Workshop Summary: TNC/NOAA Seagrass and Salt Marsh Fishery Productivity Workshop

APRIL 12-13, 2017

SAVANNAH, GA

The Nature Conservancy

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NOAA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE

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Executive Summary

Coastal marine habitats provide diverse ecosystem services, such as provision of habitat for nursery and foraging fish, sequestration of carbon, stabilization of shorelines and reduction of erosion, and removal of excess nutrients. Integrating ecosystem services benefits into decision-making requires a more detailed, targeted approach revolved around multiple drivers such as current and/or future policy, science, and management frameworks. Central to this approach is locally accurate, spatially explicit quantification of ecosystem services using metrics that can be understood, utilized, and provided at scales relevant to decision-makers.

In 2015, the National Oceanic and Atmospheric Administration's (NOAA) Office of Habitat Conservation and The Nature Conservancy's (TNC) North America Oceans and Coasts Program began a project to advance the quantification of fisheries productivity value from two key coastal habitats: salt marsh and seagrasses. The project has two key objectives: 1) Develop the science to quantify fisheries productivity value provided, primarily via nursery function, by salt marsh and seagrass habitats across the United States, where data allows; and 2) Understand where, and how, this science can be most effectively communicated into resource management and decision-making.

A critical task to advance both goals was for NOAA and TNC to host an expert workshop. Invitees consisted of NOAA Fisheries staff, Regional Fishery Management Council and Interstate Fisheries Commission staff from around the country, and state resource management agency staff, as well as TNC staff. The primary goals of the workshop were to: i) bring together a team of experts to review the science and provide input on how the models and scientific approach can be utilized in resource management decisions and how the approach can be improved to enhance usability; ii) use participants' expertise to better understand and identify possible opportunities for implementation; iii) understand how the science and information needs to be communicated and presented to various users to be most effective and useful in current decision making processes; and iv) develop a team of participating experts to serve as advisors as the project continues to move forward.

The workshop was divided into two days; Day 1 provided an overview of current ecosystem-based fisheries management strategies within NOAA, presented TNC's developing approach for estimating area-based fisheries productivity values from individual habitats, and reviewed current examples of how similar fisheries production valuation from other habitats is being communicated to potential users. Day 2 was structured with break-out activities to allow participants to think through, and provide expert input into how this type of science and evaluation could be improved to be more relevant to their work as fisheries and resource managers. For example, activities addressed what types of decisions they are faced with that this science can be useful for, where in the decision-making process it may get incorporated, and how the science needs to be communicated and presented to be most useful.

<u>Outcomes and Next Steps Identified</u>

Based feedback and participation throughout the entirety of the workshop, major themes were identified. These themes, including the value of the work, areas for incorporation into management decisions, and challengers represent areas that the project team, with the support from advisory members, will continue to pursue to ensure that development and utilization of the

science continues to significantly advance in productive and effective ways. Furthermore, the expert thinking provided via the workshop helped identify next steps and additional actions that can increase the utility of this work. This input is guiding the project and helping prioritize next steps. They include:

- Incorporation of a standardized data collection method from project funders to overcome limitations caused by availability of data in consistent formats
- Exploring methods to overcome geographic limitations caused by inconsistent data availability
- Further scientific investment in understanding the role which habitat quality plays as a variable in ecosystem service valuation
- Further scientific investment in understanding the role of adjacent habitats and how they affect valuation
- A clearer understanding of how this work can be applied towards evaluating the protection of existing habitat as well as restoration or addition of new habitat
- Incorporation of the economic data; i.e. bringing economists into science team and clearly incorporating economically important species into the outputs and messaging

Explanation of Document

This document is meant to capture high-level discussion outcomes from each of the workshop sections. The document follows the agenda chronologically. For each section, a brief description of the goal of the section is provided along with *response themes* and additional comments. *Response themes* were created by combining two or more like-minded responses which express very similar thoughts or concerns. Those responses have been carefully paraphrased into the response theme to capture the original responses as closely as possible.

Any comments which voiced thoughts or concerns significantly different from the response theme have been captured as "additional responses" in all sections.

