

Social-ecological systems science in support of ecosystem-based management

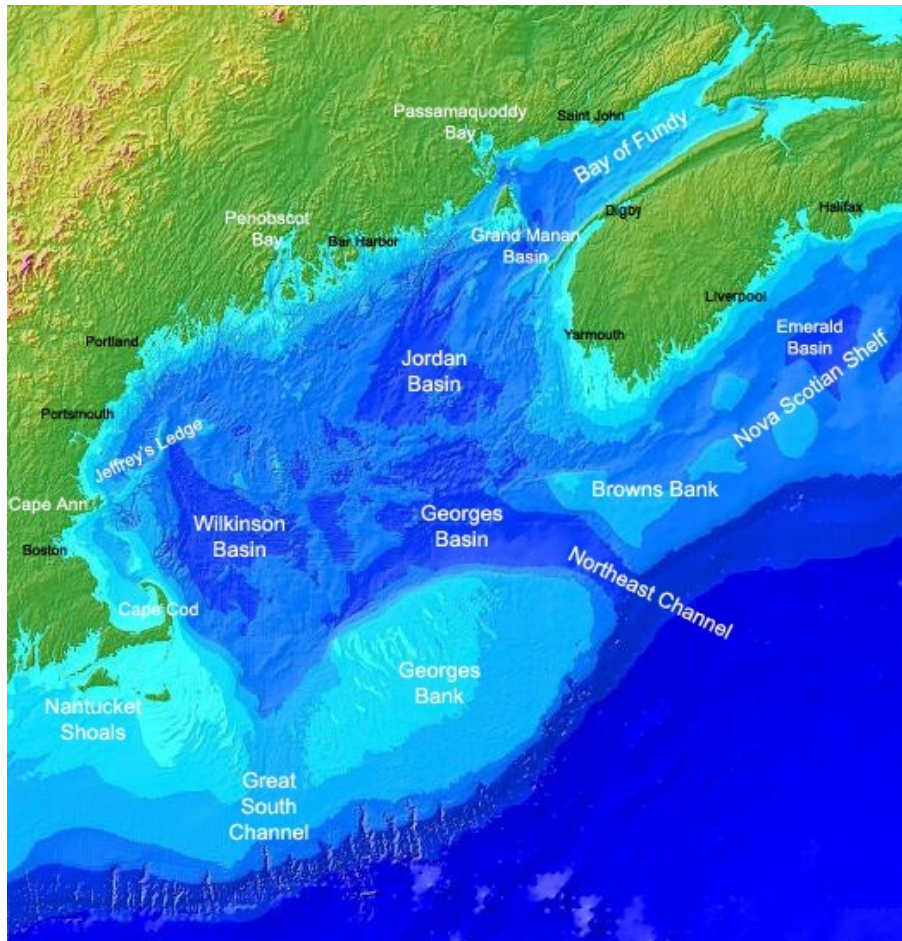
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AAAS Annual Meeting
2.14.25



Gulf of Maine



We are managing for multiple goals, including sustainable fisheries, energy, navigation, recreation, and biodiversity.

Photo credits: Portland Press Herald, AP Photo

My Main Message

The science and practice of ecosystem-based management have evolved a lot in the last 20 years.



Photo Credit: Heather Leslie

**Single-issue management
was the norm.**

**People were not part of
many concepts of an
ecosystem.**



Photo credit: Scott Hecker

Policies began to shift

→ The National Ocean Commission and Pew Ocean Commission reports (2003, 2004);

Progress continued

→ The National Ocean Policy (2010), and
→ NOAA's Ecosystem-Based Fisheries Management (EBFM) Roadmap (2016, 2024).



