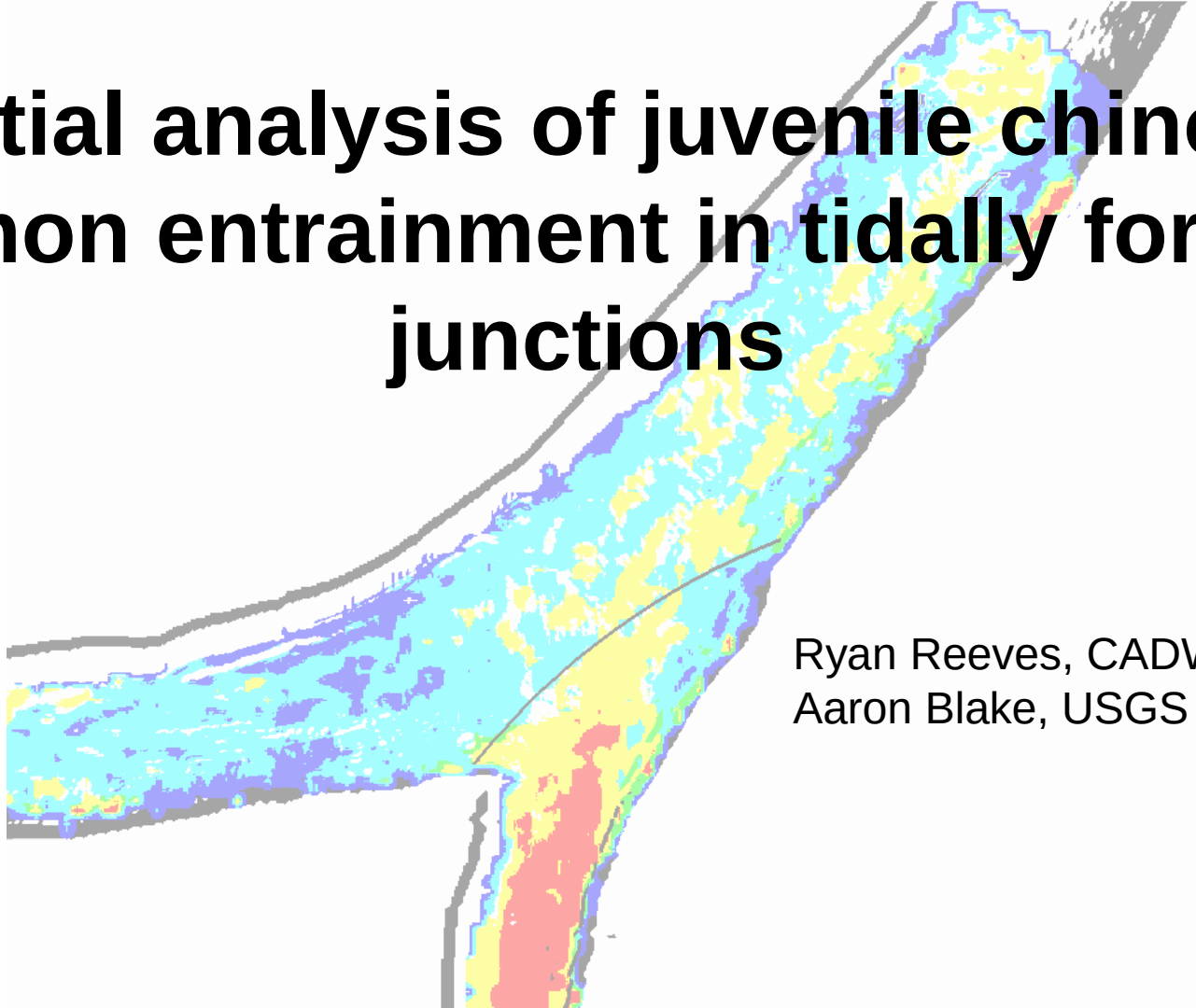
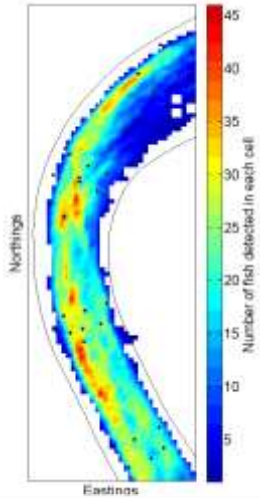
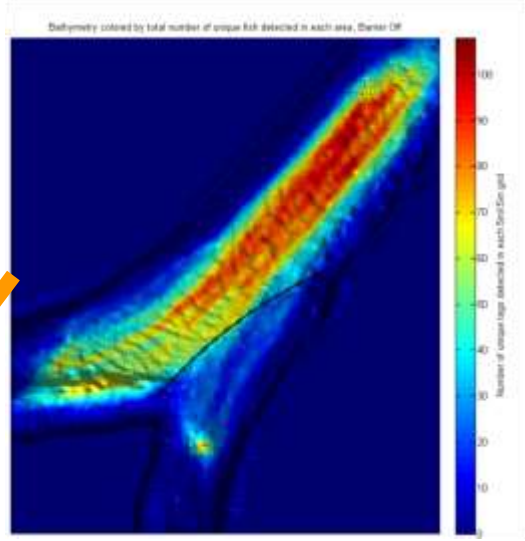
Spatial analysis of juvenile chinook salmon entrainment in tidally forced junctions



Ryan Reeves, CADWR
Aaron Blake, USGS





We will be exploring data from surgically tagged juvenile chinook salmon released in the city of Sacramento and tracked throughout the North Delta over the course of four studies:

Clarksburg Bend, Sacramento river near Clarksburg, CA

- 133 tagged fish tracked over ~ 1km of the Sacramento River in January, 2007

Junction of Sacramento River and Georgiana Slough, Walnut Grove, CA

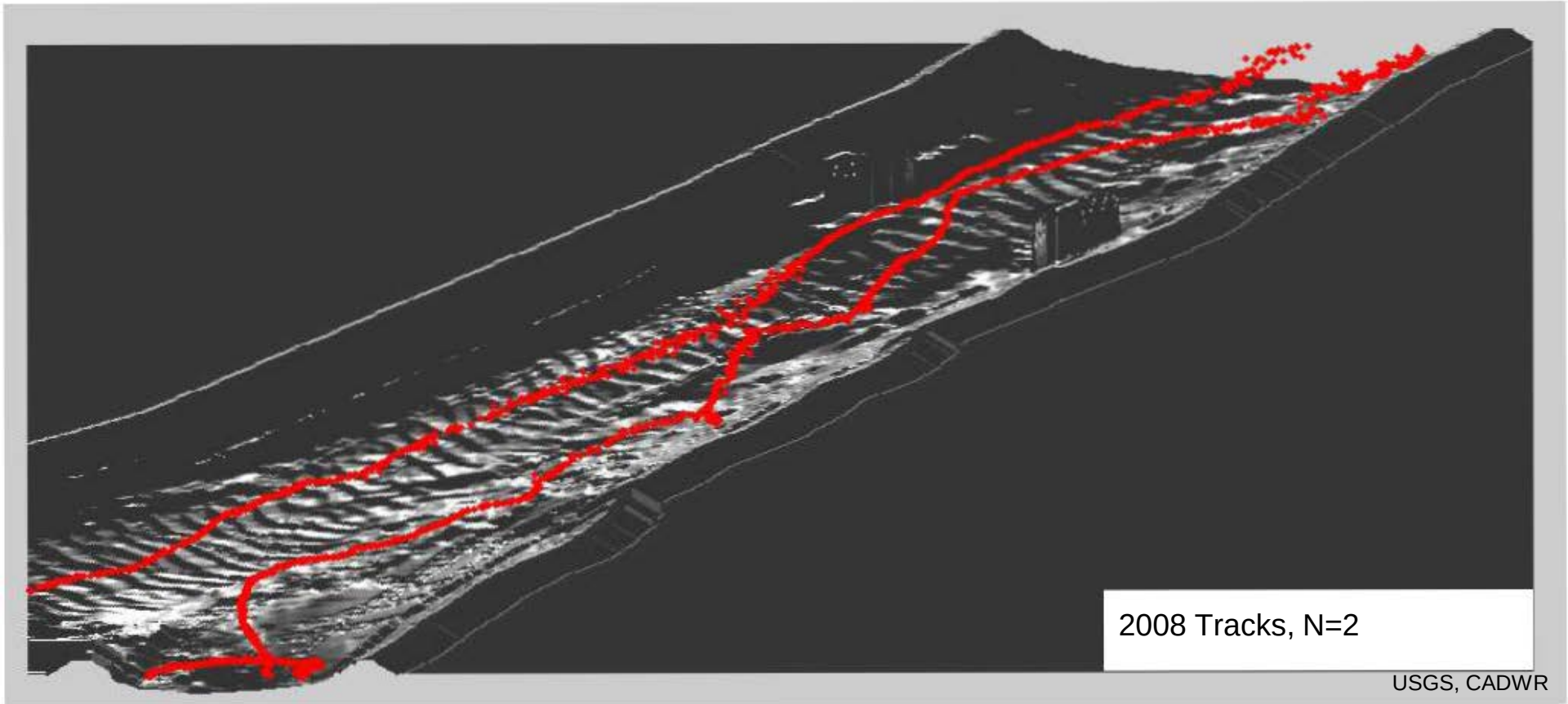
- 2008 North Delta Study, 2938 Track Segments
- 2011 DWR Study, 1410 Track Segments
- 2012 DWR Study, 1090 Track Segments

USGS, CADWR

We tracked a bunch of salmon, now what do we do?

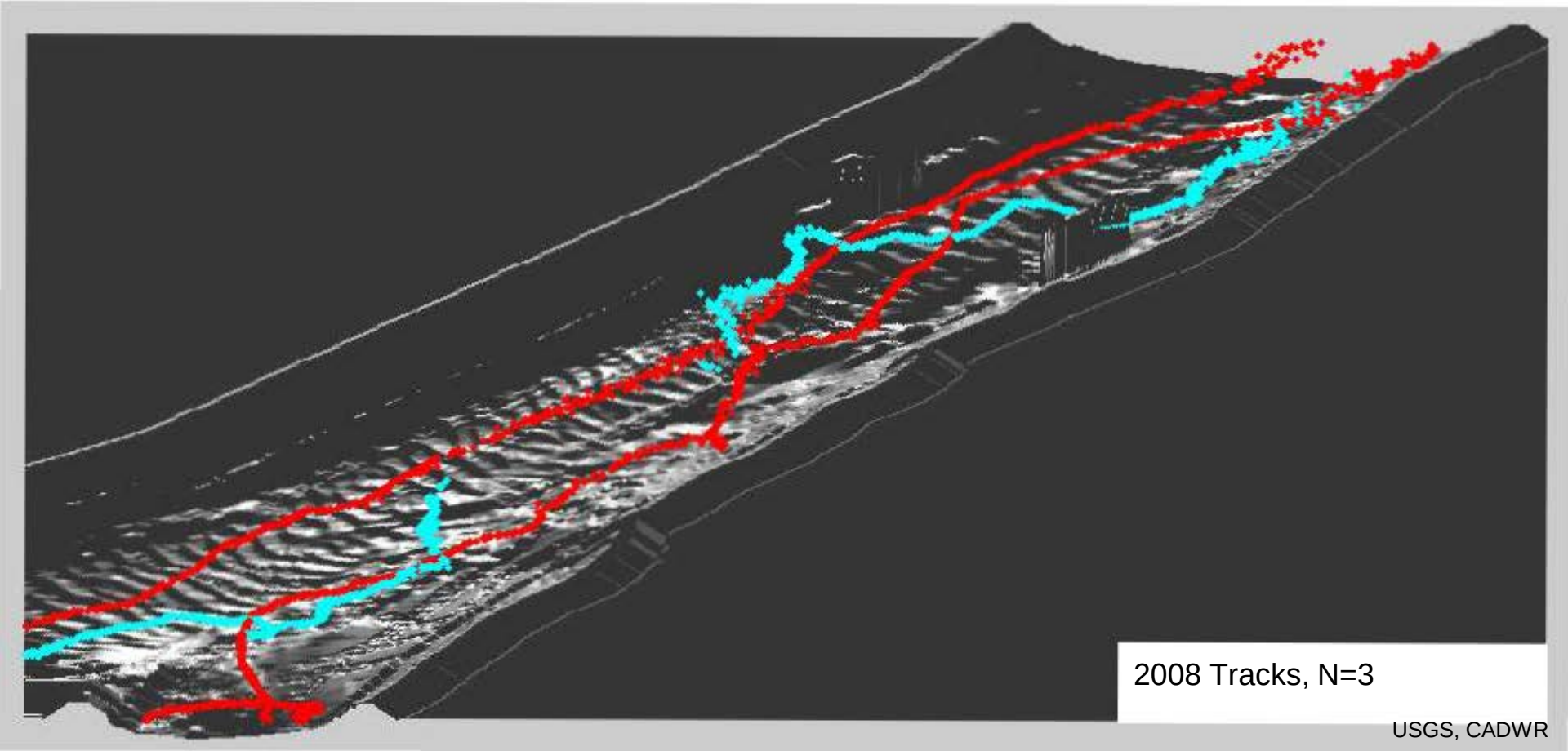
- We like stories
  - Stories are easy to understand, easy to remember, and easy to communicate
- A fish track is a “mini story” that can be compelling and interesting
- This leads to the “I once saw a fish do __”

The “I once saw a fish do __” ….



