CHaMP

HARNESSING DEMs FOR QUANTIFYING FISH HABITAT

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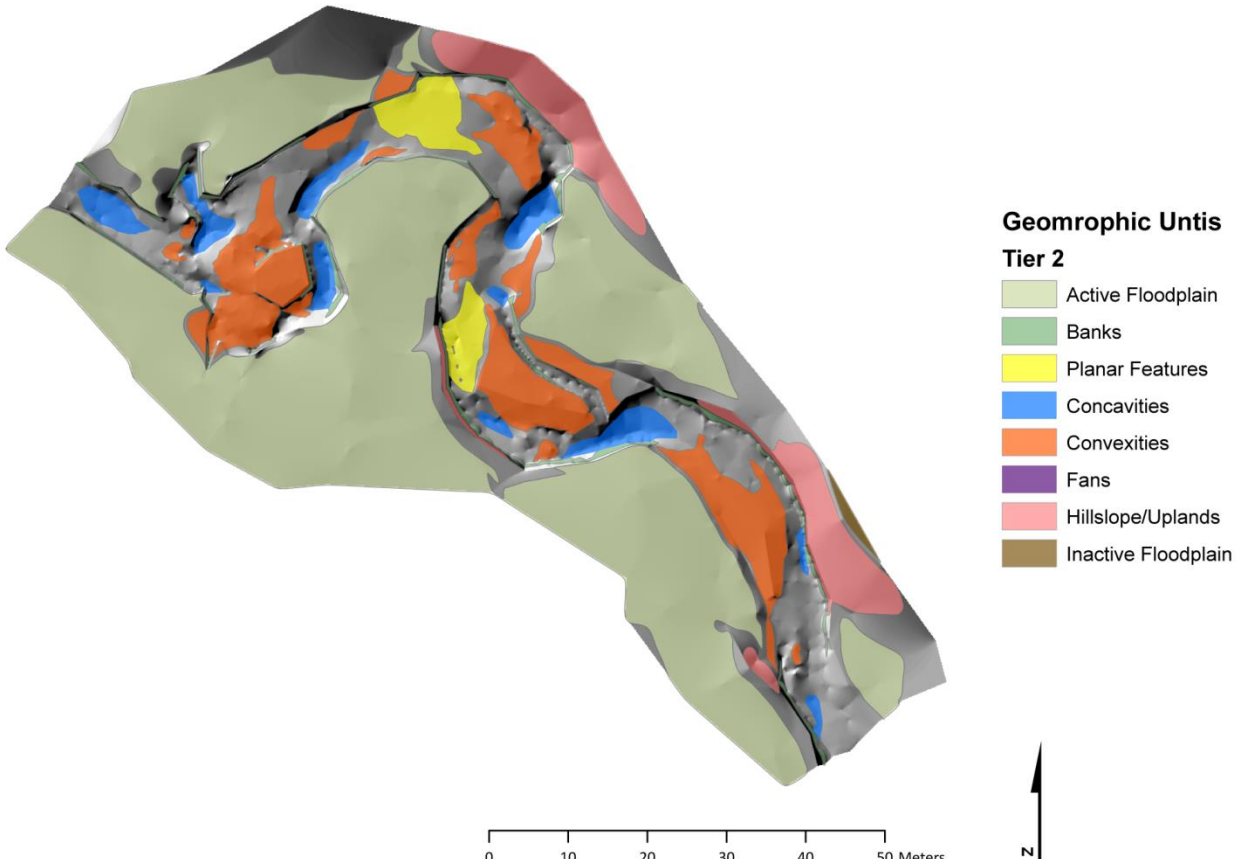
UtahStateUniversity
ECOGEOMORPHOLOGY & TOPOGRAPHIC ANALYSIS LABORATORY

PURPOSE OF TALK

- What can DEMs tell us about fish habitat?
  - Snapshot – *Status*
  - Repeat Surveys – *Trend*
  - How can this inform management? - *Effectiveness*



WHERE WE NEED TO BE…

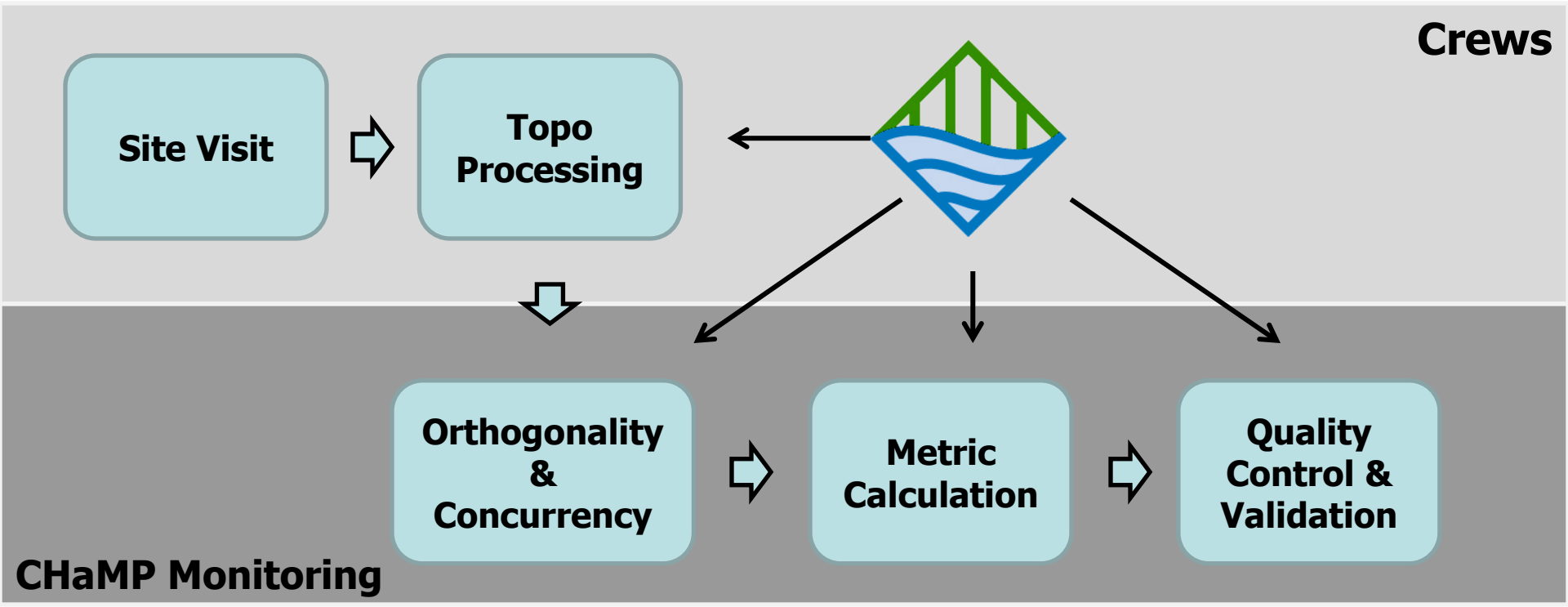
SITE LEVEL

- What are the building blocks of the reach?
- How is the reach functioning?
  - Hydrogeomorphically
  - Fish Habitat
- What is the reach's
  - Geomorphic condition
  - Habitat condition
  - Habitat recovery potential

WATERSHED LEVEL

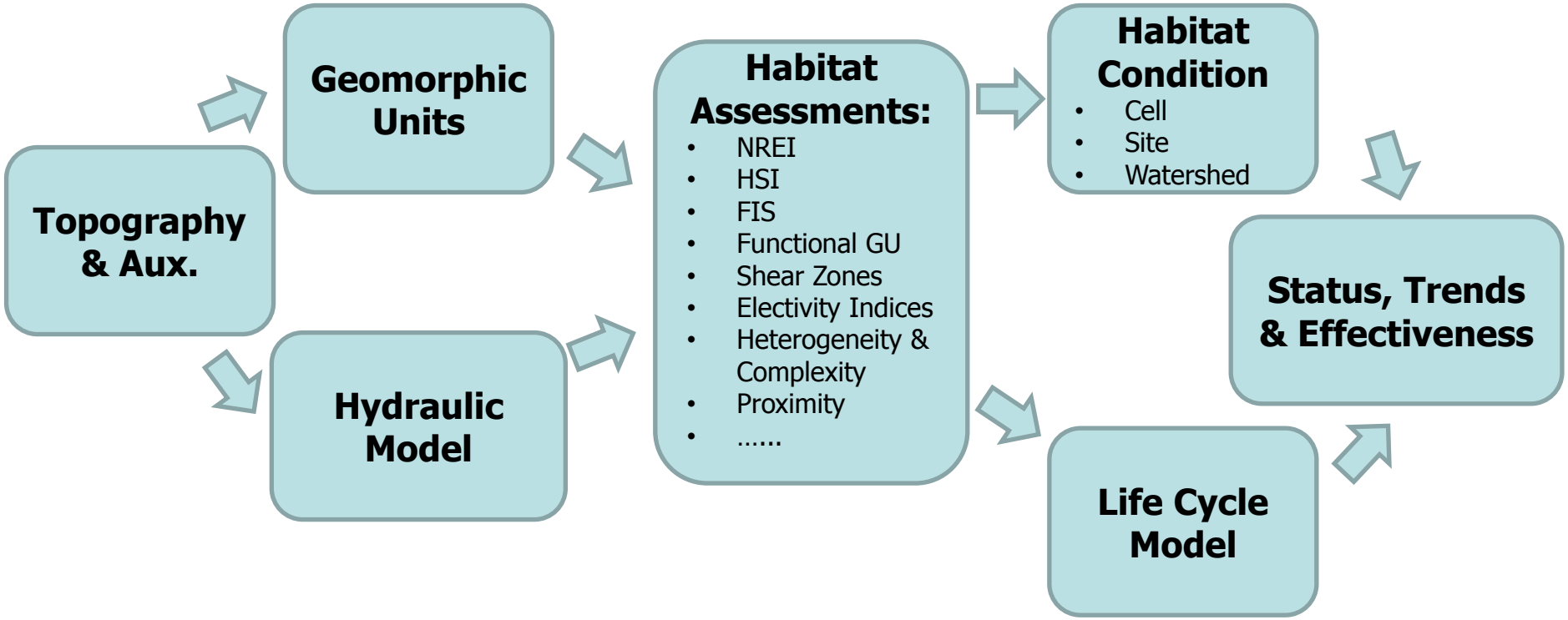
- Reach types across network
- At each reach in network map their:
  - Geomorphic condition
  - Habitat condition
  - Habitat recovery potential
- Data-driven Watershed Management Action Plans

