

# *Larval/Juvenile Lamprey Entrainment in Irrigation Diversions (Yakima Subbasin)*

CTUIR & BOR



## Yakama Nation Fisheries: Pacific Lamprey Recovery Project

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# Overview

## 1. Background

- *What we know & don't know*

## 2. Summary of Previous Findings(~2013)

## 3. New Findings in 2014

## 4. Recommendations (Short-Term & Long-Term)

# "2" Lamprey Species

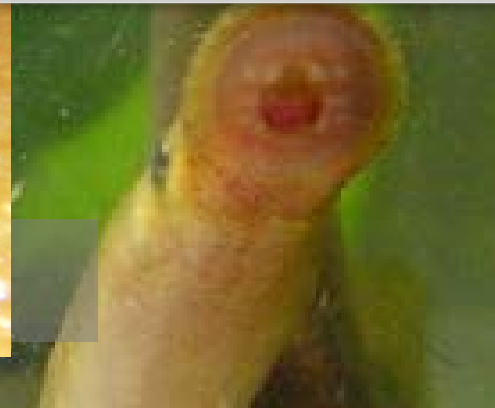


Western River Lamprey



Western  
Lamprey

Photo by Gary Susac, ODFW





**Coho  
Salmon**



**Lamprey**





• Larval Lamprey

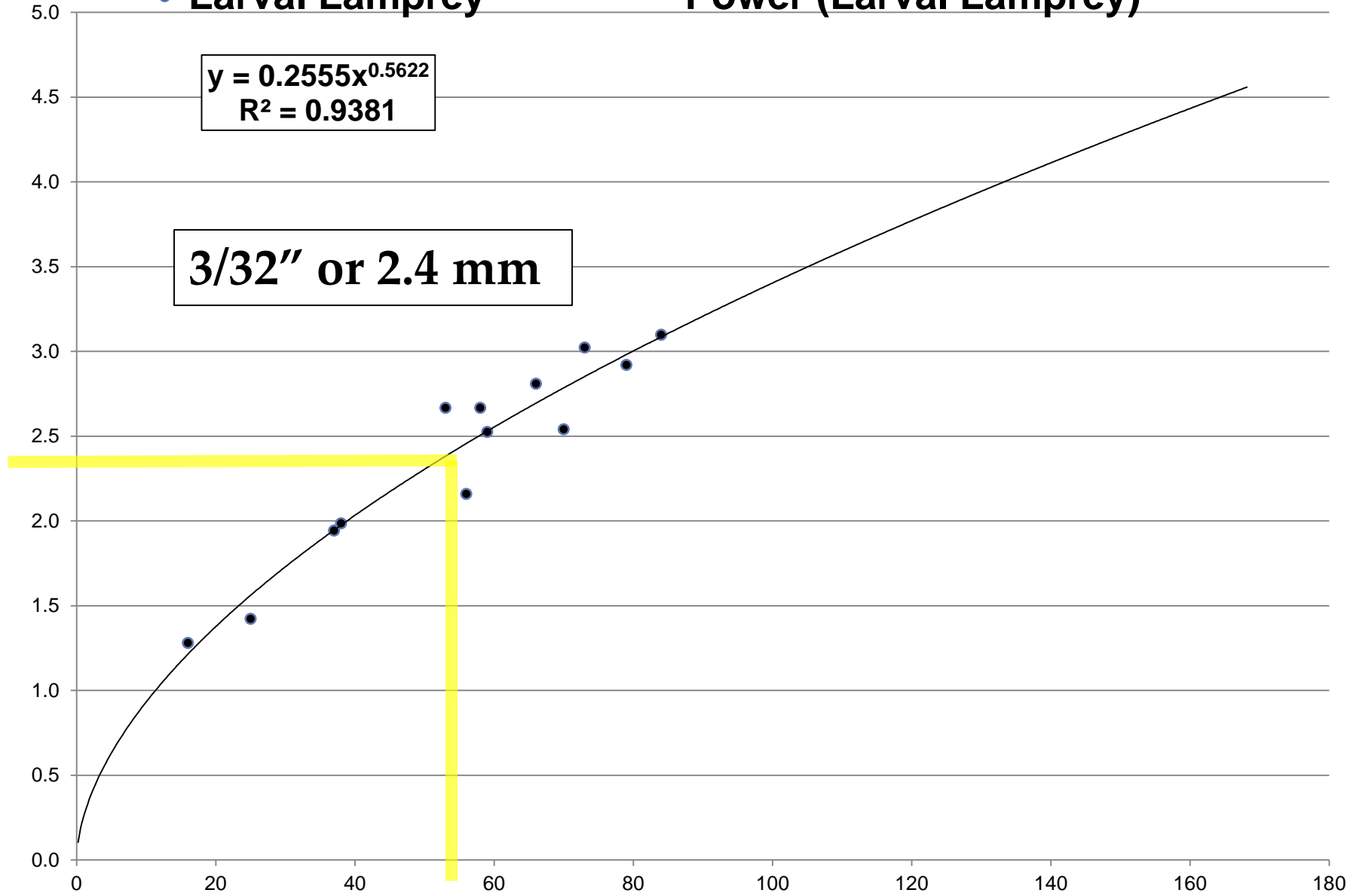
— Power (Larval Lamprey)

