Workshop Guide: Using Facilitation Techniques to Integrate Ecosystem Services into Coastal Management Decisions

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WHAT ARE ECOSYSTEM SERVICES?

Ecosystem services are benefits people receive from nature. Broadly defined, they are the benefits that flow from nature to people, for example, nature's contributions to food and timber; life-support processes, such as water purification and coastal protection; and life-fulfilling benefits, such as places to recreate or to be inspired by nature's diversity. There can also be ecosystem disservices, such as mosquito-borne illnesses and pollen-induced allergies.

—*Federal Resource Management and Ecosystem Services Guidebook*

INTRODUCTION

Why might you incorporate ecosystem services into your coastal management planning processes?

Estuarine systems are areas of immense ecological importance and provide numerous social, economic, and environmental benefits. The strong link between healthy habitats and these benefits requires incorporating the concerns of both nature and people into coastal management. An ecosystem services approach to coastal management and stewardship is defined by consideration of those benefits that flow from nature to people. As coastal managers increasingly attempt to fully characterize and communicate how natural systems affect the people who live near, work in, depend on, and care about the habitats they manage, ecosystem services considerations are progressively more important to address. Incorporating ecosystem services into management aims to result in an intact and resilient ecosystem that takes multiple beneficiary groups' needs into consideration.

Who is this guide for?

This guide is targeted at coastal resource managers and practitioners who are actively thinking about how to more deliberately incorporate ecosystem services into their coastal decision-making processes.

What is this guide for?

Ecosystem services considerations are inherently multisectoral and involve integration of multiple stakeholder perspectives. When trying to understand the ecosystem services provided by a particular location, it is often helpful to host workshops to bring multiple perspectives and types of expertise together. The purposes of such a workshop can include (1) getting a group of researchers or stakeholders on the same page about how a management decision could change how people interact with or are affected by the environment, (2) identifying what communities might be affected and be a proponent or opponent to a management choice, (3) building communication and education materials that show the community benefits and impacts, (4) thinking holistically and systematically with a group of researchers and/or other stakeholders about how a particular ecosystem affects human well-being, and/or (5) thinking about how to measure and monitor the effects of ecosystems on human communities.

### What is an Ecosystem Services Conceptual Model?

Ecosystem Services Conceptual Models (ESCMs) represent a possible entry point for beginning to incorporate a suite of ecosystem services considerations into a program or project. These models illustrate the way that a management intervention cascades through an ecological system and results in ecosystem services and other human welfare impacts (Figure 1). Generalized

ESCMs can be used as consistent templates that can be specified to the context of a particular project or program. These general models are relatively high level and less specific to enhance transferability, while site-specific models can be more detailed and precisely tailored to the conditions and processes of a particular program or project. A set of general ESCMs for coastal habitats can be found here. ESCMs are generally developed through an iterative process of literature reviews, workshops, and follow-up expert elicitations. For further information on ESCMs, see our primer here.

It is important to note that these models are designed to show *system change*. They describe how a system will change given a particular management intervention (e.g., habitat restoration) or external stressor (e.g., sea level rise), in comparison to some baseline. The model should only include those things that you expect will change given the intervention or stressor.

Figure 1. Structure of an Ecosystem Services Conceptual Model.

Ecosystem services can include different types of benefits that ecological (natural) systems provide to the social and economic well-being of people.

Potential Ecosystem Services
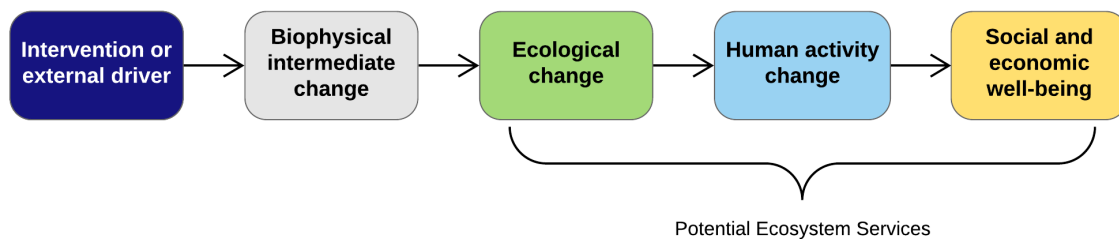
Why would you use an ESCM in a workshop setting?

After hosting many different engagements centered on ESCMs, we have consistently heard that taking part in a workshop to develop these models and ecosystem services metrics was a valuable experience. During our interactions with coastal resource managers, we've heard that the model specification process is a great way to start thinking more intentionally about ecosystem services and that the workshops help participants think about the socioecological system more holistically. The process can help identify gaps in knowledge, start to normalize ecosystem services thinking across different stakeholders, and spur careful consideration about how coastal management decisions affect different stakeholder groups.

Workshop "Menu"

We have documented our workshop process in this facilitation guide to enable any coastal resource manager to develop a workshop that uses ESCMs as an entry point for multistakeholder discussions about ecosystem services and their associated metrics and beneficiaries. Depending on what you want to accomplish, there are different types of workshop sessions you can run. Below we provide a "menu" of session types, which you can mix-and-match to create a workshop that fits your site's needs. In the following sections, you will find details on the following session types:

Workshop Basics

Before any workshop it is important to think about who to invite, where to host, and how to facilitate your workshop.

