STRATEGIC RESTORATION / PRESERVATION PLANNING OF JUVENILE SALMON HABITAT BASED ON THE COLUMBIA RIVER ESTUARY ECOSYSTEM CLASSIFICATION

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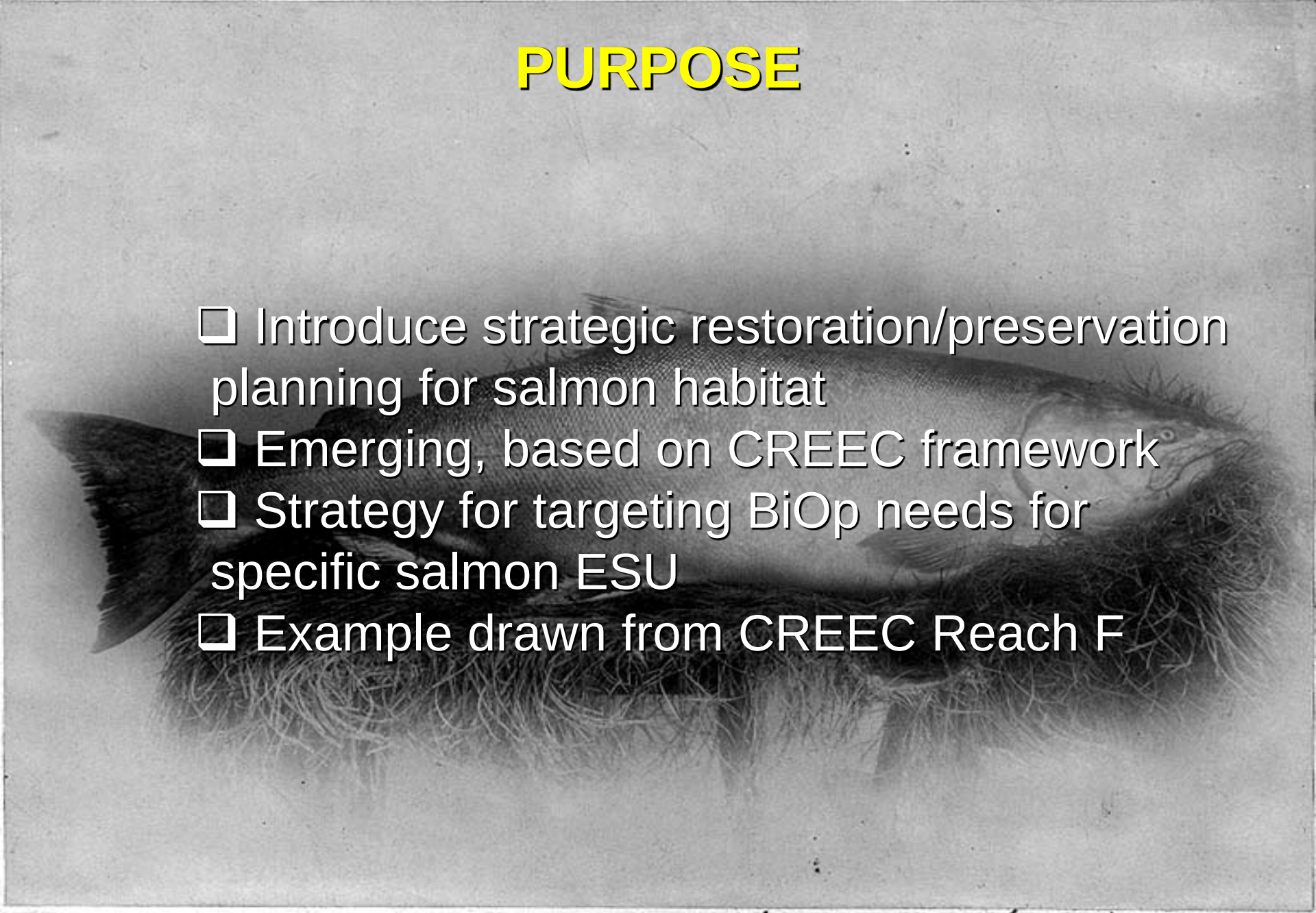
PURPOSE

- Introduce strategic restoration/preservation planning for salmon habitat
- Emerging, based on CREEC framework
- Strategy for targeting BiOp needs for specific salmon ESU
- Example drawn from CREEC Reach F



CONTRIBUTION OF ECOSYSTEM RESTORATION, ENHANCEMENT AND PROTECTION ACTIONS

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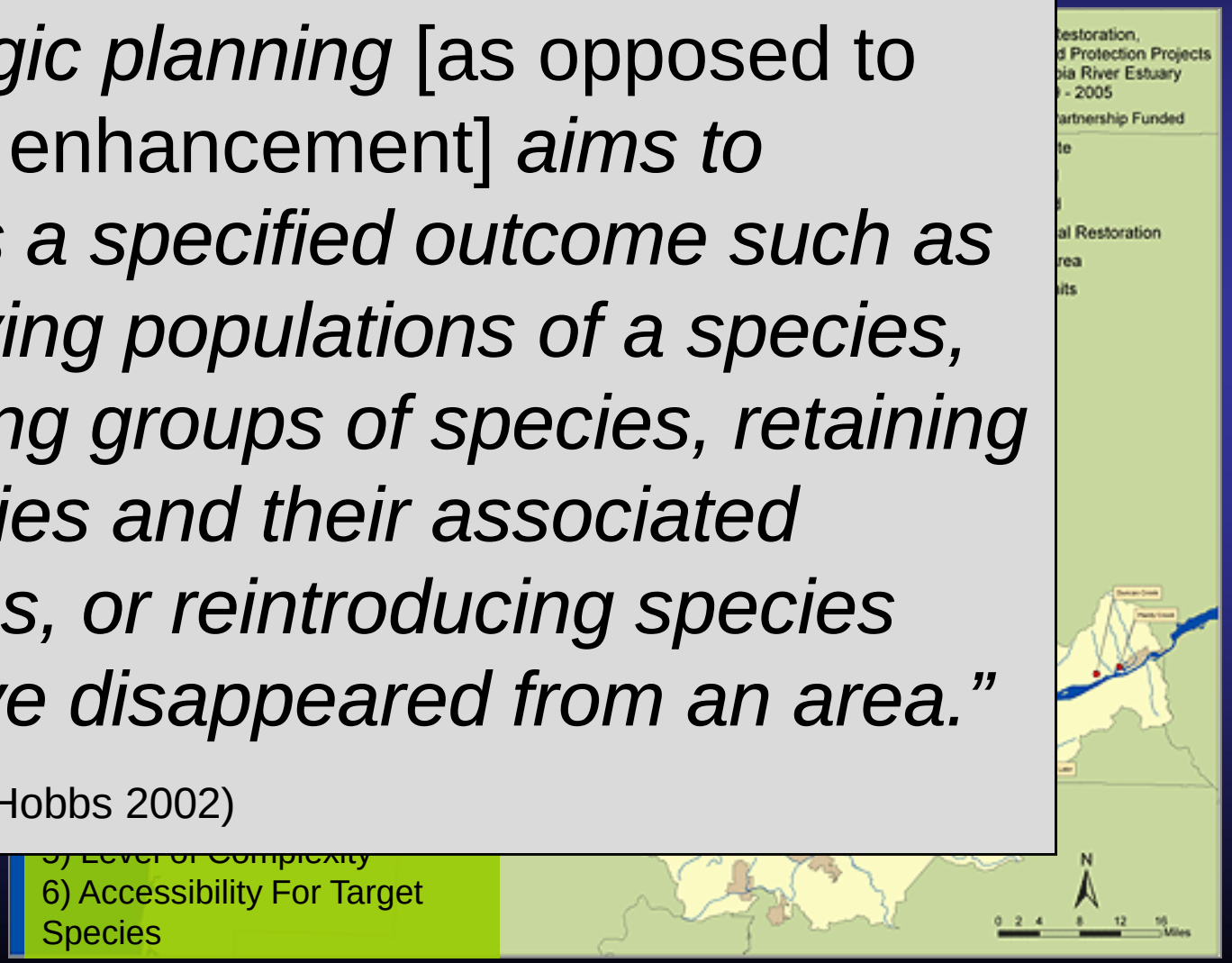
"*Strategic planning* [as opposed to general enhancement] *aims to address a specified outcome such as conserving populations of a species, protecting groups of species, retaining all species and their associated functions, or reintroducing species that have disappeared from an area.*"

(Lambreck & Hobbs 2002)



OPPORTUNISTIC AND STRATEGIC RESTORATION

Opportunistic and strategic restoration should be considered complementary not conflicting

- Opportunistic restoration
  - provides broad ecosystem benefit without particular emphasis on ecosystem functions, goods and services
  - benefits from consideration of landscape and other (e.g., constraints) context but not dependent on it
- Strategic restoration
  - important when specific ecosystem function, goods or service contingent on particular, spatially explicit habitats
  - particularly important when time and funding are limited
  - the easiest to restore are not always the 'best' to restore
- Opportunistic restoration benefits from science based screening criteria; strategic restoration/preservation requires proactive determination of needs beyond screening of "low hanging fruit"

OPPORTUNISTIC AND STRATEGIC RESTORATION AND PRESERVATION

Strategic restoration and preservation targeted towards maximizing certainty, effectiveness and sustainability

- Addresses variability in space/time distribution of juvenile salmon entering and residing in Columbia River estuary
- Location and geomorphic setting specific to ESU
- Minimize uncertainty associated with unproven actions, habitat creation, and other highly engineered approaches
- Ecosystem process-based
- spatially and ecologically integrated with preservation

APPROACH

- Structure ESU-specific occurrence by CREEC hydrogeomorphic reach; acknowledging that gaps (reaches D, E, H) being filled as we speak
- Using best science to understand (albeit weak in upper half of estuary) and relate CREEC geomorphic catena (Level 5) to juvenile salmon habitat = “fish catena”
- Use Guiding Principles to develop rules about landscape distribution
- Use spatial analysis tools (e.g., FRAGSTATS) to identify benefits and compare alternatives
- External peer-review

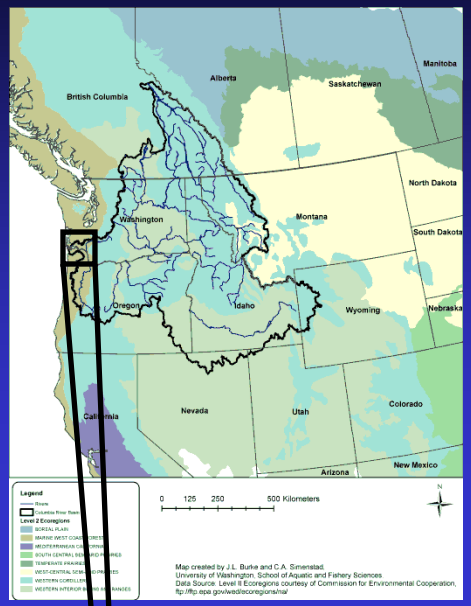
GUIDING PRINCIPLES

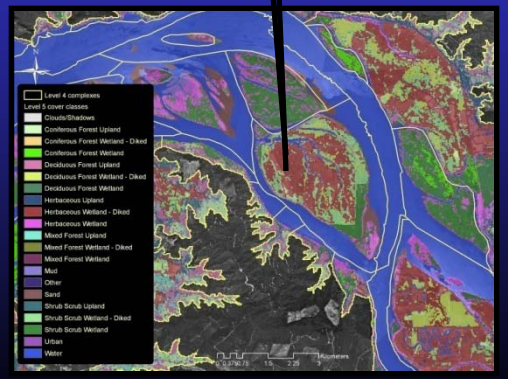
General principles are based on landscape ecology and ecosystem restoration science specifically applicable to ESU-specific salmon habitat

- Conserve intact ecosystem mosaics that constitute viable salmon habitat
  - Conserve /restore key salmon ecotones and connectivity
  - Maximize size of ecosystems that are optimum salmon habitat or prey resource production
  - Maximize ecosystem heterogeneity
  - Maximize shoreline ecotone width and length
  - Conserve/restore natural disturbance regime