The workshop reviewed and generated a vast amount of information, including presentations, existing tools, worksheets, break-out group discussions and more. This information is publicly available here**.**

Session 1: Ecosystem Based Fisheries Management

Session 1 provided an overview of where habitat/fisheries production science and tools fit into NOAA's ecosystem-based fisheries management objectives and mandates, and what NOAA's objectives are in the future. It also provided an overview of TNC's past and current work on evaluation of ecosystem services from coastal habitat and the expected outcomes of that work.

Presenters:
Kara Meckley, Habitat Protection Division Chief for NOAA's Office of Habitat Conservation, spoke to how and why NOAA is currently implementing ecosystem-based fisheries management and presented the roadmap of where that work is heading.

Boze Hancock, Marine Habitat Specialist from TNC's Global Oceans Team presented TNC's work evaluating ecosystem services from coastal habitats and how the work relates to fisheries management.

Discussion Questions:

1. What challenge do you have in EBFM or incorporating habitat ecosystem service values in your work?

   Response Theme: Availability and reliability of data; consistent formats and standardized collection methods

   - Data gaps across time, region, species, and scale
   - Inconsistent quality across data sets
   - Inconsistent/insufficient data covering various species and scales
   - Imperfect data makes for difficult decision making

   Additional Responses:

   - Fishery management tends to operate on a different level of detail than the fish production science – what is needed to match these two?
   - Translating information into real-world values and/or common language (ex. numbers, dollars)
   - A lack communication of the relationship between this type of work and fisheries management leads to a lack of joint priorities, which limits effectiveness of available funds

2. What do you hope to hear in this workshop to support incorporating this into your work?

   Response Theme: Strategies for putting theory into practice

- Strategies for translating data into practical, communicable, and transferable approaches
- Development of common language and common metrics around this issue
    - Methods for presenting data in stakeholder-relevant terms
- Strategies for finding or creating data that can be used at various scales

Additional Reponses:

- Clarity of what data is needed and how it can be collected and incorporated
- Clear connection(s) between habitat and fisheries
- Tool(s) for quantifying habitat metrics
- How to develop thresholds to maintain production and habitat protection
- Case study/success story

Session 2: Background/context on quantifying ecosystem services of fish habitat

Session 2 provided an overview of TNC's consistent approach and methodology (used across multiple habitats) for estimating area-based fisheries productivity values of individual habitats and offered current examples of such work.

Presenters:

1. Philine zu Ermgassen, a Postdoctoral Research Associate from the University of Edinburgh, explained the data and methods used to estimate area-based fisheries productivity values of individual habitats. This included:
    a. Background of approach and other habitats (e.g. seagrasses in Australia, oysters in U.S.)
    b. Overview of methodology and outputs
    c. Uncertainty estimates in the model and what they mean
    d. Assumptions/limitations of the models and approach
    e. Generally, how results can be applied

2. Jon Grabowski, Associate Professor at Northeastern University, presented examples of similar approaches of using habitat based production estimates from Cashes Ledge in the Gulf of Maine. This included overview of work, approach, results and outcomes, status of the project and expected benefit to fisheries management.

3. Bryan DeAngelis, Marine Habitat Scientist and Program Coordinator for TNC's North America Oceans and Coasts Team, demonstrated TNC's Oyster Calculator as an example of a currently existing on-line tool and platform that estimates ecosystem service values (water filtration and fish production) per area of oyster habitat, and discussed how this can serve as an example of how fisheries production values from salt marsh and seagrass habitats could potentially be expressed.

Discussion Questions:

- What do you see as the value of this approach for quantifying ecosystem services of habitat?

  Response Theme: Decision support/Comparison of Alternatives/Screening
  - Threshold concepts and economic values could help bridge Planning and Fisheries Management
  - Assistance in setting restoration targets
  - Multipurpose values that speak to various stakeholders

  Additional Responses**:**
  - Provides an opportunity to compare production levels of habitats and/or species across regions
  - Linkages between fisheries and habitats (ex. Salt marsh + oysters) require further exploration, since these approaches value habitats independently
  - What is the potential of living shoreline applications?

- What concerns you?

