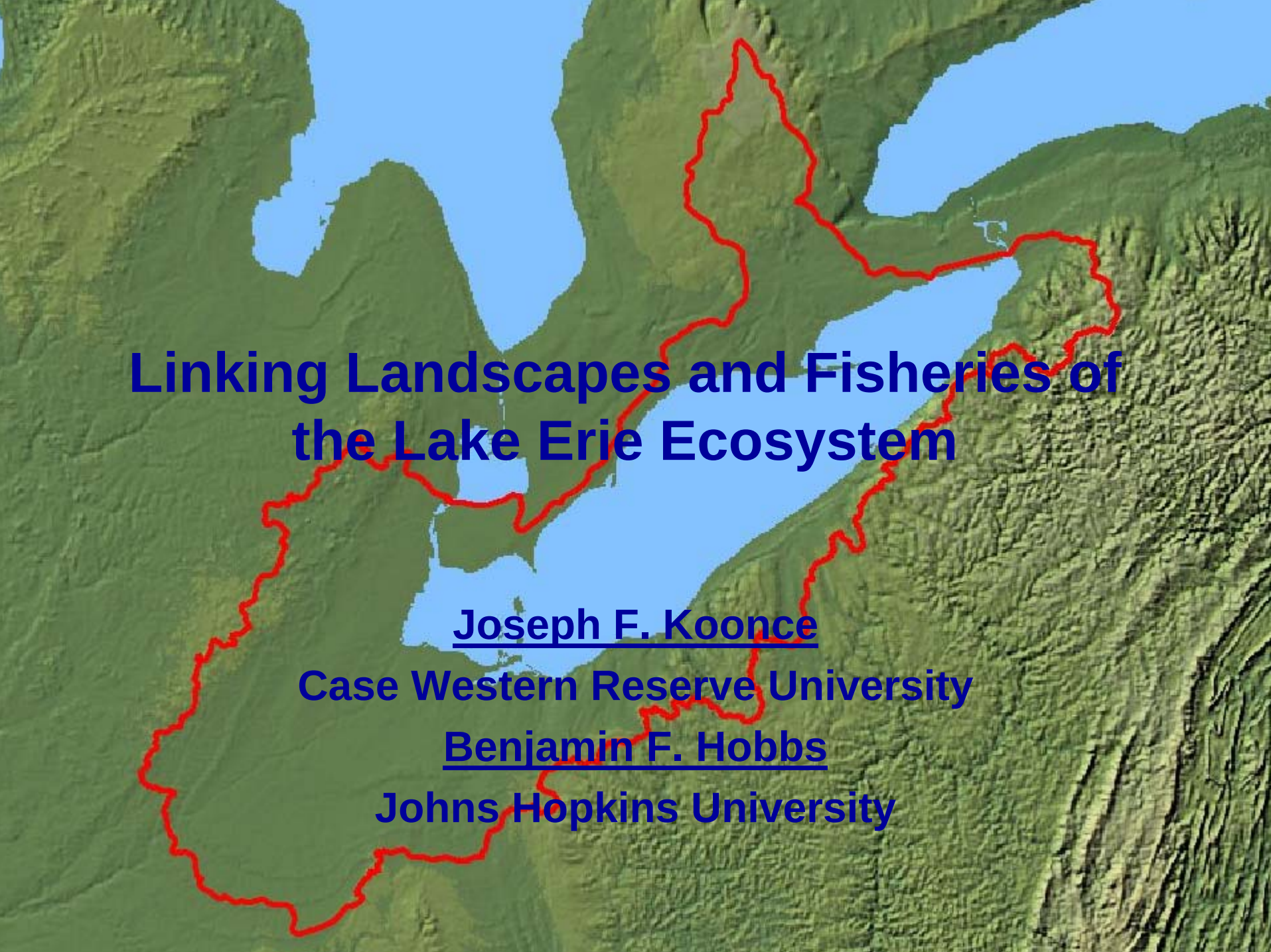

Linking Landscapes and Fisheries of the Lake Erie Ecosystem

Joseph F. Koonce

Case Western Reserve University

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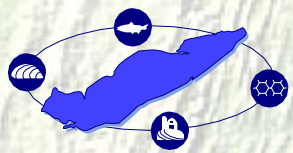
Objectives of Presentation

- Review project goals
- Update progress towards goals during year 2 of the research
- Show some results
- Review plans for year 3

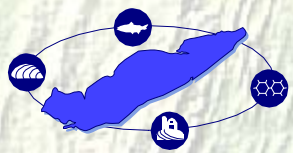
This research is funded by U.S. EPA - Science To Achieve Results (STAR) Program Grant # 83881O1



Project Goals

- **Develop a regional-scale, stressor-response model for the management of the Lake Erie ecosystem**
  - **Stressors: land use changes, nutrients, habitat alteration, flow regime modification, exotic species, and fisheries exploitation**
- **Incorporate model into a multi-objective decision making tool for use by Lake Erie managers**

This research is funded by U.S. EPA - Science To Achieve Results (STAR) Program Grant # 8388101