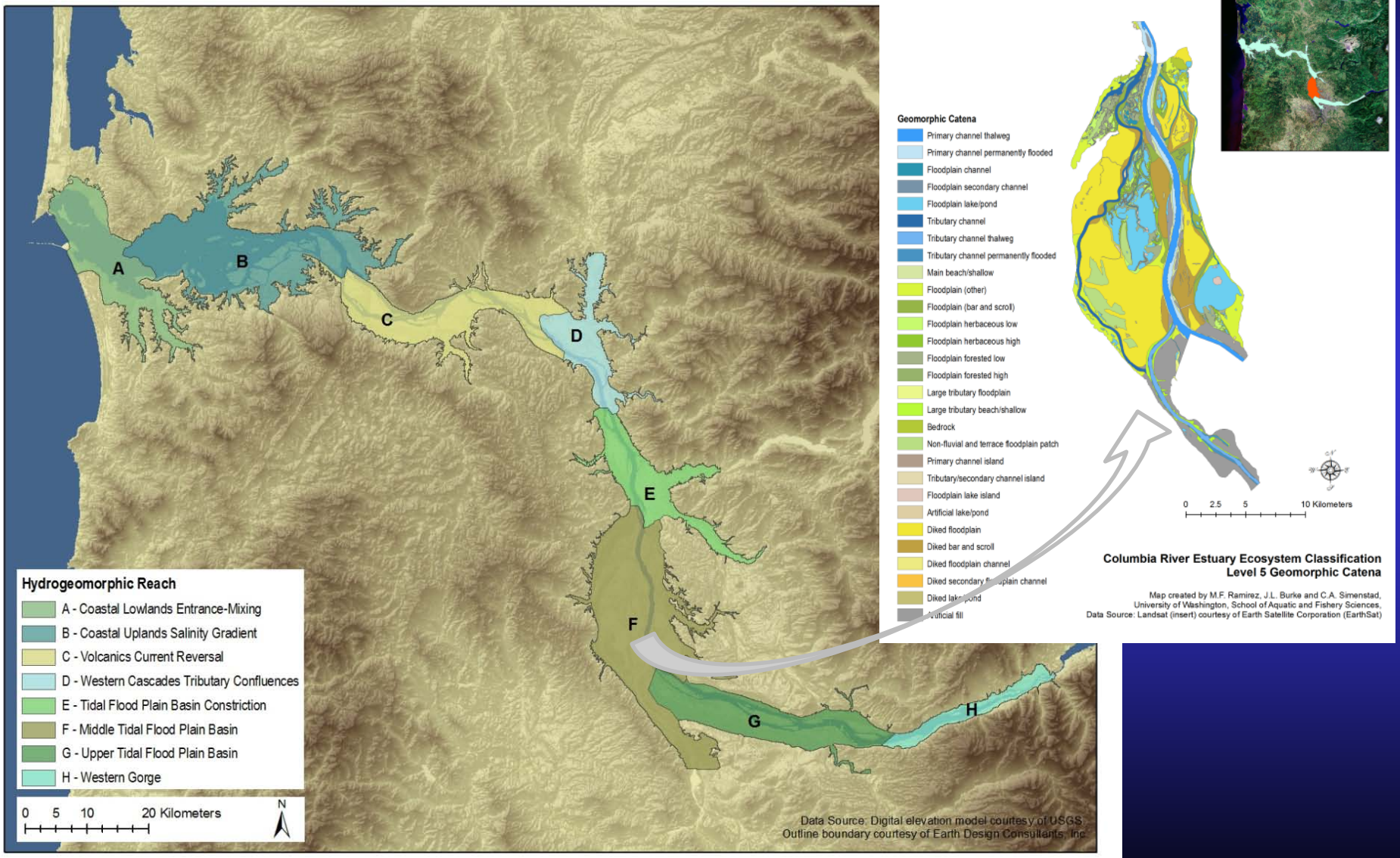
COLUMBIA RIVER ESTUARY ECOSYSTEM CLASSIFICATION

Level 1: Ecosystem Province
Level 2: Ecoregion
Level 3: Hydrogeomorphic Reach
Level 4: Ecosystem Complex
Level 5: Geomorphic Catena
Level 6: Primary Cover Class

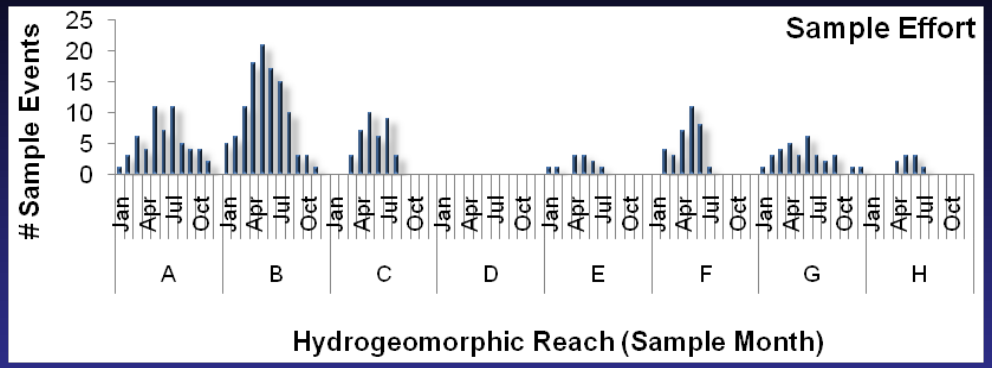


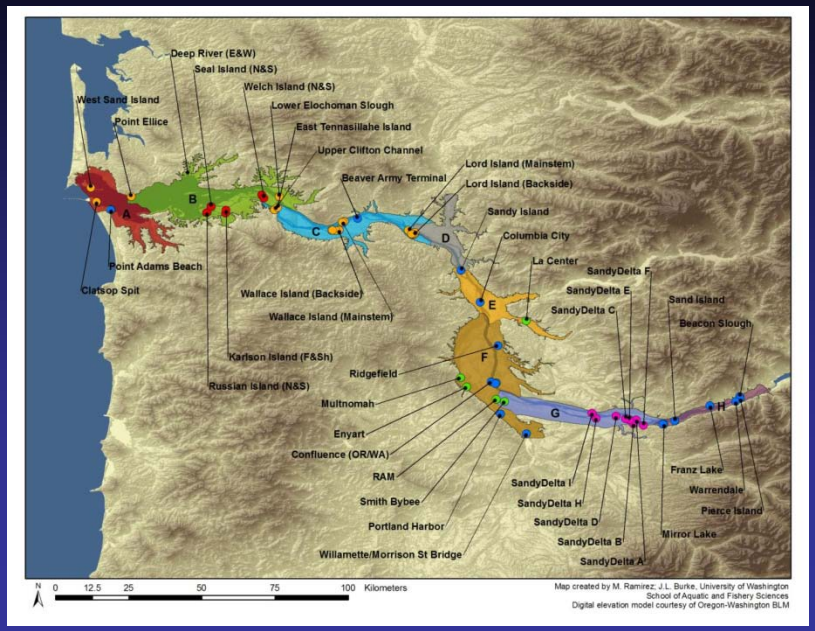


COLUMBIA RIVER ESTUARY ECOSYSTEM CLASSIFICATION: Levels 3 - 5



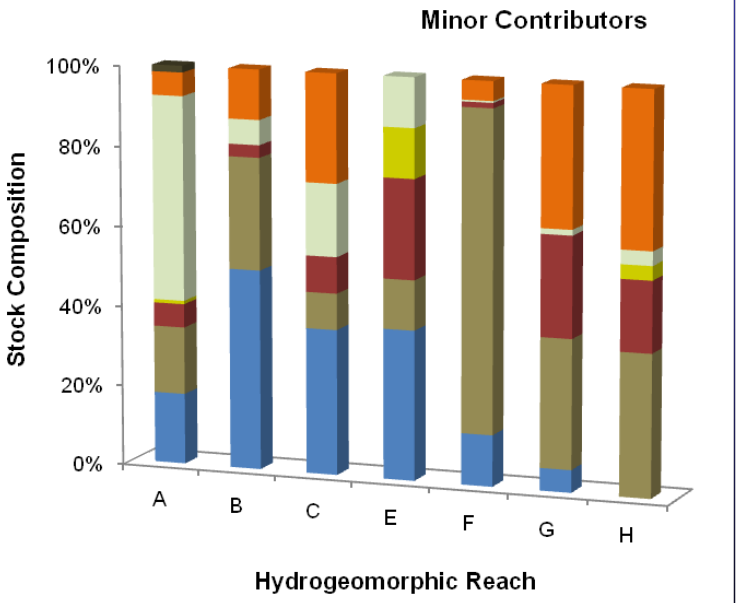
ESU-SPECIFIC OCCURRENCE BY CREEC HYDROGEOMORPHIC REACH

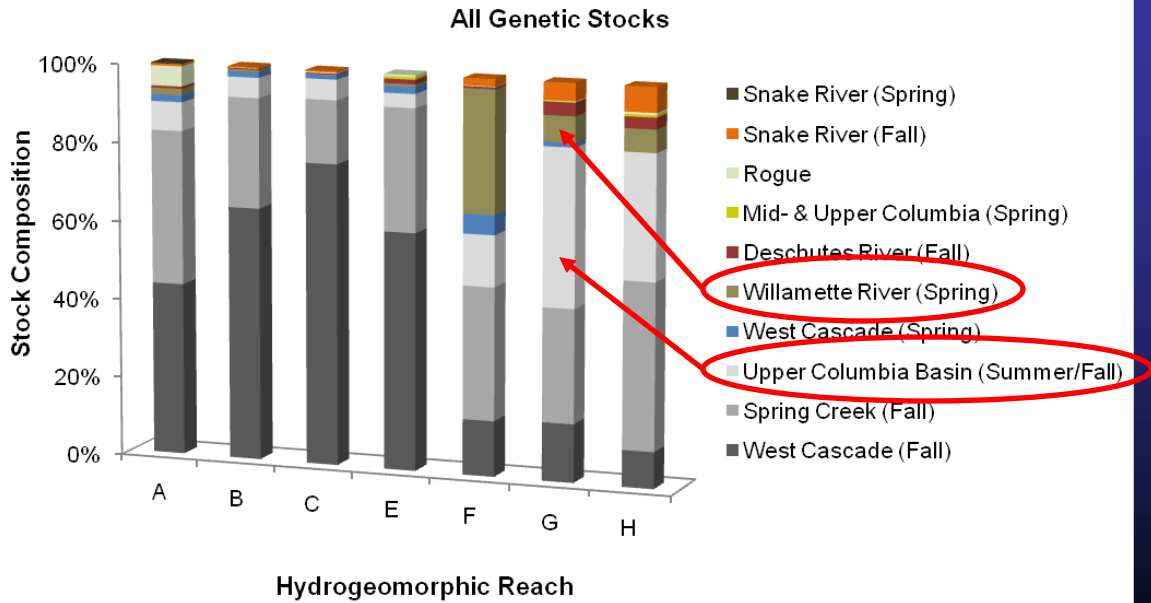




Dominant Stocks

West Cascade (Fall), Spring Creek (Fall), and Upper Columbia Basin (Summer/Fall) account for approximately 52%, 30%, and 9% respectively of all samples.