  *Response Theme***:** Possible misuse of the tool/science
  - Limitations of tool must be transparent and clearly stated to deter misuse

  Additional Responses:
  - Outputs must capture the complexity of these systems as well as trade-offs and clarify these
  - Need to capture/acknowledge habitat interactions (ex. complimentary and competing habitats), not only individual habitats
  - Outputs must be applicable and translatable to multiple sectors and users
  - Would like to see a tool which calculates the value of existing habitats, not only the value from potential restoration – it is harder to restore habitats than to protect up front
  - This approach could provide suggested restoration targets that meet standards
  - Need: language that meets ecological needs and quantifies dollars
  - Would like to see this approach scaled to the watershed level

Session 3: Applying the Methodology to Salt Marshes and Seagrasses

Session 3 offered a review of the area-based fisheries productivity approach applied thus far to seagrass and salt marsh habitats in the U.S. Session 3 focused on the progress to-date that TNC has achieved on a) compiling applicable and appropriate data sets across the United States and implications for preliminary results; b) showing preliminary results of augmented species per habitat/per area (based on work so far); and c) demonstrating work to date in compiling national-level seagrass and salt marsh habitat maps use that are anticipated to be used to inform the approach and end-user interfaces.

Presenters:

1. Philine zu Ermgassen presented TNC's science work to date to estimate augmented fisheries production values from both habitats. She presented on the implications of data

availability and what it means in terms of where the models seem to be most applicable, and where they do not. She also presented preliminary figures and tables demonstrating the augmented species determined so far in the analysis, for both habitats.

2. Marta Ribera, Spatial Ecologist at TNC, presented her work focused on compiling national-level seagrass and salt marsh spatial habitat maps for informing the approach and expected to be utilized in the end-user interface. She presented on the methods, challenges, success and progress to date.

Session 4: Input on approach for quantifying fish production of salt marshes and sea grasses

Session 4 was meant to gather input on the science of the proposed approach for fish production quantification of salt marsh and seagrass, including gaps, limitations, and suggestions for improving the approach. Session 4 was facilitated via break-out groups, which the participants were divided into, equally.

Additionally, Session 4 introduced the opportunity for workshop participants to make the project leads aware of potential data sources around the country that currently were not part of the analysis, but potentially could be. Conversations and data exploration continued throughout the workshop.

Break-out Group Discussion Questions:

1. Now that you've heard about the methodology and how it's been applied, are there any outstanding questions?

   Response theme: How does this approach account for habitat variables?
   - Lacking data on connections between habitat types
     - Capture estuarine function, not just salt marsh or seagrass (does network modeling connectivity do this?)
   - Can these tools help set habitat goals to answer the question of how much habitat is enough?
   - How are we going to account for habitat quality?

   Additional Reponses:
   - Can historical data lend credence? Re: understanding change in system to date
   - Can we calculate the value of protection as well?
   - How can this be evolved as new data becomes available?
   - What's the importance of the 'control' sites?
   - How comfortable are we extrapolating results from the region to sub-regions that were not included in the analysis?

2. Based on the preliminary results presented, are they what you expected? If not, why do you think this?

Response Theme 1: Yes, the results are what was expected.

Response Theme 2: Species and related messaging

- Which species will speak to each stakeholder?
- Which species will drive utility?
- What are we losing by looking only at augmented species?

Additional Responses:

- How do these results compare to pre-impact?
- How do we balance value of habitat used by older/larger fish with productivity gained through nursery functions?

3. How would you envision the uncertainty estimates could be applied in your work? Is there another way we could be expressing uncertainty to increase its utility?

Response Theme: Be transparent, communicate limitations, but do not over-emphasize uncertainty. Messaging is critical.

- Be sure to clearly document, in a user-friendly manner, where the data has come from, the gaps, species of interest, etc.
    - Be transparent about limitations
    - Be transparent about methods
- Recognize values that can't yet be captured due to lack of data, build them into the output in some way

Additional Responses:

- Use uncertainties to help identify possible tipping points
    - Ranges can be valuable
- Amount of precisions needed depends on your communication goal/audience
- Can we communicate the data gaps in ways that drive funding to those areas?
    - Tie the species for which we have data, to the species that audiences are interested in *(See species theme above)*
        - Functional grouping could be valuable

4. Are we providing the right information to allow users to tailor the results to individual sites?

Response Theme: Better understand who the user(s) is, how they will use the information (ex. species theme above), and in what format they need the information