USGS, CADWR

...



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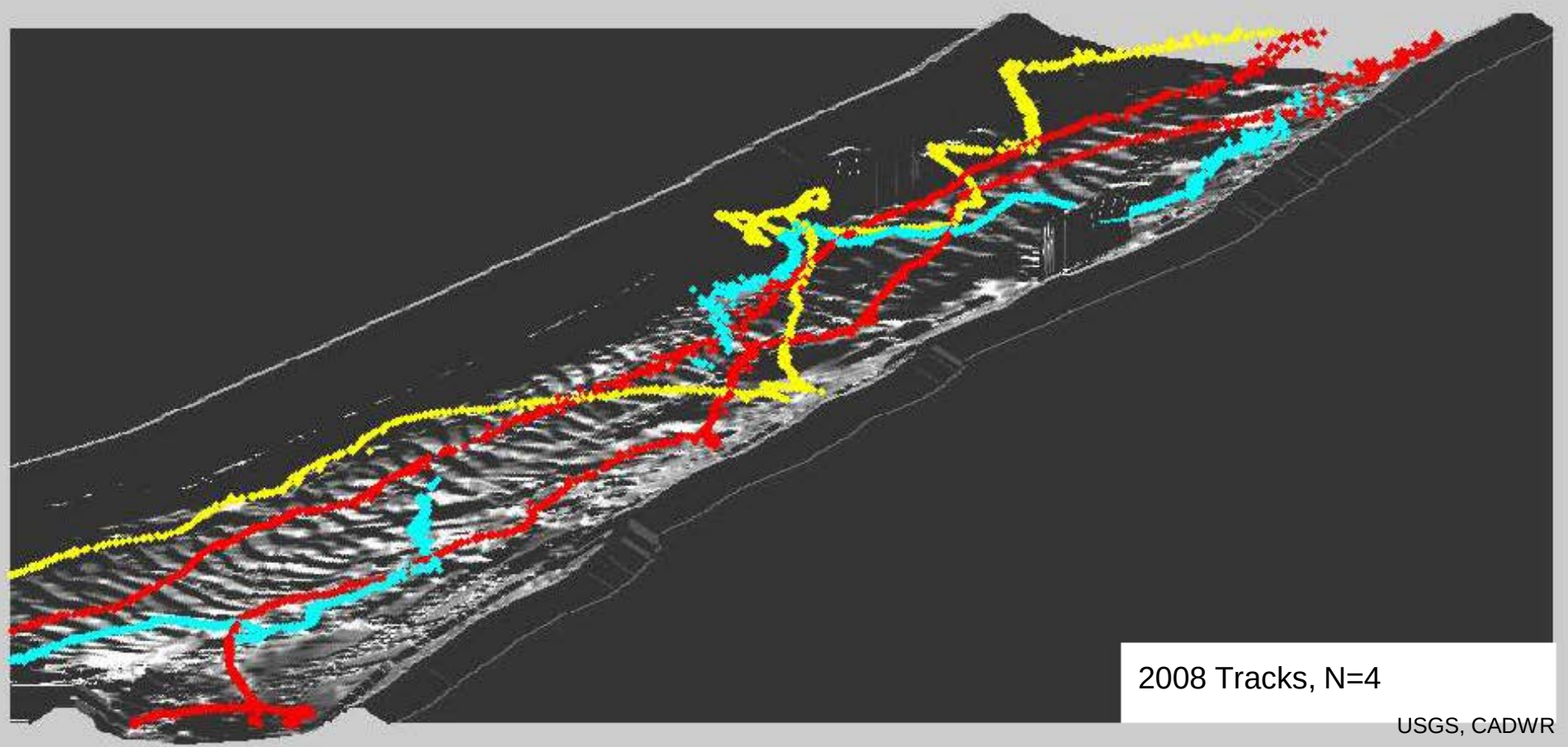
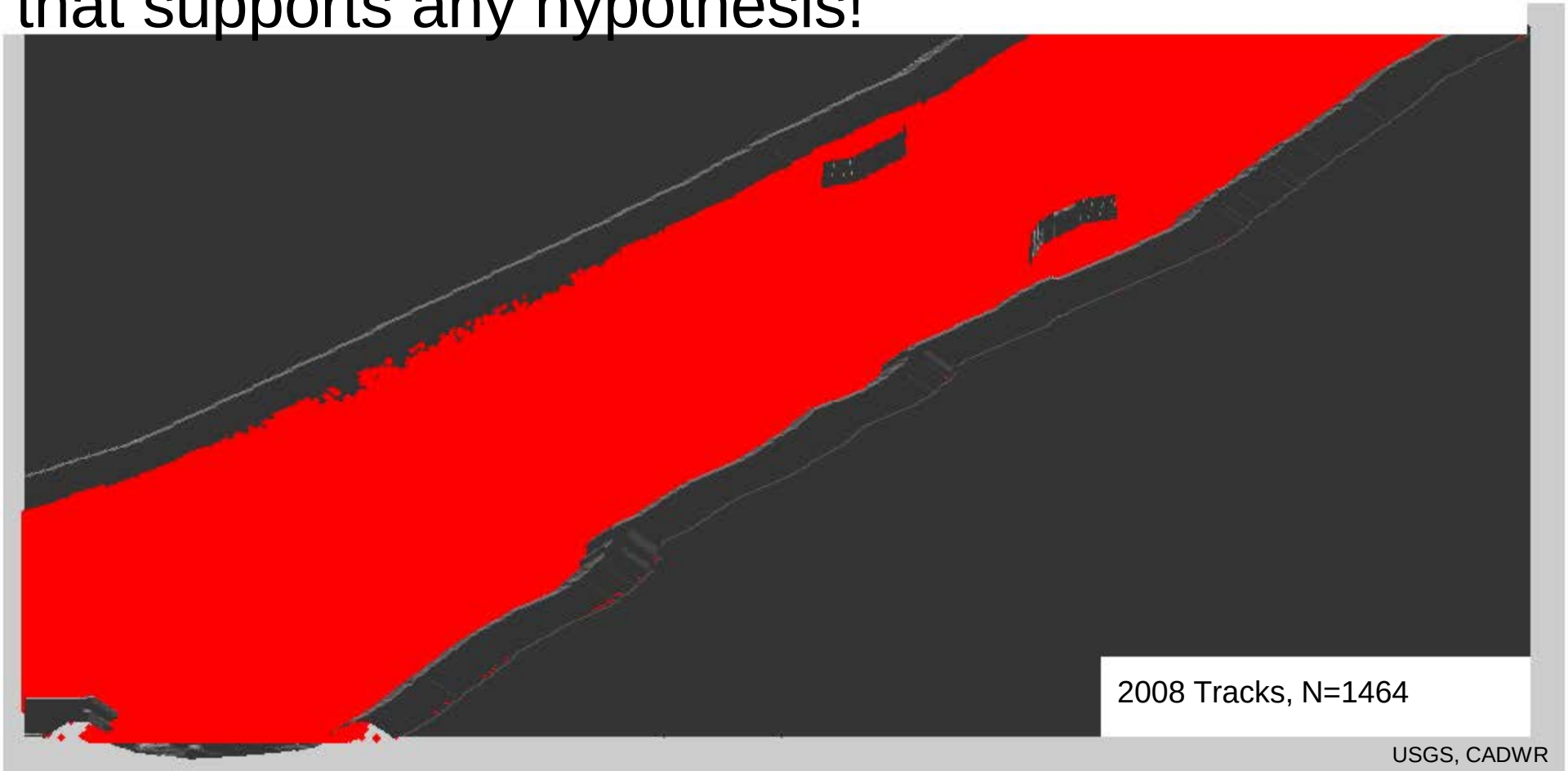