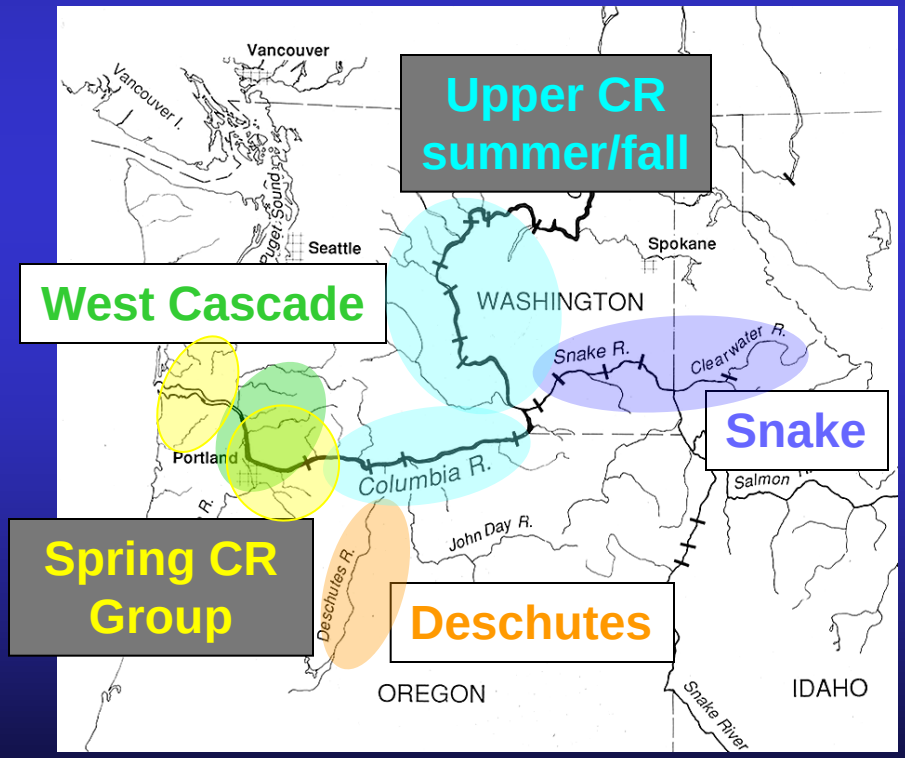




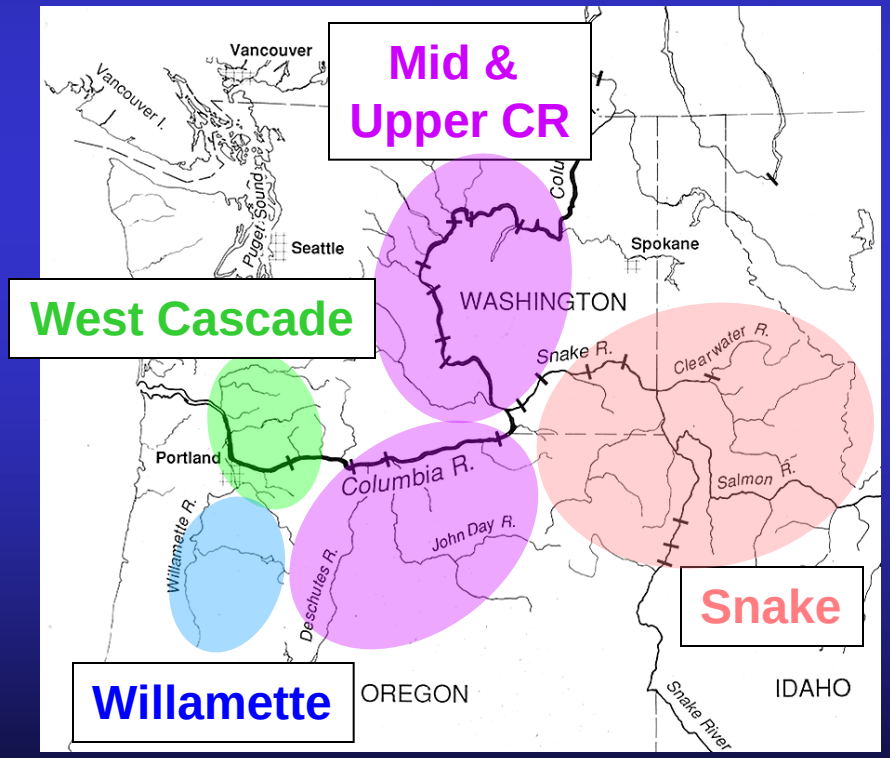
COLUMBIA RIVER BASIN CHINOOK SALMON

Genetic Stock Groups Resolved with GAPS Microsatellite Loci

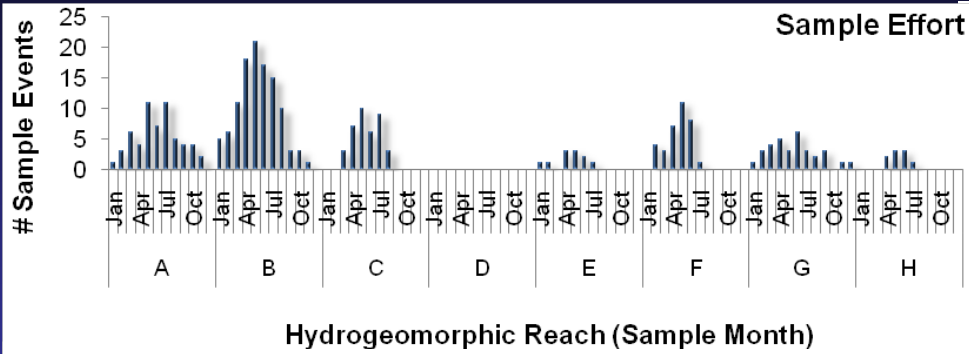
Fall Run

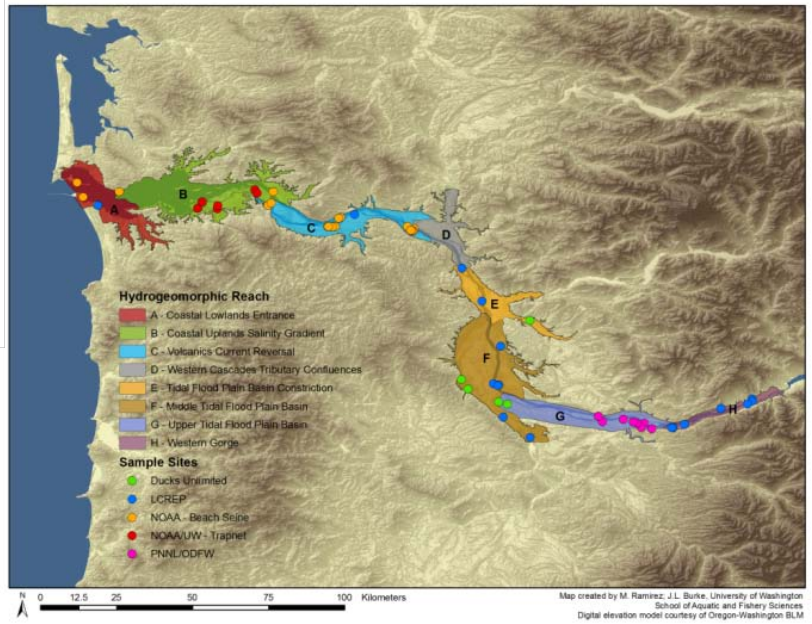


Spring Run

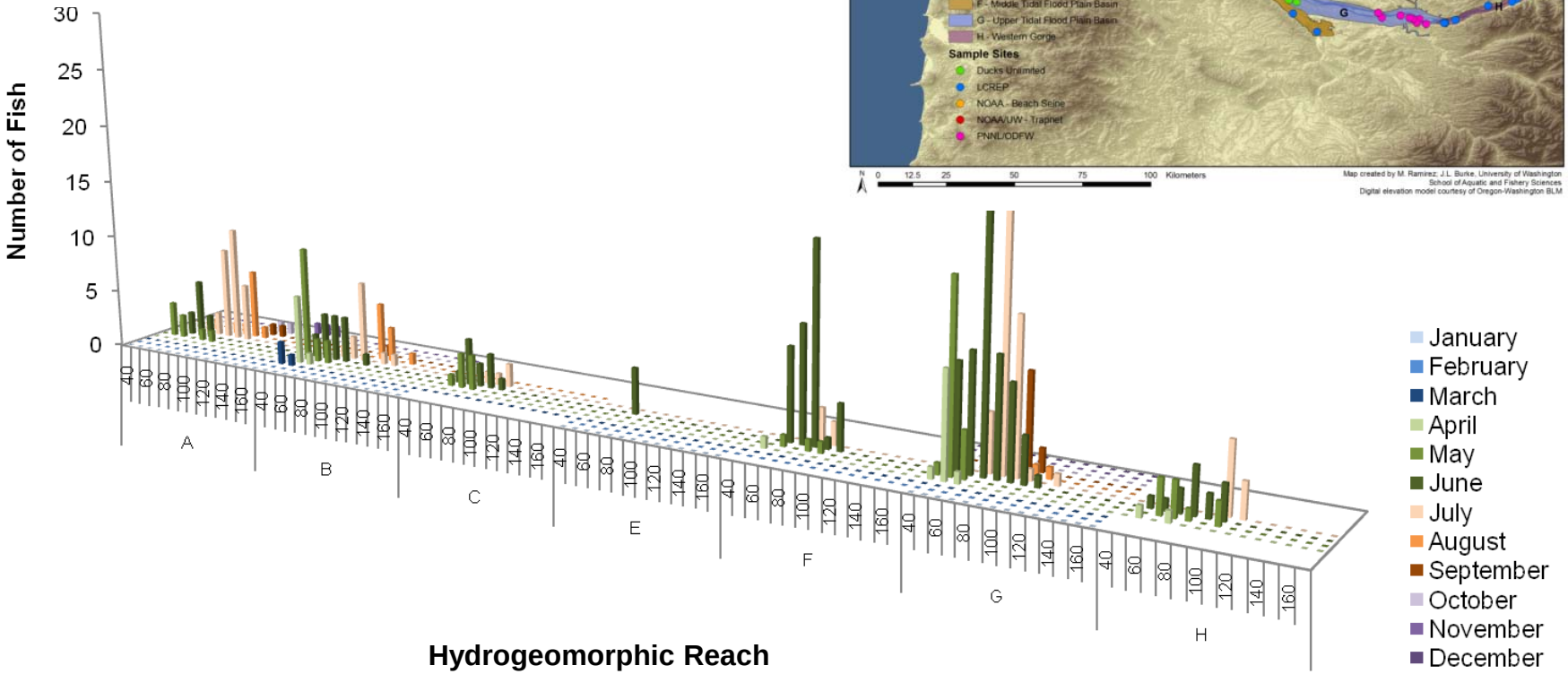


UPPER COLUMBIA BASIN (Summer/Fall) CHINOOK BY CREEC HYDROGEOMORPHIC REACH