$y = 0.2555x^{0.5622}$   
 $R^2 = 0.9381$

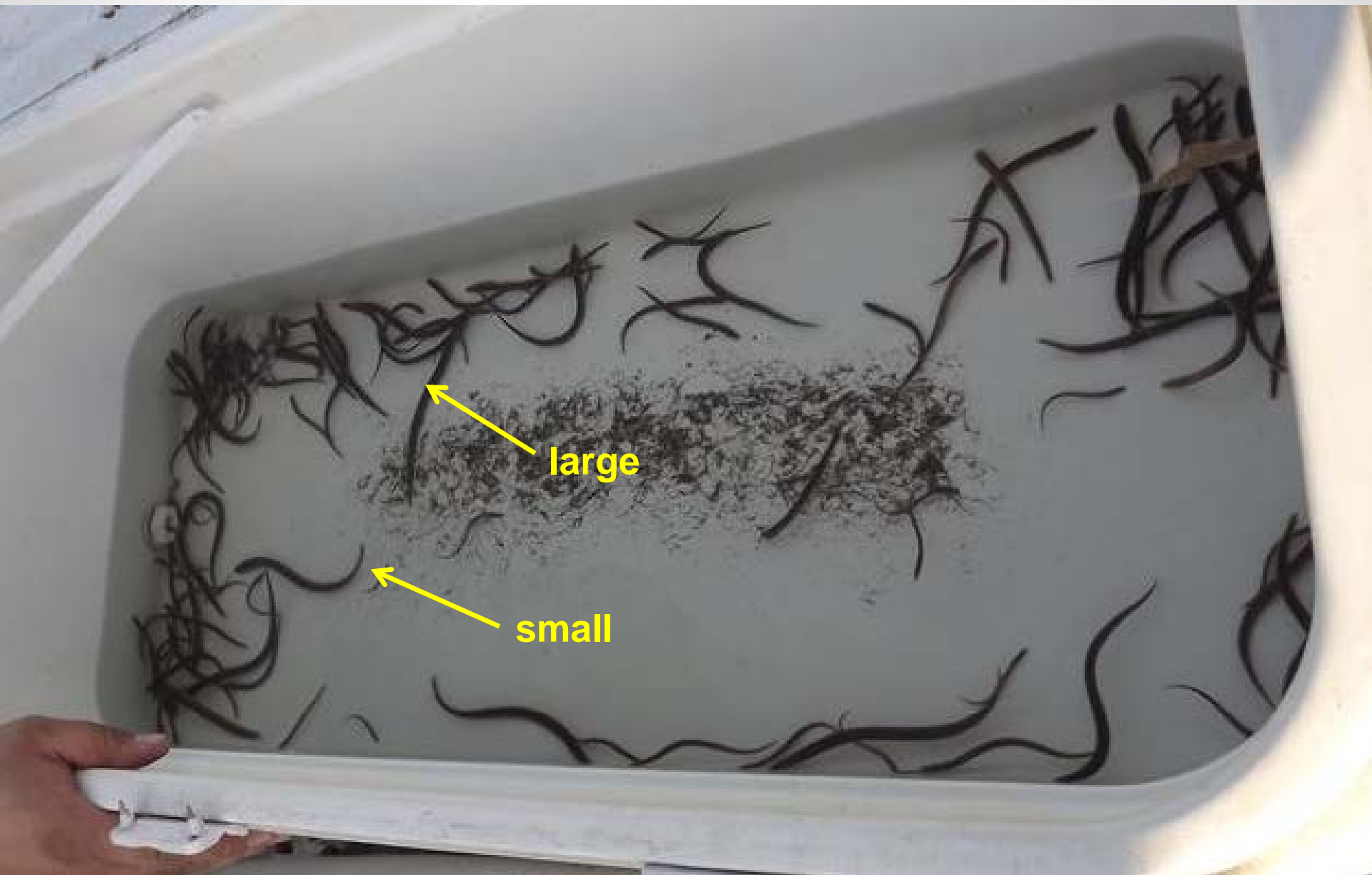
**3/32" or 2.4 mm**

Adjusted Maximum Width (mm)

