



Gravel Augmentation Update Recreation and Park Commission



Lilly Allen

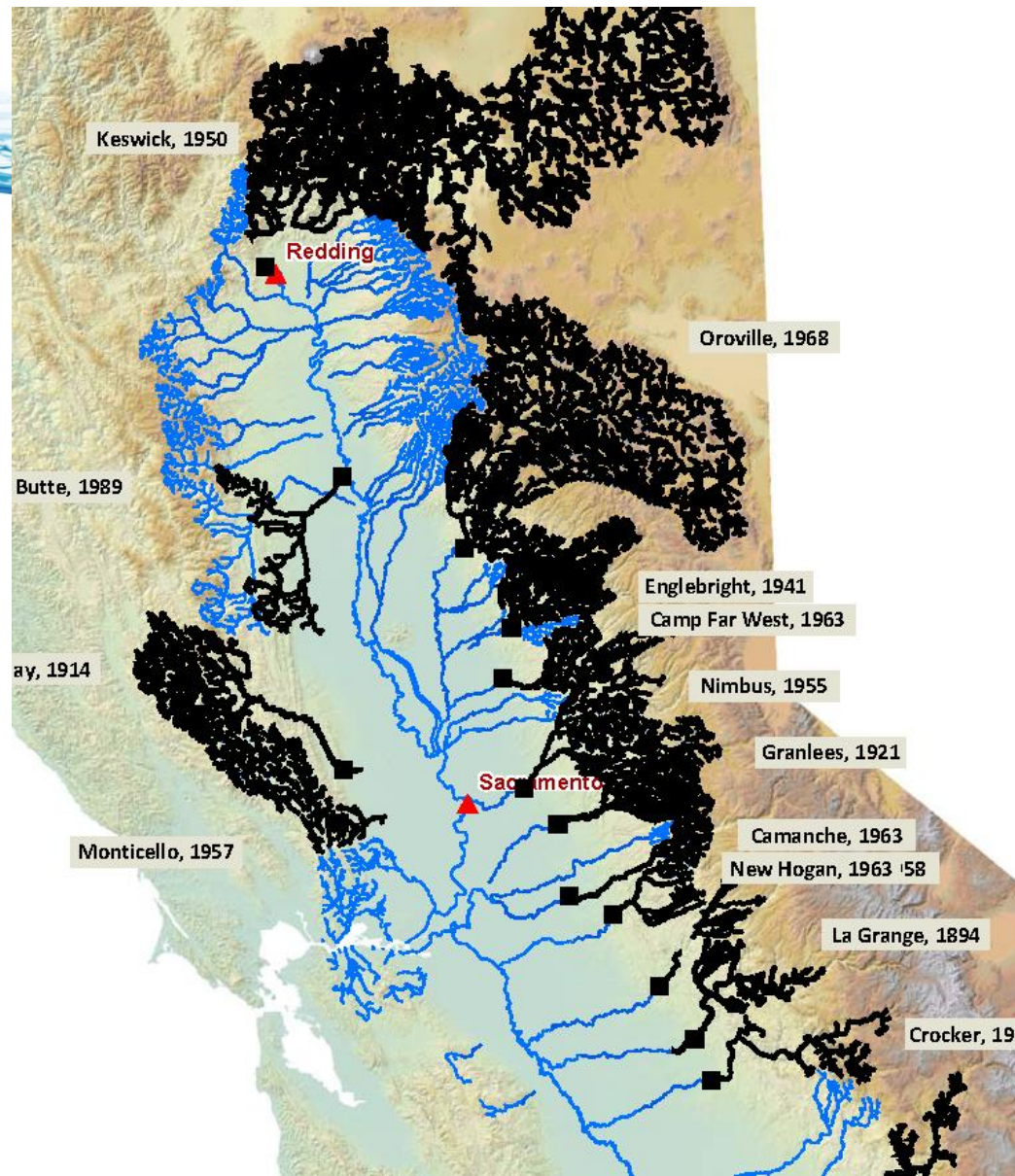
5/25/16

Overview

- Why Gravel Projects?
- Past Projects
- 2016 Project
- Questions?
- If interested & time allows:
 - Underlying Science
 - Beyond 2016

Declining Fish Habitat

Central Valley dams have drastically reduced habitat.

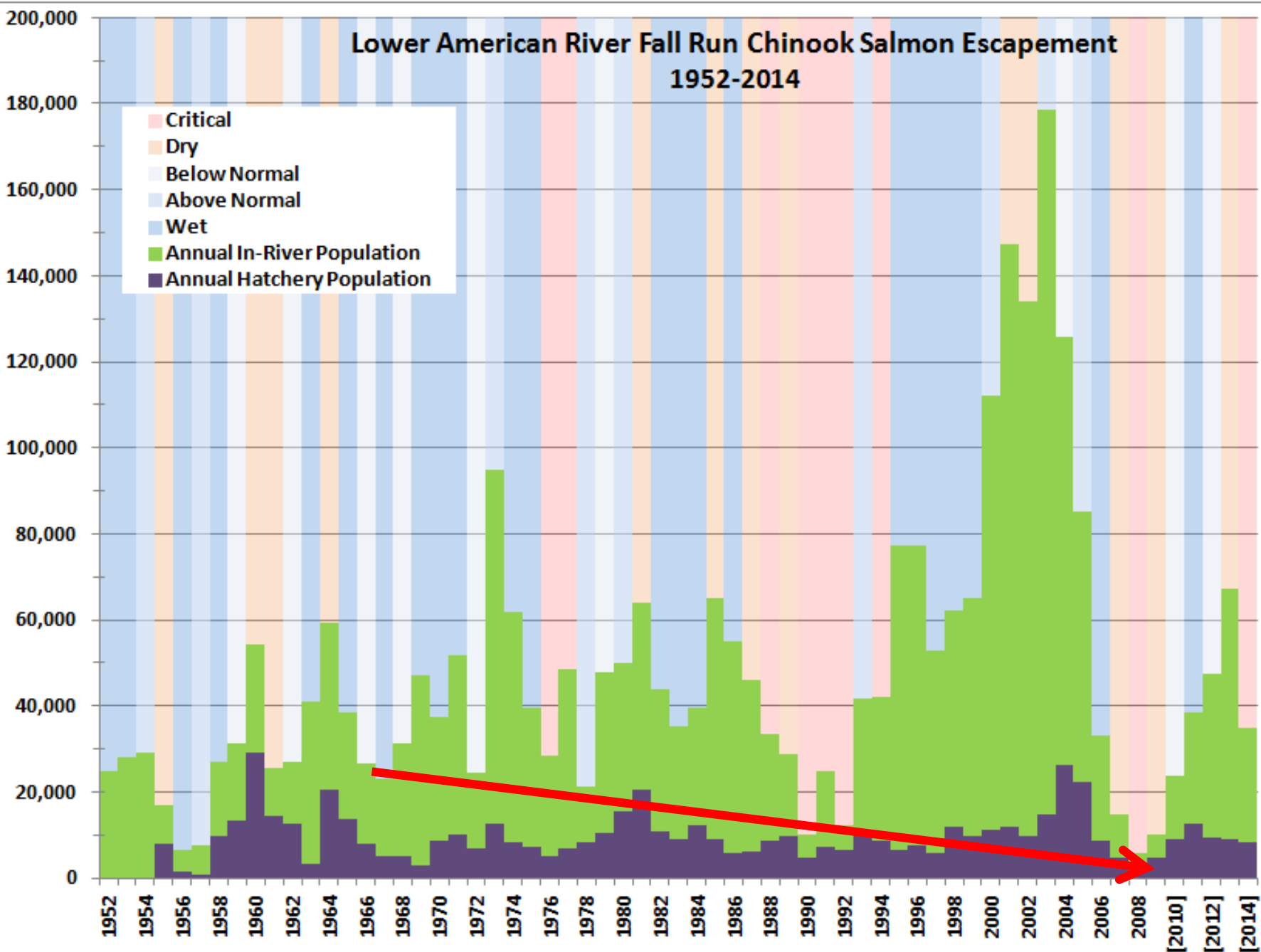
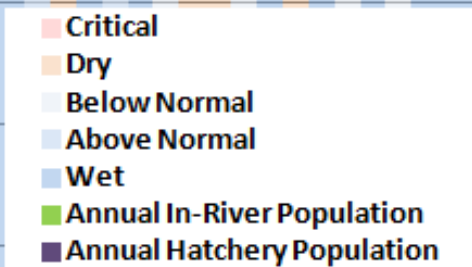


