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)

Funding

M | WATER CENTER
UNIVERSITY OF MICHIGAN

Team members

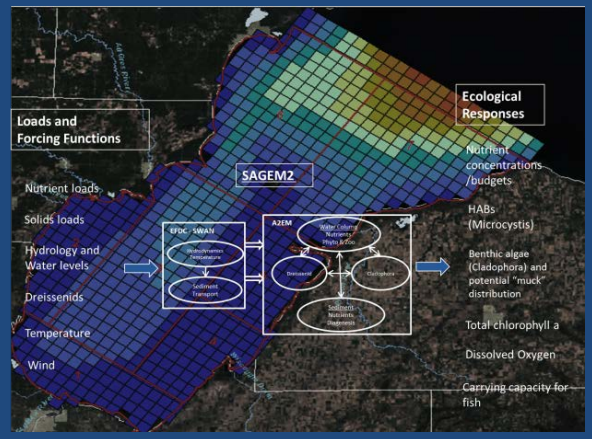
- Mary Anne Evans (USGS science for a changing world)
- Elaine Brown (MDARD)
- Charles Bauer (MDEQ)
- Bretton Joldersma
- Brian Sweeney
- Ruth Shaffer
- Ronnie Maurer (USDA)
- Ed Verhamme
- Todd Redder
- Derek Schlea
- Chelsie Boles
- Dan Rucinski (LimnoTech Water Environment | Scientists Engineers)
- Mary Fales
- Jared Ross
- Doug Pearsall
- Gust Annis (The Nature Conservancy, Protecting nature. Preserving life.)
- David Caroffino (DNR)
- Kyle Cissell
- Art Martin
- Andrew Miller
- Rhett Mohler (Smarter WATER, SAGINAW BAY ENVIRONMENTAL SCIENCE INSTITUTE)
- Jon Bartholic
- Vicki Anderson
- Glenn O'Neil (MICHIGAN STATE UNIVERSITY | Institute of Water Research)

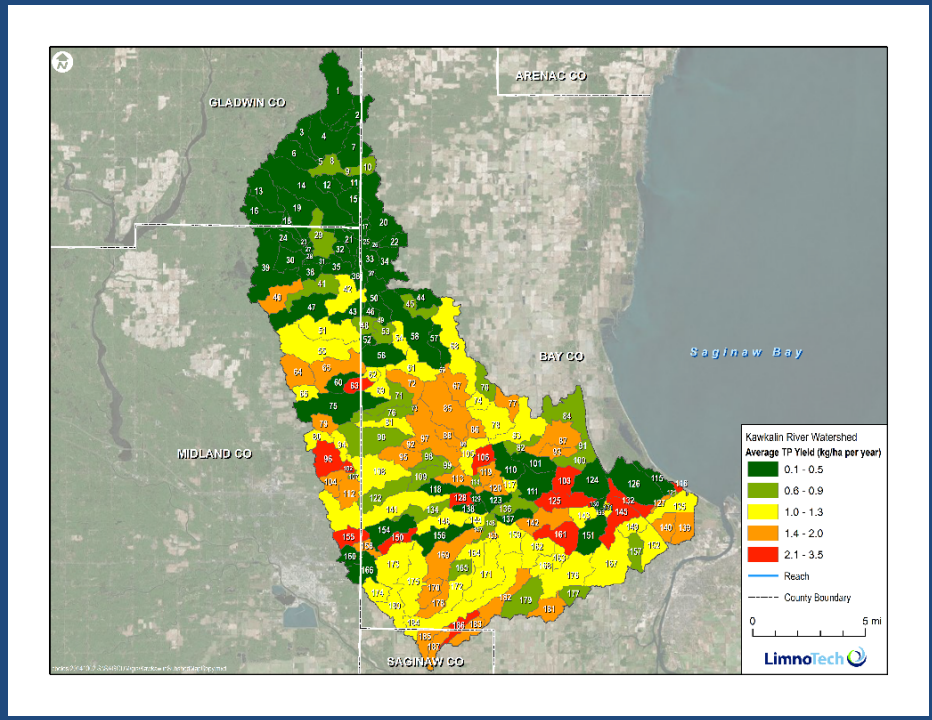
Key Project Objectives & Questions:

- 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?