Project task structure

- Linking changes in watershed habitat and nutrient loading to Lake Erie ecosystem health
- Quantifying uncertainties in model predictions the effects of uncertainties on management decisions
- Evaluating cross-scale interaction of stressors
- Developing tools to evaluate ecological risk of land-use changes
- Identifying and evaluate critical break-points in ecosystem and management integrity

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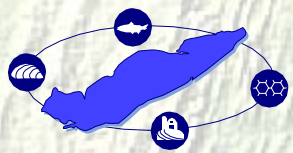

Year 2 Accomplishments

- Completed testing of models for establishing habitat supply inventory for Lake Erie watershed
- Established a functional dependence of tributary flow and nutrient loading on land cover
- Assembled a component-based DEVS modeling and simulation framework to perform cross-scale analysis of the interaction of stressors
- Developed and began testing a decision analysis framework to explore the trade-offs associated with dam removal

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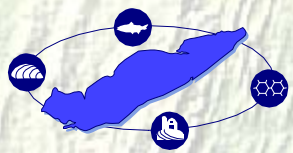

Functional Integration of Habitat

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Grant # 8388101

Estimation of Habitat Availability

This research is funded by U.S. EPA - Science To Achieve Results (STAR) Program Grant # 8388101

Habitat modeling

- Apply geomorphic principles to estimation of instream fish habitat
- Generate regional scale habitat supply inventories for the entire Lake Erie drainage basin

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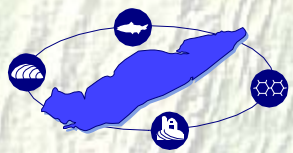
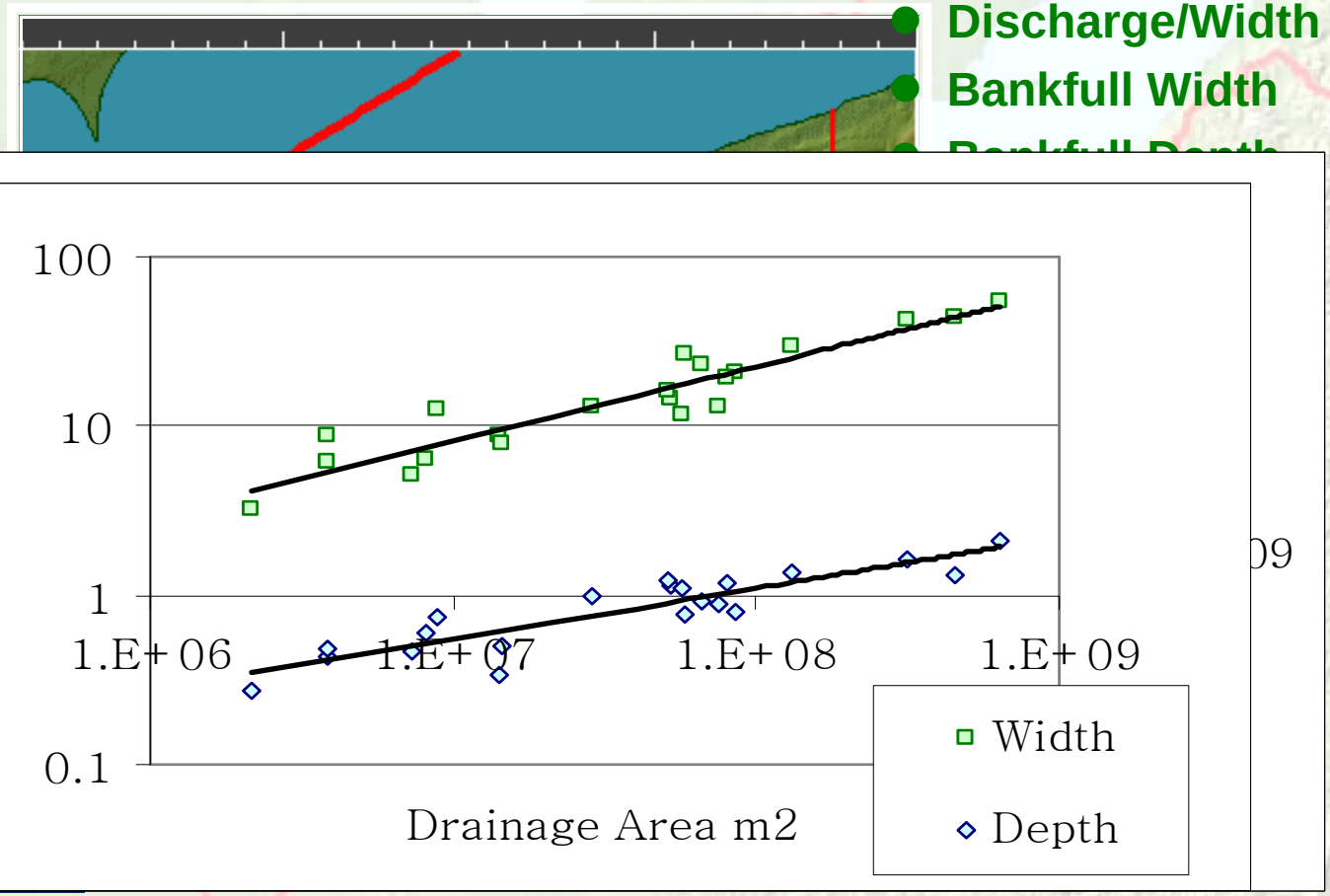
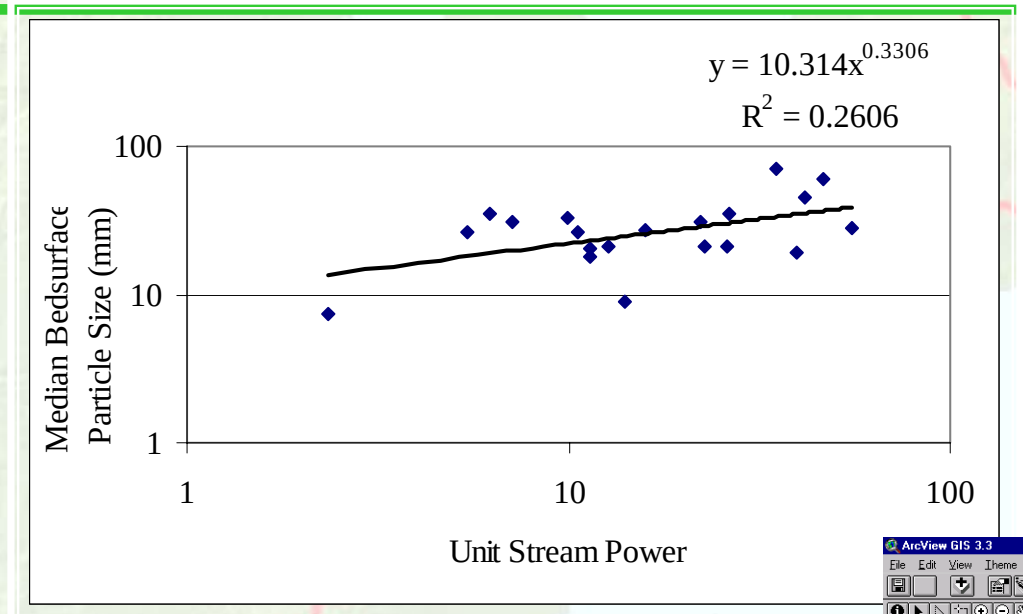