Source:
Lindley et al.2006:
Historical
population
structure of
Central Valley
steelhead and its
alteration by dams

Model of suitable
historical habitat
for steelhead


Lower American River Fall Run Chinook Salmon Escapement 1952-2014

Fall-Run Chinook Salmon Escapement



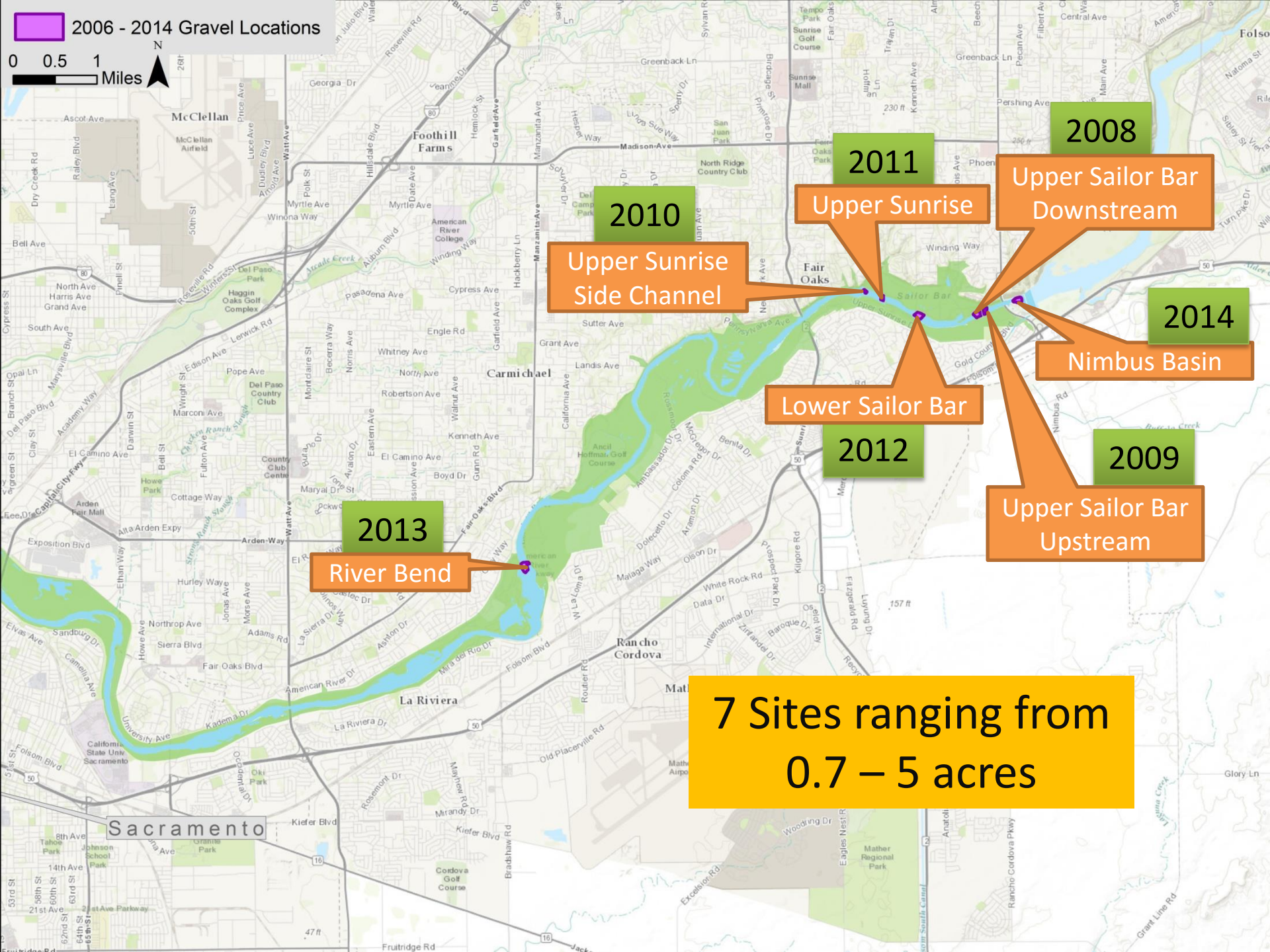
Preliminary Data
2009-2014

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2006 - 2014 Gravel Locations

