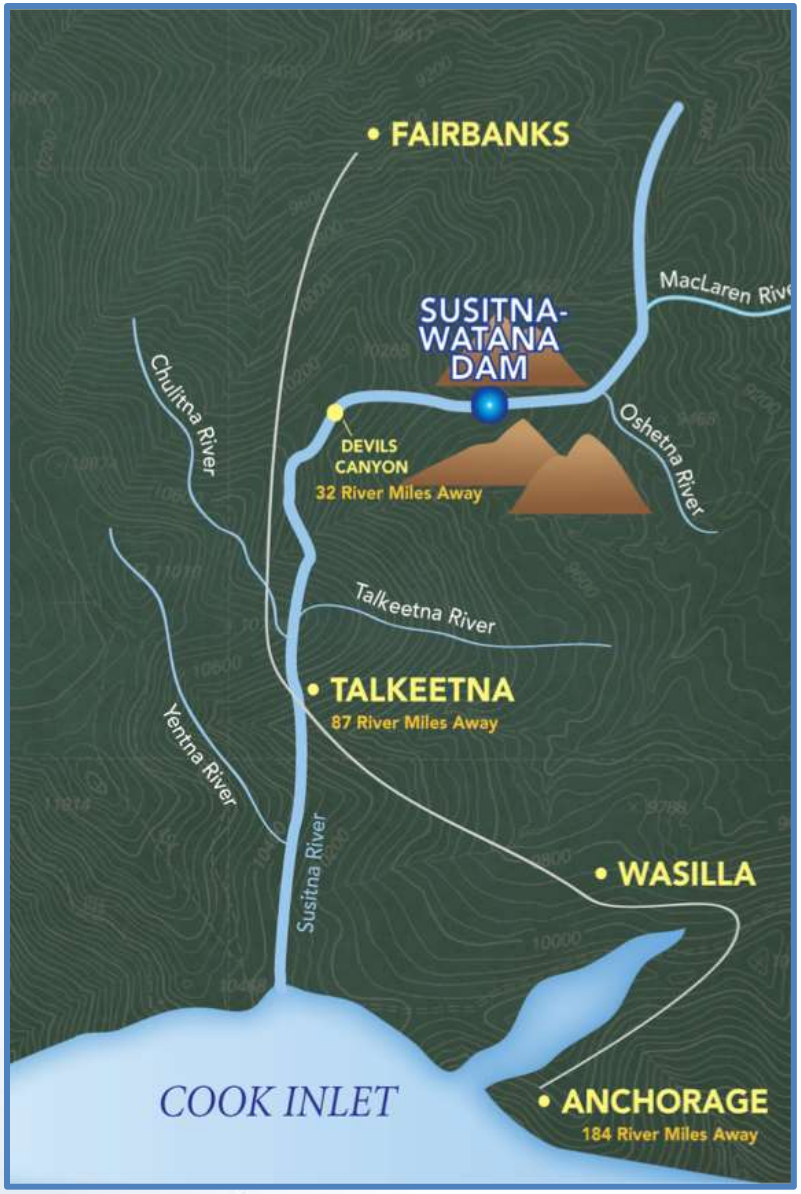

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Technical Team Meeting

Study 9.8 River Productivity HSC/HSI Development

March 21, 2014

Prepared by R2 Resource Consultants, Inc.

Study 9.8 River Productivity HSC/HSI Development

River Productivity RSP, Objective 6:

Generate habitat suitability criteria for Susitna benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of the proposed dam site.

Study 9.8 River Productivity
HSC/HSI Development

River Productivity RSP, Objective 6 Elements:

- *Habitat variables*
  - *HSI: turbidity (compensation depth), duration of inundation and dewatering*
  - *HSC: depth, velocity, substrate*
- *Search and development of literature-based draft curves*
- *Identification of appropriate benthic metrics (determined through data analysis)*
- *Development of curves from site-specific data*

Study 9.8 River Productivity
HSC/HSI Development

HSI: Turbidity (compensation depth), inundation and dewatering

- *2013 collection of turbidity and PAR measures at each site and collection date, and Water Quality Study has collected TSS data and turbidity.*
- *This information can be used to generate light extinction coefficients, and a relationship to turbidity (and/or TSS),*
- *Should be able to calculate compensation depths (depth that 1% of PAR reaches)*

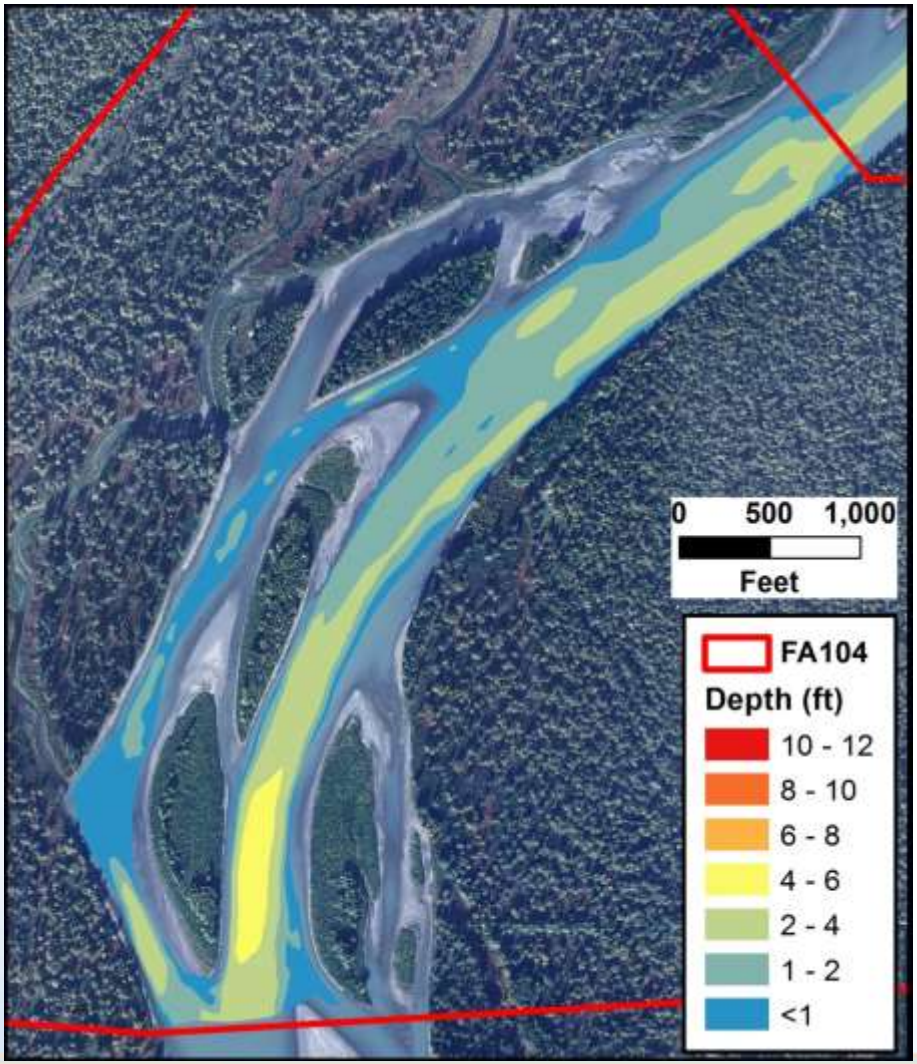
Study 9.8 River Productivity
HSC/HSI Development

