South Slough Salmon Rearing Habitat Enhancement Project

South Slough NERR
Coos Watershed Association
Oregon Department of Fish and Wildlife
Oregon Department of Transportation

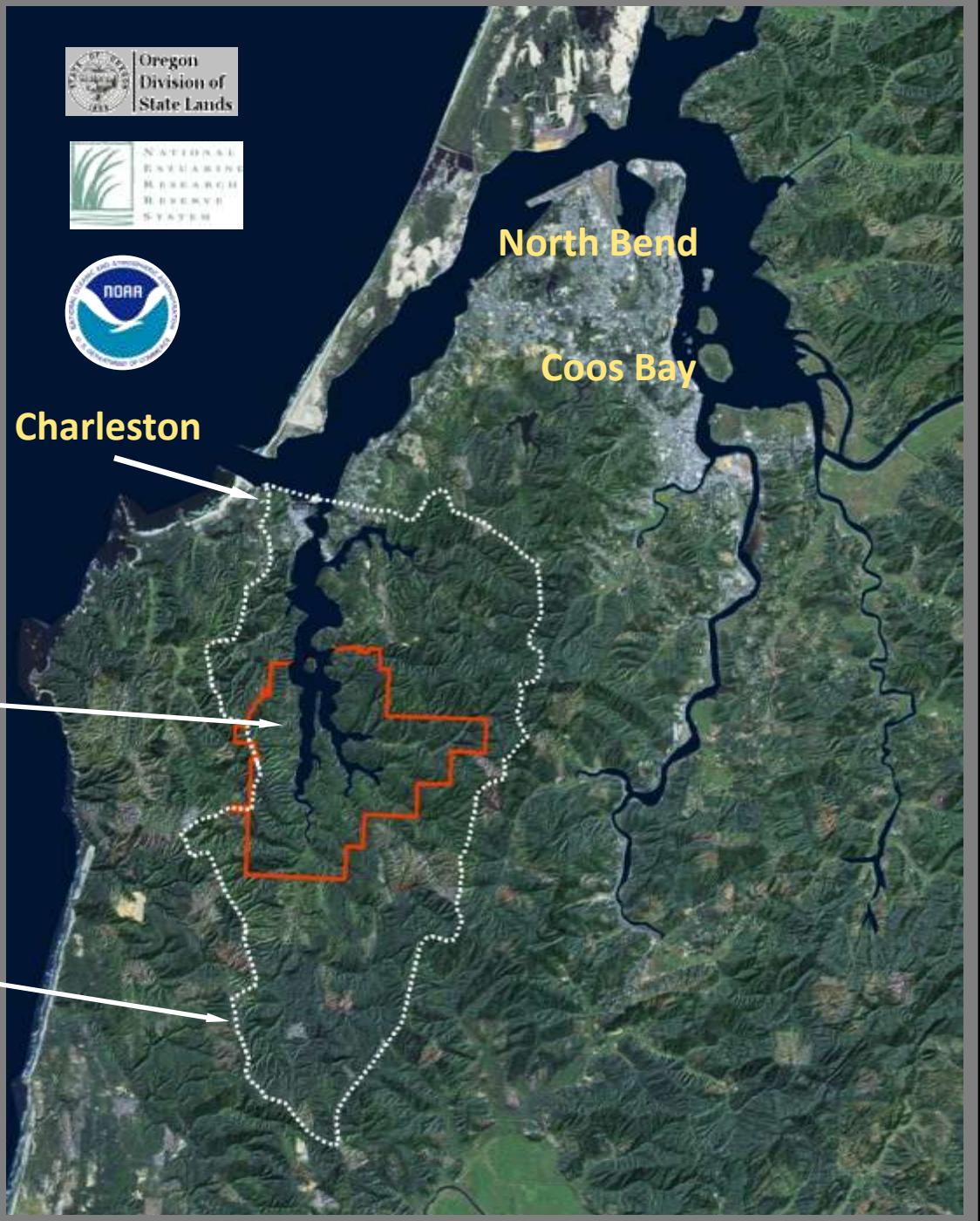
2004

Funding: FishAmerica Foundation / U.S. Fish and Wildlife Service

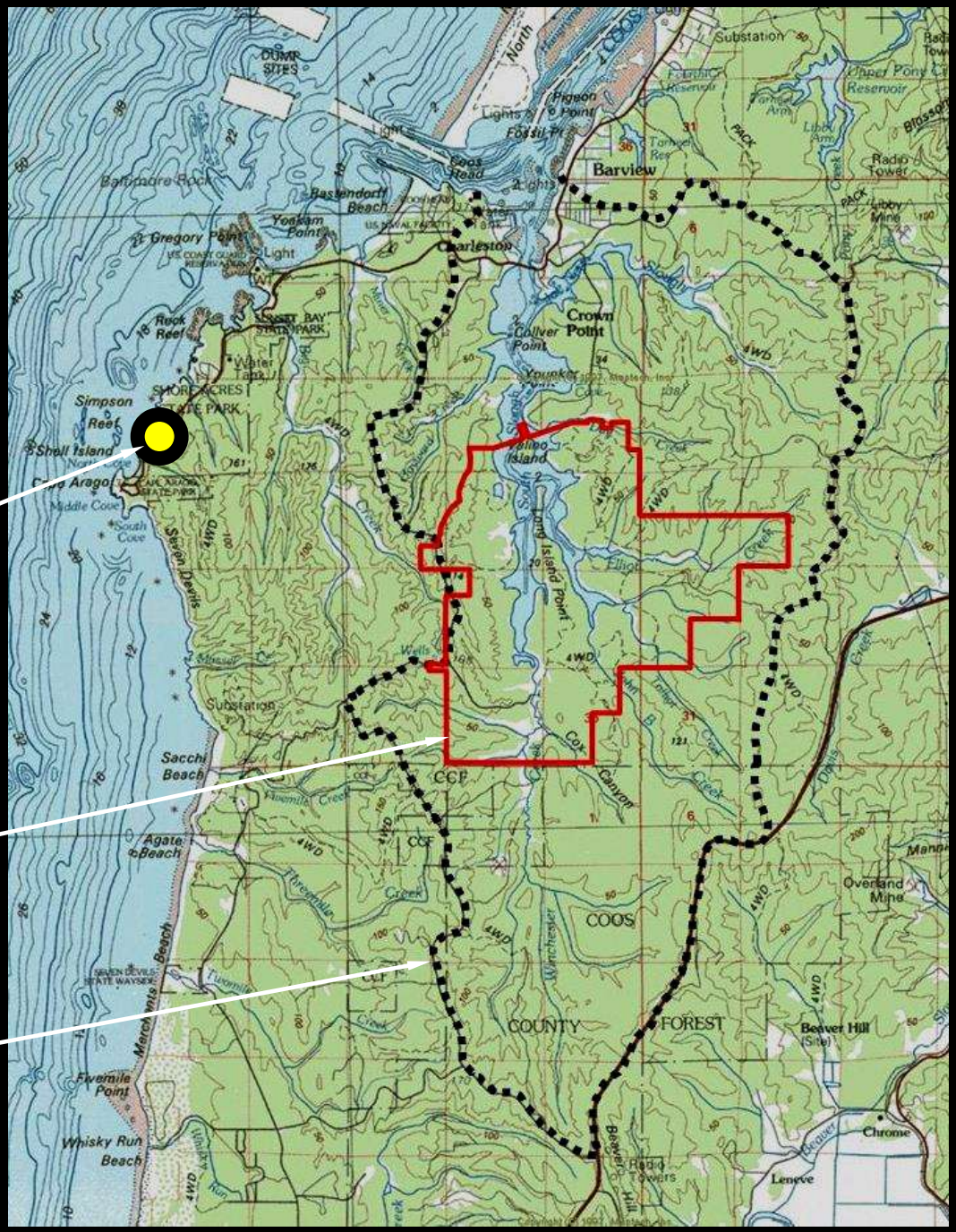
Vancouver Island
Vancouver
Seattle
Washingto
Portland
Coos Bay
Oregon

PACIFIC OCEAN
Columbia River
Necanicum River
CLATSOP
Nehalem River
Tillamook Bay
TILLAMOOK
Netarts Bay
Sand Lake
Nestucca Bay
Salmon River
Siletz Bay
Depoe Bay
Yaquina Bay
LINCOLN
Alsea Bay
LANE
Siuslaw River
Umpqua River
DOUGLAS
Coos Bay
COOS
Coquille River
Sixes River
Elk River
CURRY
JOSEPHINE
Rogue River
Pistol River
Chetco River
Winchuck River

South Slough National Estuarine Research Reserve



Project Location



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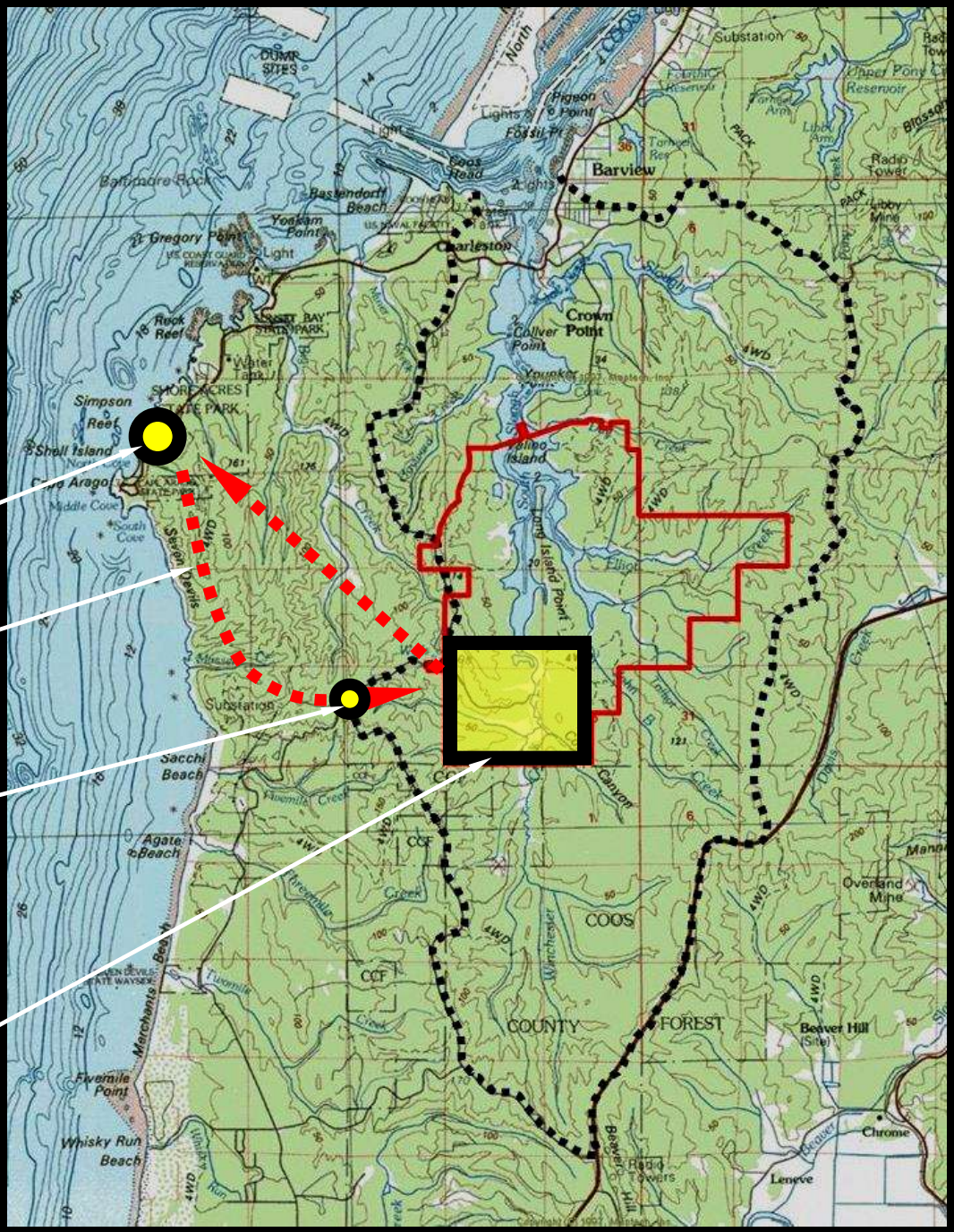

Project Goals:

1. To evaluate the effectiveness of placing large wood in estuarine channels for improved habitat for juvenile salmonids.