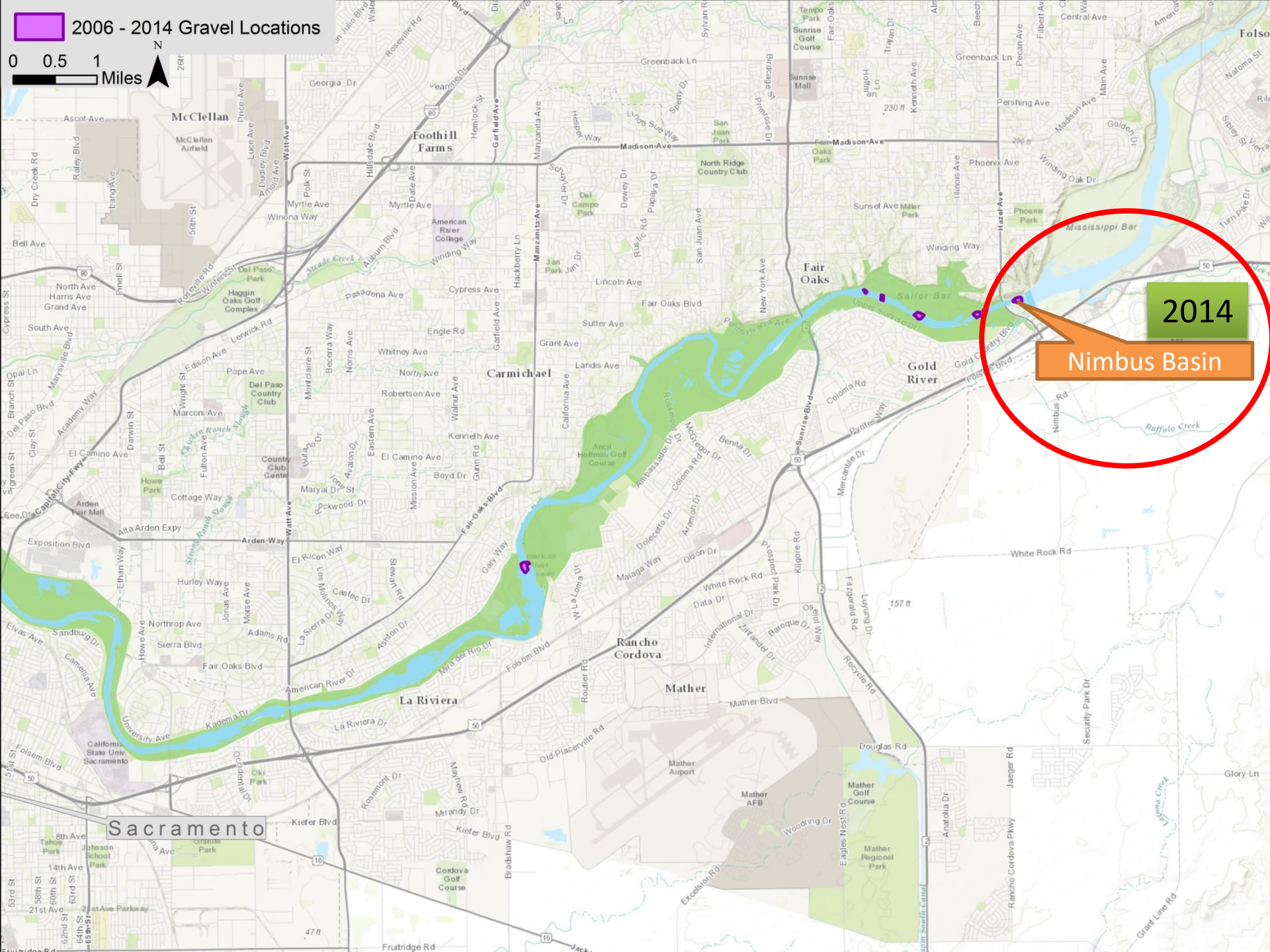
0 0.5 1 Miles



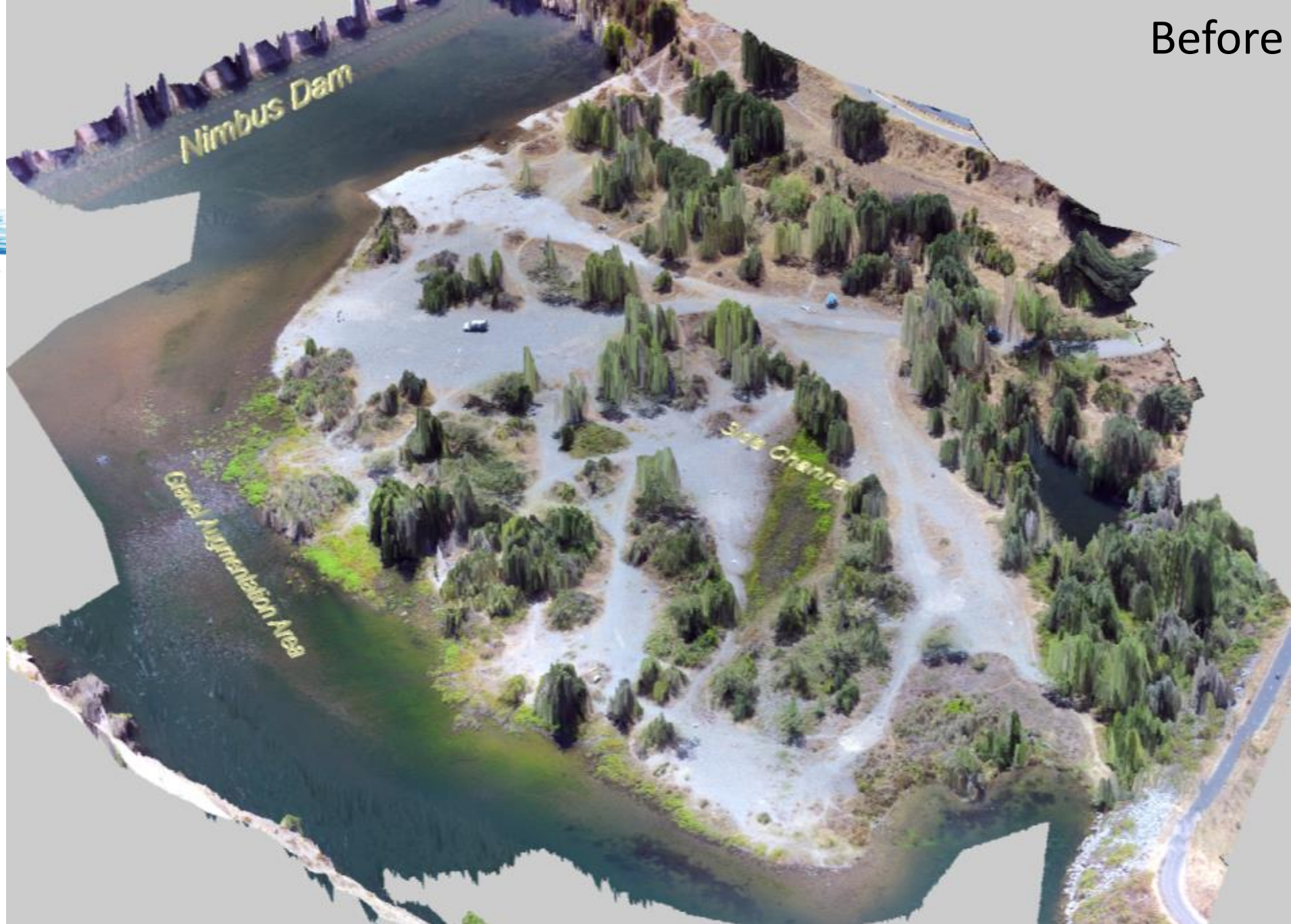
7 Sites ranging from
0.7 – 5 acres

2006 - 2014 Gravel Locations

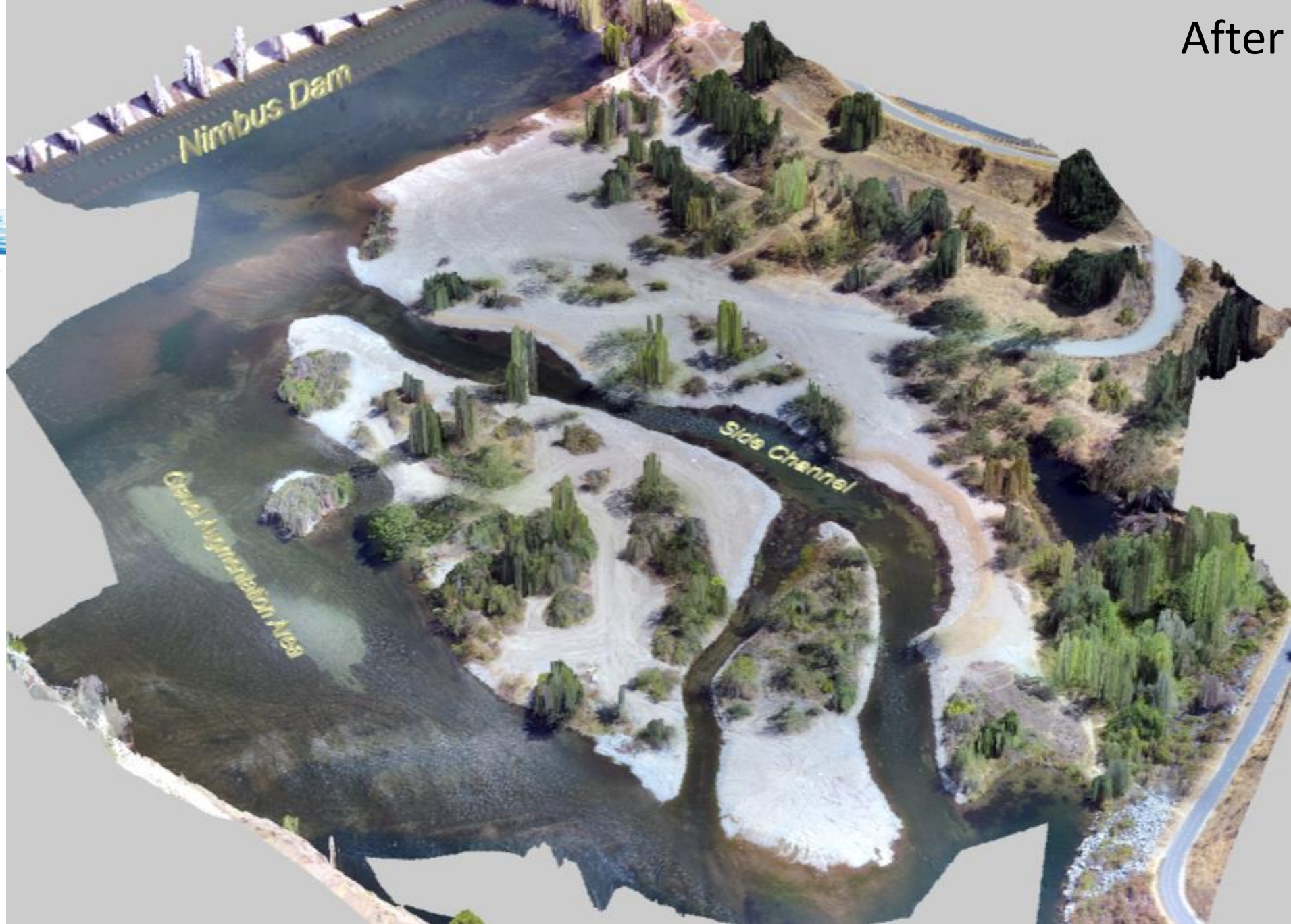