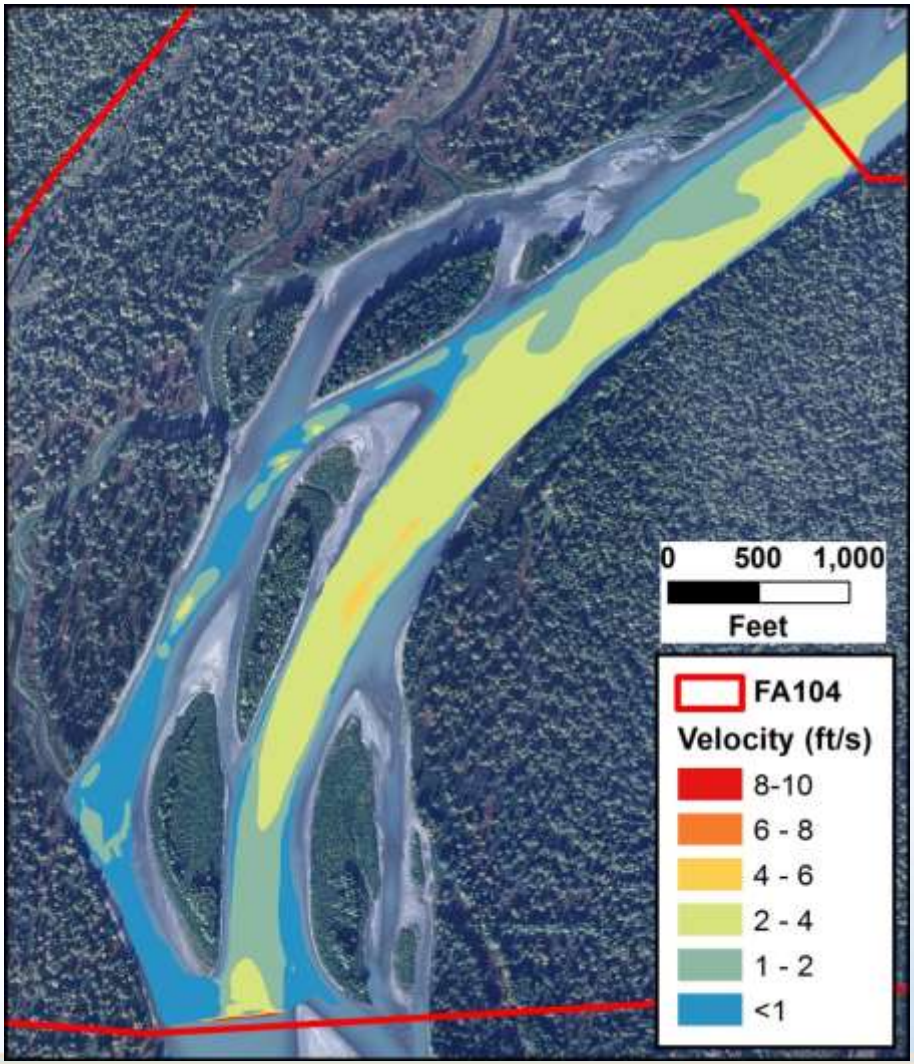
HSI: Turbidity (compensation depth), inundation and dewatering

- *Using Water Quality model, coupled with the flow operation model, we should be able to quantify area with:*
  - *Light reaching the wetted substrate*
  - *Inundation for different duration levels (for example: 1, 2, 4, 6 weeks)*
- *Areas with light and that are wetted = areas of potential production*

2- D Hyd. Model Output: 2,000 cfs FA-104 (Whiskers Slough)

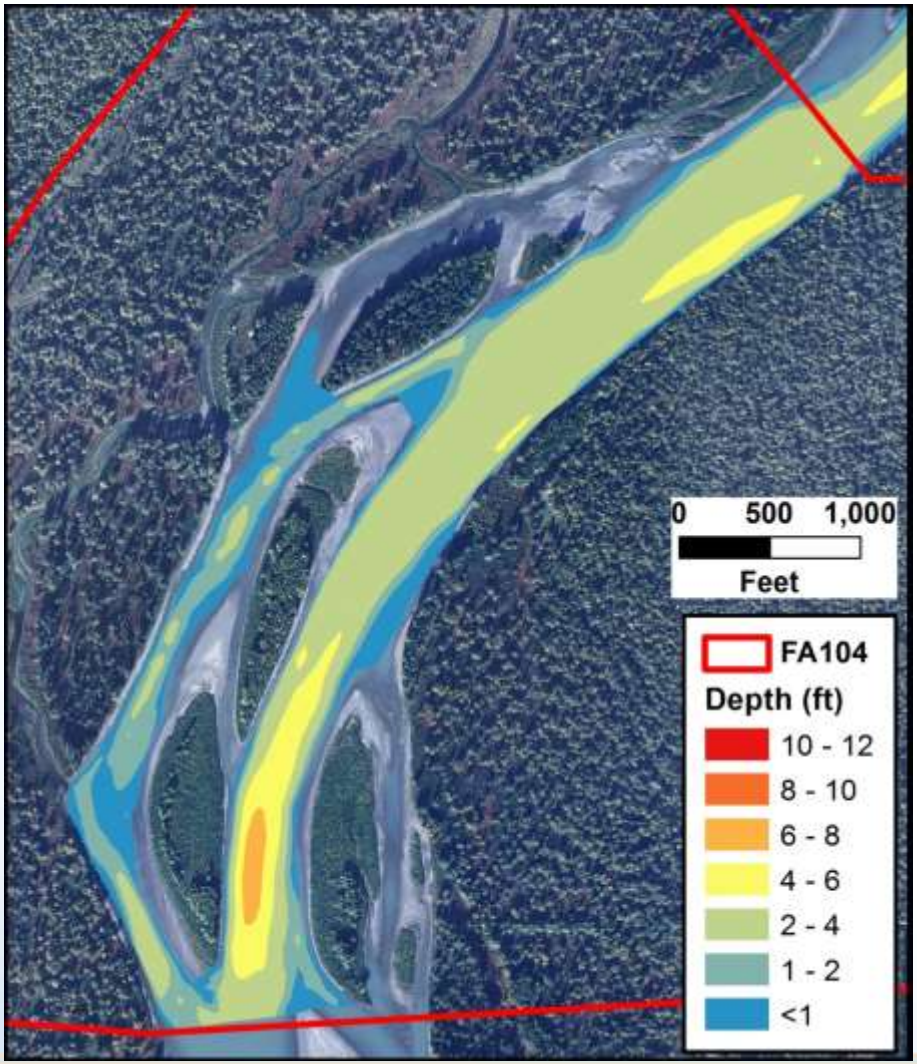
Note: All 2-D model results are preliminary and for illustration purposes only. The model has not been calibrated.

