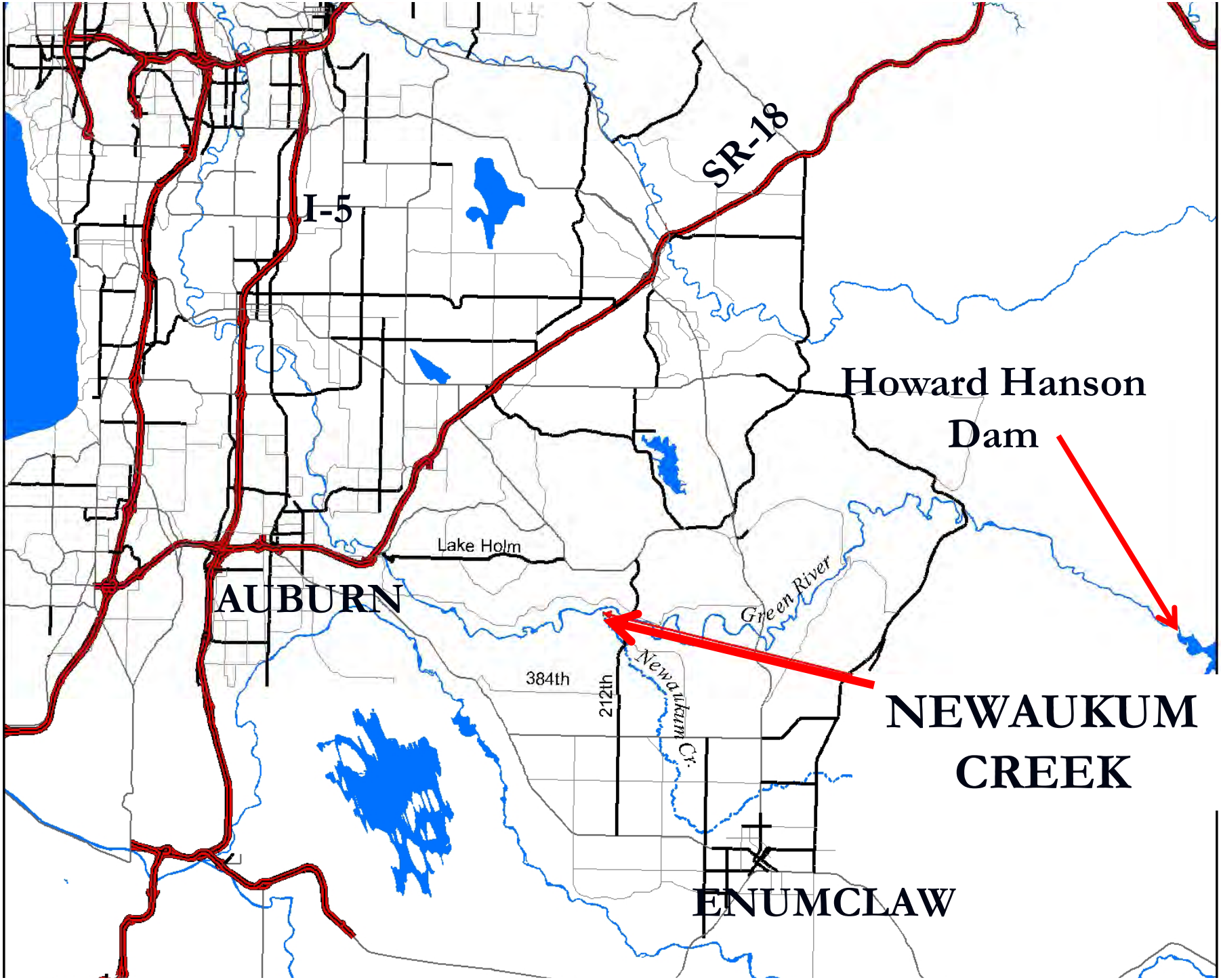
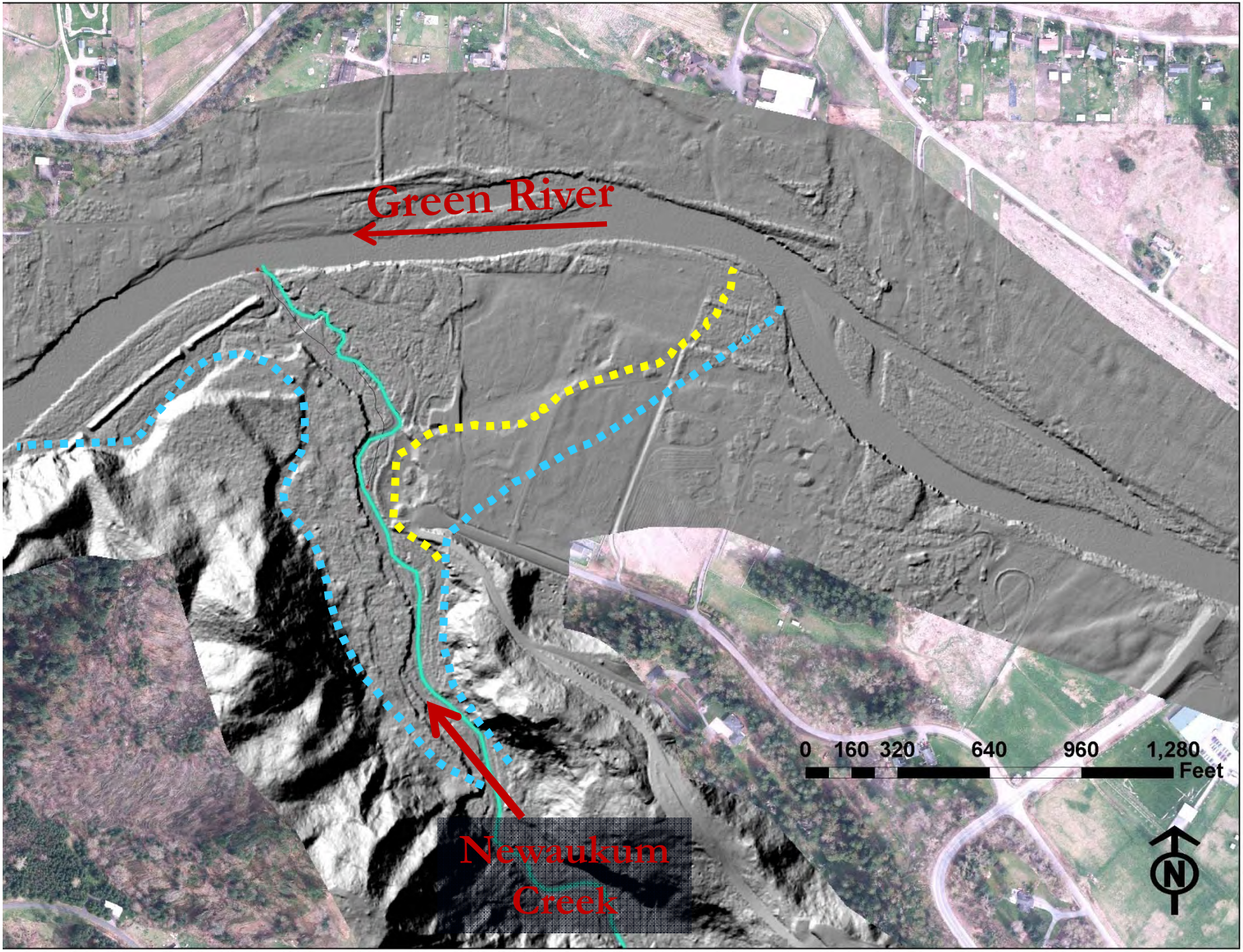
Risks & Rewards

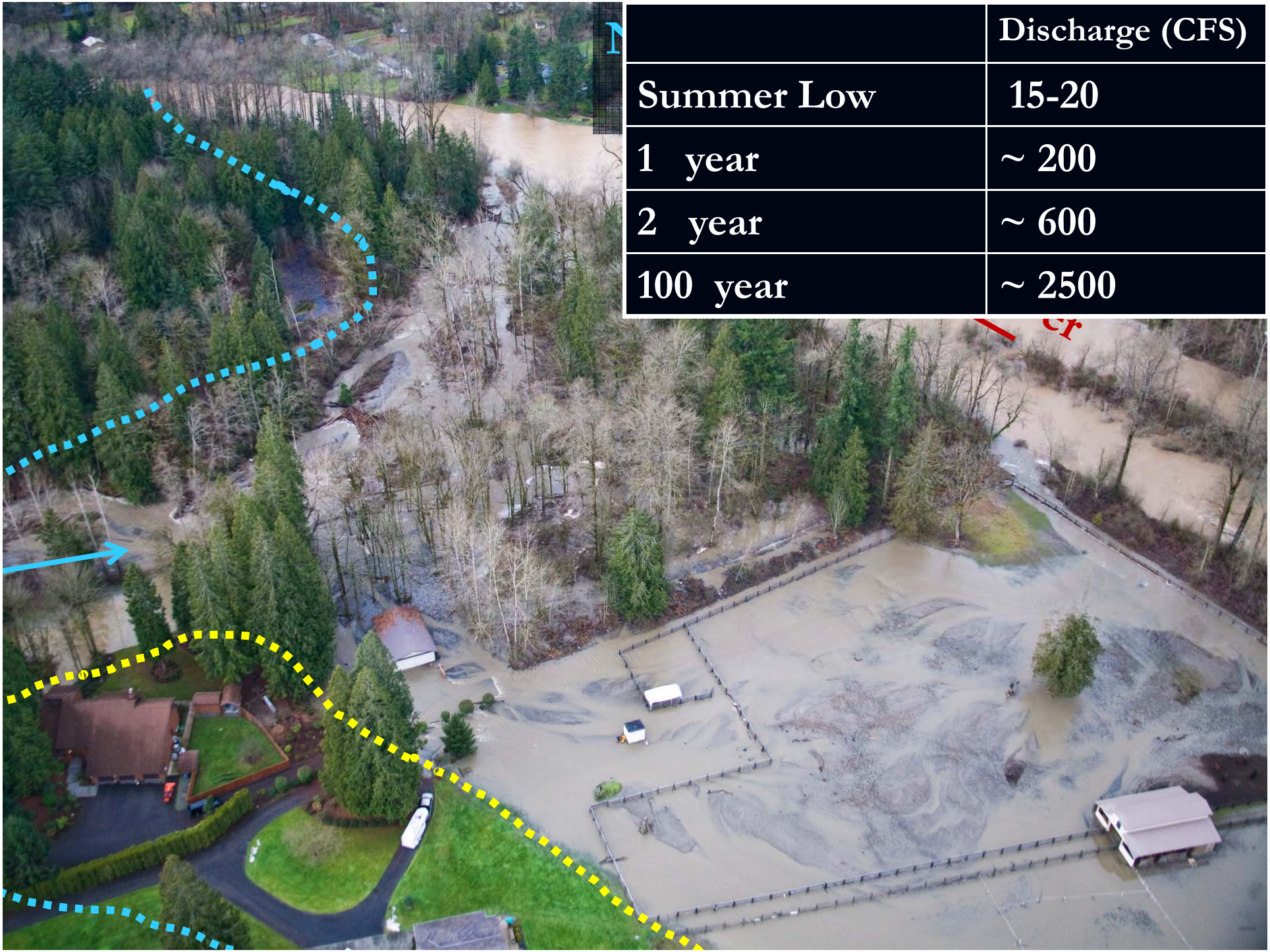
An Alluvial Fan Case Study

Dan Eastman
King County DNR

A collaborative project between King County DNRP, Salmon Recovery Funding Board, King Conservation District , FEMA and two private landowners.


SR-18
I-5
Howard Hanson
Dam
Lake Holm
AUBURN
Green River
384th
212th
Newaukum Cr.
NEWAUKUM
CREEK
ENUMCLAW


Green River
Newaukum Creek
0 160 320 640 960 1,280
Feet
N



	Discharge (CFS)
Summer Low	15-20
1 year	~ 200
2 year	~ 600
100 year	~ 2500

Hypothesized Pre-Disturbance Conditions
More frequent, large, channel-spanning jams obstruct and split flow, trap sediment, etc.