RBT within CHaMP



DEM-DRIVEN FISH HABITAT

- Multiple lines of *topographic* evidence



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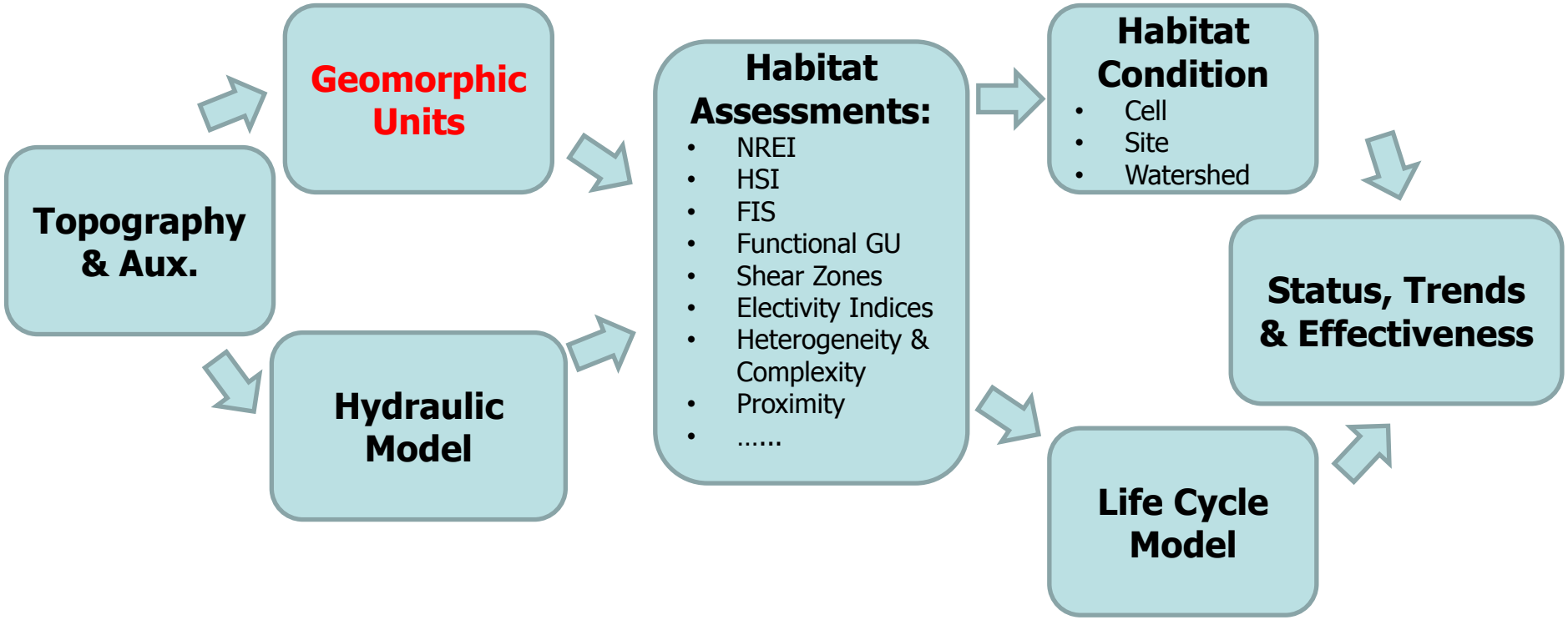
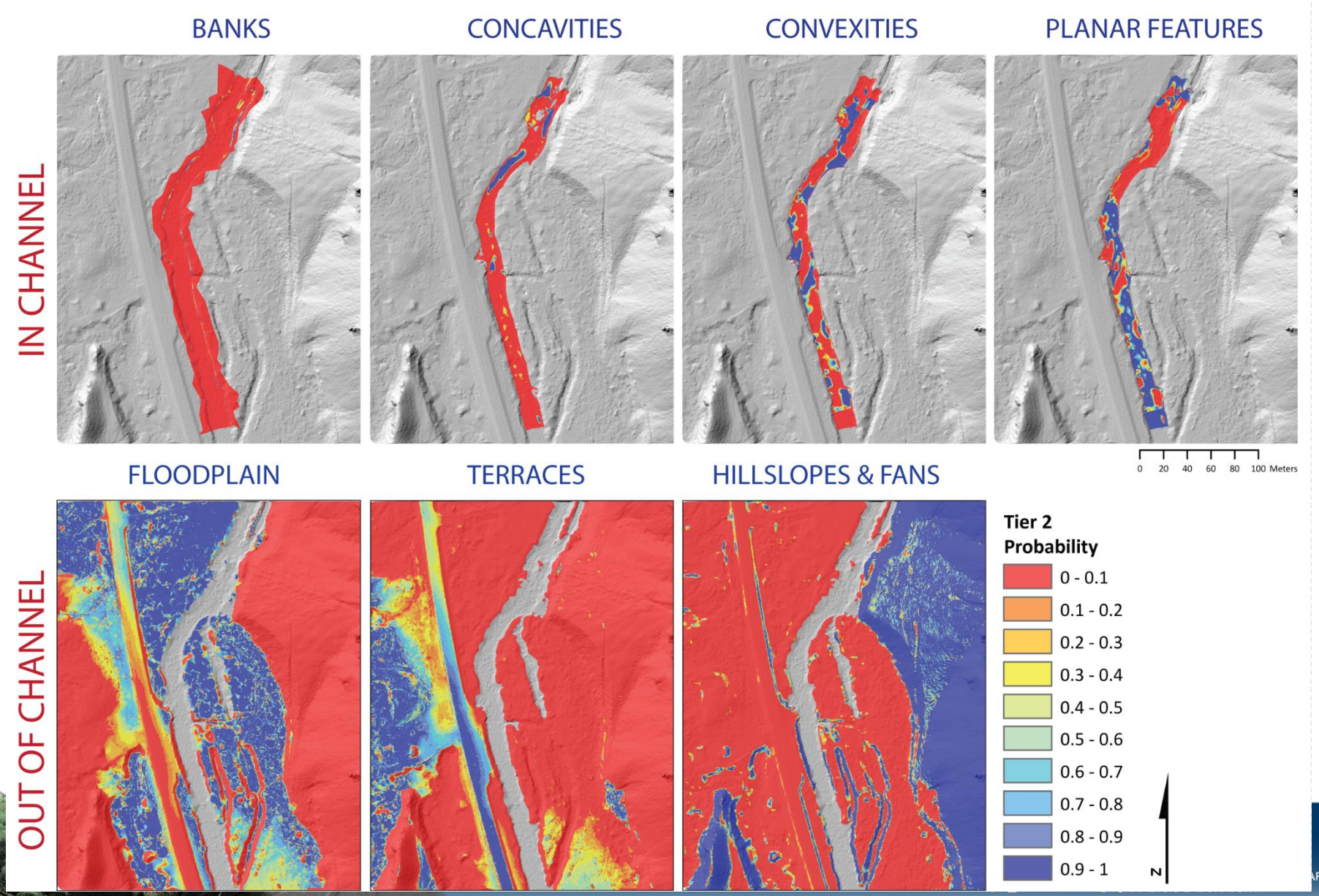
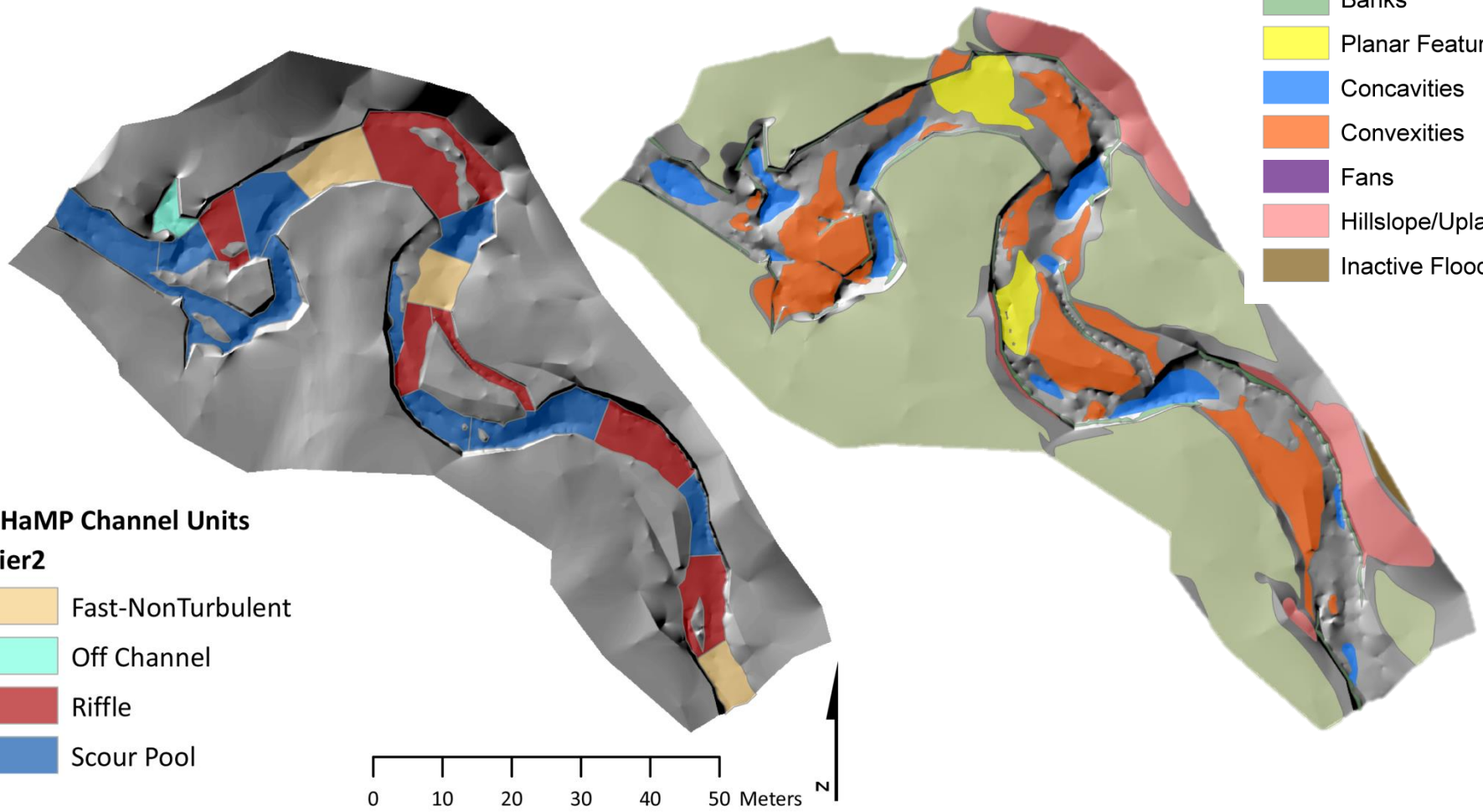