Who to invite

- Invitation lists will differ depending on the purpose of the workshop, but generally participants should include local natural resource researchers and practitioners who are familiar with the focal ecological system. In the past, we have invited:
  - local natural resource managers,
  - federal government employees,
  - state/local government employees,
  - researchers from local universities (ecologists and social scientists),
  - natural resource educators,

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[1]. Click page number to jump to that section.

- local NGO representatives, and

- community stakeholder representatives (if appropriate, see note below).

- Ecosystem services are all about how ecosystems and people connect, so you don't want to forget to include social scientists.

- While it is essential to incorporate the perspectives of local stakeholder groups, they may not be engaged best by a long meeting discussing the details of an ESCM. Parts of this process are technical, making some participants with less technical backgrounds feel like they can't contribute. It often works best to conduct independent outreach to these people/groups after a draft model has been created, to get feedback and ideas for how to improve the draft.

- 8–20 people is a common workshop size, but this is adjustable given specific needs.

Where to host

- Central location as convenient as possible for participants.

- If possible, the room should have a whiteboard and AV capabilities (or room for a portable projector).

- There should be enough space to have breakout group discussions.

The importance of a facilitator

- Assigning a facilitator role to someone who can guide your workshop is important. This can be more than one person if need be.

- The facilitator helps keep the group on target, keeps track of time, and makes sure that the group accomplishes its objectives (see Appendix A for some facilitation resources).

GLOSSARY

Node—If you think of the ESCM as a box and arrow diagram, this is the box. Think of nodes as different parts of the system that are changing.

Link—If you think of the ESCM as a box and arrow diagram, this is the arrow. Think of links as processes that connect different nodes in the system.

Chain—This is a set of connected nodes and links, usually stretching from the starting node (intervention or stressor) to an endpoint on the right side of the diagram.

Outcome—This is some aspect of the system that changes as a result of the intervention or stressor. An outcome is usually, but doesn't have to be, at or near the end of a chain. Outcomes are simply nodes that we care about monitoring. We talk about three different kinds of outcomes in relation to ESCMs: ecological outcomes, human activity outcomes, and socioeconomic outcomes (see Figure 1). There are often multiple metrics that could be used to monitor an individual outcome.

Dominant outcome—We define dominant outcomes to mean outcomes that are: 1) Tightly linked: the expected change in the outcome is likely to be large and strongly driven by the intervention or external stressor in the model; and 2) Important: the expected change in the outcome matters to many people or to groups of special concern.

Metric—This is a way to measure (or monitor) an outcome that you care about tracking. This should be specific enough that it has a unit. We talk about three different kinds of ecosystem service metrics:

(1) Ecological: those metrics that measure changes in ecological processes including individual species, entire habitats, and abiotic conditions that are important for ecosystems. These metrics measure the supply of ecosystem services. We normally recommend going "beyond" an ecological metric to track ecosystem services to incorporate human considerations, but there are some ecological outcomes that people care deeply about and can therefore be considered ecosystem services metrics.

(2) Human activity: those metrics that represent how human activities or experiences are altered by a change in the ecological or biophysical system; they link ecological and social factors. They represent something that is valued by people, and as much as possible contain information on who is doing the valuing. These metrics should be understandable by lay audiences, and data on these metrics should resonate with those audiences. These metrics measure the use of ecosystem services.

(3) Socioeconomic: those metrics that measure change in economic or human well-being conditions as they relate to ecosystems. These do not have to be monetary metrics, but they can be.
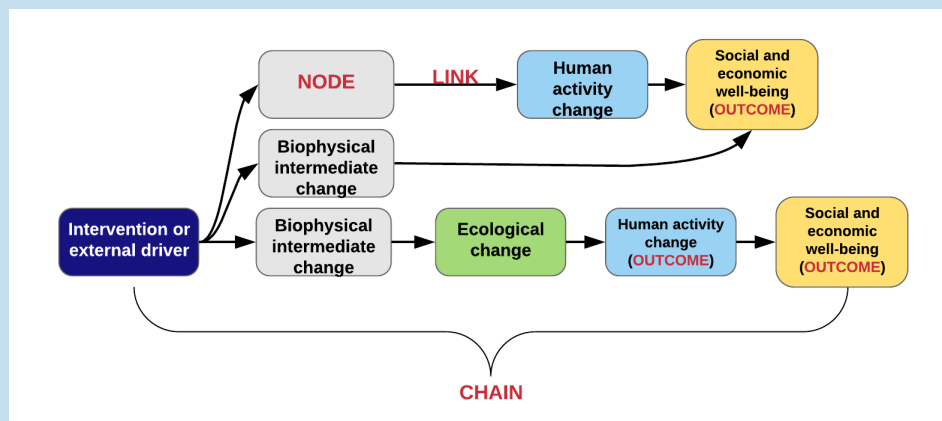
Session Description:

Make an ESCM with a group of managers and experts. This type of session should be held if you need to develop an ESCM but don't yet have a draft model or a generalized model to adapt to your site.

Note: You can build a model without a workshop, starting with your own knowledge or the literature, then asking others for input. However, if getting buy-in with the expert and manger community is important, then a workshop can be most useful.

Session Goal:

Develop an ESCM and get expert and manager community on the same page about the system and services affected.

Session Output:

A fully fleshed out ESCM describing the socioecological system of a particular site or region.

Estimated Session Time:

1–3 hours; depending on system complexity, number of breakout groups, and length of discussion.