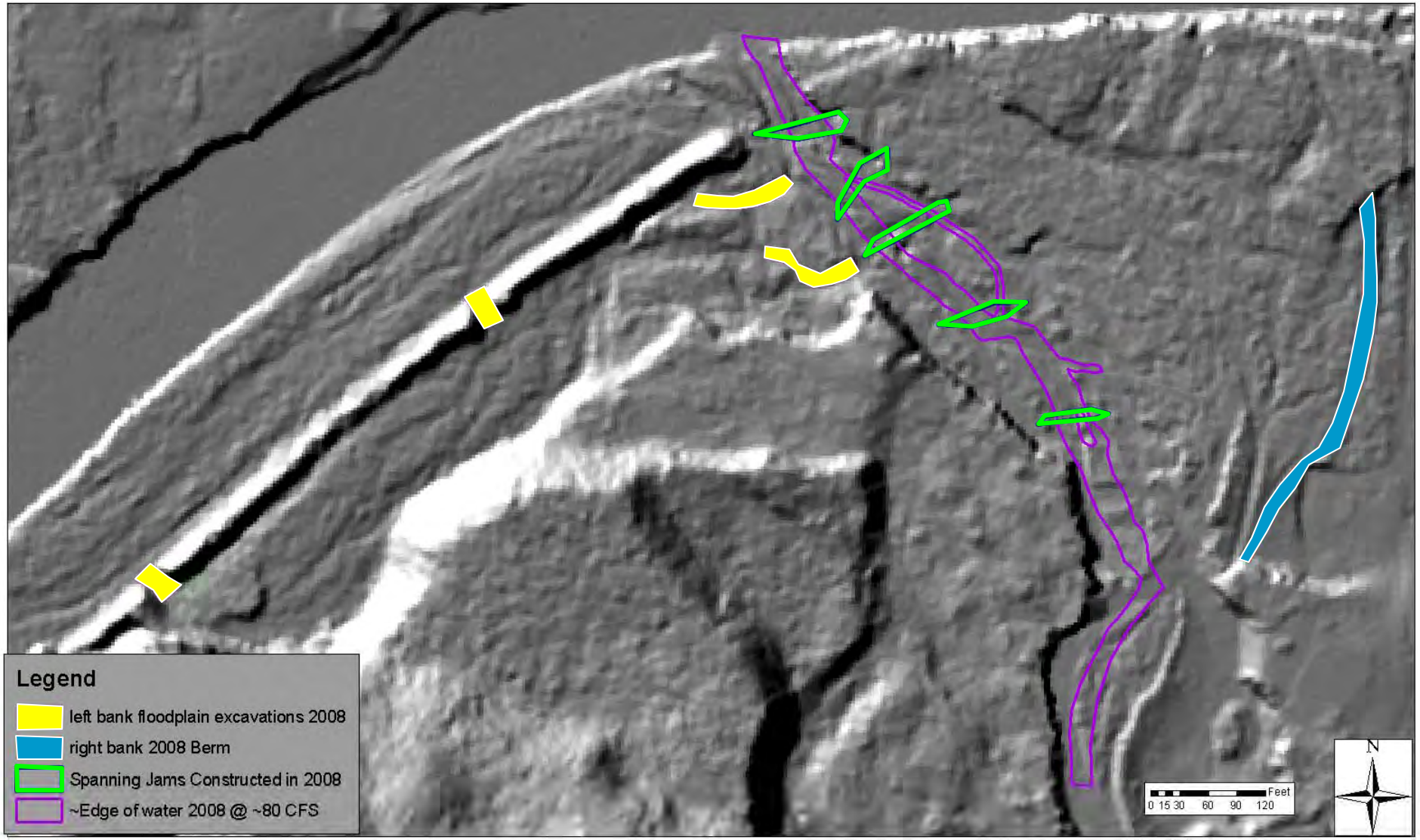
Pre-Project Conditions

- Minimal LWD –
  - Far below reference conditions
- Few pools
- High energy = course substrate
- Disconnected floodplain

Restoration Objectives

- Create stable, full-spanning log jams
- Aggrade the streambed and raise the associated water surface elevation closer to the top of bank
- Increase the frequency and duration of over-bank flow
  - Improving connectivity with floodplain features
  - Increasing availability of high quality rearing habitat

Phase 1 Actions



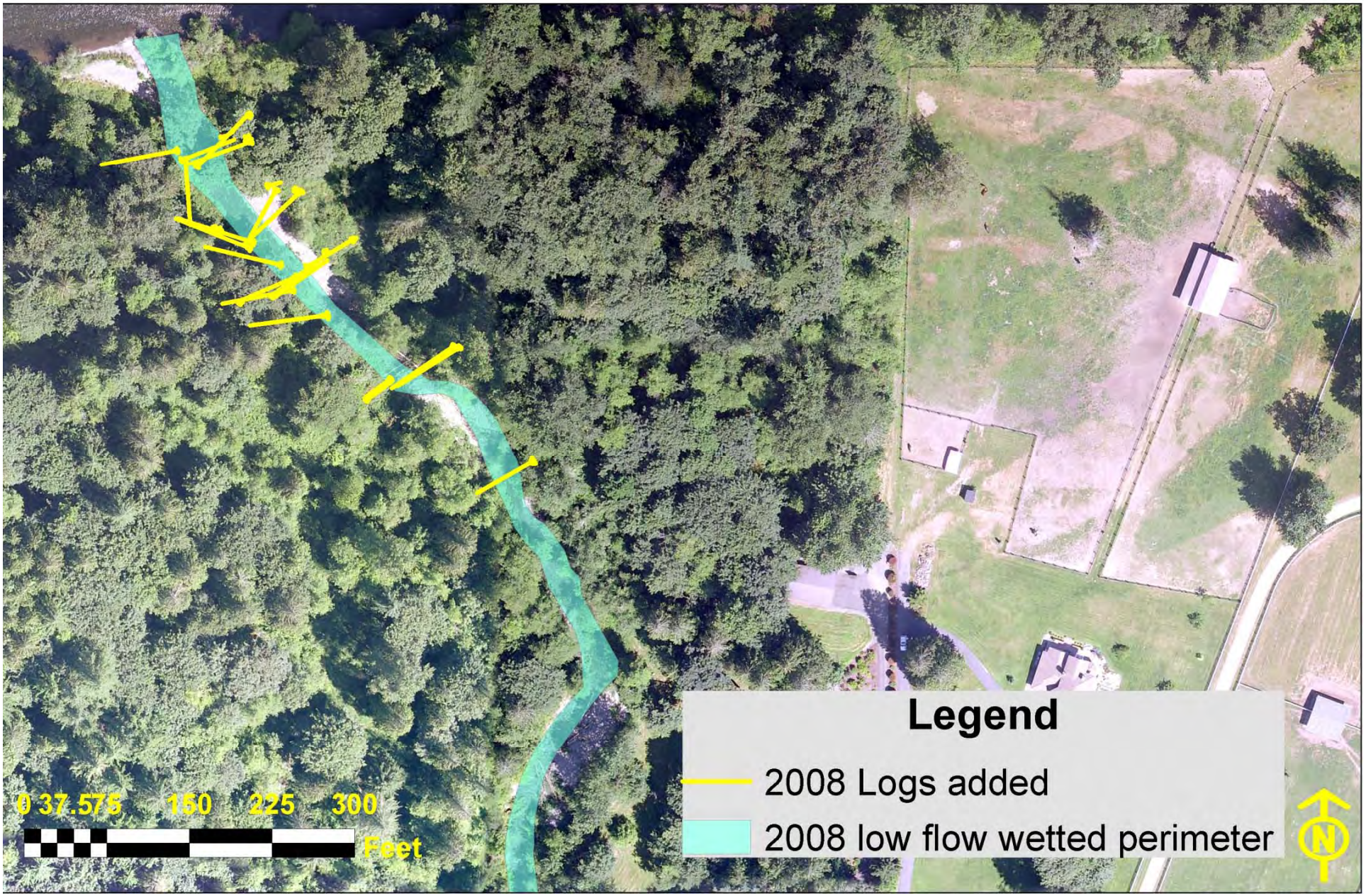
Lower Newaukum Creek Habitat Restoration Project

King County

Figure 1: 2008 vs. 2009 surface model comparison showing ~ edge of water at ~80 CFS each year

Implementation Summer 2008

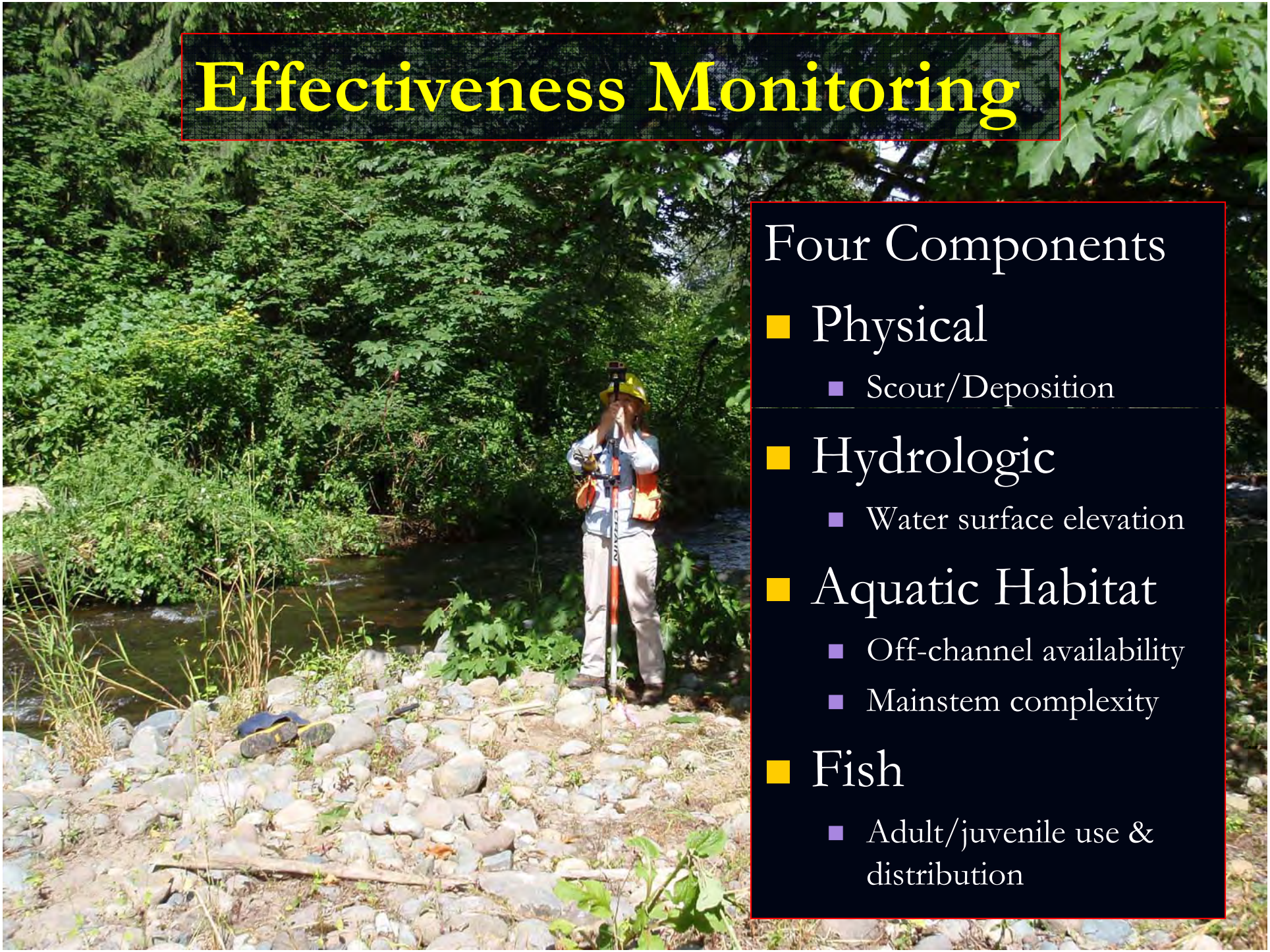
2008 As-built log locations



January 8th, 2009 flood
> 1200 CFS = 10+ yr flood

Flood Response
January 2009

Effectiveness Monitoring



Four Components

- Physical
  - Scour/Deposition
- Hydrologic
  - Water surface elevation
- Aquatic Habitat
  - Off-channel availability
  - Mainstem complexity
- Fish
  - Adult/juvenile use & distribution