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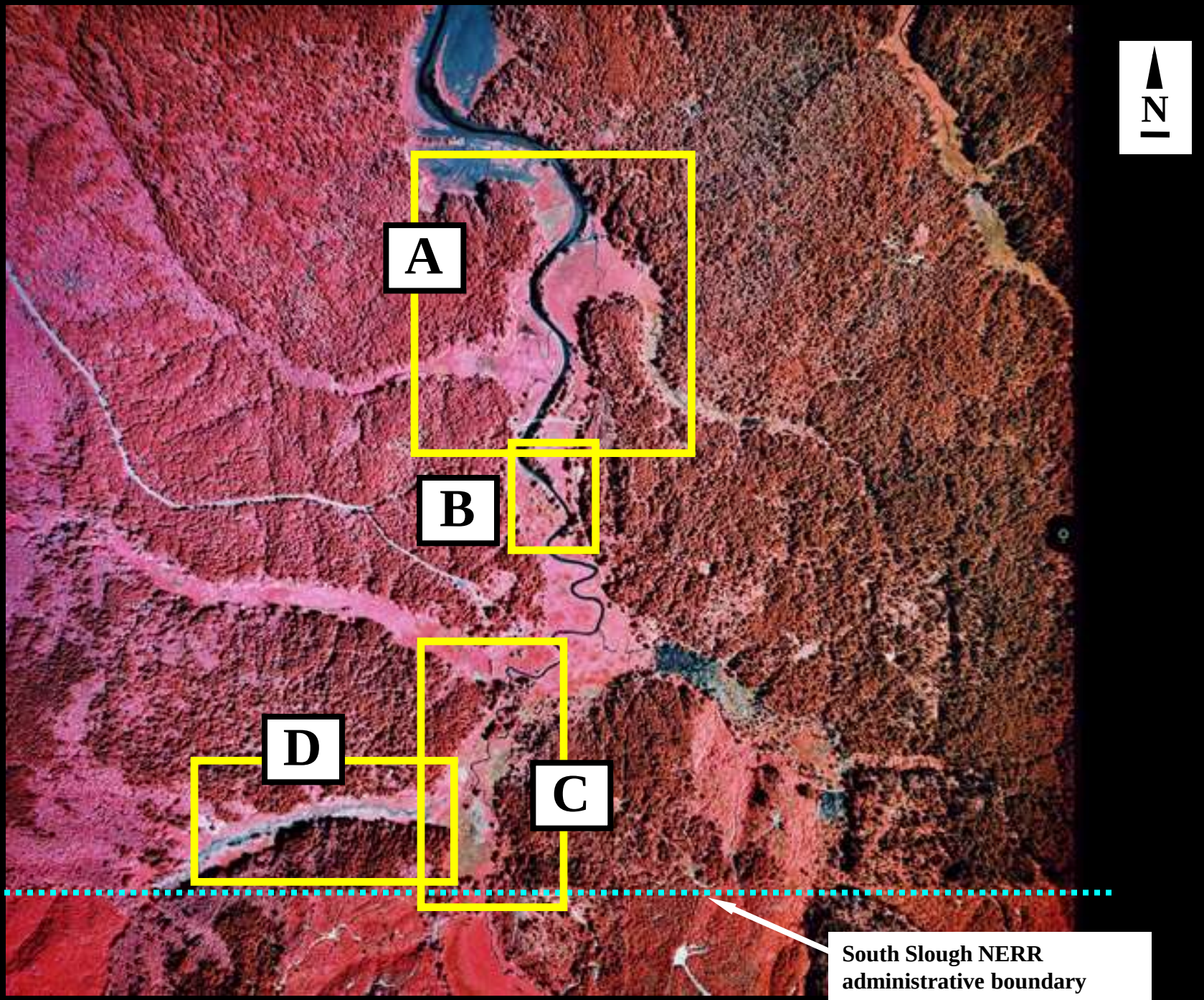
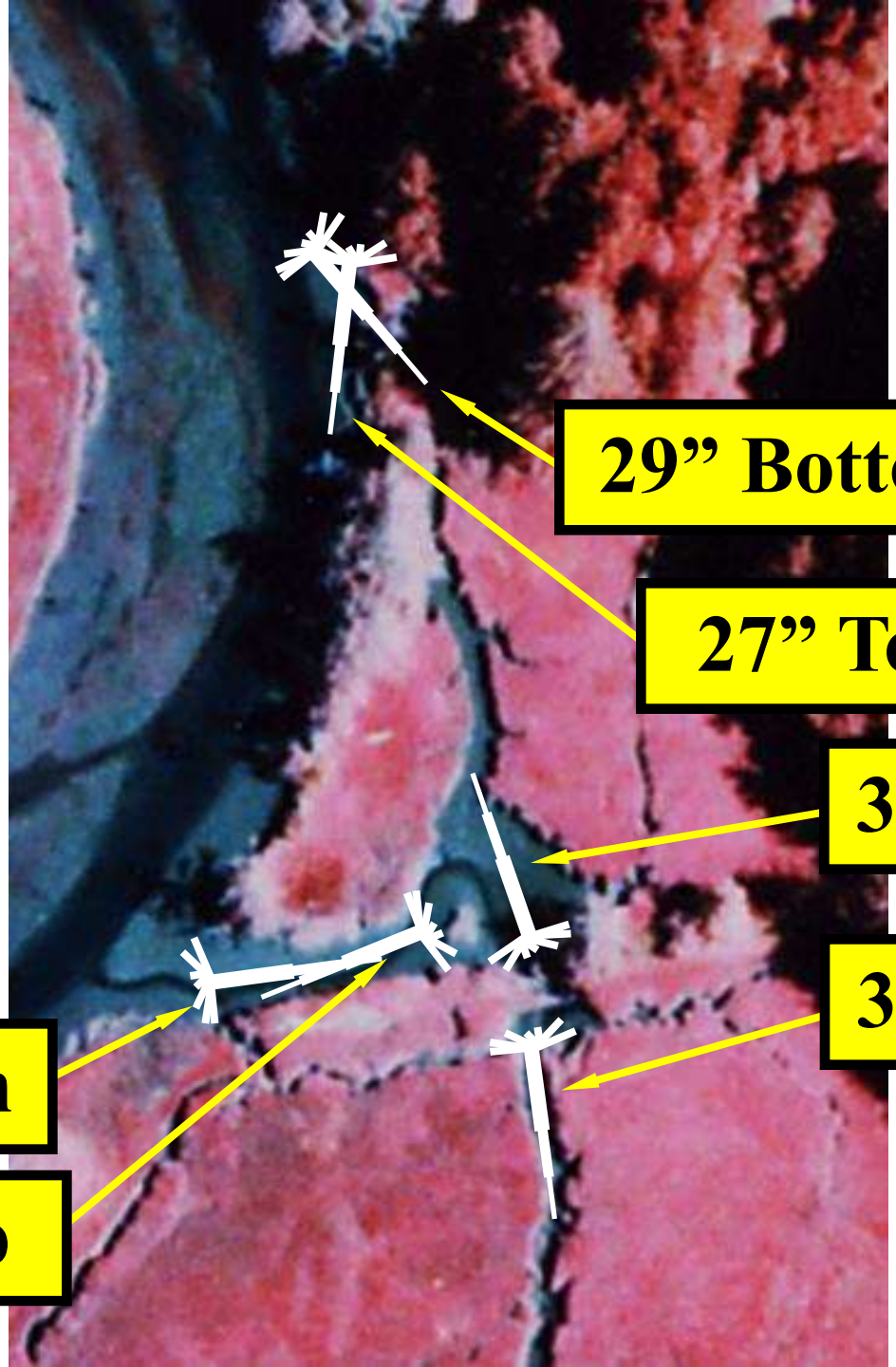
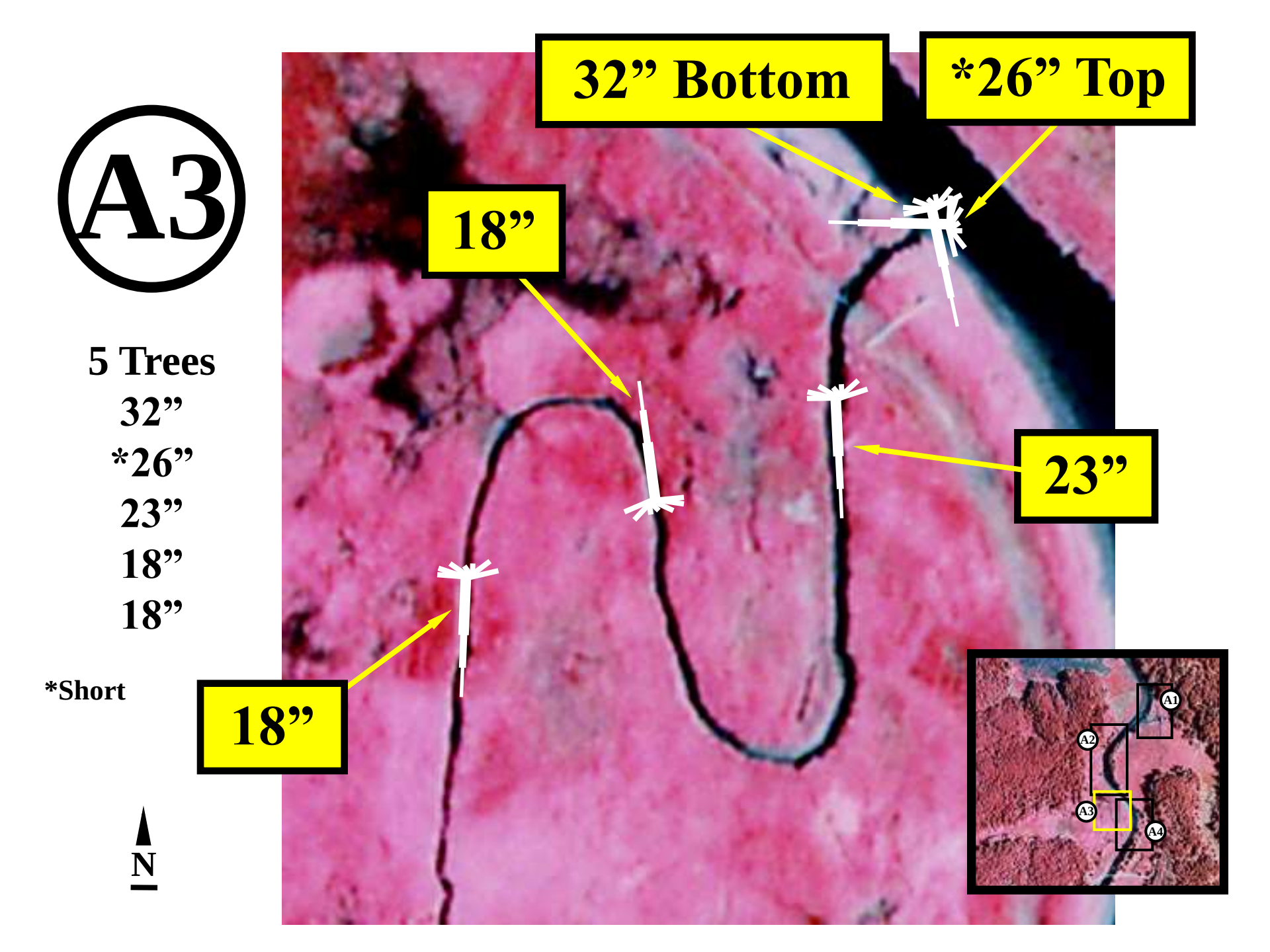
2. To develop recommendations for placing large wood in tidal channels for habitat restoration/enhancement purposes (mainly targeting watershed councils, natural resource agencies / scientific community).


A
B
C
D
N
South Slough NERR
administrative boundary

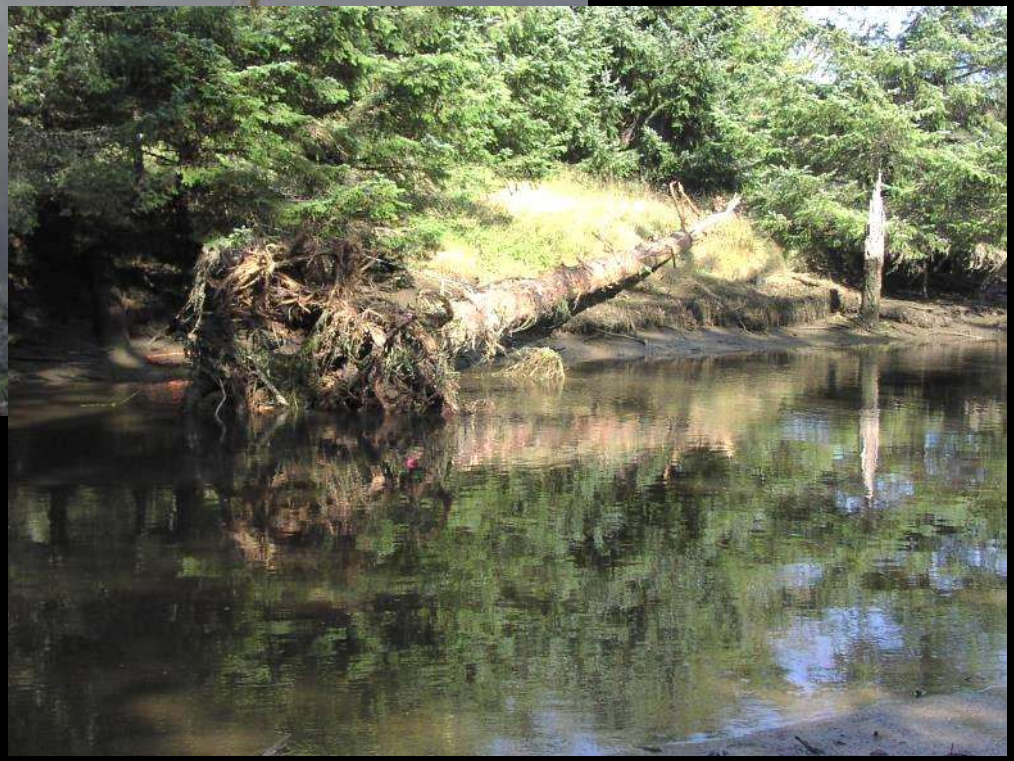

A1
6 Trees
38”
36”
35”
29”
27”
25”
29” Bottom
27” Top
36”
35”
38” Bottom
25” Top
A1
A2
A3
A4
N


