Habitat Diversity in Alluvial Rivers

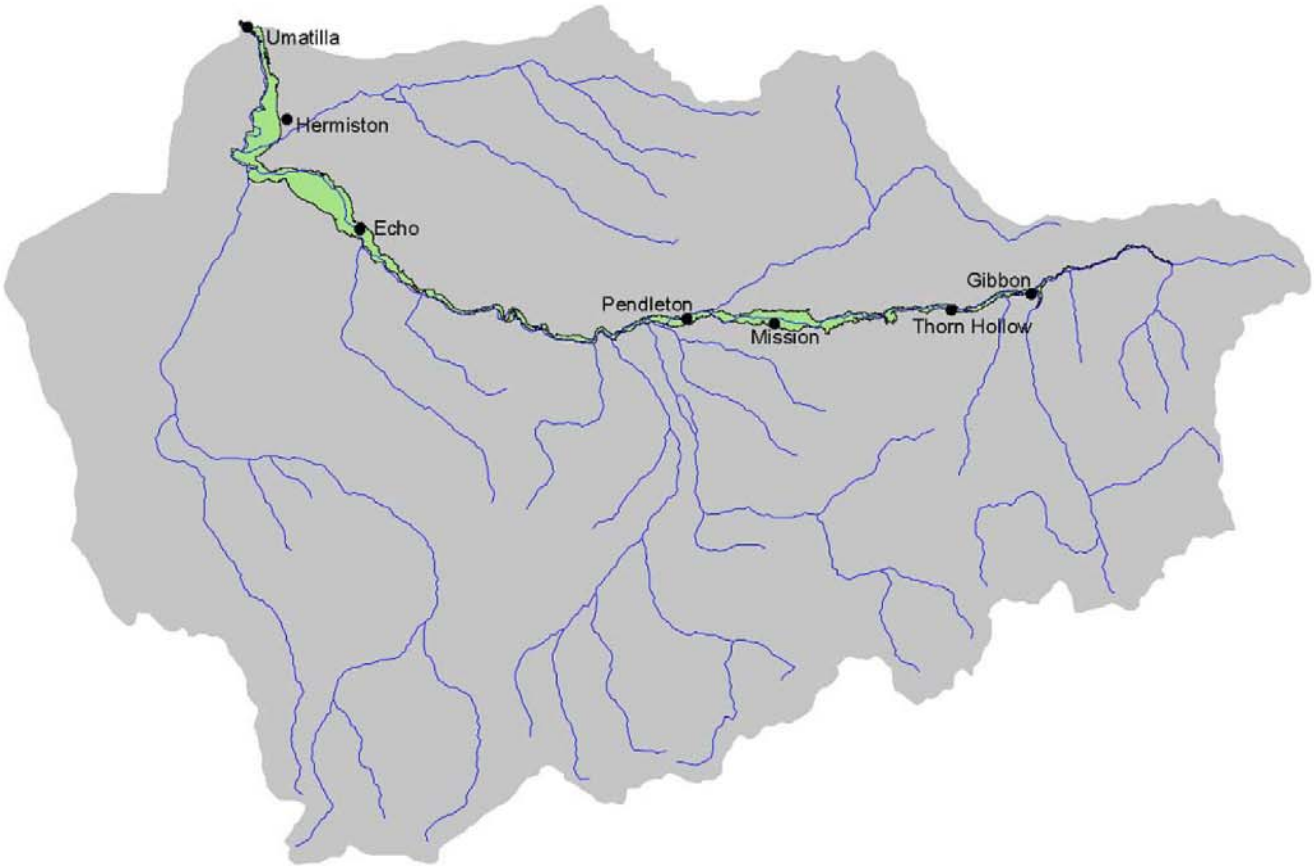
Funded under BPA Innovative Projects, 2001

Final Report presented to the CBFWA Anadromous Fish committee
5/26/04

Scott O'Daniel, Confederated Tribes of the Umatilla Indian Reservation
Geoff Poole, Eco-metrics, University of Georgia
Leal Mertes, University of California

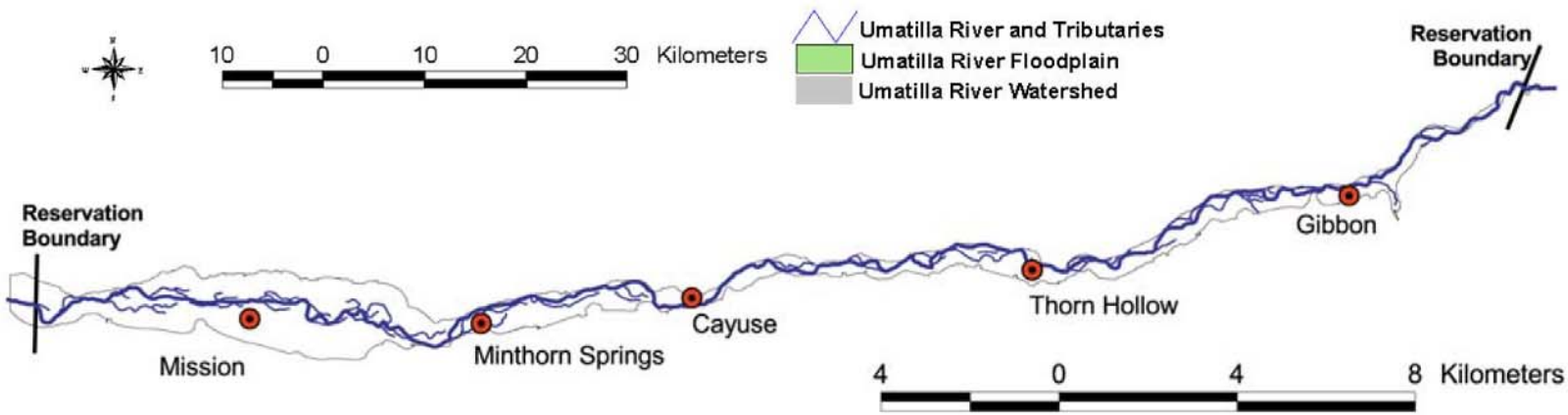
Participants

- CTUIR
- Eco-metrics, Inc.
- University of California – Santa Barbara
- Watershed Sciences, LLC.