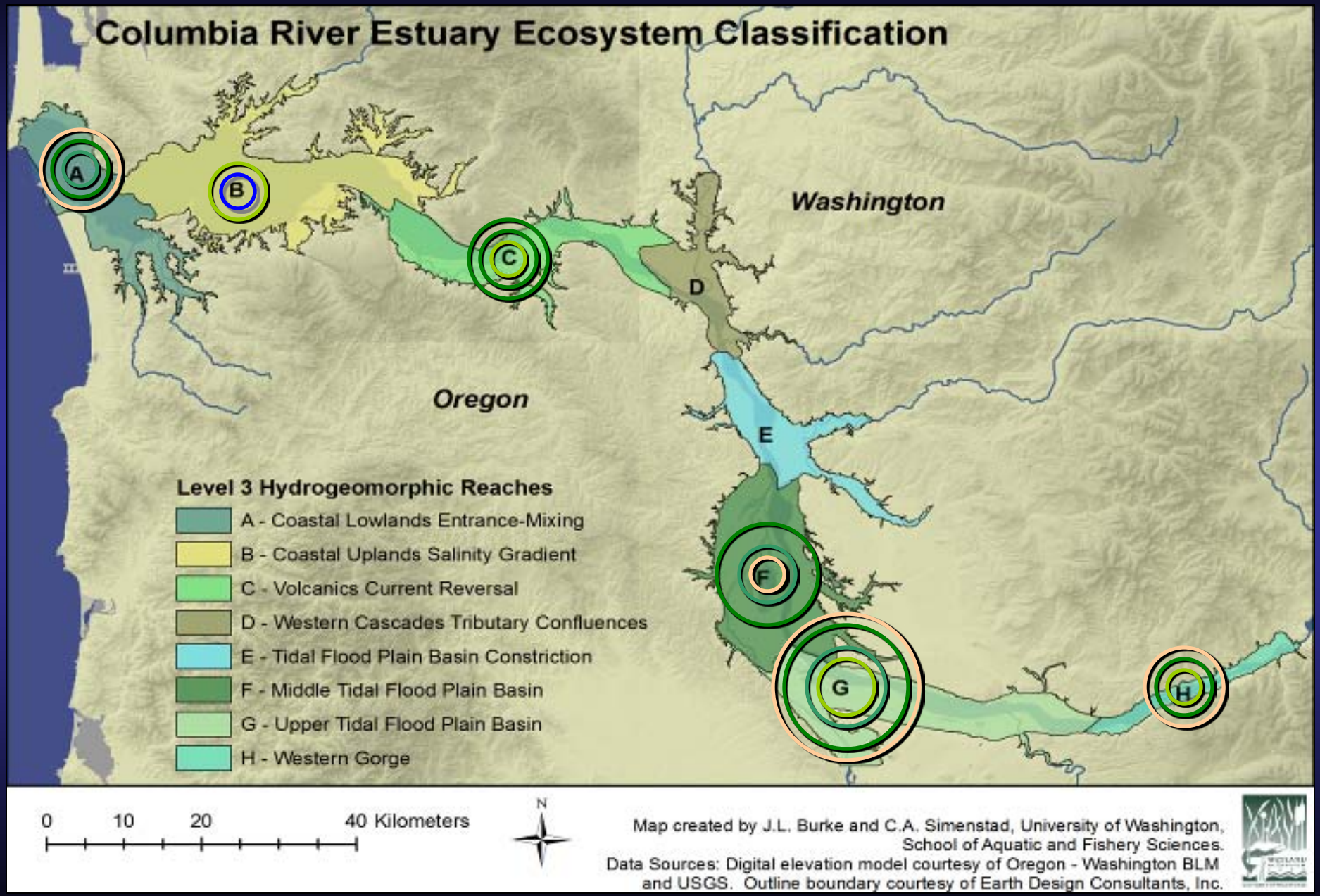




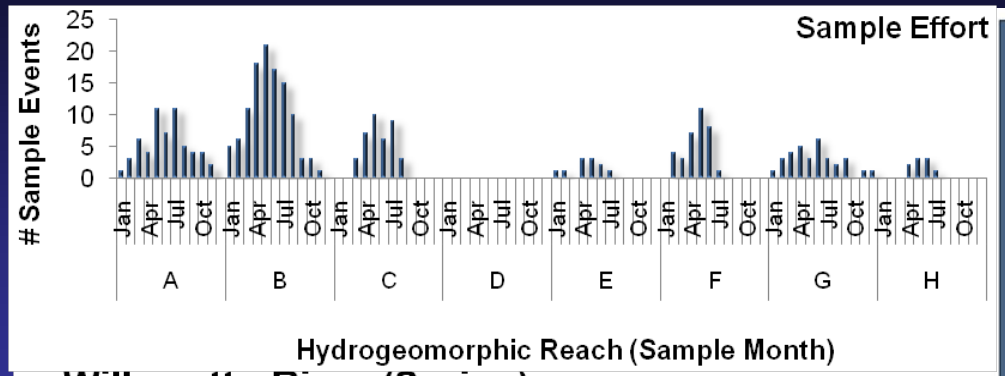
Upper Columbia Basin (Summer/Fall)

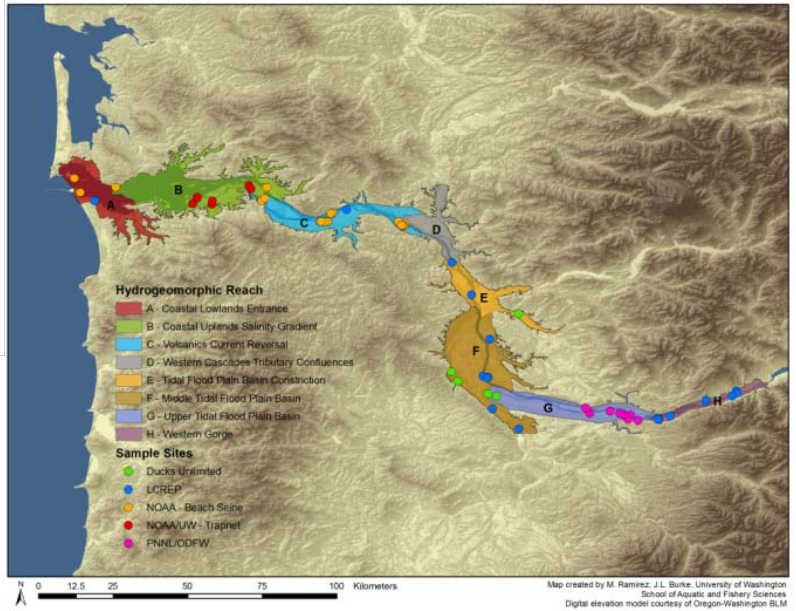


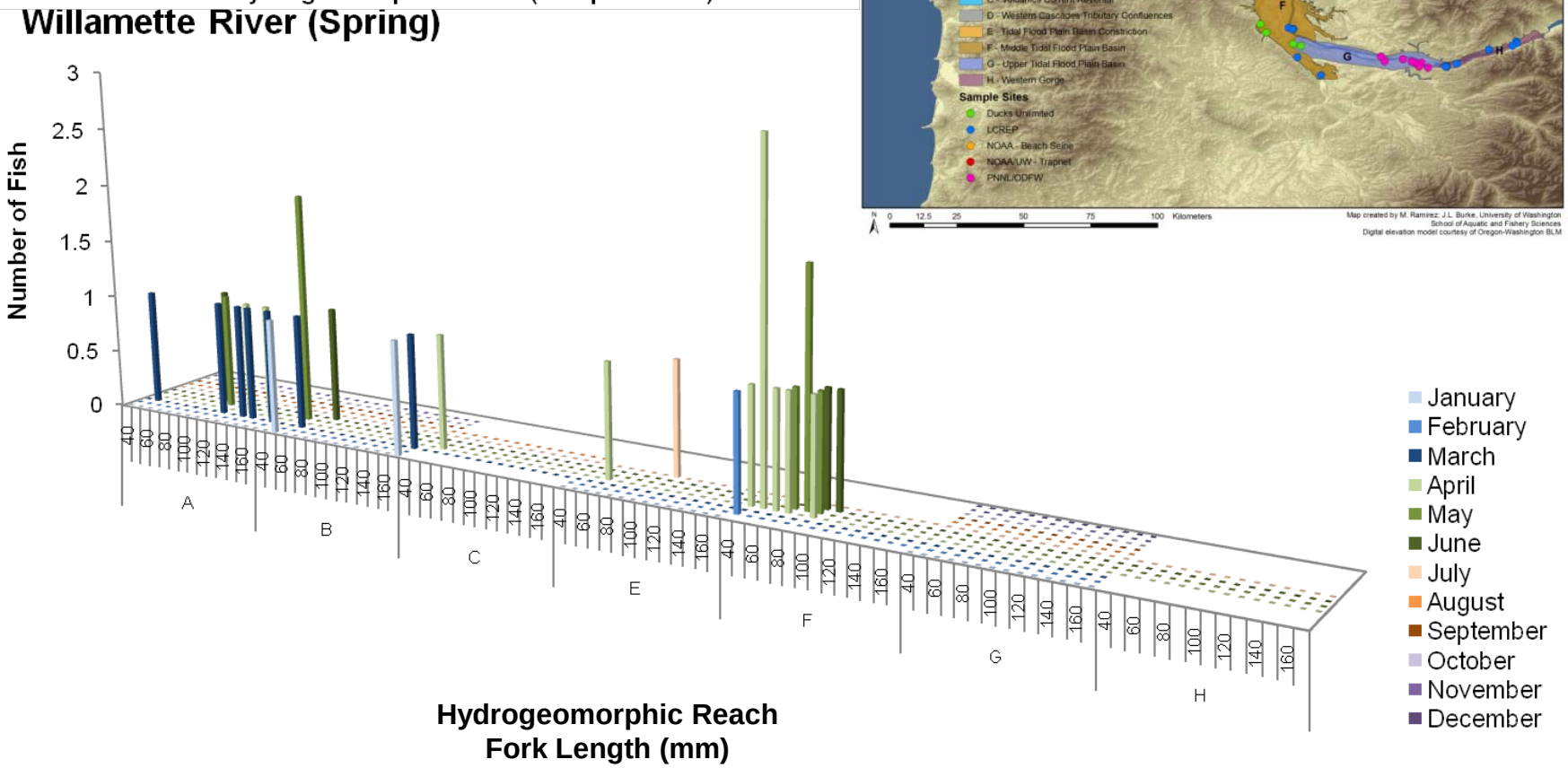
UPPER COLUMBIA BASIN (Summer/Fall) CHINOOK ESU



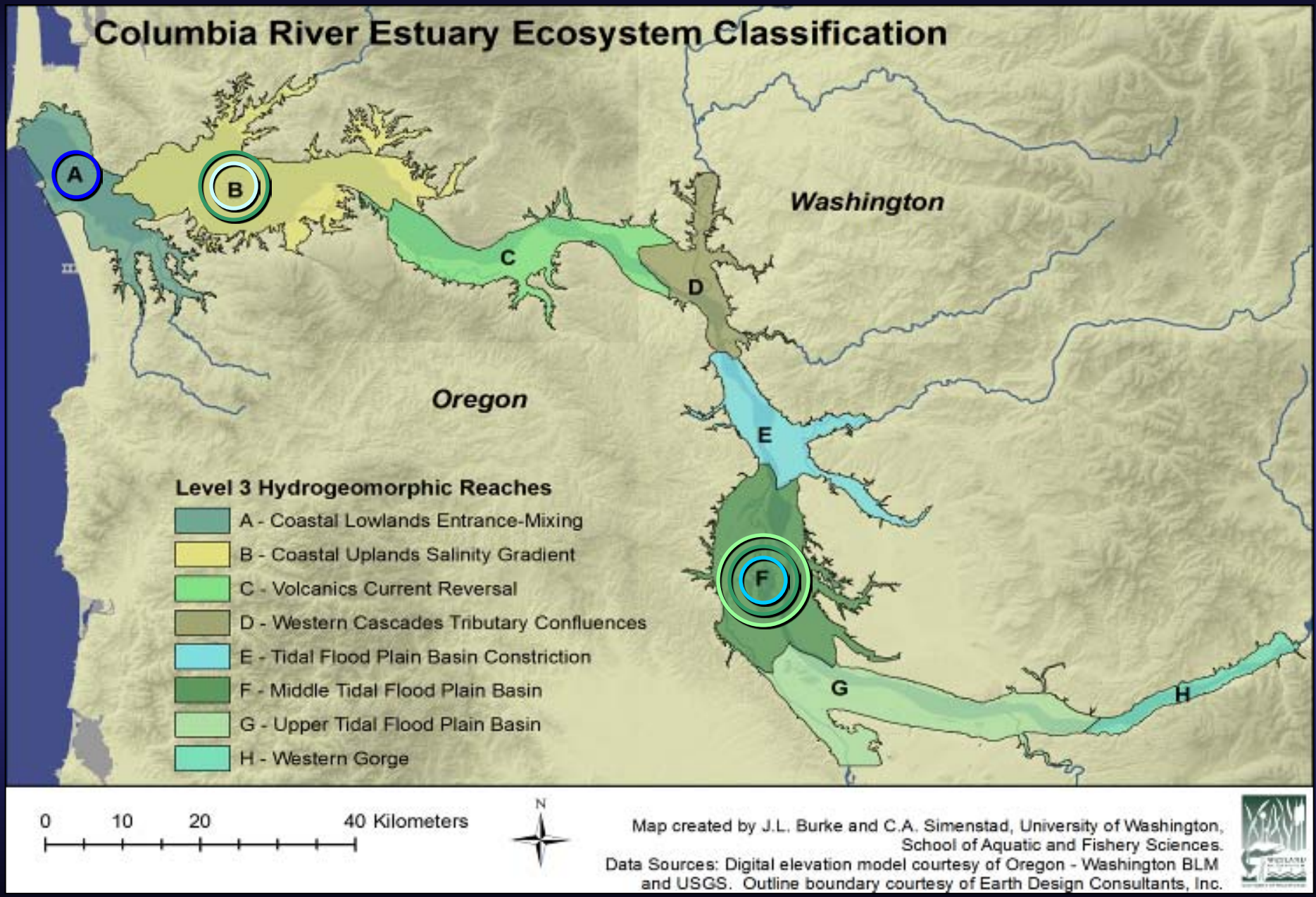
WILLAMETTE RIVER (Spring) CHINOOK ESU BY CREEC HYDROGEOMORPHIC REACH