A3
5 Trees
32”
*26”
23”
18”
18”
*Short
32” Bottom
*26” Top
18”
23”
18”
N
A1
A2
A3
A4


kayakingsucks.com

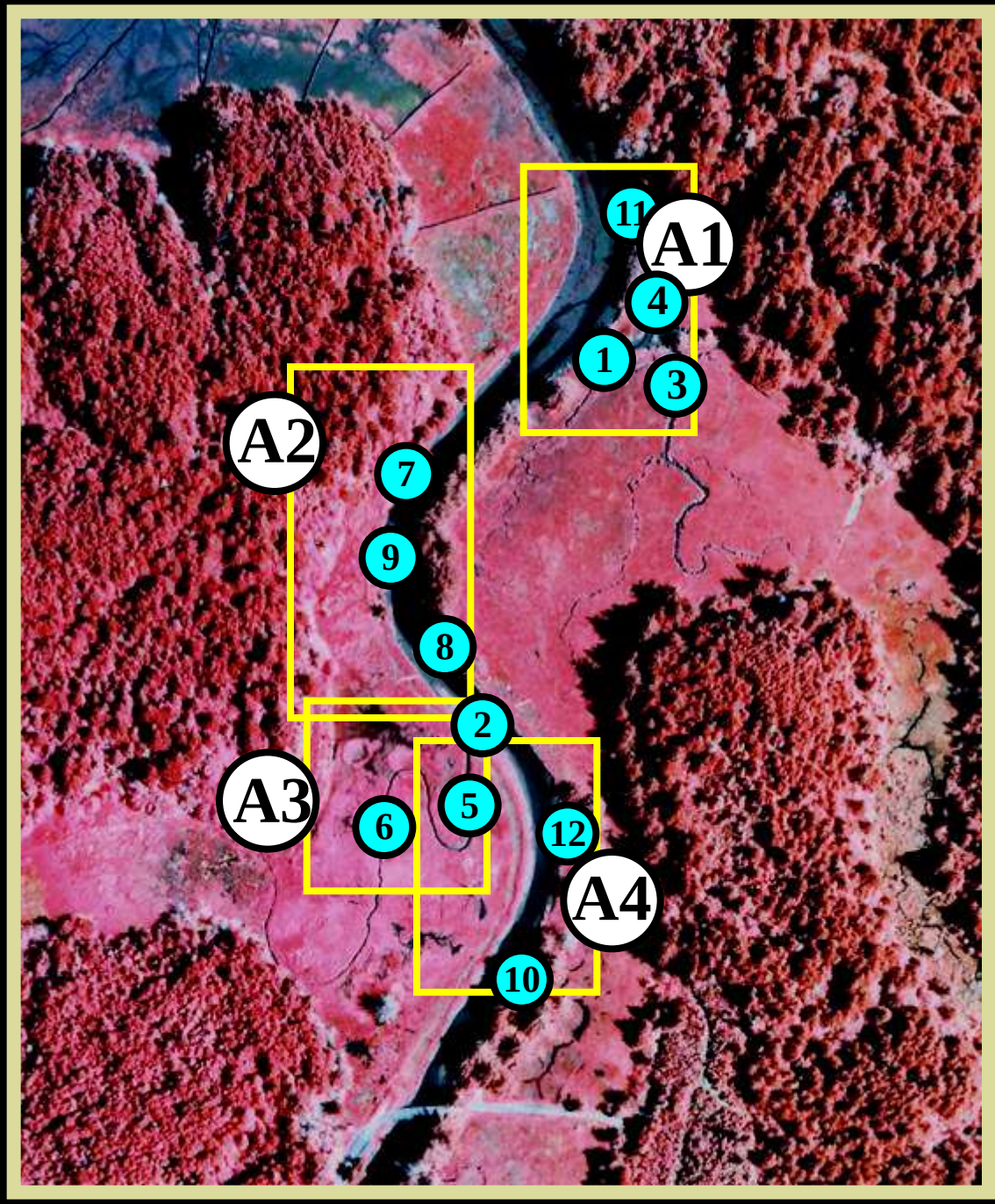
Tree Source

Destination



Study Locations

- Mouth of Tom's and Dalton Creeks
- In tidal channels
- Mainstem Winchester Creek



Restoration Monitoring

Questions:

- Are there higher densities of juvenile salmonids near LWD compared with habitats lacking LWD?
- Does placing LWD at the mouths of tidal creeks create a staging area for fish to hold before foraging up tributary tidal creeks during flood or ebb tide?
- Is the presence of LWD increasing fish prey resources?

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Questions:

- Does placing LWD in tidal channels create habitat for juvenile salmonids (e.g., scour pools)?
- What significant changes in temperature or water flow occurs with the placement of LWD?
- Does the wood move?

Restoration Monitoring

People:

- Stan van de Wetering and Ryan French, Confederated Tribes of Siletz Indians
- Ayesha Gray, Cramer Fish Sciences (now mgr. Grand Bay NERR, MS)
- Russ Faux, Watershed Sciences, Inc. (now Quantum Spatial)
- Bruce Miller, Oregon Department of Fish and Wildlife (ret.)
- Jena Lemke, Michele Koehler, ABR, Inc.
- Craig Cornu, South Slough NERR (now semi-ret./ETG)

Project Conclusions

Q: Are there higher densities of juvenile salmonids near LWD compared with habitats lacking LWD? (van de Wetering and French)

A: A qualified "Yes“

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Project used three methods to determine whether estuarine fishes (juvenile salmonids in particular), would use the LWD:

1. *Underwater videography (van de Wetering and French)*
2. *Electrofishing/block netting, and seining (Lemke and Koehler)*
3. *Acoustic tagging (Miller)*

Fish Monitoring Method 1: Underwater Videography

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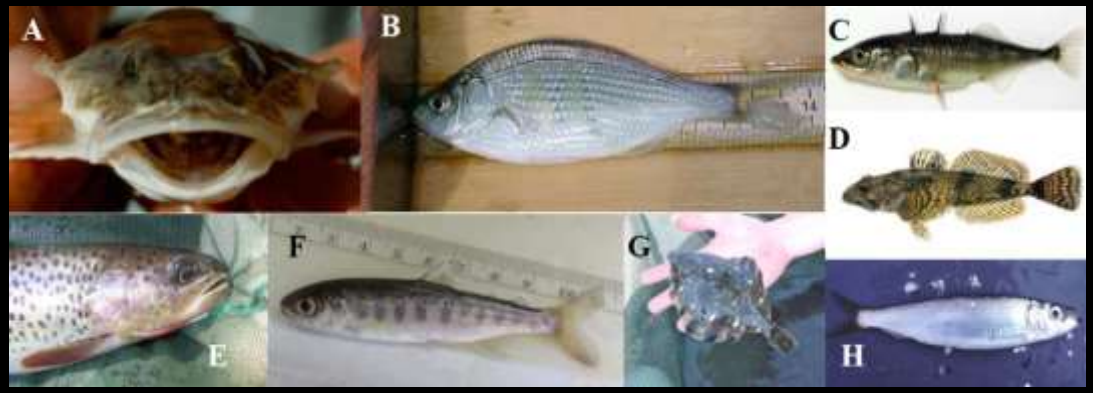
- Wood located at the mouth of the Dalton Creek tidal channel provided the most optimal habitat for both age-0+ and age-1+ salmonids especially during 2005.
- Greater activity at Dalton is attributed to the complexity of the LWD and associated high quality cover, prey availability, optimal feeding lanes, and refuge from tidal currents.

Fish Monitoring Method 2: Electrofishing and Seining



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- Overall, fish were more abundant in Dalton Cr (LWD) reaches than Tom's Cr (no LWD) reaches.
- While only a small number of salmonids were observed in the study area, all tributary tidal creek salmonids were found in Dalton Creek (LWD) the first year of sampling and in both creeks the second year (cutthroat trout only found in Dalton 2nd yr).

Fish Monitoring Method 2: Electrofishing and Seining

- All salmonids in Dalton Creek were found under an old wood weir structure, not associated with the placed LWD (may be explained by the difficulty of sampling under the placed LWD, where branches and deep water limit the effectiveness of electrofishing).

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- Young-of-the-year coho were observed in Dalton Creek, while primarily coho smolts were observed in Winchester Creek.
- No significant differences in water temperature, salinity, or conductivity were observed between Dalton and Tom's Cr reaches.
- Unclear whether results are influenced by the presence of LWD, or other factors.

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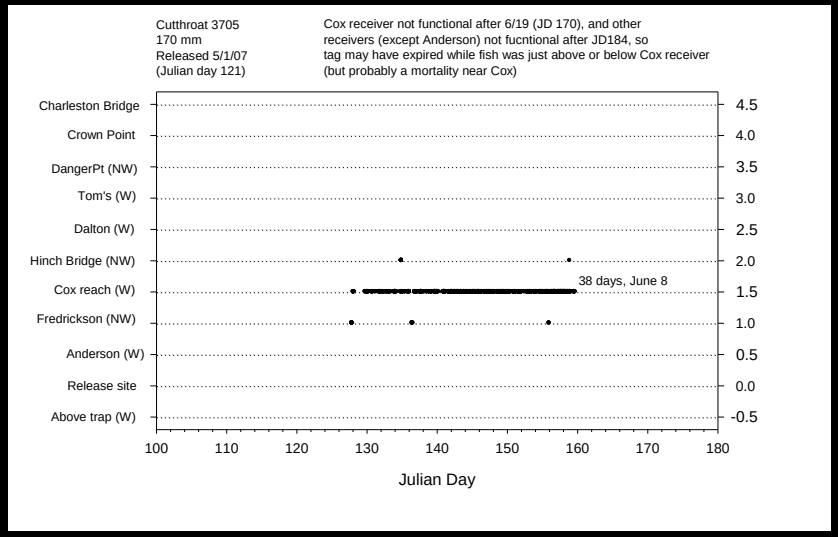
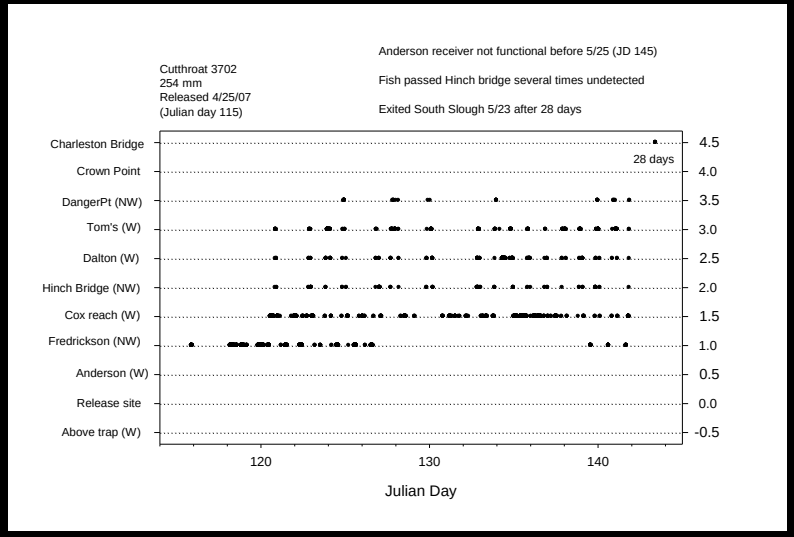
- There was a clear overall trend showing juvenile cutthroat trout presence in zones with LWD present.
- Juvenile trout preferences were the Cox natural wood reach (includes old, naturally-occurring LWD). The natural LWD has formed much more complex scour pool and bar habitat for fish than the newly placed LWD structures have so far.

Fish Monitoring Method 3: Acoustic Tagging

- In addition, interesting behavioral patterns associated with habitat use were observed: some fish exhibited strong fidelity to one or two sites ("stayers") and while others used many different habitats ("movers").



Typical pattern of acoustic tag detections for a "stayer"



Typical pattern of acoustic tag detections for a "mover"

NW = no wood site; W = wood site. Each black dot represents one detection. (Figures courtesy of Bruce Miller, ODFW)

Project Conclusions

Q: Does placing LWD at the mouths of tidal creeks create a staging area for fish to hold before foraging up tributary tidal creeks during flood or ebb tide? (van de Wetering and French)

A: A qualified "Yes“

LWD at the Mouths of Tidal Creeks

- LWD at Dalton Creek mouth showed increased activity into the marsh tributary at the beginning of the flood, the beginning of the ebb, and the end of the ebb tide.

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- Results suggest tidal current velocities were a limiting factor: age-0+ fish were observed migrating into and out of the salt marsh only during those periods when the velocities were at a minimum.
- Speculation that the timing of upstream movement may be feeding activity- movement during times of low current velocities and optimal prey resource drift -and/or- during times when predators are not as likely to be in or near the LWD.