0 0.5 1 Miles



Before



After




Nimbus Basin

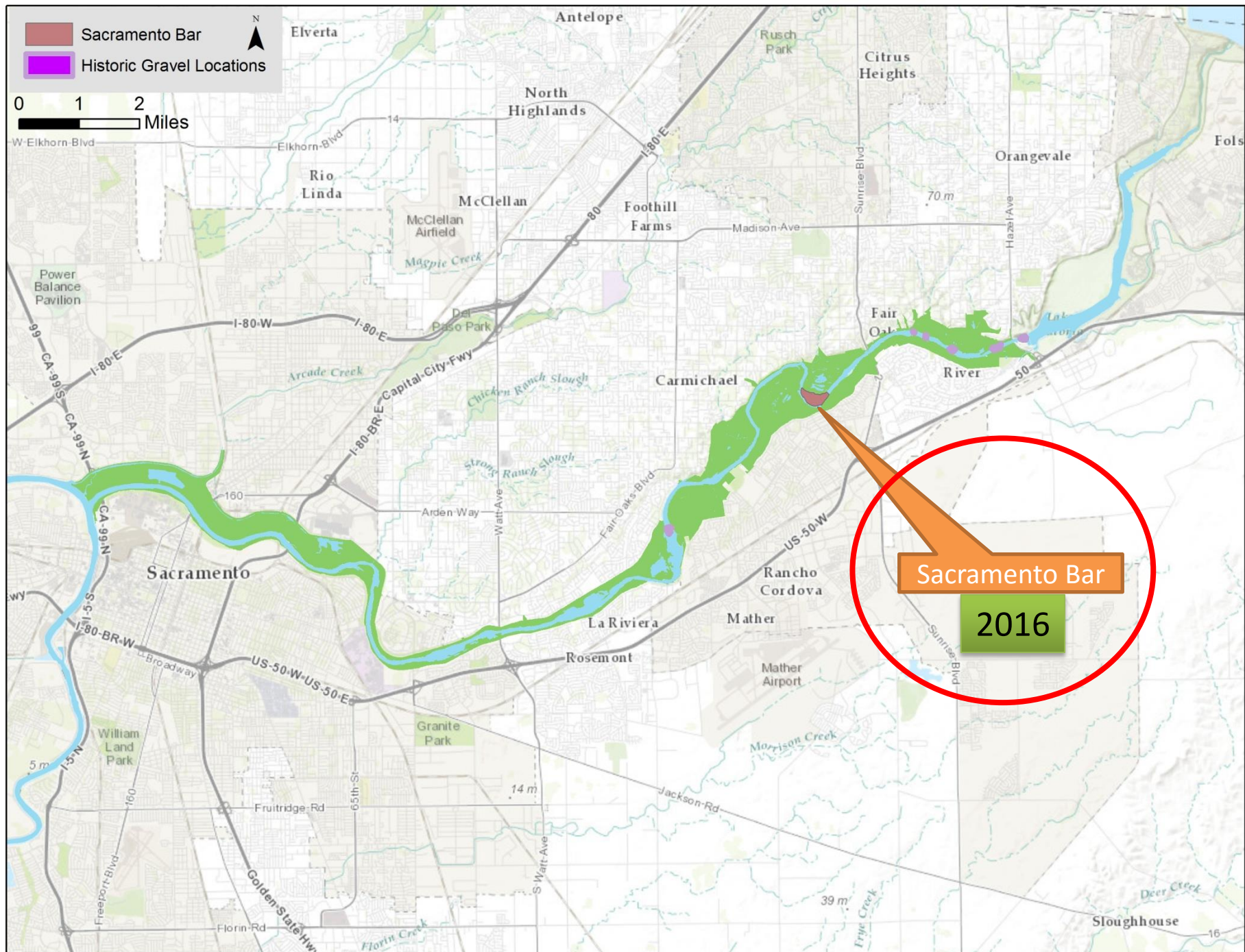
Before

After



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Parking lot at the end of
Pennsylvania Ave, Fair Oaks