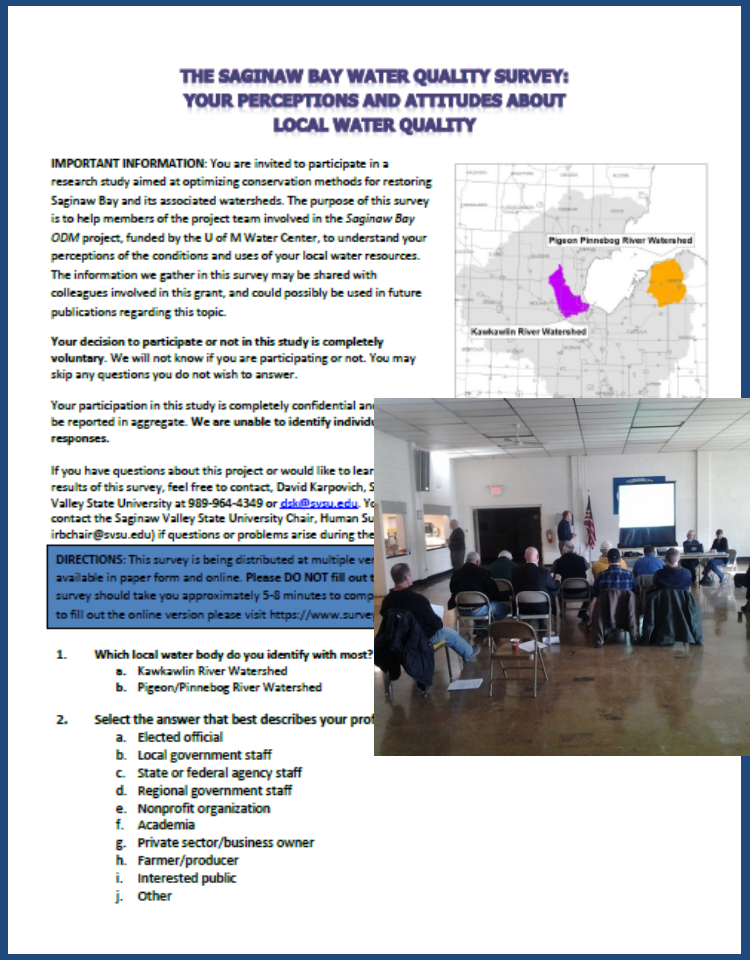
SagODM integrates the following to optimize multiple ecological benefits from conservation:

- Field, watershed, and Saginaw Bay Tools & Models
- Interests and values from ecosystem users
- Needs of SagODM endusers





We have sought stakeholder input



THE SAGINAW BAY WATER QUALITY SURVEY: YOUR PERCEPTIONS AND ATTITUDES ABOUT LOCAL WATER QUALITY

IMPORTANT INFORMATION: You are invited to participate in a research study aimed at optimizing conservation methods for restoring Saginaw Bay and its associated watersheds. The purpose of this survey is to help members of the project team involved in the *Saginaw Bay ODM* project, funded by the U of M Water Center, to understand your perceptions of the conditions and uses of your local water resources. The information we gather in this survey may be shared with colleagues involved in this grant, and could possibly be used in future publications regarding this topic.

Your decision to participate or not in this study is completely voluntary. We will not know if you are participating or not. You may skip any questions you do not wish to answer.

Your participation in this study is completely confidential an
be reported in aggregate. **We are unable to identify individu**
responses.