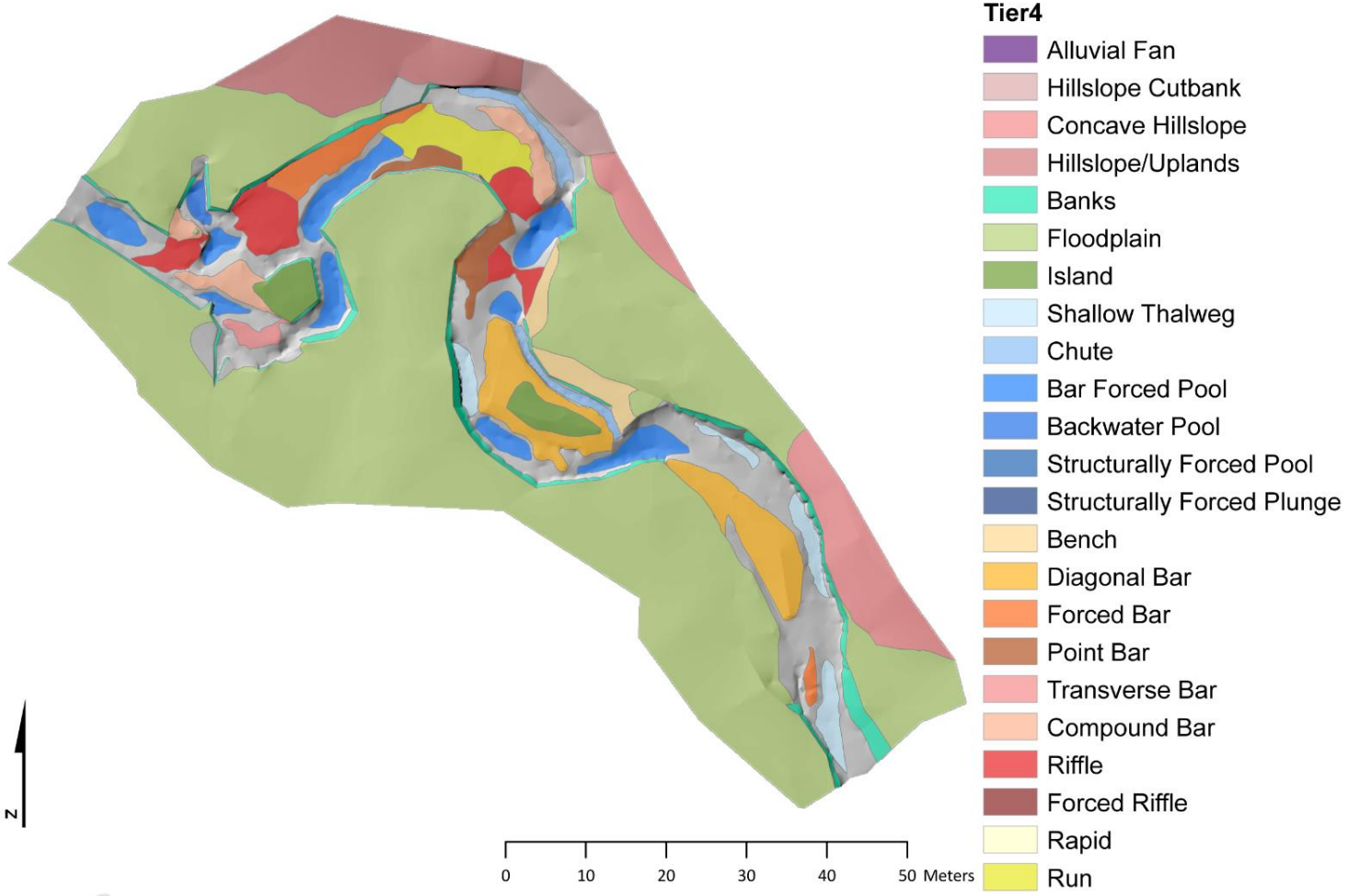
FROM DEM…. PROBABILITY OF GU TYPE



FROM CUs TO GUs



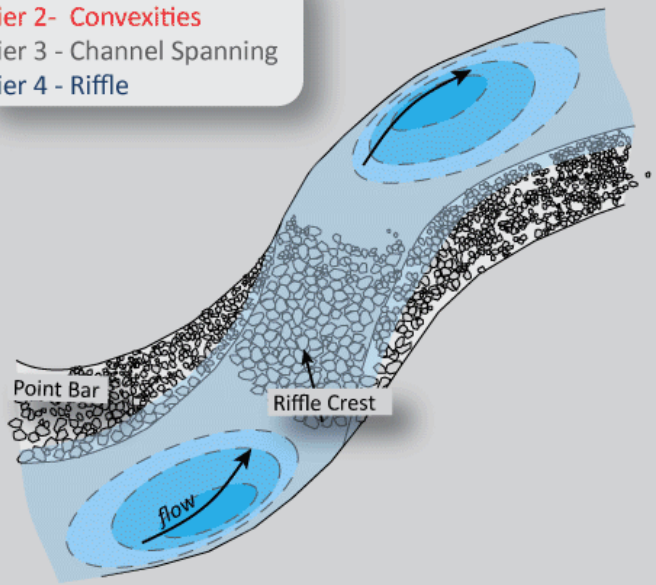
GEOMORPH TRIVIA? SPECIFIC GU



PLAYING CARDS -> RIFFLE

RIFFLE

Tier 1 - (< or > bankful)
Tier 2- Convexities
Tier 3 - Channel Spanning
Tier 4 - Riffle



Jungle Creek, Middle Fork John Day Watershed, OR

TIERED GEOMORPHIC UNIT BUILDING BLOCK REFERENCE CARDS

GEOMORPHIC FORM

Riffles form as topographic highs along an uneven longitudinal profile, between bends in sinuous alluvial channels. Alluvial riffles are shallow, step-like, channel-spanning features.

Middle Fork John Day River, OR

PROCESS INTERPRETATION

Riffles are zones of sediment accumulation that increase channel roughness during high flow stages, and are maintained or built at various flow stages by the consequent increased turbulence and reduced velocity over the steepened surface. Riffles are often dissected at low flow stages, and reworked or removed altogether at stages higher than bankful.