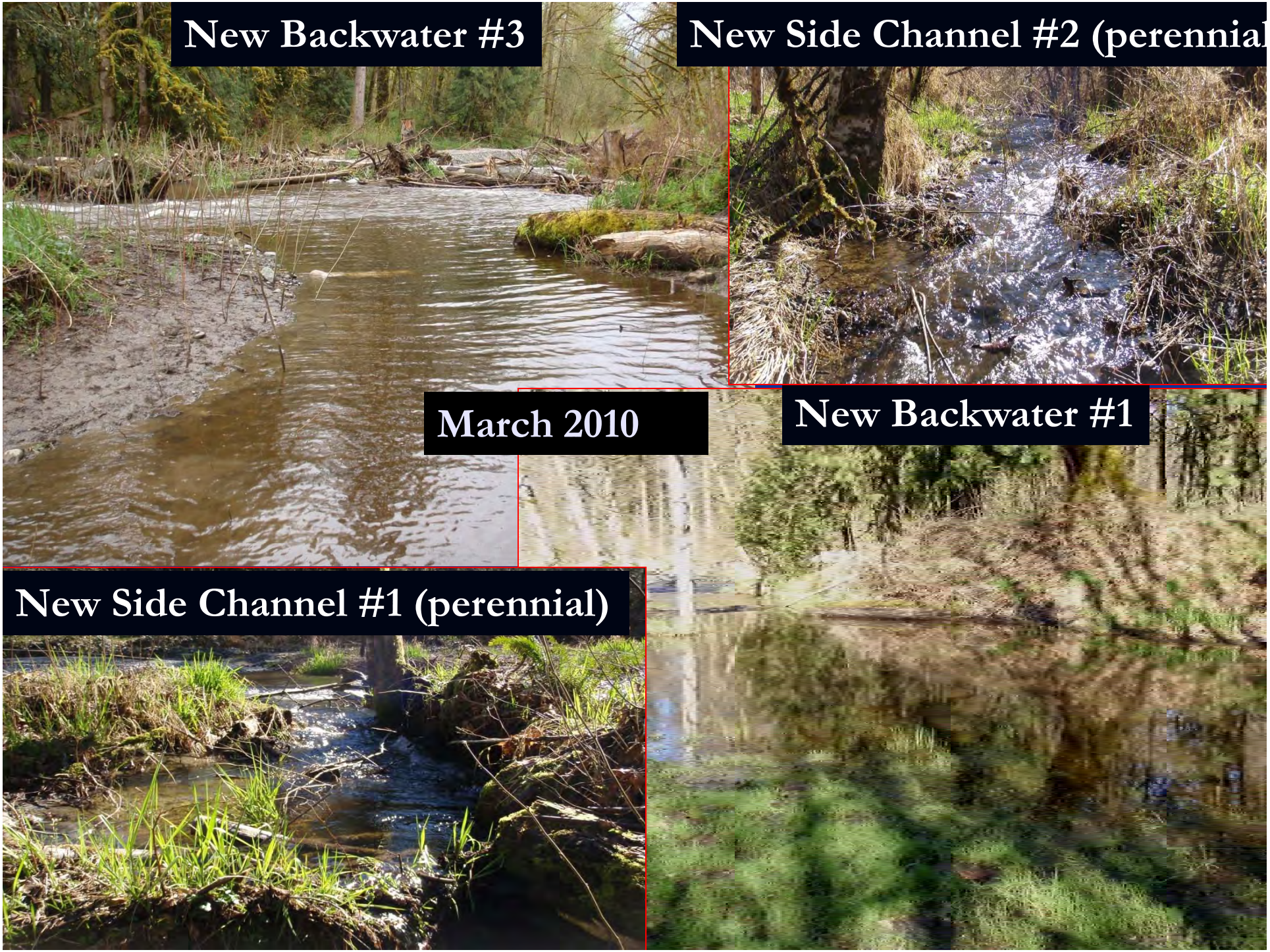
Pre-Project – June 2008

As-built – August 2008

February 2009 – post flood

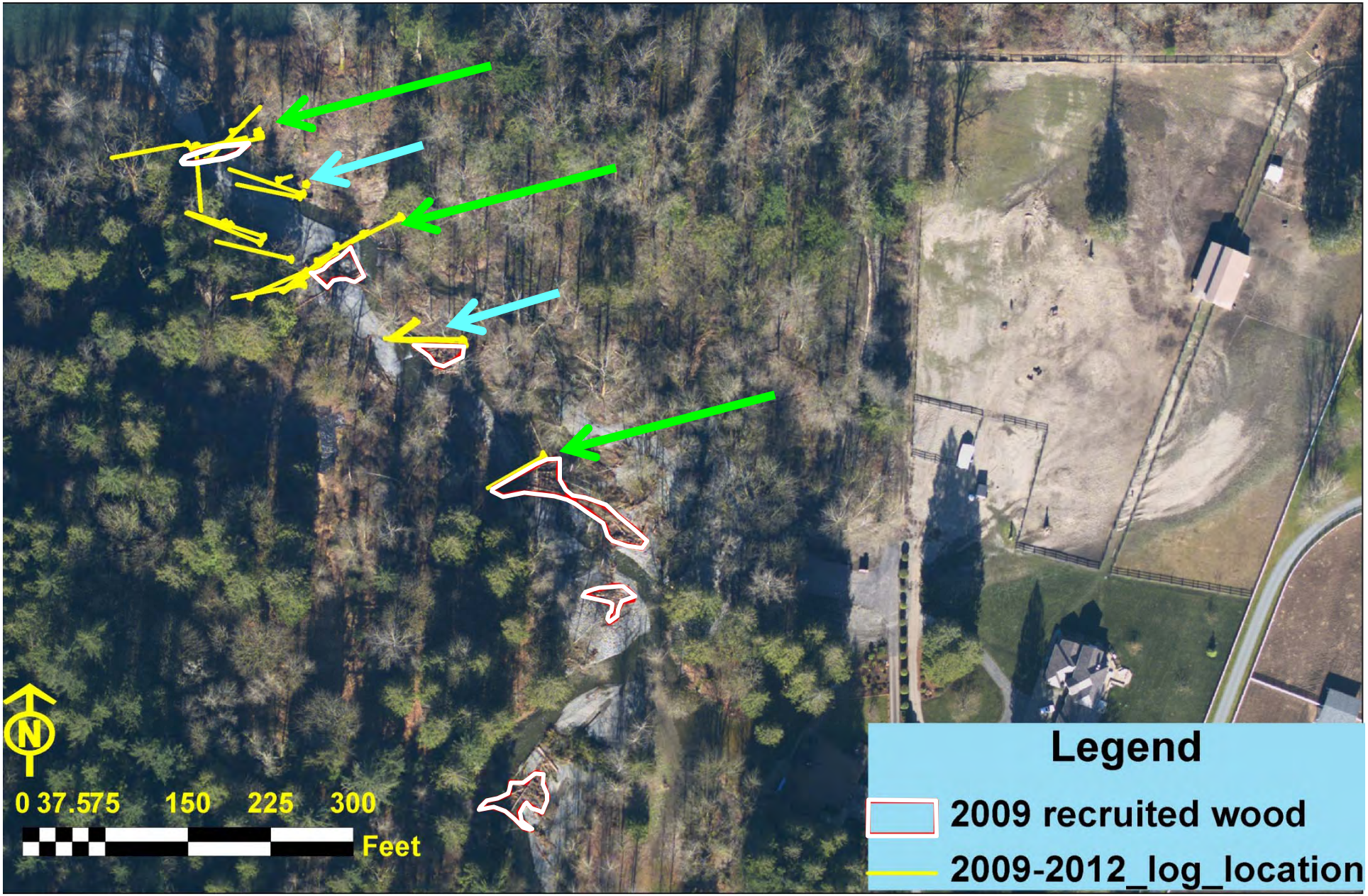
March 2010 – post phase 2 + 2nd water year

July 2012 – after 4 years

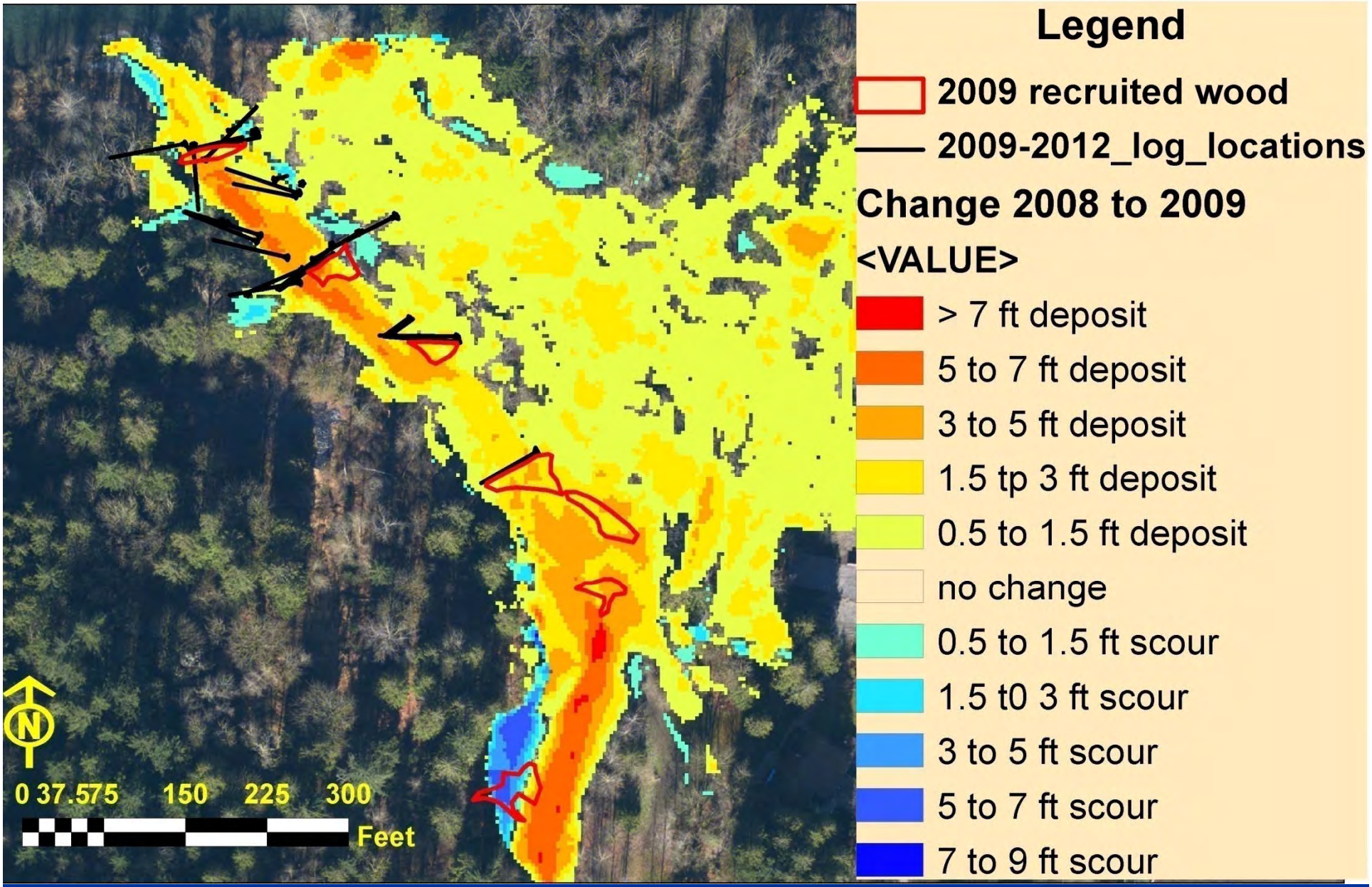

New Backwater #3
New Side Channel #2 (perennial
March 2010
New Backwater #1
New Side Channel #1 (perennial)

