Saginaw Bay Optimization Decision Tool: Linking Management Actions to Multiple Ecological Benefits via Integrated Modeling

**Principle Investigators**
- David Karpovich, Saginaw Bay ESI at SVSU
- Joseph DePinto, LimnoTech
- Scott Sowa, The Nature Conservancy (TNC)

**Team members**
- Mary Anne Evans
- Elaine Brown (MDARD)
- Charles Bauer (MDEQ)
- Bretton Joldersma
- Brian Sweeney
- Ruth Shaffer
- Ronnie Maurer
- Ed Verhamme
- Todd Redder
- Derek Schlea
- Chelsie Boles
- Dan Rucinski

**Funding**
- Mary Fales
- Jared Ross
- Doug Pearsall
- Gust Annis
- David Caroffino
- Kyle Cissell
- Art Martin
- Andrew Miller
- Rhett Mohler
- Jon Bartholic
- Vicki Anderson
- Glenn O’Neil
Key Project Objectives & Questions:

- **Objectives**
  - Linking of watershed actions to responses in specific parts of the bay
  - Optimization to achieve goals for ecological and socioeconomic values

- **Questions**
  - Where should Ag BMPs be implemented to achieve ecological and socioeconomic goals?
    - **Ecological targets:**
      - Fish spawning sites
      - Stream habitat
      - Cladophora biomass, etc.
    - **Socioeconomic values:**
      - Public beaches
      - Birding sites, etc.
  - How much conservation action is enough?
SagODM integrates the following to optimize multiple ecological benefits from conservation:

- Field, watershed, and Saginaw Bay Tools & Models
- Interests and values from ecosystem users
- Needs of SagODM endusers
We have sought stakeholder input

Stakeholder surveys - 15 questions
- Perceived ecosystem health
- Important uses of water
- Understanding of water quality
- 74 total responses via focus groups and individual surveys

Sub-Watershed focused meetings
- March 24 in both sub-watersheds
- Karpovich, DePinto, Selzer, Fales
- Presentation on ODM
- End-users & ecosystem users

The **Conceptual Model** has been designed to link to values revealed in the **stakeholder surveys**.
Linking of models to optimization

- SAGEM2 will enable linking of tributary outputs to specific nearshore grid cells
- SWAT will establish:
  - proportional contribution of subwatersheds to rivermouth flow points
  - Water quality conditions that impact ecological health of stream networks in watershed
- Marxan can incorporate these relationships and optimize BMPs to benefit stream and nearshore endpoints
  - Ecosystem user’s evaluation incorporated into optimization
Ecological and Socioeconomic Values

- Fish spawning locations
- Recreational fishing
- Commercial fishing
- Public water intakes
- Birding sites (eBird)
- Coastal wetlands
- Migratory birds
- Etc.
Different Proportional Influences on Important Bay Habitats

Spawning Sites

Coastal Wetland

Au Gres River

Rifle River

Kawkawlin River
Identify Best Areas for Conservation

- Ultimately will incorporate:
  - Multiple ecological features
  - Human values
  - Costs

- Resulting in:
  - Optimized locations for implementing Ag BMPs in entire Saginaw Bay watershed
Project Outputs

1) An idealized ODM decision process and tool
2) A conceptual model linking conservation actions to riverine and bay ecological endpoints and associated ecosystem services and human values
3) A gap analysis of data, knowledge, models and decision tools needed to support the idealized ODM
4) A functional, realized ODM decision process and tool kit based on available data, knowledge, models and decision tools.
5) A map of NHD+ catchments for implementing BMPs to optimally achieve ecological and socioeconomic goals
Project Expected Outcomes

1. Strengthening of relationships and communication among Saginaw Bay stakeholders;
2. Key stakeholders (e.g., MDARD, MDEQ, NRCS, Drain Commissioners, Soil Conservation Districts) begin to use SAGODM to inform management decisions and to track benefits of their actions
3. Shared priorities for optimal BMP implementation;
4. Increase the likelihood that producers will participate in MAEAP to meet shared ecological and socioeconomic goals.