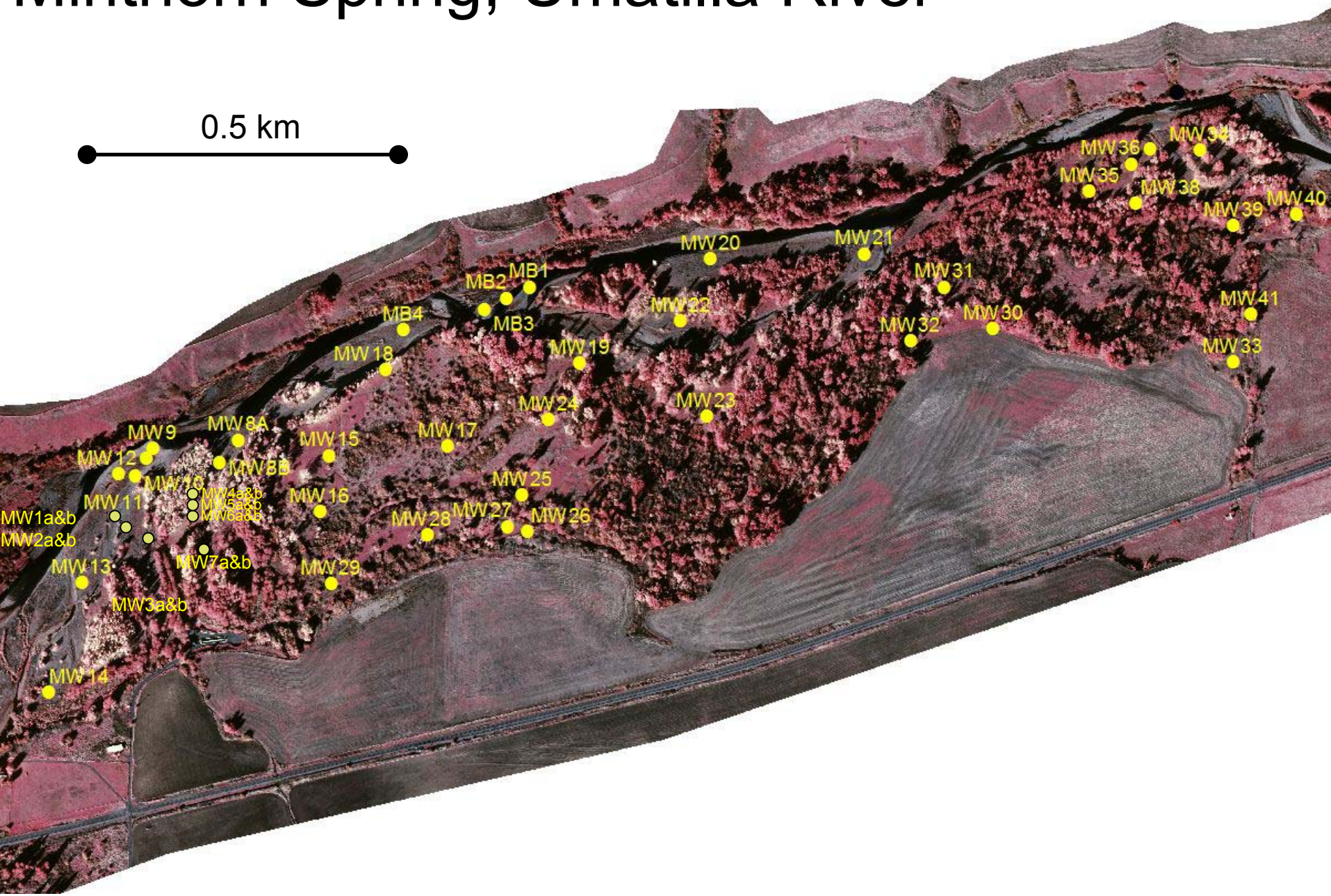


10 0 10 20 30 Kilometers

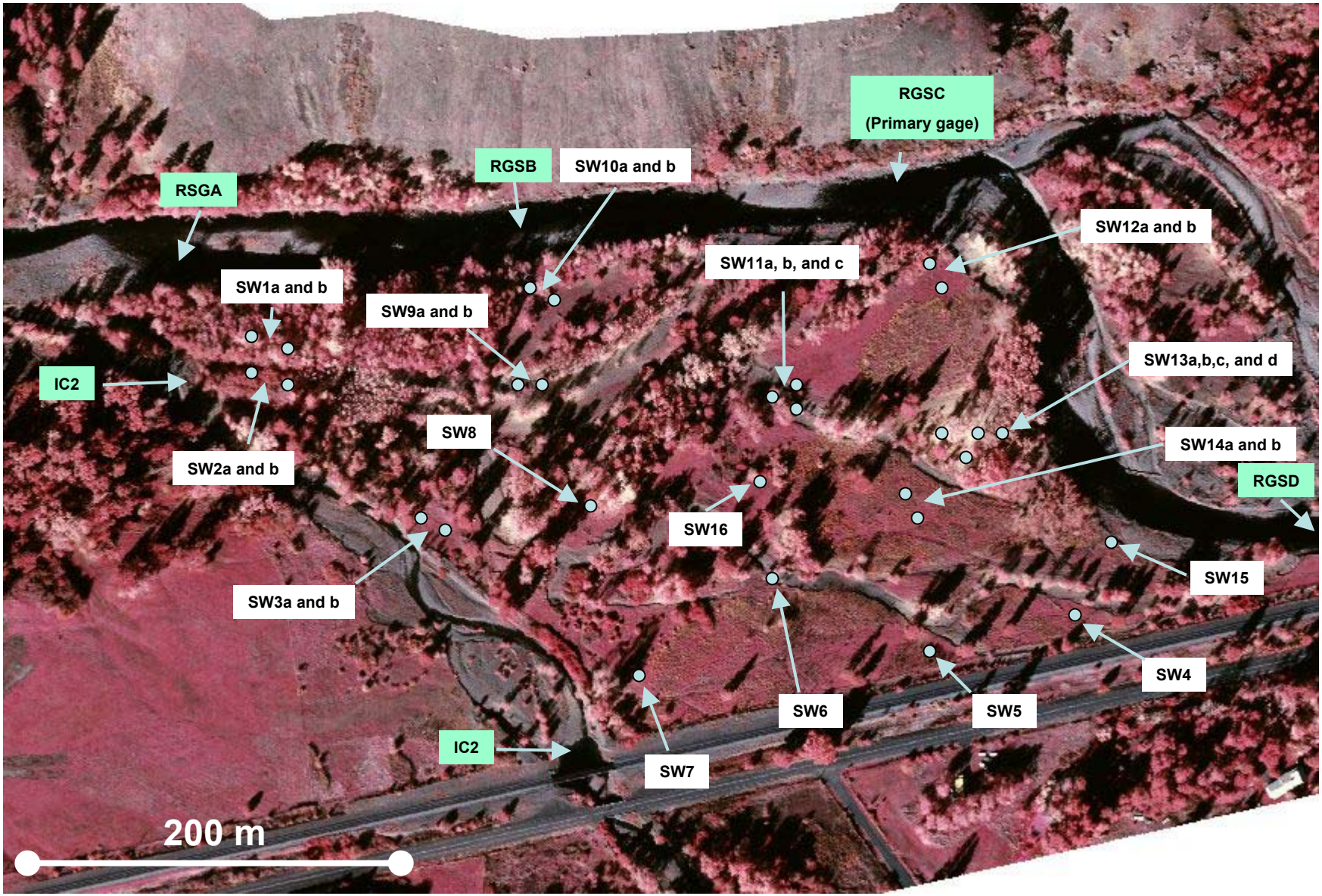
Umatilla River and Tributaries
Umatilla River Floodplain
Umatilla River Watershed



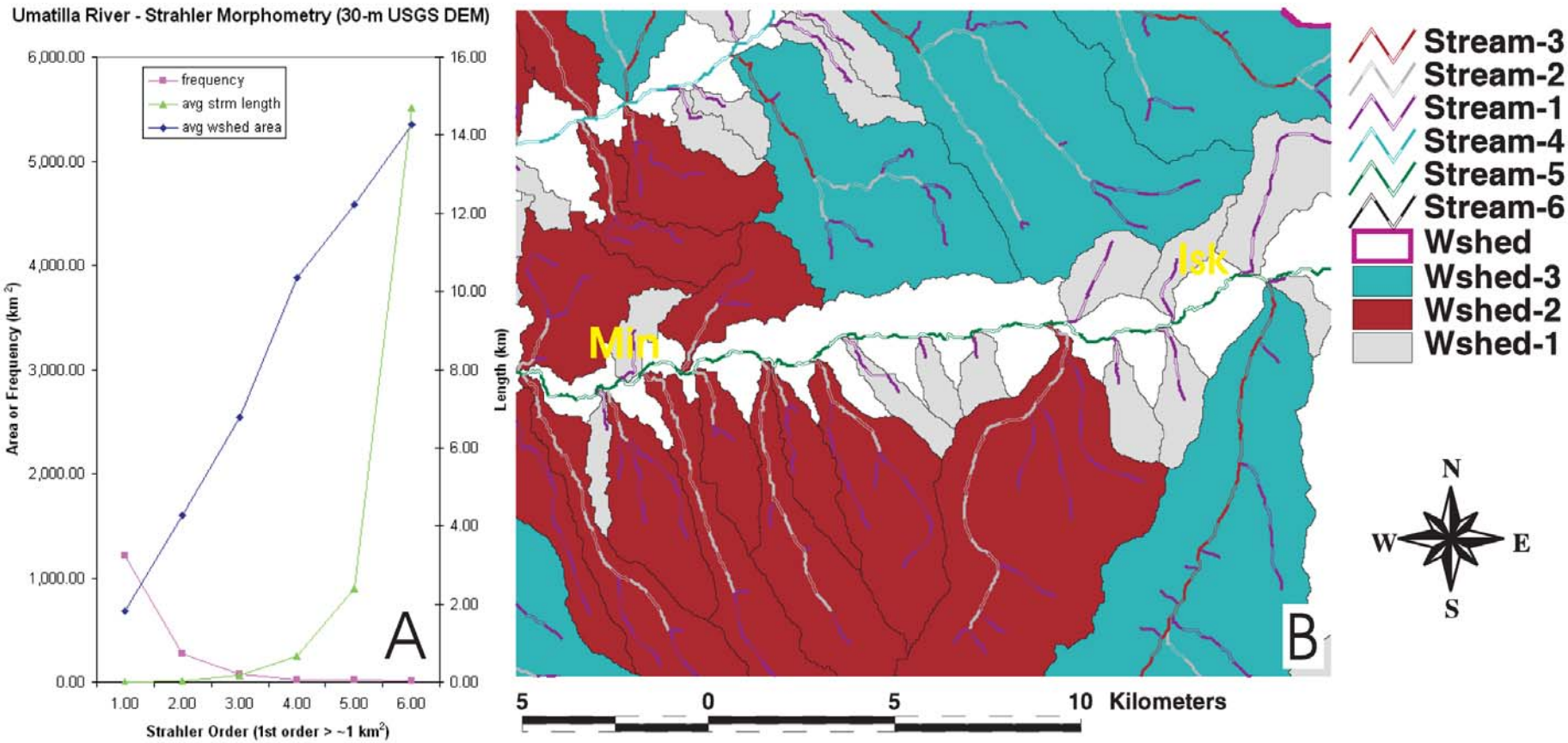
Minthorn Spring, Umatilla River



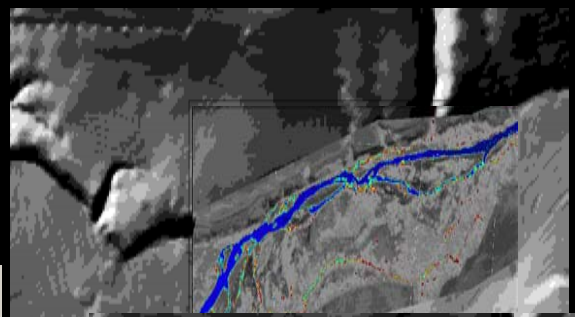
Iskuulpa Creek, Umatilla River



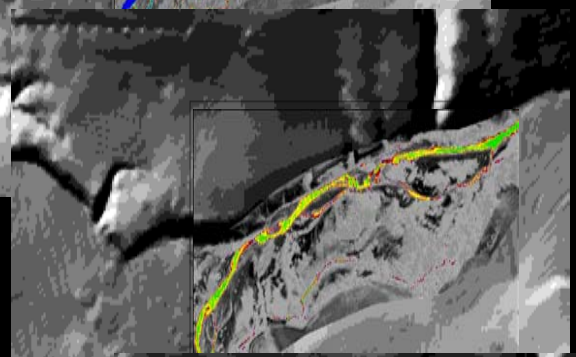
Watershed morphometry of the Upper Umatilla River, Oregon