2008 Tracks, N=4

USGS, CADWR

...if you look at enough tracks, you will see a track that supports any hypothesis!



USGS, CADWR

Spatial aggregation is a platform for quantitative analysis of tracking data

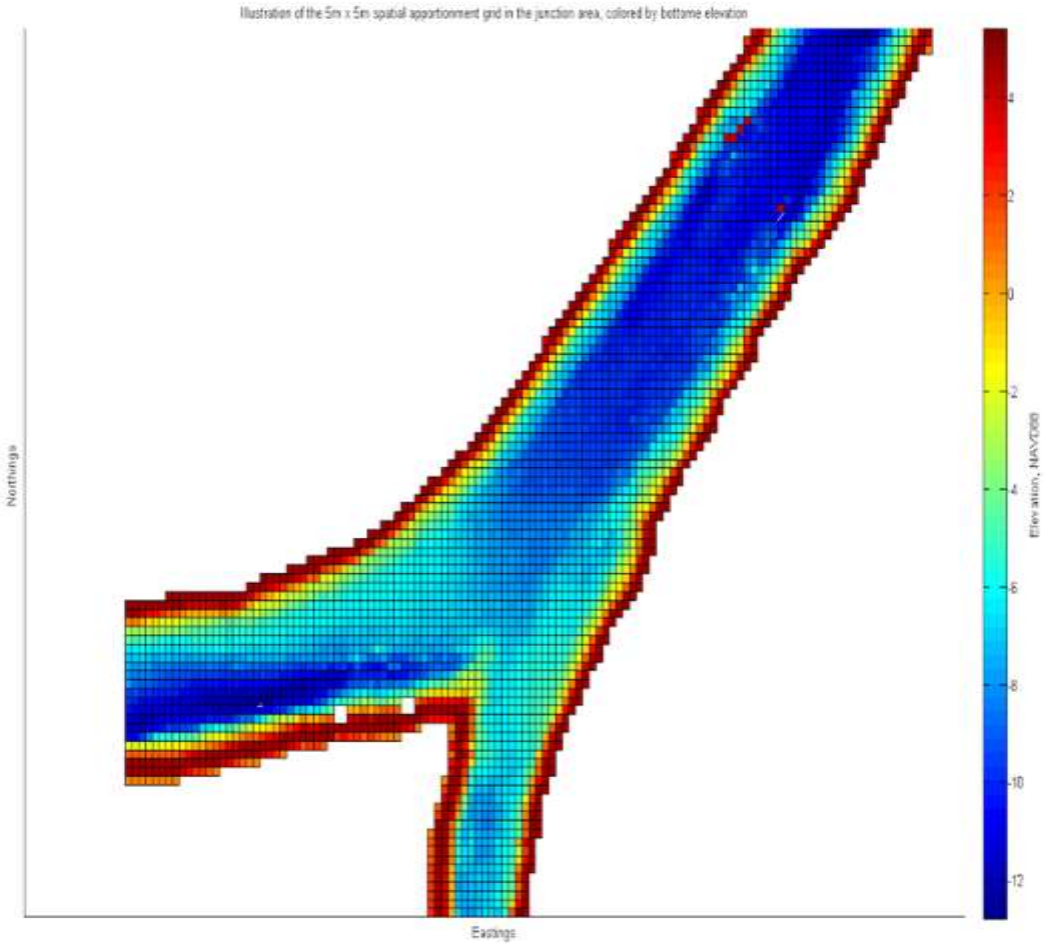
Basic Steps:

1. Divide domaine into a discrete grid

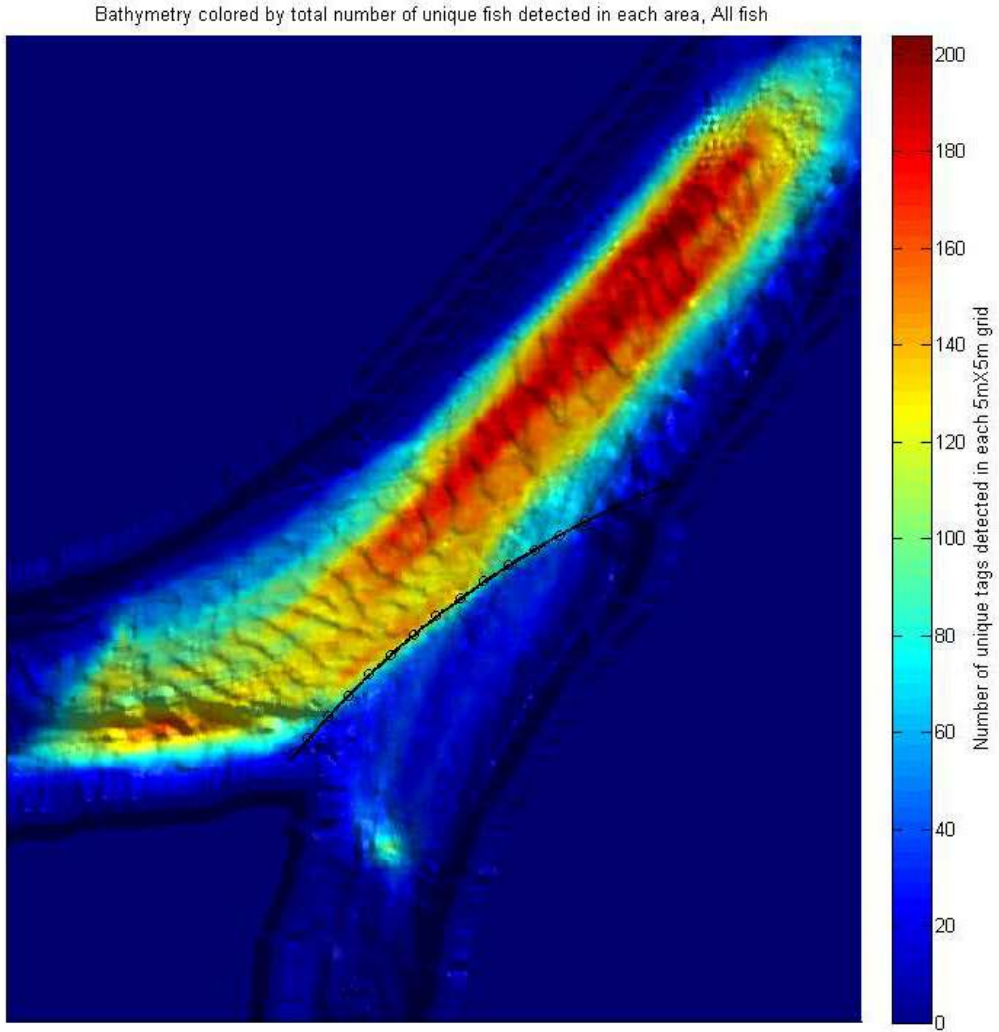
1. Interpolate all fish tracks onto **a common time step** that is small enough that **the fastest fish track will have at least one point in every grid cell** it passes through

1. For each grid cell, keep track of:
    a. Every **unique** tag code that passes through each grid cell. This will be used to calculate the fish distribution. **Do not double count!**

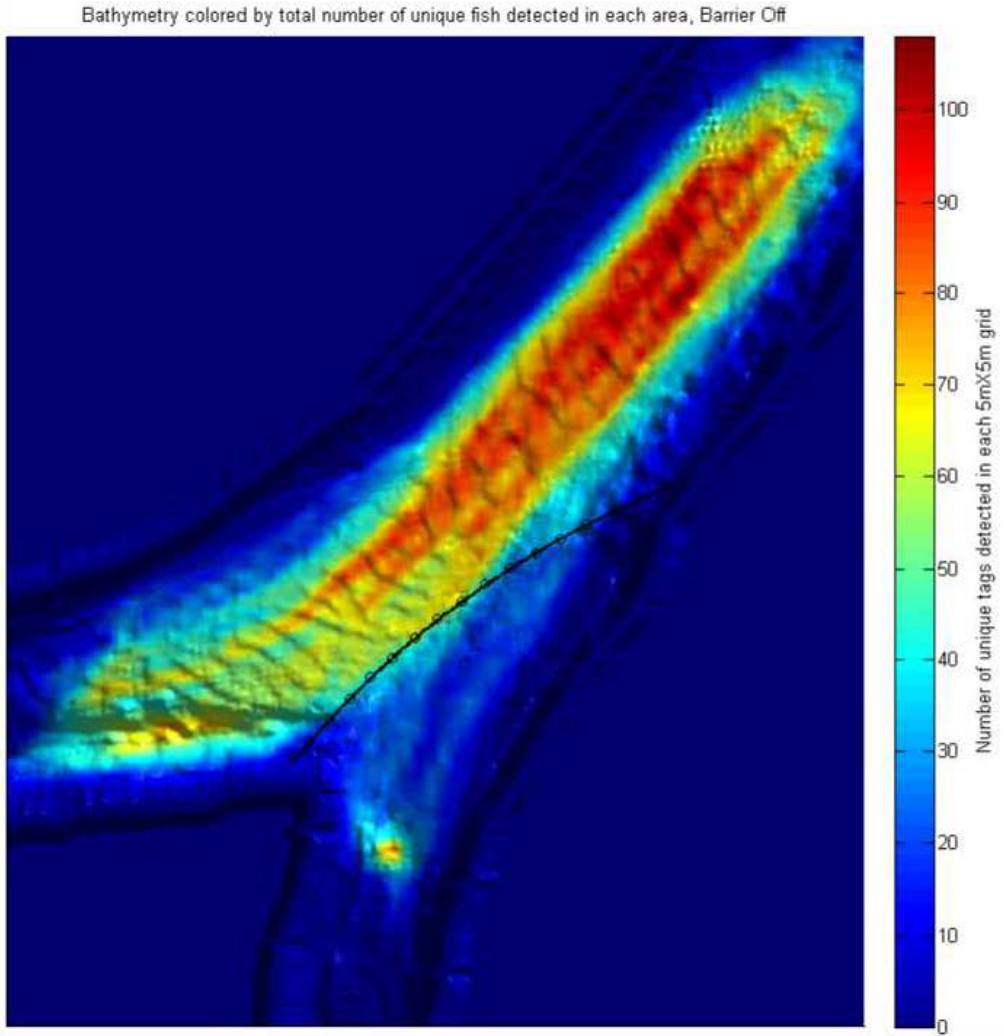
    a. How much **time** each fish spends in each grid cell. This will be used to calculate the residence time distribution.