Preworkshop Prep:

The facilitator should be familiar with ESCM structure and the model-building process described below to help guide the group through model building. The facilitator should be somewhat familiar with the habitat or specific location for the ESCM. It may be helpful for the facilitator to have their own initial draft of a model for reference.

Materials:

Large paper (flip chart-sized) or whiteboard

Markers

Sticky notes

Format of Engagement:

This can be done as a full group or in breakout groups. Ideal breakout group size to be working on a model at one time is 4–6.

General Process:

- Introduce the group to ESCMs and their general structure.

- Have the group(s) deliberately select:

  - The management intervention(s) or external stressor(s) that will be the model starting point. Think about these in comparison to some baseline—this might be current management practice or no management.

  - Model spatial scale: is this model being built for a particular restoration site, a specific reserve, a state, a coastal region, or a general habitat type?

  - Model temporal scale: what time scale is the group interested in? Are you trying to document all changes to the system or only changes that occur within a particular time span? Or both?

- Depending on group size, use the model building steps below to build a model as a full group or separate into breakout groups to develop draft models.

  - If you use breakout groups, leave *at least* 30 minutes to come back together as a full group to compare models, discuss differences, and come to consensus on a single model draft.

- Use the general guiding questions provided below to think about the model as a group, and to refine it.

Session Tips, Tricks, and Guidance:

We've found that building a model from scratch comes easily to some and is very difficult for others. This process often takes longer than you think it might. Depending on the materials you have available or want to use, you can build a model draft on flip chart paper or a whiteboard. Some people prefer to draw out the whole model with markers only, but some prefer to write out each node on sticky notes and move them around as they are building the model. We often provide both options (markers and sticky notes) so people can choose how they want to build a model.

It is important to remember that these models are designed to show *system change*. They describe how a system will change given a particular management intervention or external stressor, in comparison to some baseline. Only include those things in the model that you expect will change given the intervention or stressor.

It might be helpful to look at a few example models with the group before starting. You can find example models here.

Model Building: Below, you'll find a general process to follow for model building. This can be adapted to fit your group's needs and level of experience.

- Write the management intervention or stressor on the far left side of the paper/whiteboard.

- Brainstorm a list of ecosystem services provided in your system and write those on the far right side of the paper/whiteboard.

  - It may also be useful to make a list of stakeholders, for reference. The stakeholder list can help the group to brainstorm additional services as they think about what is important to various stakeholders on the list.

- Consider the first service on the list. How could your intervention/stressor affect the provision of this service? What ecological changes or intermediate effects would occur? Think about different ecosystem structures, processes, and conditions. If there are relevant social effects, include those as well.

- What additional services do those intermediate effects impact? Could those services be affected by other intermediate outcomes?

- Continue this iterative process of identifying ecological changes/intermediate effects and services until the group feels that most of the interactions have been captured.

- Some important things to remember:

  - The process of creating the diagram may identify additional services that were not on your original list.

  - Not all services originally listed may be affected by your intervention or stressor; they can be removed.

At this point you will have a sketch of a model with human well-being impacts on the right side. Don't worry too much about being consistent about what these endpoints look like—human activities, categories of services, or impacts to people. The next step is to clean up and flesh out these details. The best way to do this is to walk through a couple of questions about each outcome.

- How does this outcome affect people? (water quality—through swimming, or aesthetics, or fishery closures; recreation—changing the access to or abundance of a recreational opportunity? Changing the number of jobs in a recreation type?) This can then be used to clarify what is in the boxes and whether there are both changes in human activity and in social and economic outcomes.

- Have you extended your model all the way to ecosystem services and associated human welfare outcomes? A common problem is not extending model chains all the way out to their impacts on people. For example, we often see people list things like "water filtration"

as a service at the end of a chain. But water filtration *for what* or *for whom*? Is it water filtration that affects wildlife, recreation, irrigation, drinking water, aesthetics, dredging frequency, or something else? If you extend your services out to their impacts on people, your model will be much more informative—it will help push beyond ecological outcomes to human activity or social and economic outcomes.

Figure 2. ESCM Structure


Potential Ecosystem Services
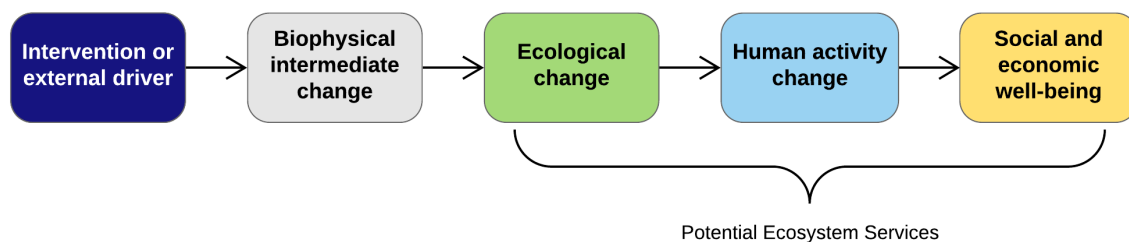
General guiding questions to ask during the model-building process:

- *Have you considered services important to all stakeholder groups?* Think about the system from the perspective of different types of stakeholders. This can sometimes result in the addition of extra services, or potentially highlight unintended negative outcomes. Example lists and descriptions of ecosystem services can be found here.

- *Have you considered both the benefits and the harms that the intervention or stressor might cause?* Sometimes, when people come into a model-building session with a preconceived notion about whether a management intervention or stressor is good/bad, they will only focus on the benefits it provides or the harms it causes. Try to think about both positive and negative outcomes.