If you have questions about this project or would like to lear
results of this survey, feel free to contact, David Karpovich, S
Valley State University at 989-964-4349 or dsk@svsu.edu. Yo
contact the Saginaw Valley State University Chair, Human Su
irbchair@svsu.edu) if questions or problems arise during the

DIRECTIONS: This survey is being distributed at multiple ve
available in paper form and online. Please DO NOT fill out t
survey should take you approximately 5-8 minutes to comp
to fill out the online version please visit https://www.surve

1. **Which local water body do you identify with most?**
   a. Kawkawlin River Watershed
   b. Pigeon/Pinnebog River Watershed

2. **Select the answer that best describes your prof**
   a. Elected official
   b. Local government staff
   c. State or federal agency staff
   d. Regional government staff
   e. Nonprofit organization
   f. Academia
   g. Private sector/business owner
   h. Farmer/producer
   i. Interested public
   j. Other

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

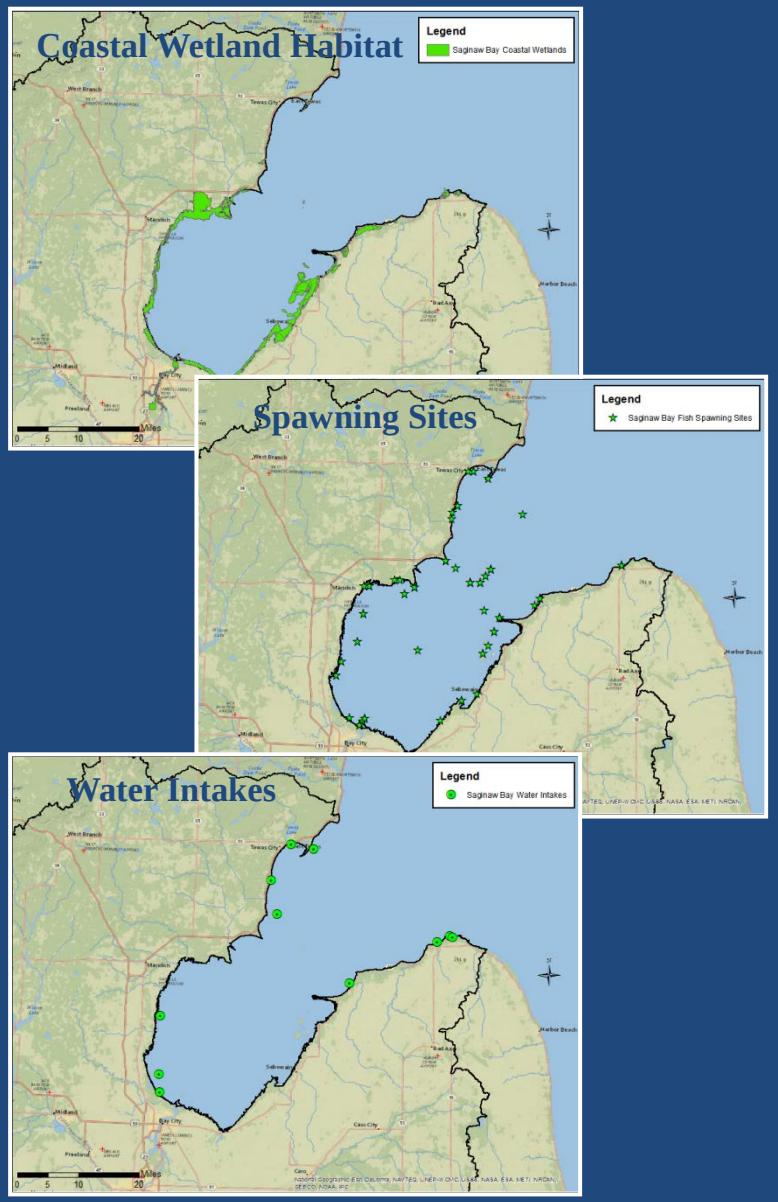
The Conceptual Model has been designed to link to values revealed in the stakeholder surveys.