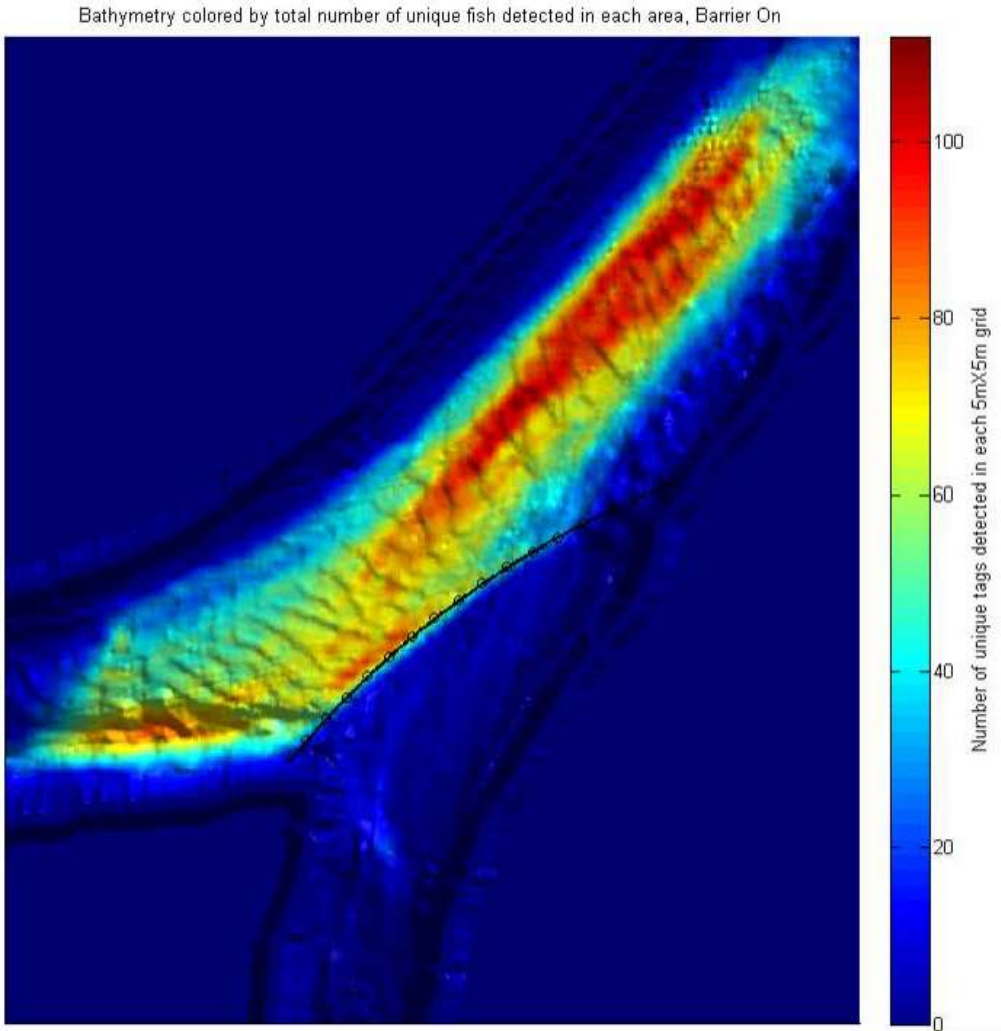
GSB 2011 - All fish



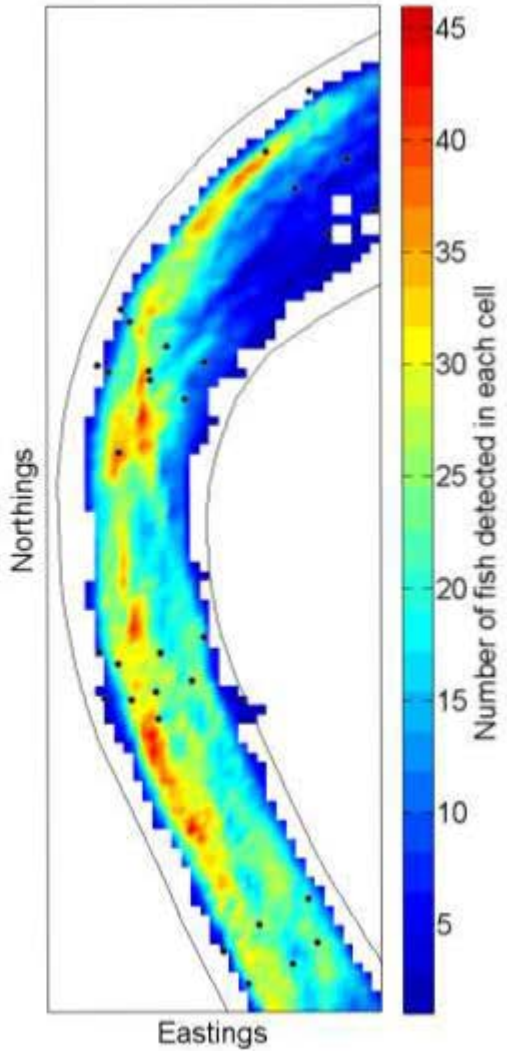
GSB 2011 - All fish barrier off