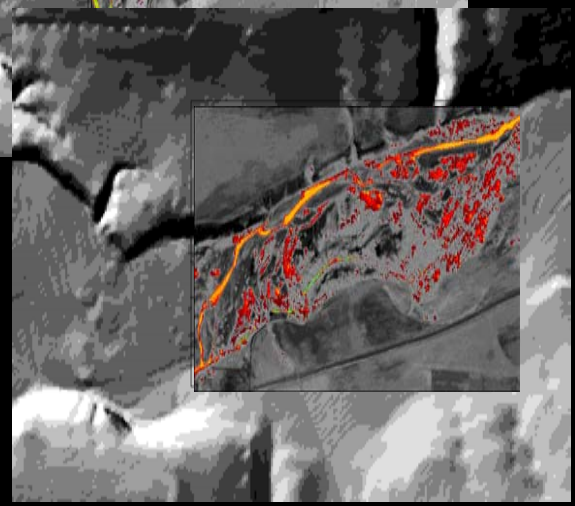
Forward Looking Infrared Radiometer -FLIR



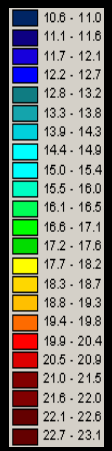
April



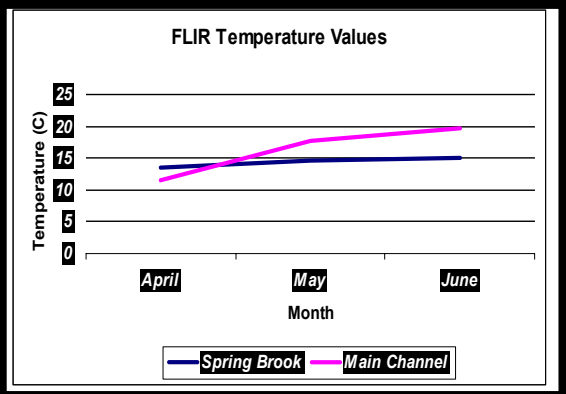
May



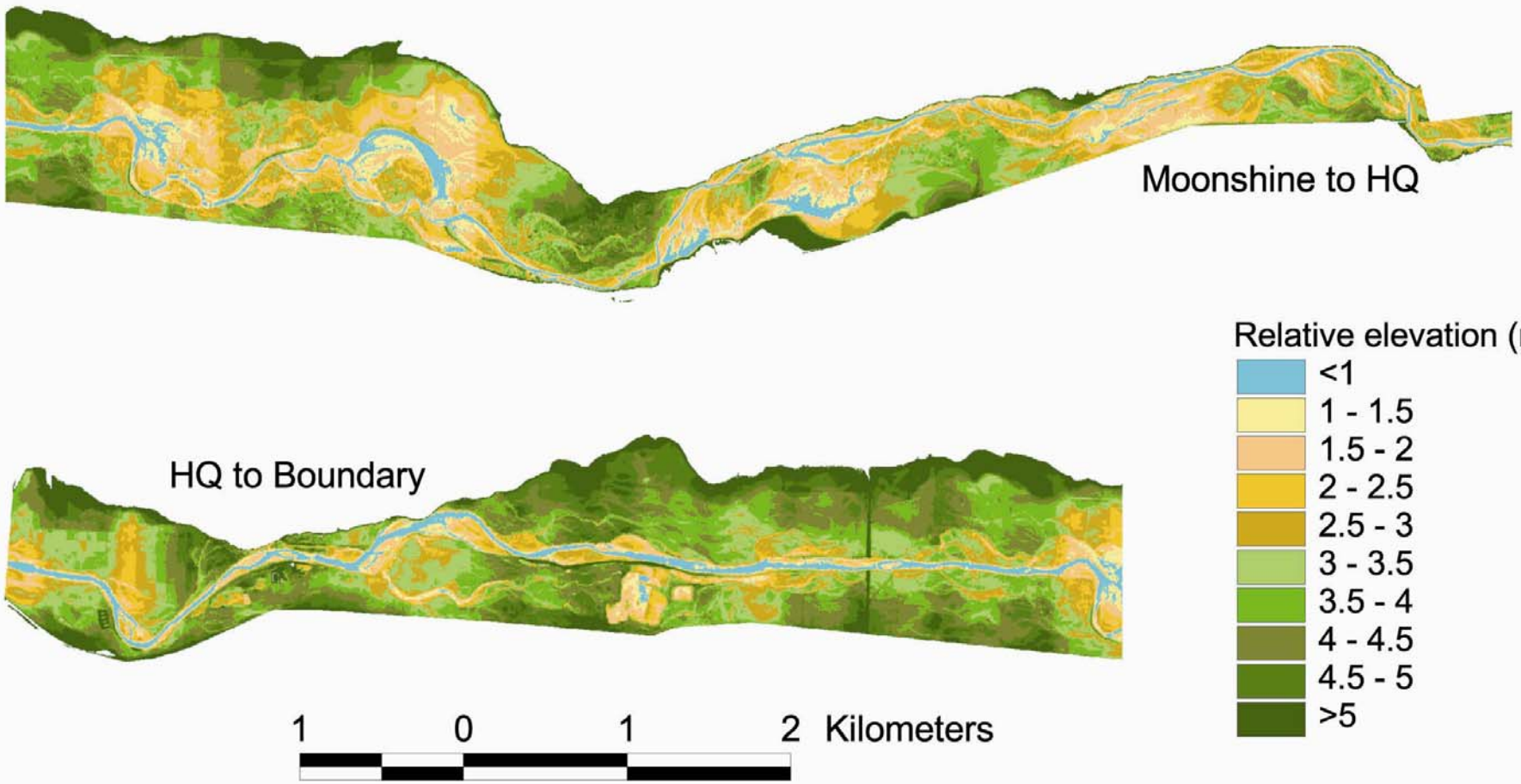
June



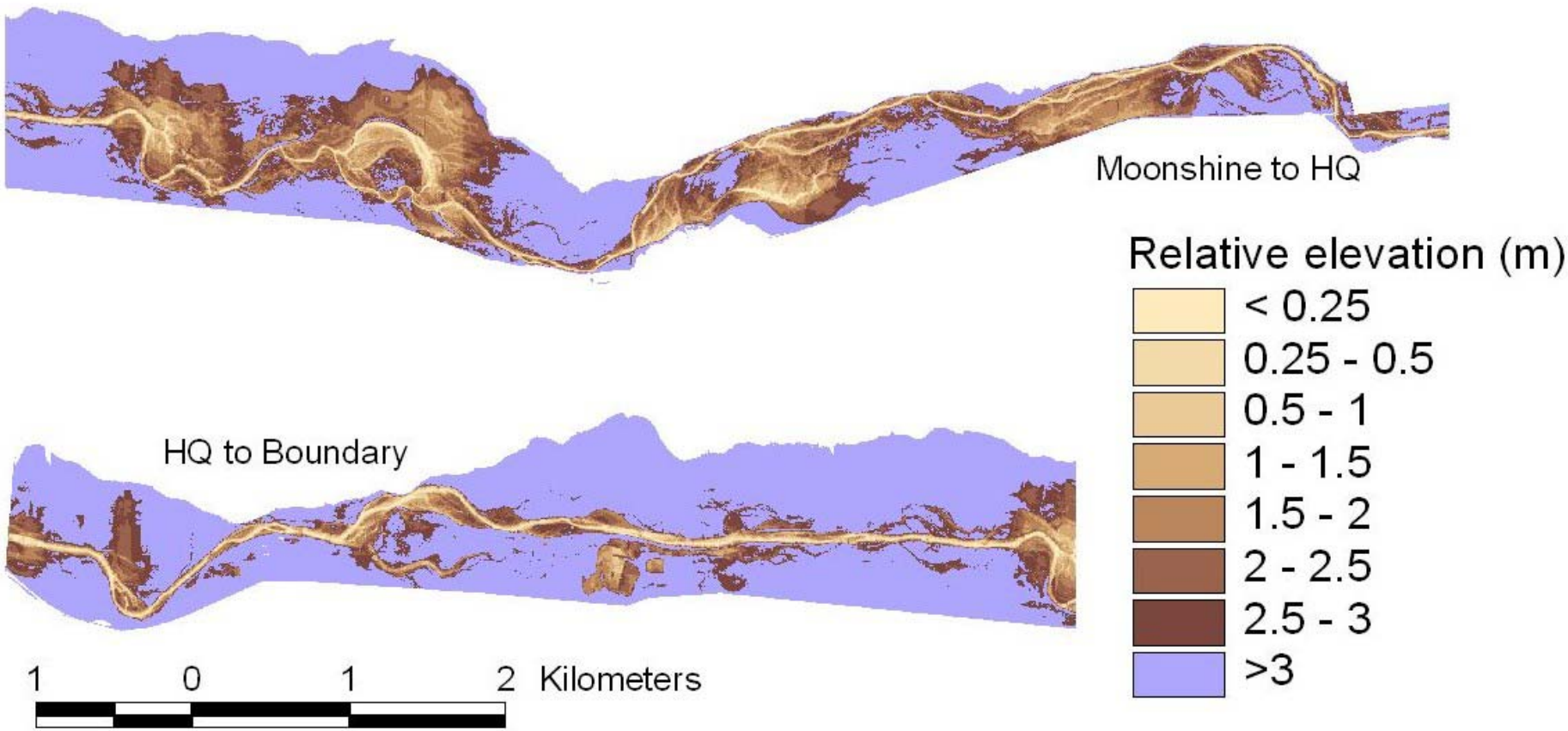