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

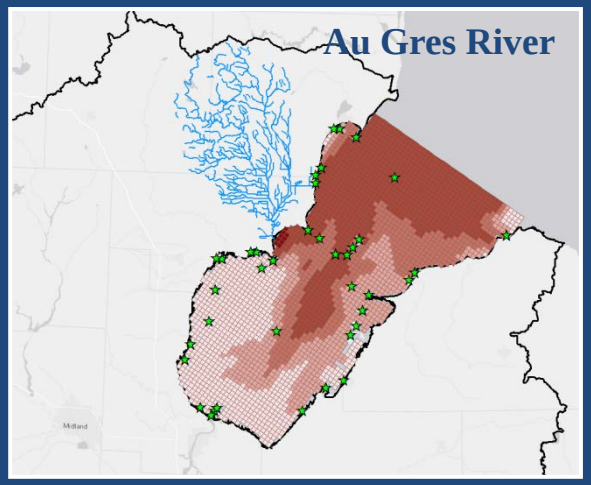
Ecological and Socioeconomic Values

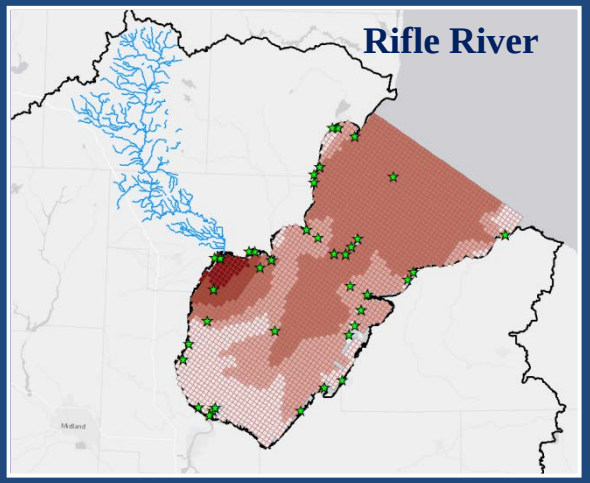
- Fish spawning locations
- Recreational fishing
- Commercial fishing
- Public water intakes
- Birding sites (eBird)
- Coastal wetlands
- Migratory birds
- Etc.