Geomorphologic Principles

- Drainage Area is related to:
  - Depth*Velocity
  - Discharge/Width
  - Bankfull Width
  - Bankfull Depth

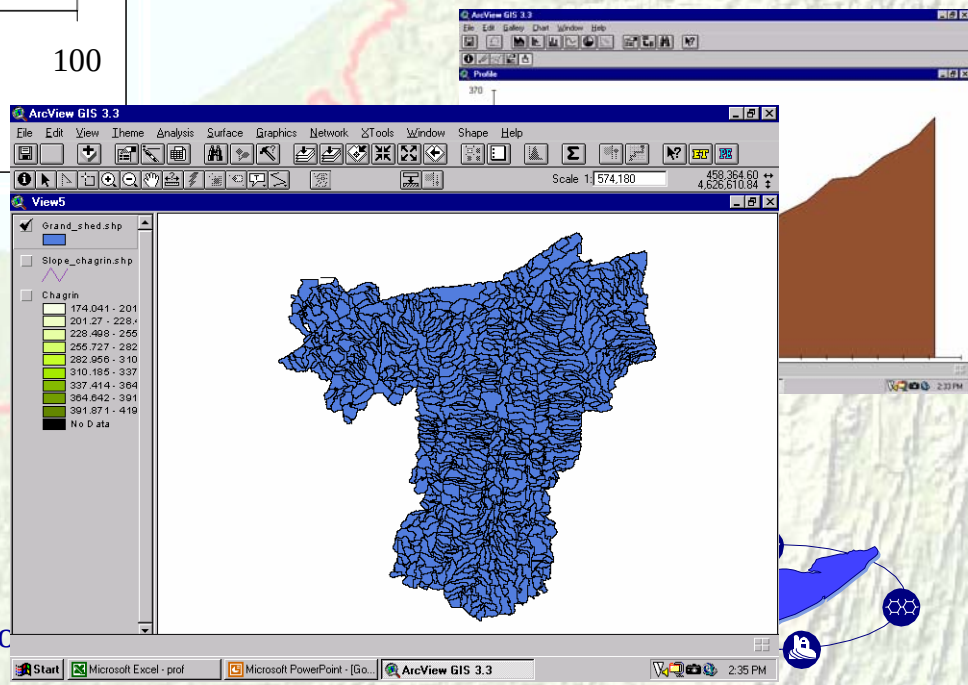


Geomorphologic Principles



- **Median Substrate Size (D50) is related to Stream Power**

- **Power is a function of:**
  - **Drainage Area**
  - **Stream slope**



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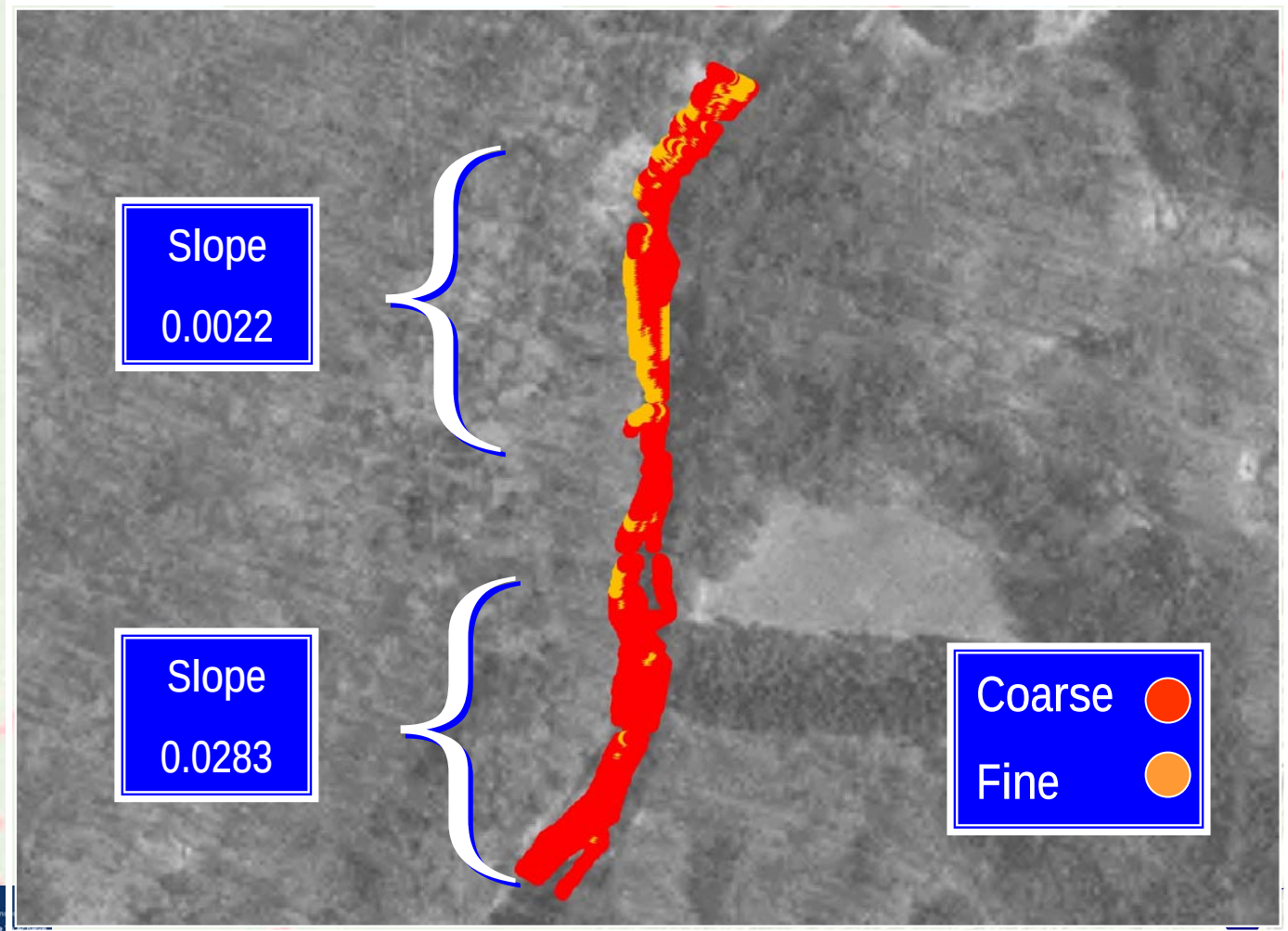
Applying GIS—Estimates of Slope