Legend in Degrees Centigrade



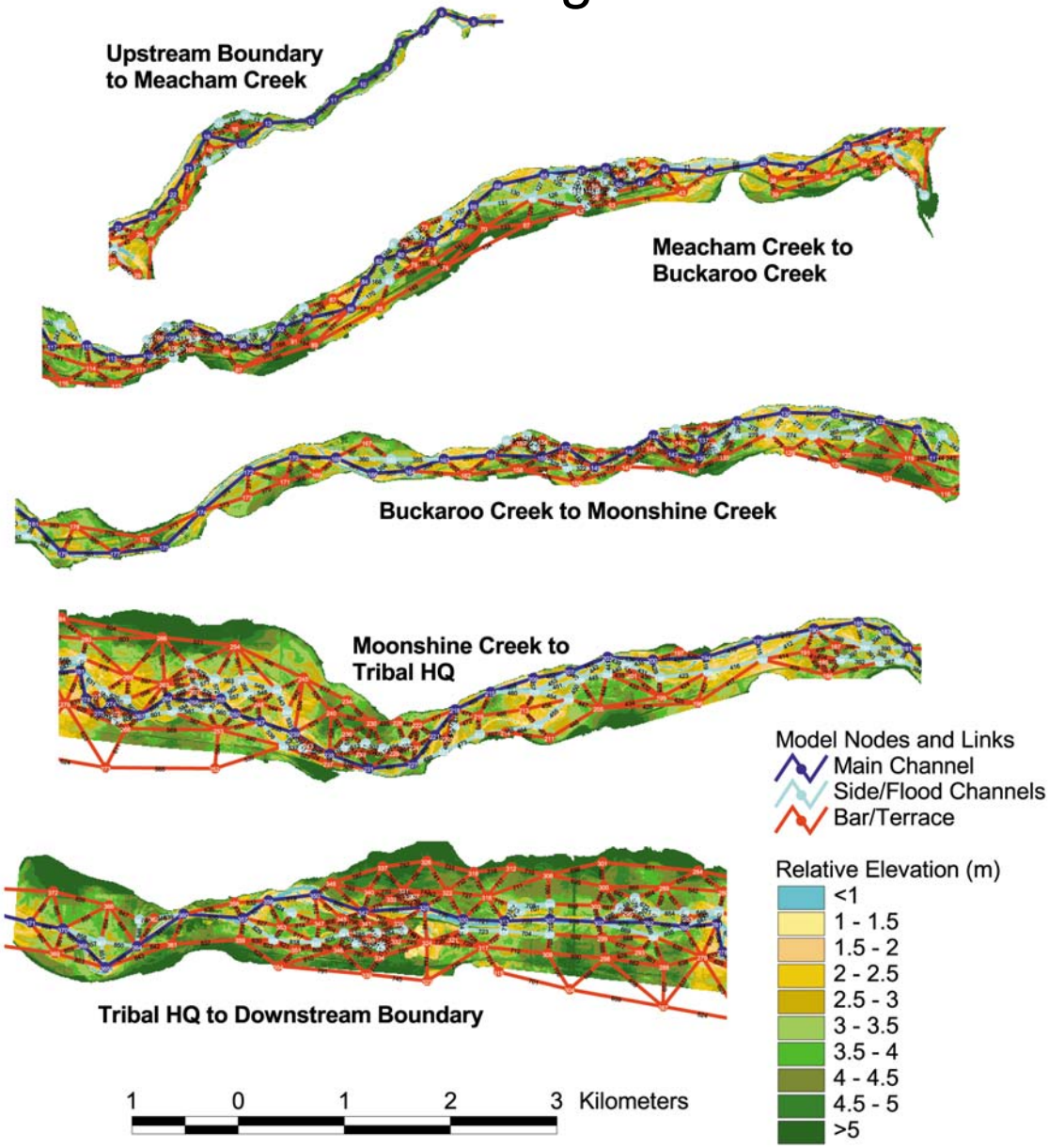
Flood-Plain Elevation Relative to Streambed

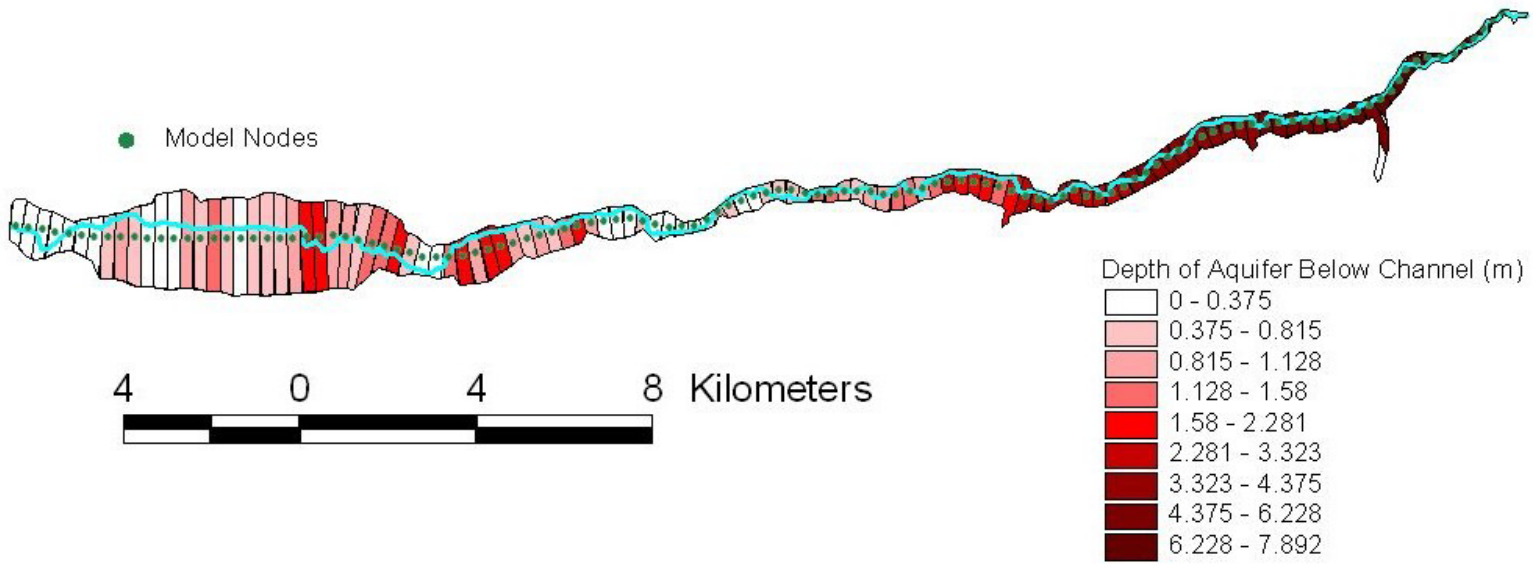


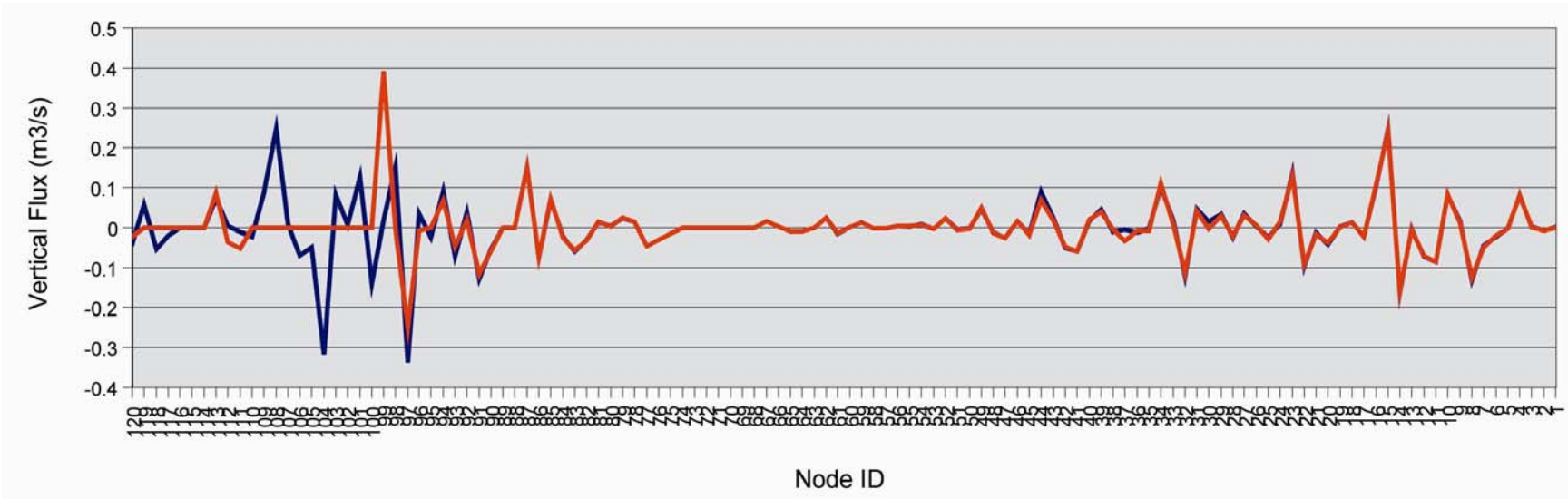
Reduced Flood-Plain Connectivity due to Dredging