- *Have you considered feedback loops?* There are many feedback loops in socioecological systems. We do not normally include these loops in our diagrams (to reduce complexity) unless they significantly impact the outcomes that affect people. It is up to the model-building team's discretion as to whether feedback loops should be included.

- *Are there areas of the diagram you are uncertain about?* If there are linkages that you are uncertain about, you can display these using a distinctive arrow (dotted line or different color). These represent areas of the model that you can get further feedback on from outside experts, or where additional literature review might be needed.

- *Are there multiple time spans of interest?* Some linkages and/or outcomes in your model may represent changes that occur at different times. For example, if the management intervention involves bottom disturbance, excess turbidity may be a short term outcome but will not be an issue after one year. These shorter term outcomes can be distinguished by a distinctive arrow (dotted line or different color).

- *Are you missing intermediate nodes?* Each link should represent a single, testable hypothesis (e.g., a change in x will result in a change in y). Have you added a "leap of faith" that oversimplifies your system? (See an example in Figure 3.)

Figure 3. Example of a "Leap of Faith."

The top image shows a diagram where an intermediate node has been left out. Links should represent a single, testable hypothesis and should not oversimplify the system.
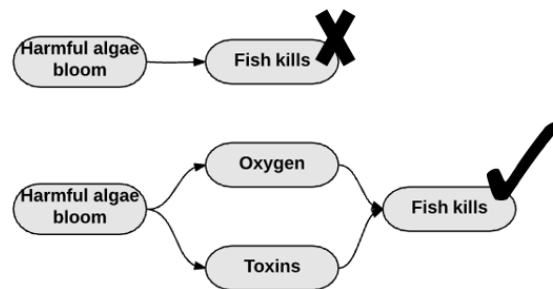
Process Agenda:

When planning a workshop it is helpful to plan out the day using a process agenda. The agenda provided below is an example, meant to help jump-start your workshop process. This should be modified and specified for each workshop depending on how you decide to run your activities. This is a static version, but you can download an editable version on our website.

Session Type 1. *Making a Model from Scratch*	Length: 1–3 hours Time:

Objective(s): Develop an ESCM.

Outputs: A fully fleshed-out ESCM describing the socioecological system of a particular site or region.

Session Details:	Materials Needed	Person needs

• Introduce the group to ESCMs and their general structure.
 	
• Building an ESCM:
 	
  • Have the group deliberately select:
 	
    • The management intervention(s) or external stressor(s) that will be the model starting point. Think about these in comparison to some baseline—this might be current management practice or no management.
 	
    • Model spatial scale: is this model being built for a particular restoration site, a specific reserve, a state, a coastal region?
 	
    • Model temporal scale: what time scale is the group interested in?
 	
    • Use the steps discussed in Session Type 1 to build a model.
	–Presentation that introduces ESCMs
	
	–Large paper (flip chart-sized)
	
	–Markers
	
	–Sticky notes
	
	–Whiteboard and markers
		–Person to introduce ESCMs
		
		–Person to facilitate and guide model creation
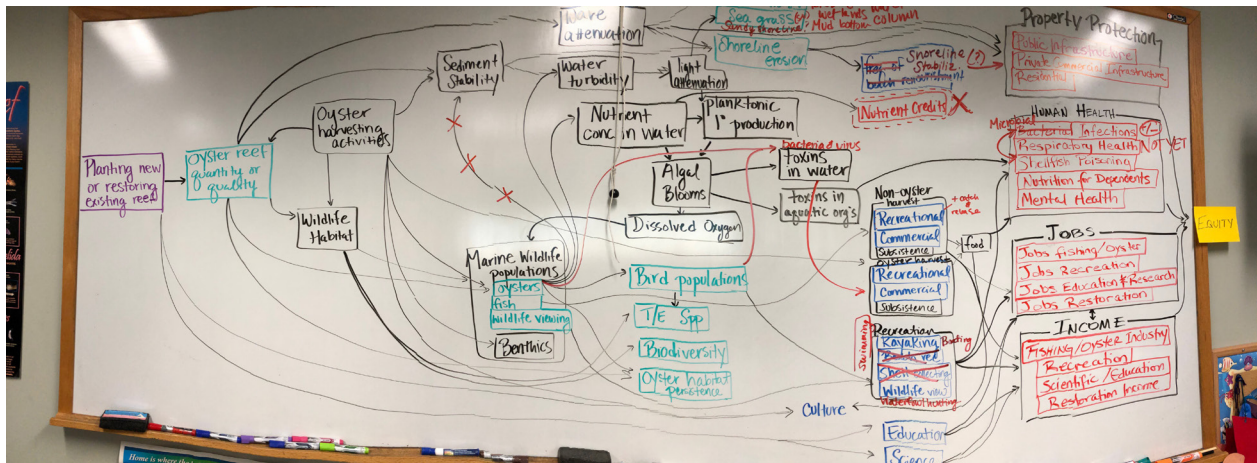
DRAWING ESCMs

During a workshop you can draw an ESCM using markers and/or sticky notes on a whiteboard or large paper, but there is value in transferring the model to the computer to make a sharable and editable version for further iteration. There are a variety of software options:

- **Draw.io** – An open-source web application flowchart maker that connects with Google Drive and allows the user to make free flowcharts.
  - Price – Free for the purposes of creating a flowchart.
  - Pros – Multiple users can work on a flowchart, quite user-friendly.
  - Cons – Complex diagrams can get messy as arrows are somewhat hard to maneuver.
- **PowerPoint** – Available through the Microsoft Office suite that helps the user create flowchart using the "SmartArt" graphic options.
  - Price – Microsoft Office suite license ranges from $69.99–149.99/year.
  - Pros – Users can save flowcharts easily using Microsoft as .ppt, .png, .jpg, or .pdf making it easily transferable.
  - Cons – Can be difficult to create complex diagrams.
- **Visio** – Available through the Microsoft Office suite, this program can be integrated into Microsoft Word, Excel, PowerPoint, Access, and Outlook to create flowcharts.
  - Price – Different plans range from $5/month to $589.99/year.
  - Pros – Easy to draw complex diagrams.
  - Cons – Expensive; hard to share editable versions with people who don't have Visio access.
- **Lucidchart** – Easy to use online flowchart making software (this is our favorite!)
  - Price – Between $9.95 and $11.95/month depending on which plan you get. Many universities provide access to Lucidchart for free.
  - Pros – User-friendly with many options; easy to share diagrams that are stored on the cloud.
  - Cons – Somewhat difficult to share editable versions with people who don't have LucidChart access.

To read more about these options and others, see this article comparing flowchart software.

Session Description:

Adapt a generalized ESCM to a specific site. You should host this type of session if there is already an existing model for the habitat type you are working in and you want to be able to modify that existing model so it reflects a particular site.

Session Goal:

Revise and add detail to a generalized model to apply it for a particular site. Do this based on consensus among different expert, management, and stakeholder groups.

This session requires that a general model for your system has already been created or already exists. The model could have been created during a previous workshop session (see Session Type 1) or could be pulled from an existing model collection.

Session Output:

Project or program specific ESCM.

Estimated Session Time:

1–2 hours.

Preworkshop Prep:

Find an available general ESCM or draft a new model for the relevant habitat(s).

Conduct a basic literature review and/or expert engagement to understand areas of the model with least certainty for your context.

Develop guiding questions for specifying the model.

Materials:

Draft model already written on large paper (flip chart-sized), whiteboard, or projector

Markers

Sticky notes

Format of Engagement:

Whole group discussion with guided questions.

General Process:

- Introduce the group to ESCMs and their structure.

- Introduce the group to the general model that has already been created.

- Explain model specification and agree on the level of detail that the group wants to include. (Steps to specification are described below in the Tips, Tricks, and Guidance section.)

- As a whole group, or in breakout groups, use a process like what is described below and outlined in the specification worksheet (Appendix B) to guide a discussion about adapting the existing model to the local site. This process will involve adding context-specific detail to your model, removing irrelevant nodes and linkages from the model, and clarifying areas of uncertainty about the model.

- If you split into breakout groups, save some time (at least 30 minutes) to return as a whole group to discuss specifications you made and discrepancies between groups.

- Workshop facilitator should run through their prepared list of questions to help the group further add detail and nuance to the context-specific model.

Session Tips, Tricks, and Guidance:

- Specification centers on two central questions:

  - How does the general model need to be adapted to fit your specific context? (See steps below.)

  - What areas of uncertainty are there about your context that the group needs to think about together?

- Specification includes the following general steps:

  - Adding to the general model to ensure that nothing specific to your project, program, or site has been left out.

  - Removing anything from the general model that is not relevant to your project, program, or site.

  - Adding detail to the general model that improves specificity of the model to your project, program, or site (e.g., specific species affected, specific stakeholder groups affected, specific infrastructure affected).

- Example questions to guide model discussion:

  - Are there any ecological outcomes that are missing from this model specific to this site?

- Are there any intermediate outcomes that are missing from this model specific to this site?

- Are there any human activity outcomes that are missing from this model specific to this site?

- Do any of these links not make sense or do not apply to this specific site?

- Are there additional links that should be added between existing outcomes?

- Are there any other generalized nodes in the diagram that should be specified to better represent the local site? (e.g., species, types of recreation, outcomes for particular stakeholder groups, etc.)

- For edits, a whiteboard with the draft model is recommended but it takes time to prepare and neat handwriting is imperative. This can also be done live on a computer if you are comfortable using your selected diagramming software.

Process Agenda:

When planning a workshop it is helpful to plan out the day using a process agenda. The agenda provided below is an example, meant to help jump-start your workshop process. This should be modified and specified for each workshop depending on how you decide to run your activities. This is a static version, but but you can download an editable version on our website.

Session Type 2. *Specifying an Existing Model to a Site*	Length: 1–2 hours Time:

Objective(s): Revise and add detail to a generalized model for a particular site. Use information to do so based on consensus amongst different stakeholder groups.

Outputs: Site-specific ESCM.

Session Details:	Materials Needed	Person needs
• Introduce the group to ESCMs and their structure. • Introduce the group to the draft or generalized model. • Explain model specification and agree on the level of detail that the group wants to include. • As a whole group, or in breakout groups, use a process like what is outlined in the specification worksheet (Appendix B) to guide a discussion about adapting the existing model to the local site. • If you split into breakout groups, save some time (minimum 30 minutes) to return as a whole group to discuss specifications you made and discrepancies between groups. • Workshop facilitator should run through their prepared list of questions to further add detail and nuance to the site-specific model.	−Draft model on large paper (flip chart-sized), whiteboard, or projector −Markers −Sticky notes −Whiteboard and markers	−Person to introduce models and the activity −Facilitator for the model specification

Session Description:

Identify and prioritize outcomes on the ESCM and possible metrics to monitor those outcomes.

