RED TIDE AS A FISHERY ECOSYSTEM ISSUE: A CASE STUDY

Ecosystem Technical Committee Meeting
Gulf of Mexico Fishery Management Council

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April 19, 2023

Acknowledgements

NOAA

John Walter - SEFSC

Mandy Karnauskas - SEFSC

Chris Kelble - AOML

Matt McPherson - SEFSC

Skyler Sagarese - SEFSC

Rick Stumpf - NCCOS

CIMAS

Suzana Blake

Ian Smith

Tyler Christian

Rachel Cohn

UF

Dave Chagaris

FCWC

Casey Streeter

John Mertz

Jay Mullins

GMFMC

John Froeschke

Natasha Méndez-Ferrer

Crew and volunteers

R/V Walton Smith

NOAA white ships

Purpose

1. Provide worked example of FEI loop using red tide

2. Make recommendations on FEP / FEI process

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What is the FEP loop?

1. Iterative process to operationalize EBFM (LGL, 2022)

2. Flexible guidance and not ready made cookbook (Essington et al. 2016)

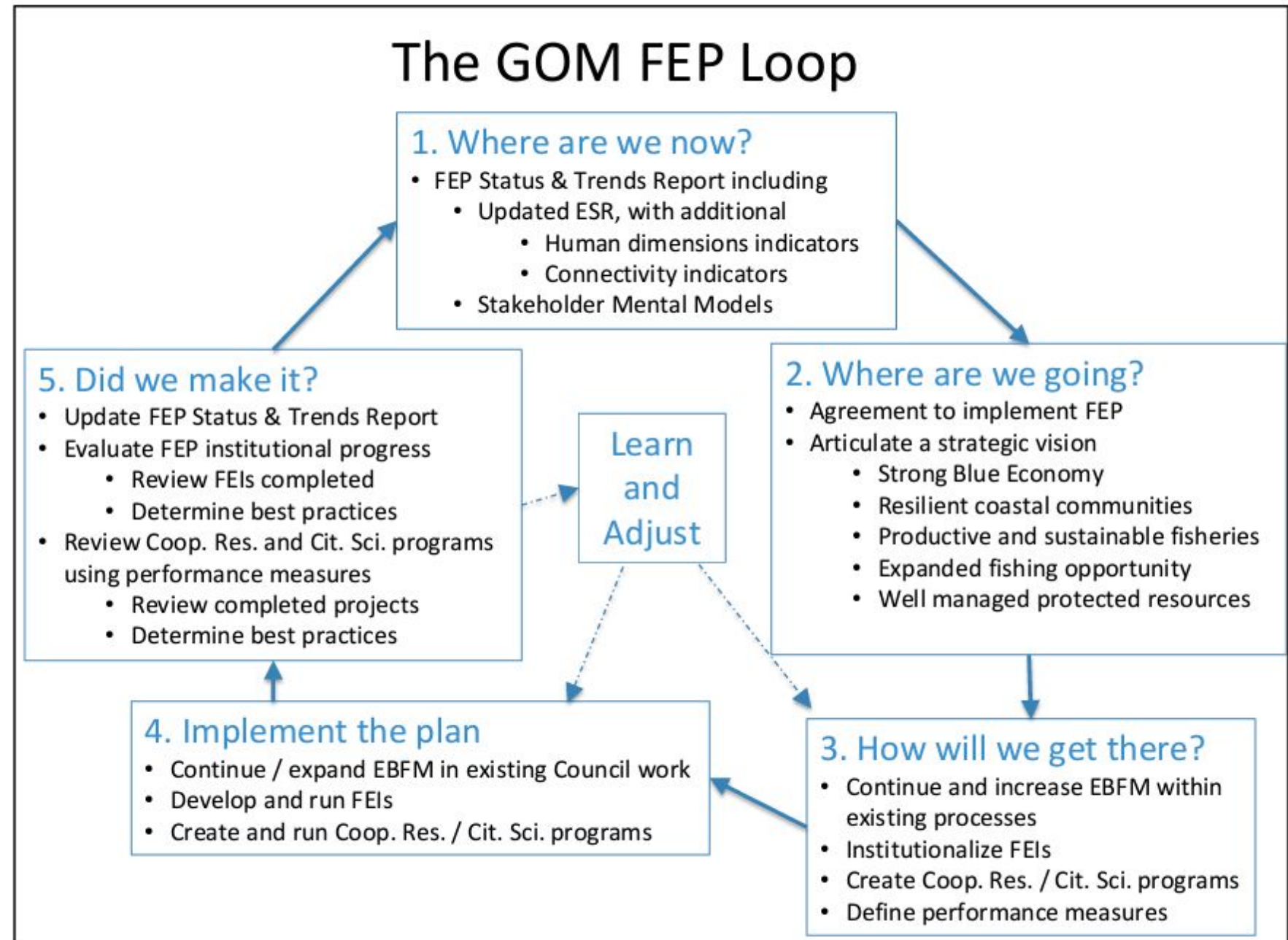3. Full cycle: ~10 years (Marshall et al. 2018)