Project Conclusions

Q: Is the presence of LWD increasing fish prey resources? (Gray)

A: A qualified "Yes“

Macroinvertebrate Monitoring

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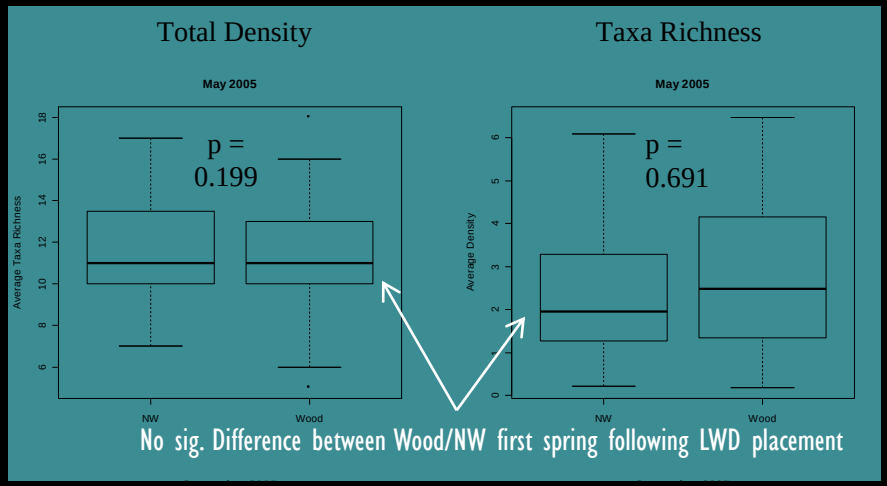
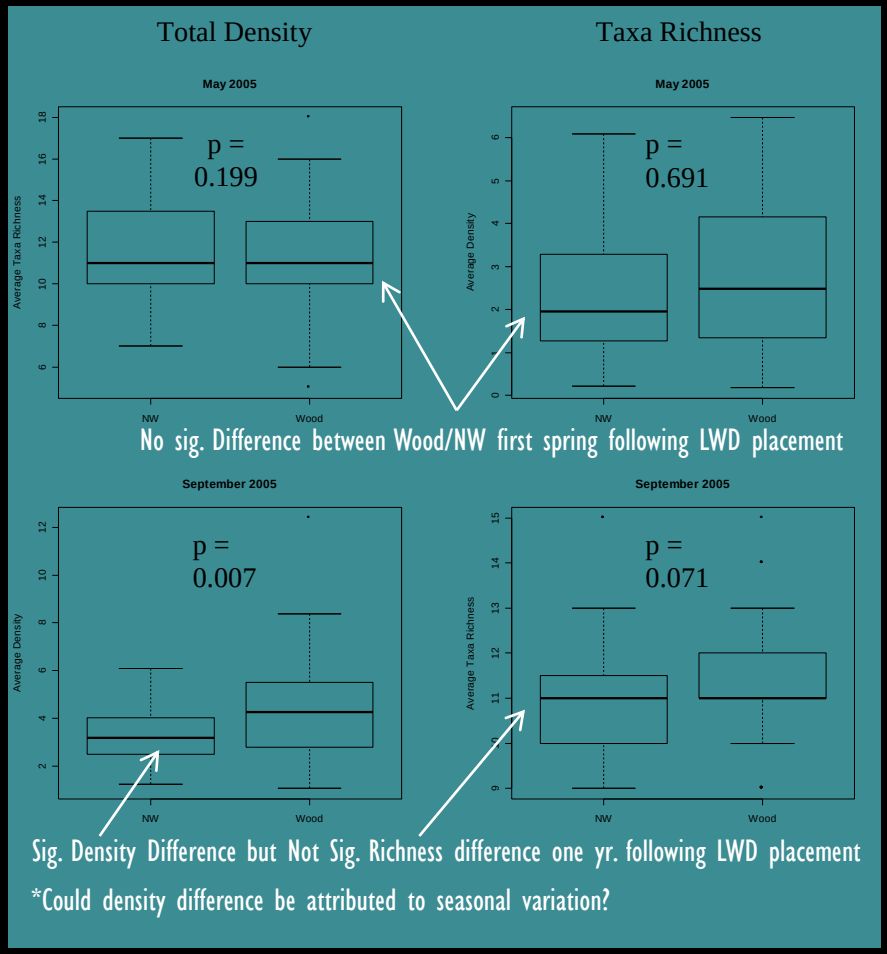
- Total density of benthic invertebrates was found to be significantly greater at LWD sites compared with paired sites lacking LWD.
- Taxonomic richness was found to be significantly greater at LWD sites compared with paired sites lacking LWD by May 2006 (end of study).
- No differences in community composition were detected.



Comparison of total density and taxonomic richness by sampling period. "NW" and "Wood" refer to paired sampling sites with no wood and LWD placements, respectively.



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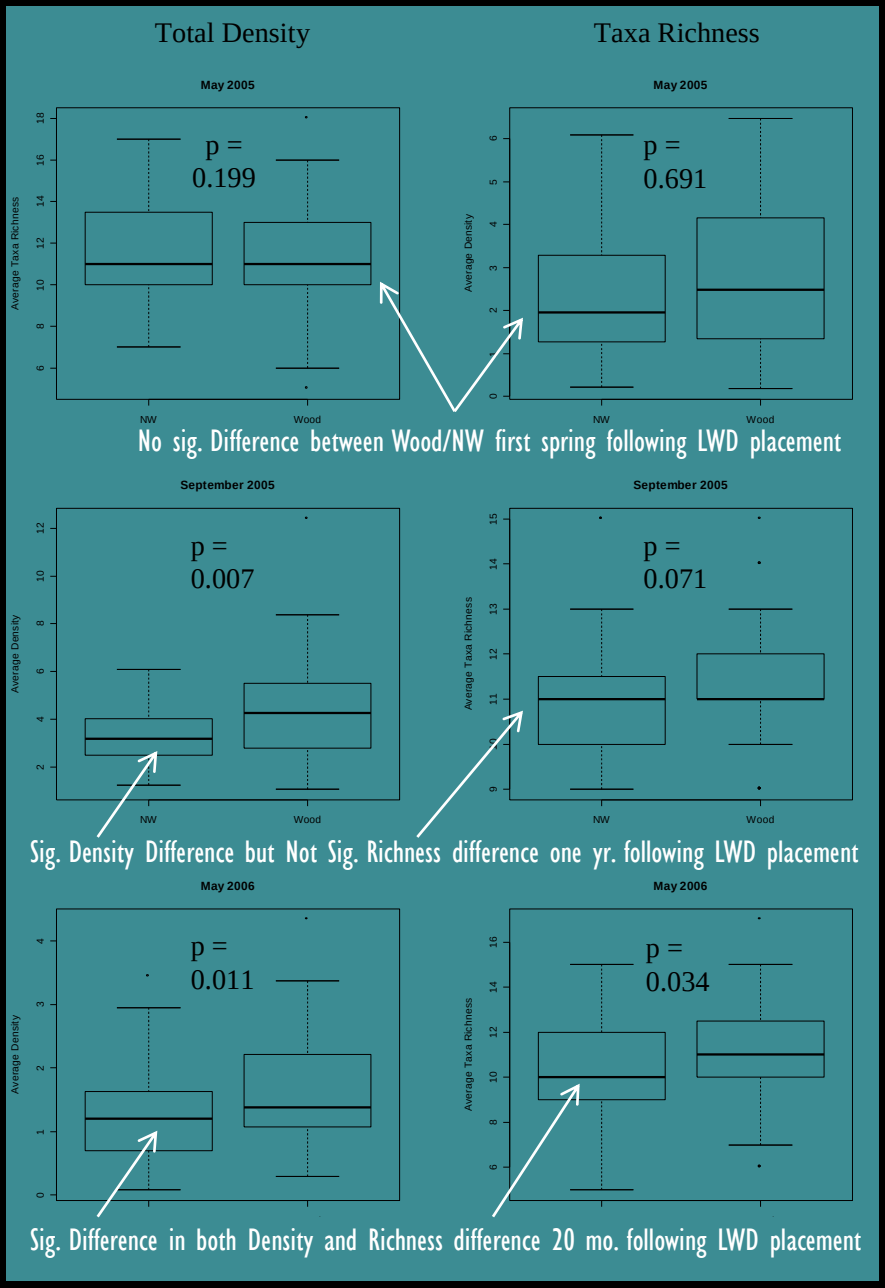

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Cautious Interpretations:

1)Changes in invertebrate abundance and composition occur soon (within one year) after restoration; and

2)The addition of LWD may result in the increase in benthic macroinvertebrate density and taxa richness.

Project Conclusions

Q: Does placing LWD in tidal channels create habitat for juvenile salmonids (e.g., scour pools)?

A: "Inconclusive"

LWD and Channel Morphology/Fish Habitat

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- However, site conditions are highly dynamic. Three relatively large scour holes detected in 2006 were filled by the time of the 2007 the survey.
- Some of the scour hole filling was due to LWD movement.
- Elsewhere it's less clear what why scour holes filled.

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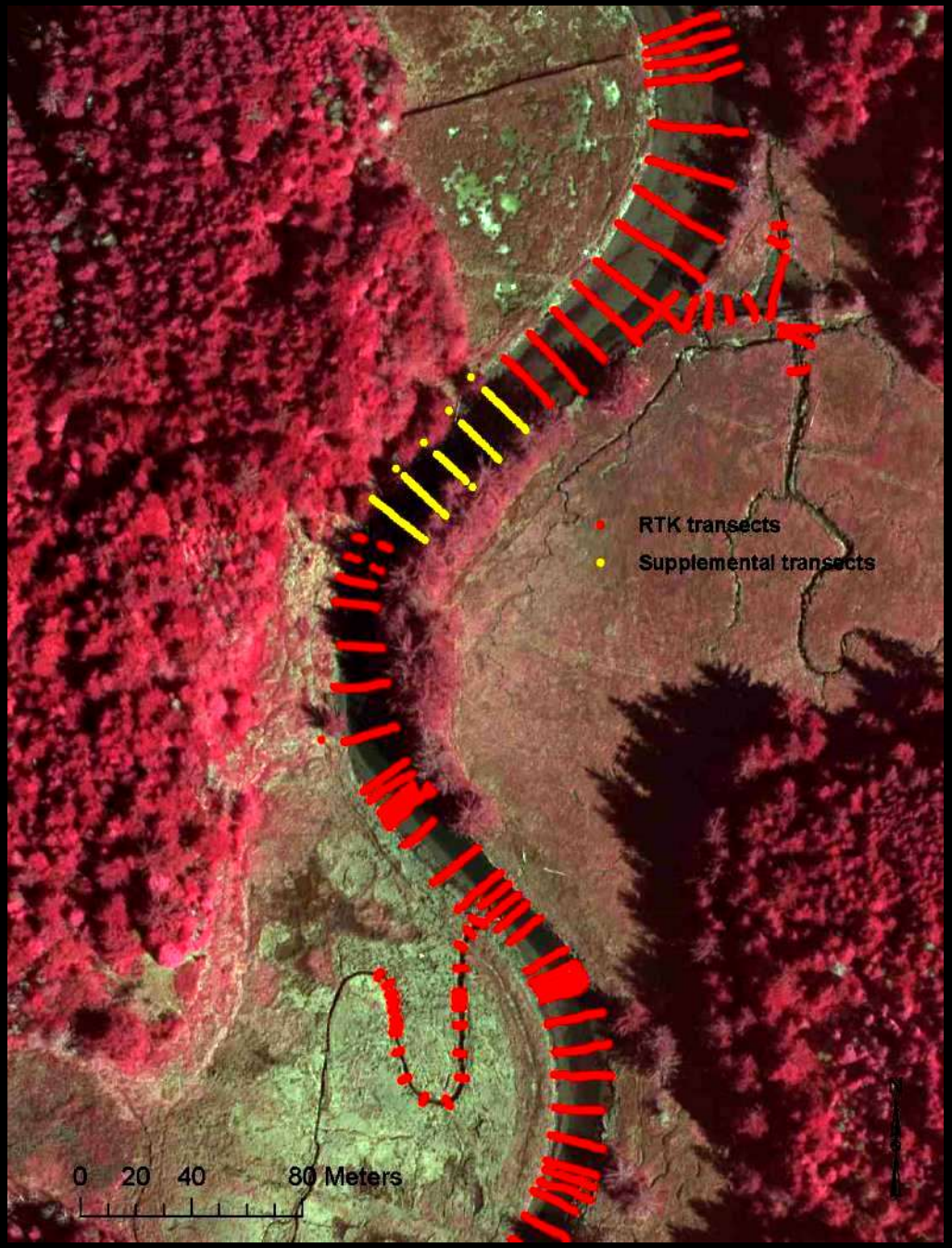
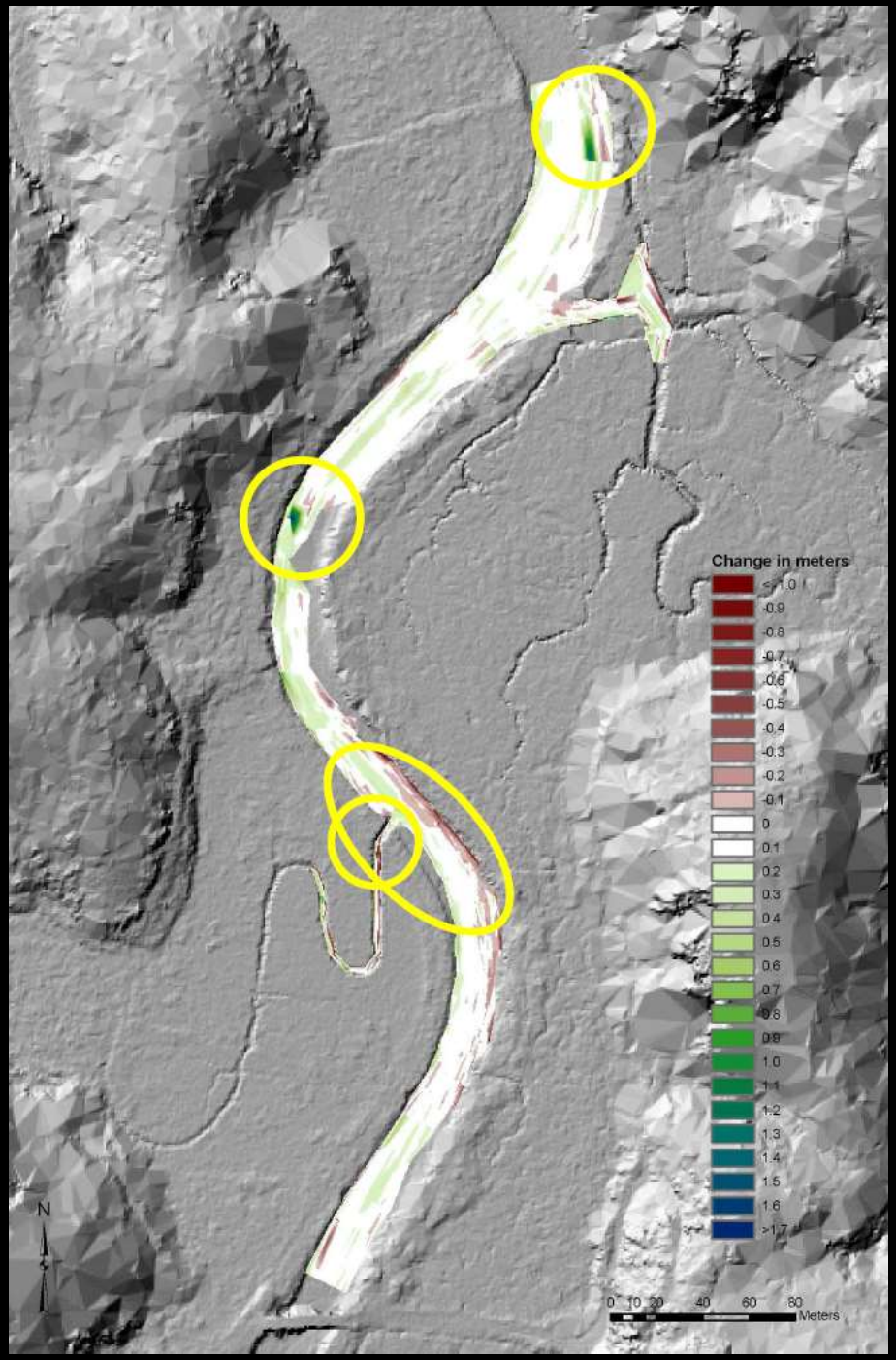
LWD and Channel Morphology/Fish Habitat

- While the presence or absence the LWD structures notably influencing channel morphology, how these changes "increase habitat quality" for salmonids is far from clear.
- Since subtidal and intertidal channel fish habitat around LWD will take some time to develop it's too soon to make judgments about the habitat quality.