Length (mm)



- Hundreds of thousands of juvenile and larval lamprey are found each year in dewatered diversions



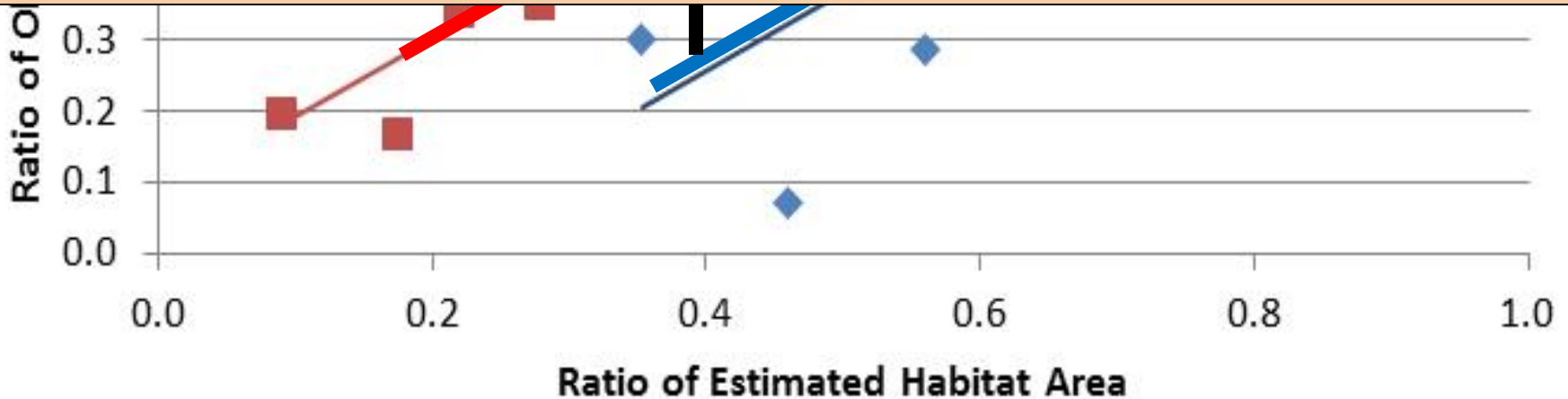
- Irrigation Diversions provide refuge and ideal habitat for juvenile/larval lamprey





# 2013 Match-Pair Analysis

- **More sediment = more lamprey**
- **Control the fine sediment, control larval entrainment?**