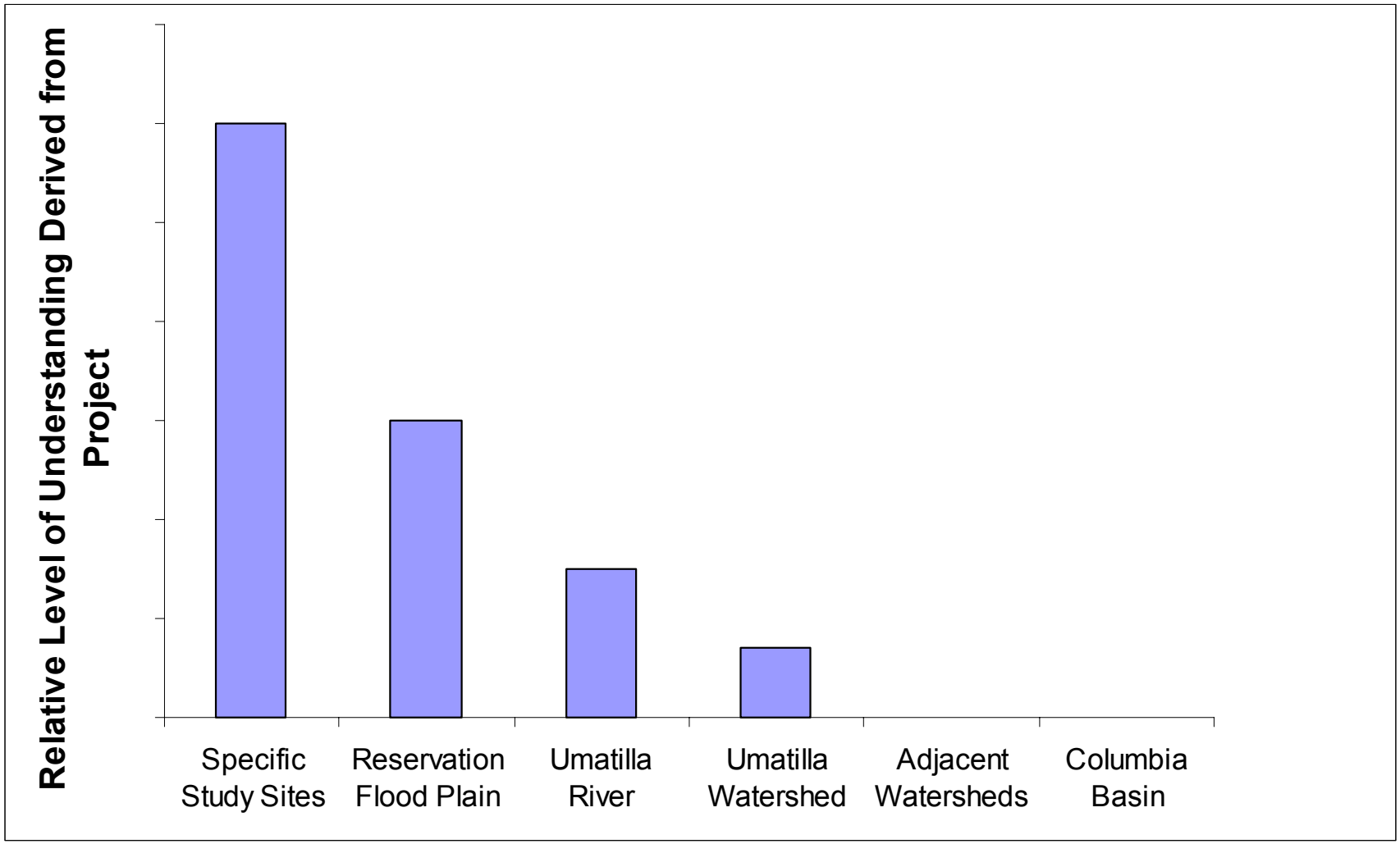
Resulting link and node locations used in the Wetlands Dynamics Water Budget Model




Model Nodes
4 0 4 8 Kilometers
Depth of Aquifer Below Channel (m)
0 - 0.375
0.375 - 0.815
0.815 - 1.128
1.128 - 1.58
1.58 - 2.281
2.281 - 3.323
3.323 - 4.375
4.375 - 6.228
6.228 - 7.892


Vertical Flux (m3/s)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
Node ID
Current Conditions
Reverse Dredging

Project Benefit



Outcomes of the 2001 Innovative Grant

- Variation is stream temperature is strongly associated with active floodplain nodes
- With mostly public domain data, we have built a detailed understanding of these floodplain nodes
- Hyporheic flow plays an important role in regulating stream temperature
- Evidence for strong interactions between hyporheic flow and the thermal regime of the well-mixed main channel using remote sensing data

Creating tools for assessing and restoring floodplain habitats in the Columbia River Basin

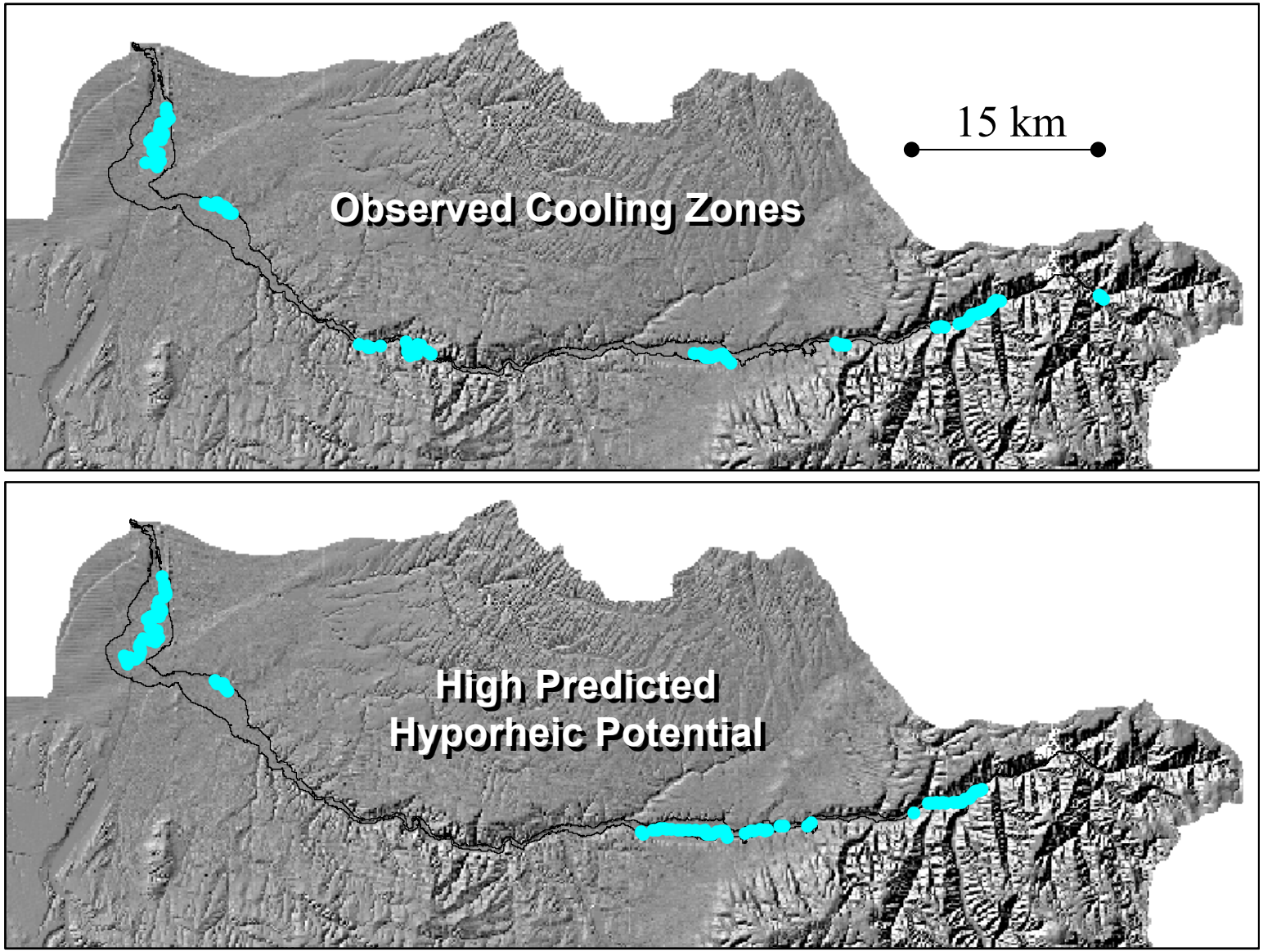
Participants

- CTUIR (DNR and GIS)
- Eco-metrics, Inc. (Dr. Geoff Poole)
- University of California (Dr. Leal Mertes)
- Colorado State University (Dr. Colden Baxter)
- University of Montana (Dr. Bill Woessner)