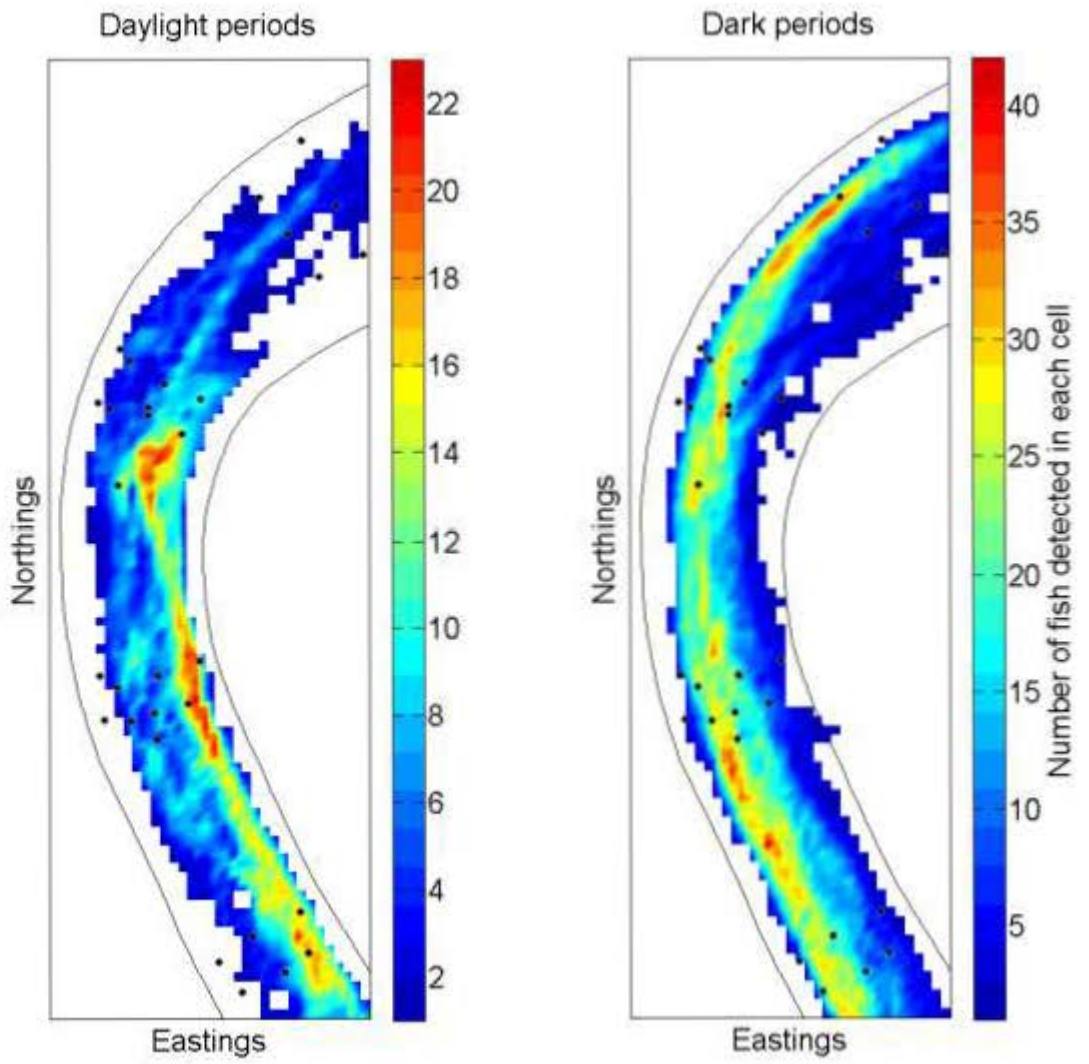
GSB 2011 - All fish barrier on



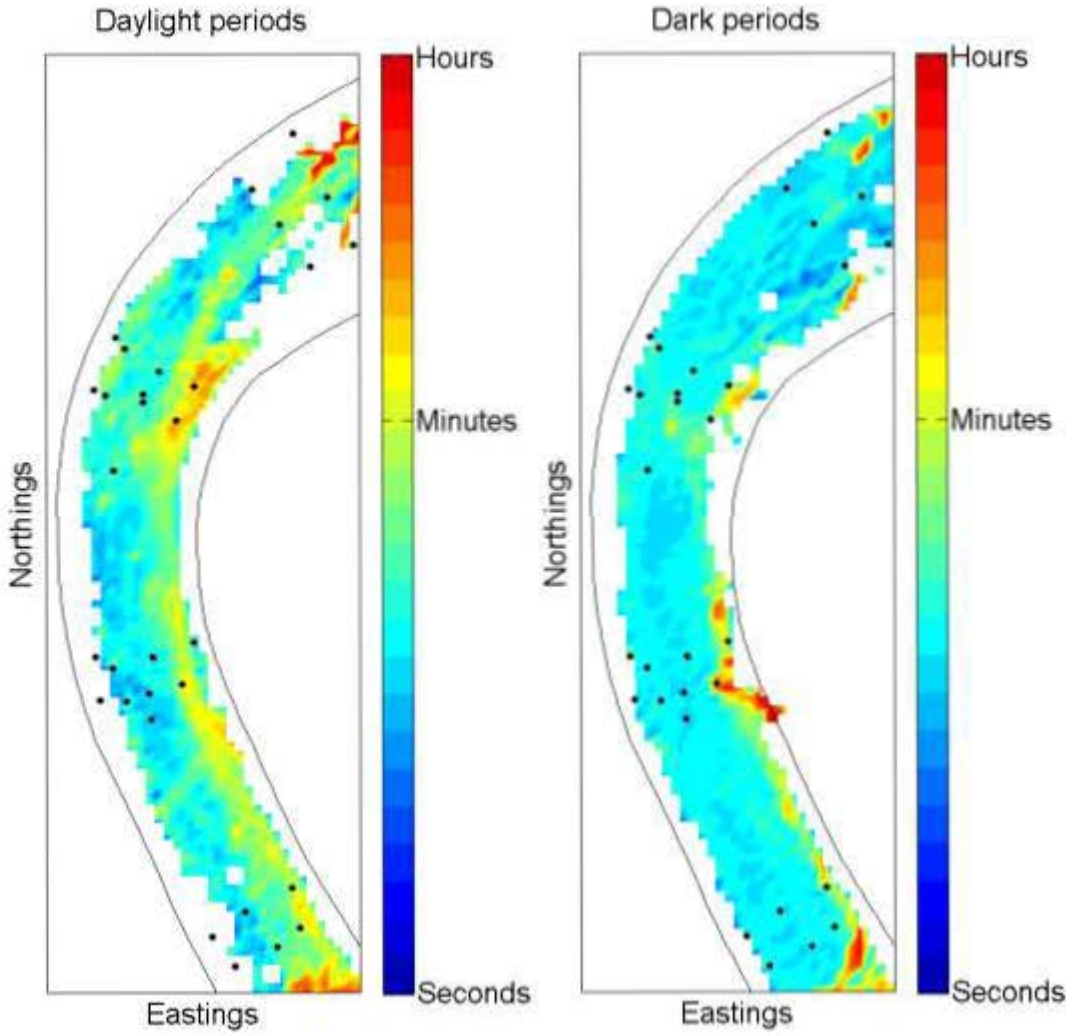
CB Bend 2006 - Fish Density Distribution For All Fish