Hypothesis #1

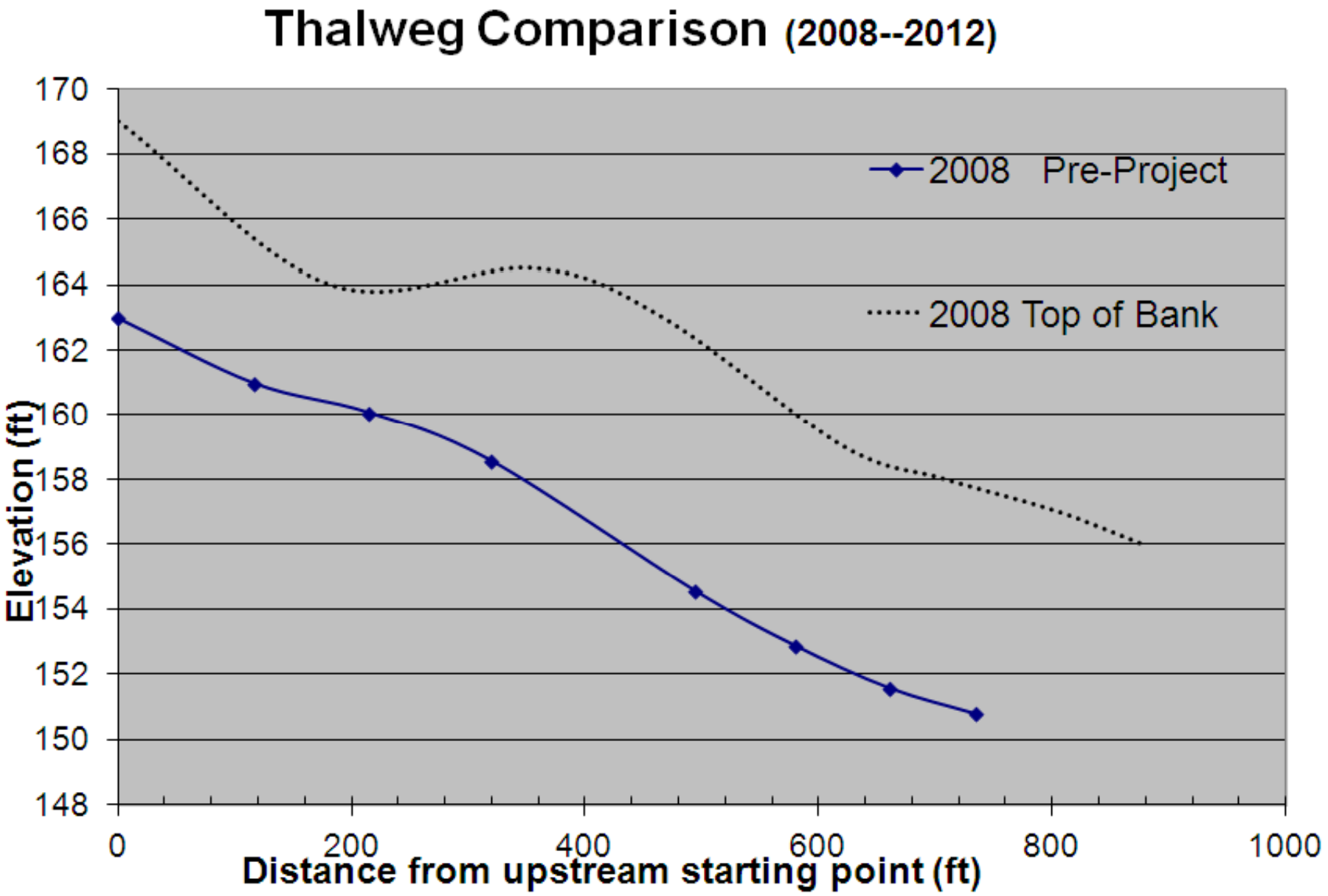
- Full spanning jams will remain stable and cause substantial aggradation.



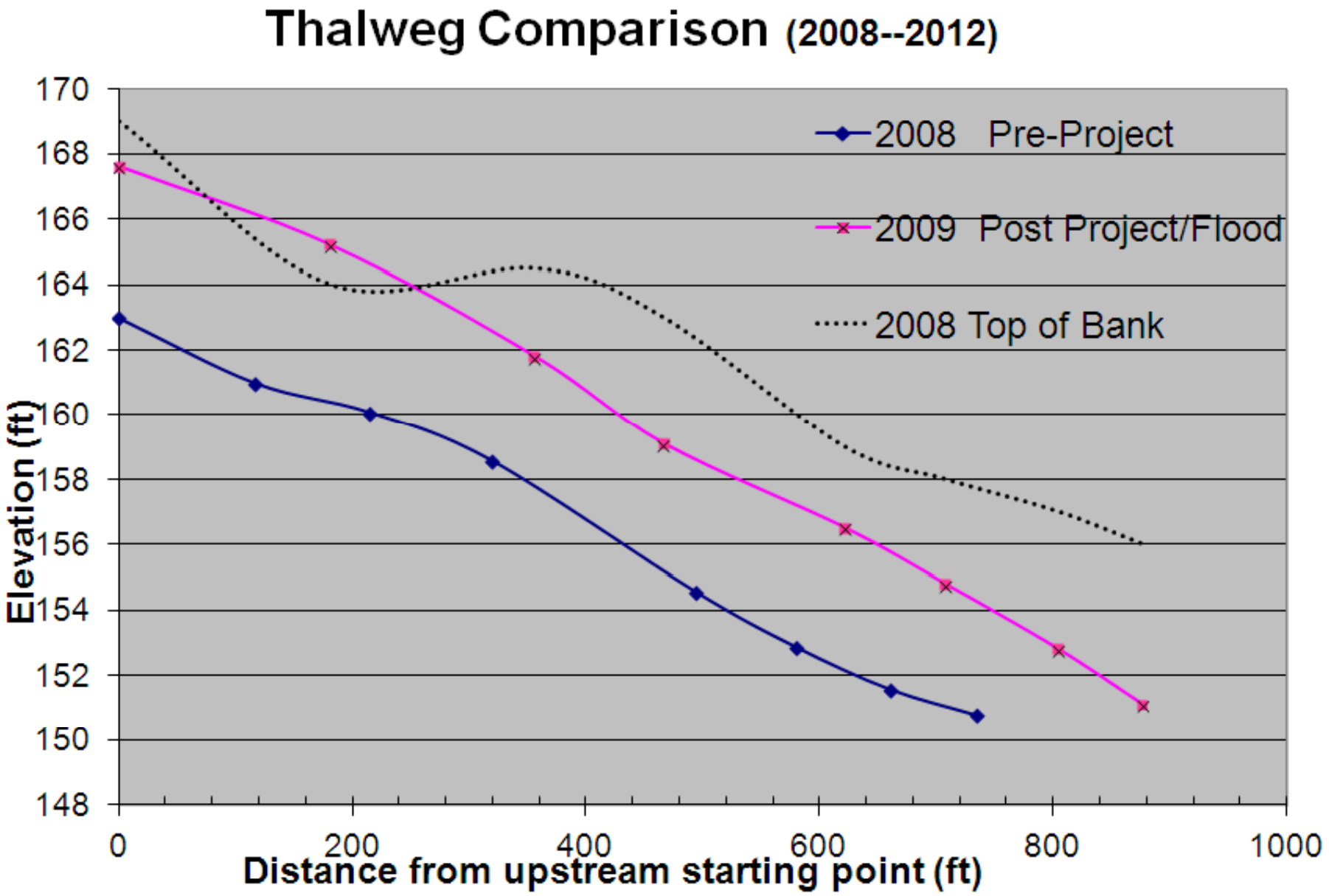
Logjam Stability (2009-2012)



2009 post-flood sediment storage



Profile Evolution



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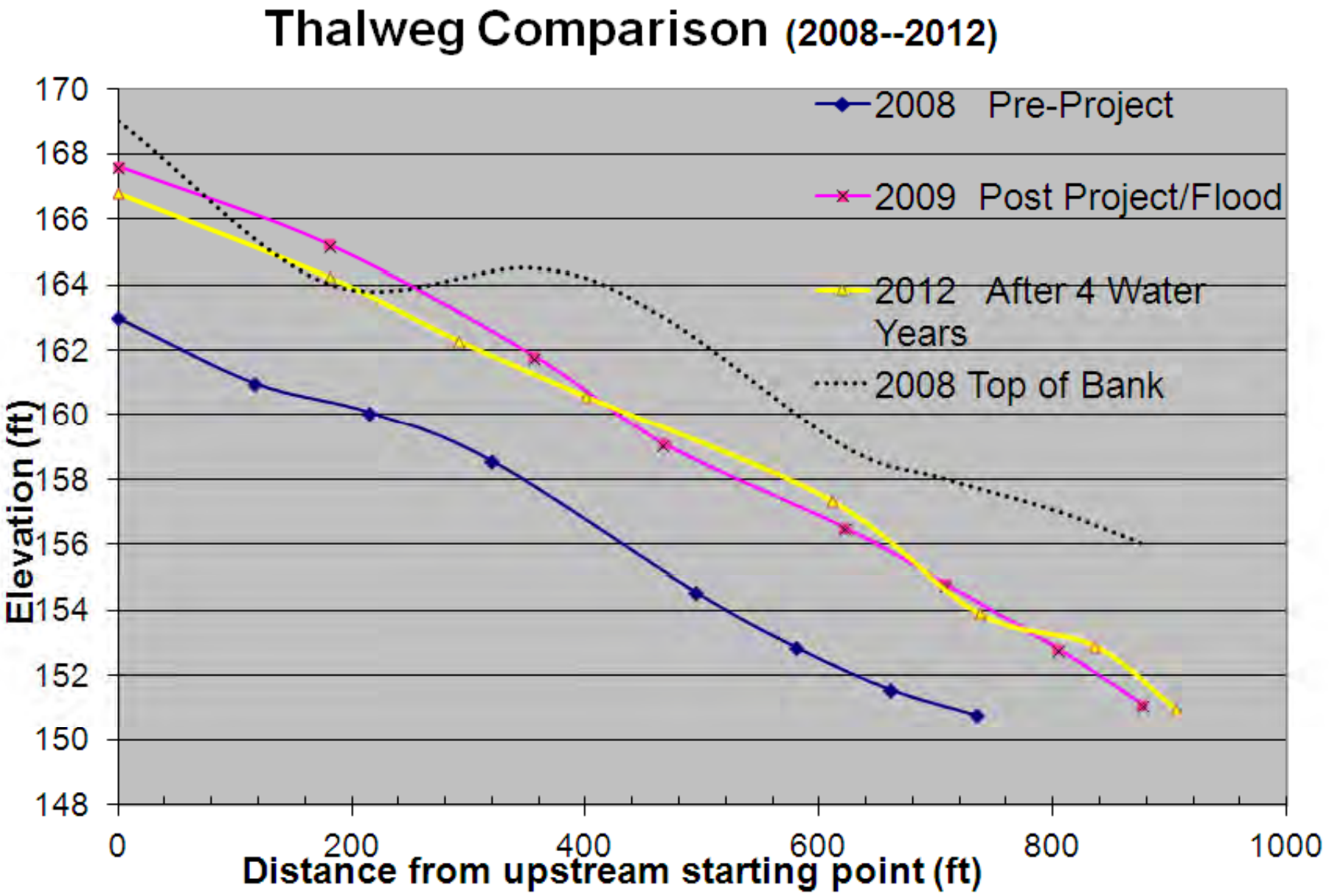