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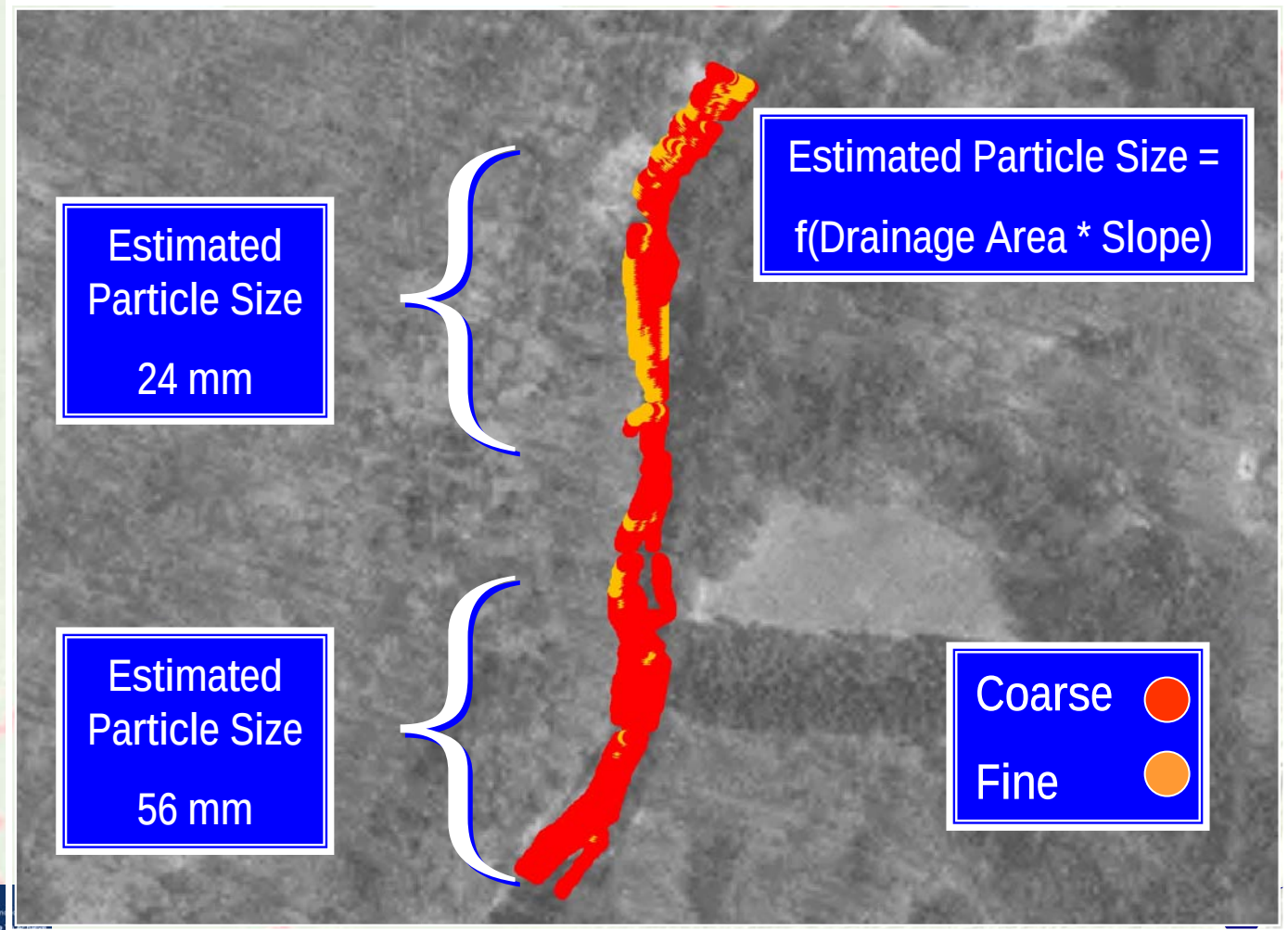
Applying GIS-Estimates of Median Particle Size



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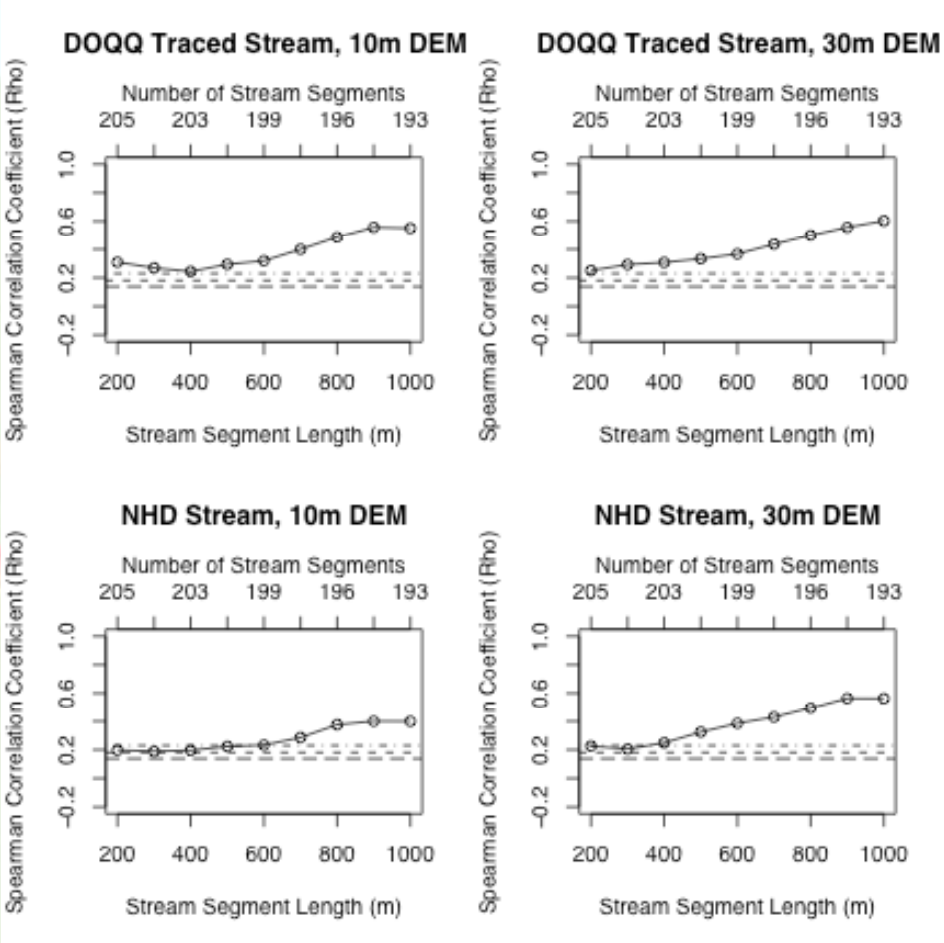
Scale Dependence of Slope Estimates