- Could a tool produce different outputs for different users?
- An output that's targeted to "all" audiences becomes not useful
- Balance ease-of-use with precision for more informed users
- Scale: how can it be rolled-up (or down)? Scale will impact the design of the outputs

Additional Responses:

- How can this be used for valuing protection as well as restoration?
- Understand the historical context and incorporate it appropriately
- Consider in the context of connectivity between habitats (*See habitat theme above)*
- Consider the location of habitat(s) within the system (*See habitat theme above)*
- Can different habitat outputs be used together? Ex. Oyster calculator and pending saltmarsh / seagrass outputs
- Add list of uses to white paper
- Survey users on their needs/preferences
- Offer case studies/success stories
- Grey literature is critical, consider simply publishing data without writing a paper

DAY TWO

4/13/17

Day 2 opened with a recap of information presented on Day 1 and a brief period of reactions to said information. A short amount of time was also spent reviewing and addressing concerns raised on Day 1 and eliminating those which had since been alleviated.

Session 5: How can fish productivity estimates from salt marsh / seagrass inform management decisions?

The goal of Session 5 was to understand the value that this approach of quantifying fish productivity of salt marsh/seagrasses brings to the process of fisheries management and EBFM; including how the approach would apply in decision making and usability of outputs. Session 5 was also meant to identify potential decision scenarios and gather feedback on how outputs apply, and identify the best opportunities for implementation. Session 5 was facilitated through a break-out activity during which participants, amongst groups, discussed current decision-making processes, applied the proposed approach for quantifying fish productivity of seagrass and salt marsh habitats to those decision processes, and offered feedback on potential implementation of the proposed approach. Afterwards, each break-out group shared their answers with the entire workshop.

Break-out Group Questions

1. What kinds of KEY decisions are you making related to fisheries and habitat (issue, species, and region)?

    - Mitigate loss ecologically
    - Addressing conservation issues related to water quality (prevention of habitat loss)
    - Augmenting habitat that has been lost historically (how much, where)
    - Use of information in land use planning and regulatory framework
    - Focus on economically-important species as context for decision making, both commercially and recreationally
    - Use of permitting programs
    - Advising management councils
    - EFH consultations/designations
    - Habitat protection, important ecological area sites, & conservation investment decisions
    - Informing state and local regulatory decisions (water management, fisheries, coastal resources)
    - Catch limitation recommendations: Fisheries management plans and rebuilding stocks; collecting stock assessment info.
    - Exploring on/off shore connections; Coastal development and permitting decisions (federal)
    - Tracking cumulative impacts and understanding timing of activities

- Removing data gaps
- Deciding regional investment priorities
- Decision making regarding formation of partnerships
- Developing common rationale and language

2. How are you addressing coastal management (salt marsh and seagrass) currently?

- Making assumptions of value of certain habitats through creation of zones – understanding these values and communicating value of special zones is hard to do effectively because external influences are deriding/competing with the process (public and political)
- Spatial planning (case by case vs. holistically)
- Partnership development and bringing partners together
- Coastal managers are relying on right partnerships and tools for connecting fisheries and habitat in terms of setting correct goals for relevant actions and integrating fisheries management councils
- Through partnerships with universities, local governments, and at national levels – in terms of monitoring and damage assessments

3. What is challenging or limiting to you (data, expertise, time)

- Cumulative impact analysis for past losses is missing - lack of good GIS
- Missing knowledge and data on impacts for effects of ancillary projects
- Lack of follow-up on mitigation projects
- Upfront mitigation is very rarely done
- Missing habitat goals for specific basins
- How similar tools are communicated (ex. An infographic highlighting what the tool quantifies, while recognizing other variables and linkages that cannot be quantified
- Finding the right science - information is mostly qualitative
- Fine resolution data/data and tools that are scale-able (sub-regional watershed scale)
- Caution of evaluating habitats on wrong data (ex. choosing between high marsh and low marsh for fish and water management decisions)
- Need for spatial and temporal connectivity
- Valuing data points over time
- Lacking productivity that can feed into fisheries management plans
- Limited staff time and resources and ability to bring all experts together when making decisions.
- Making this a priority is still a challenge
- Funding
- Data gaps & Prioritizing data gaps
- Synthesizing data
- Time scale: how to identify appropriate benchmarks to demonstrate success
- Trying to integrate societal value into assessments and how to do this at scale

4. Where and when in the decision process could the proposed salt marsh or seagrass approach/outputs be helpful? Why or why not?