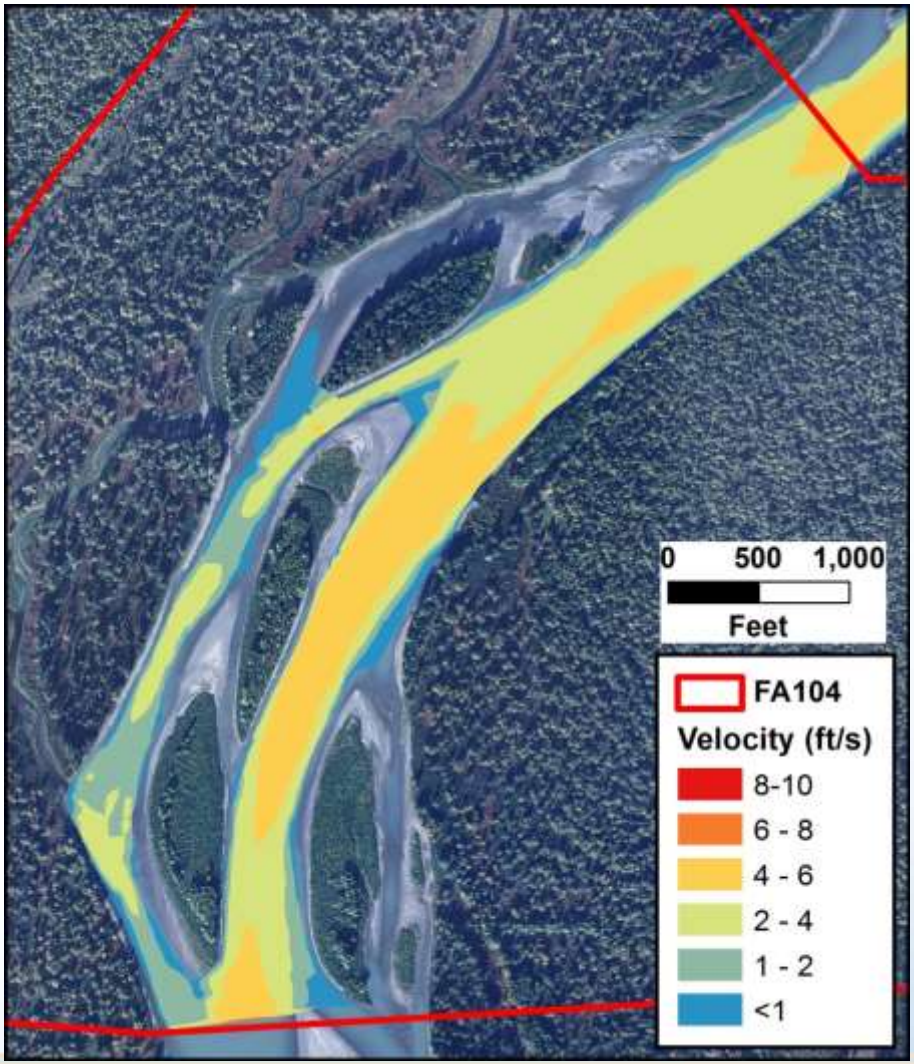




2-D Hyd. Model Output - 6,000 cfs FA-104 (Whiskers Slough)