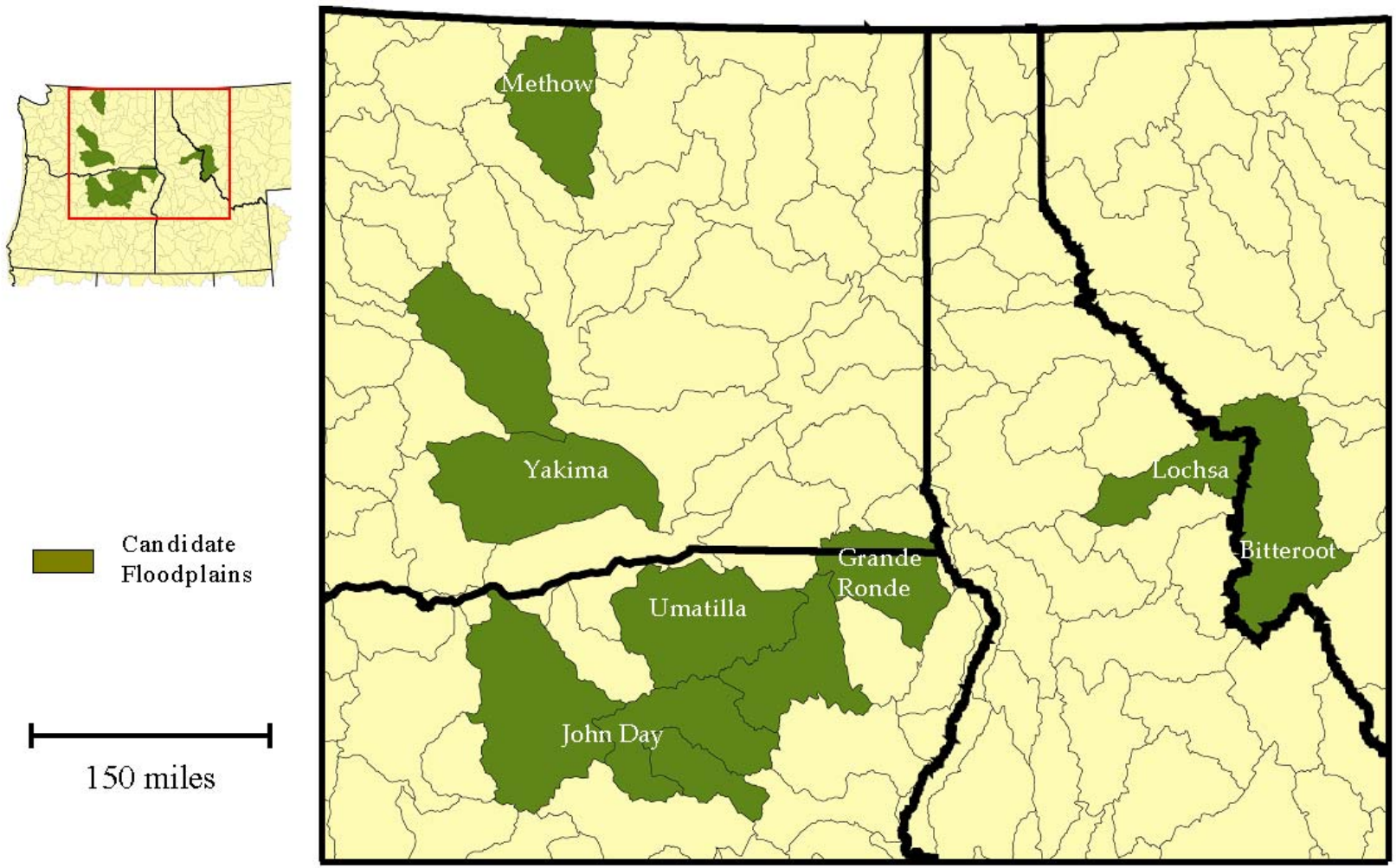
Address multiple scales of floodplain

- Restoration Design (Mission floodplain)
- Regional Assessments (Columbia Basin wide)