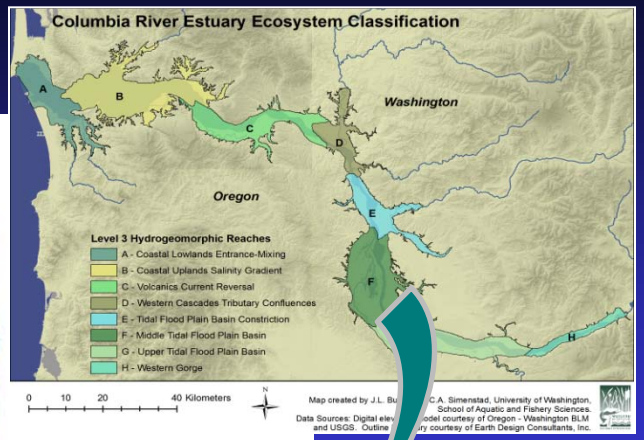


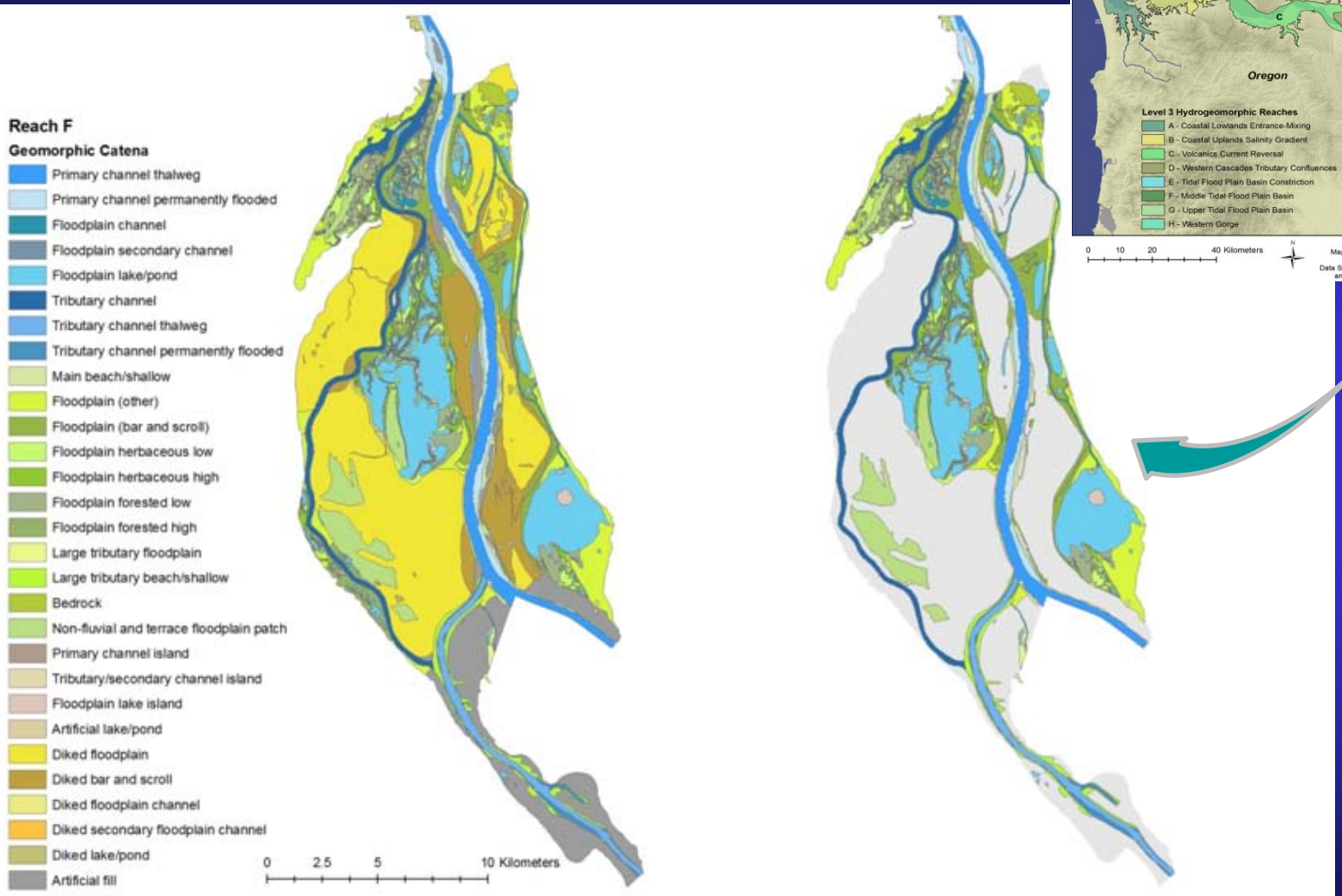


WILLAMETTE RIVER (Spring) CHINOOK ESU



HYDROGEOMORPHIC REACH F – GEOMORPHIC CATENA

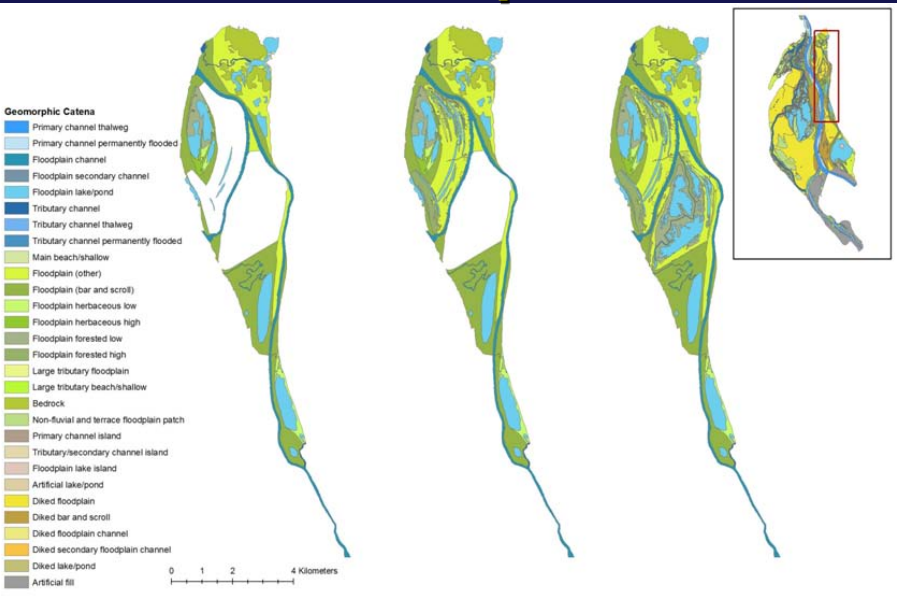




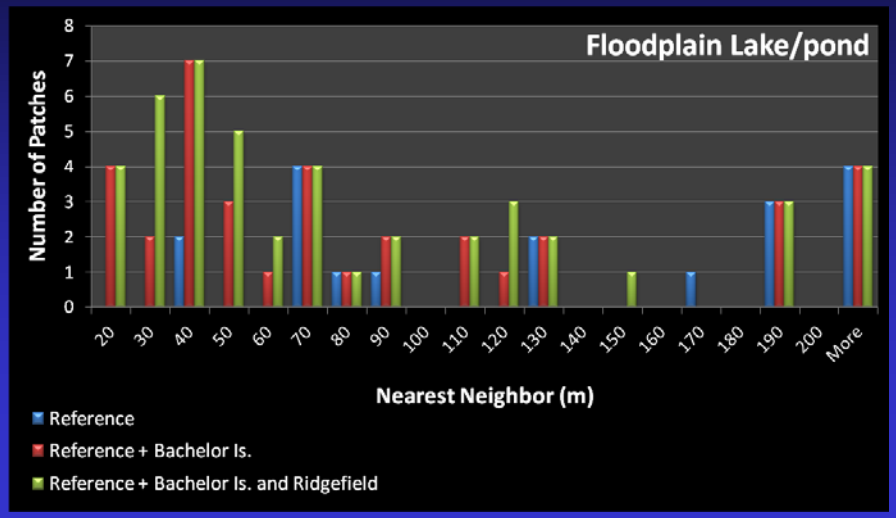
	Reach F	Reach F (available habitat)
Total Area (ha)	27,795	14,480

LANDSCAPE METRICS

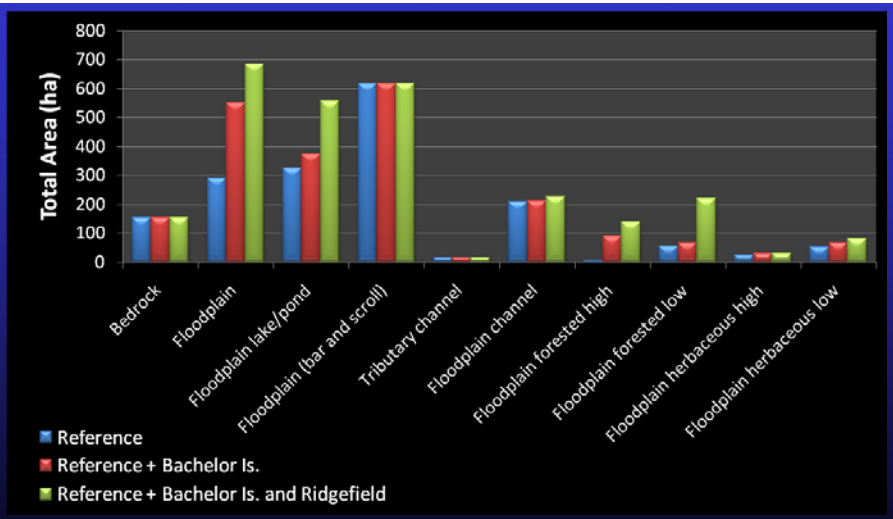
Campbell Lake Restoration Scenario

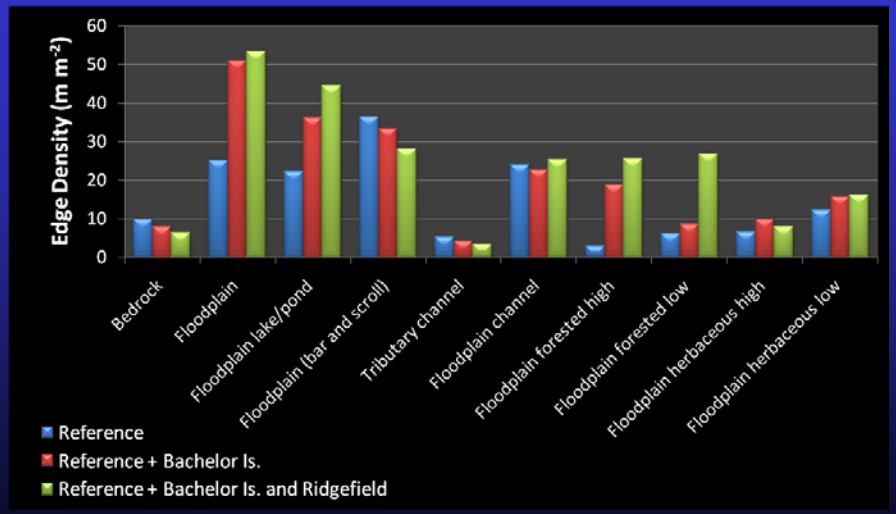


	Reference	+ Bachelor Is.	+ Bachelor Is. and Ridgefield
Total Area (ha)	1,754	2,178	2,727