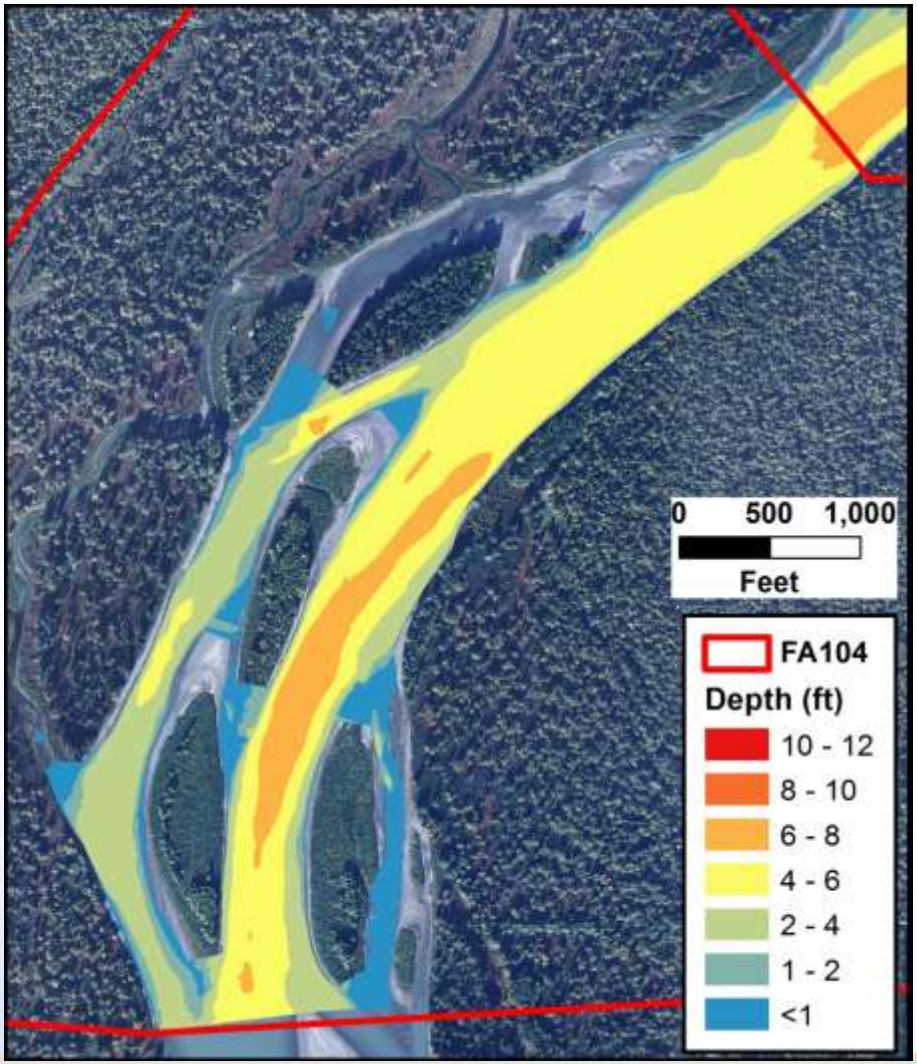
Note: All 2-D model results are preliminary and for illustration purposes only. The model has not been calibrated.

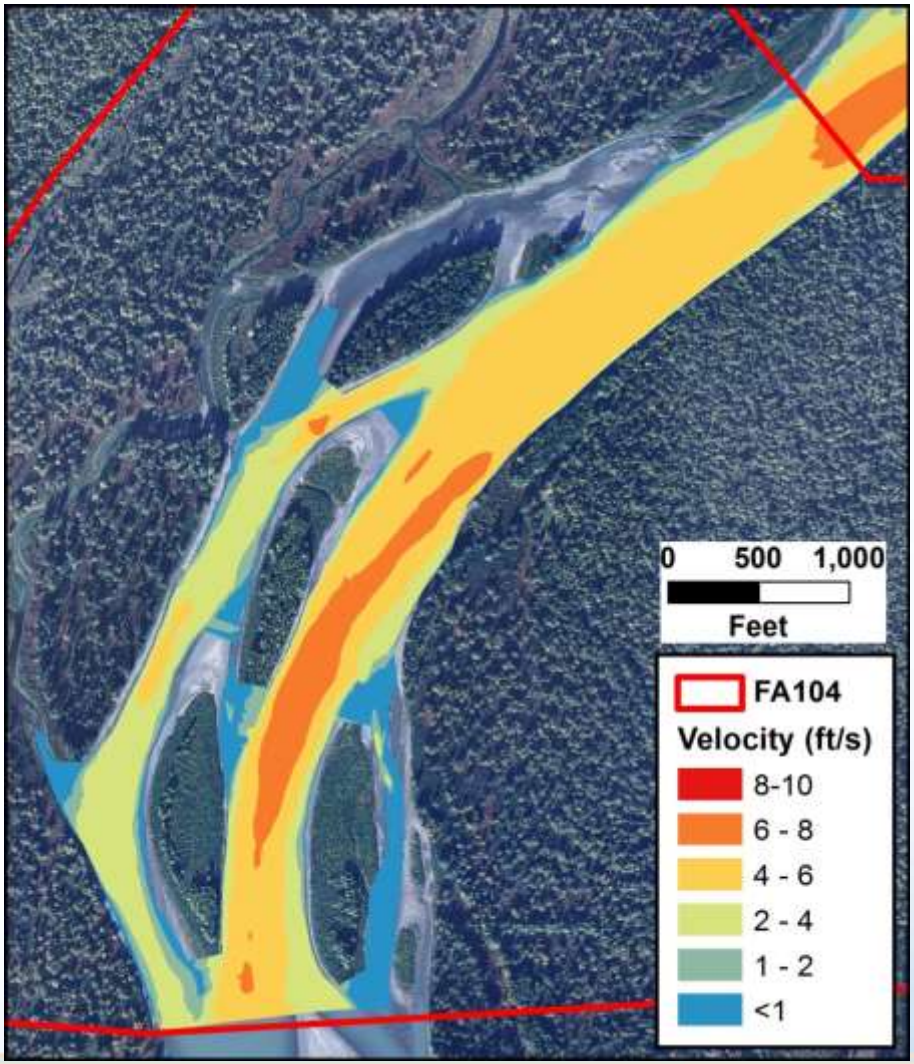




2-D Hyd. Model Output: 14,000 cfs FA-104 (Whiskers Slough)