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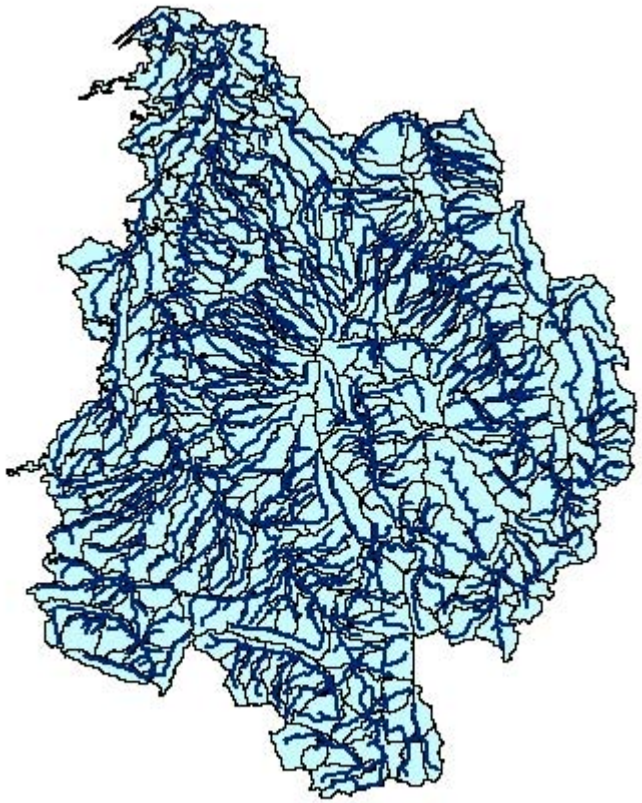
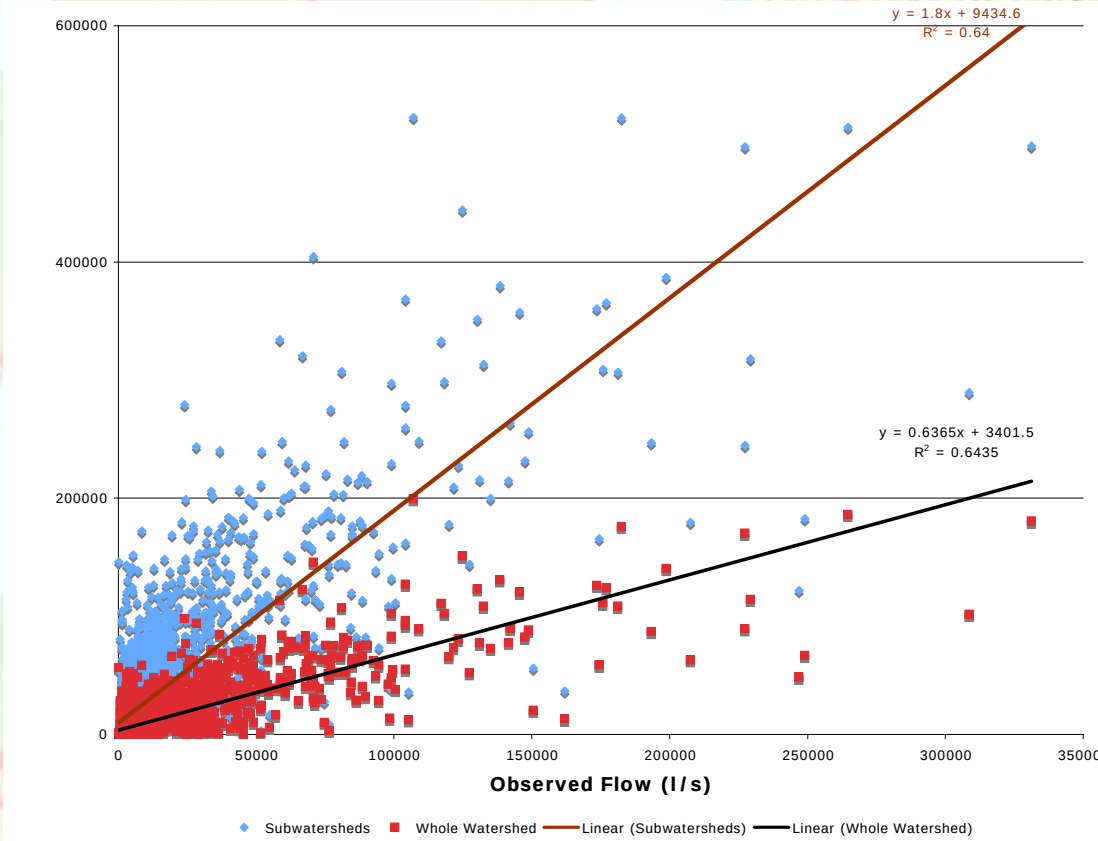
Effects of Scale on Flow Predictions