Ideally, common ecosystem services metrics would be monitored everywhere so that outcomes between projects could be compared and data could be rolled up. However, we understand that different locations/sites/agencies/programs are at different stages of measuring and monitoring ecosystem services, and have different resource pools to do so. Because ecosystem services monitoring is so fragmented, it is often necessary to think on an individual site level about how these types of outcomes can be monitored by those involved in the focal project or program.

This type of session can be used to brainstorm ecosystem services metrics for an individual site, project, or program. However, we encourage subsequent sessions that aim to refine metrics and develop common ecosystem services metrics across an agency, network, or region (see Session Type 4). This has been attempted in the Gulf of Mexico for RESTORE-funded restoration projects, see more about metric coordination here.

Session Goal:

Brainstorm a list of metrics that correspond to all or selected dominant ecosystem services outcomes.

Session Output:

Maybe: List of dominant outcomes.

Definitely: List of at least three metrics for each outcome, two of which seem feasible to stakeholder group and one which is a "dream" metric.

Estimated Session Time:

2–4 hours

Preworkshop Prep:

List of all outcomes (ecological, human activity, and socioeconomic) from ESCM (on flip chart or whiteboard).

Prepared list of potential metrics for outcomes (meant to encourage conversation, not limit options; see example metrics database here).

Worksheet for breakouts for identifying metrics for each outcome (see Appendix C for example worksheet).

Materials:

Large paper (flip chart-sized) or whiteboard

Markers

Sticky notes

Dot stickers (if you choose to do optional session part 1)

Draft metric list for each outcome (see our example metrics database, but these will likely need to be adapted for specific workshop needs)

Worksheet for breakouts (one per outcome per group); see Appendix C

Format of Engagement:

Whole group discussion followed by small breakout sessions (3–4 people per session).

General Process:

1. Identify dominant outcomes (optional)—In most cases there will be many outcomes on an ESCM, and you won't want to spend time creating metrics for all of them. Thus, if you want to focus in on the most important outcomes, this activity can be used to prioritize which outcomes the group wants to develop metrics for.

- Decide how you want to prioritize outcomes. We often introduce the idea of **dominant outcomes**. We define dominant outcomes to mean that the outcome:

  - 1. Is **tightly linked**: the expected change in the outcome is likely to be large and strongly driven by the intervention or external stressor in the model.

  - 2. Is **important**: the expected change in the outcome matters to many people or to groups of special concern.

- Create a list of all of the outcomes in your model (ecological, human activity, and socioeconomic).

- Review the scale at which you are working. The importance (or whether an outcomes is dominant) can change depending on whether you are working at the site-specific scale or at a larger regional scale. The group should agree at what scale they need metrics.

- As a group, list the outcomes that are **tightly linked** to the focal intervention or external stressor that you think would have a measureable, significant change.

- Give each workshop participant three dot stickers (colors do not matter).

- All stakeholders are asked to apply their stickers on anywhere from one to three outcomes that they perceive to be the most important (can be important for themselves, who they are representing, or universally relevant). Remind participants to consider different stakeholder groups, and how different outcomes matter to these different stakeholder groups as they assign importance.

- Choose outcomes with most votes. We often choose 10, but this number can vary. Ensure all stakeholders feel comfortable with this list.

- There may be outcomes that the group thinks are important, but uncertainty remains about the strength of their linkage to the focal intervention or stressor. These outcomes might be important to monitor because they represent a gap in knowledge. Ask the group if there are one or two outcomes that fit this category that they would like to add to the outcomes list to generate metrics for.

- Write a final list of the selected prioritized outcomes.

2. Identify metrics

- Review or establish metric criteria that the group wants to work with. We have a suggested list of criteria in Appendix D. These lists should be adapted to represent local priorities.

- Post these criteria in a place where everyone can see them as they work through the metric brainstorming process (on a whiteboard, flip chart, or print-out)

- Review the difference between ecological, benefit relevant, and monetary metrics (see glossary for definitions).

- Split into breakout groups of 4–5 and distribute worksheets with metrics (see worksheet in Appendix C).

    - Each group should have a facilitator who can guide the metric selection process.

    - Remind participants that the metric lists are simply meant to spark conversation— **they do not need to select metrics from this list!** Metrics from the list can be specified or adapted, and there are blank spaces for new metrics to be created.

    - For **each outcome**, every breakout group should identify their top three metrics— two metrics that fit (or mostly fit) the metric criteria and one "dream" metric. It is important to consider the criteria when assessing metrics, but it is also important to think about what ideal metrics might look like. Dream metrics are those that don't necessarily seem feasible (i.e. they are expensive or hard to measure), but represent information that would be extremely useful to have.

- You'll see in our example database and metric worksheets (Appendix C) we have coded the metrics to try and help the group think about metric differentiation. You can code your metrics this way if you find it helpful.

    - Each metric is marked to show if it is ecological (E), human-activity (H), or socioeconomic (S) (see glossary for definitions of these metric types).

    - Each metric is also marked to show if it is relevant at the site (S) or the regional (R) level.

- The full workshop group reconvenes and each group shares their top three metrics for each outcome.

    - Facilitator writes each group's metrics on a flip chart or whiteboard.