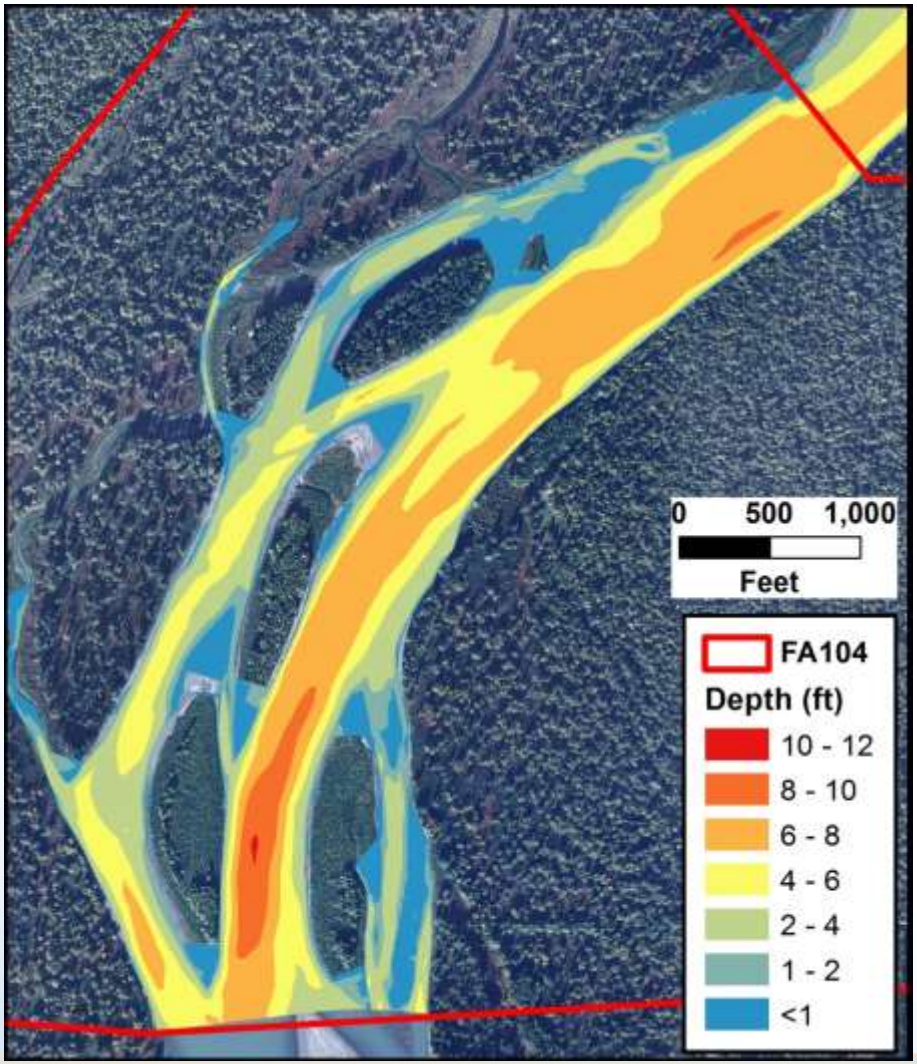
Note: All 2-D model results are preliminary and for illustration purposes only. The model has not been calibrated.

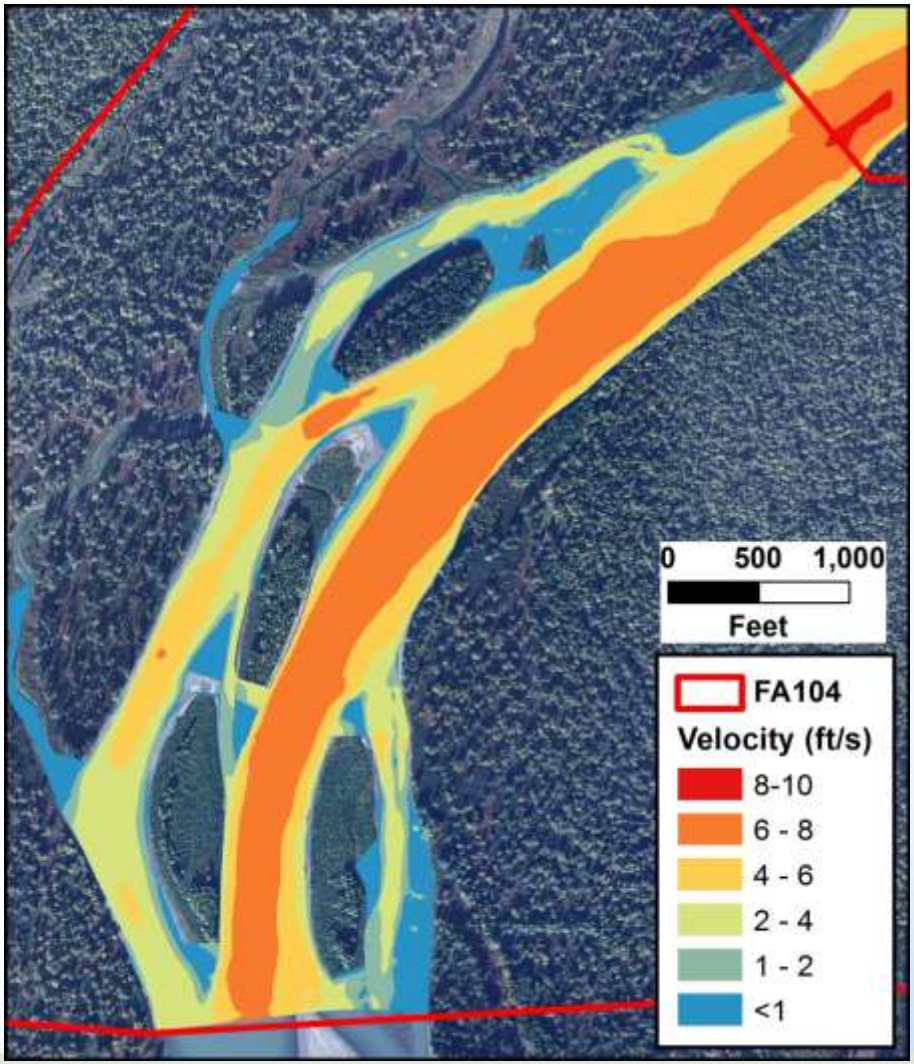




2-D Hyd. Model Output: 24,000 cfs FA-104 (Whiskers Slough)

Note: All 2-D model results are preliminary and for illustration purposes only. The model has not been calibrated.