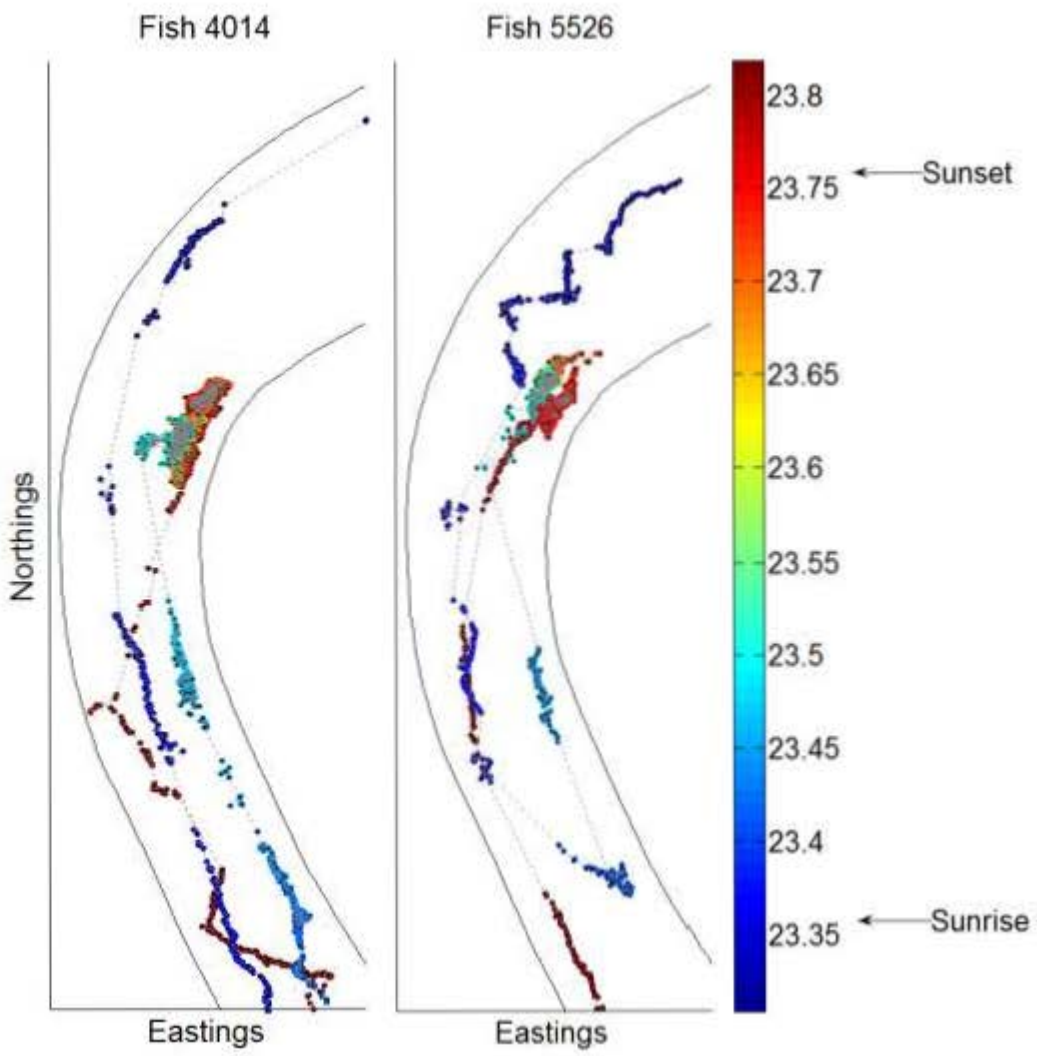
CB Bend 2006 - Fish Density
Light Vs Dark



CB Bend 2006 - Residence Time Light Vs Dark



CB Bend 2006 -
Example fish tracks that exhibit holding behavior



Acknowledgements

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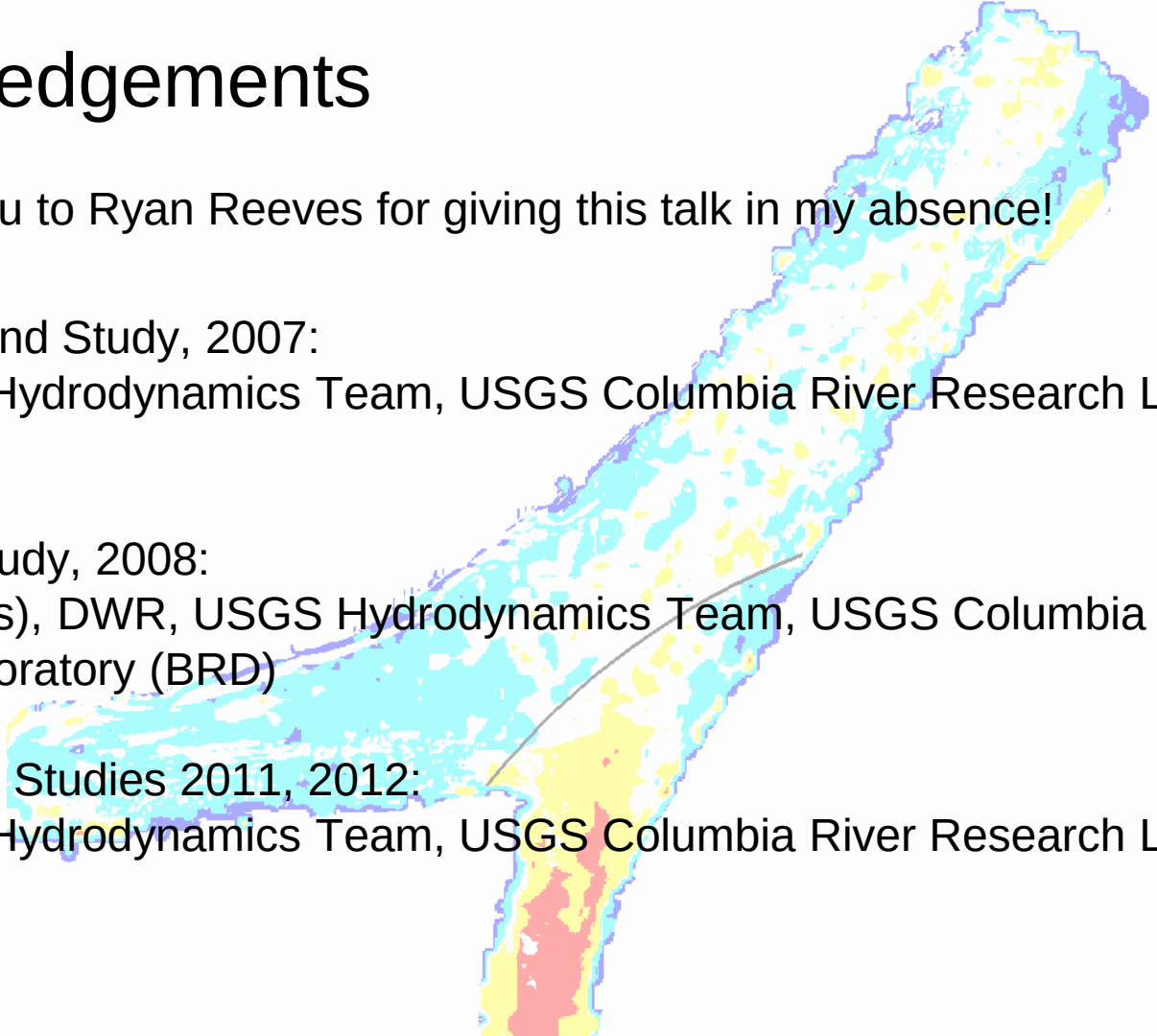
Clarksburg Bend Study, 2007:
DWR, USGS Hydrodynamics Team, USGS Columbia River Research Laboratory (BRD)

North Delta Study, 2008:
USBR(analysis), DWR, USGS Hydrodynamics Team, USGS Columbia River Research Laboratory (BRD)

DWR Junction Studies 2011, 2012:
DWR, USGS Hydrodynamics Team, USGS Columbia River Research Laboratory (BRD)



Questions

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