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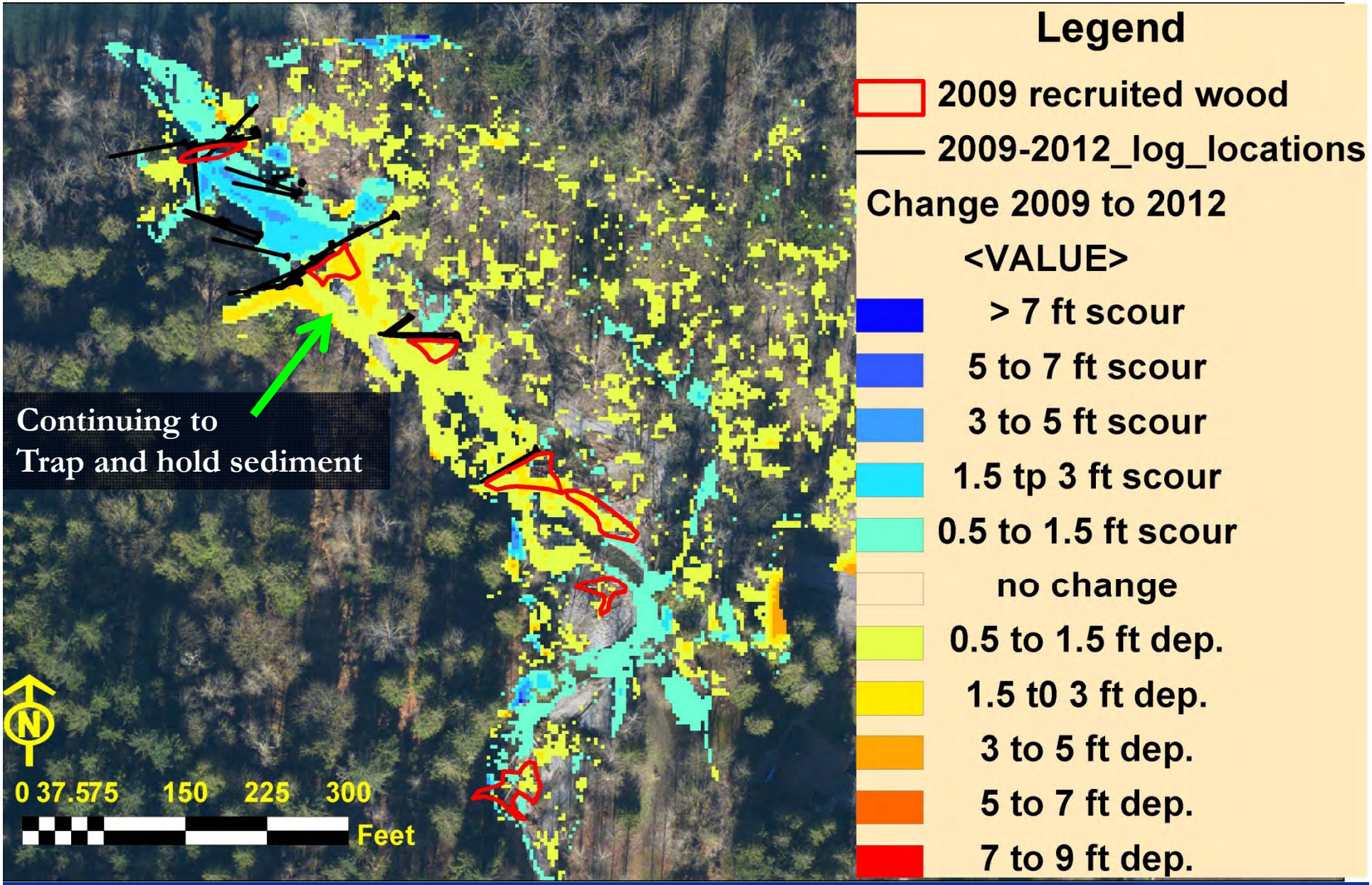
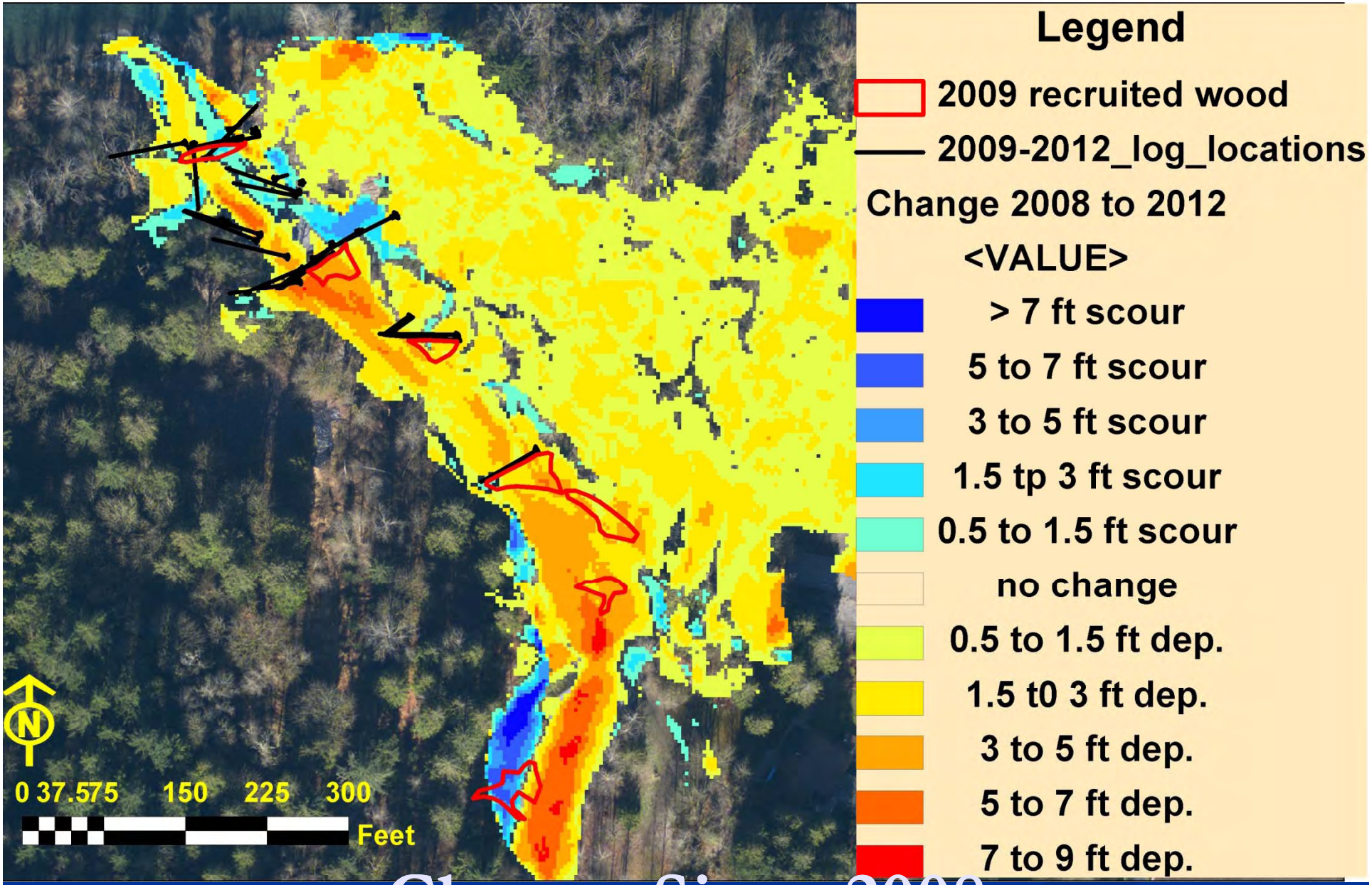


Change Since 2009



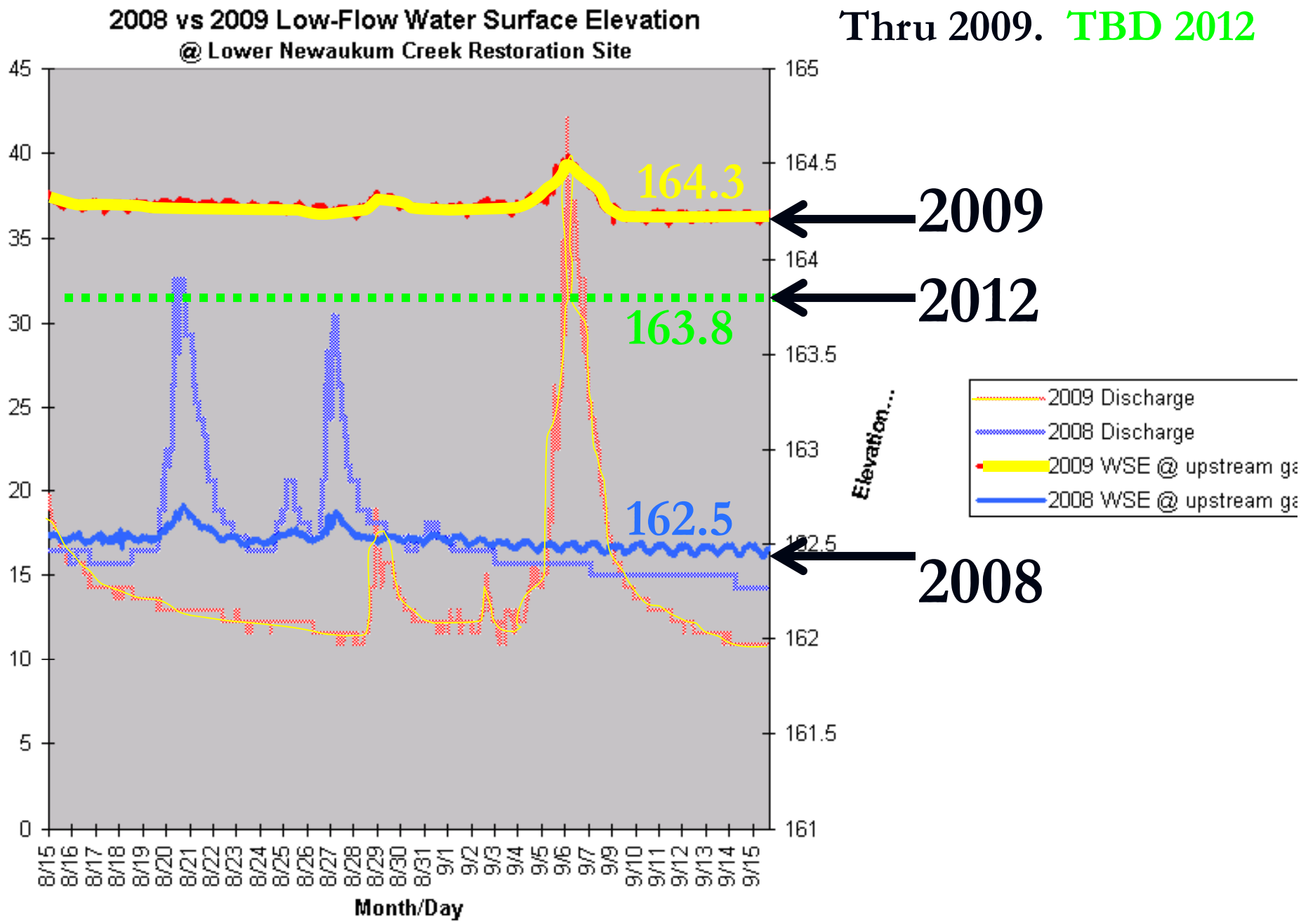
Change Since 2008

Spanning-jams mostly stable and continuing to hold sediment

Hypothesis 2

- Water surface elevation will rise in response to jams and aggradation

Hypothesis 2 Confirmed Thru 2009. TBD 2012



Hypothesis 3

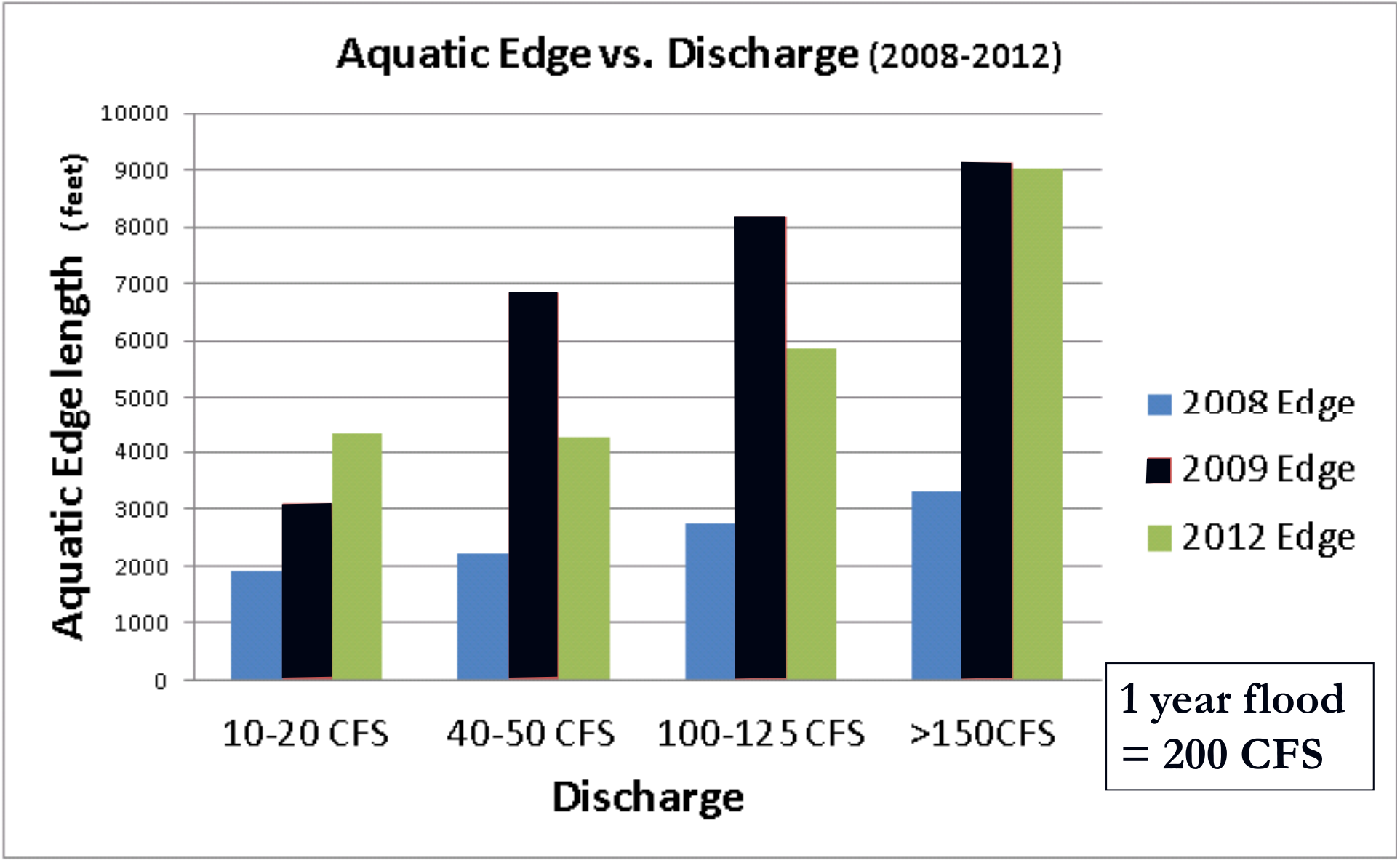
- Increased water surface elevation will result in greater floodplain connectivity and improved aquatic habitat