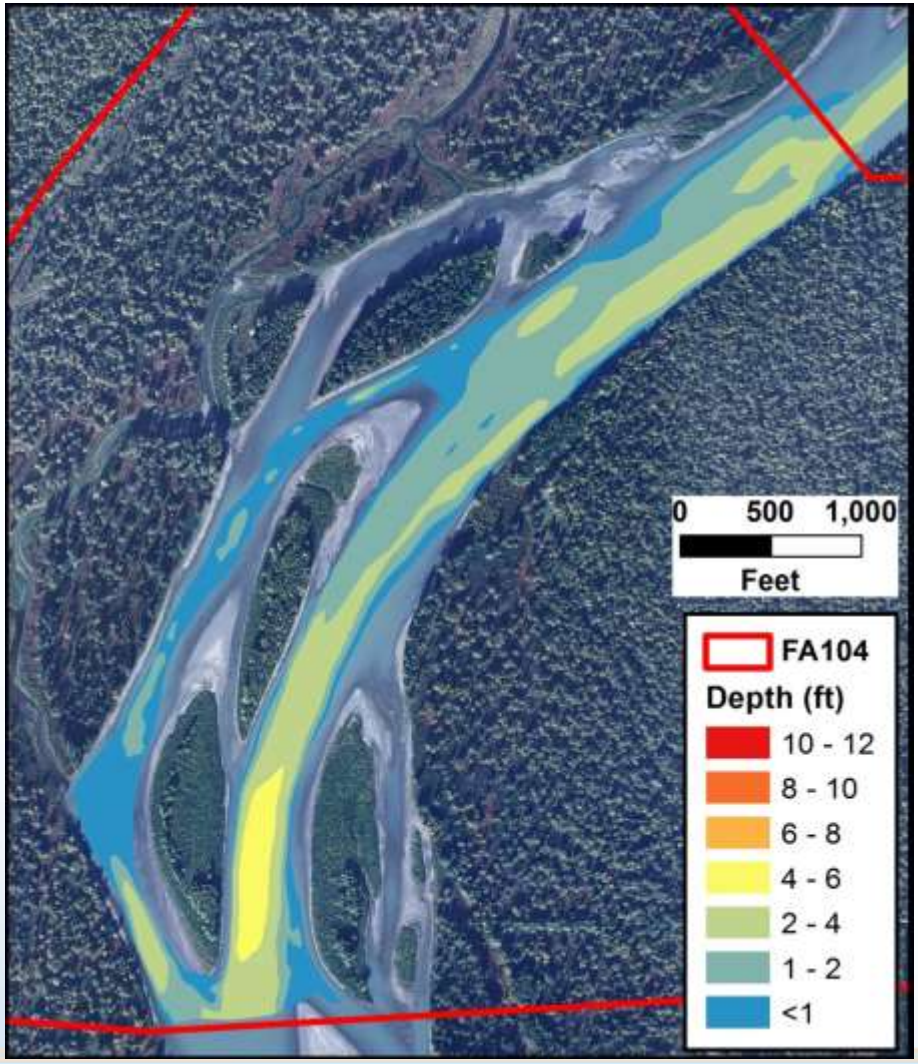




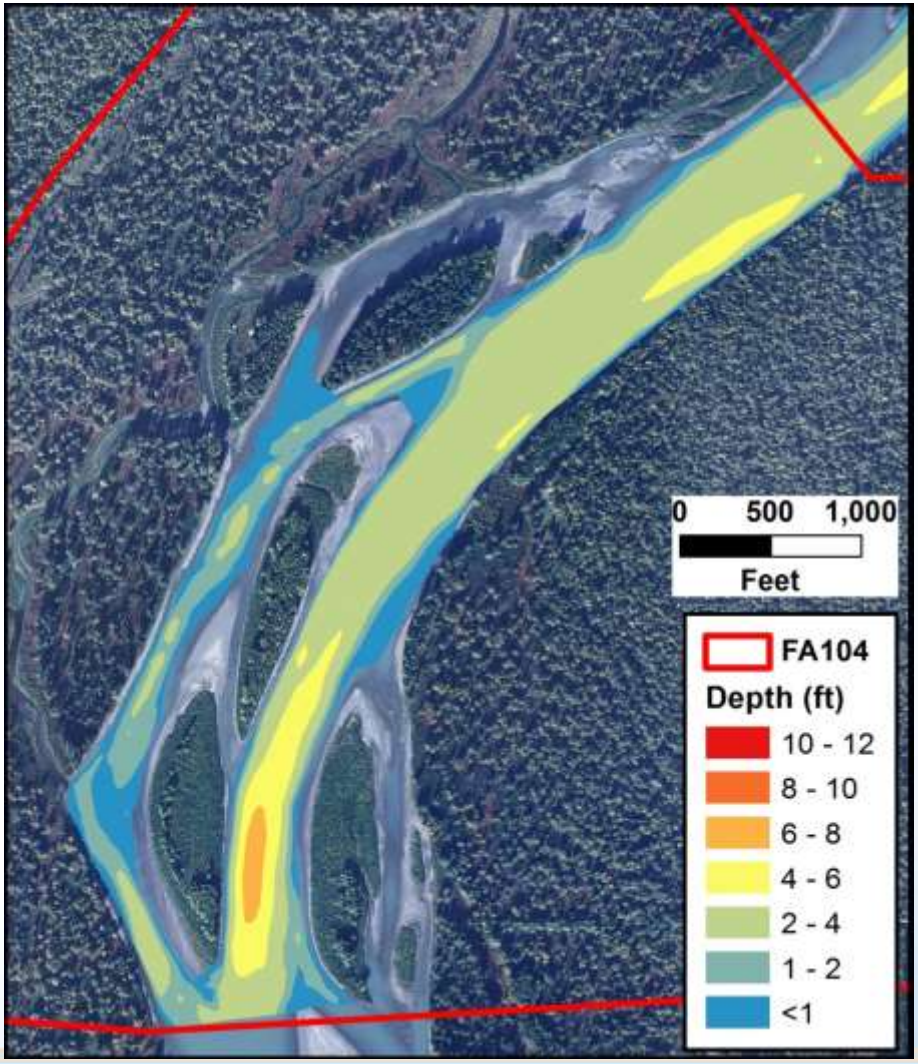
2-D Hyd. Model Comparison: 2,000 and 6,000 cfs FA-104 (Whiskers Slough)

Note: All 2-D model results are preliminary and for illustration purposes only. The model has not been calibrated.

