Red Swamp Crayfish Structured Decision Making

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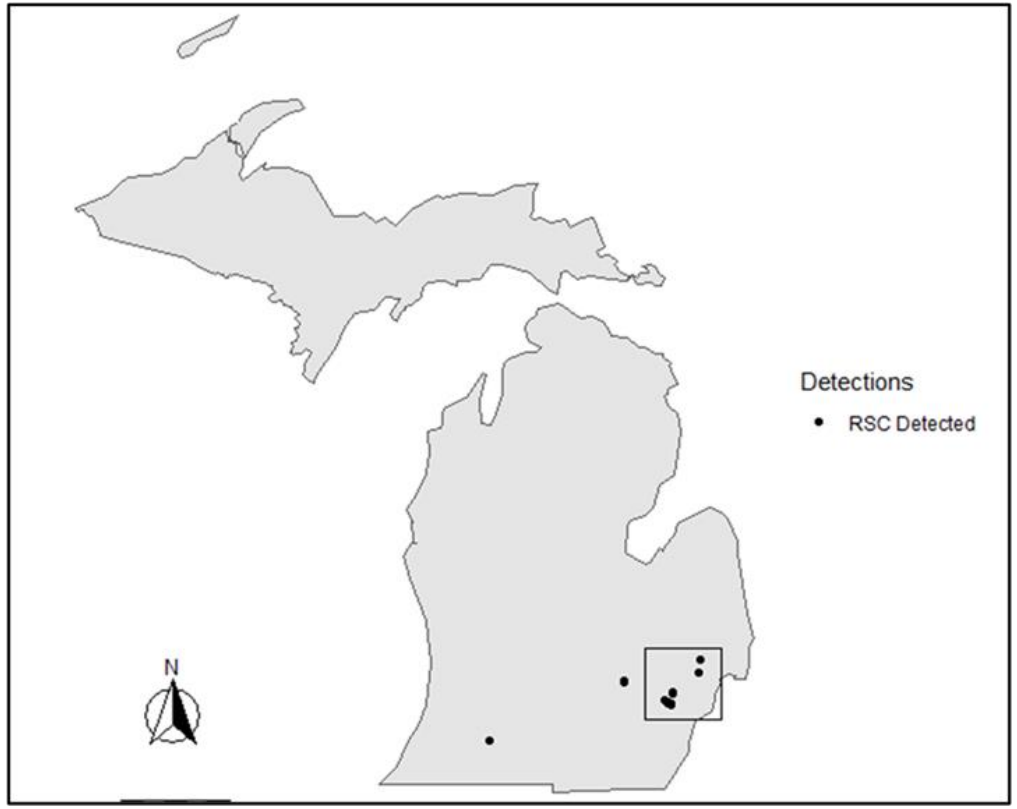
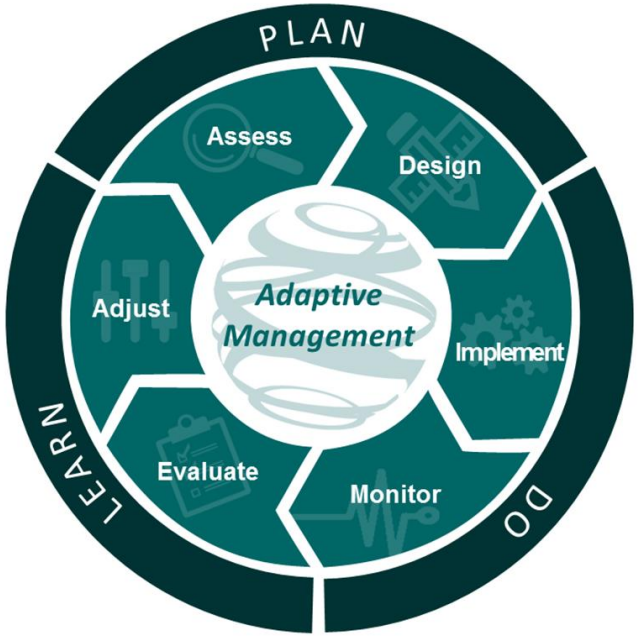
Michigan Invasion