# 2014 Observed # of Lamprey

63.6%

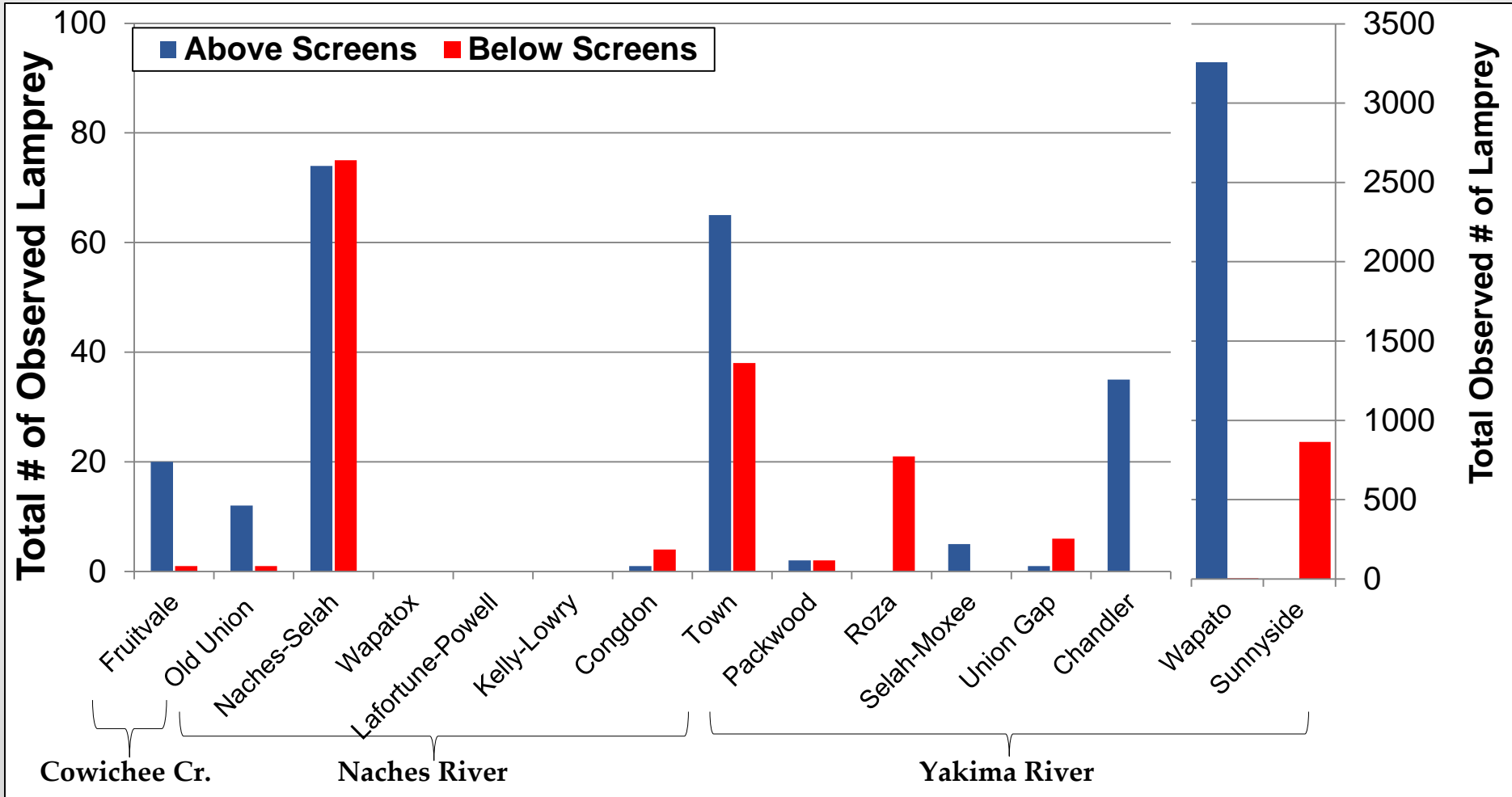
36.4%

Total = 3,427

2178

864

4,514



→ Downstream

# ***Desiccated Lamprey***

- 1087 total desiccated lamprey (mostly < 50 mm)
- 24.1 % of the total # of observed lamprey
- Underestimate of total number
- Snake-like trail markings on sediment