2,000 cfs



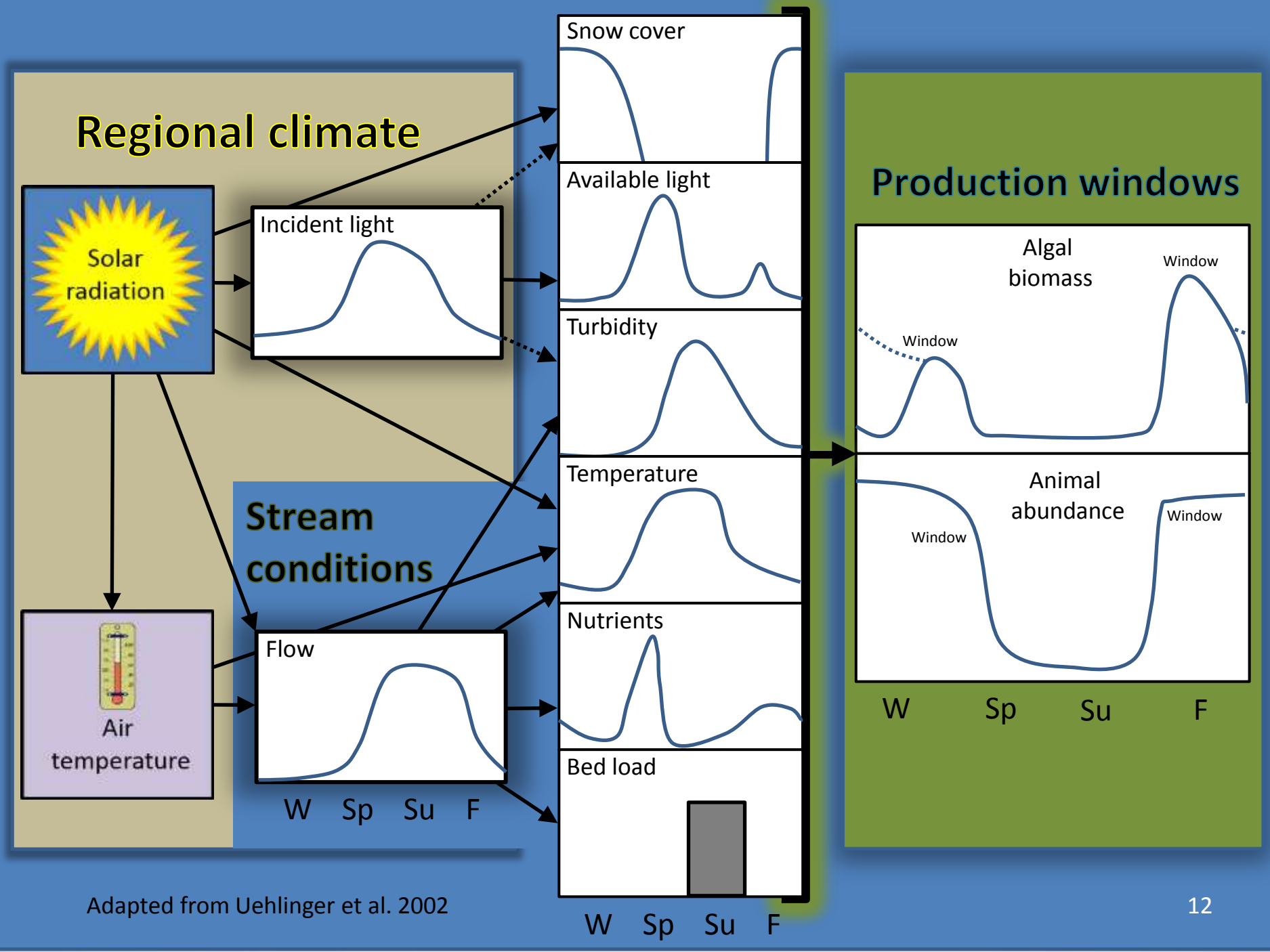
6,000 cfs



Study 9.8 River Productivity
HSC/HSI Development

HSI: Turbidity, inundation and dewatering

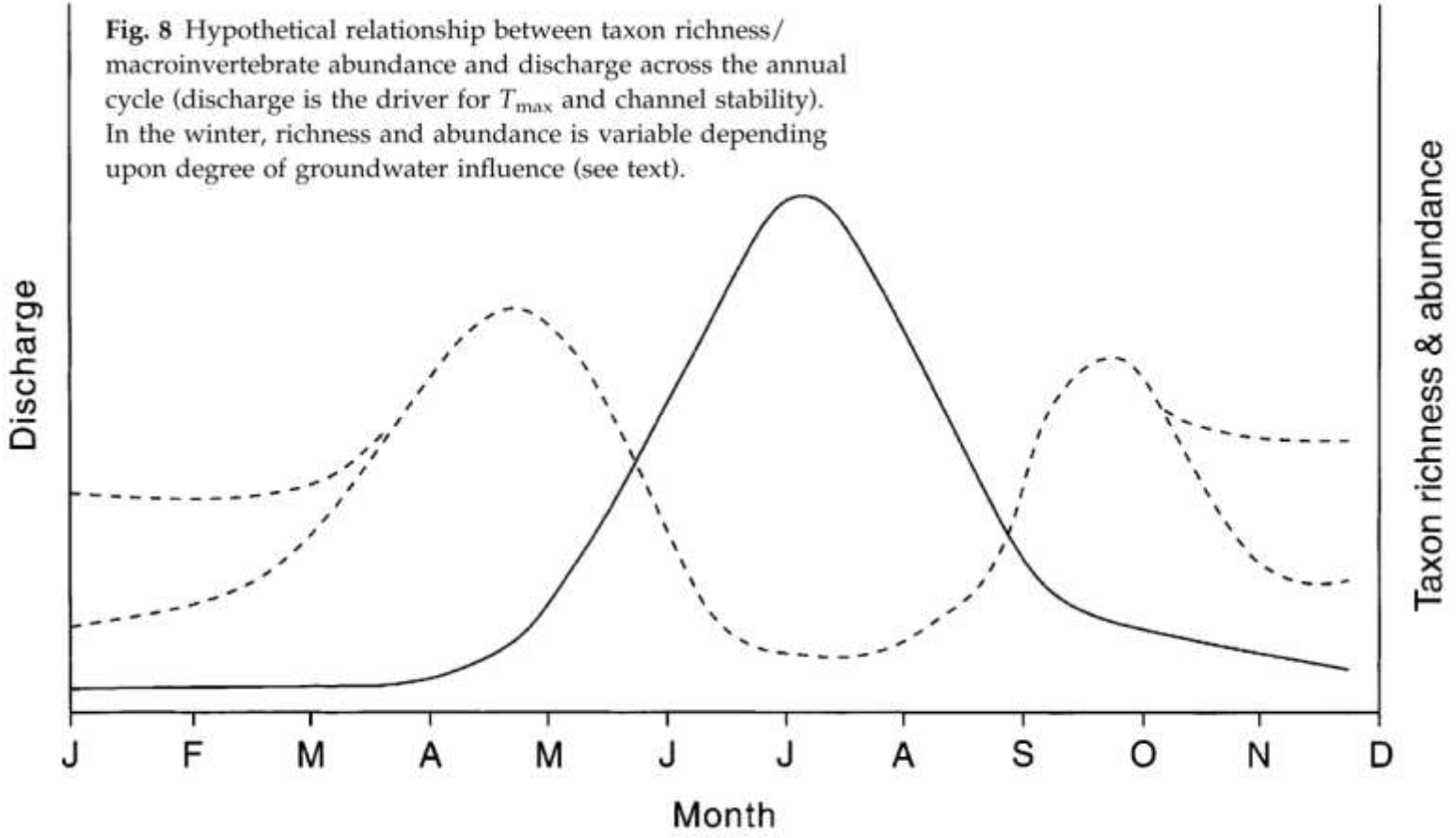
- *In winter, increased flow from dam releases may provide a gain in wetted potential production area; however, higher turbidity reduces light penetration*
- *In summer, reduced dam releases during reservoir refill may reduce wetted production area; however, reduced turbidity will increase light penetration*