The GOM FEP Loop

1. Where are we now?
- FEP Status & Trends Report including
  - Updated ESR, with additional
    - Human dimensions indicators
    - Connectivity indicators
  - Stakeholder Mental Models

2. Where are we going?
- Agreement to implement FEP
- Articulate a strategic vision
  - Strong Blue Economy
  - Resilient coastal communities
  - Productive and sustainable fisheries
  - Expanded fishing opportunity
  - Well managed protected resources

3. How will we get there?
- Continue and increase EBFM within existing processes
- Institutionalize FEIs
- Create Coop. Res. / Cit. Sci. programs
- Define performance measures

4. Implement the plan
- Continue / expand EBFM in existing Council work
- Develop and run FEIs
- Create and run Coop. Res. / Cit. Sci. programs

5. Did we make it?
- Update FEP Status & Trends Report
- Evaluate FEP institutional progress
  - Review FEIs completed
  - Determine best practices
- Review Coop. Res. and Cit. Sci. programs using performance measures
  - Review completed projects
  - Determine best practices

Learn and Adjust

Figure: LGL, 2022

What is the FEI loop?

1. "Structured, action-oriented planning processes that address specific fisheries issues" (LGL, 2022)

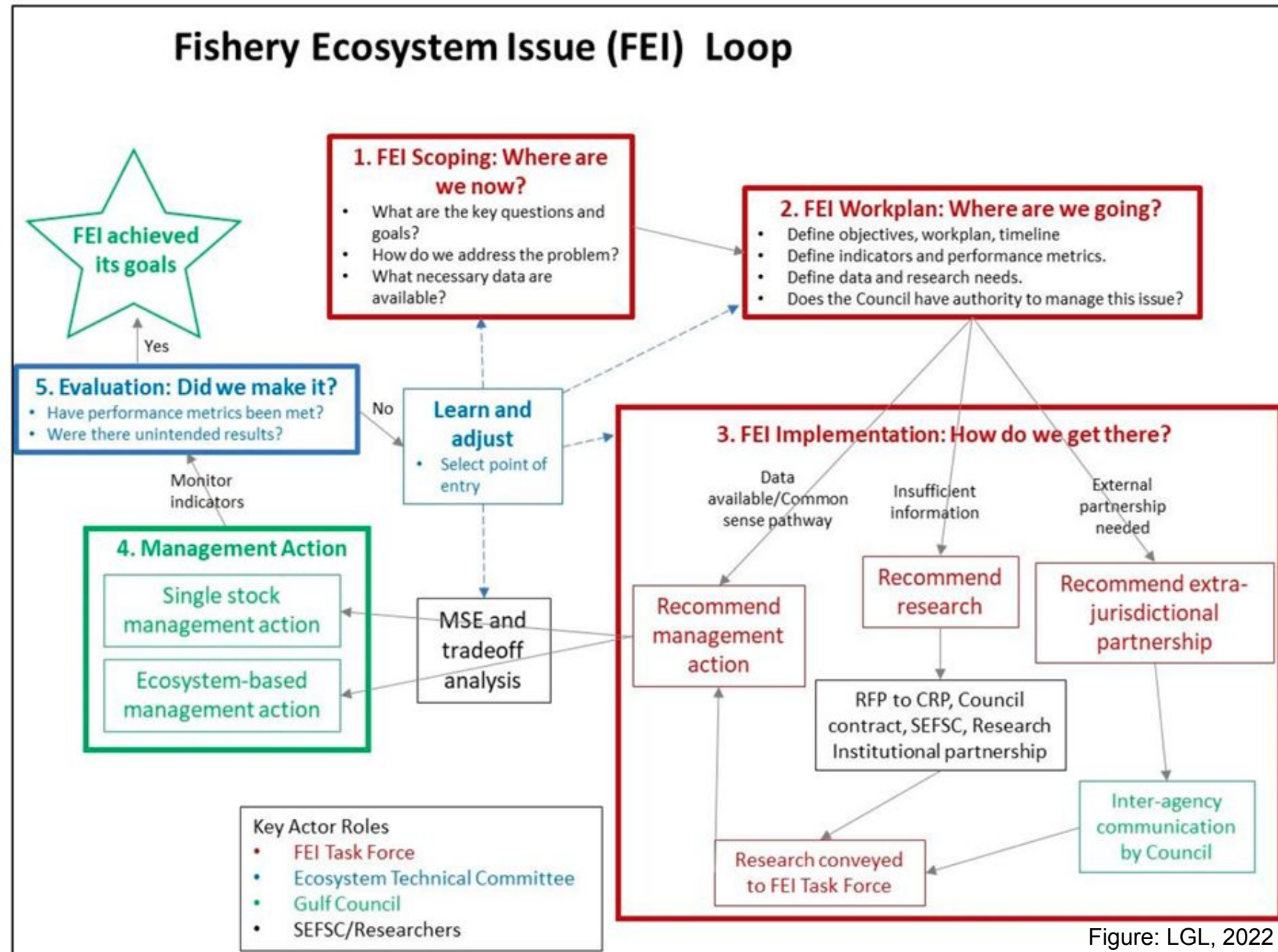2. Full cycle: 4 months to 3 years (LGL, 2022)