TYPICAL *ADJACENT* GEOMORPHIC UNITS

Riffles are commonly associated geomoprhic units that help to force it as a channel spanning bar: the *riffle crest* and steepened planar surface separates the upstream and downstream *Bar-Forced Pools, Bank-attached bars (i.e., Point Bars),* and undercut banks.

TYPICAL SALMONID FISH HABITAT ASSOCIATIONS

Typical fish habitat is focused at pool tails at the tops of riffles where holding occurs, and pool heads at their bases, where fish can forage on food items being washed down from the steepened ramp above.

Anadromous life stages	Fry	Parr (Juvinile)	Smolt	Adult
Foraging				
Energy Refugia	O	O	O	O
Predation Refugia	✓	✓	✓	✓
Thermal Refugia	X	X	X	X

na- Not Applicable ; X - Not Typically Important ; O - Occasionally Provided ; ✓Critical

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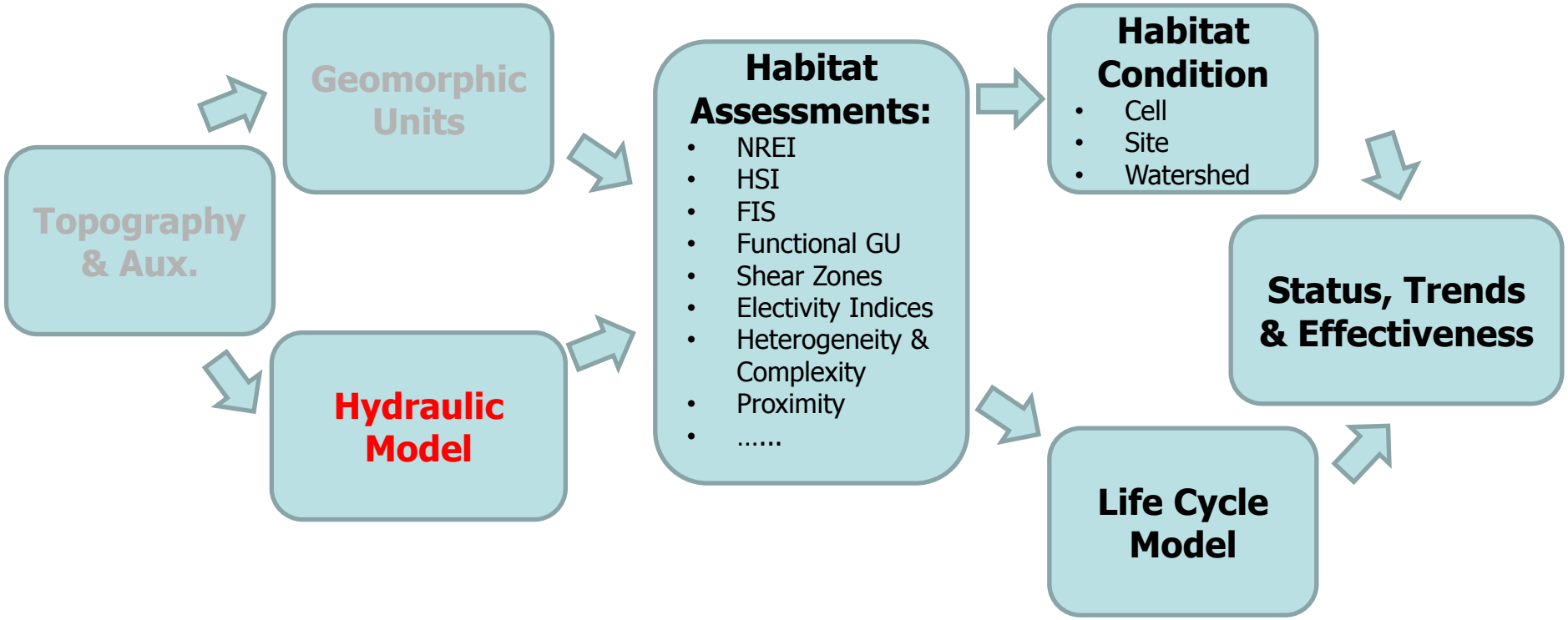
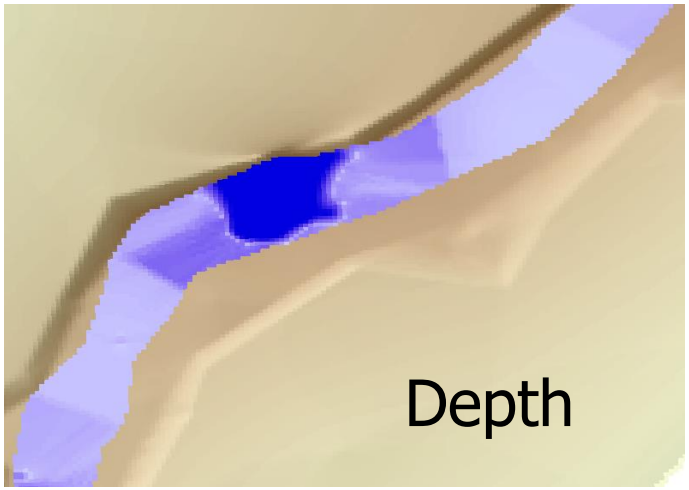
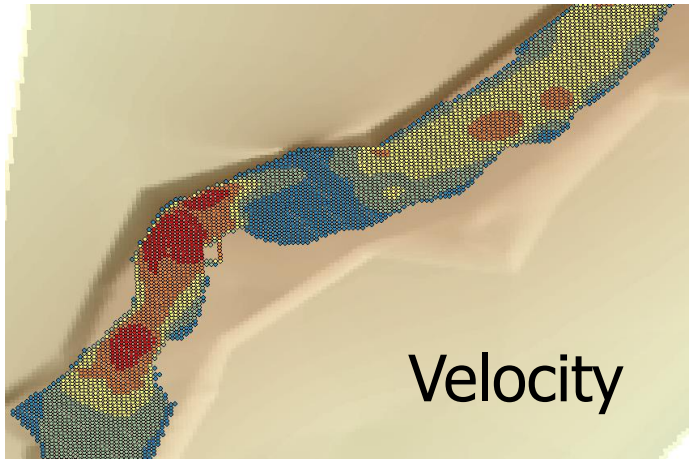
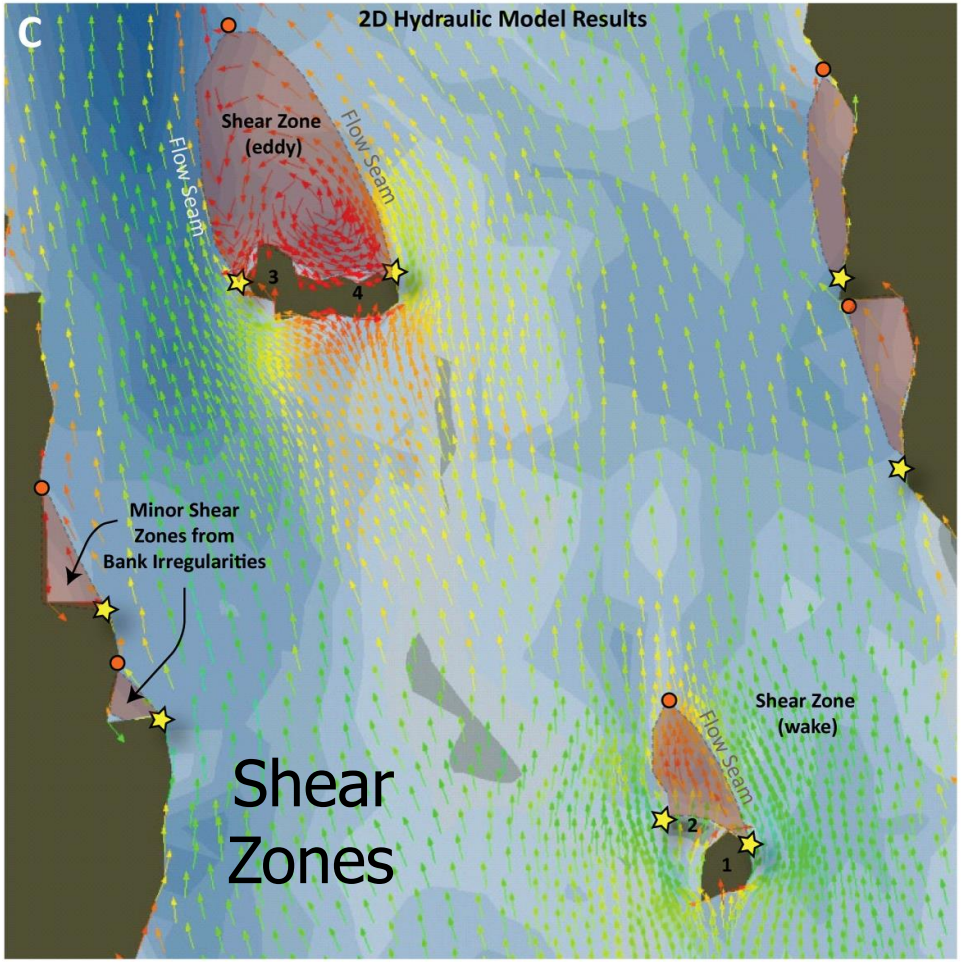