Ecosystem-Based Fisheries Management Guidelines
NOAA 2024

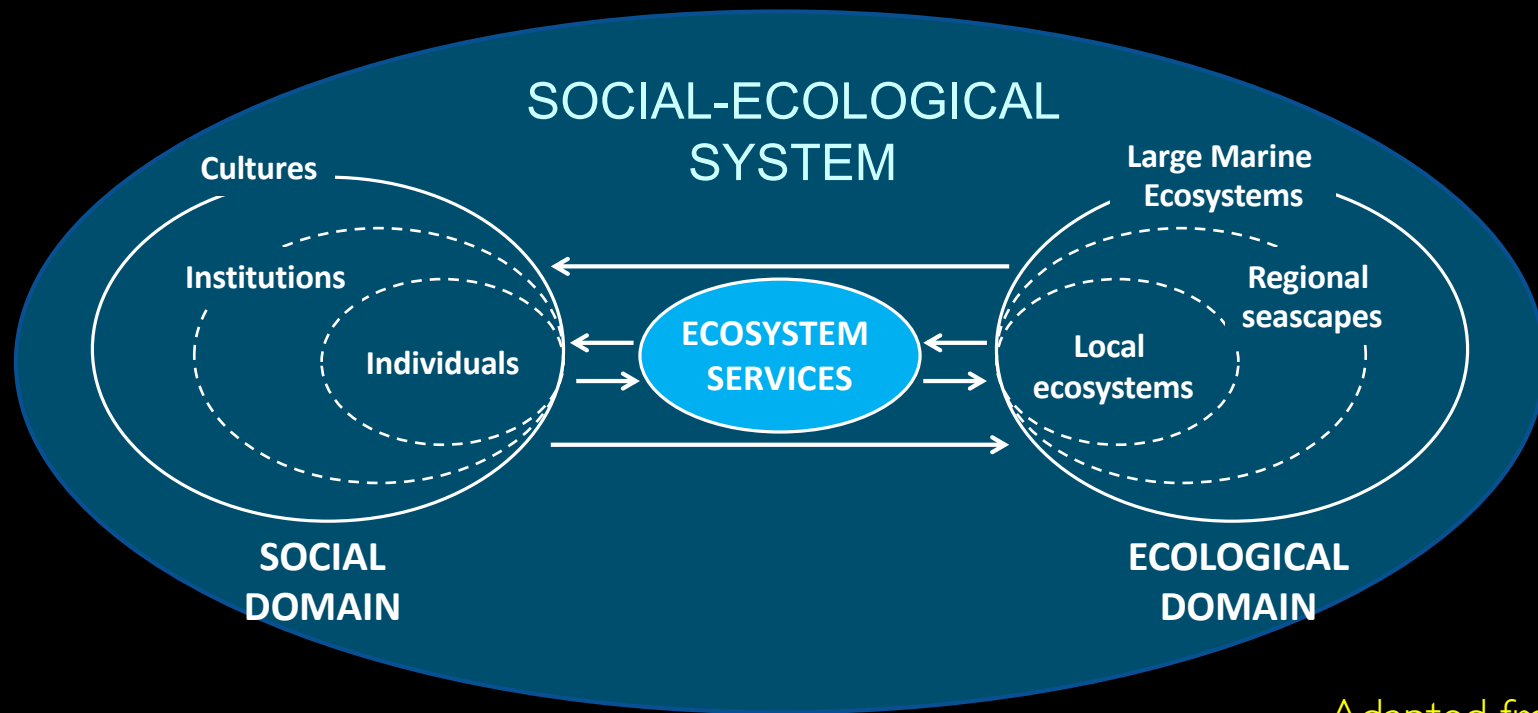
The science of social-ecological systems is a keystone element of ecosystem-based management

- Embraces the reciprocal links among people and nature
- Recognizes the value of multiple disciplines and ways of knowing
- Contributes to solutions



Photo credit: Heather Leslie

People are part of social-ecological systems



Adapted from Fig. 1.1,
McLeod and Leslie 2009

Two examples of how EBM science and practice have evolved

- Nationally and regionally:
NOAA's Integrated
Ecosystem Assessment
- Locally: Collaborative
research in coastal Maine to
support community-led
shellfish management