- 2013 - Red Swamp Crayfish (RSC) reported but not found
    - DNR & MSU risk assessment
- 2015 - RSC were prohibited in the state
- 2017- RSC found in Michigan
    - Over 40 waterbodies in 9 complexes
    - Retention ponds, golf courses, backyard koi ponds



Adaptive Management

- 2017 Response Plan
    1. Determine the **distributional extent** of red swamp crayfish infestations
    2. Implement and evaluate an **early detection monitoring strategy** for red swamp crayfish in high-risk areas in Michigan
    3. Determine the **source and relatedness** of red swamp crayfish infestations
    4. **Collect baseline biological and physical information** that will inform a future **assessment of impacts** in areas of where effective control or eradication is not possible or feasible
    5. **Evaluate control measures** to increase effectiveness of response efforts
- Implemented through teamwork among RSC partners



Michigan Invasive Species Grant Program

Why are we doing this now?

- Time period for initial response plan has passed
  - Focused on intensive trapping and pesticide treatments in the past
  - Use new knowledge and address uncertainties
- Need an updated plan
  - Incorporates feedback from all partners
  - Applicable to the entire state of Michigan

Structured Decision Making (SDM)

- Organized approach for working together to make informed and transparent choices in complex decision situations
- Goal: 5-year plan to guide statewide efforts from 2025-2030

RSC SDM Workshop

RSC Partners
March 12-13, 2024

1. **Review and refine problem statement:** *"Develop a 5-year response plan for red swamp crayfish in the state of Michigan to limit impacts to ecosystem and human infrastructure given limited resources"*
2. **Articulate the things we care most about as fundamental objectives, means objectives, and measurable attributes.**
3. **Develop creative and unique alternatives (actions) to achieve objectives.**

Get feedback from Expert Panel on objectives and alternatives.

Revise as needed.

Workshop Follow-up

4. **Estimate the consequences, or the probability of outcomes, of the alternatives given the objectives that were identified.**

Get feedback from Expert Panel and RSC Partners on consequences.

Revise as needed.

Decision Analysis

6. **Select alternative that best achieves desired objectives**
5. **All objectives may not be attainable at the same, so tradeoffs will need to be considered by weighting (prioritizing) objectives. Assign weights based on feedback from RSC Partners.**

Draft response plan, share with RSC Partners and Expert Panel; revise as needed

Finalize Response Plan and Implementation

7. **Begin plan implementation (2025 field season)**

Fig. Gleason et al. (2021)

SDM Facilitators

RSC Partners

22 participants

Riparian Owners

Expert Panel

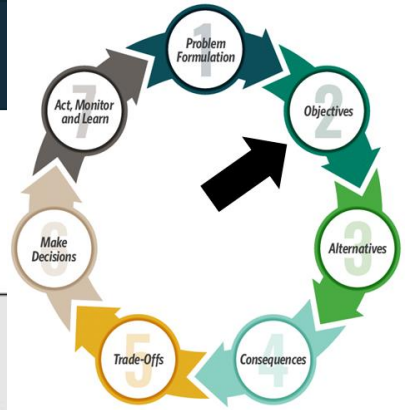
Riparian Owners

Problem Statement

Develop a 5-year response for red swamp crayfish in the state of Michigan to limit impacts to ecosystem and human infrastructure given limited resources.

Protect, sustain, and improve social-ecological systems in the state of Michigan from the negative impacts of red swamp crayfish and potential actions associated with addressing their invasion. A collaborative and actionable 5-year Plan will be developed using an adaptive management framework.