# 2014 Observed Larval Habitat

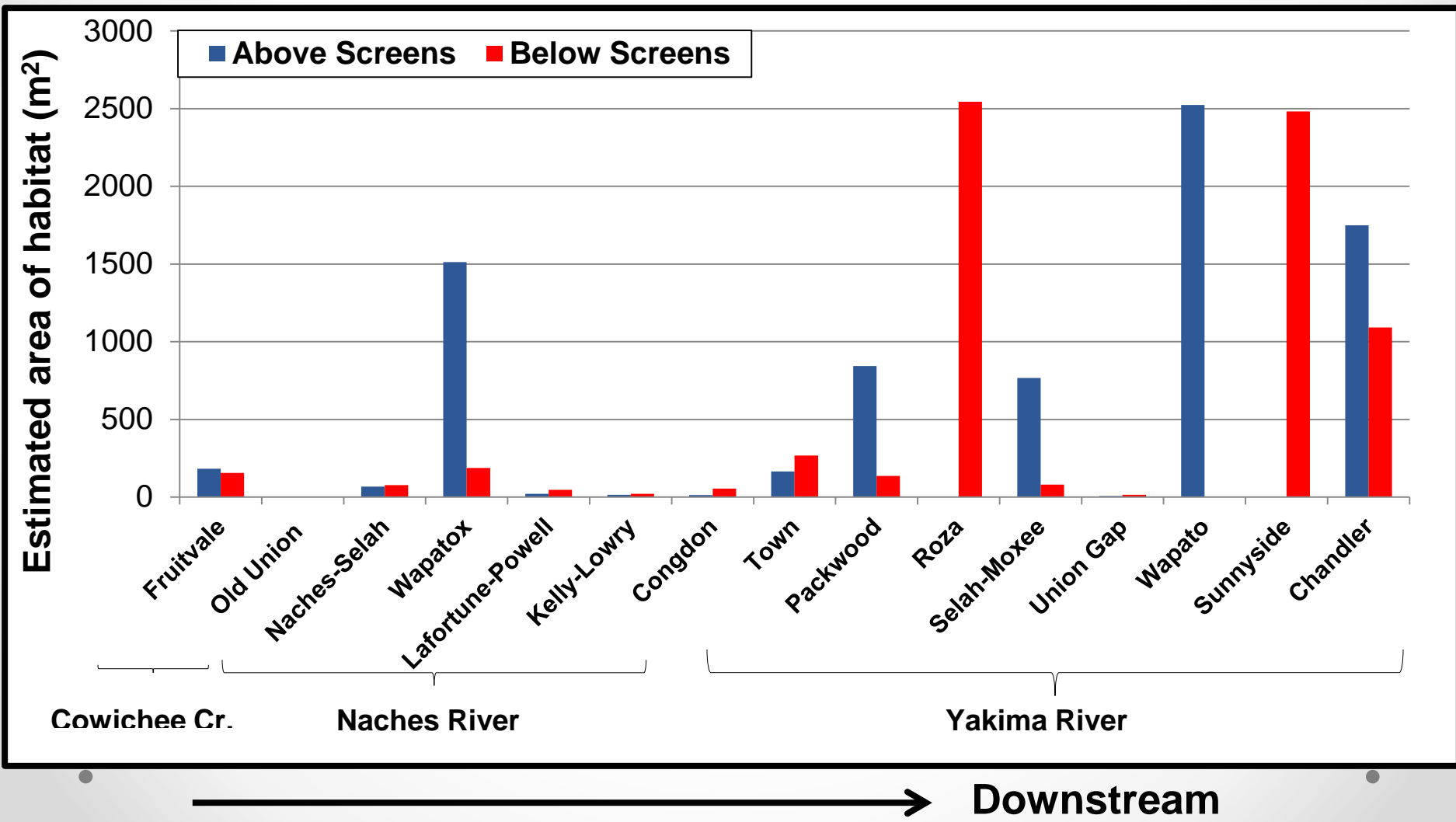
49.6%

50.4%

7024 m<sup>2</sup>

7159 m<sup>2</sup>

**Total = 14,183 m<sup>2</sup>**  
**(32,102 m<sup>2</sup> in 2013)**









**3/32"-1/8"  
(2.38-3.18mm)**

**Wire Cloth/ Rotary  
Drum 1/8" Wire Mesh**





# ***Larvae # Estimations***

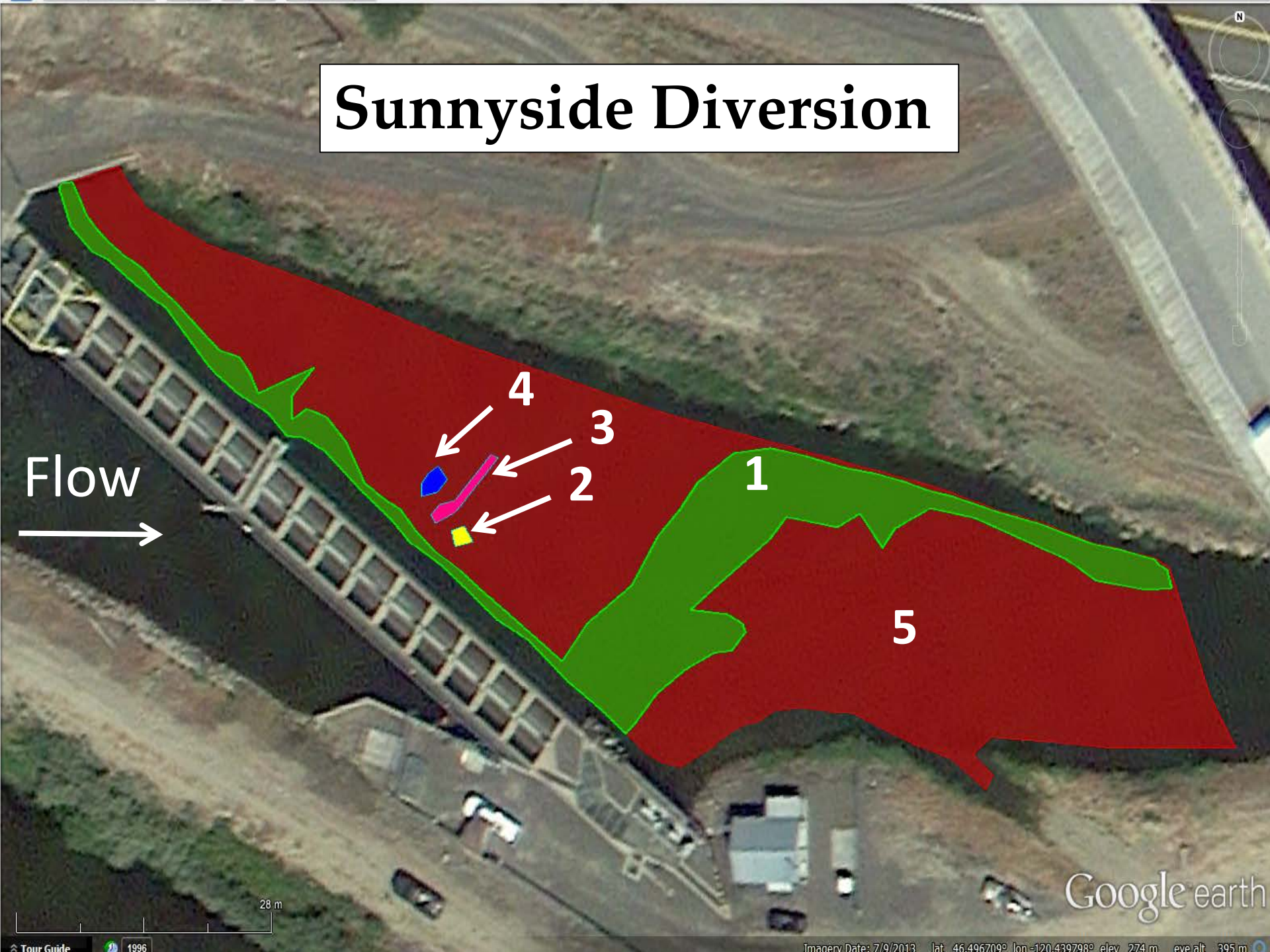
## **1. Single Day Estimation**

- Wapato and Sunnyside Diversions
- Wet vs. Dry Larval Habitat
- Exclude # of dry/desiccated lamprey
  - Finding by chance
- Divided wetted habitat in sections
- Estimated # of lamprey per section

## **2. Mark-Recapture Study**

- Wapato Diversion
- Chapman Mark-Recapture Method
- VIE Tagging

# Sunnyside Diversion



Flow