Photo credit: Heather Leslie

(1) NOAA's Integrated Ecosystem Assessment

**The Northeast
Integrated
Ecosystem
Assessment is
supporting
ecosystem-based
science and
management**

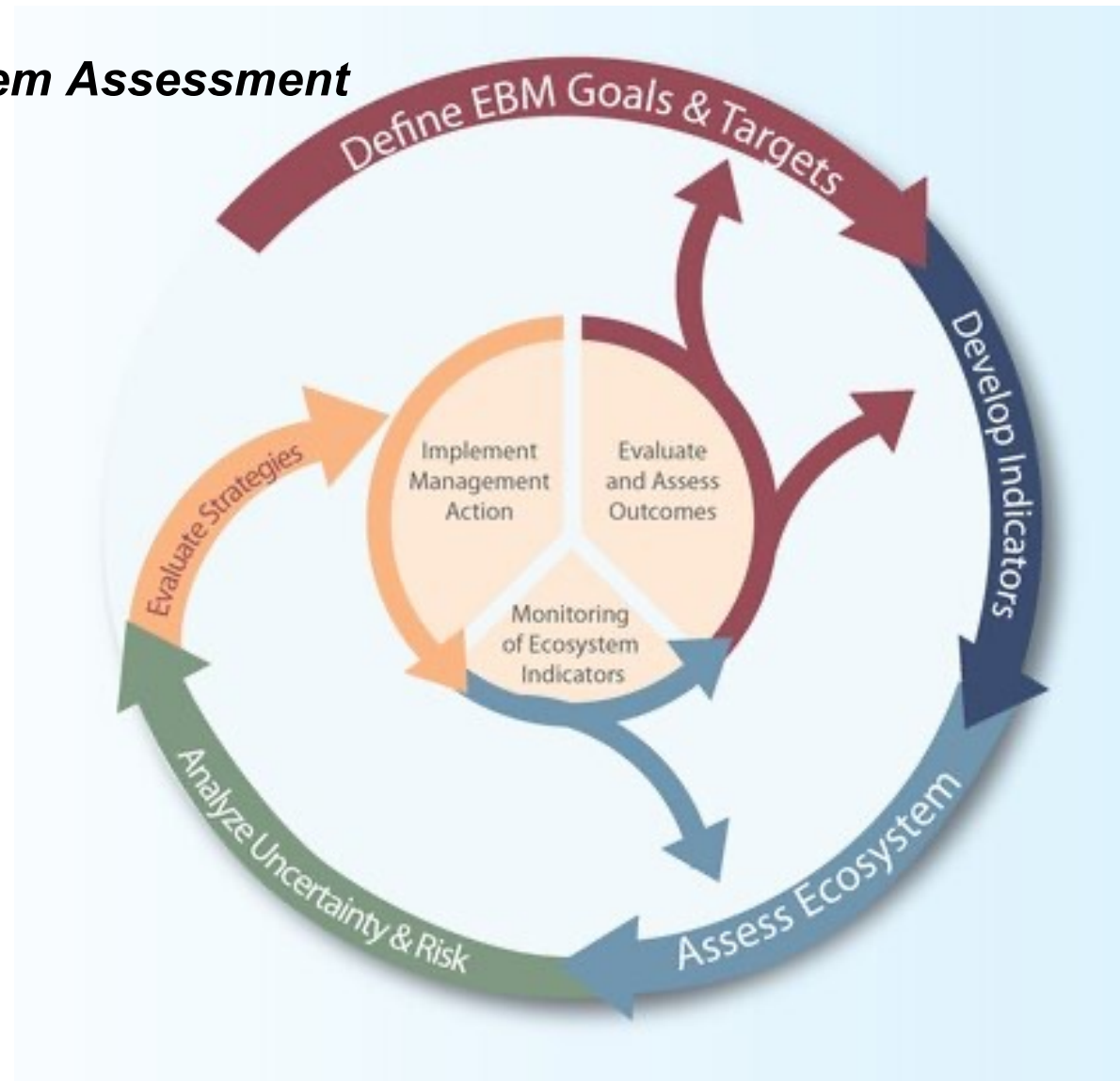
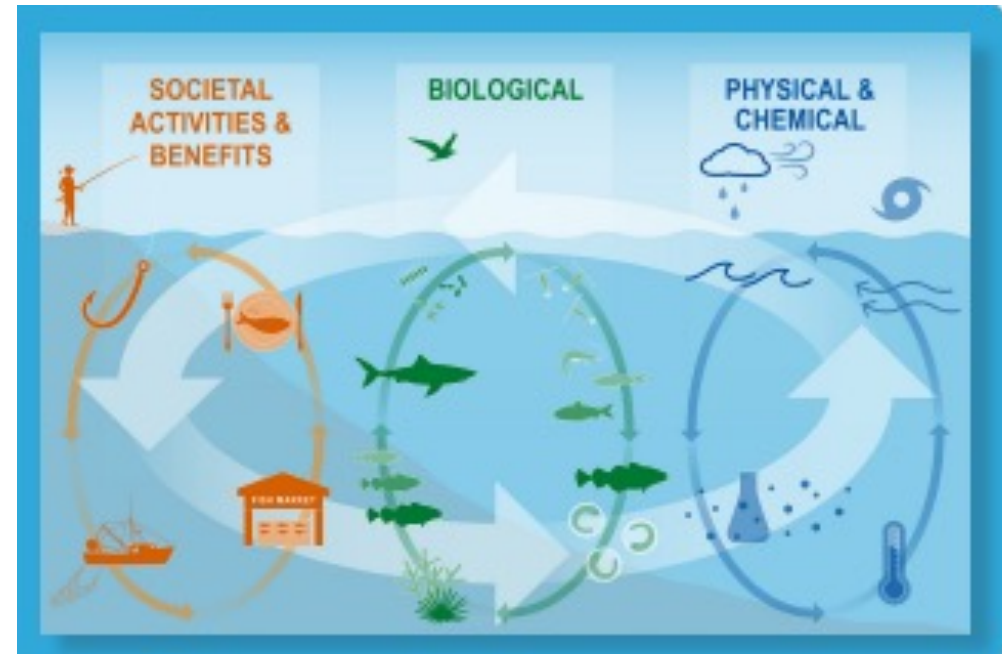