Groups were prompted to use one of the key decisions they identified in Questions 1 to inform this discussion.

*Response Theme***:** The approach/outputs would be immediately actionable to compare possible alternatives.

Group 1: steps for siting marinas in FL: The approach could be used during (1) the pre-application process for initial discussion with developers, (2) public comment period, (3) internal agency review process, and (4) permit issuing process.

- Economic services gained/lost by any action should be broken-up by sectors (would require economists).
- Concern: Output could be used to show winners/losers
- The full range of potential services of habitats needs to be brought forth to minimize impacts
- Output should be designed to support 'avoidance of impact' as a potential alternative
- Should/could include a visual map of ecosystem services in play

Group 2: (1st scenario) EFH consultation process for a proposed marina: Approach/outputs could be used for evaluation criteria to compare/rank different alternatives. Immediately actionable.

- Look at production of specific habitat types, policies or priorities for habitat types for prioritizing protection, whether production form these habitats is linked to fisheries, status of effected stocks, tradeoffs and stressors.

  (2nd scenario) – Species Management: Approach/outputs could inform understanding of protection needs by habitat type. The tool could inform decision-making and help groups focus information on species management process (implement into stock assessments, etc.). Could also be used for outreach opportunities. It is currently actionable for this.

Group 3: Army Corps of Engineers dredge project: Approach/outputs would be applicable to compare alternative actions – show whether an action is economically and ecologically viable. Could be used now.

Group Discussion: Reactions to Session 5

During this discussion, participants shared their reactions to the things they had heard from each group above. The following questions guided the discussion.

1. Did you hear a scenario from the breakout groups that applies to your work?

- EFH consultation process and fisheries management
- Stock assessments and rebuilding plans
- Siting projects
- Inform identification of mitigation
- Habitat conservation at project level

- ESA recovery plans
- Evidence for incorporating habitat into stock assessments
- Tool will help advocate for incorporation of habitat and this tool + similar tools

2. Are there other applications of the approach/outputs to your work?
   - Coastal community protection
   - Habitat conversion decisions
   - Outreach to public and policy makers
   - Marine spatial planning
   - Place-based conservation investments (restoration and/or protection)
   - Validation of EFH or EFH-HAPC designation
   - Economic value of habitats for prioritization
   - Communication
   - Setting watershed to regional conservation objectives
   - Identifying key areas for future research/ justifying research needs/proposals
   - Informing monitoring projects
   - Assessment of impacts from changing hydrology and conversion of tidal impoundments
   - Evaluating alternatives in permitting process

3. Can you think of situations where the approach/outputs would not be appropriate in decision making?

Participants felt any situation which may result in the approach being used to justify personal, political, or economic motives which are at odds with the health of the habitat and/or species would be inappropriate.
Additionally, participants expressed that given the limitations of this approach, it may be inappropriate for (1) situations which require a precise quantification of monetary value (such as damage assessments), (2) management of endangered species, (3) conducting comparisons across habitat type, (4) setting targets to achieve desired population size, and/or (5) quantifying the production levels of a specific locale.

4. Any other thoughts or comments about the approach/outputs?

Participants felt that while limitations should be made transparent, they should not slow or hinder the progression and implementation of this work. Despite its limitations, this approach will be helpful.

Additionally, participants stressed that a comprehensive roll-out plan should be carefully crafted. Presentation of the data, messaging, and visuals for users will be critical in ensuring its utilization. The use of infographics was highly recommended.

Furthermore, participants recommended the incorporation of economic data and expertise. For instance, participants recommended bringing aboard economists and clearly incorporating economically important species into the messaging.

Session 6: Product Delivery and Key Audience Activity

Session 6 was to review products created for similar work, determine target audiences/users, and explore potential products and/or delivery mechanisms for reaching said target audiences/users.