4

3

2

1

5

28 m

Google earth

Imagery Date: 7/9/2013 lat: 46.496709° lon: -120.439798° elev: 274 m eye alt: 395 m

Tour Guide 1996

# ***Results from # Estimations***

- **Single Day Estimation**

- **Sunnyside – 5,249**
- **Wapato – 3,259**

- **Mark-Recapture Study**

- **19-45 % observed during a single pass survey**
- **45 % (conservative)**
- **Sunnyside – 11,664**
- **Wapato – 7,423**

**18, 907 entrained larval/Juvenile Lamprey**



## ***% PA Entrainment***

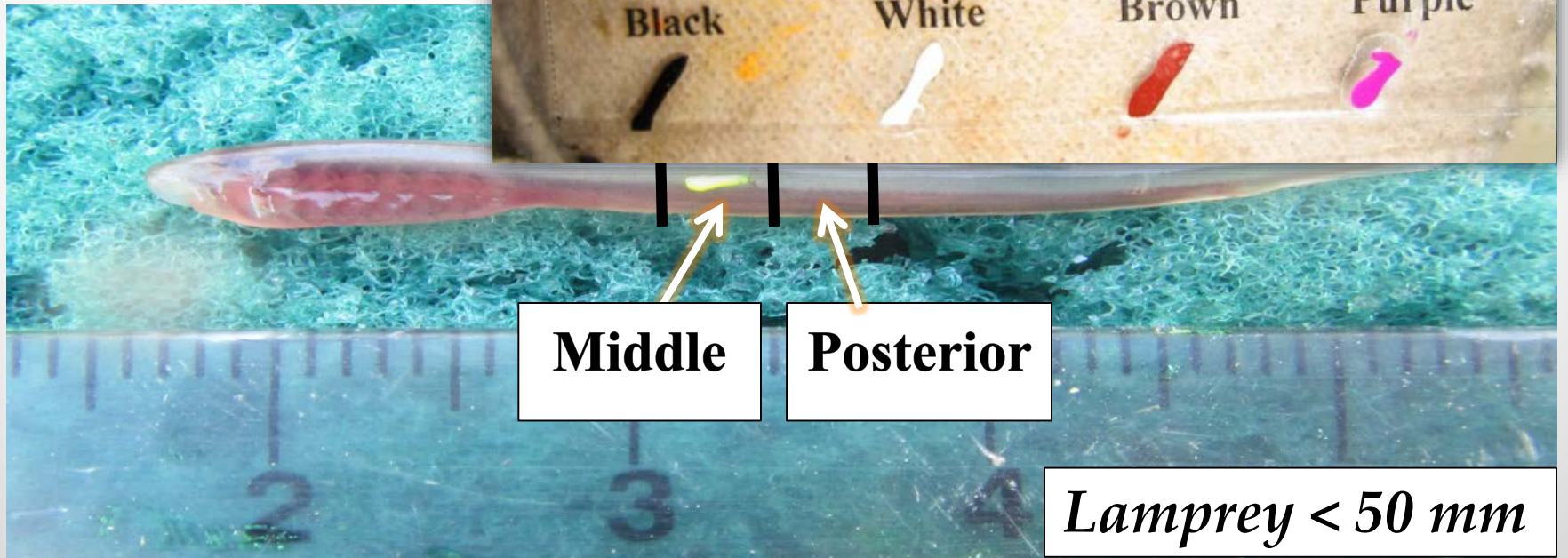
- **Diversions downstream Roza Dam**
- **Identified 1201 larval lamprey**
- **Average PA % = 7 %**
- **Wapato**
  - **~ 519 PA lamprey**
- **Sunnyside**
  - **~ 816 PA lamprey**