Figure from Samhoury et al. 2014

(1) NOAA's Integrated Ecosystem Assessment

The ecosystem is changing due to multiple system drivers, including

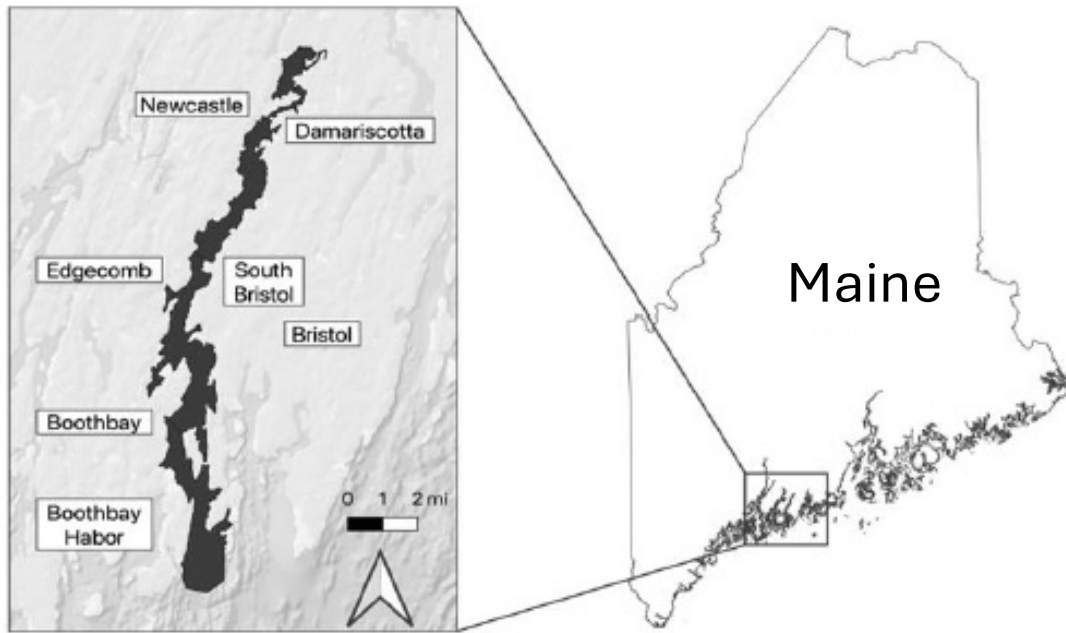
- human activities
- biological interactions
- physical and chemical processes.



The behavior of people, fish, plankton, *and* other ecosystem components are part of this conceptual model. **That's social-ecological systems science.**

<https://www.integratedecosystemassessment.noaa.gov/regions/northeast/northeast-marine-ecosystem>

(2) Collaborative, community-led research in coastal Maine



The Damariscotta River estuary is in midcoast Maine, three hours northeast of Boston.

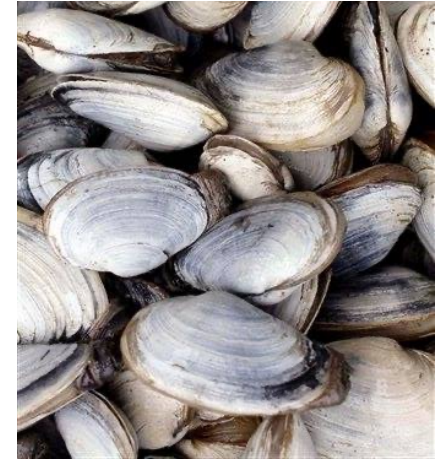


Photo Credit: Sarah Risley

(2) Collaborative, community-led research in coastal Maine

Since 2019, the Damariscotta River Estuary's Community Science Program has enabled collaboration among

- researchers,
- shellfish harvesters,
- students,
- municipal leaders, and
- other community members.