HYDRAULIC MODEL OUTPUTS: DELFT3D







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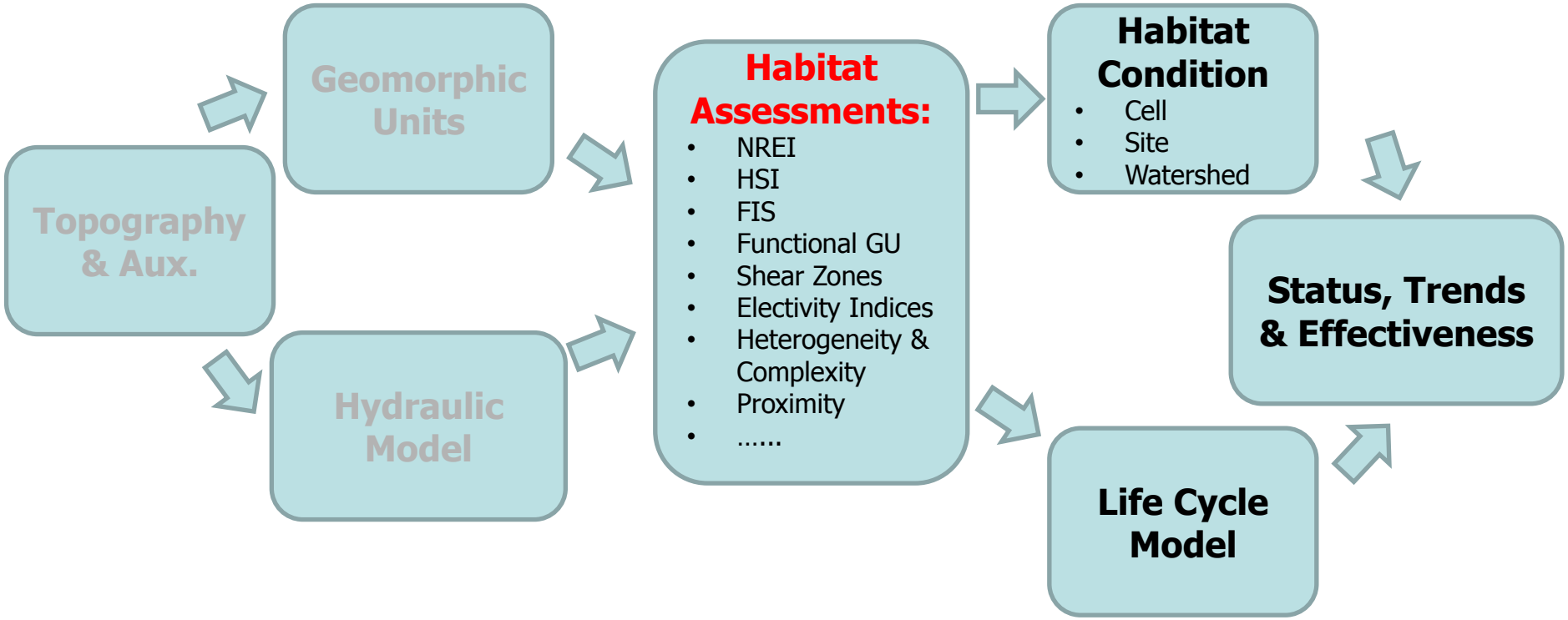
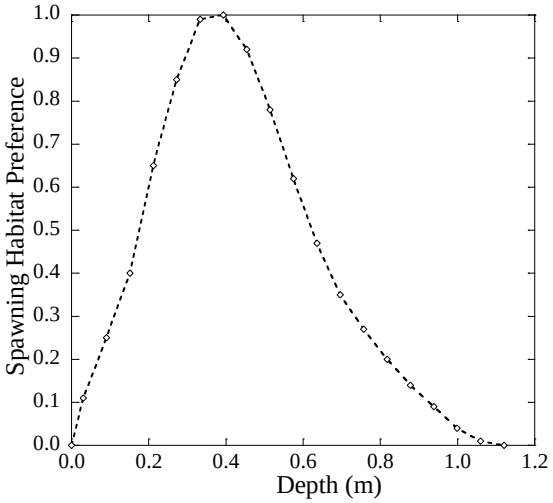
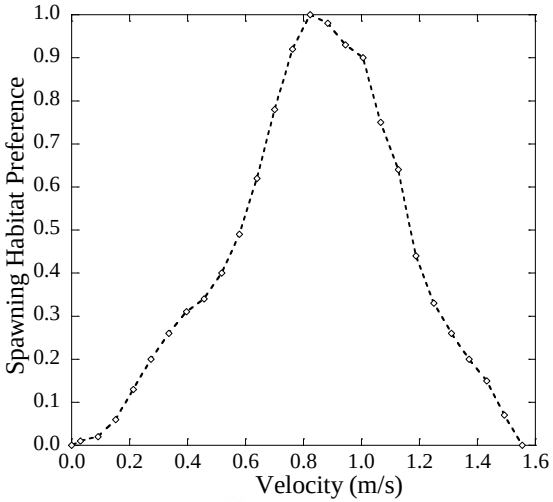
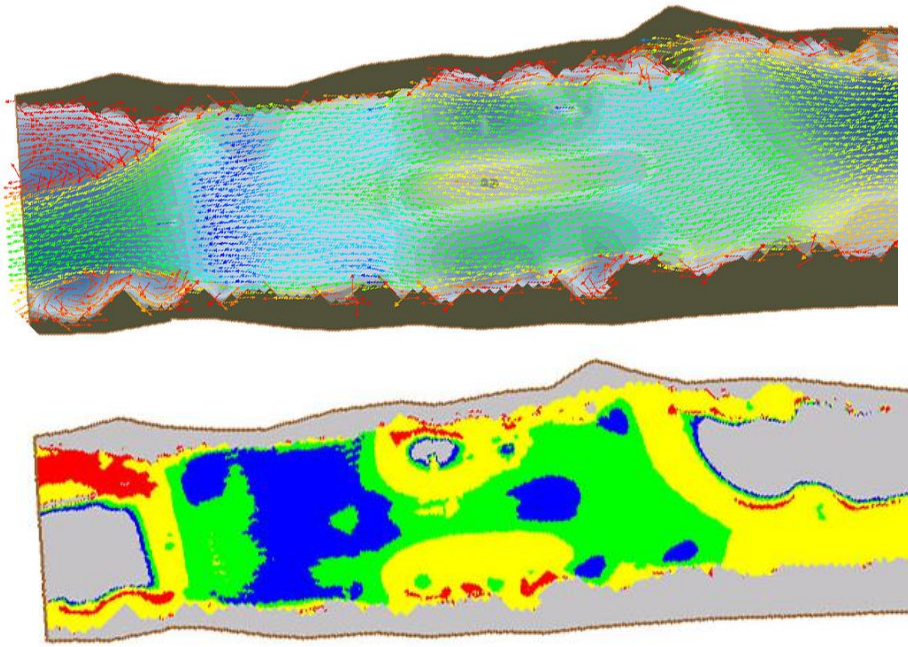