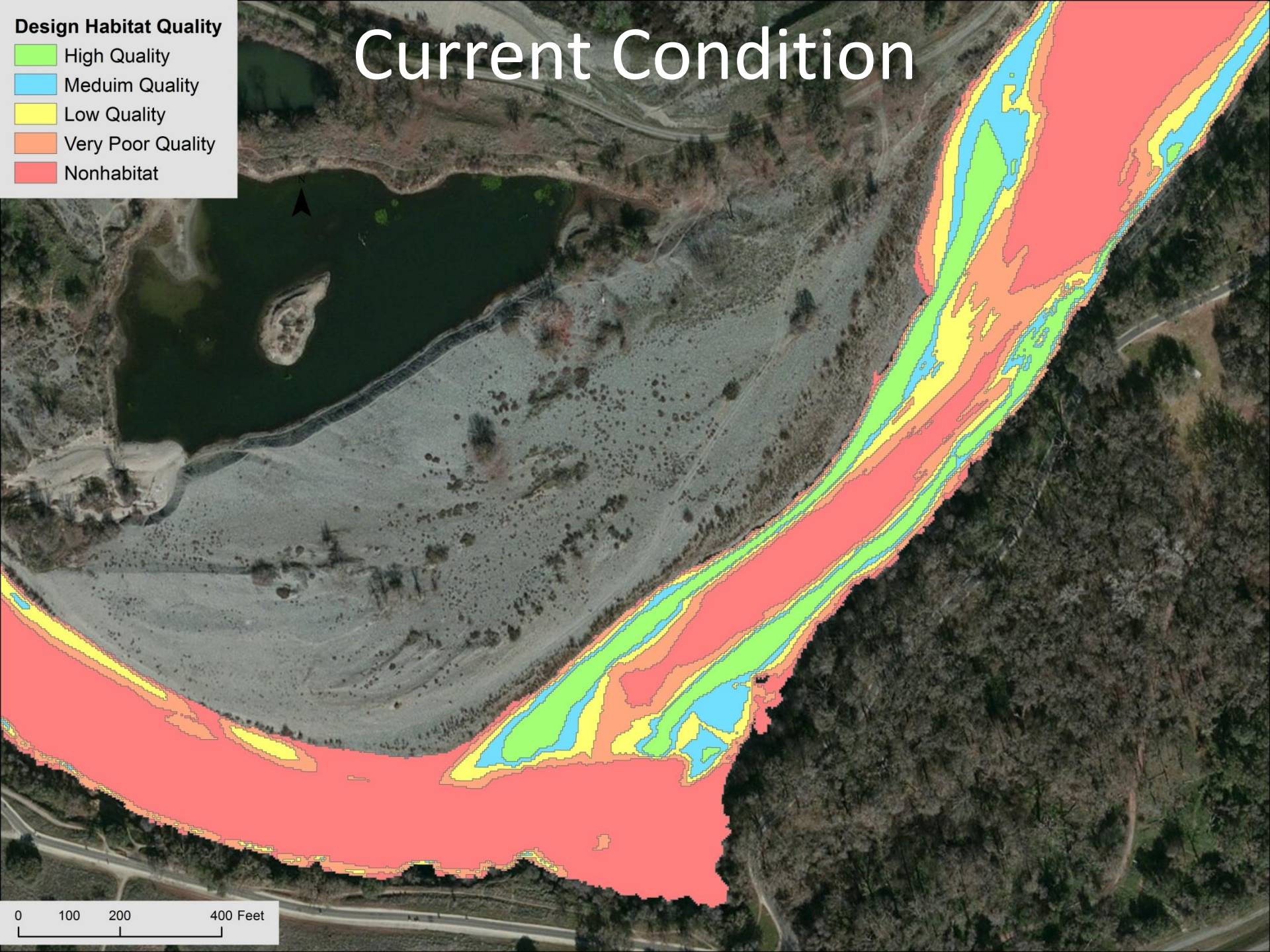
Fire Road to site

2016 Gravel Site

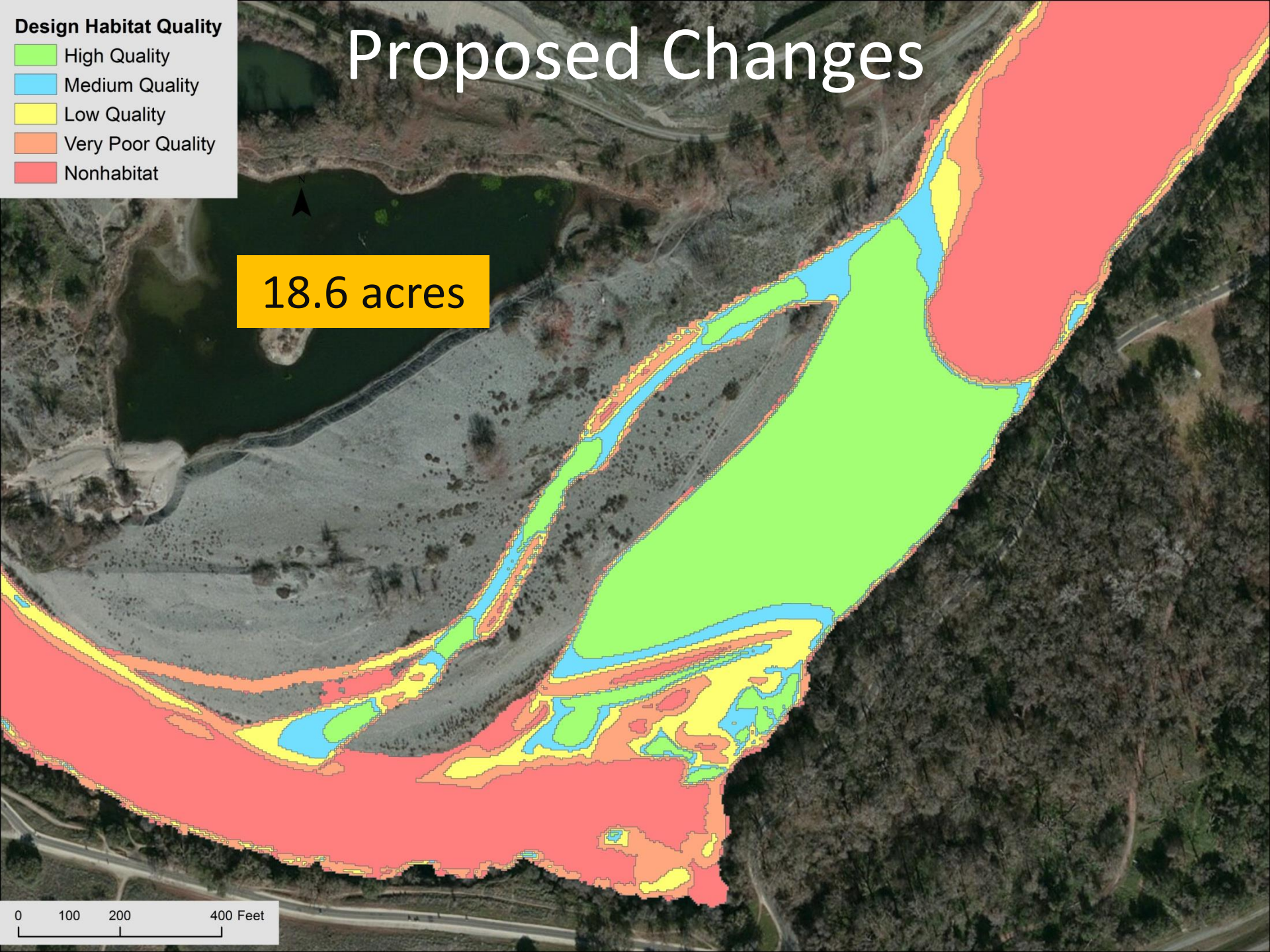




Current Condition



Proposed Changes





Big Trucks for Baby Fish?



This September, folks visiting the Sacramento Bar may be surprised to see construction equipment in the river. However, despite the bulldozers, the noise and disruption, this project is actually restoring the river for salmon and steelhead.

The river downstream of the Nimbus Dam was once well used by salmon and steelhead building redds ("nests"), but now this area goes almost unused. "Back in the 1980's I used to watch the salmon building redds all over this area" says fisheries biologist Joe Merz. "But most of the suitable spawning gravels have been washed out in the big floods. We want to see this part of the river healthy again."

We hope that this will be the eighth year of restoring fish spawning gravel beds on the lower American River. The previous four years' projects have been up river, mostly at Sailor Bar. This year, this project is moving downstream and will be new for many people. Construction will begin in September and will be completed in one month. Work will be scheduled Monday through Friday from 8am to 5pm. This river restoration is being completed through a partnership of the Bureau of Reclamation, US Fish and Wildlife Service, CA Dept. of Fish and Wildlife, and the Water Forum.

If you have any questions, please contact Lilly Allen at lallen@waterforum, (916) 808-1997.



Public Outreach: Mailers & Signs

CAUTION
Heavy Equipment in
the River on Weekdays

Salmon and Steelhead Restoration Project

Spawning Gravel
Placement in River

September 9 - 27



**For Further
Information Call:**
(916) 978-5106

Construction Zone

Salmon and Steelhead Restoration Project

Spawning Gravel
Placement in River

September 9 - 27



**For Further
Information Call:**
(916) 978-5160

Salmon and Steelhead Habitat Restoration Project

Spawning Gravel
Placement in River

**August 27
to
September 28, 2012**

For further information call
916-978-5106



**ROADS AND TRAILS CLOSED
to the Public Week Days**

Salmon and Steelhead Habitat Restoration Project

Spawning Gravel
Processing and Placement
in River

**August 27
to
September 28, 2012**

For further information call
916-978-5106



Disturbance



Woody Material Placement








A photograph showing a large number of small, silvery fish swimming in shallow, greenish water. The water is slightly murky, and there are several dark, thin branches or sticks submerged in the water, some of which are in the foreground. The fish are densely packed in some areas and more spread out in others, creating a sense of a large school. The overall scene is captured from an overhead perspective, looking down into the water.

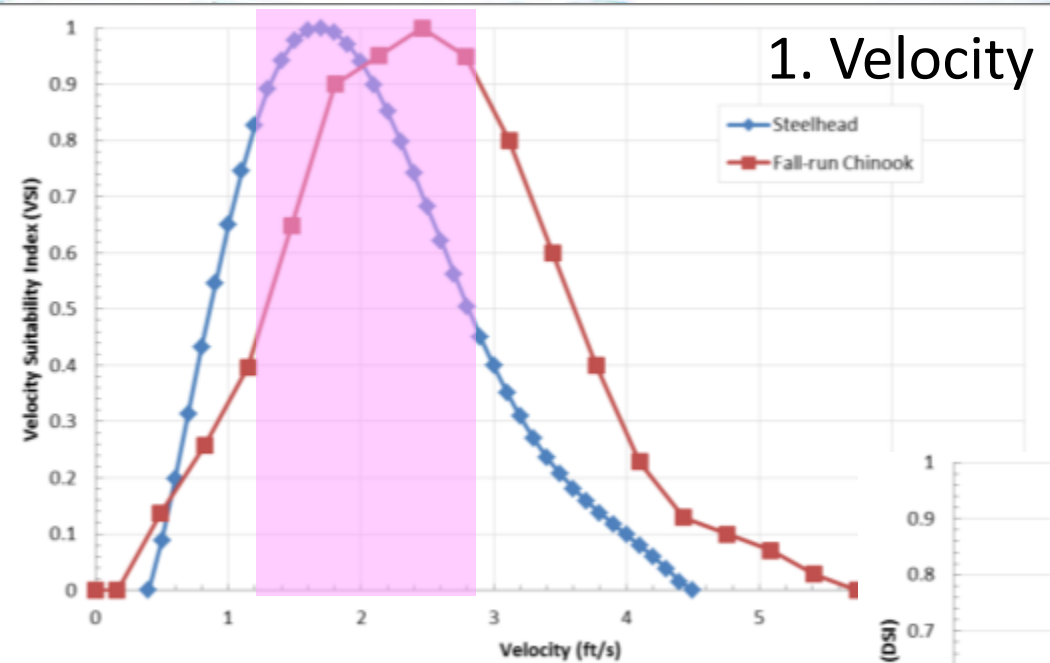
Questions?