# ***Instream Monitoring of Larval Movement, Behavior and Entrainment***

- Monitor Instream Movements through repeat surveys
- Find lamprey after diversion dewatering
- Tagging
  - VIE Tags (> 15 mm)
  - PIT Tags (> 70 mm)
  - Fin clip markings (> 50 mm)

**Anterior**

**Posterior**



**Middle**

**Posterior**

*Lamprey < 50 mm*

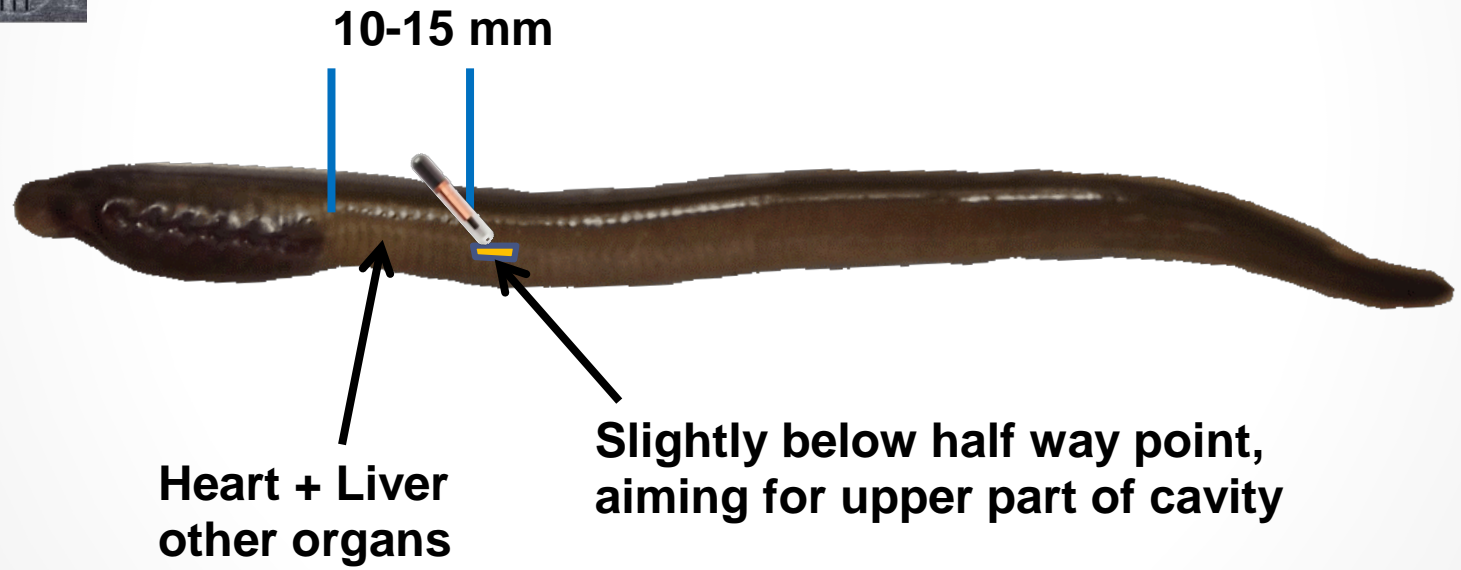


# Tagging Methods – PIT (>70 mm)

8 mm Pico PIT tags



3mm microsurgical blades (full cut)



\*Method by CTUIR

# Roza Reservoir



3

1

100 m

© 2014 Google

Google earth

Imagery Date: 7/9/2013 lat 46.750332° lon -120.465844° elev 376 m eye alt 879 m

# Chandler Diversion Outmigration

## 2014

- 8 captured at Chandler Bypass.
- 35 additional large larvae - Dryden Diversion
- Only 12.5% of the macrophthalmia and 2.9% of the larval lamprey were detected.