Changes in Channel Morphology

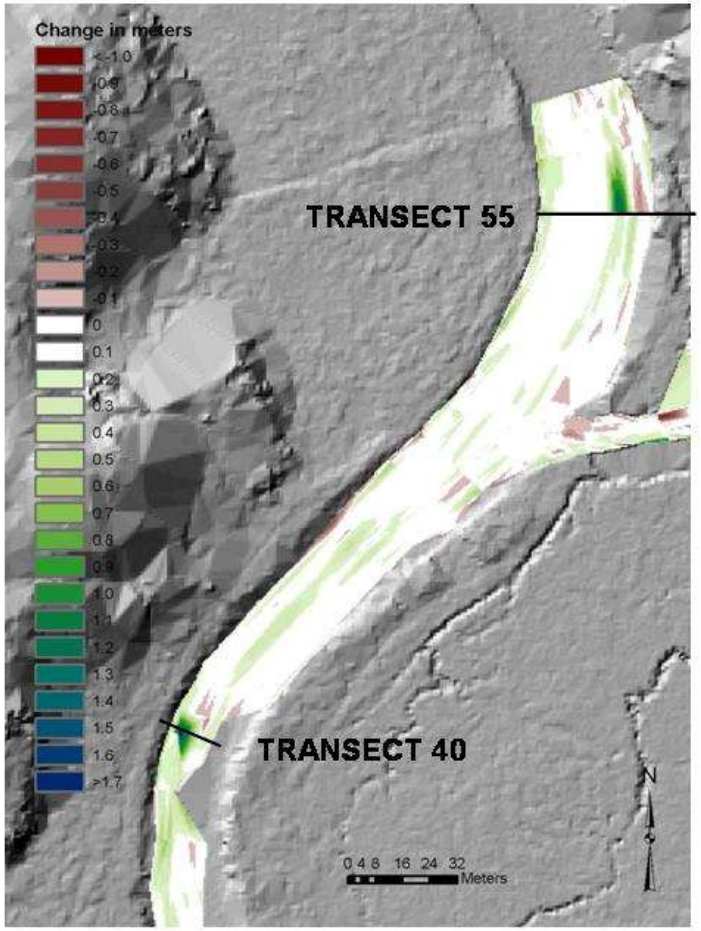
Watershed Sciences Channel Profile Survey





Bathymetric changes detected from 2006 to 2007 along Winchester Creek. Areas shown in deep green to blue indicate areas of aggradation. Areas seen in red are areas of erosion and degradation.

Change Without Locations of LWD Indicated



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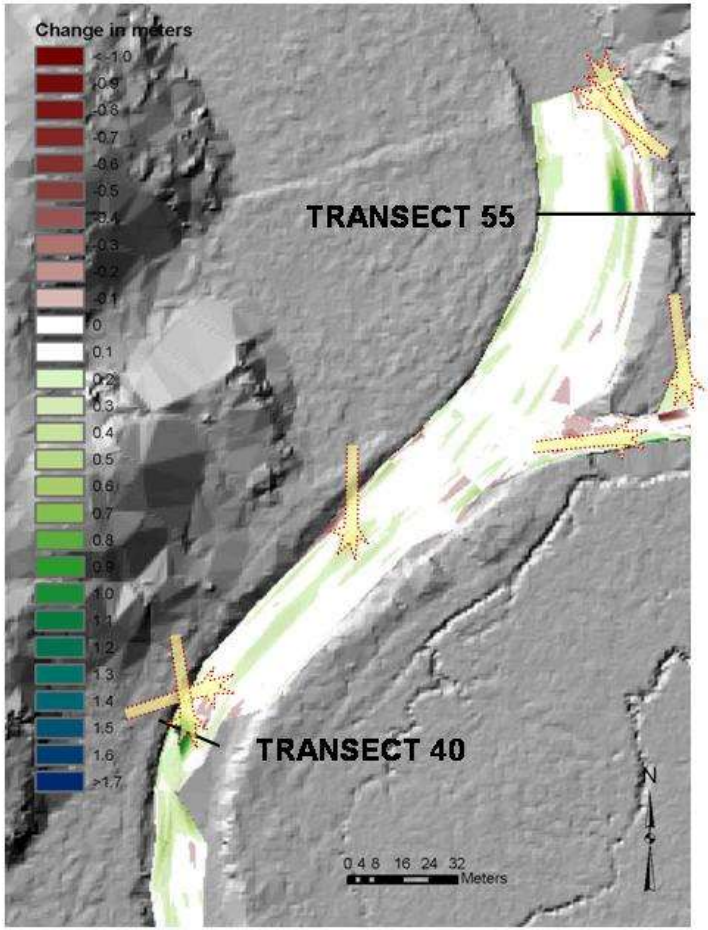

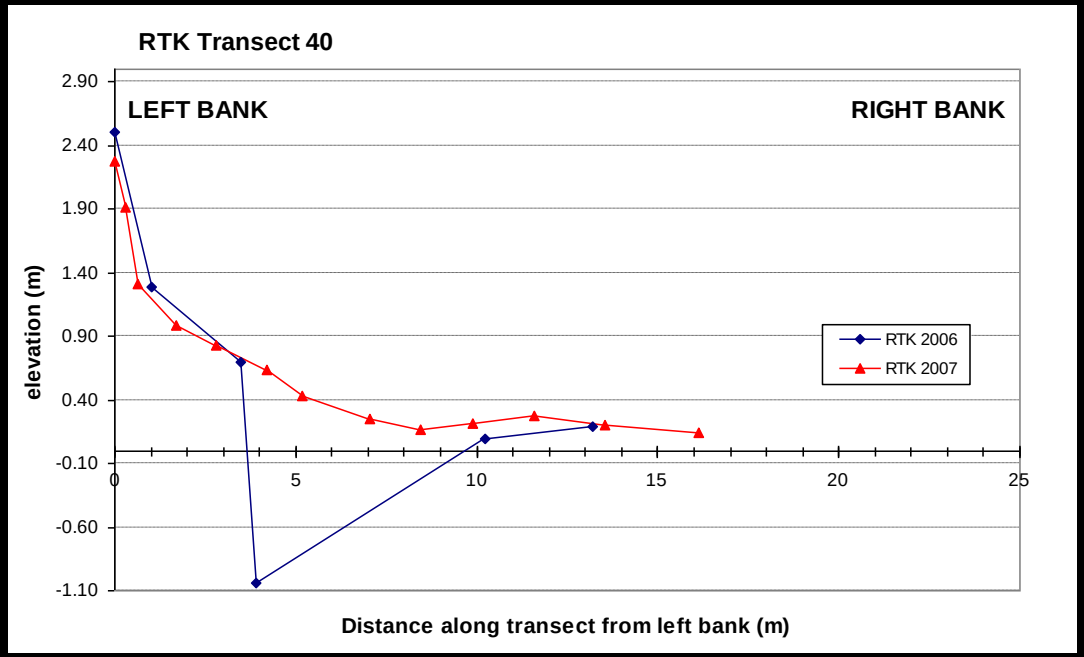

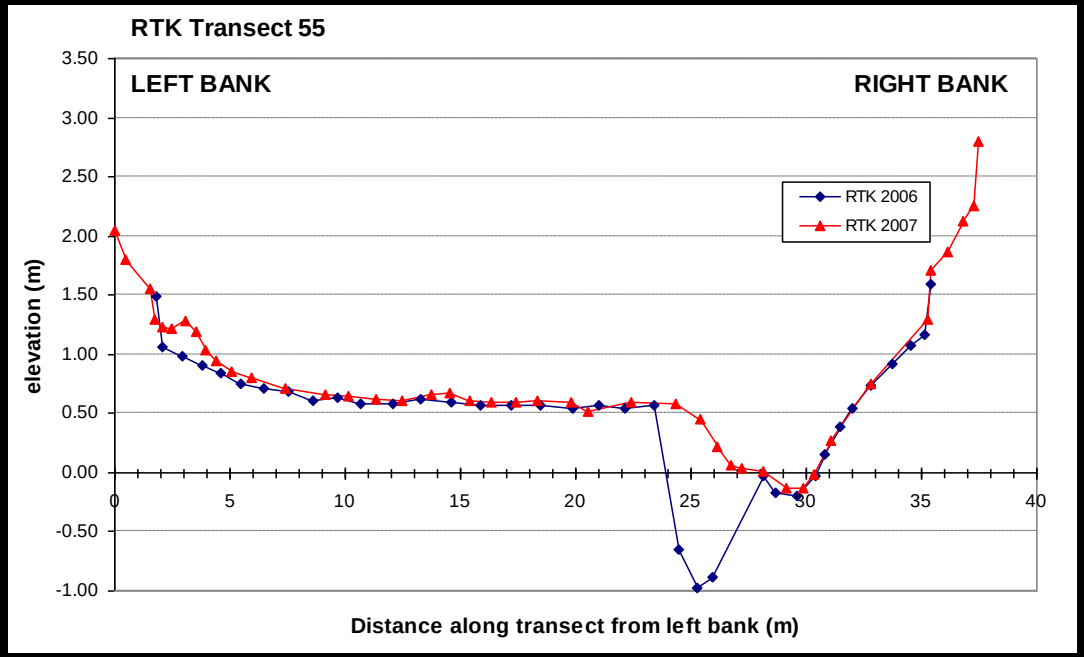

In the northern half of the survey area, at transects 40 and 55, two significant areas of deposition occurred. In both cases, large holes seen in the 2006 surveys were no longer there.

Project Conclusions

Q: What significant changes in temperature or water flow occurs with the placement of LWD?

A: Temp: Inconclusive- limited data show no change in water temperatures; Flow: Inconclusive?- data indicated detectable changes in flow.

LWD and Water Temp

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LWD and Water Temp

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- Data collection for this part of the project was not completed, in part because many of the TidBit loggers were buried under shifting LWD logs.
- What little data was retrieved indicated that water temperature was no different near or under LWD structures than water temperature in areas with no LWD.

LWD and Water Flow

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- Current velocities in Winchester Creek were found to vary between LWD structures and between habitats around the LWD structures.
- Higher velocities were recorded during ebb tide flows.

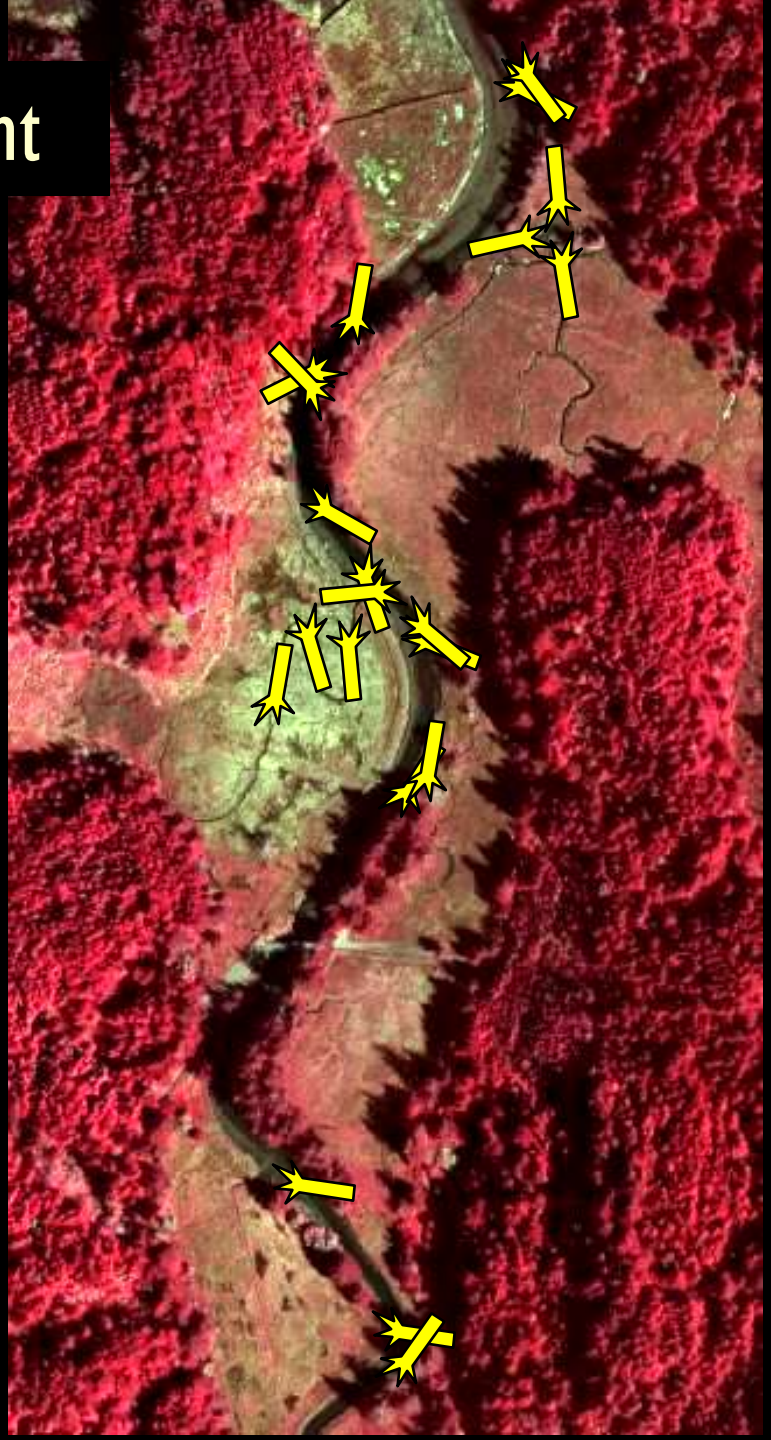
Project Conclusions

Q: Does the wood move?