Target audiences/users identified:

- Federal Agencies
- NOAA Habitat Staff
- Academia
- NGOs
- Regional partnerships
- Regional Fishery Management Councils
- State Resource Managers

Key Audience Activity

During the Key Audience Activity, participants split themselves into groups each representing one target audience/user (see above) and answered the following questions.

1. Where does this audience currently get information from?
2. What would you expect them to do with the SG/SM information?
3. How would we best reach this audience?
4. What kinds of products would help us do this?
5. What training is needed for this audience/where?

Federal Agencies Group:
The Federal Agencies Group decided to hypothetically identify themselves as the US Army Corps of Engineers (USACE)

1. Want to target the District Colonel
2. Use the output as a decision support/evaluation 'tool'.
3. Reach the Dis. Colonel through the people whom report up to and influence him/her
4. Examples and case studies demonstrated by an expert to show utility; fact sheets; full documentation; online demos
5. Webinars and on-site training, video (4-minutes), detailed walk-through of tool and its capabilities with staff who would be using it

NOAA Habitat Staff Group

1. Information is coming from literature, colleagues, experience, field assessments, EFH Mapper
2. NOAA Habitat Staff would be expected to use the information to support consultations, recommendations, and project development; as an outreach tool with action agencies; for EFH designations and to prioritize activities that Staff become involved with
3. Providing the tool with information on how to use it – webinars, workshops, summary of information used to develop the output(s)

    a. Something that offers a general, comparison of relationship between habitat types is very useful
4. Users guide, story maps, metadata (synthesis report w/ underlying research),
5. Webinars, workshops, information on dealing with uncertainty, hands-on training

Academia Group

1. Professional societies, peer reviewed literature, newsletters, dissemination from NOAAs office of Education
2. Review the data inputs and identify missing studies; tailor their science for use in the portal; conduct regional and local analysis to examine connections between habitat quantity and fish population dynamics.; build upon the model (add additional ecosystem functions); train students and development workforce
3. Booth at professional meetings with information and demonstration, pre-conference workshops, special sessions, TNC newsletter and NOAA communications (listservs), individual invitation to academics to review product, guest seminars, webinars
4. Electronic communications (PowerPoints, listservs, webinar, demonstration video, presentations), fact sheet, poster displays
5. Training the students and trainers: graduate level webinars, workshops (reaching graduate students), courses and modules for existing professionals and/or students

Regional Partnerships Group

1. Literature, databases – state and federal, partners, conferences/networking events
2. Add it to their suite of products that they use to make recommendations for restoration/conservation decisions
3. Webinars
4. Short video with demonstration; graphic by email; listserv; introduce to the higher-level persons in Partnership; fact sheet linking to methods, case study (eventually)
5. Teach the teacher

NGOs Group

1. Internally, word of mouth, partnerships
2. Use fish production for conservation; Community education
3. In-person training, story map, case studies, small group training

Fishery Management Councils Group

1. NOAA, state agencies, academic partners, federal agencies, professional associations
2. Re-broadcast the information to interested parties; update EFH designations
3. Habitat staff, Council Chairs: email/phone outreach, present in person. Higher level information to higher level staff, detailed information for other Staff
4. Web tool, webinar/powerpoint, infographic, case studies and success stories would resonate well
5. Teach how to use/how not to use the tool and convey disclaimers/caveats

State Resource Managers Group

1. Inventory resources, websites, conferences, habitat plans, literature, colleagues
2. Use it appropriately. Planning, prioritizing, implementation, funding support
3. Listservs, focused and targeted webinars, trainings dovetailed into existing meetings
4. Examples of successful implementation, story maps, fact sheets
5. Basic use of the tool and how can data be generated to continue to feed the tool

Conclusion

The Nature Conservancy and NOAAs Office of Habitat Conservation thank the professionals who attended this workshop. We greatly value the input and effort provided by the workshop participants, and are encouraged by their enthusiasm and support for this work. The insight, knowledge and information gained through their expert participation has significantly shaped and improved the utility of this project, as well as contributing to refining and prioritizing next steps and future work. We plan to utilize the workshop participants as scientific advisors throughout the remainder of this project. In the coming year, the project team will continue to advance and develop the science around evaluating fisheries productivity estimates from salt marsh and seagrass habitats. We also plan to start the design of outreach products, and decision tools which will allow the science to be applied to real-world decision around fisheries management and habitat conservation and restoration. The continuation of the science development, along with the decision-support tools will be significantly shaped and improved by the information and insight gained during this workshop.