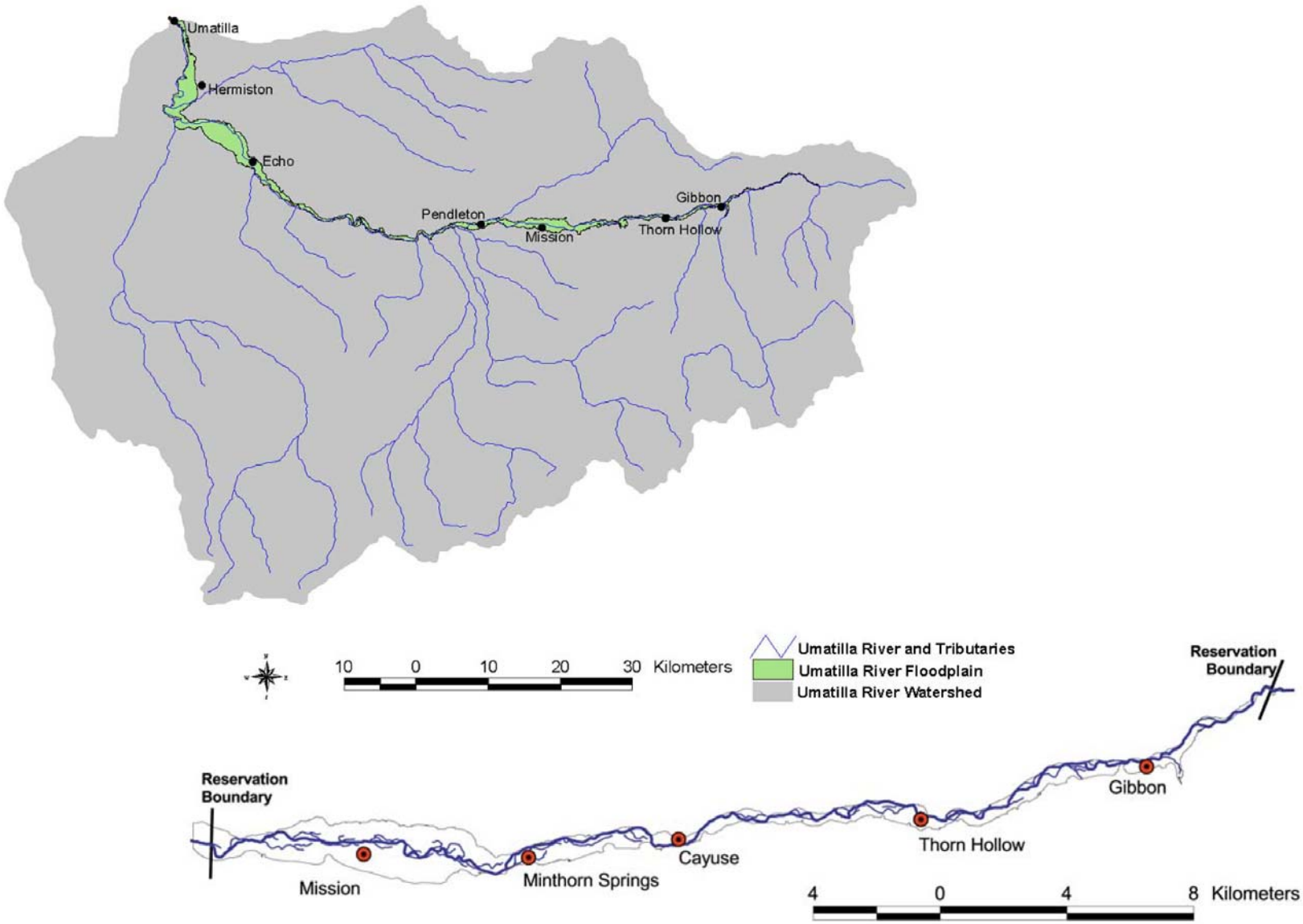
Basin wide temperature

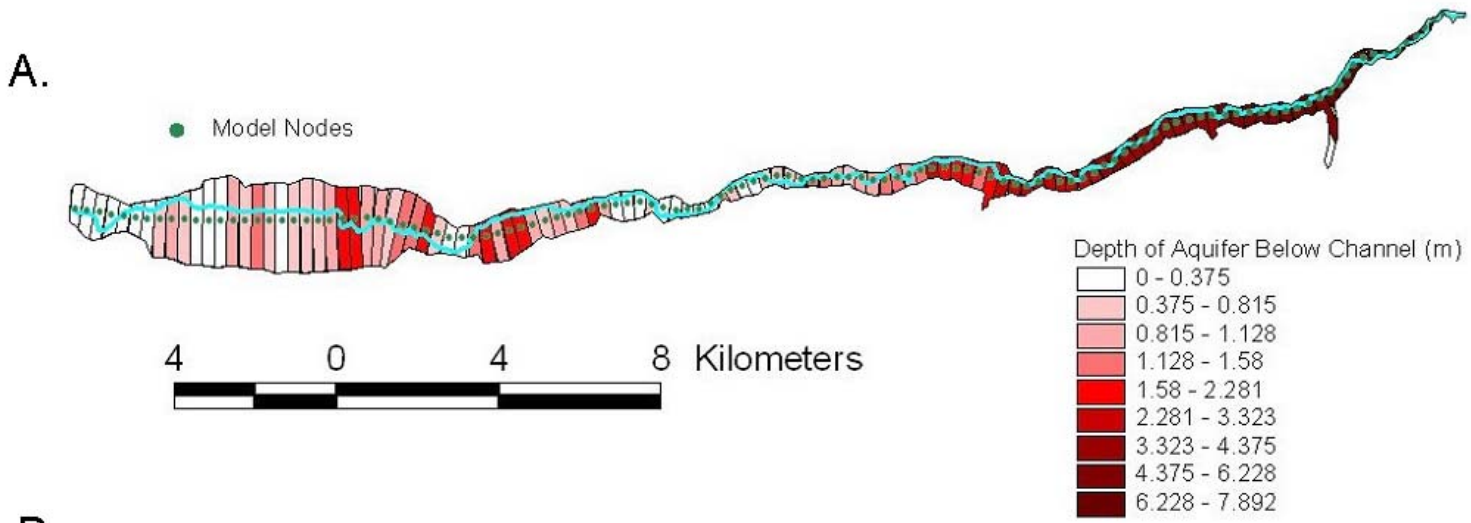


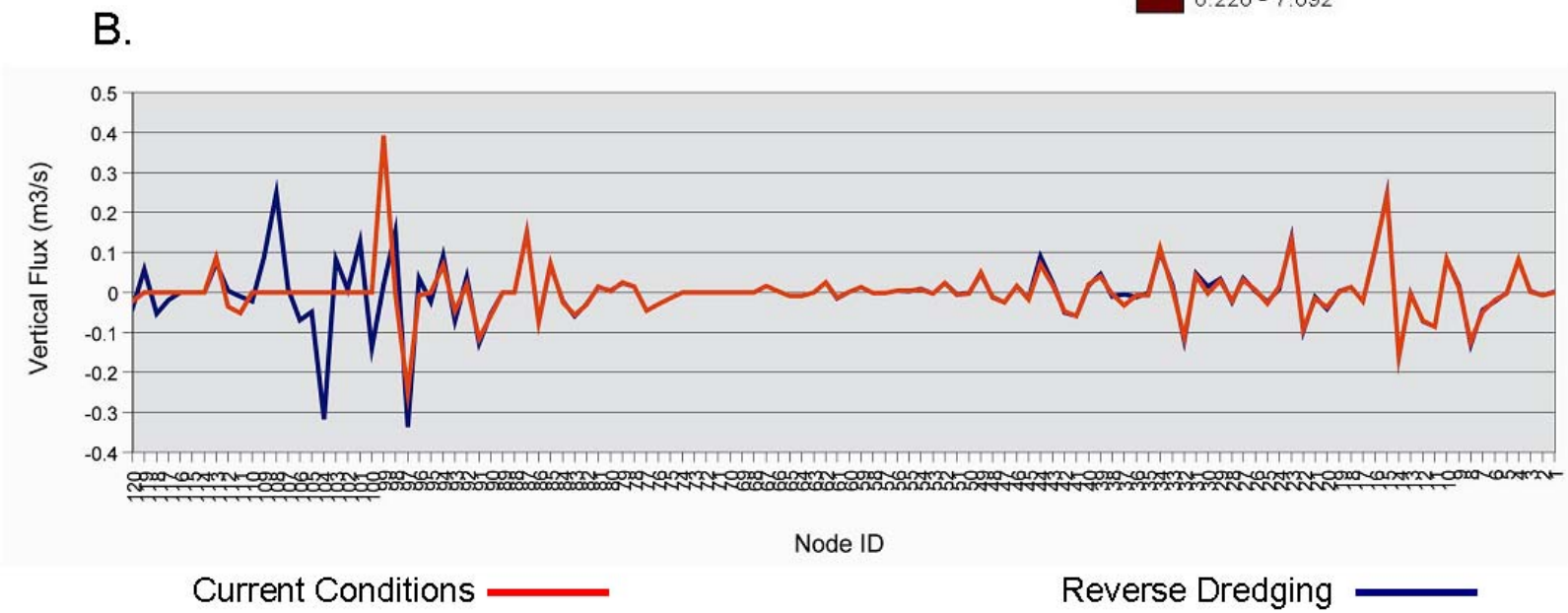
Candidate floodplains



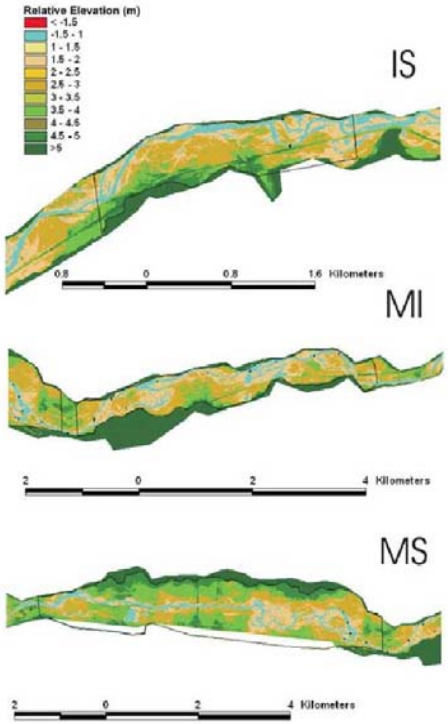
Context of floodplains

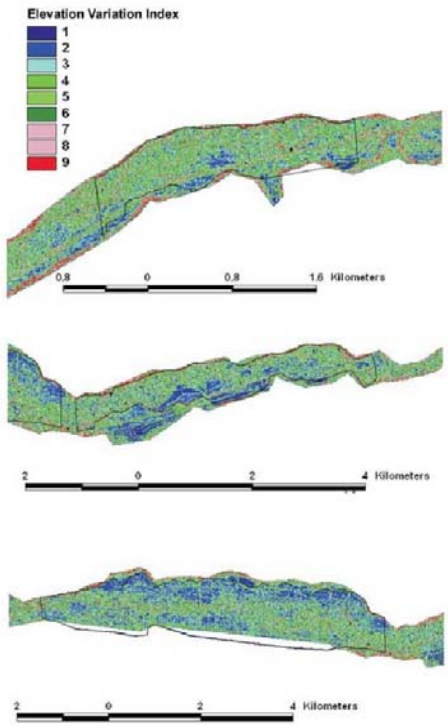


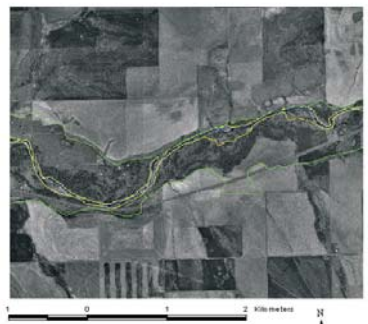

A.
Model Nodes
4 0 4 8 Kilometers
Depth of Aquifer Below Channel (m)
0 - 0.375
0.375 - 0.815
0.815 - 1.128
1.128 - 1.58
1.58 - 2.281
2.281 - 3.323
3.323 - 4.375
4.375 - 6.228
6.228 - 7.892

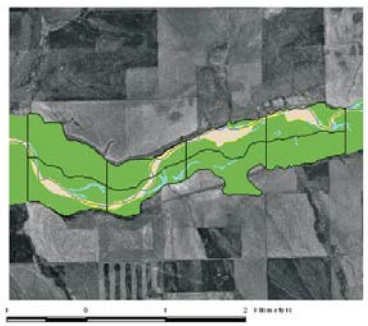

B.
Vertical Flux (m3/s)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
Node ID
Current Conditions
Reverse Dredging

Measuring geomorphic complexity - two ways





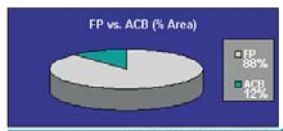




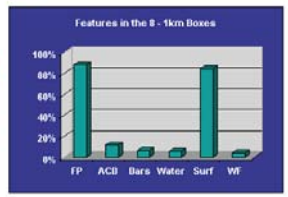
FP = Floodplain
ACB = Active Channel Boundary
Bars = ACB Bars
Water = ACB Water
Surf = FP Surface
WF = FP WaterFeatures

Floodplain
Active Channel Boundary
Channel Center Line

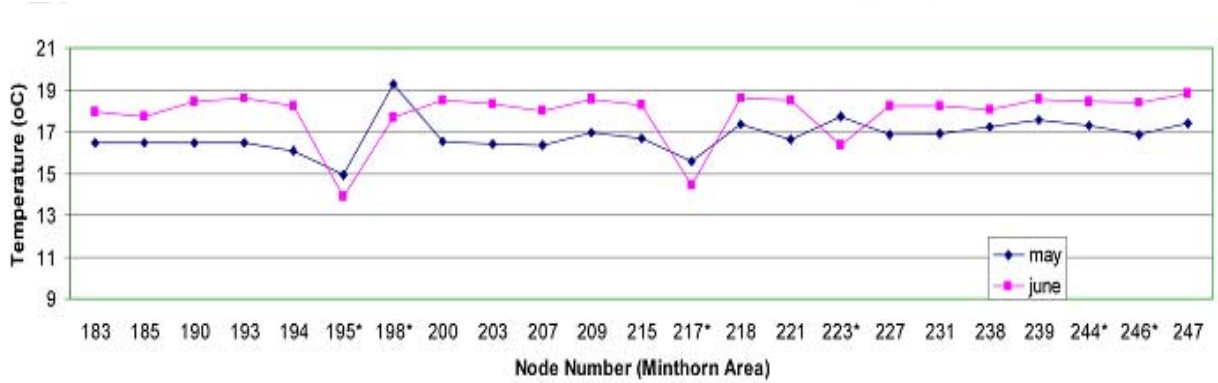
1km-boxes-north
1km-boxes-south
Channel Center Line
Bars
Floodplain Water Features
Active Channel Boundary
Floodplain



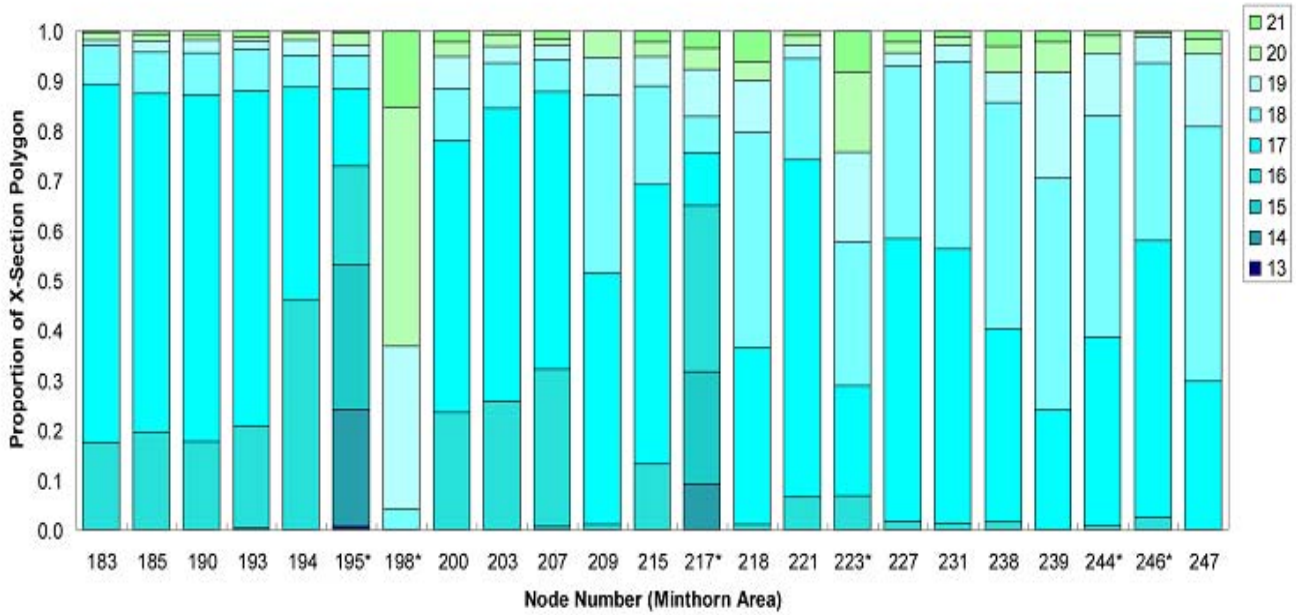
	Area (sq m)	Perimeter (m)	% of 100m Box
FP	2,611.0	37,061.0	88.2%
ACB	348.0	10,564.0	11.8%
ACB Bars	185.0	8,931.0	6.3%
ACB Water	163.0	16,659.0	5.5%
FP Surface	2,493.0	30,237.0	84.3%
FP Water	118.0	26,026.0	4.0%