Overview

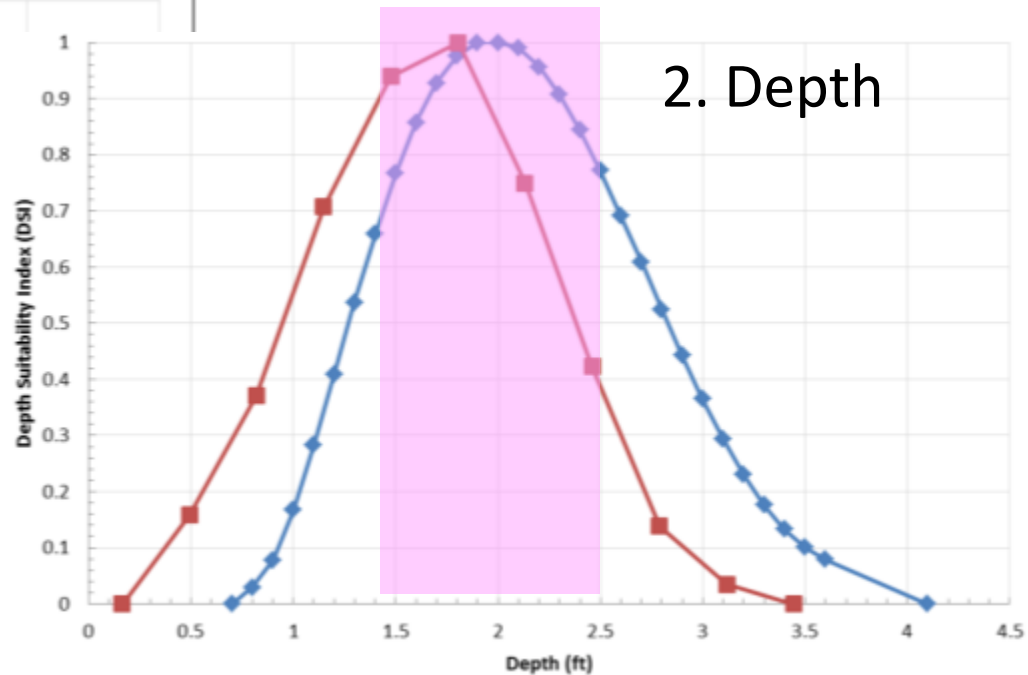
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American River Specific Habitat Suitability Criteria