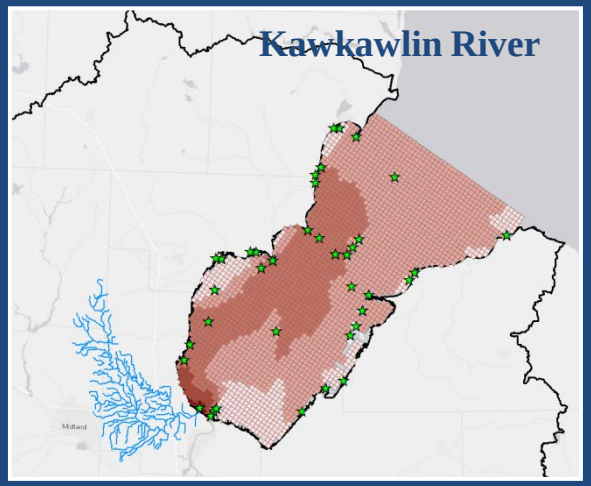


Different Proportional Influences on Important Bay Habitats

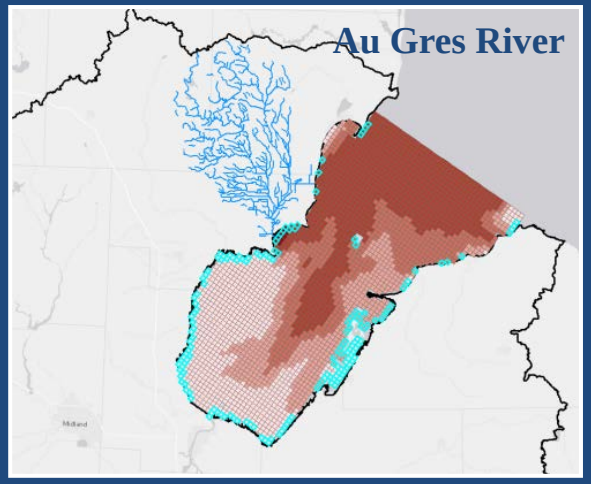
Spawning Sites

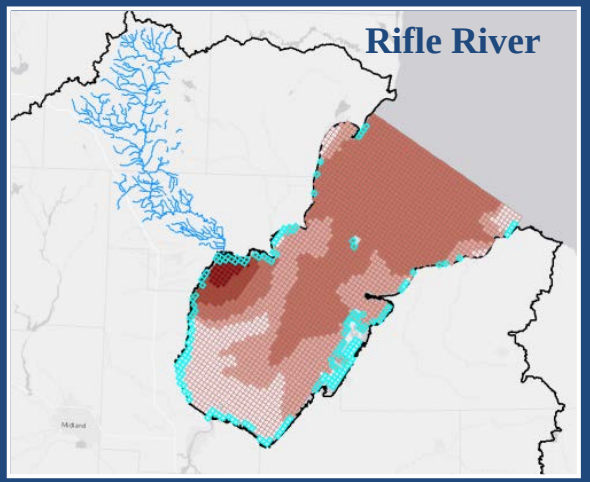


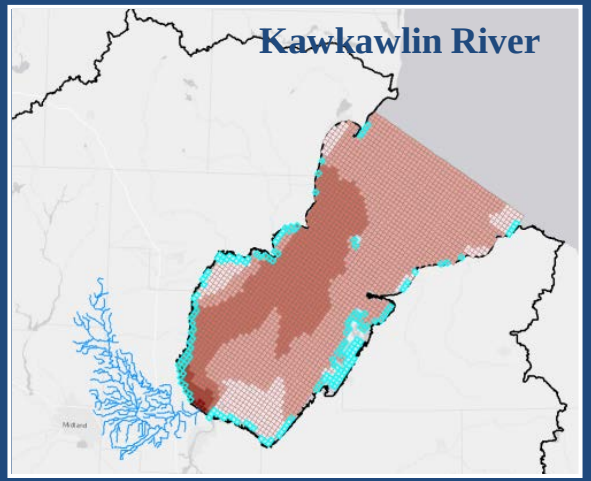




Coastal Wetland

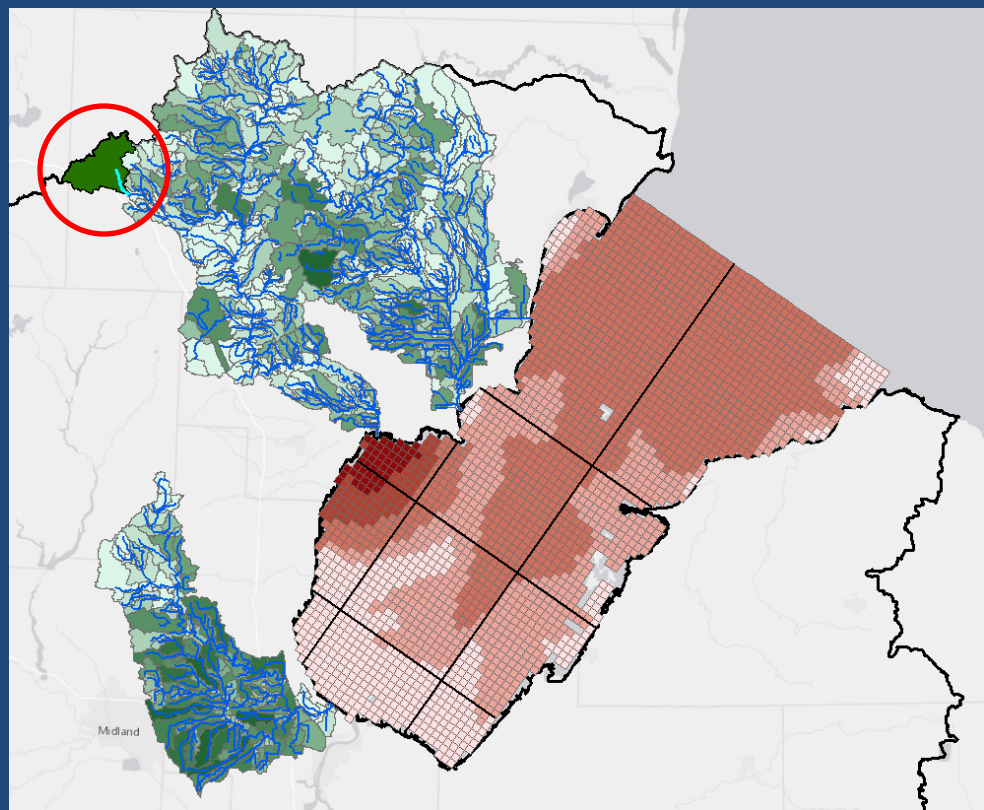






Identify Best Areas for Conservation

- 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.