Adapted from Uehlinger et al. 2002

Study 9.8 River Productivity
HSC/HSI Development

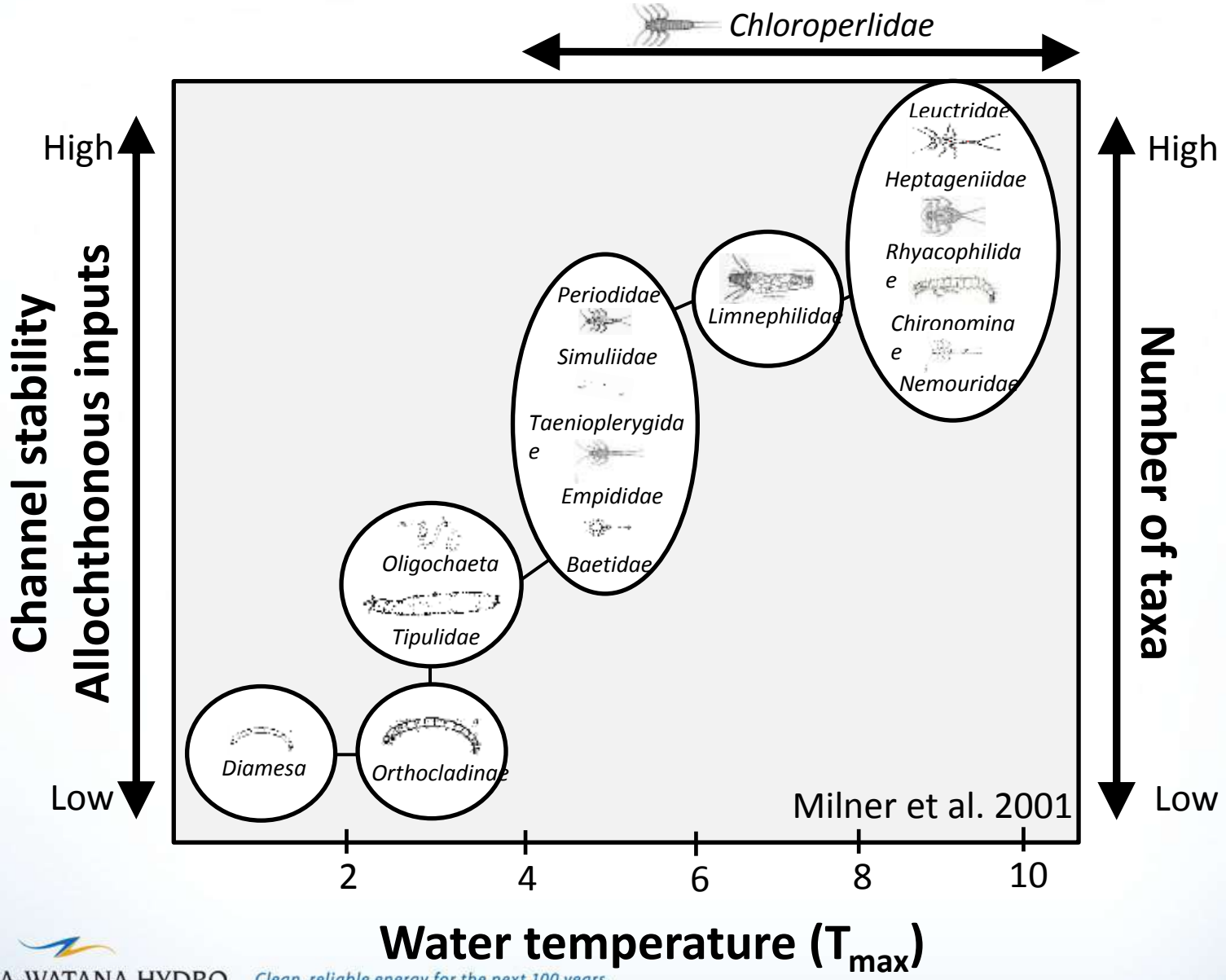
Milner et al. 2001



Study 9.8 River Productivity
HSC/HSI Development

HSI: Temperature

- *In 2013, measurements taken at each site*
  - *Tidbits installed, data in 30 min increments*
- *Data analysis can look benthic metrics with strong relationships to temperature metrics*
- *Search literature for temperature preferences of relevant taxa*
- *Water quality model could show pre- vs. post-project changes in temperature regime*



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Study 9.8 River Productivity
HSC/HSI Development

HSC: Depth, Velocity, Substrate

- *Measurements taken alongside samples*
  - *Hess = 300*
  - *Algae = 349 (averages of n=5)*
  - *Snags = 150*
- *Can be applied for site-specific HSC curves, given the appropriate benthic metrics*

Study 9.8 River Productivity
HSC/HSI Development

HSC: Depth, Velocity, Substrate

- *Possible benthic macroinvertebrate metrics*
  - *Estimated density, estimated biomass*
  - *functional feeding groups (FFG)*
  - *dominant taxa (benthic, drift, or fish diet)*
  - *behavioral groups (Hansen and Richards 1985)*
- *Algae metrics*
  - *Chlorophyll-a and AFDM measurements*

Study 9.8 River Productivity
HSC/HSI Development

HSC: Depth, Velocity, Substrate

- *Data analysis can look benthic metrics with strong relationships to these measures*
- *HSC for depth, velocity, and substrate can be applied to the model for wetted area with available light for further refinements*

Study 9.8 River Productivity
HSC/HSI Development

Literature-based criteria

- *Indicates current knowledge in the scientific community; i.e., a starting point*
- *Preference for model use would be to use site-specific criteria if available, and then literature-based criteria*