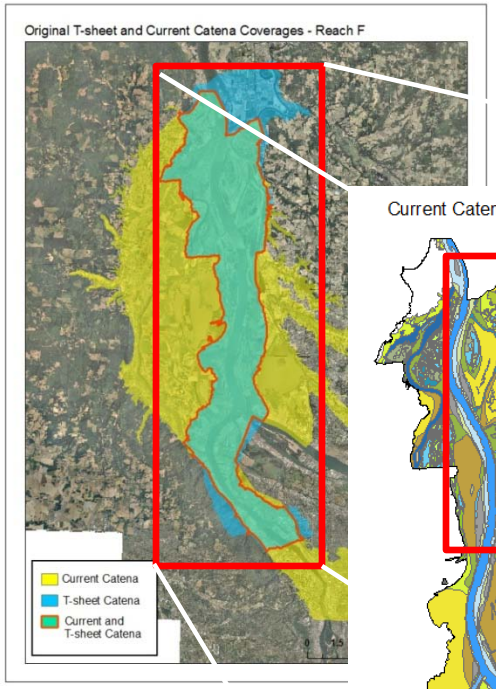


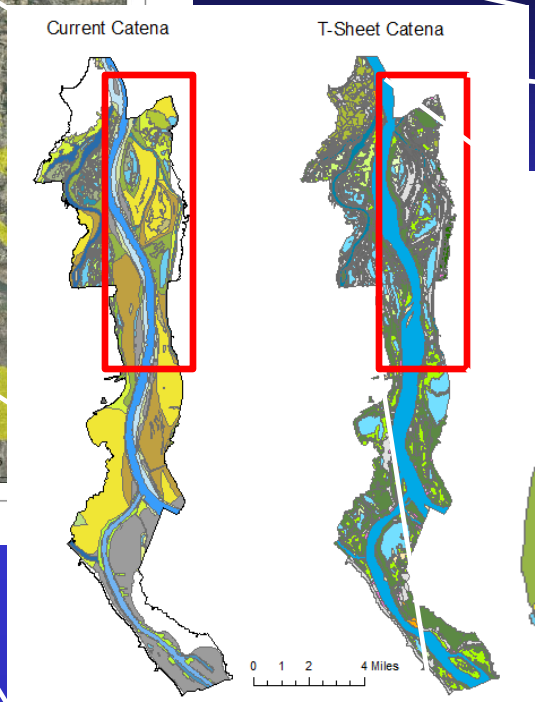
	Reference	+ Bachelor Is.	+ Bachelor Is. and Ridgefield
Mean Nearest Neighbor (m)	154.0	96.6	89.2
Standard Deviation (m)	104.4	89.7	83.2

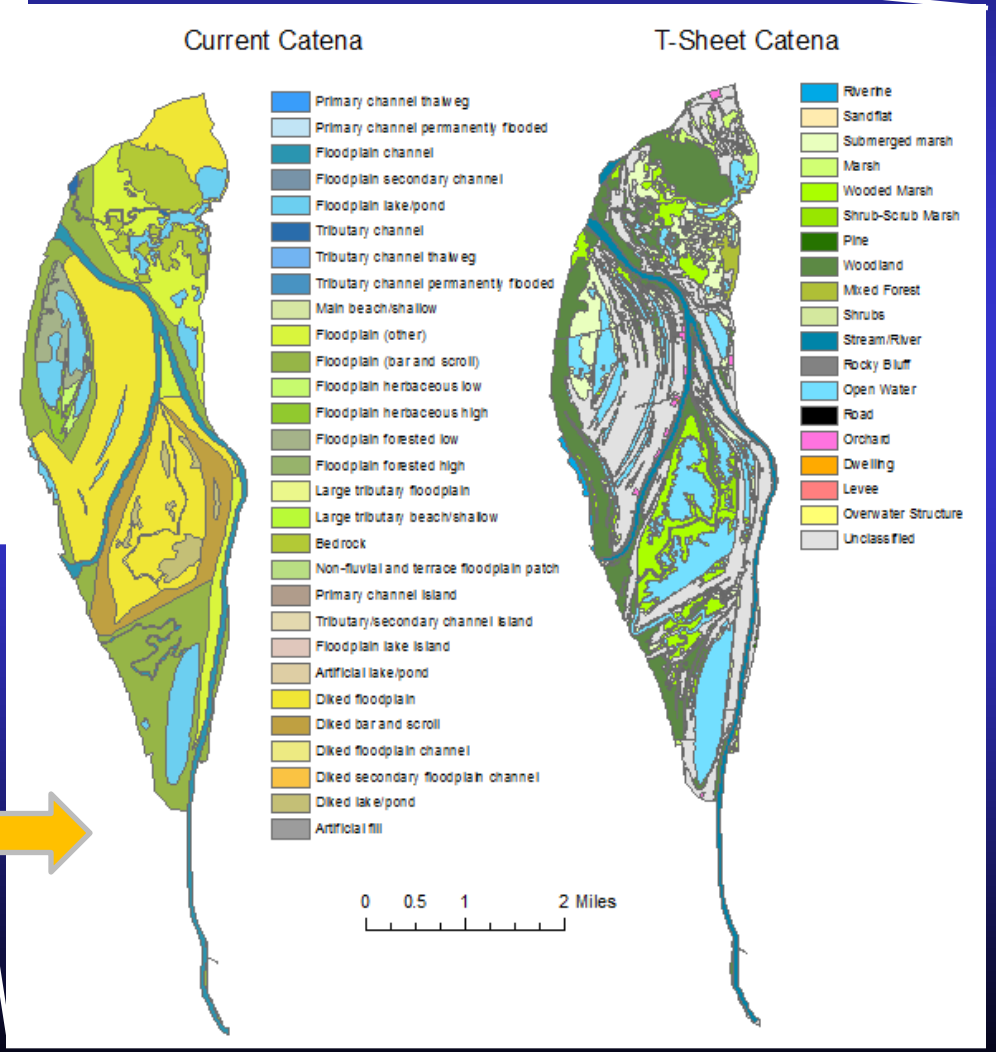




CURRENT vs. HISTORIC CATENA
Hydrogeomorphic Reach F

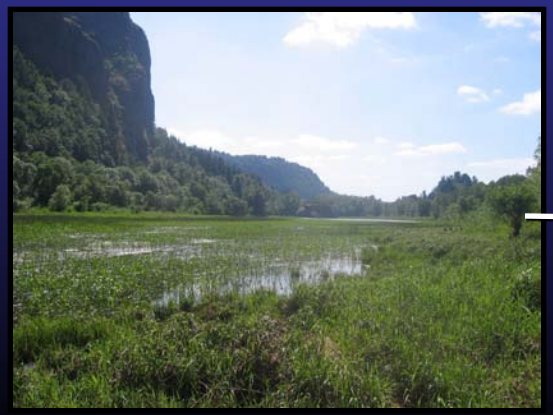






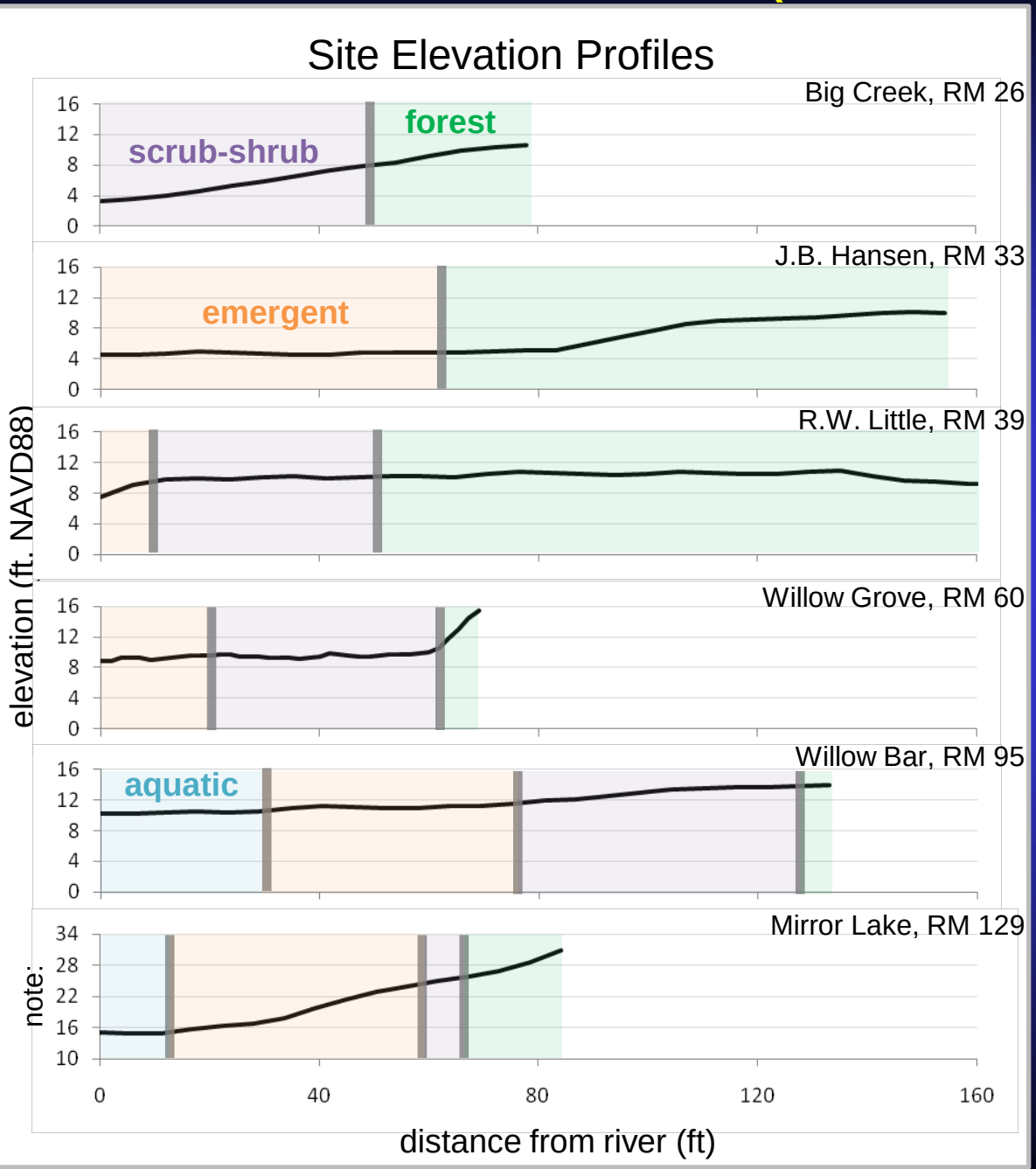
Campbell Slough Landscape Historic and Current Catena

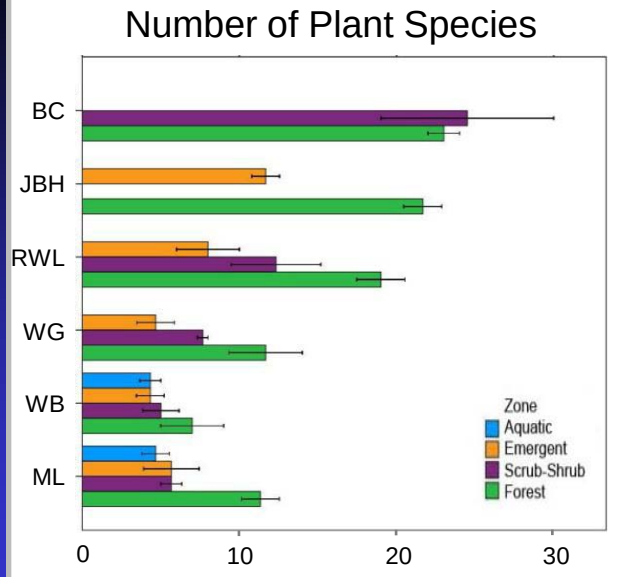
FISH CATENA EXAMPLE: Floodplain Channels Edges

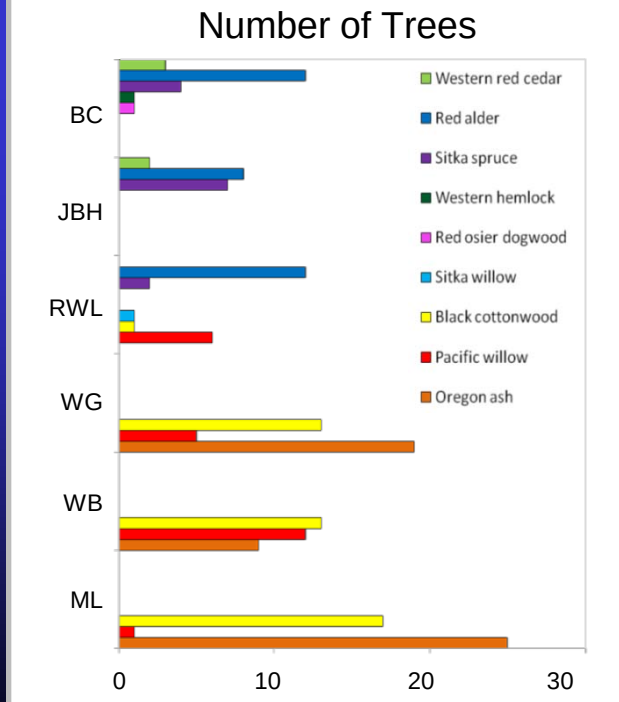


CREEC geomorphic catena that individually or as mosaic contribute to juvenile salmon survival through direct and indirect habitat contributions (e.g., opportunity, capacity, realized function): examples of tidal freshwater forested communities from Johnson (2010)