Figure: LGL, 2022

Major milestones for red tide FEI

2006 - Acknowledged impacts from red tide to gag and red groupers

2009 - Red tide extra mortality estimated in stock assessments

2014 - Discard only fleet, ecosystem models, and red tide index in stock assessments

2016 - Ecosystem model based MSE recommendations

2018 - Stock Synthesis based MSE recommendations

2019 - Collaborative monitoring of red tide & hypoxia initiated

2021 - Use of hypoxia monitoring data in catch limit deliberations

Full lifecycle (thus far) ~17 years

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1. FEI Scoping: Where have we been?

1. What are the key questions and goals?
    a. How do red tides affect managed stocks?

2. How do we address the problem?
    a. Interdisciplinary team – NOAA Integrated Ecosystem Assessment efforts (USF, UF, FWRI, SEFSC, AOML) and external funding sources (FATE, RESTORE)
    b. Stakeholder participatory modeling

3. What necessary data are available?
    a. FWRI HAB cell count data, Local Ecological Knowledge, Satellite data

<u>Missing from FEI loop:</u> Explicit inclusion of stakeholder engagement
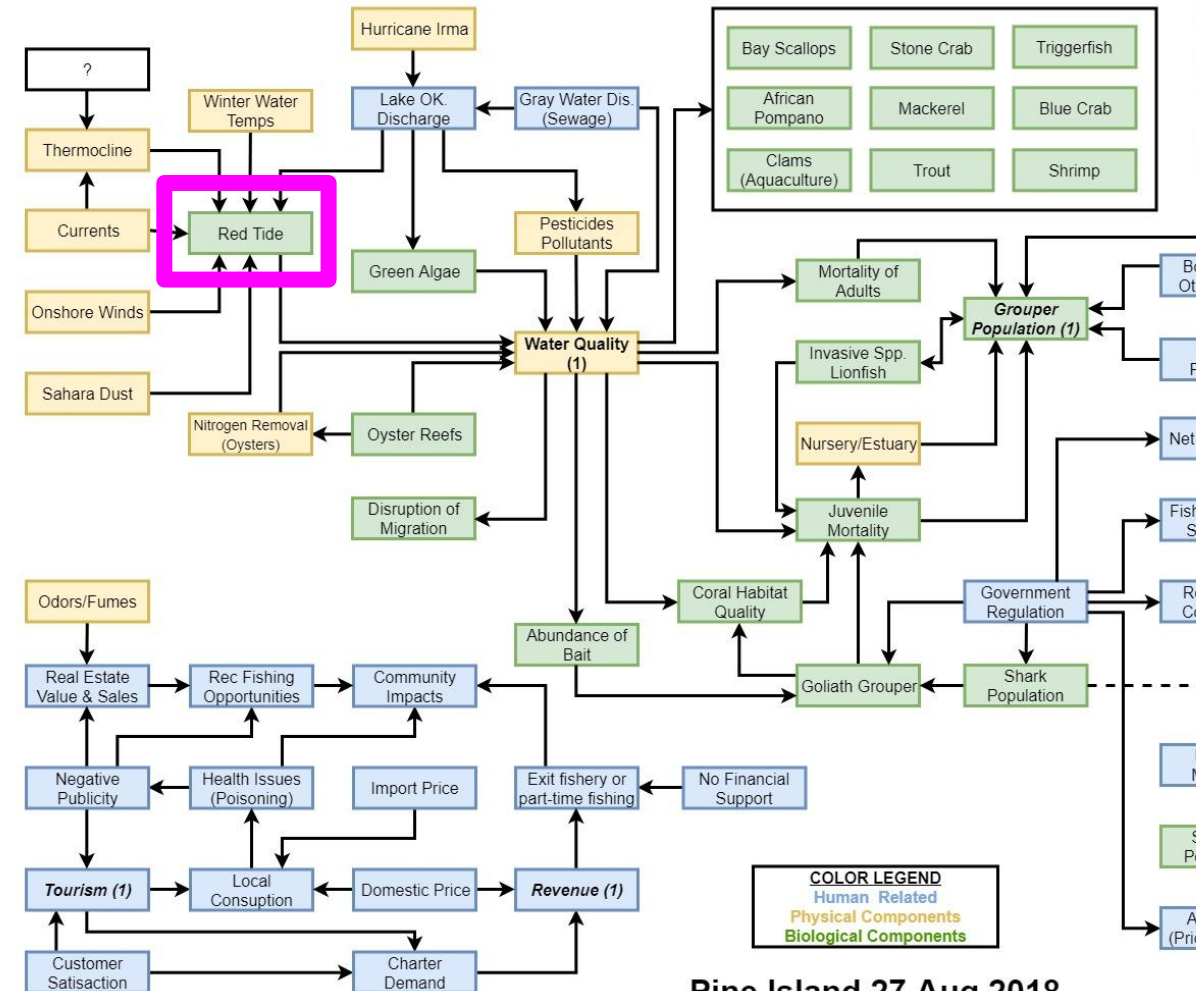
Pine Island 27 Aug 2018
SEFSC Participatory Modeling Initiative