HSI MODELS

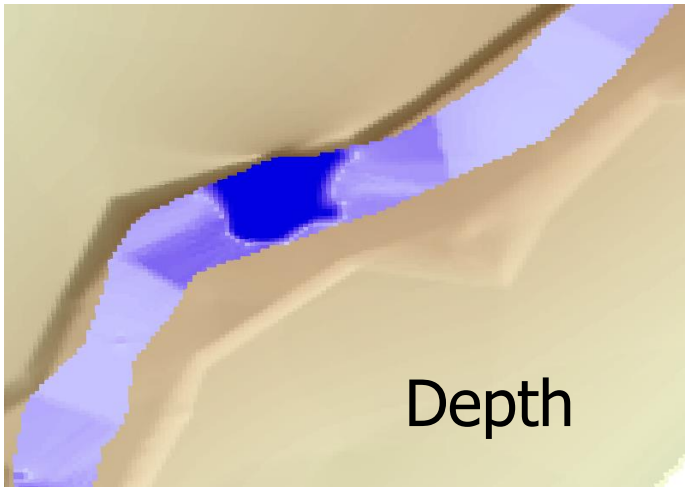


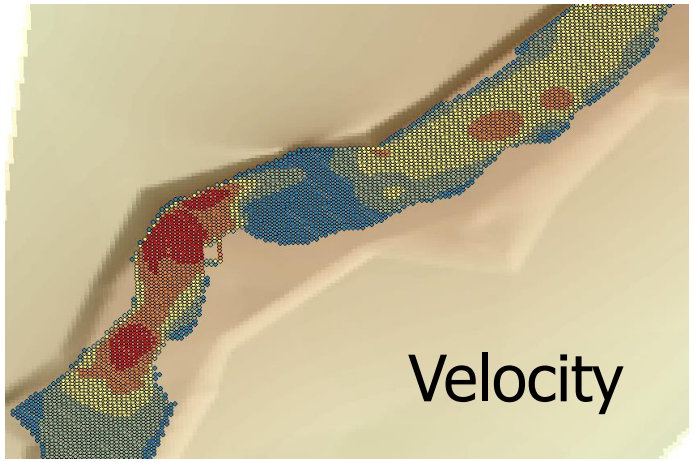


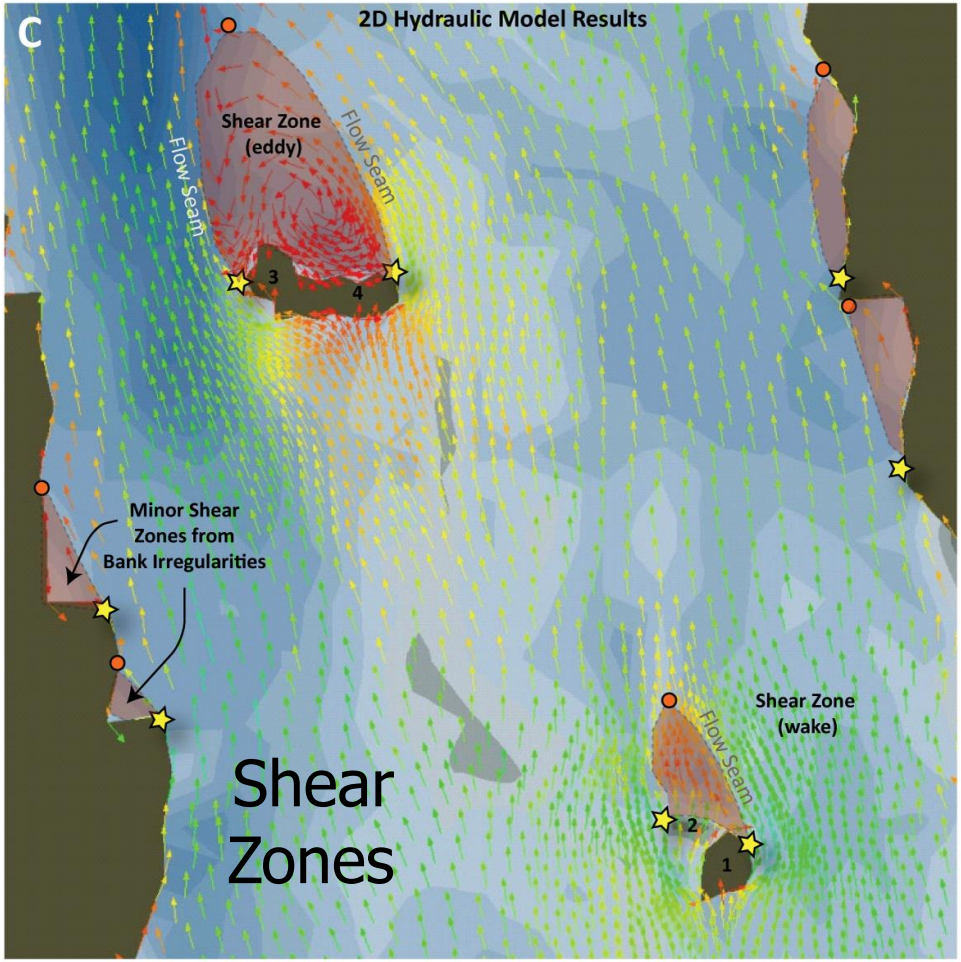
- Relate physical habitat preferences (empirically through observations) to abiotic variables
- Habitat suitability curves specific to species and life stage