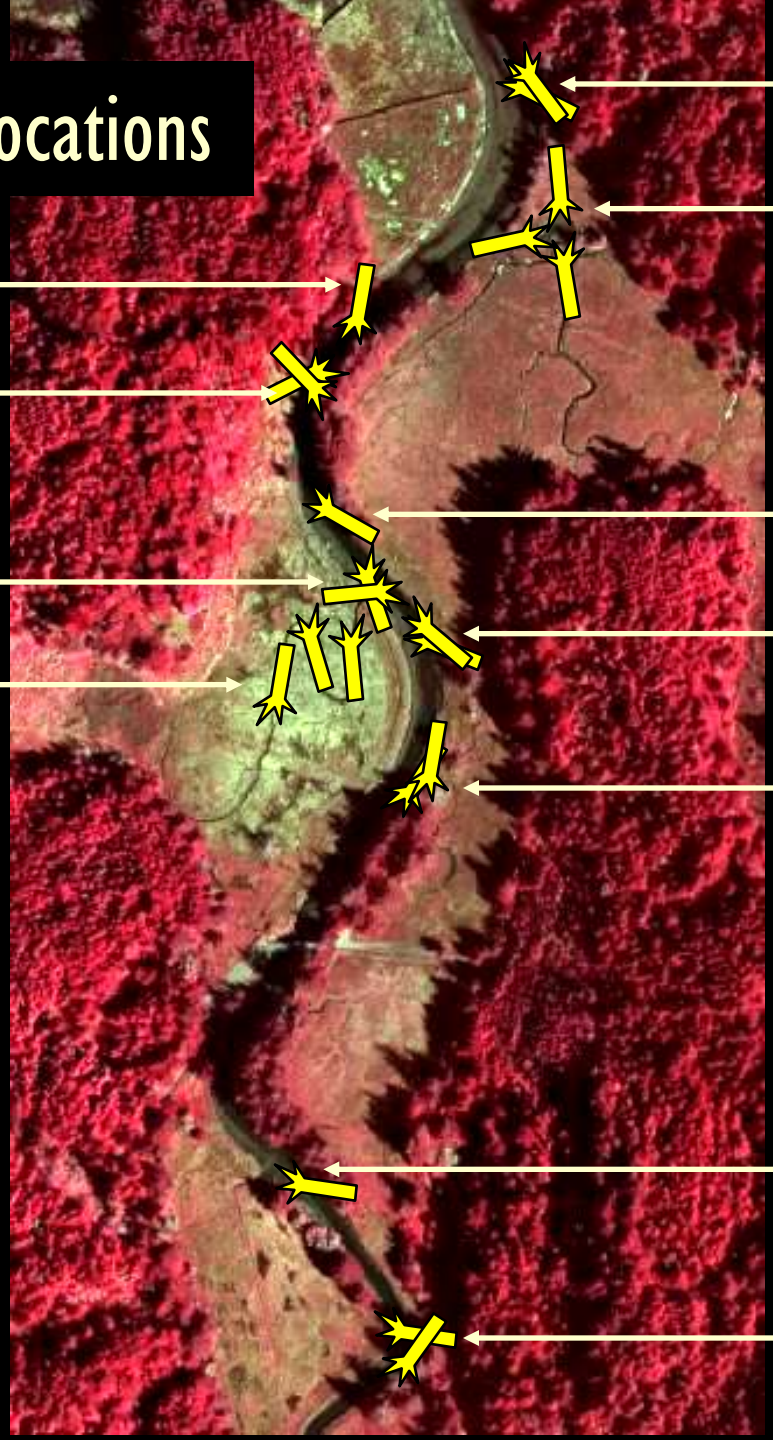
A: "Yes."

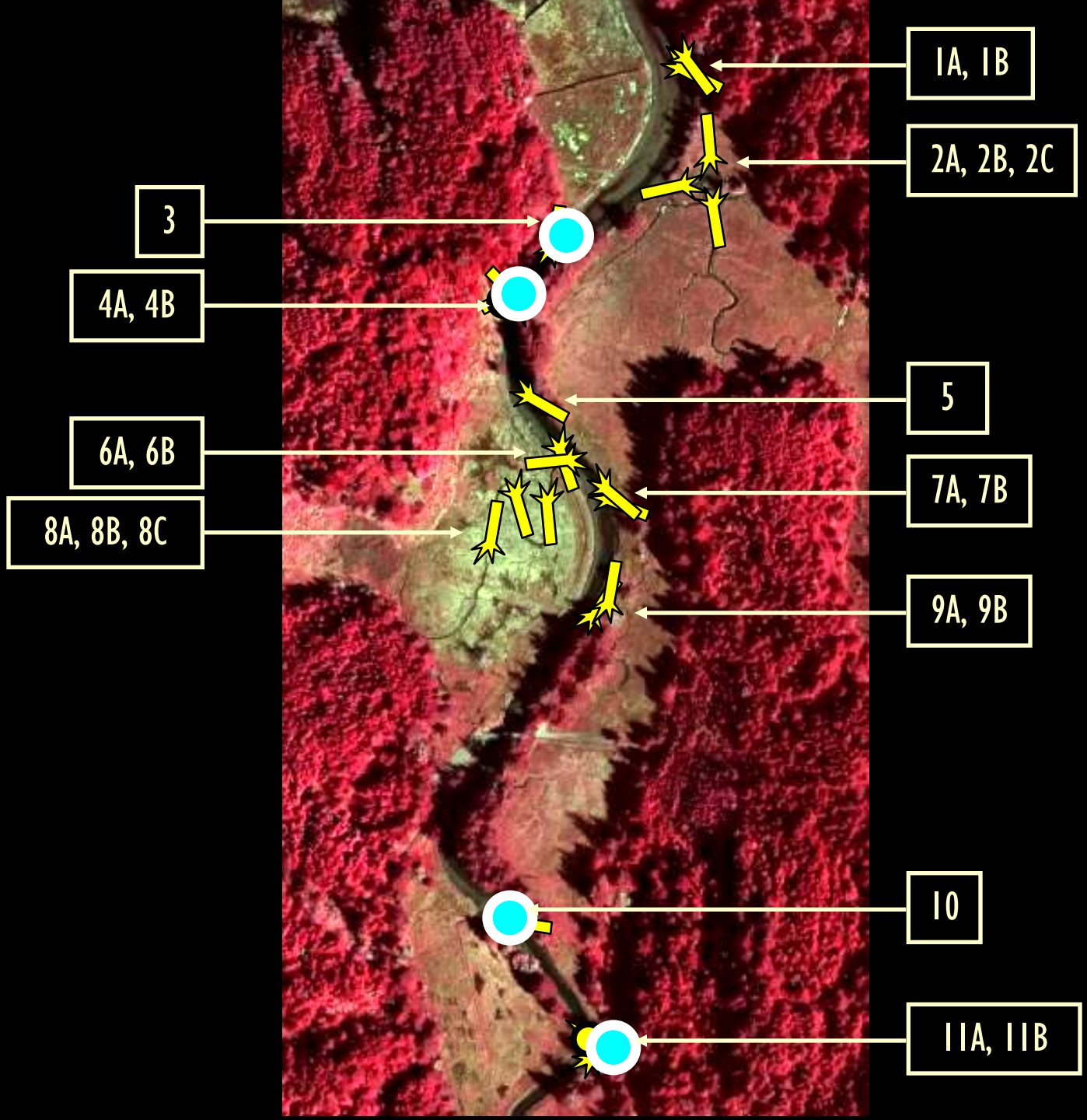
Several LWD structures moved, as expected, during extreme winter high tides and moved both upstream and downstream, with the net direction of movement being downstream.

LWD Movement



LWD Initial Locations




1A, 1B
2A, 2B, 2C
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4A, 4B
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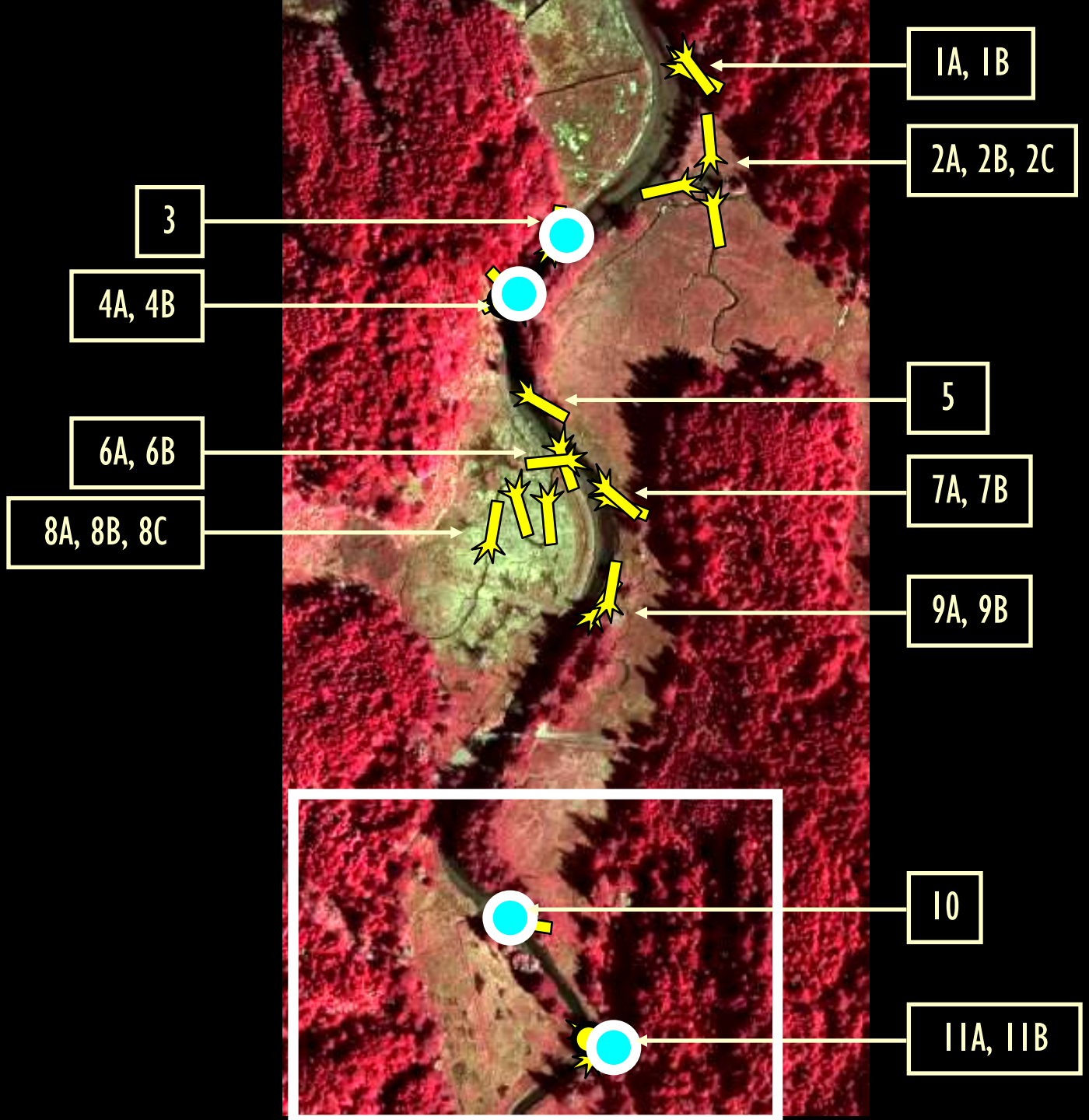
6A, 6B
7A, 7B
8A, 8B, 8C
9A, 9B
10
11A, 11B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2A, 2B, 2C
3
4A, 4B
5
6A, 6B
7A, 7B
8A, 8B, 8C
9A, 9B
10
11A, 11B

