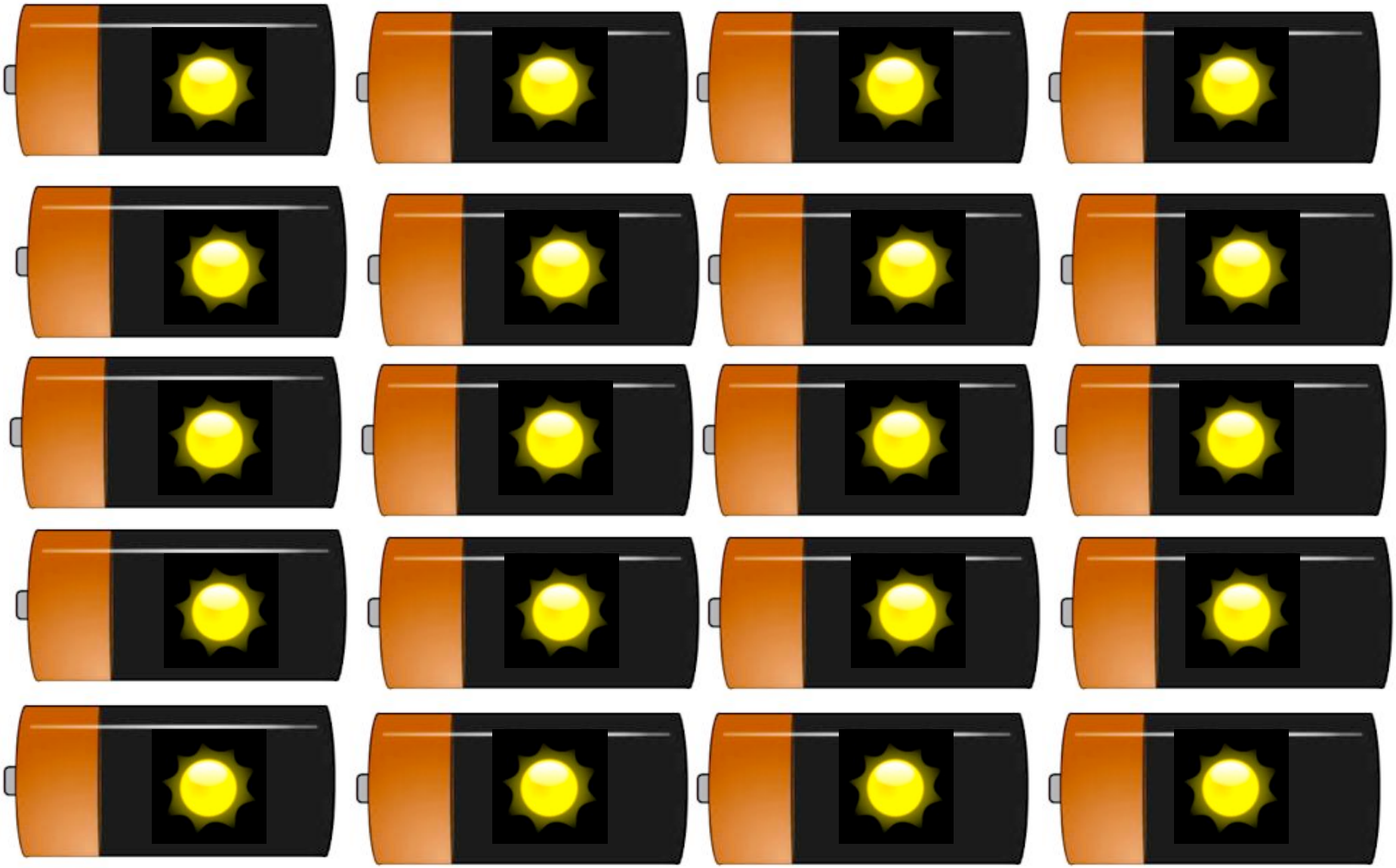
More Inundation
(flow related solutions)

Flood weirs
Levee gates

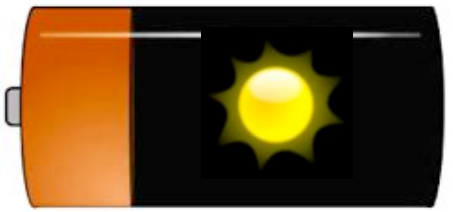
Longer Inundation
(water retention related solutions)