## 2015

- 31 Macrophthalmia
- 1 PA Larvae

## Possible Impacts:

- Predation, screens designed for salmonids or other unknown factors

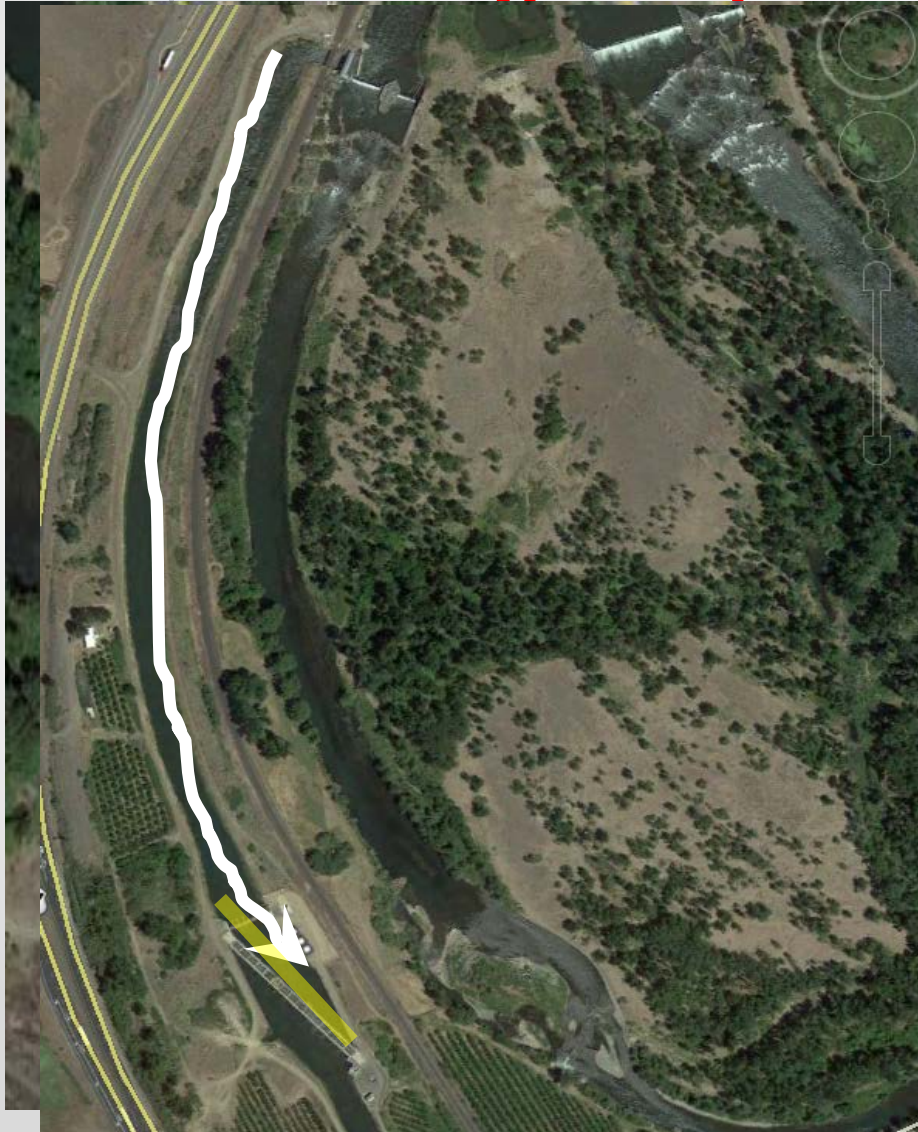




# Long-term Fixes

Headgate Orientation Configuration Sediment

- Headgate opening not from bottom





# Short-Term Fixes





The image shows three lampreys, parasitic fish, with their mouths open and attached to a surface. Their mouths are circular and contain rows of sharp teeth. The lampreys have a silvery, elongated body. A blue thought bubble is overlaid on the right side of the image, containing the text "Other Solutions??".

**Other Solutions??**