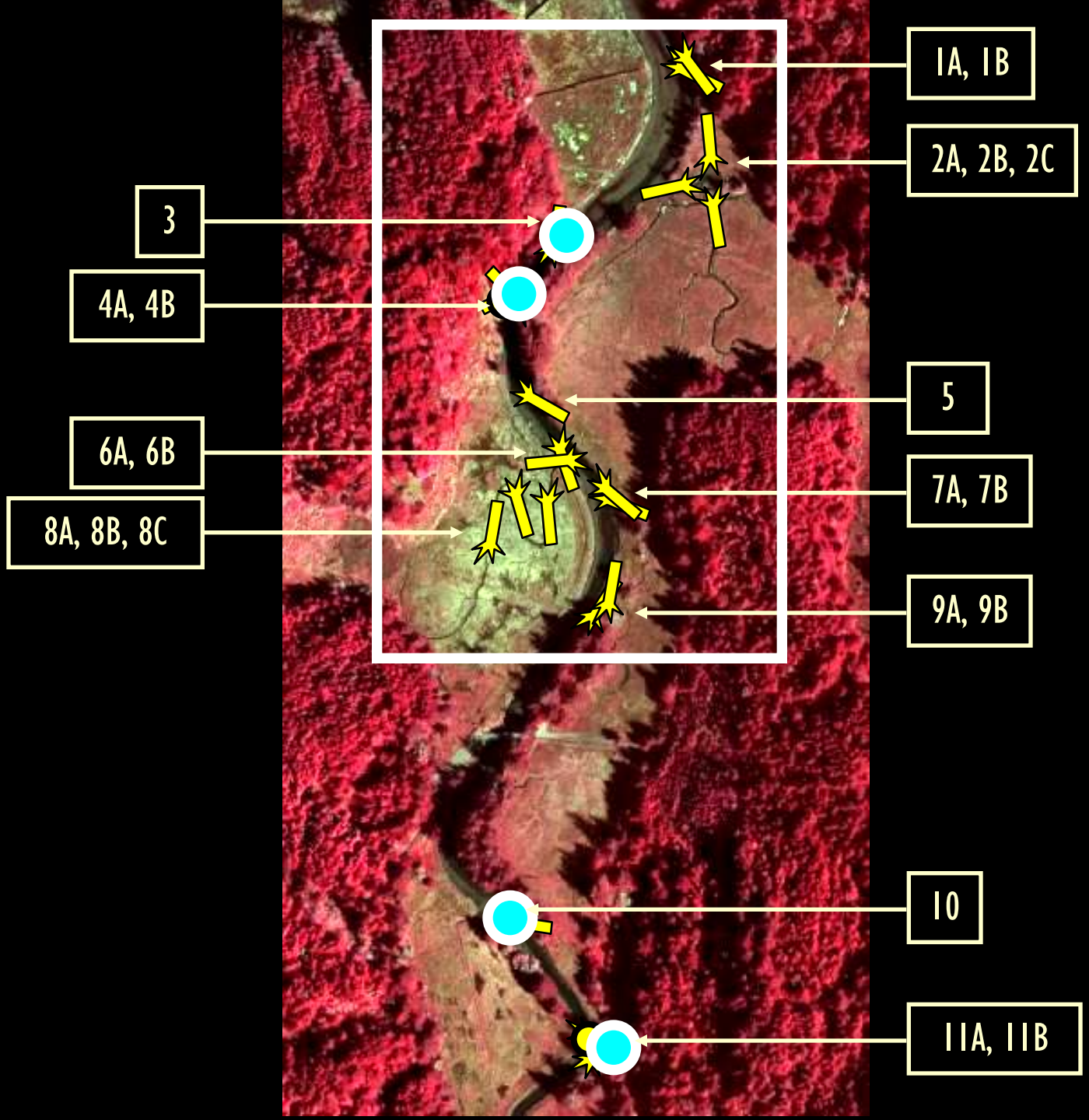

Detail 1
Trees 10, 11A, 11B
September 2004
10
11A, 11B


Detail 1
Trees 10, 11A, 11B
September 2004


Detail 1
Trees 10, 11A, 11B
May 2006


Detail 1
Trees 10, 11A, 11B
October 2006


Detail 1
Trees 10, 11A, 11B
January 2007


1A, 1B
2A, 2B, 2C
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4A, 4B
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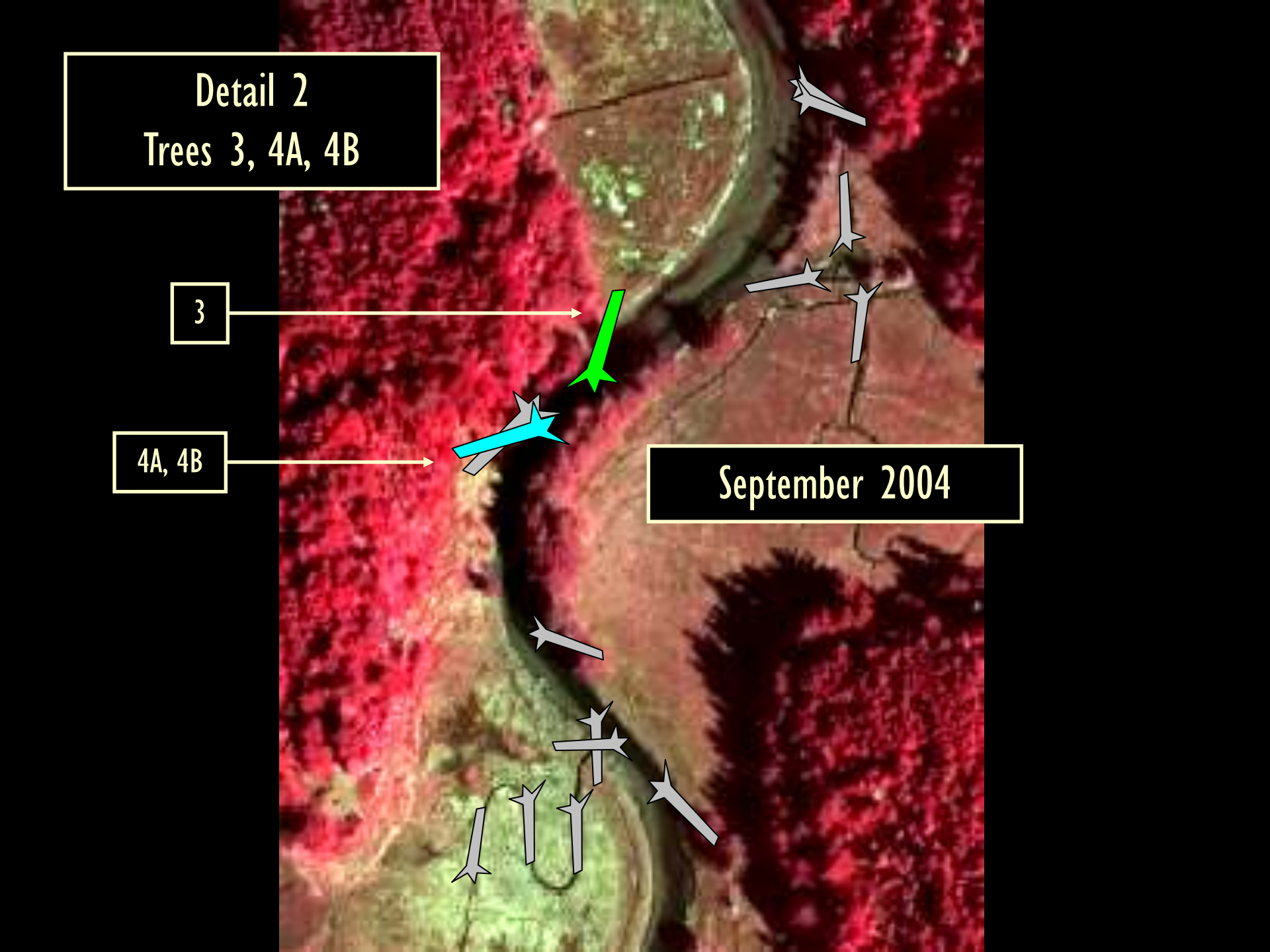
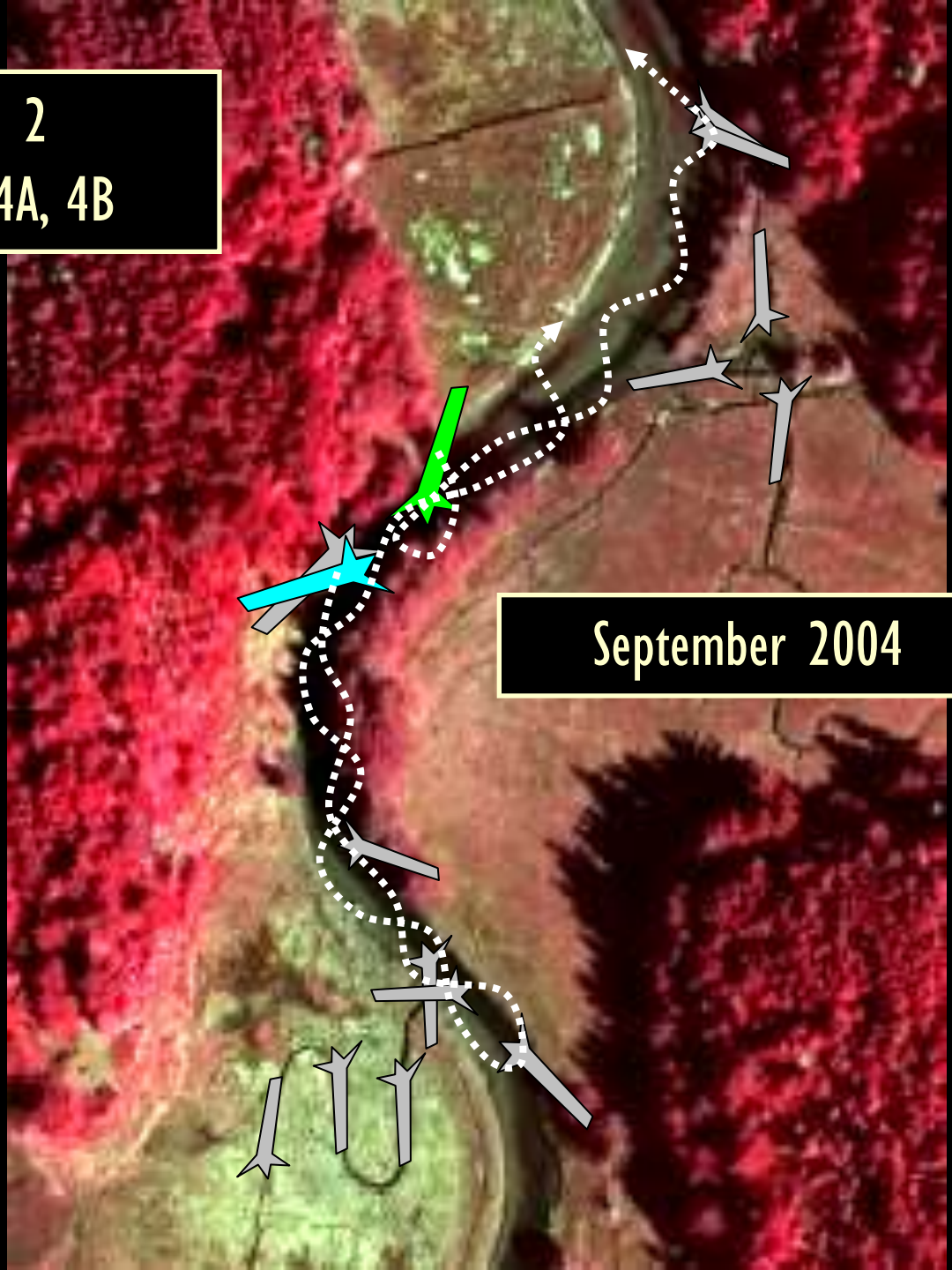
6A, 6B
7A, 7B
8A, 8B, 8C
9A, 9B
10
11A, 11B