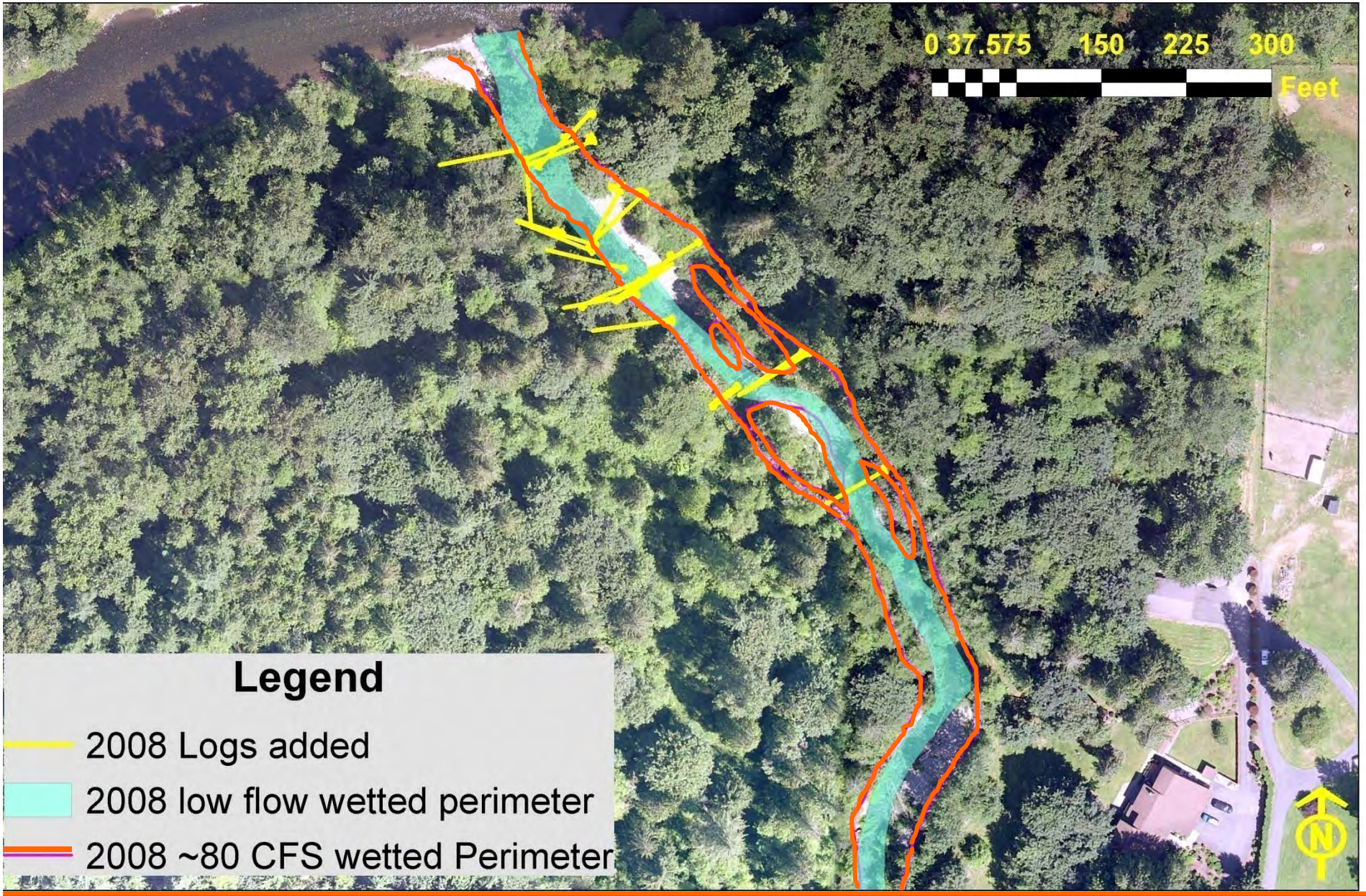
March 2010

New Side Channel #4 = Relict left bank channel

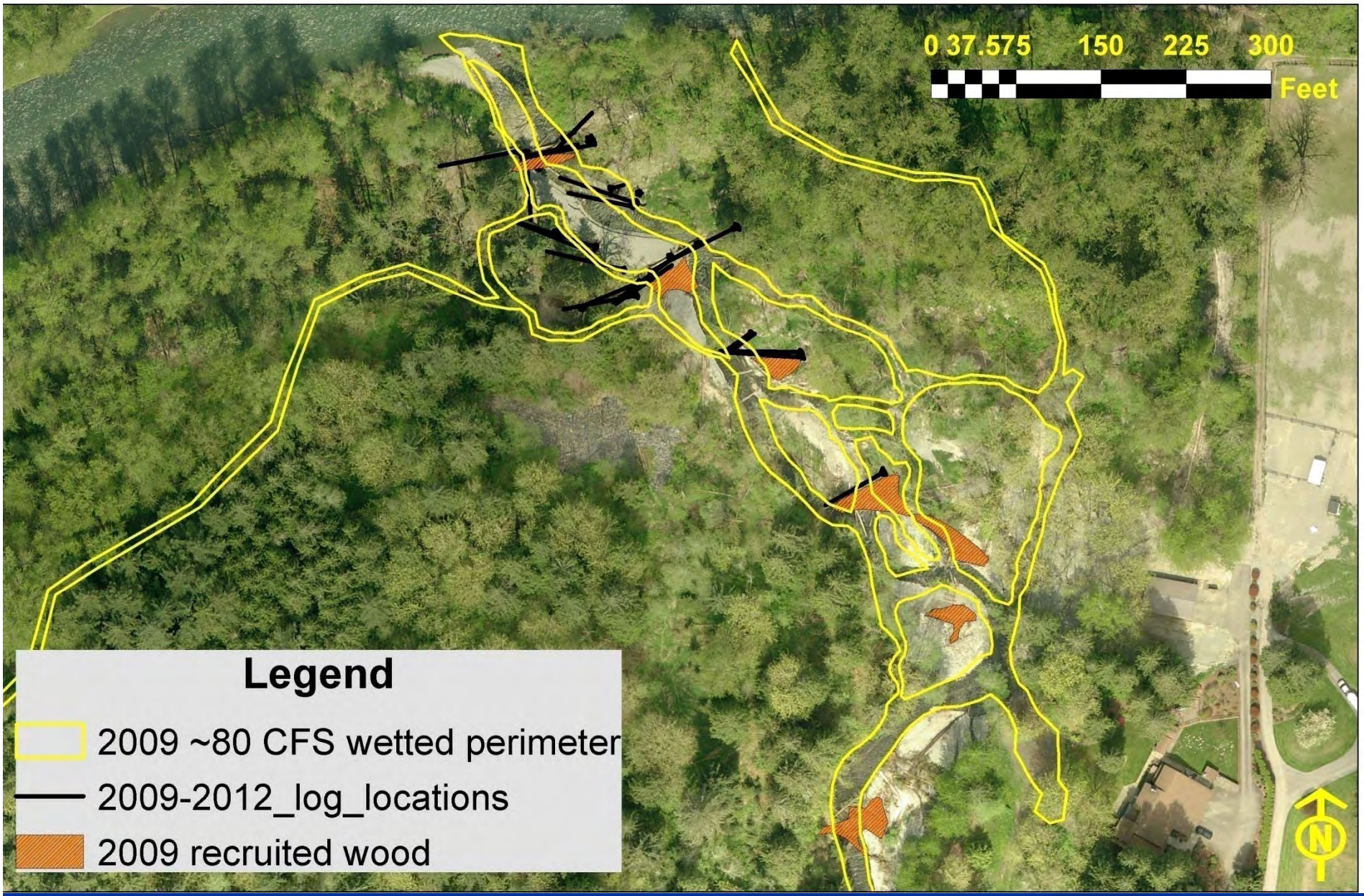
Floodplain Connectivity!!!!!