Rocky River, Ohio. IHACRES Predictions



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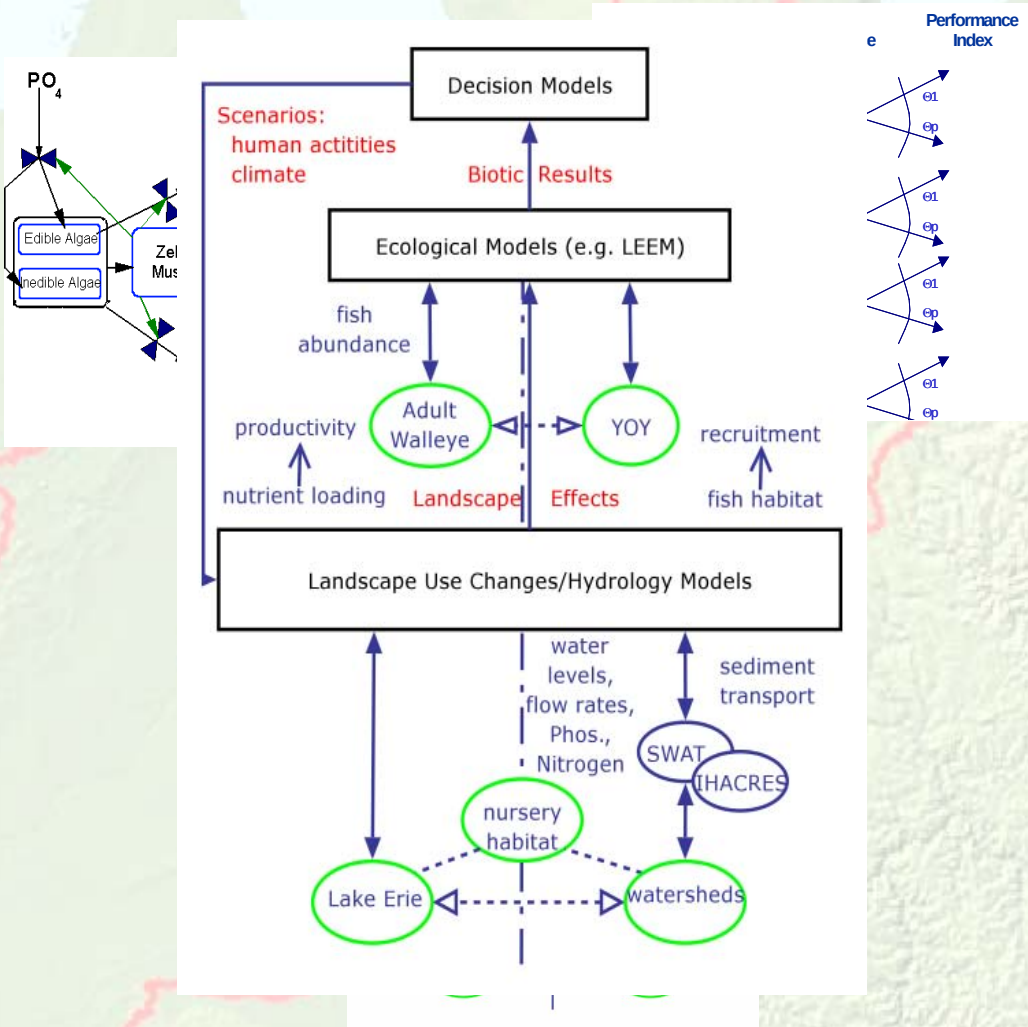
Model Implementation