    - If there are differences in the group's top three metrics (there likely will be!), have a discussion about which metrics the full group can agree on as the top three for each outcome.

    - Ideally the group will retain two realistic and one "dream" metric per outcome, but this is not a strict rule.

    - We expect more refinement to a final set of metrics will happen following the workshop (perhaps through a process described in Session Type 4).

Session Tips, Tricks, and Guidance:

- The facilitator and project team, with the guidance of the stakeholder group, should decide whether or not it is necessary to prioritize and select dominant outcomes (part 1) depending on factors such as number of outcomes, team capacity (to identify three metrics per outcome), and whether or not the scale of the outcome is relevant (i.e., will the change be hard to detect at the scale you are measuring it).

- It makes sense to complete part 1 of this session type if you have a list of more than 10 outcomes that you are working with—brainstorming metrics takes a lot of time, and doing more than 10 tends to burn out workshop participants.

Process Agenda:

When planning a workshop it is helpful to plan out the day using a process agenda. The agenda provided below is an example, meant to help jump-start your workshop process. This should be modified and specified for each workshop depending on how you decide to run your activities. This is a static version, but but you can download an editable version on our website.

Session Type 3. *Identifying and Prioritizing Metrics*	Length: 2–4 hours Time:

Objective(s): Brainstorm a list of metrics that correspond to either all or selected dominant ecosystem services outcomes.

Outputs: List of at least three metrics for each outcome, two of which seem feasible to stakeholder group and one which is a "dream" metric.

Session Details:	Materials Needed	Person needs

1. ***Identify dominant outcomes—optional*** (This part of the session is optional. In most cases there will be many outcomes on an ESCM, and you won't want to spend time creating metrics for all of them. This part 1 optional activity can be used to prioritize which outcomes the group wants to develop metrics for.)
 	
• Decide how you want to prioritize outcomes. What determines a priority outcome?
 	
• Review all of the outcomes (ecological, human activity, and socioeconomic) and answer any outstanding questions about these outcomes and their relation to the model.
 	
• Review the scale at which you are working.
 	
• As a group, decide on a select number of outcomes that are tightly linked to the focal intervention or external stressor. These are outcomes that you think would have a measureable change, given the change expected based on the intervention or external stressor.
 	
• Choose top dominant outcomes (we often choose 10, but this number can vary) based on tally of votes per outcome using a dot sticker activity.
 	
• Write a final list of the selected prioritized outcomes.
 	
2. ***Identify metrics***
 	
• Review metric criteria that the group wants to work with.
 	
• Review the difference between ecological, benefit relevant, and monetary metrics (see glossary for definitions).
 	
• Split into breakout groups of 4–5 and distribute worksheets with metrics.
 	
• For each outcome, every breakout group should identify two metrics that fit the metric criteria and one "dream" metric.
 	
• The full workshop group reconvenes and each group shares their top three metrics for each outcome.
 	
• Facilitator writes each groups' metrics on a flip chart or whiteboard.
 	
    • Have a full group discussion about which metrics everyone can agree on as the top three for each outcome.
 	
    • Ideally the group will retain two realistic and one "dream" metric per outcome, but this is not a strict rule.
	–Large paper (flip chart-sized)
	
	–Markers
	
	–Sticky notes
	
	–Whiteboard and markers
	
	–Dot stickers
	
	–Worksheets for breakout groups (one per outcome per group)
		–Session facilitator

Session Description:

This session is very similar to Session Type 3, but requires more preparation and a more refined preworkshop metric list. With this type of session, the hope is to narrow the list of potential metrics, consider the practicalities of measuring them, and to determine if there is a minimum set of metrics that can be agreed upon for use in monitoring.

Ideally, common ecosystem services metrics would be monitored everywhere so that outcomes between projects could be compared and data could be rolled up. If it is possible, you can use this type of session to refine metrics and develop common ecosystem services metrics that could be commonly measured across an agency, network, or region.

Session Goal:

Obtain participant agreement and feedback on a constrained set of metrics associated with outcomes on an ESCM.

Session Output:

List of metrics that for each metric includes:

- Suggested method/approach for measurement (e.g., an existing dataset that could be used to track the metric or a methodology for data collection that has been identified).

- The scale at which the metric should be measured—should the metric be tracked at the project level, or is it better indicated at a different scale? (e.g., county, state, regional level).

- Equity considerations: are there ways to breakdown data collection for that metric that will better illustrate who is being affected by changes to a particular outcome? How could data be differentiated to describe this? (e.g., by gender, income level, education level, etc.).

Estimated Session Time:

1–1.5 days (depending on the number of outcomes you are developing metrics for).

Preworkshop Prep:

Draft list of proposed metrics brainstormed from previous workshops (e.g., from Session Type 3 activities) and additional literature review conducted by team running the workshop.

Develop criteria for metrics (examples in Appendix D).

Develop a list of guiding questions to facilitate conversation around each outcome and metric (see Tips, Tricks, and Guidance section for example questions).

Materials:

Slides with outcomes and metrics, and key questions

Handout with metric criteria

Handout with proposed metrics

Format of Engagement:

Whole group discussion with guided questions and break-out groups.

General Process:

- Before the workshop, group metrics into categories according to the outcome they are meant to measure (one list of metrics for fishing jobs, one list of metrics for fishing revenue, one list of metrics for bacterial infections, etc.).

- Review with the group the goal for the workshop: to hone and narrow the list of possible metrics in order to identify a shortlist of metrics that fit the criteria.