Aquatic Edge Habitat
2008, 2009, 2012

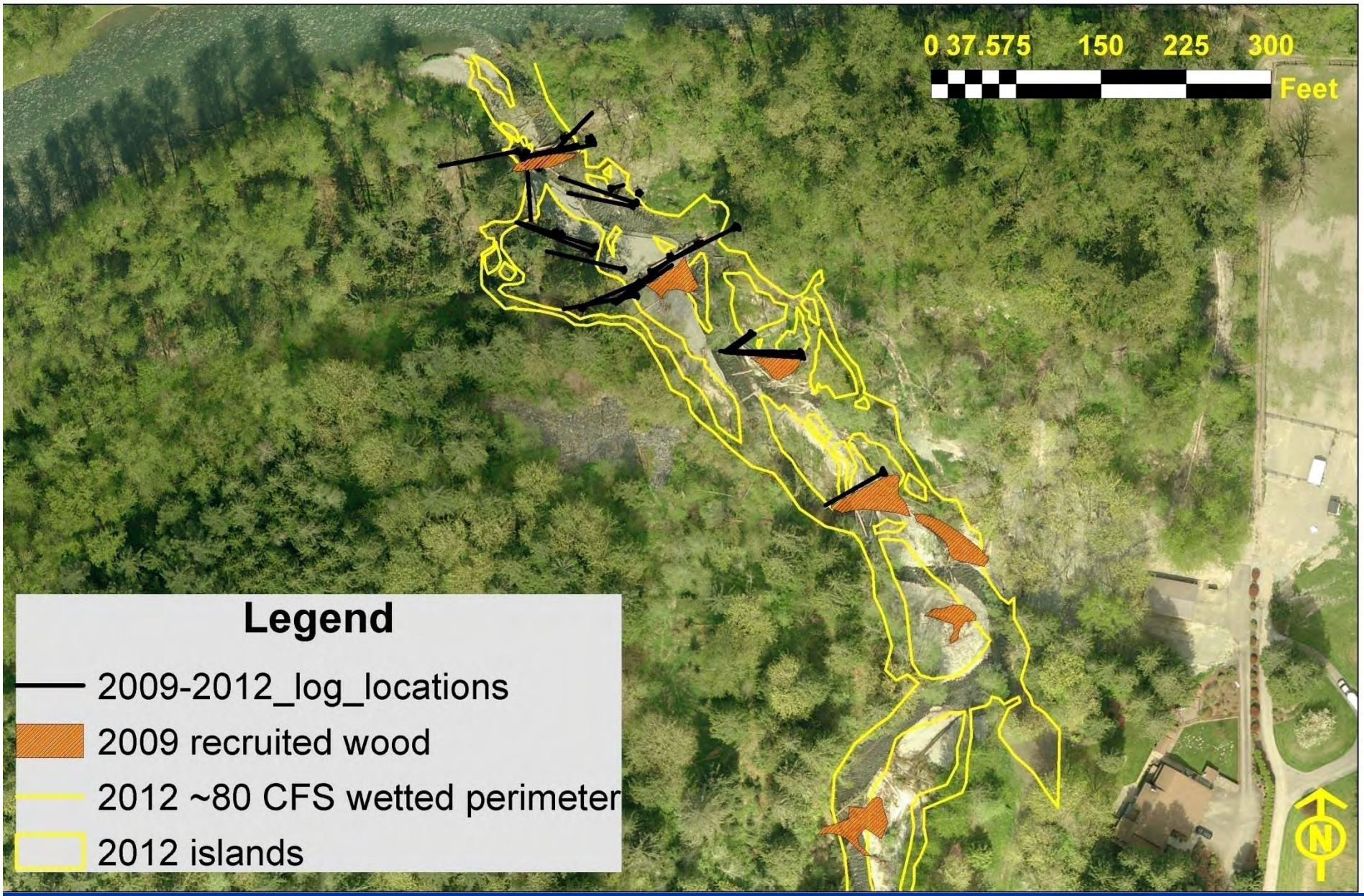




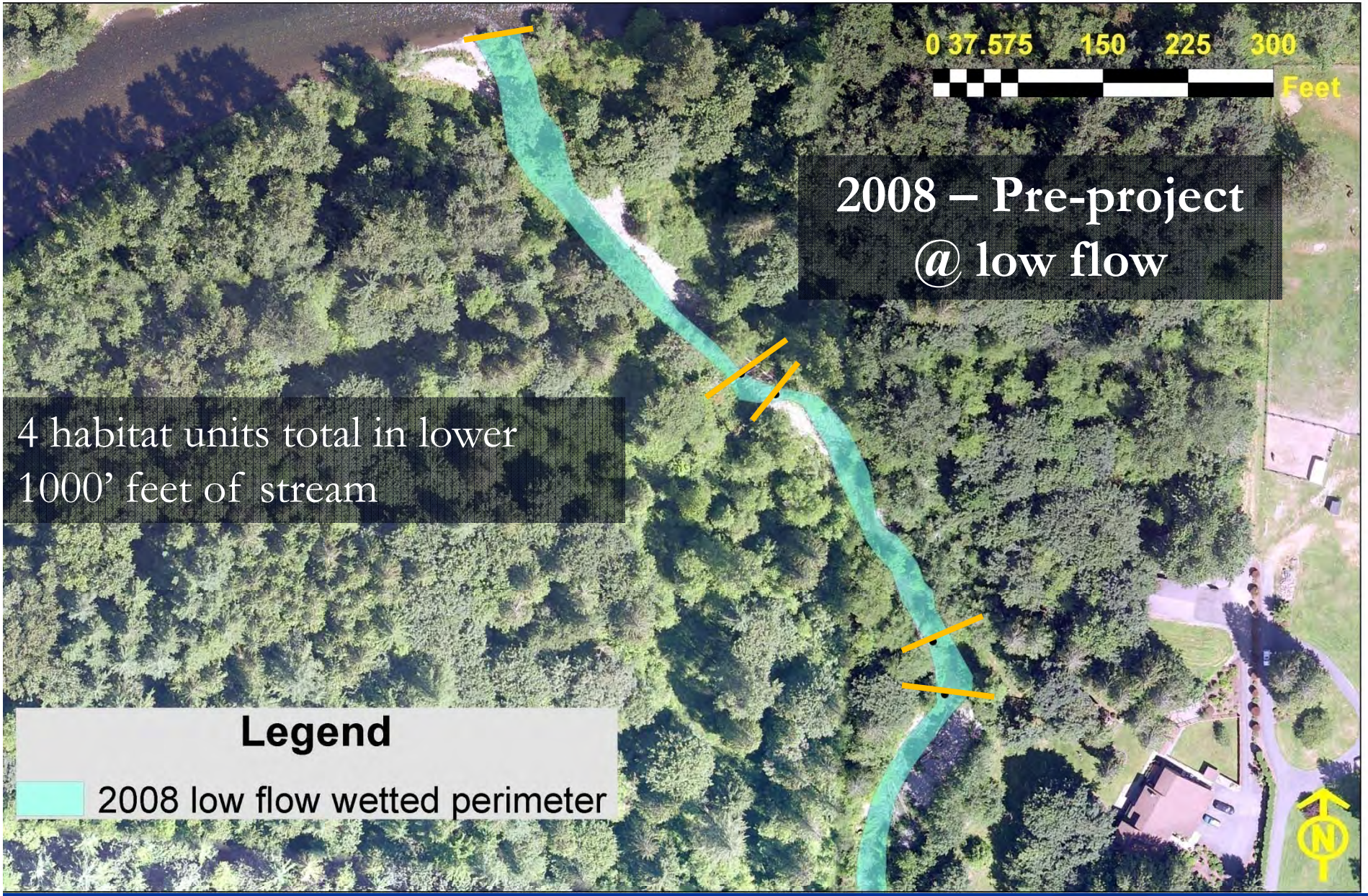
Pre-Project Connectivity & Edge - 2008



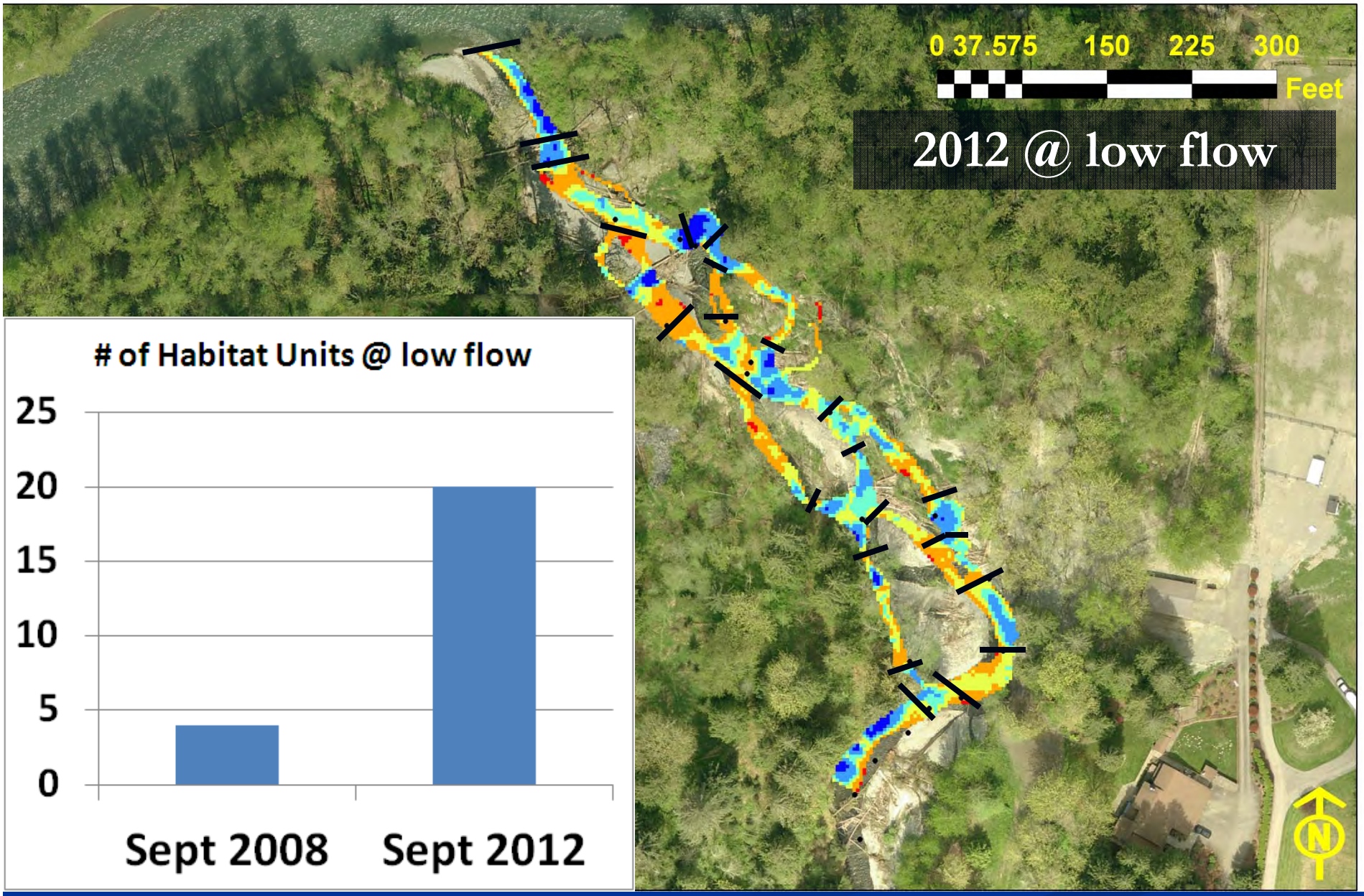
Post-Flood Connectivity & Edge - 2009



Current Connectivity & Edge - 2012



Habitat Complexity



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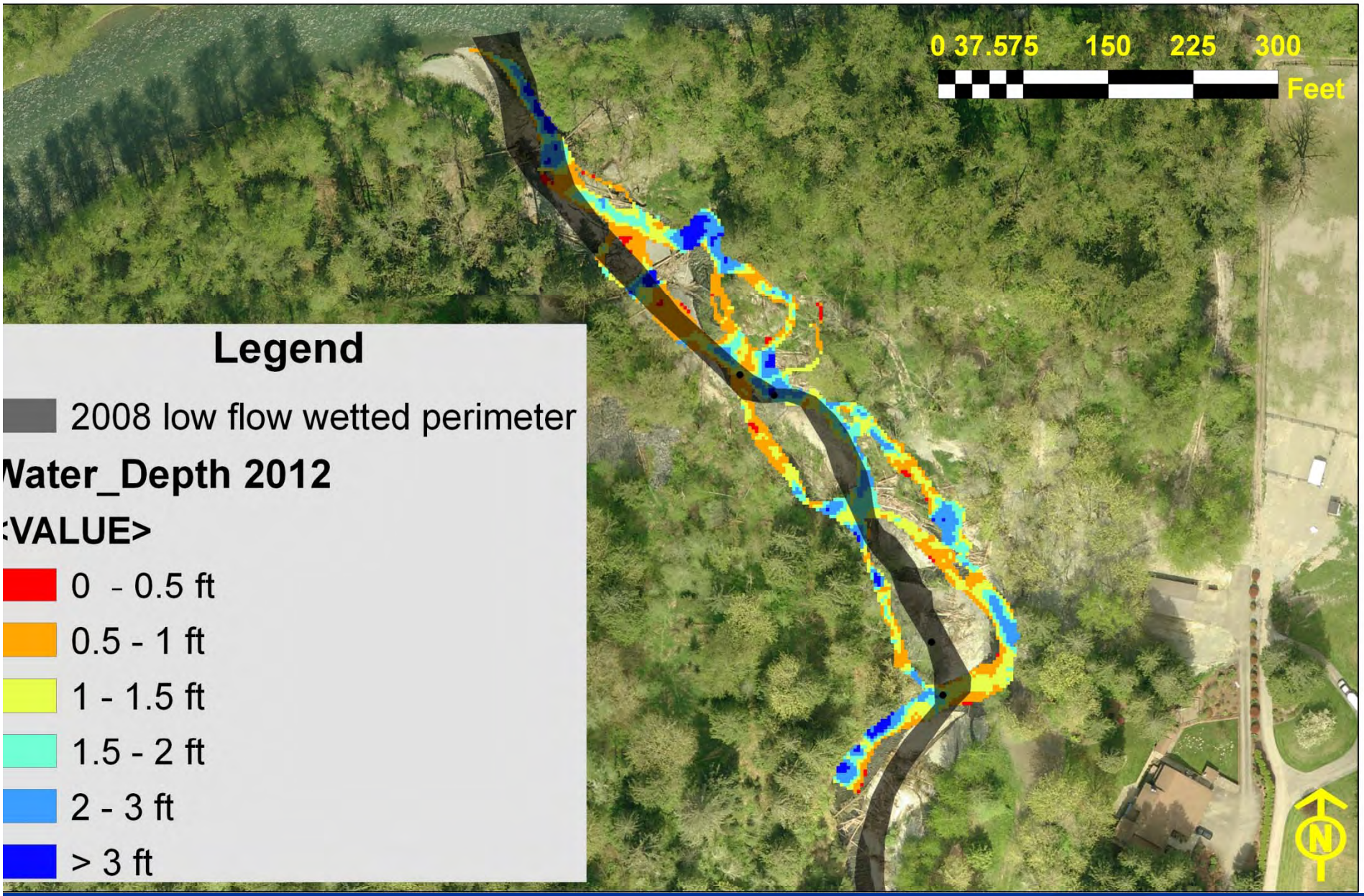