1. Velocity

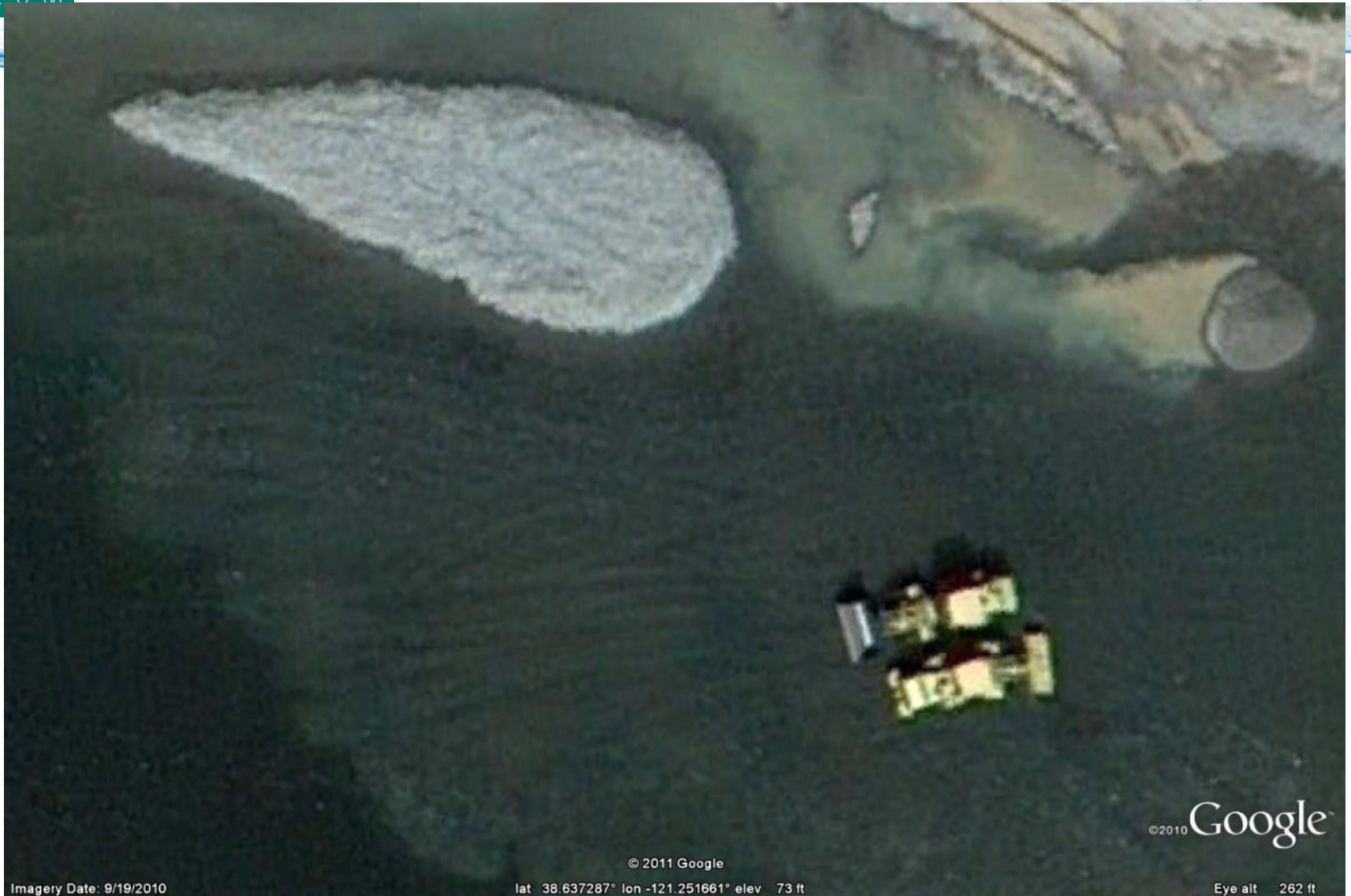


2. Depth

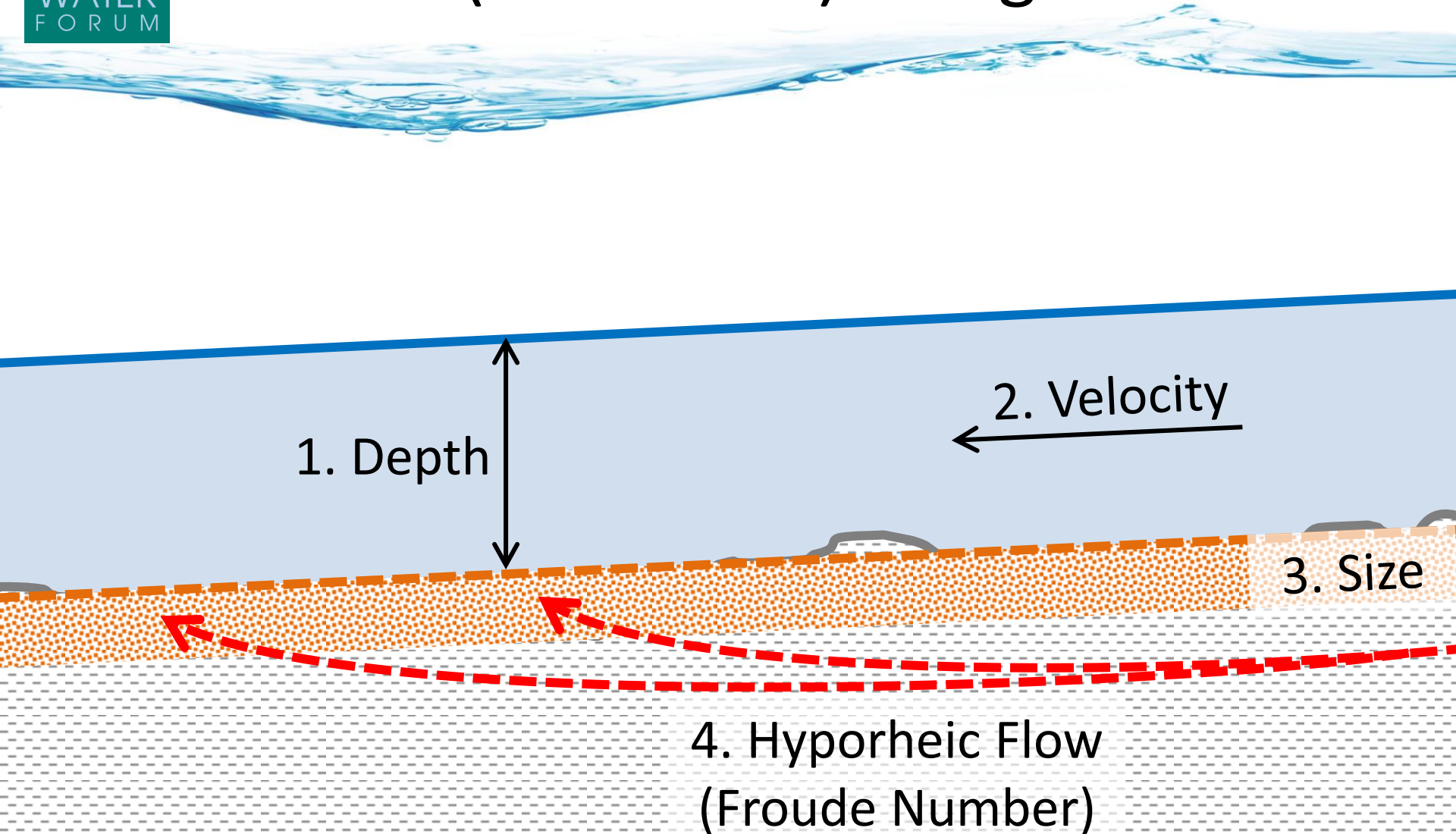


3. Gravel Size

2010 Site – Upper Sunrise



A New (additional) Design Criterion



New Horizons in Design

Calculating hyporheic flow using
Froude numbers

$$Fr = V / \sqrt{gD}$$

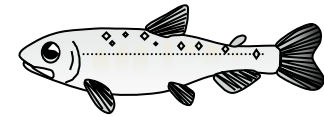
Fr = Froude Number

V = Water Velocity

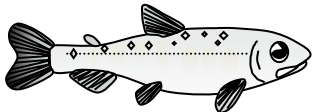
g = Gravity

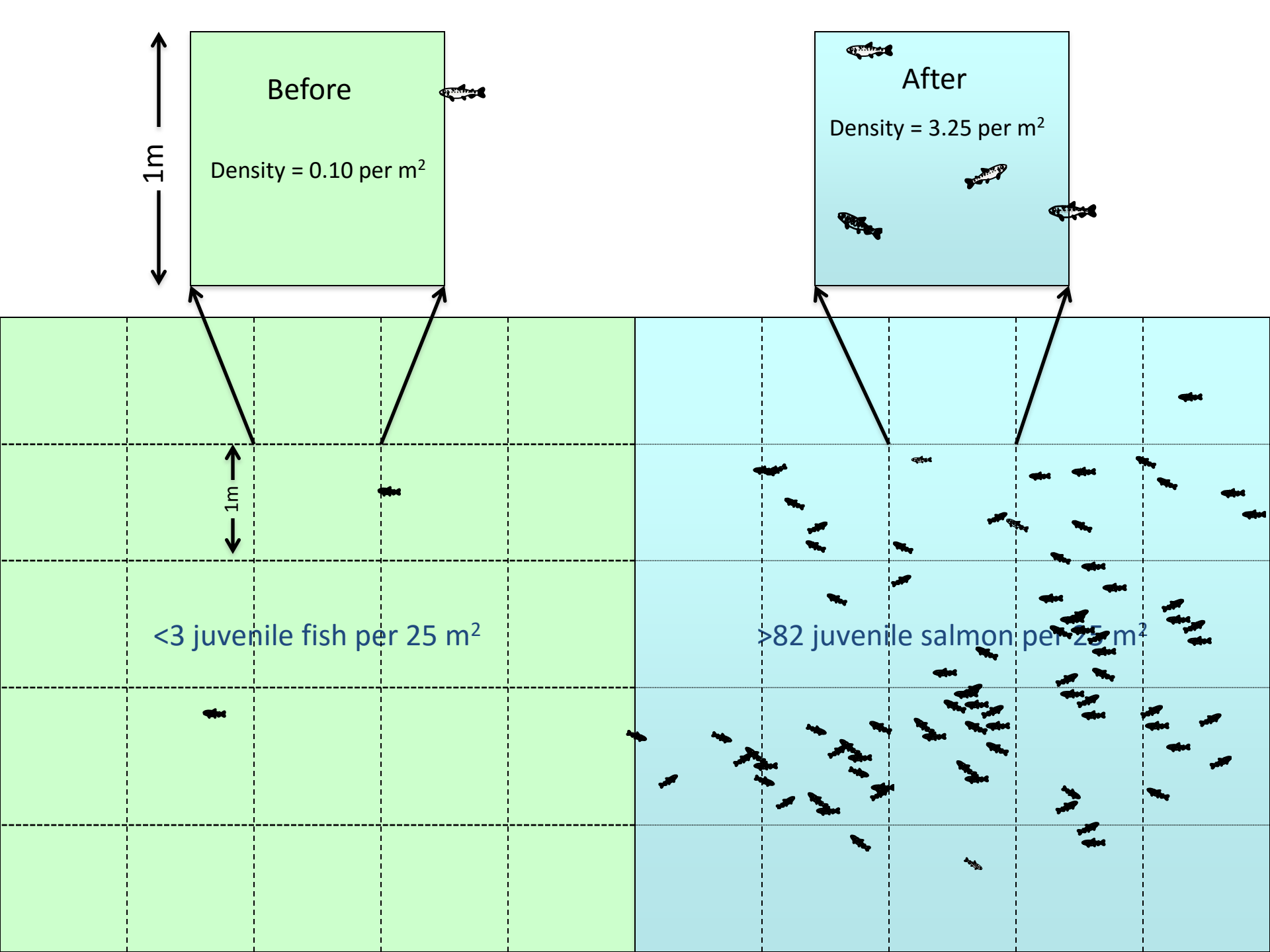
D = Hydraulic Depth

Gravity
—
Inertia = Helps indicate
boundary between
turbulent and
laminar flow
conditions