EXAMPLE FISH CATENA (Johnson 2010)

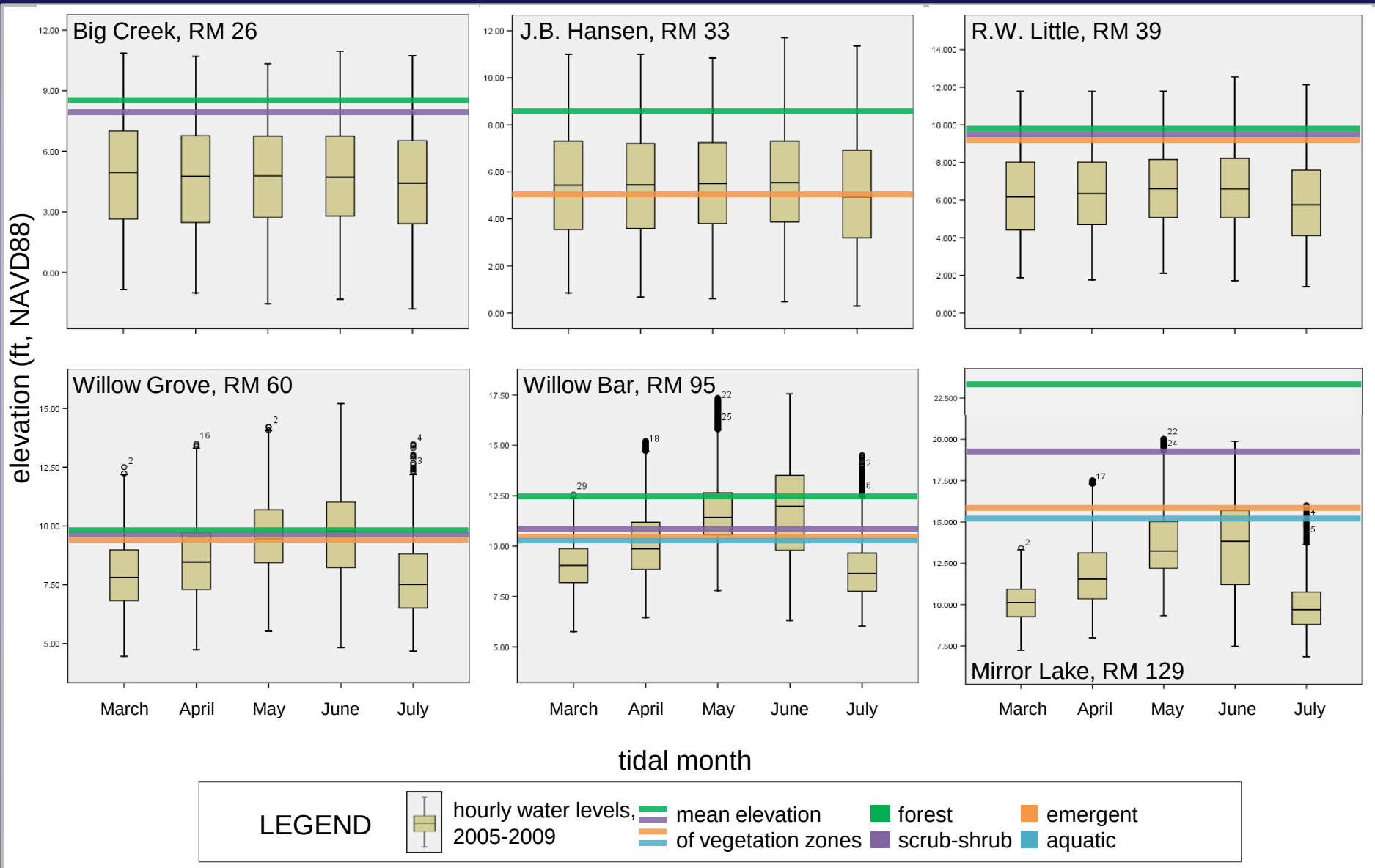






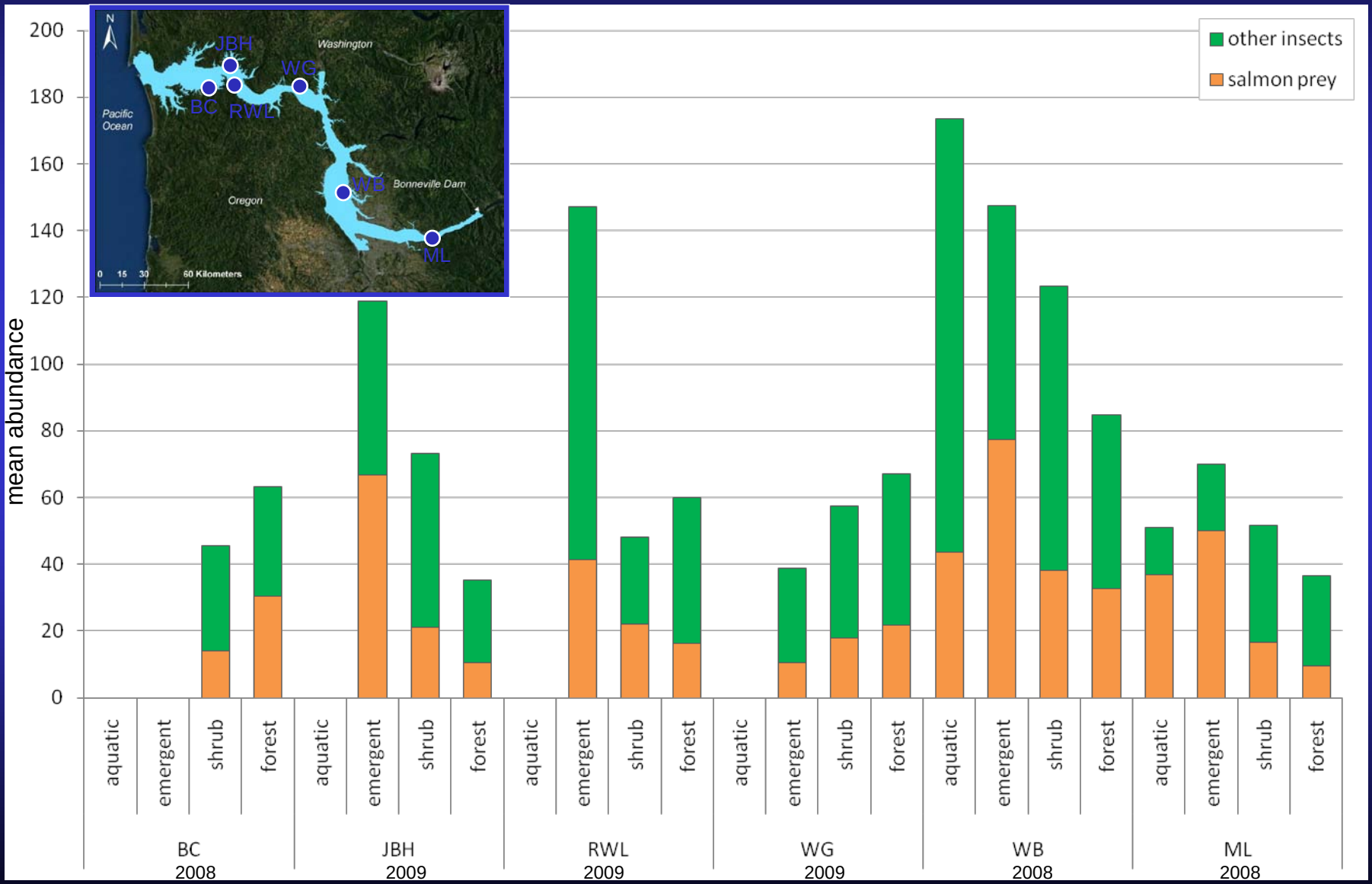
FLOODING OF FISH CATENA ZONE

(March-July; Based on Johnson 2010 elevations)

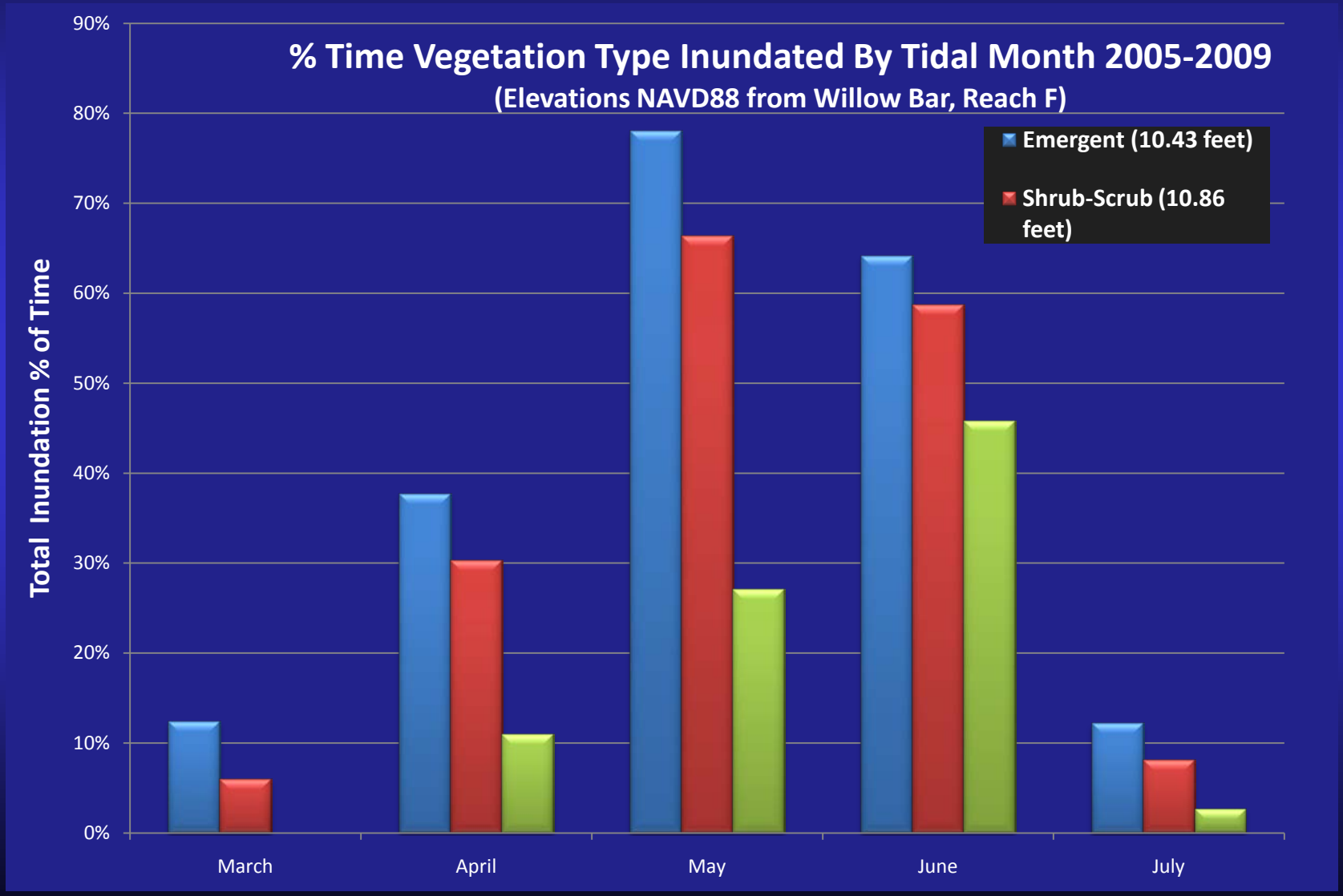


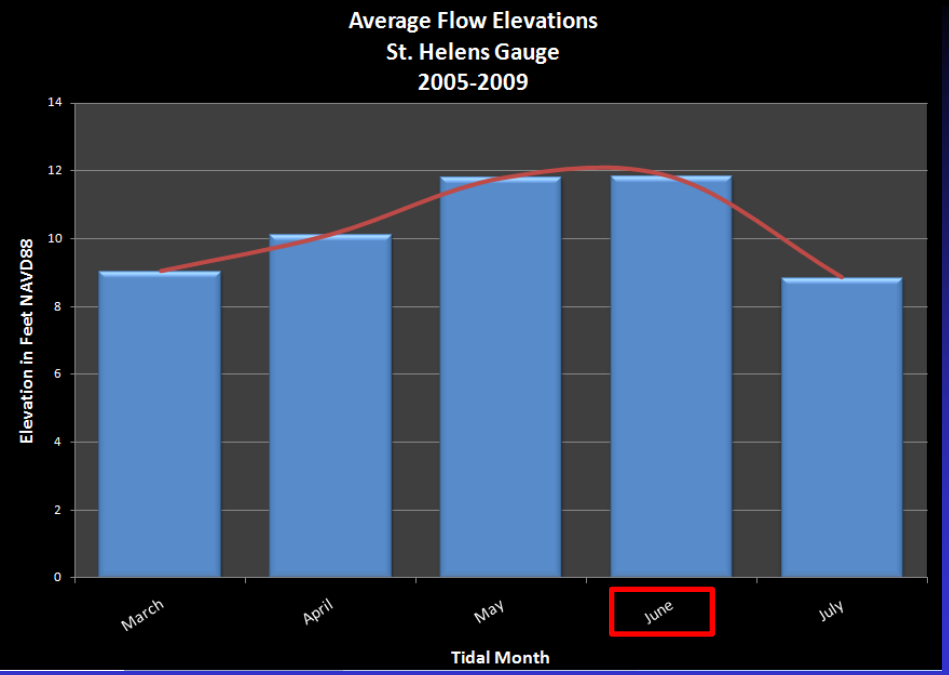
INSECT ABUNDANCE BY FISH CATENA ZONE

(Johnson 2010)