Detail 2
Trees 3, 4A, 4B
3
4A, 4B
September 2004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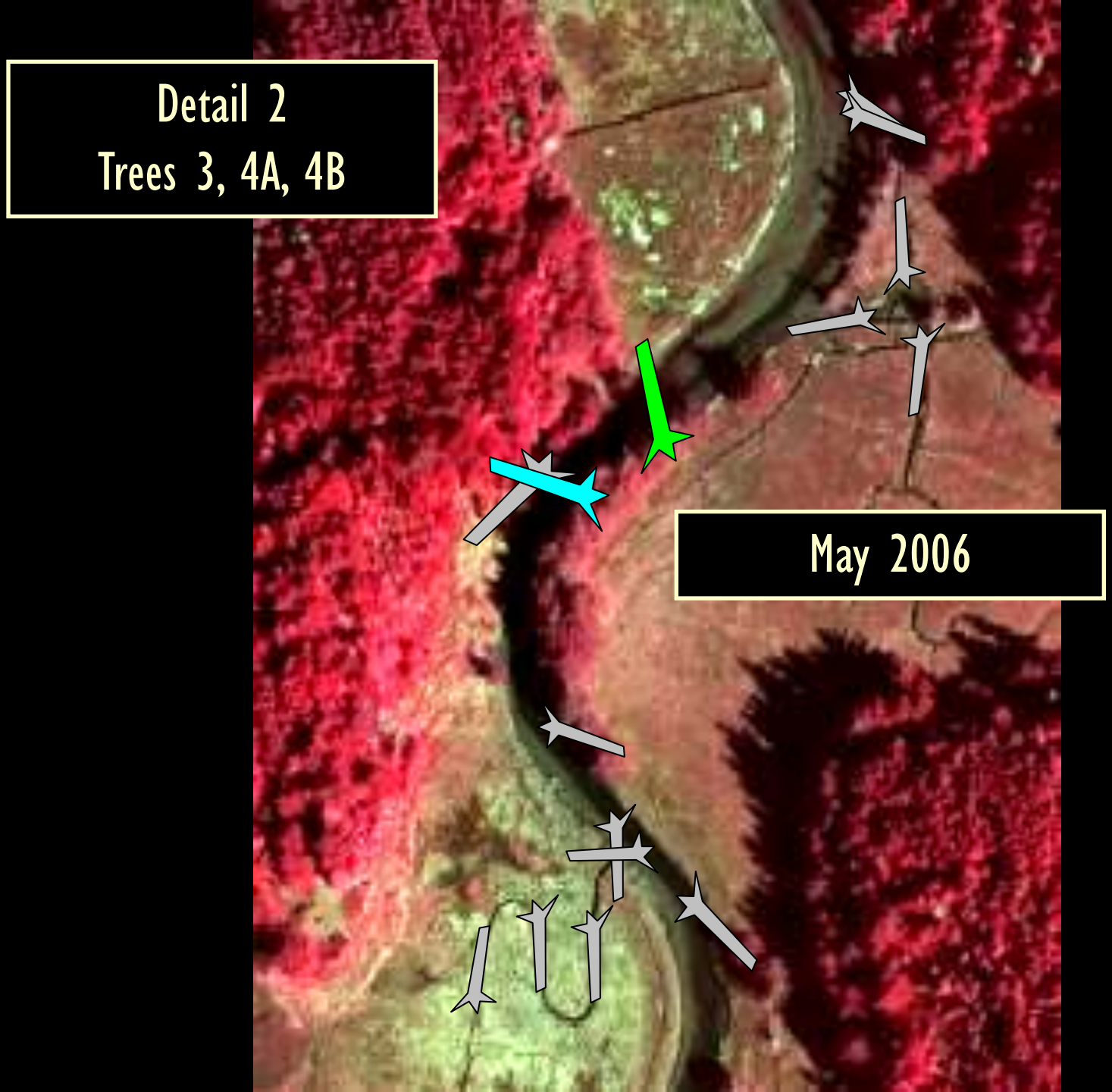
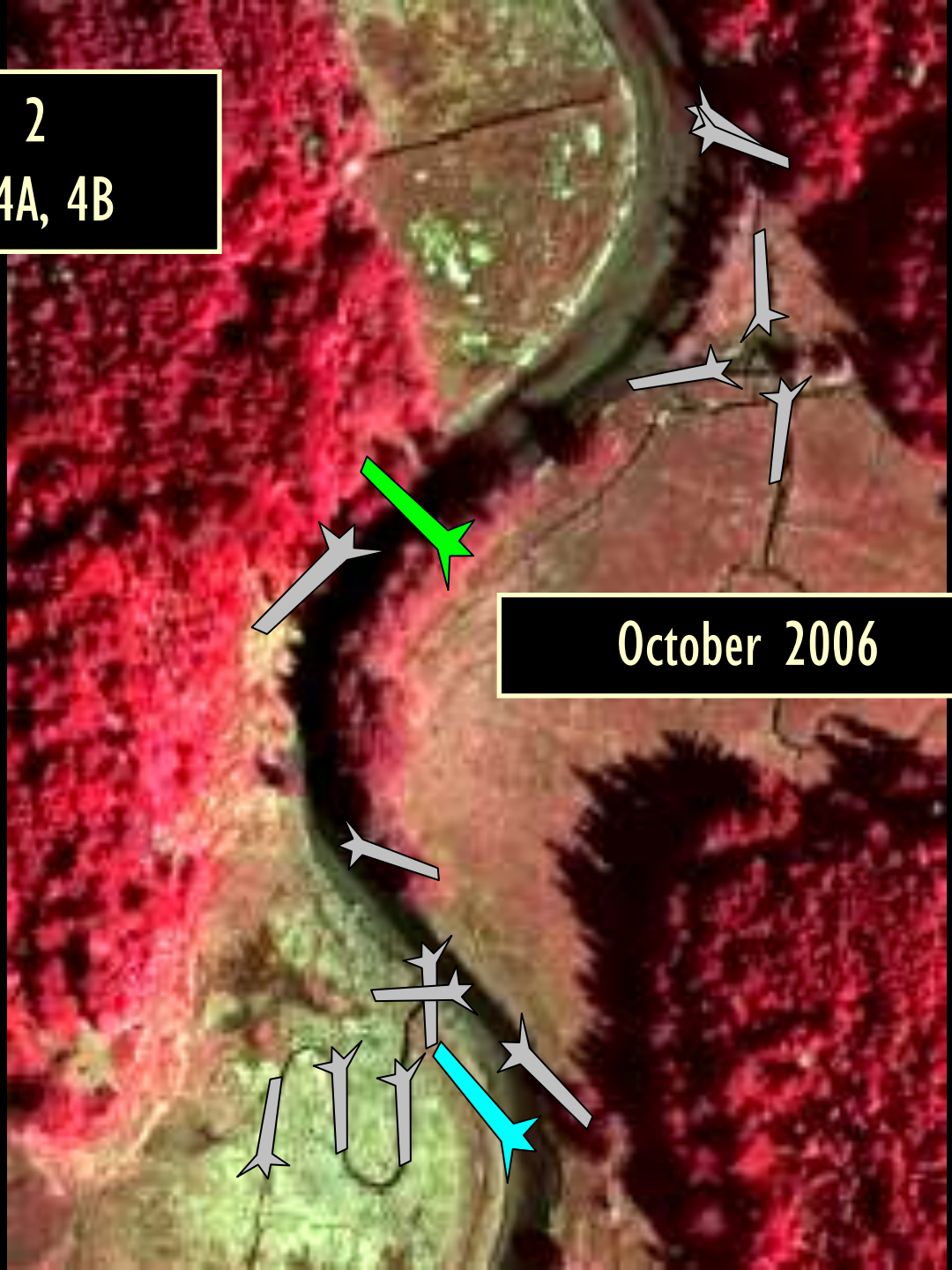
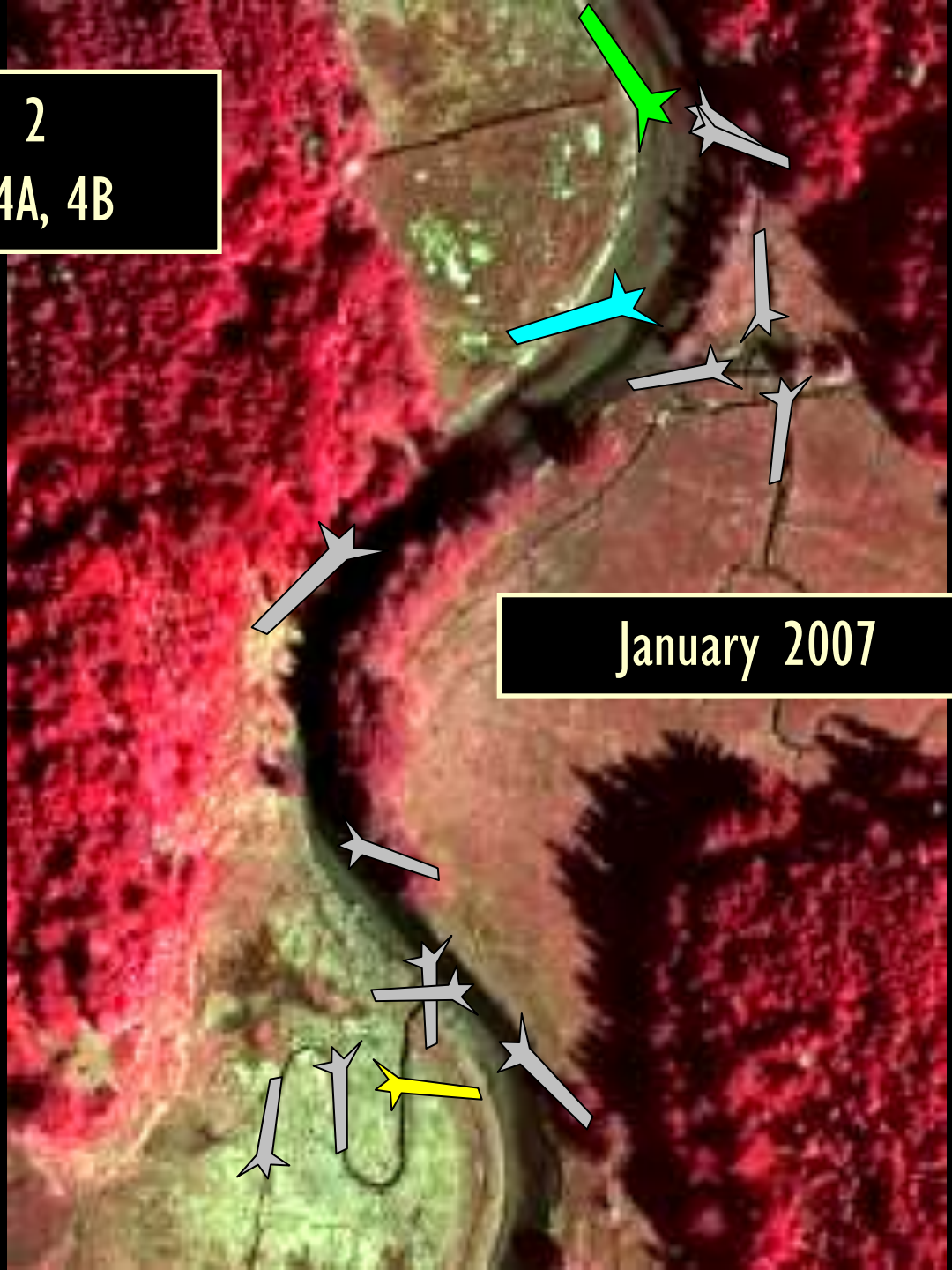

Detail 2
Trees 3, 4A, 4B
May 2006

Detail 2
Trees 3, 4A, 4B



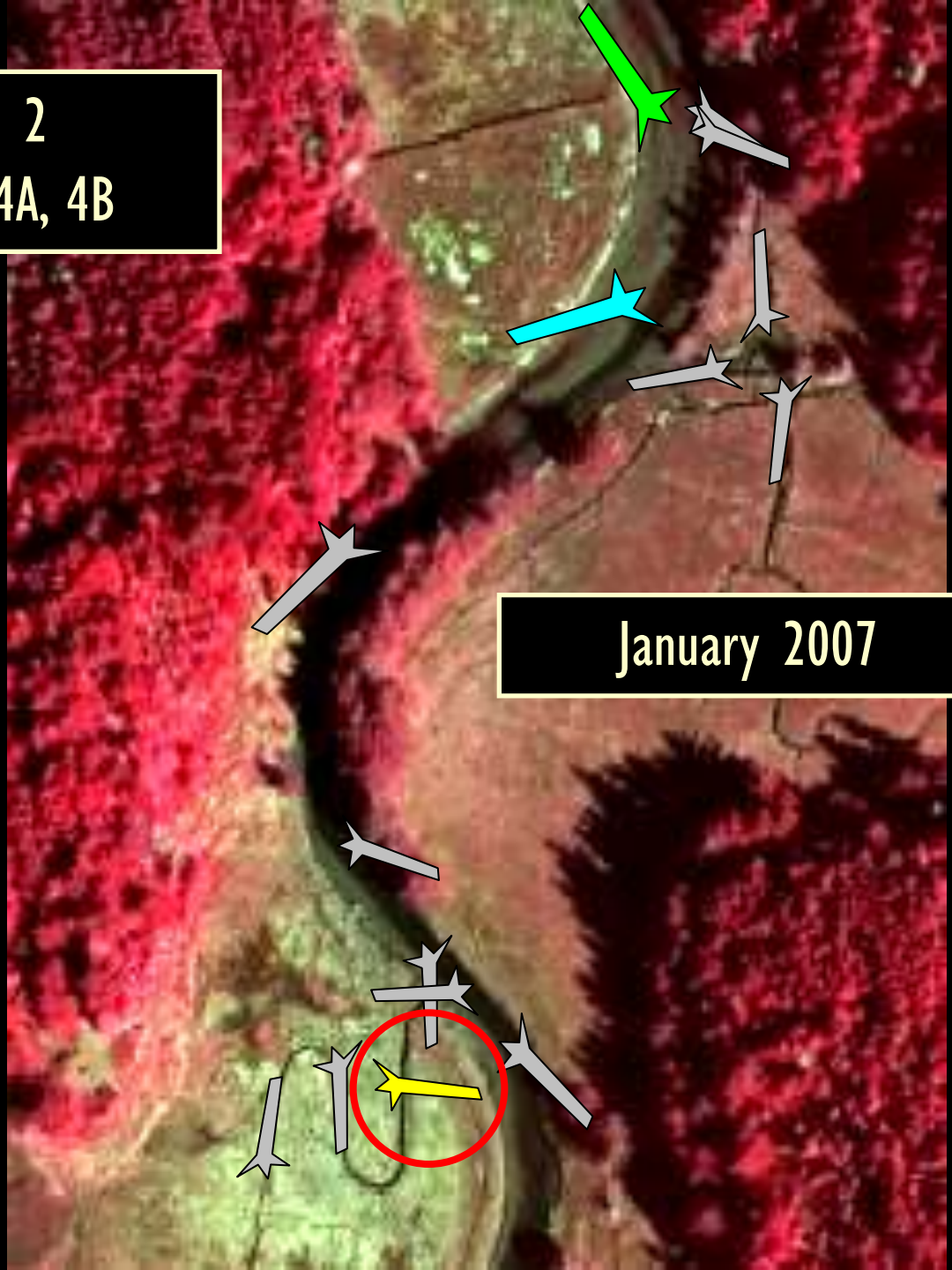
October 2006

Detail 2
Trees 3, 4A, 4B



January 2007

Detail 2
Trees 3, 4A, 4B



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