SHEAR ZONE MODEL







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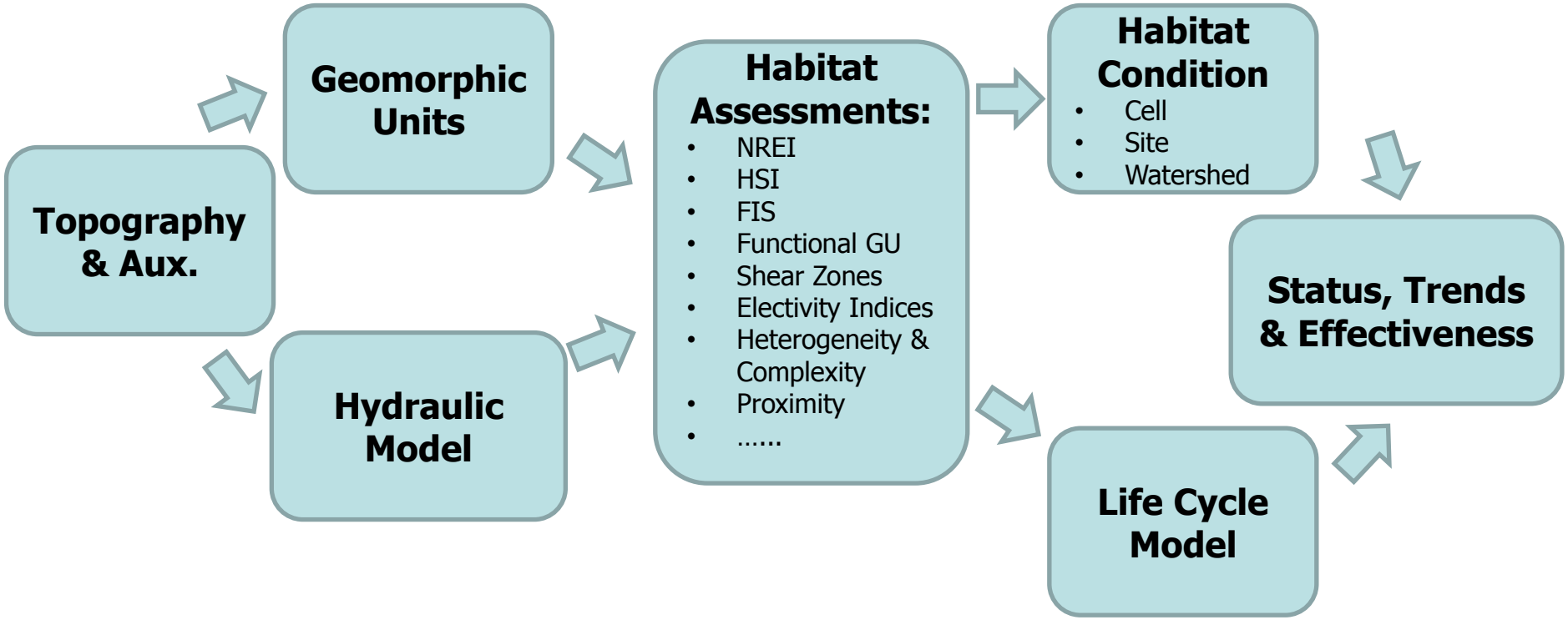
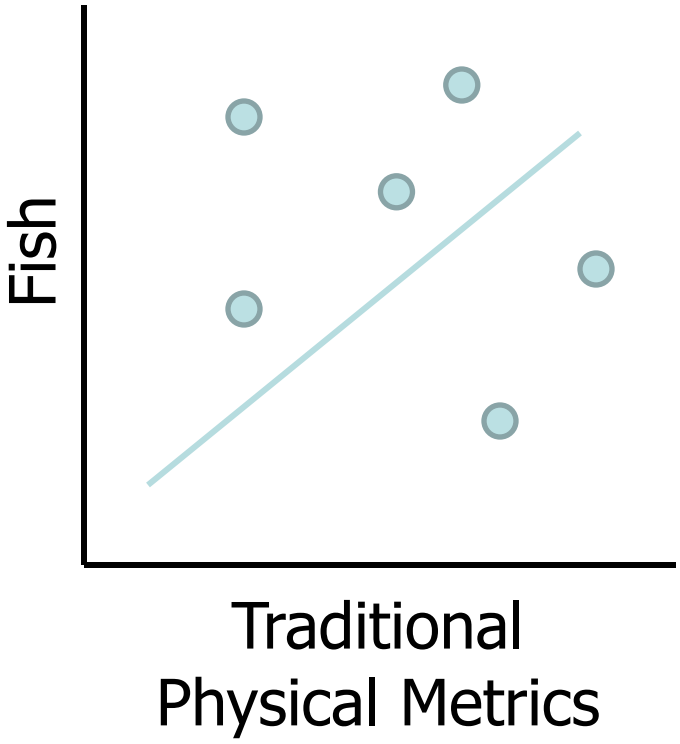
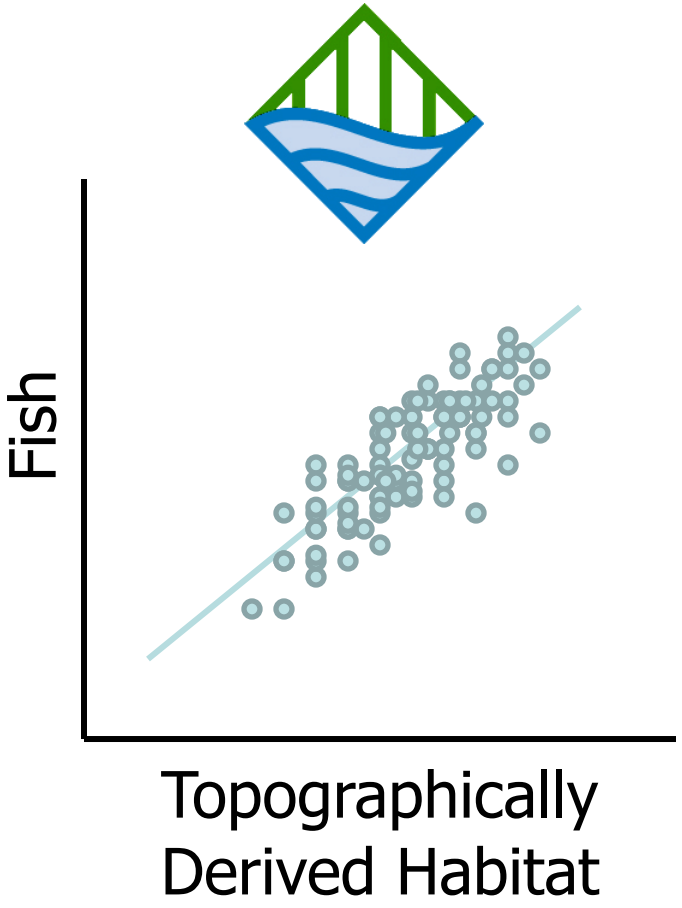
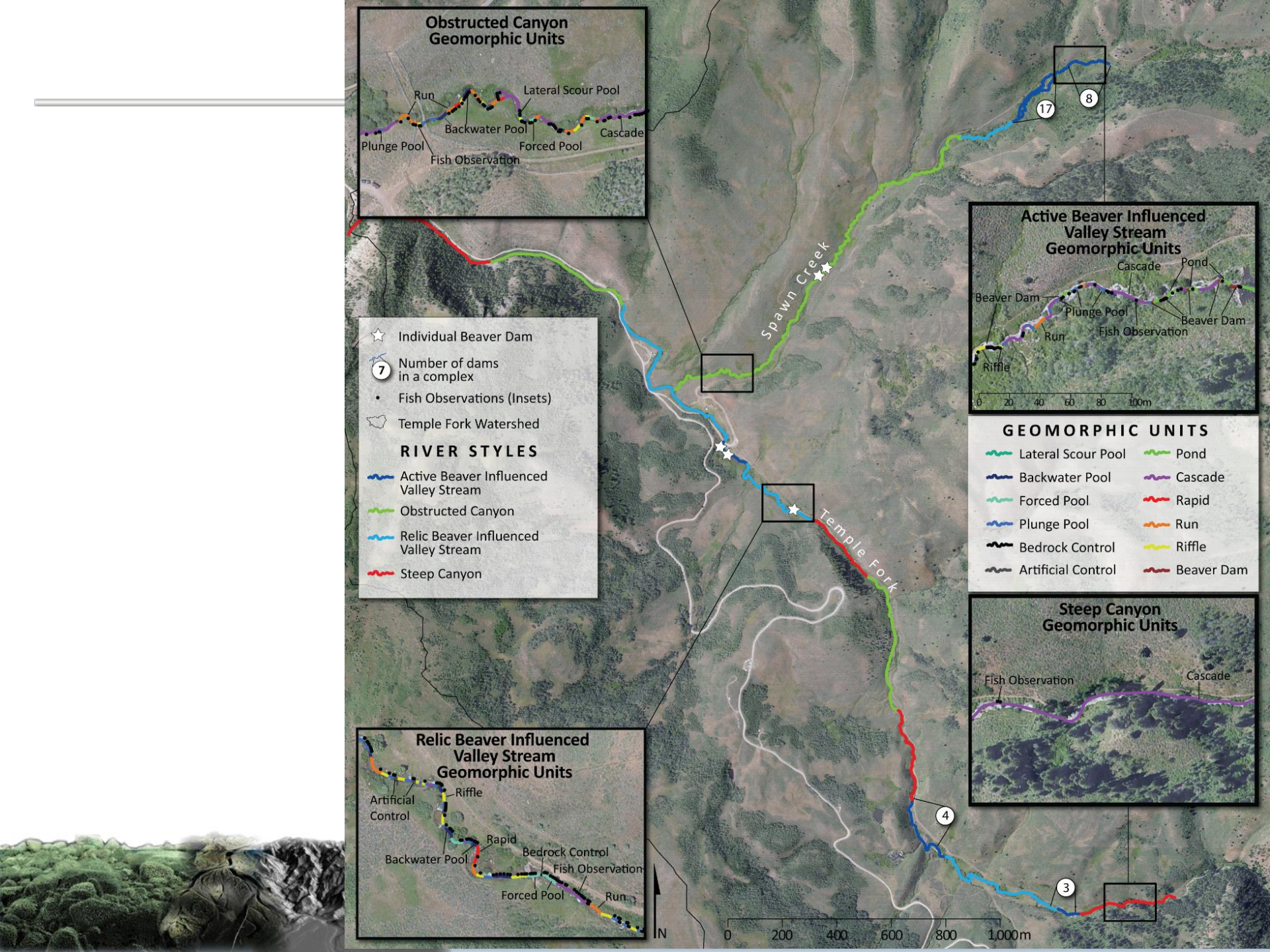