FLIR temperatures – longitudinal and local variability

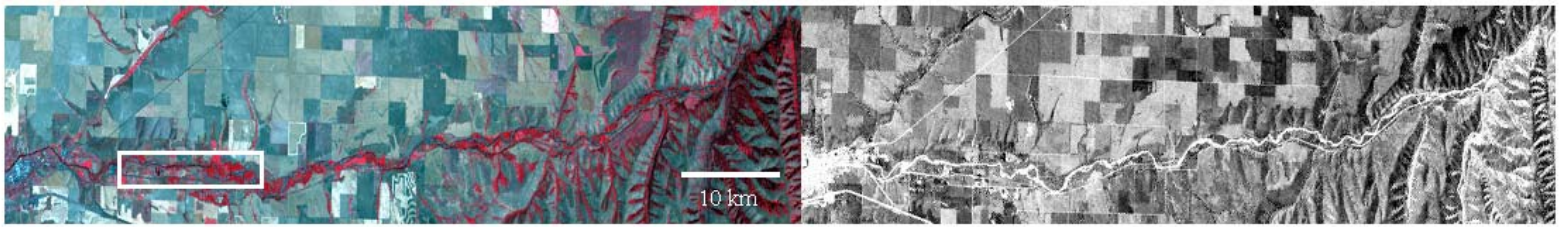


May 2001

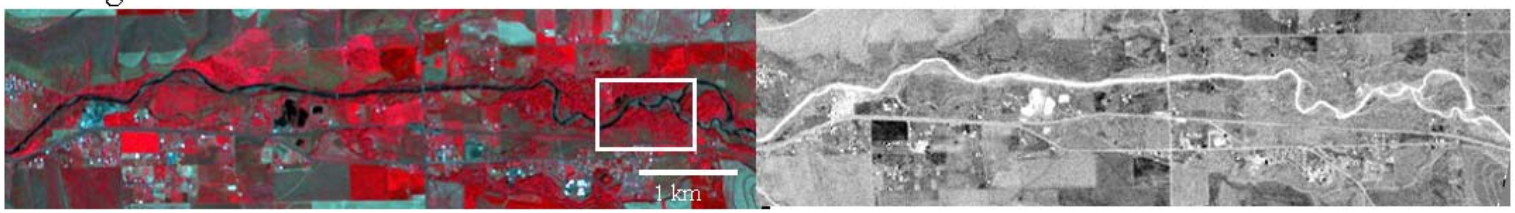


Several data sources are used to identify geomorphic and land cover of floodplains

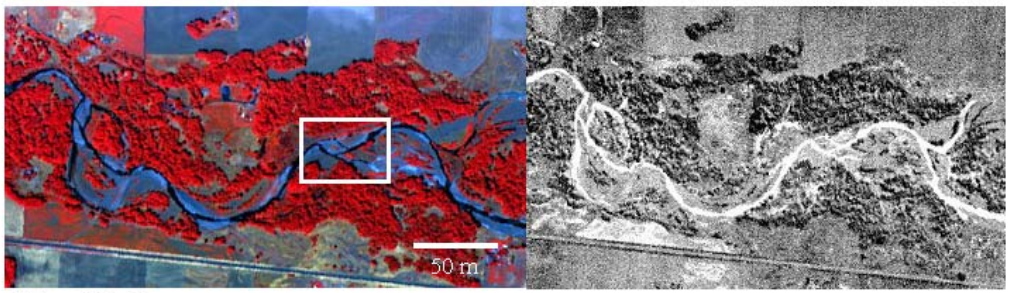
A. River



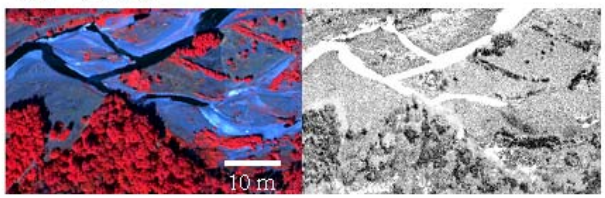
B. Segment



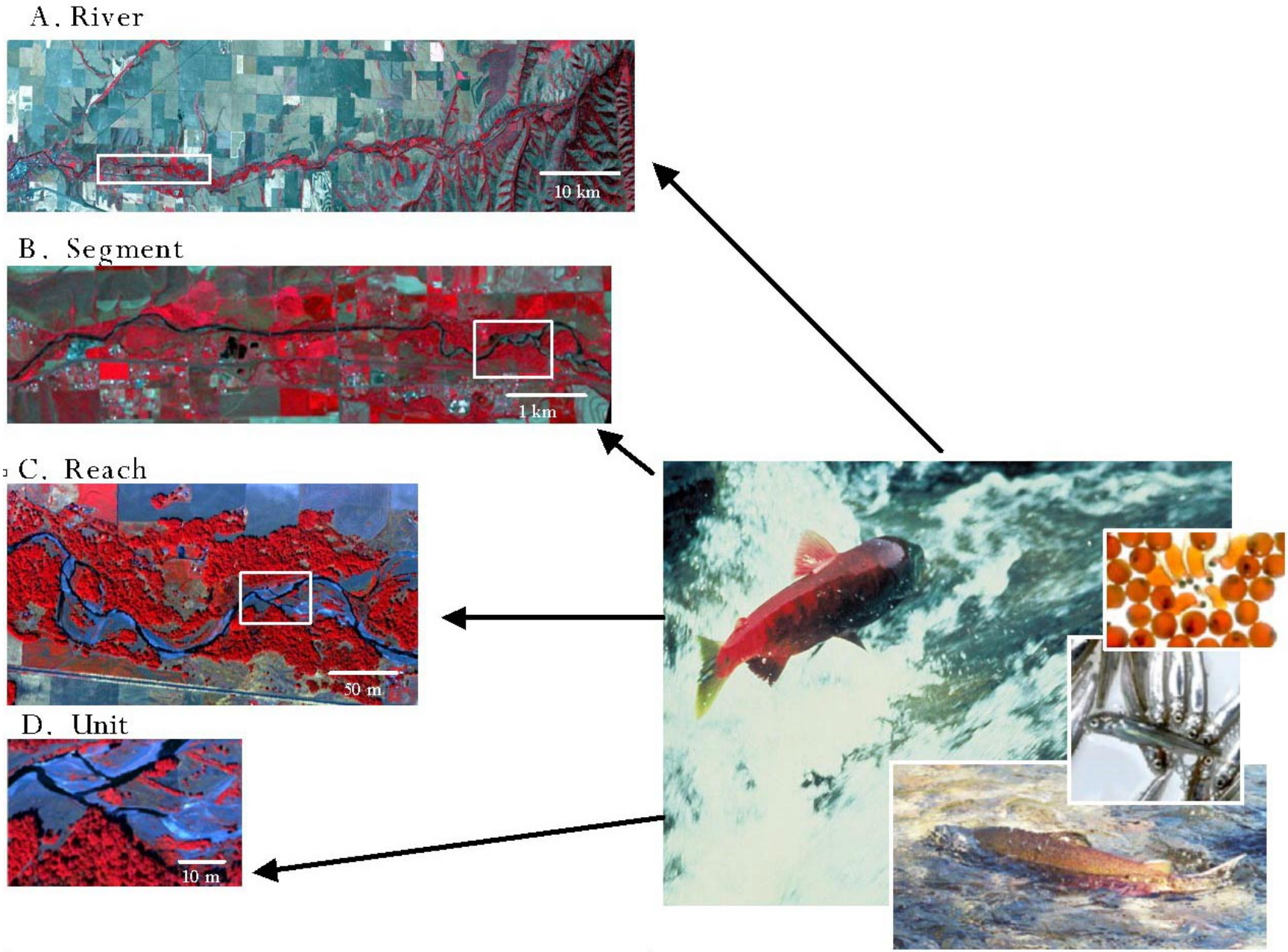
C. Reach



D. Unit



Build understanding of salmonid life stages at nested scales



Elements of Successful Restoration

- Establish a context (history of the river)
- Informed (scientifically defensible)
- Deliberate/purposeful (setting up appropriate goals - rates)
- Holistic (scope)

Regional Application to the Columbia Basin

- Conduct floodplain diversity assessments for several basins using existing data sources
- Assessments linked to temperature profiles
- Also linked to biological productivity

Proposed Project Benefit