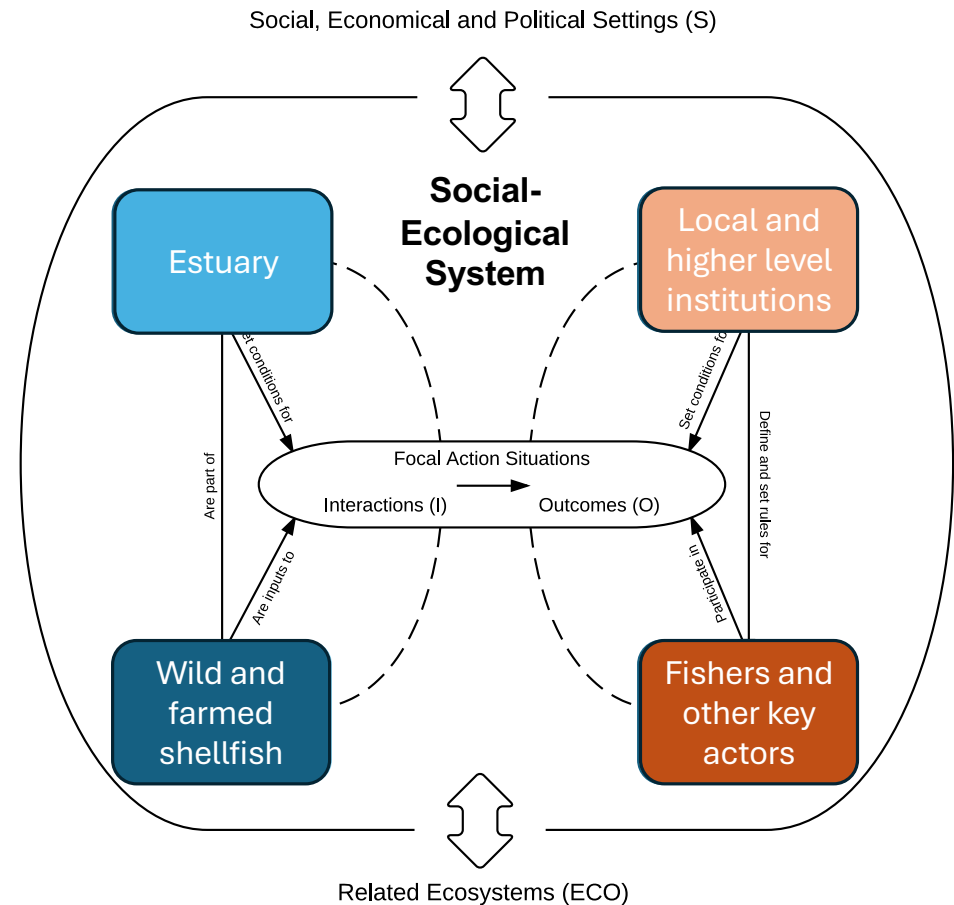
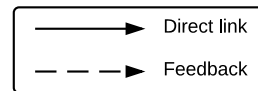
Soft shell clams
(Mya arenaria)

We are collecting, interpreting, and applying data in ways that contribute to municipal shellfish fishery management and broader ecosystem sustainability.

Risley et al. 2023

Ostrom's social-ecological systems framework supports collaborative science and stewardship

*Leslie et al. 2023,
after Ostrom 2009 and
Basurto et al. 2013*



How has social-ecological systems science contributed to ecosystem-based management?

- By bringing together multiple knowledges, about different types of connections and components of the system, and
- Thereby generating more robust information and understanding,
- This new ecosystem science supports identification a more varied set of management strategies.



To return to my main message

The science and practice of ecosystem-based management have evolved a lot in the last 20 years.

→ This scientific progress has supported implementation of EBM at multiple scales, local to national.

→ We still have work to do! We need to monitor and document the impacts of EBM on nature and people.

→ To do this well requires collaboration among scientists, fishermen, resource managers, and others within the system.



Thank you!

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