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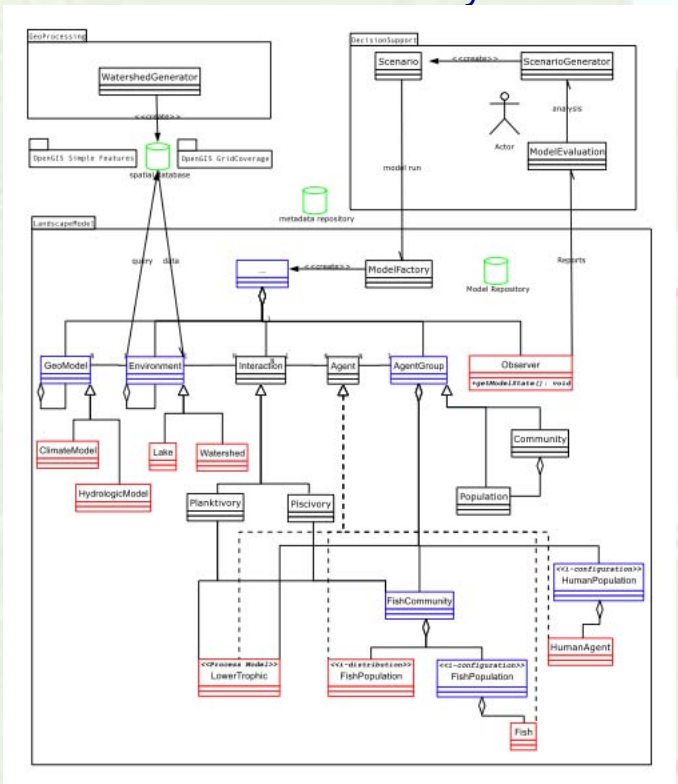
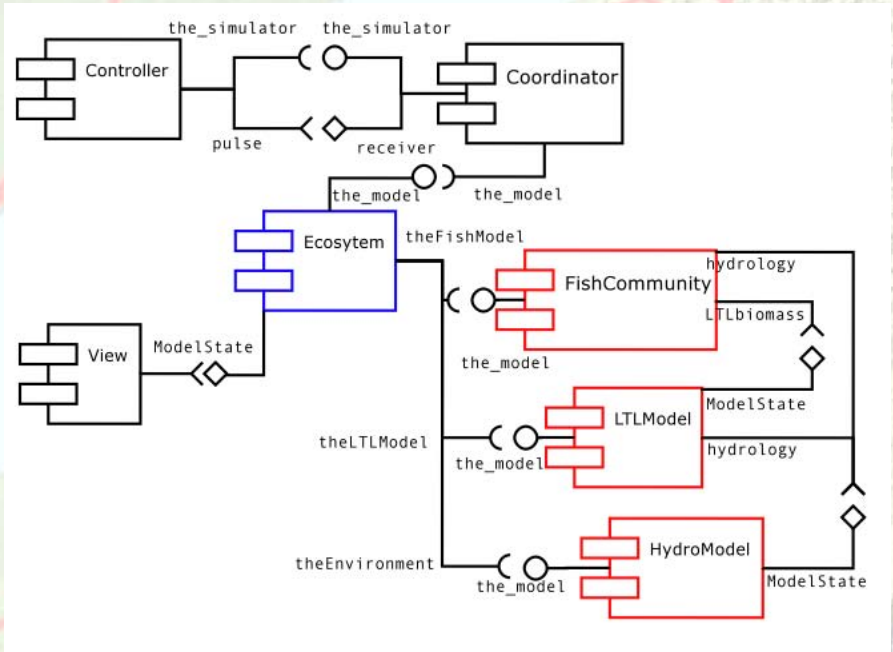
Modeling and Simulation Framework

UML Representation of Lake Erie Model Hierarchy



Component-based DEVS Modeling and Simulation Framework



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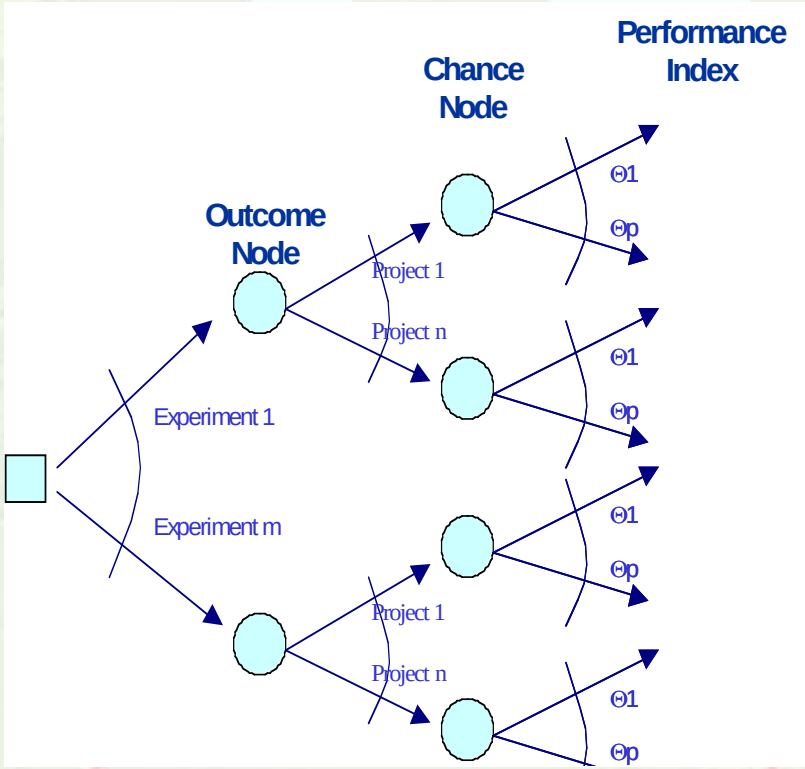
Decision Applications



- **Dams**
  - Dam removal creates a trade-off between control of sea lamprey and exploitation of Lake Erie fish populations
- **Priority Conservation Areas**
  - Ohio Balanced Growth Initiative priority--establish a scientific foundation for demarcation of PCAs

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Next Steps

- Identification and evaluation of critical break-points in ecosystem integrity of the Lake Erie ecosystem and of its integrated management.
- Continue engagement with landscape management policy issues in the Lake Erie Balance Growth Initiative.
  - PCA demarcation criteria—linked to TMDL
  - Join with the Chagrin River Watershed Partners to evaluate the effects of implementing best management practices for runoff control
- With Lake Erie fisheries management agencies, analyze interacting stresses affecting the fish community of Lake Erie and to test our decision-making tools

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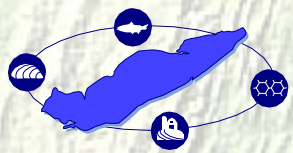

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Chagrin River Watershed Partners

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