2. FEI Work Plan: Where did we go?

1. Does Council have authority to manage issue (**do this during scoping phase**)?
   a. Can manage fishing mortality
   b. Cannot stop red tides, but communicate impacts to other management bodies

2. Define objectives, workplan, timeline
   a. Include red tide mortality in single species stock assessment
   b. Develop ecosystem models to explore tradeoffs
   c. Create red tide index

3. Define indicators and performance metrics
   a. Unknown

4. Define data and research needs
   a. Outlined in SEDAR reports
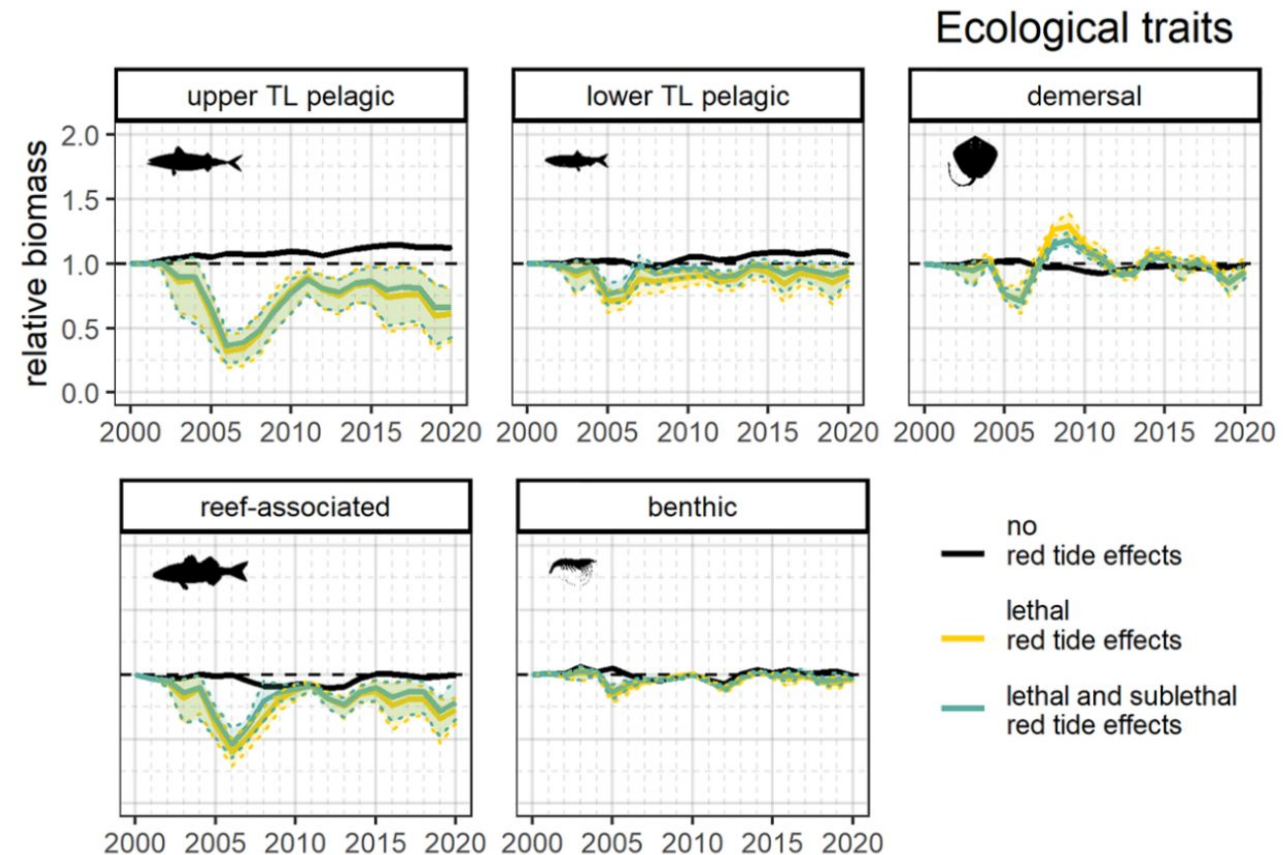
Figure: Vilas et al. 2023