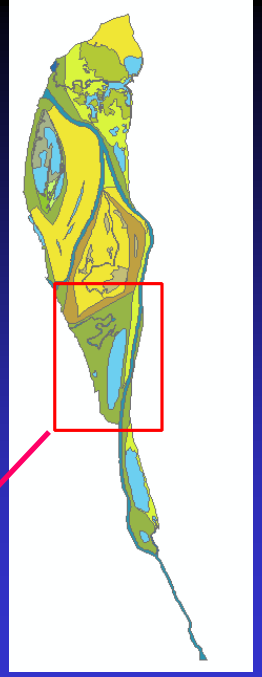
FISH CATENA ZONE FLOODING INUNDATION TIME (Reach F; % tidal month)

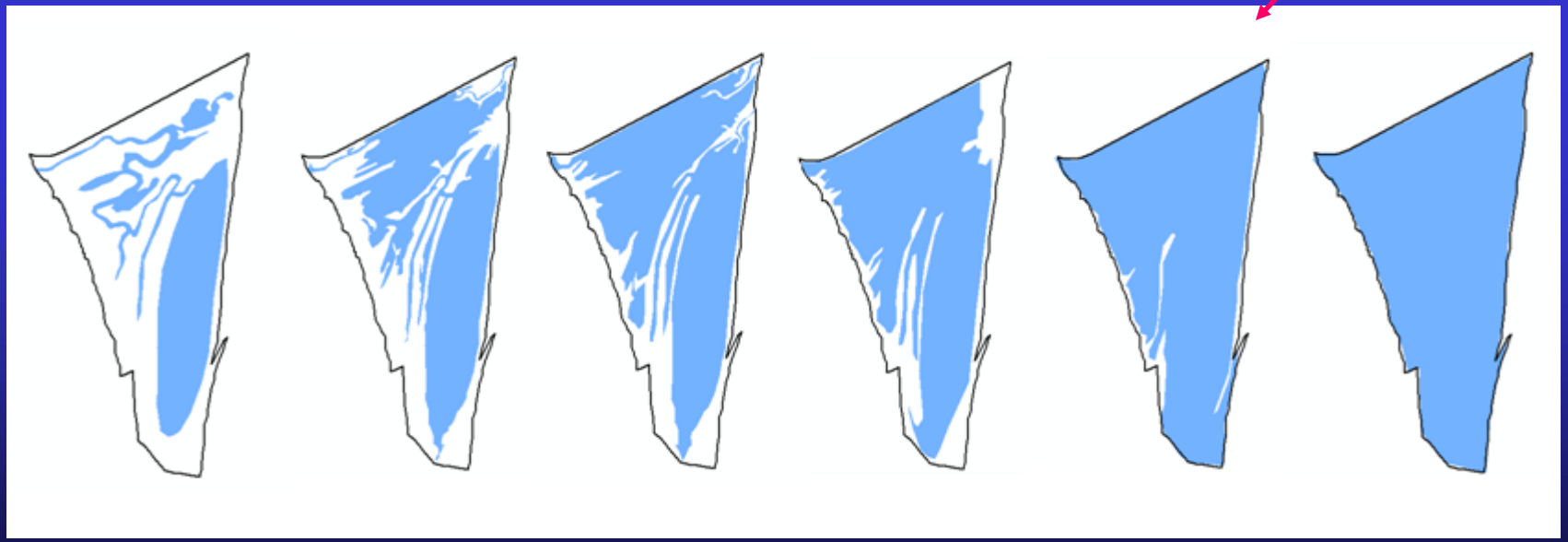




Campbell Lake Inundation Tidal Month – June

(Starting at June average and increasing at 3 foot intervals until level of 1950 flood)

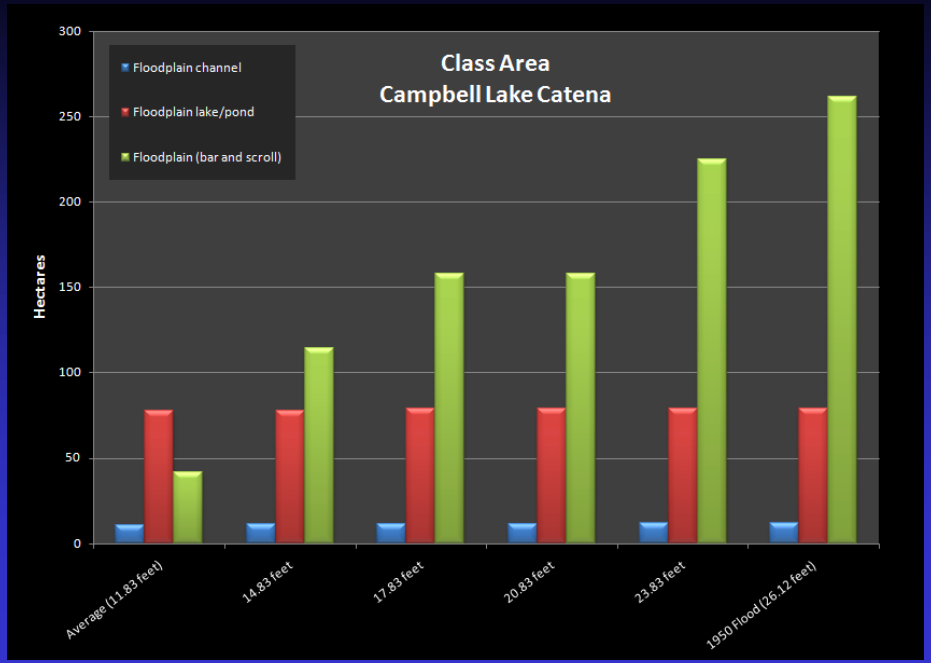


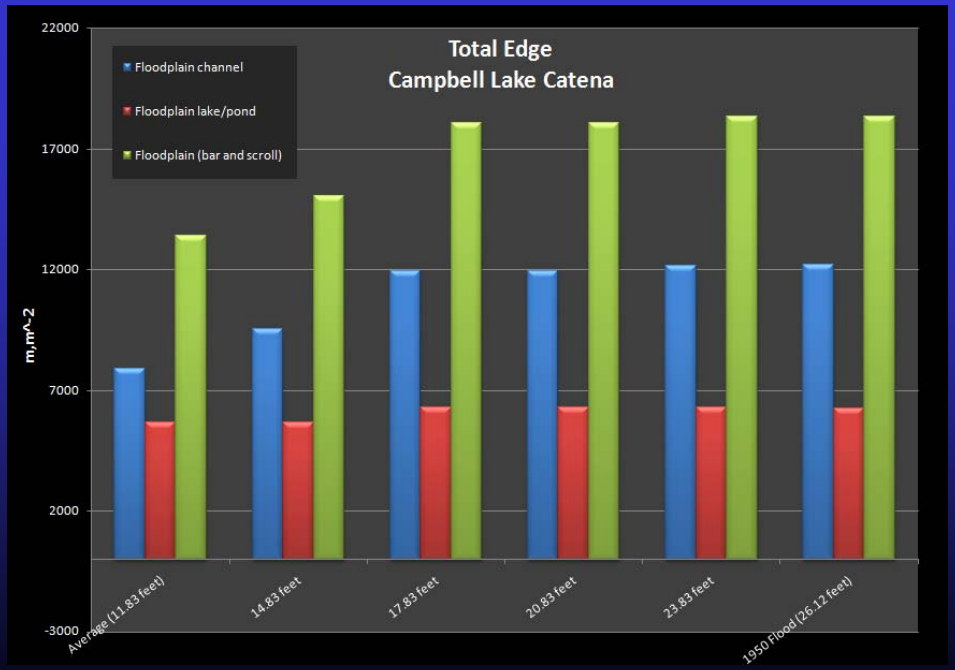


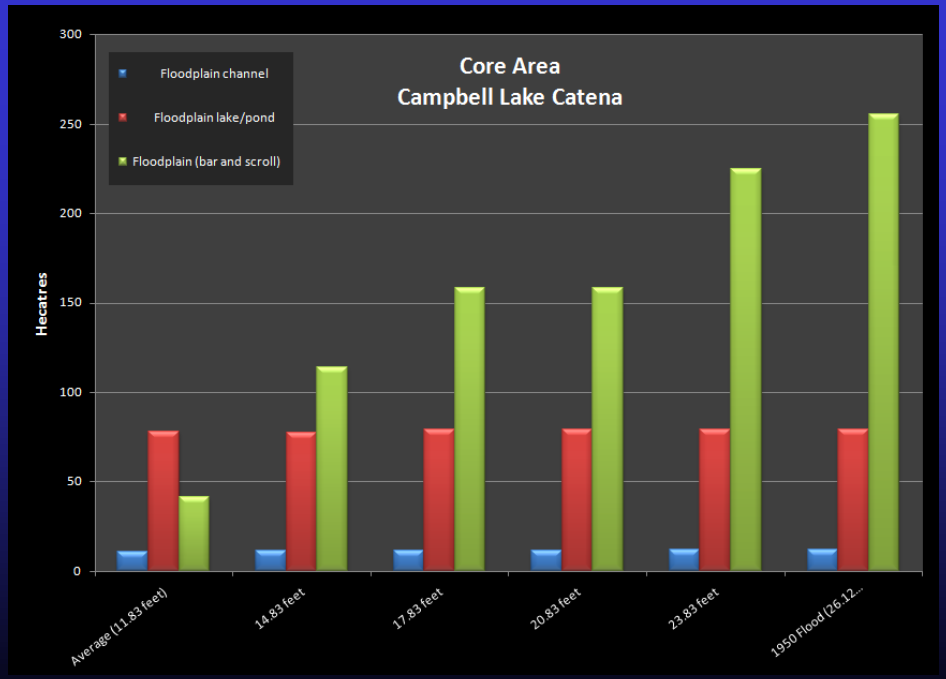
Tidal Month - June					
Average	***(Increasing at 3 foot intervals)***				**1950 Flood**
11.83	14.83	17.83	20.83	23.83	26.12

FRAGSTATS METRICS

Campbell Lake
Fish Catena
Tidal Month - June







SUMMARY

- Tool in development: evolving approach and analysis, tied to completion of CREEC
- Considerably limited by uncertainty about how different ESU and life history of juvenile salmon use habitat mosaics (“fish catena”)
- Recognize numerous constraints to strategic “spatial positioning” of restoration and preservation to benefit BiOp salmon in CRE, but that’s the way many ESU appear to have adapted or are constrained to using the estuary
- Need to acknowledge social constraints with broadly appreciated ecosystem goods and services

THANK YOU

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Contact: Si Simenstad (simenstd@u.washington.edu)
Phil Trask (Phil@pctrask.com)