Berms and
Bladder dams

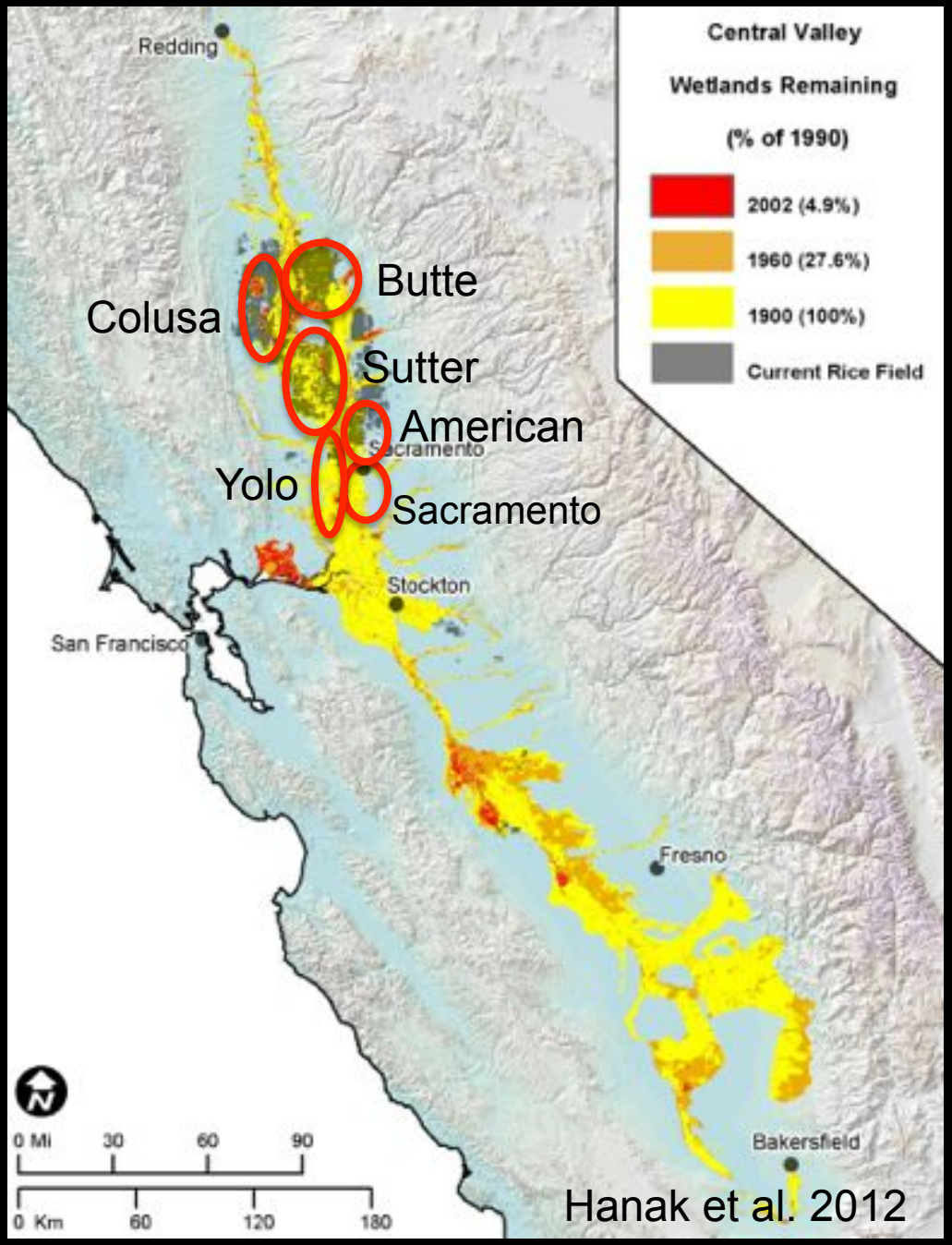
Central Valley Before Levees



Central Valley today



River Ecosystem Losing Power



Sac Valley Flood Basins

Large & Flat =

High residence time of flood waters =

Aquatic productivity

Thicktail chub

extinct

A Cooperative Partnership

California Trout

The California Department of Water Resources

The UC Davis Center for Watershed Science

Cal Marsh and Farm Ventures, LLC

Knaggs Ranch, LLC

The U.S. Bureau of Reclamation

NOAA – Southwest Fisheries

This work is collaborative and could not be achieved without the effort of many:

Ted Sommer, Louise Conrad, Gina Benigno, Steve Brumbaugh, Josh Martinez (DWR), Carson Jeffres, Peter Moyle, Nick Corline, Miranda Tilcock, Veronica Corbet, Eric Holmes (UCD), Josh Israel (US Bureau of Reclamation), Joe Kiernan and Sean Hayes (NMFS), Jason Roberts Krystal Acierto (DFW), John Brennan, David Katz and Huey Johnson (Cal Marsh and Farm)

Questions?