Participant List

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Agenda

TNC/NOAA Salt Marsh and Seagrass Fishery Productivity Workshop
April 12-13, 2017
Savannah, GA

- Learn about the most recent partnership project between NOAA's Office of Habitat Conservation and The Nature Conservancy to advance the ability to set quantifiable conservation and restoration objectives for salt marsh and seagrass based on fish production.

- Provide input on a new approach and suite of tools that calculate ecosystem services value for fish habitat, and ensure that this science is put into the hands of decision-makers in user-friendly, spatially relevant ways.

- Lend your expertise to help us understand how the tools and process can be improved to enhance the use by fisheries managers and others, and to identify what and where there are potential opportunities for near-term implementation.

AGENDA

Day 1, April 12 **8:15 - 5:00**	**Location – Savannah Embassy Suites, Salon A (first floor)**	**Speakers / Presenters**
8:15 - 9:15	**Workshop welcome** ● Local guest speaker ● Review workshop goals and agenda ● Introductions	TBD Facilitators
9:15 - 10:30	**Session 1: Ecosystem services and fisheries habitat** ● Ecosystem-based fisheries management at NOAA ● TNC's focus on evaluating ecosystem services ● Discussion	Kara Meckley, NOAA and Boze Hancock, TNC
10:30 - 11:00	**Break**	
11:00 - 12:30	**Session 2: Quantifying ecosystem services of fish habitat** ● Overview of approach to estimating area-based fisheries productivity values from individual habitats ● Current examples ○ Cashes Ledge, Gulf of Maine	Philine ZuErmgassen, University of Edinburgh; Jon Grabowski,

	○ Oyster fisheries enhancement ○ Demonstration of Oyster Calculator ● Q/A	Northeastern University; and Bryan DeAngelis, TNC
12:30 - 1:30	**Lunch – on your own**	
1:30-1:50	**Session 2 (continued)** ● Reactions to the approach for quantifying ecosystem services of habitat	Facilitators
1:50 - 2:50	**Session 3: Applying the methodology to salt marshes and seagrasses** ● Review how the area-based fisheries productivity approach can be applied to salt marsh and seagrass habitats ● Progress TNC has made on compiling national-level seagrass and salt marsh habitat maps to inform the approach and utility ● Q/A	Bryan DeAngelis, Philine ZuErmgassen, and Marta Ribera, TNC
2:50 - 3:15	**Break**	
3:15-4:45	**Session 4: Input on approach for quantifying fish production of salt marshes and seagrasses** ● Discuss the science of the proposed approach for fish production quantification of salt marsh and seagrass habitats, including gaps, limitations, and suggestions for improving ● Report out	Facilitators
4:45 - 5:00	**Wrap-up Day 1**	Facilitators
5:00	**Adjourn; optional group dinner**	

Day 2, April 13	**Location – Embassy Suites, Salon A**	**Speakers / Presenters**

8:30am - 3:00pm		
8:30-9:00	**Welcome Day 2** ● Summary of Day 1, reactions, review Day 2 agenda	Facilitators
9:00-10:30	**Session 5: How can fish productivity estimates from salt marshes and sea grasses inform management decisions?** ● Share current decision-making processes ● Relate proposed approach for quantifying fish productivity of salt marsh and seagrass habitats to decision scenarios ● Feedback on application of proposed approach	Speaker TBD Facilitators
10:30 - 11:00	**Break**	
11:00 - 12:00	**Session 5 (continued)** ● Report out and reactions	Facilitators
12:00 - 1:15	**Lunch – on your own**	
1:15 - 2:30	**Session 6: Product delivery** ● Review products created for similar work ● Determine target audiences/users of the approach for quantifying fish productivity from salt marsh and seagrass habitats ● Explore products and delivery mechanisms to reach target audiences/users ● Report out	Bryan DeAngelis Facilitators
2:30 - 3:00	**Workshop wrap-up** ● Review input gathered during the workshop ● Next steps ● Workshop feedback	Bryan DeAngelis and Kara Meckley
3:00	**Adjourn**	