3. FEI Implementation: How did we get there?

1. Data availability / common sense pathway
   a. Recommend management actions using SEDAR assessments

2. Insufficient information
   a. Recommend research
   b. Collaborative research with commercial and recreational fishermen (e.g., FCWC; floridawatermen.org)

3. External partnership needed
   a. Extrajurisdictional partnerships to address nearshore water quality improvements (e.g., Hypoxia Task Force)
   b. Advise ACE on Lake Okeechobee releases

FCWC Water Quality Bulletin
Collected: Oct16, 2021
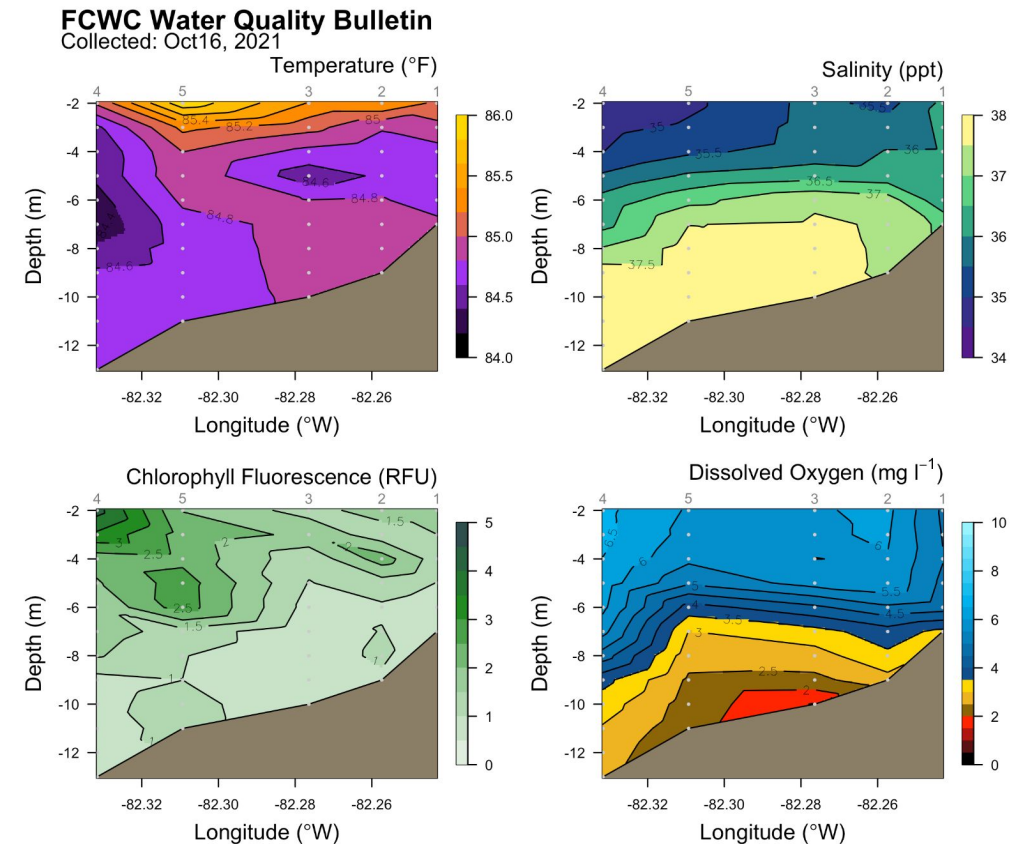
4. Management Action

1. Single stock management actions
   a. ***Primary mode of action for council***
   b. Adjust OFL, ABC, and ACL for gag and red groupers