Carson Jeffres

Carson Jeffres

Process-Based Reconciliation

Integrating a working knowledge of natural process, into management of natural resources

Flooding instead of burning

Central Valley Waterfowl

Unassisted access to diverse
habitats in space and time →

expression of diverse
life history strategies →

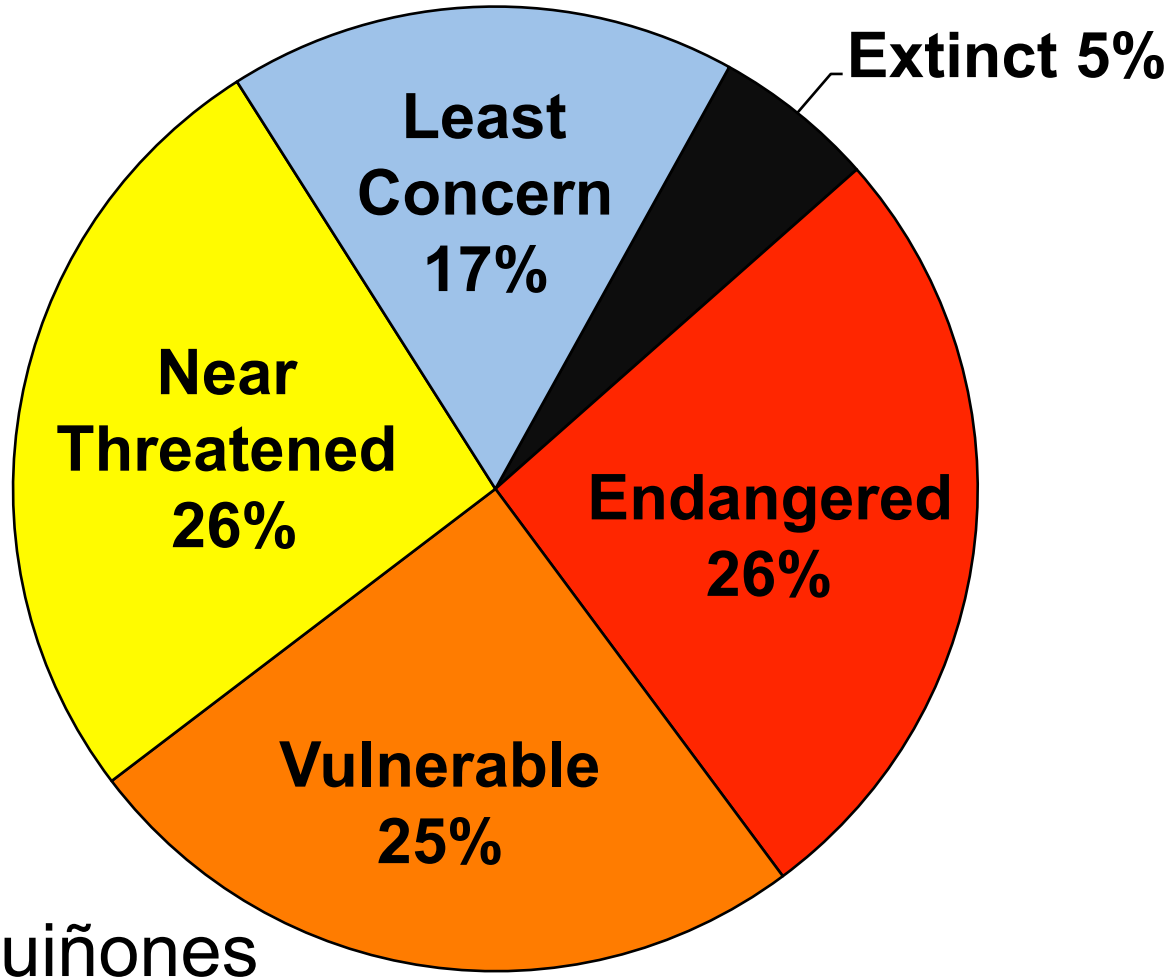
limited gene flow
between breeding groups →

adaptation to local environmental conditions
via natural selection →

evolution and maintenance
of discreet populations (runs)