We can use this to better predict where salmon will spawn

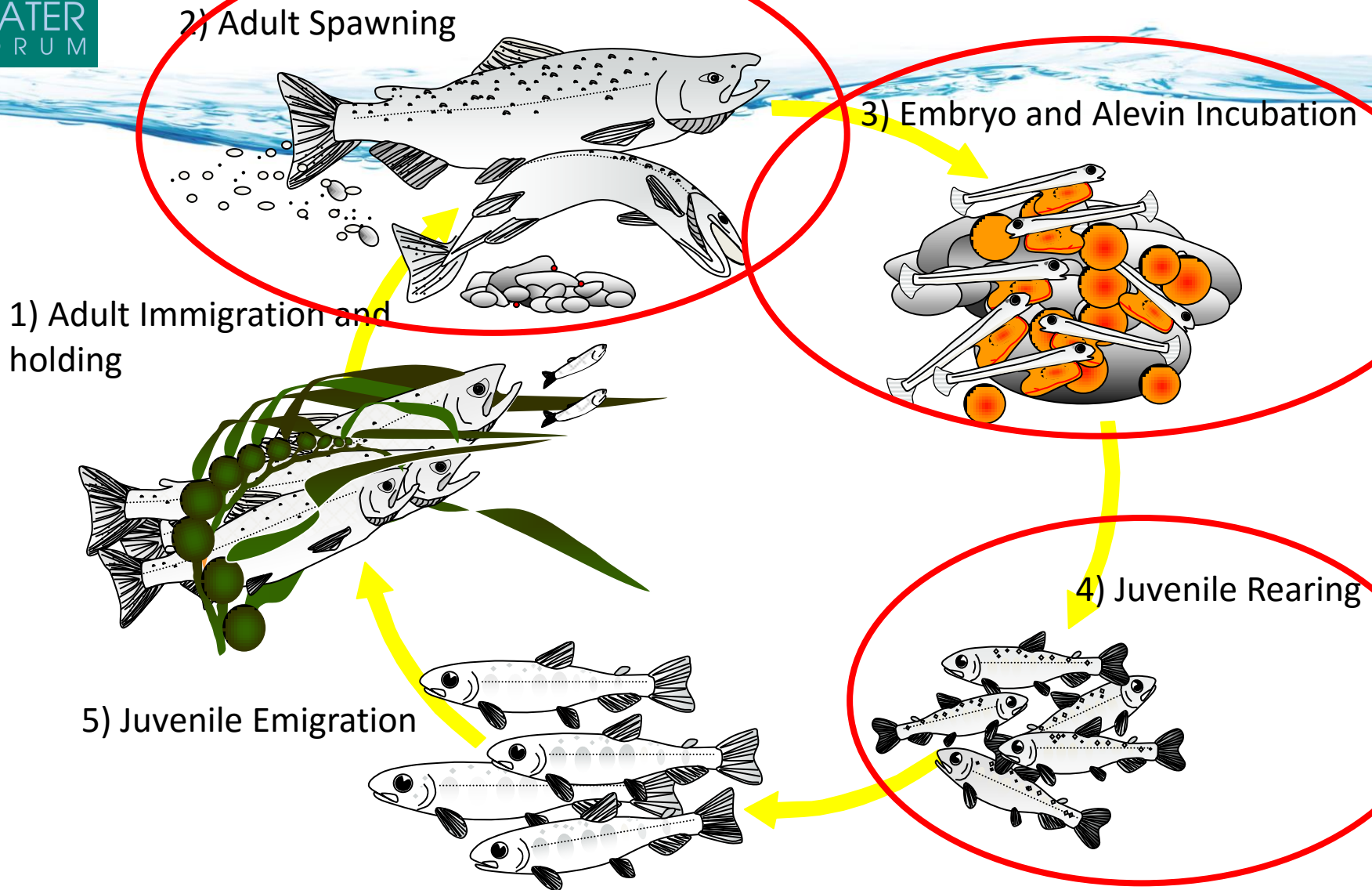




Overview

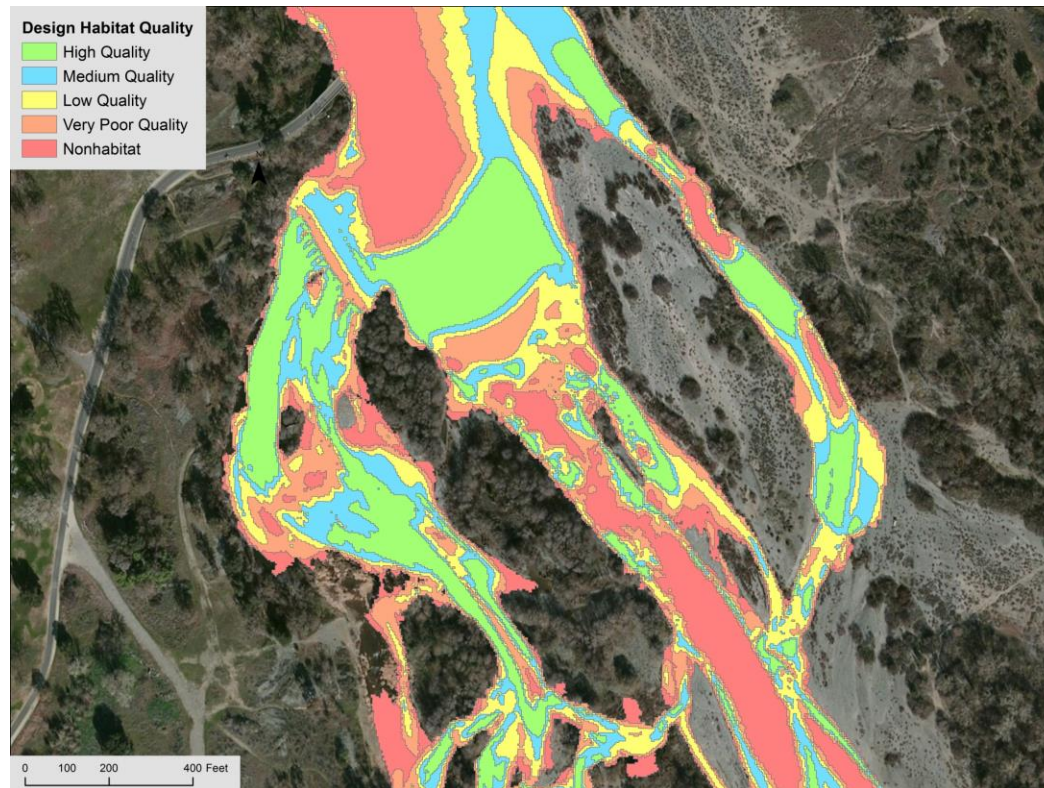
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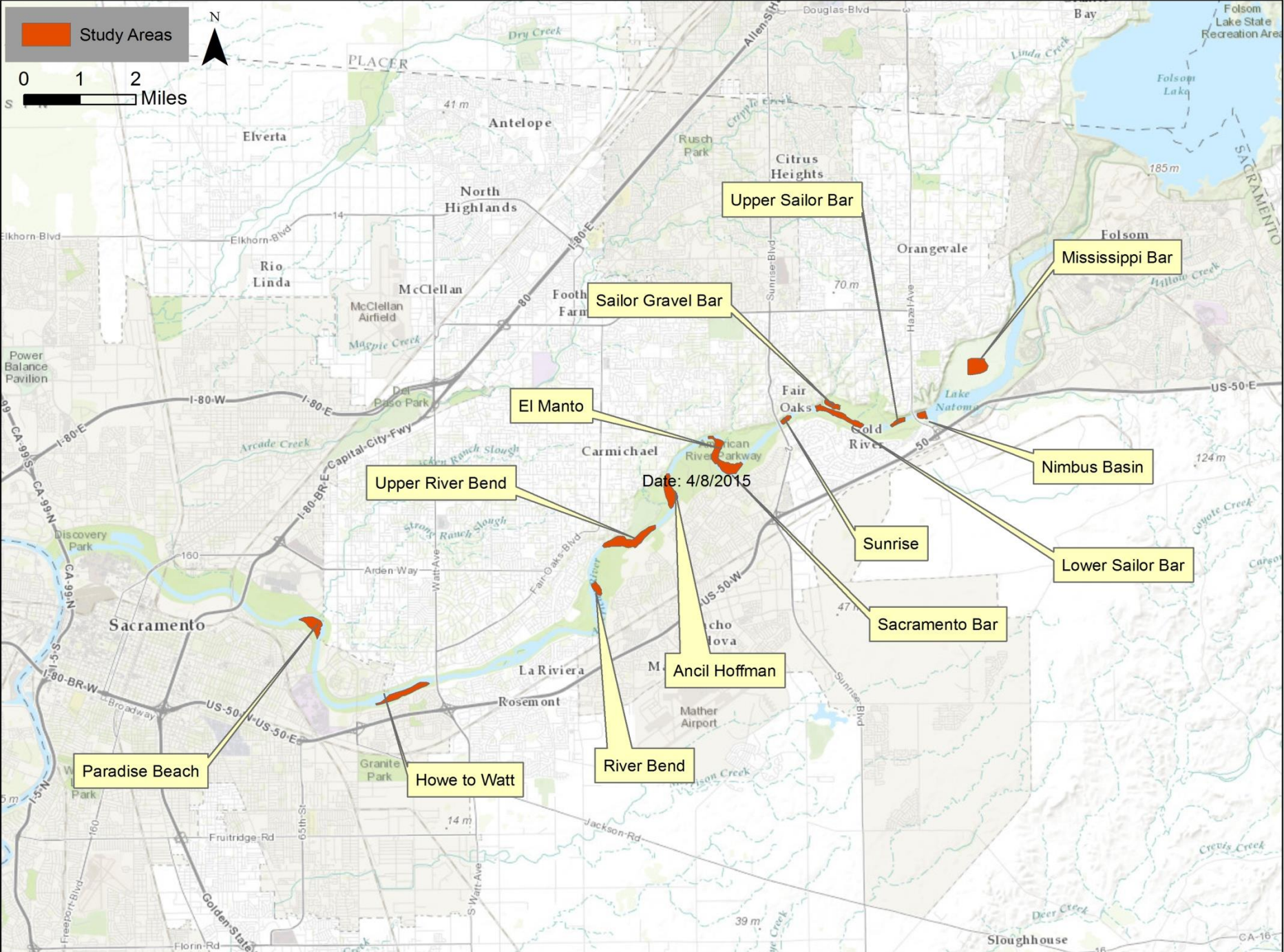
What do they need? General salmon life cycle



Juvenile Rearing

Complex side channel habitat





Questions?