Objectives



A - Min. Crayfish Impacts

Minimize biotic disturbance (RSC)

Minimize abiotic disturbance (RSC)

Spread within a complex
# of sites with RSC

Min. impacts to societal & cultural resources (RSC)

B - Min. Non-Target Impacts

Minimize abiotic disturbance (actions)

Minimize biotic disturbance (actions)

Min. impacts to societal & cultural resources (actions)

C - Max. System Resiliency

Metrics will need to specify timeline is after-RSC or after-action

Max. ecosystem improvements post-action

Min. potential for re-invasion; Max. deterrents

Biodiversity Inc.
Cultural resources

D - Max. Public Support

Max. public support

Citations
Pet stores w/ prohibited species

E - Min. Cost

Min. cost

Process/Strategy

Min. risk/Max. confidence in expected outcomes

Max. learning/Min. uncertainty

Max Understanding impacts of management

Develop new technologies

Max. early/proactive collaborative input

Monitoring results/ outcomes

Max. location-/system-specific solutions

Compliance with laws and regulations

"Parking Lot"

Max. ecosystem services

Maximize ecosystem structure and function

Minimize competition with native species; Max. biodiversity of native species

total costs (materials, time)

Min. effort

Max. ability to define an end

Minimize bank erosion (RSC)

Maximize water quality (actions)

Maintain buy-in from collabs/ funders/ public

Max. community engagement

Max. awareness/ comm among partners & public

Minimize native species mortality

Max. opportunities for enhancement

Min. impacts from alternatives (restoration)

Max. public [and institutional] understanding

^Minimize habitat distubance (actions)^

Max. perception of ecosystem integrity

Max. species-specific control

Min. new introductions (human sparks)

Min. new introductions (complex spread)

Max. ability to detect new populations early

Min. spread from existing populations

Min geographic extent of RSC

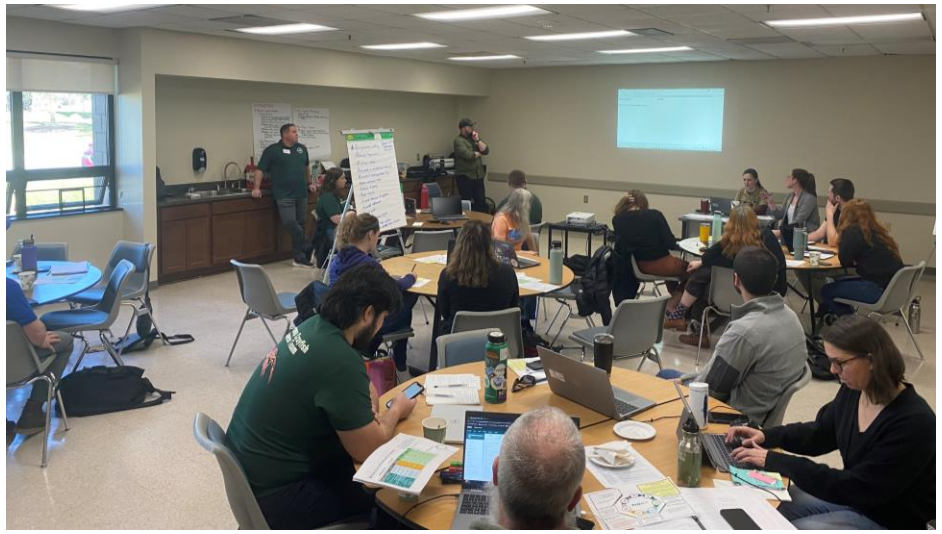
Max. removal of red swamps

^Connectivity of waterbodies^

Alternatives & Strategies

- 32 actions
  - Control
  - Outreach
  - Prevention
  - Miscellaneous
- Asked 5 groups to compile into strategies
  - Themes: Research, Control, Prevention via outreach & regulation, Increase management tools, Decrease population growth, Prevent new introductions, Eradicate, etc.

Next Steps



- Feedback from Expert Panel on objectives and alternatives.
  - Revise as needed.
- Estimate the consequences, or the probability of outcomes, of the alternatives given the objectives that were identified.
- Please contact me about joining our expert panel

Acknowledgements

- Michigan DNR
  - Ryan Wheeler
  - Mauri Liberati
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  - Lucas Nathan
  - Brennen Wright
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Questions?

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