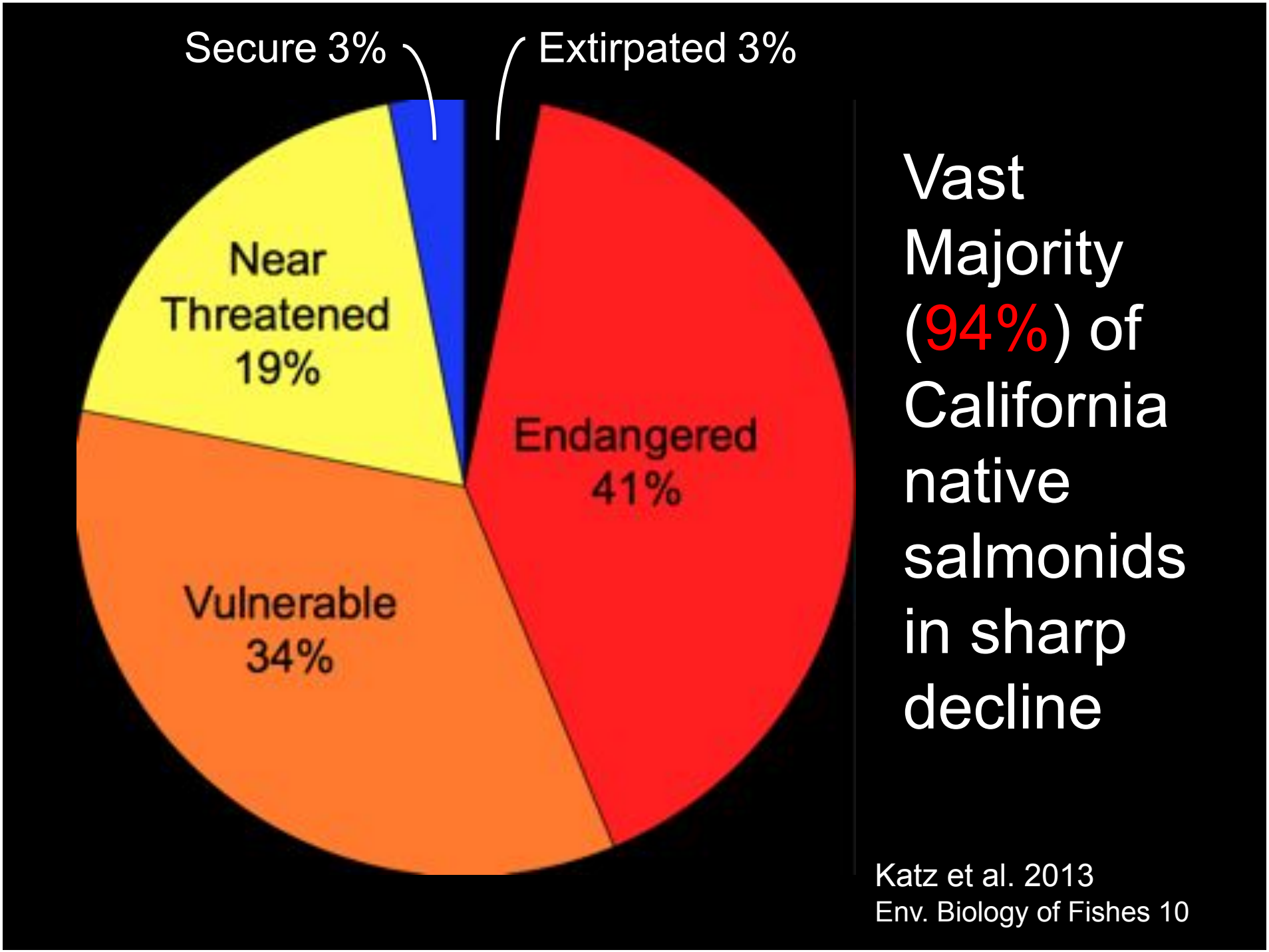
CA NATIVE FISHES 2011

83%
Extinct or
in decline



Moyle, Katz & Quiñones
Biological Conservation,
Vol 144, issue 10, Oct. 2011

N=129



Vast Majority (94%) of California native salmonids in sharp decline

Katz et al. 2013
Env. Biology of Fishes 10

Native species must to be able to recognize their environment

We are never going back!

But we must look back in order to move forward.

We must have a working understanding of natural systems in order to build better more effective human systems