2. Ecosystem-based management actions
   a. ***None enacted***, not because science wasn't available (see Grüss et al. 2017)
   b. Use of ecosystem models
   c. Ecological reference points (e.g., environmental drivers, species interactions)

Amendments explicitly considering red tide mortality

Year	Gag	Red Grouper
2022		Amendment 53 & Modification
2021		
2020		
2019		Modification
2018		
2017	Amendment 44	
2016	Framework Action	Framework Action
2015		
2014		
2013		
2012	Amendment 32	
2011		Regulatory Amendment
2010		Regulatory Amendment
2009	Amendment 30B	

*Interim rules not included

5. Evaluation: Did we make it?

1. Have performance metrics been met?
   a. Stock assessment output better fit to indices of abundance (assessment metric)
   b. *No management metrics defined*

2. Were there unintended results?
   a. *Unclear; retrospective analysis needed*
   b. **"Red tide fatigue" – objectives, timeline, and performance metrics not initially defined**

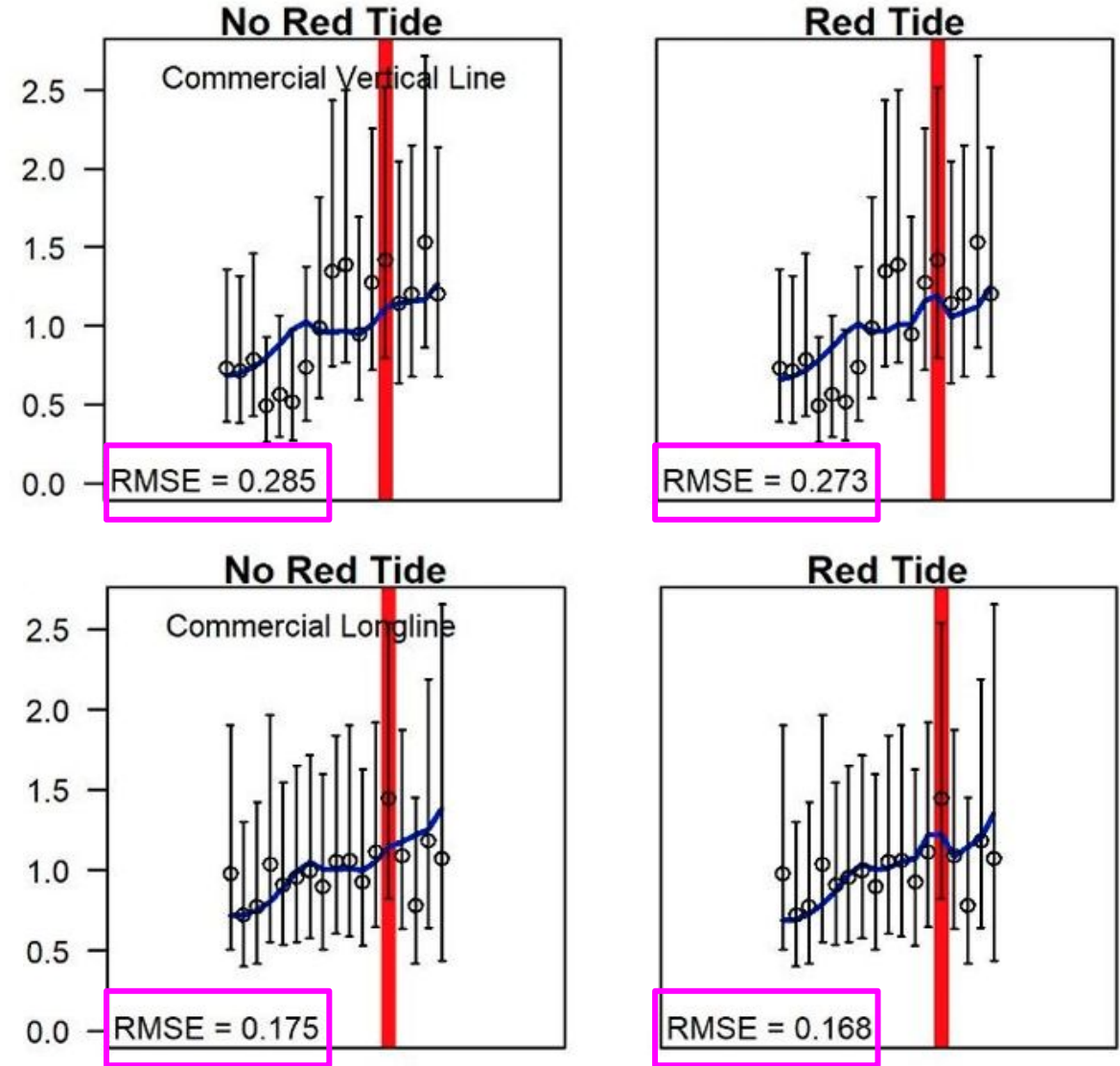*If NO, reiterate any previous step and/or perform MSE and tradeoff analysis*