FISH HABITAT ASSOCIATIONS






Obstructed Canyon Geomorphic Units
Run
Lateral Scour Pool
Backwater Pool
Cascade
Plunge Pool
Forced Pool
Fish Observation
Active Beaver Influenced Valley Stream Geomorphic Units
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Pond
Beaver Dam
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Riffle
0 20 40 60 80 100m
Spawn Creek
Temple Fork
Individual Beaver Dam
7 Number of dams in a complex
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17
8
4
3
N
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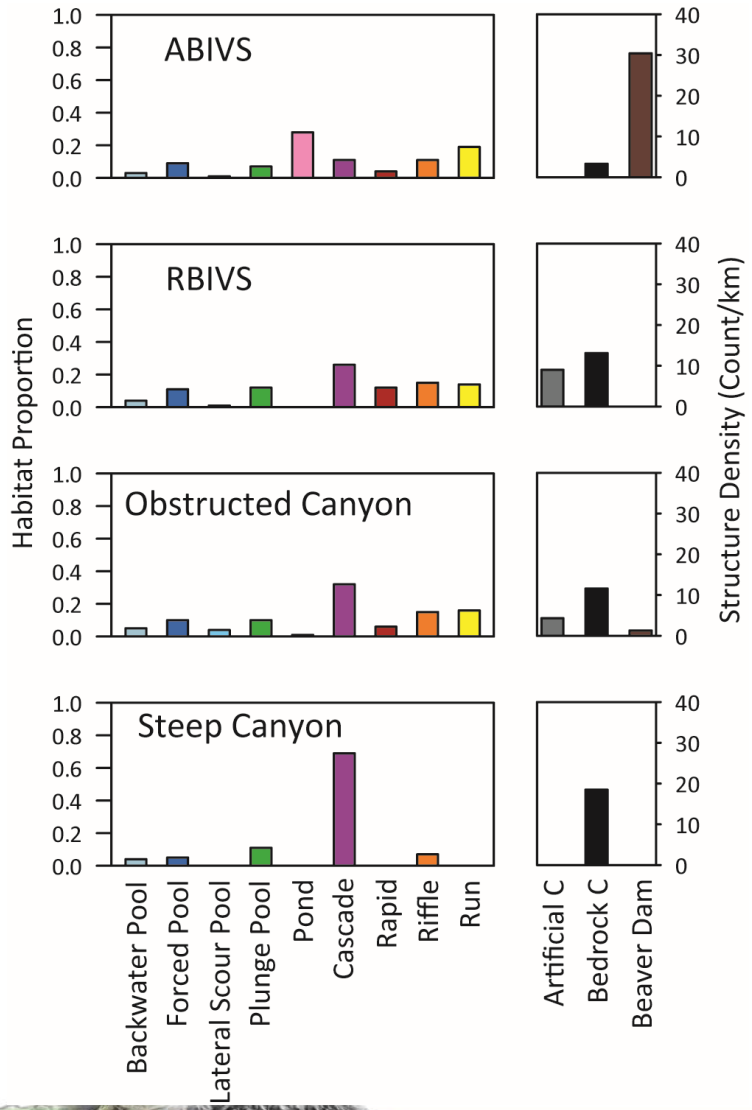
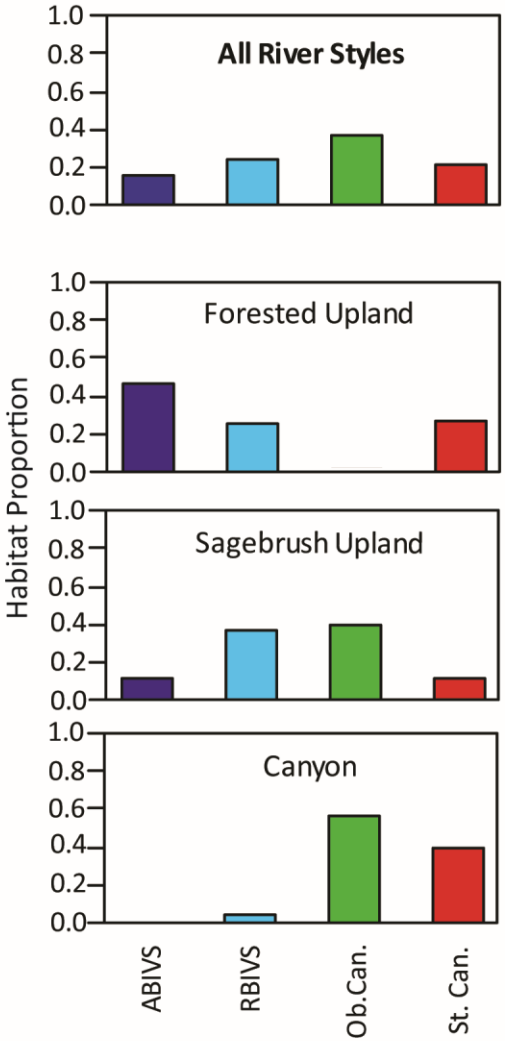
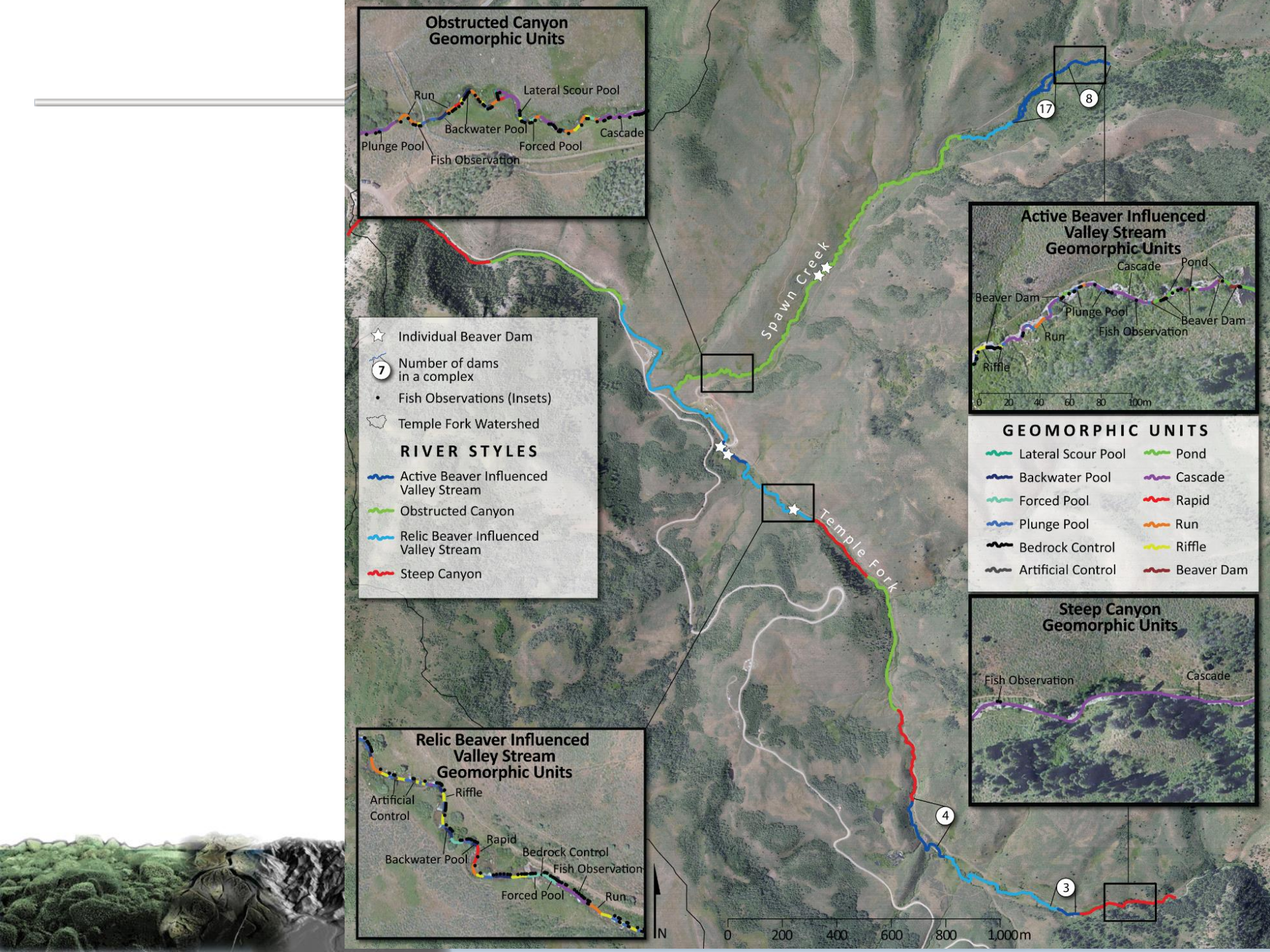
RBT CAN SUMMARIZE @ MULTIPLE SCALES



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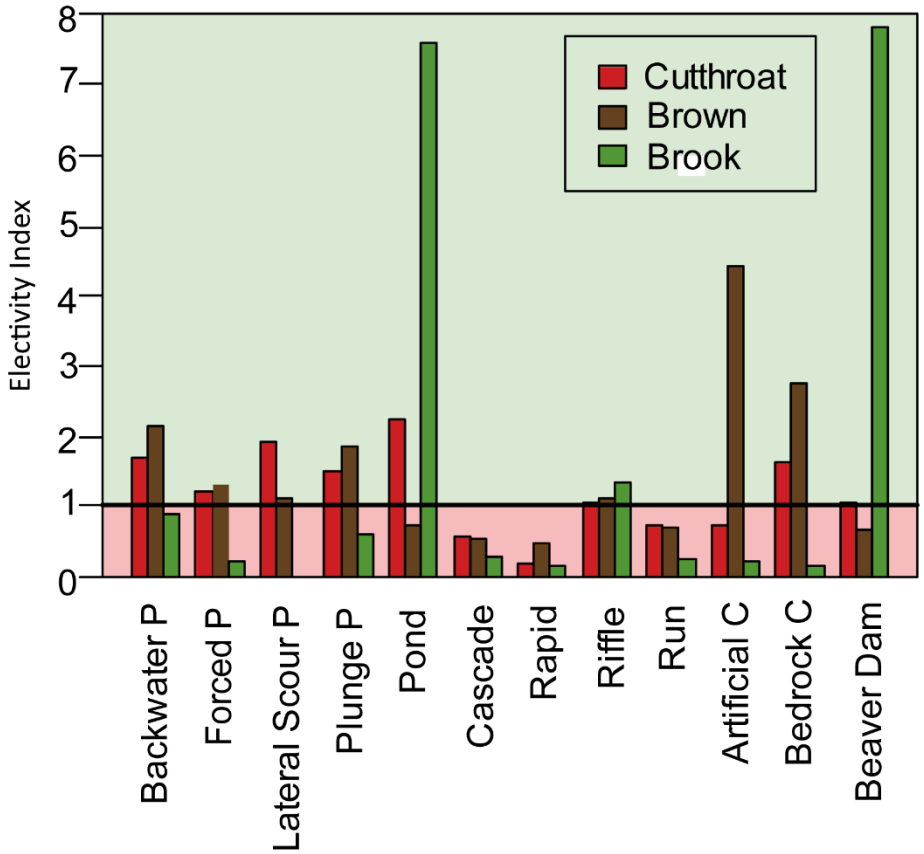
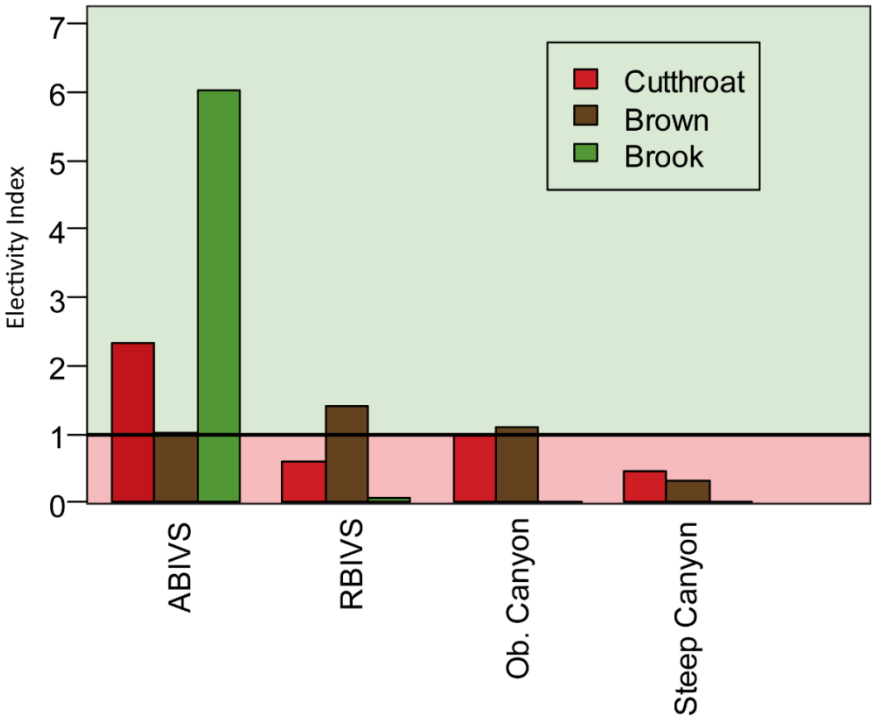
FISH ELECTIVITY INDICES

GU & SE SCALE



REACH SCALE



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