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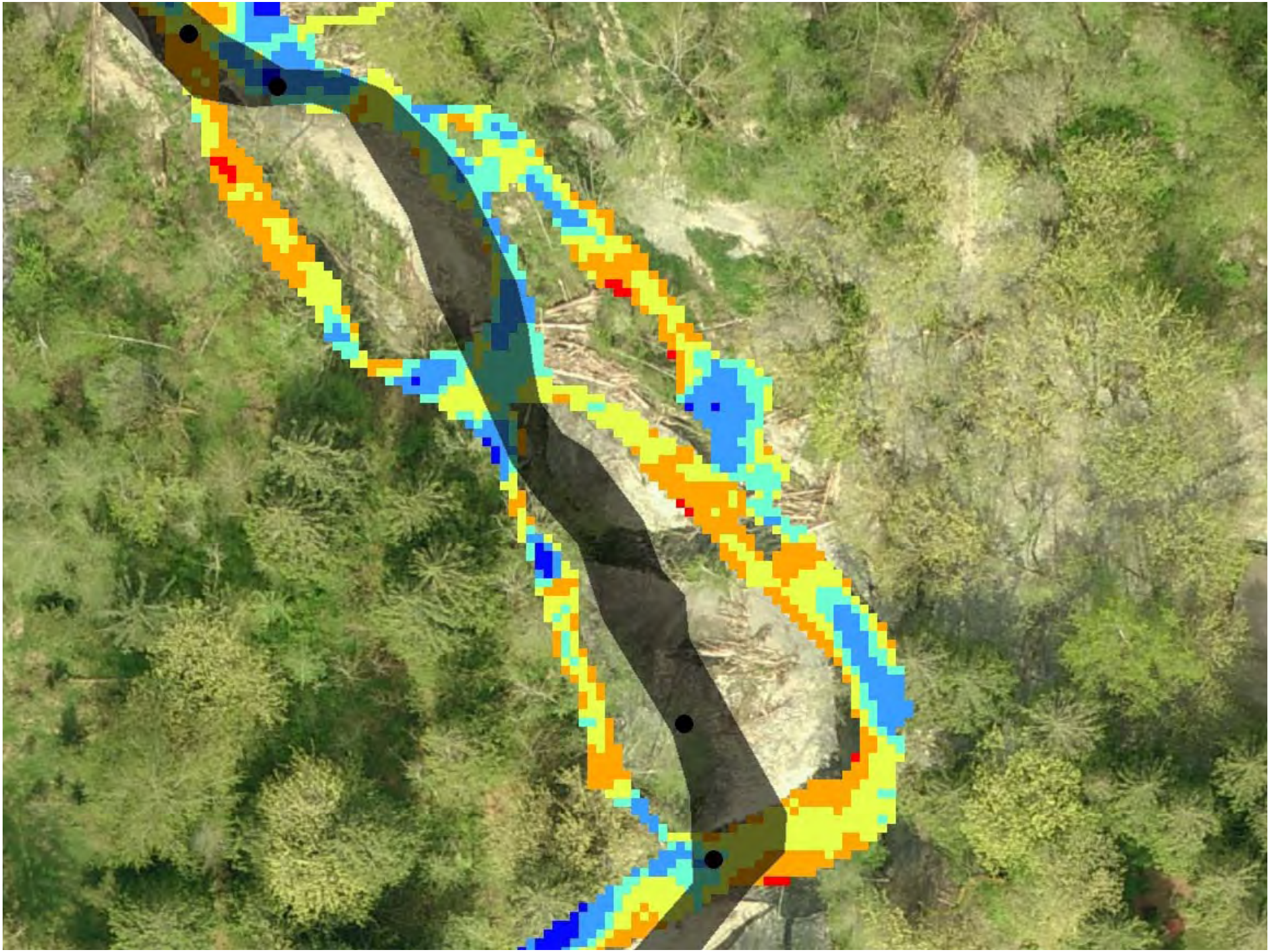


Other Monitoring – to be continued

- Substrate texture (Fining)
- Juvenile surveys (lots of rearing fish)
- Adult salmon use (more spawners)
- Wood and vegetation

  (more retention and recruitment)

2010, 2012 Snorkel Surveys

Conclusions

GO BIG!!

Reversing decades of damage

Need demonstrable benefits

Don't give up on your vision

Be Careful!!

Consider worst-case sediment

Build perimeter accordingly

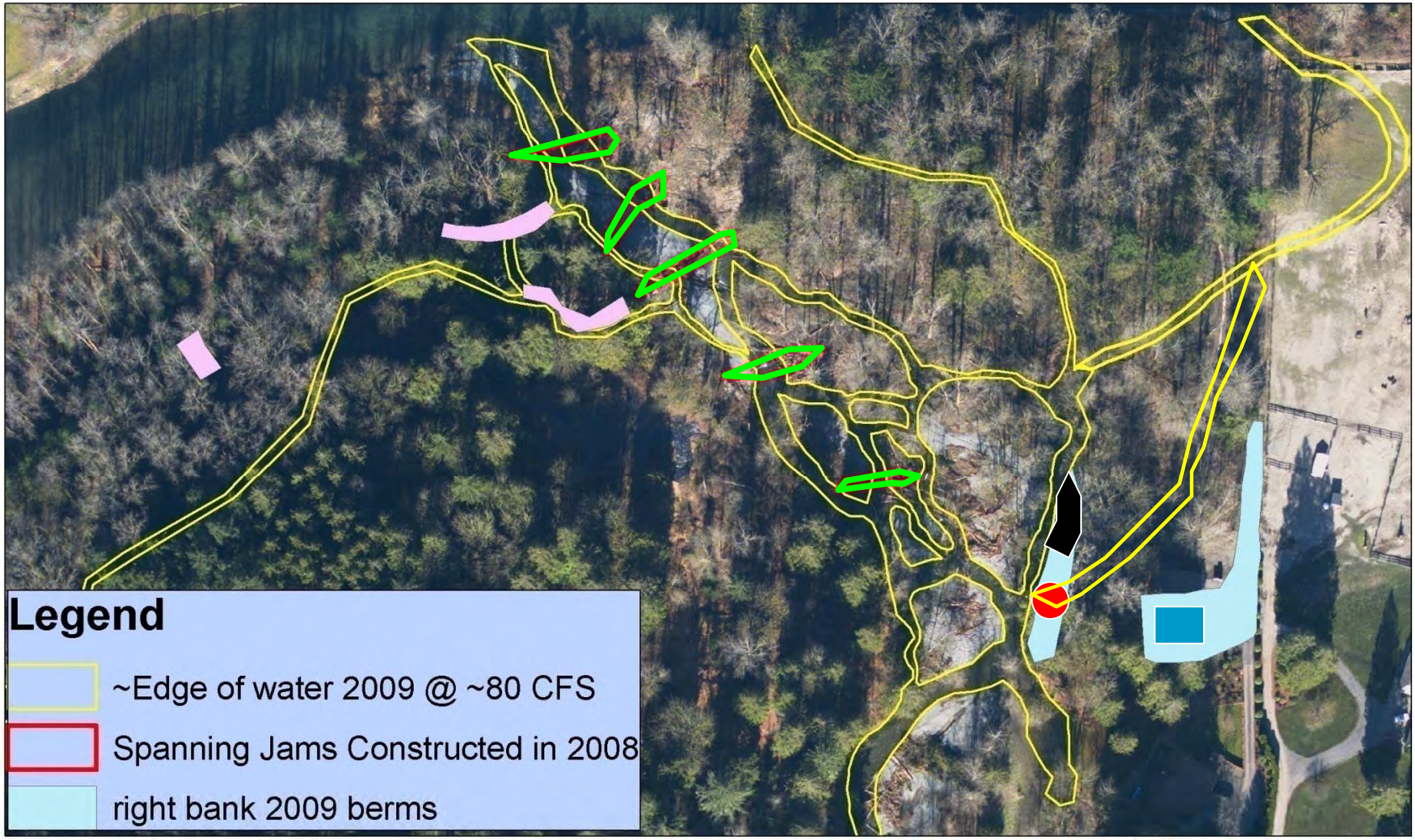
Acquire more land

Acknowledgements

- Project Implementation funded by:
  - Salmon Recovery Funding Board
  - King Conservation District
  - King County Surface Water Management Fees
  - FEMA

- Effectiveness Monitoring funded by:
  - King County Surface Water Management Fees
    - Through the CIP Monitoring Program
  - Salmon Recovery Funding Board – as-built only

Phase 2 – 2009



Lower Newaukum Creek Habitat Restoration Project

0 75 150 300 450 600

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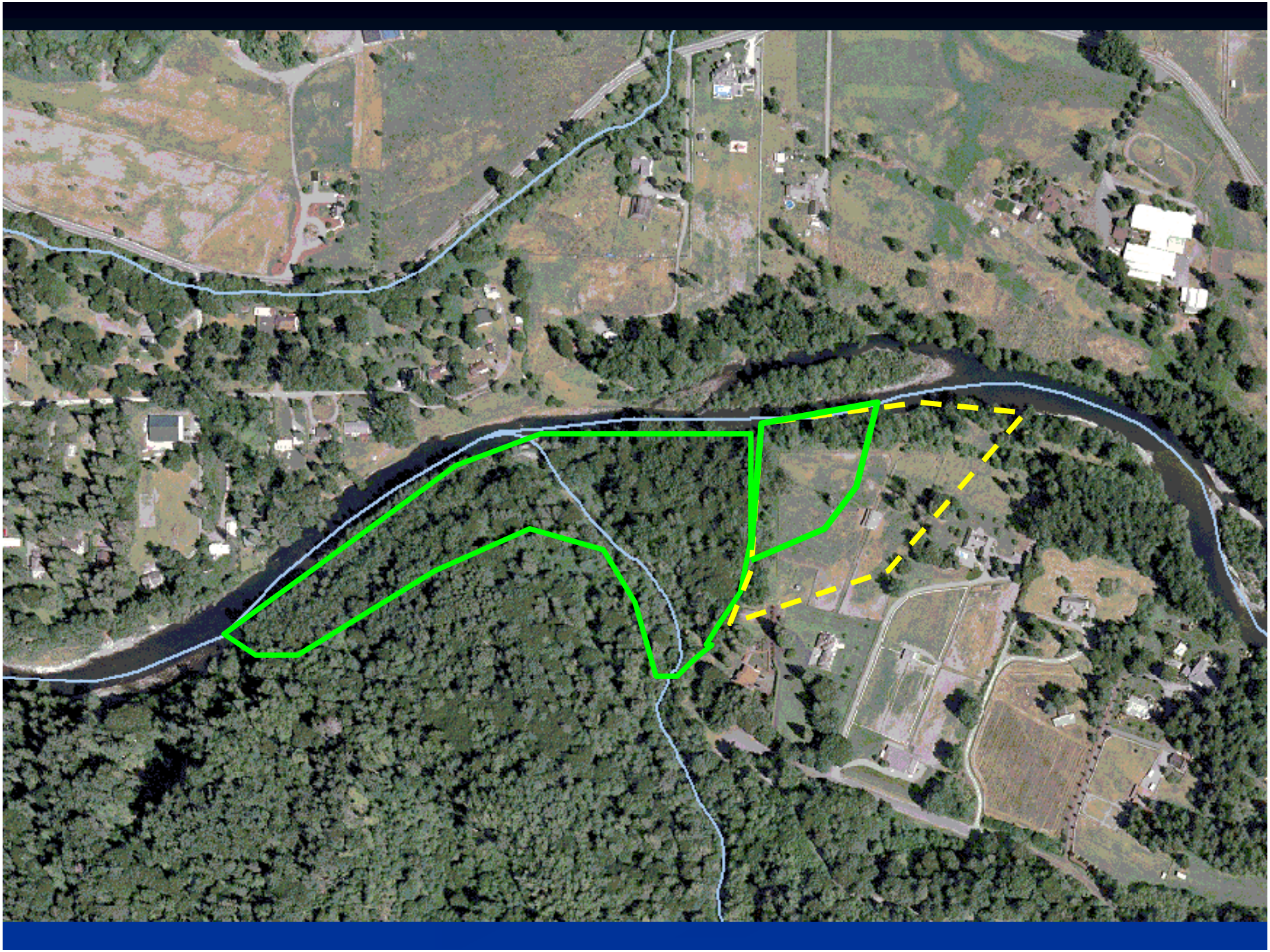

Sediment and wood still adjusting

Beavers have moved in!!!

Some large trees will fall

Extensive natural recruitment of native plants

Dynamic Site
Stay Tuned!!!