Figure: Sagarese et al. 2021

6. Learn and Adjust

1. Management Strategy Evaluation (MSE)
   a. Ecosystem model based (Grüss et al. 2016)
   b. Stock Synthesis based (Harford et al. 2018, Sagarese et al. 2021)

2. Tradeoff analysis
   a. MSEs considered reactive strategies vs. increased buffers (*preferred*)
   b. Reactive strategies can achieve higher catches but are data hungry
   c. Projections without red tide increase probability of overfishing
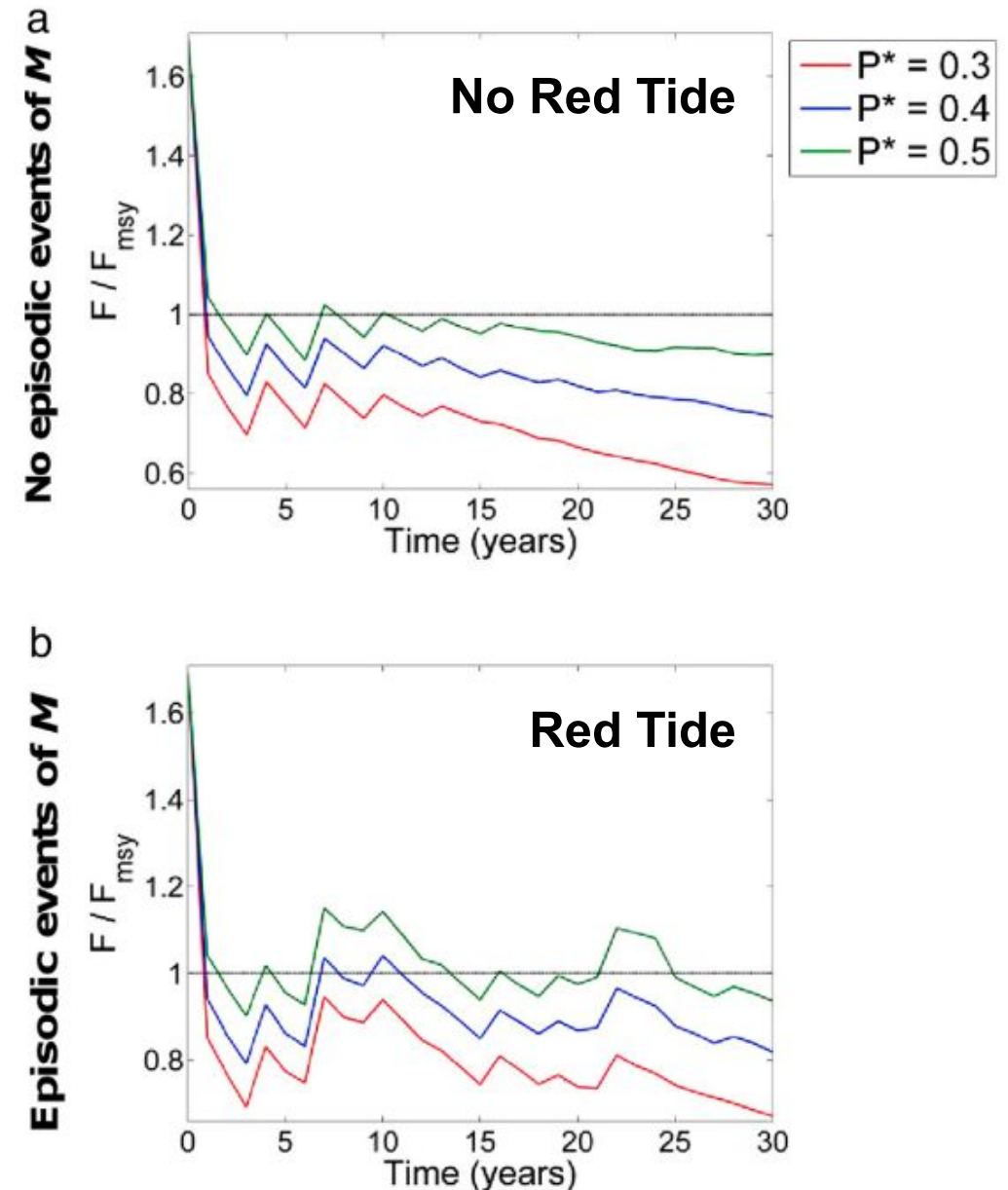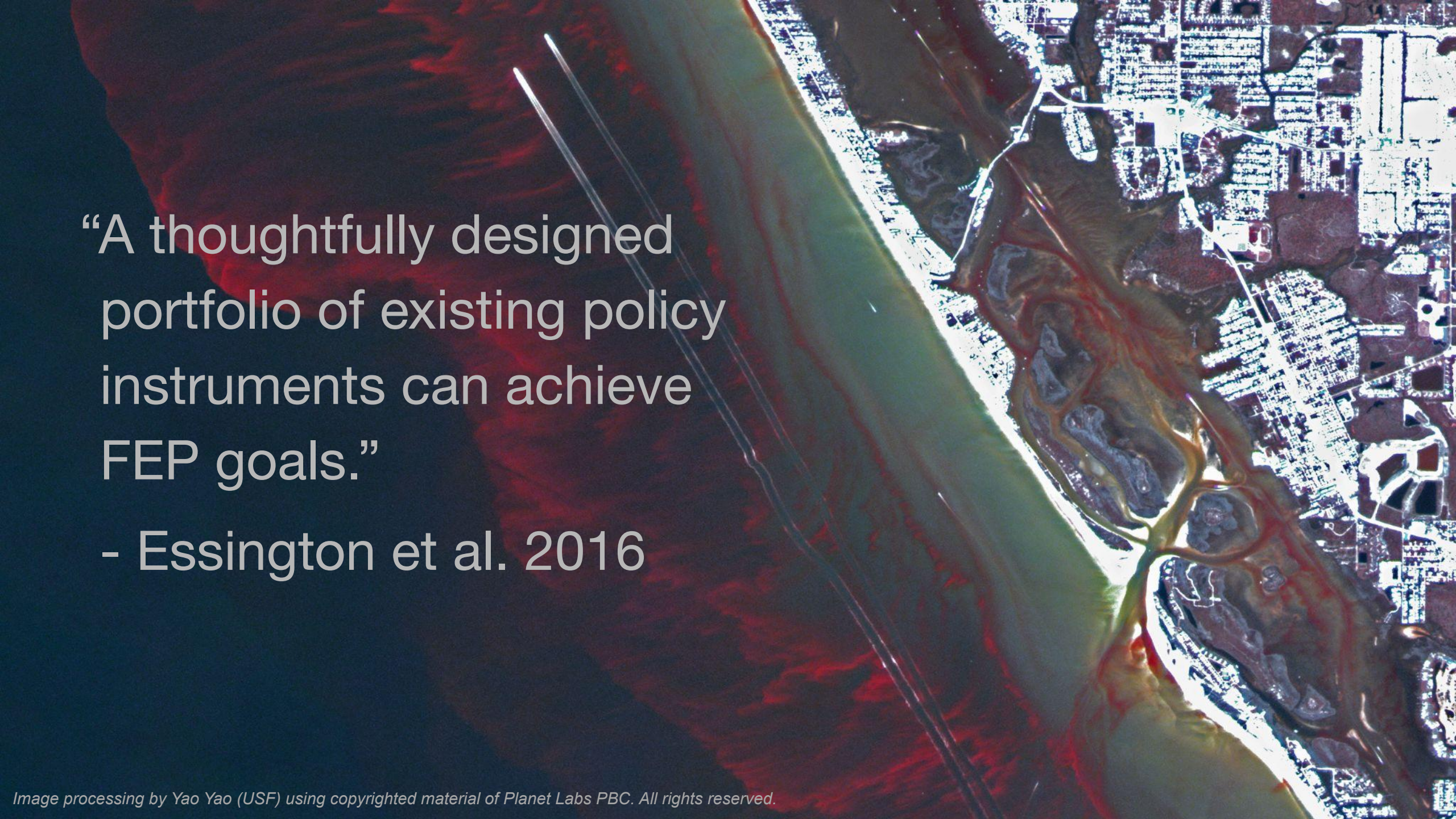   d. Ecosystem models suggest broader trophodynamic impacts

Figure: Grüss et al. 2016

Recommendations

1. Listen to fishermen and seek active stakeholder engagement

2. Review potential FEIs together to find common issues; or find common solutions that satisfy multiple issues
   a. e.g., red tide = episodic mortality event, and episodic mortality likely more common with climate change

3. Clearly define FEIs and performance metrics

4. Need SEDAR-like environmental data review process

   a. Satisfy MSA National Standard 2 – best scientific information available

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"A thoughtfully designed portfolio of existing policy instruments can achieve FEP goals."

- Essington et al. 2016