- Introduce the full workshop group to the outcomes and their associated metrics. In the past, we have done this by printing out metric lists on handouts to provide participants, and by putting them in PowerPoint slides that we use to present the metrics.

- Review metric criteria with the group, and edit if needed.

- Let the group know they will be working in break-out groups, and provide instructions for break-out sessions: for each outcome category, participants will break out into small groups of 4–6 people, and run through the list of suggested metrics, deciding which ones meet the necessary criteria or coming up with new metrics. For each metric the breakout group thinks is good, they should come up with a possible way to measure it, or a data source that could be used to calculate it, and the scale at which it could be measured (e.g., site, county, regional).

- For the first outcome, participants review the metric list on their own for a few minutes.

  - Participants consider criteria and note some questions, considerations, or suggestions they have for metrics or answers/responses to proposed questions.

- Break into small groups: breakout groups discuss and agree on metrics for the first outcome.

  - Groups discuss thoughts on metrics (and potentially brainstorm new metrics).

- Discuss possible data sources and/or data collection methods.

- Determine appropriate scale of measurement.

- Agree on recommended metric(s) to provide to the full group.

- The group documents any remaining questions they want to bring to the full group's attention.

- Each group should document notes on a worksheet that can be submitted to facilitators.

- Group report out:

  - The full group comes back together and discusses which metric they think is best for the focal outcome.

  - Participants confirm that the listed metric for each outcome meet metric criteria.

  - One person from each group suggests new questions that arose during the breakout session.

- Group discussion:

  - Discuss which metrics to keep in the context of realistic metrics data gathering for your site/region. Consider the following information:

    - Projects vary in their capacity to measure outcomes. Some projects are part of a larger network of regional habitat (ecosystem) interventions aimed at achieving outcomes at the project level as well as at a regional level. It is important to identify metrics to prioritize given this diversity.

  - First, the group should find consensus on a final metric for each focal outcome that can be measured on the *project scale*. These would be considered "required" or "first-tier" metrics.

  - For projects with anticipated regional outcomes or resources to track focal outcomes across a region, stakeholders can agree on a set of "optional" or "second-tier" metrics. These include metrics that are measured on the project scale but not feasible for the majority of projects, or metrics that are more meaningful or only detectable on a regional scale. Such metrics can, for example, only be measured through the implementation of a longitudinal county or statewide survey instrument that would likely be resource intensive for one project to conduct.

  - Find consensus about which metrics to keep. Ideally there will be only one final metric for the focal outcome, however, the group may agree on a second-tier optional metric that would add additional information about the outcome.

- Note: it is very possible that the group may come to the consensus that some outcomes will not have an associated metric because there is currently no feasible way to measure that outcome.

- Repeat this breakout group process for *each outcome.*

- Hold time for a session at the end to discuss equity. For the metric shortlist, have breakout groups discuss whether monitoring data should be disaggregated in any way to capture how groups/communities/gender identities are being affected differently.

Session Tips, Tricks, and Guidance:

- Have individual breakout sessions per outcome category and then reconvene.

- Start with the more straightforward outcome/metric categories (typically jobs) and then continue to the more complicated/nuanced ones.

- Remind participants that the starting metric lists represent a way to spark conversation, but final metrics do not need to be chosen from these lists.

- It is helpful to have a facilitator in each breakout group to keep the conversation focused.

- You may want a slightly different type of participant group to complete a session type like this. It is helpful to have a variety of expertise in the room so that you have different sources of information on the types of data available and ways to measure the suggested metrics. We have included participants with expertise in the habitat or natural resource of interest, economics, health, etc. Bringing academics into this type of conversation may be particularly helpful.

- Ecological and human activity outcomes are more likely to be measurable at the project scale; social and economic outcomes are more likely to be measureable/modeled at the country or regional scale. So, which kind of outcomes and metrics you prioritize may depend on the scale of your needs—project scale monitoring and assessment or regional scale monitoring and reporting. Often, you may want a few of each metric type, but this will depend on your specific needs.

Process Agenda:

When planning a workshop it is helpful to plan out the day using a process agenda. The agenda provided below is an example, meant to help jump-start your workshop process. This should be modified and specified for each workshop depending on how you decide to run your activities. This is a static version, but but you can download an editable version on our website.

Session Type 4. *Developing, Honing, and Improving Metrics*	Length: 1–1.5 days Time:

Objective(s): Obtain participant agreement and feedback on metric(s) associated with outcomes on an ESCM.

Outputs: List of metrics for outcomes that includes additional details such as method/approach for measurement, scale, equity considerations, and more.

Session Details:	Materials Needed	Person needs
• Introduce the full workshop group to the outcomes and their associated metrics in relevant categories. • Review metric criteria with the group. • Review with the group the goal for the workshop. • Break into small groups: Small breakout groups discuss and agree on outcomes and metrics for the first outcome. • Groups discuss thoughts on metrics (and potentially brainstorm new metrics), consider ways to measure each suggested metric, and agree on recommended metrics to provide to the full group. • The full group comes back together, and discusses which metrics they think are best for the focal outcome. • Repeat this breakout group process for each outcome's metric list. • Hold time for a session at the end to discuss equity.	−Slide deck with outcomes and draft metrics −Handout with metric criteria −Handout with proposed metric lists	

Session Description:

In this session you will be using an ESCM model to identify and specify stakeholders who will be affected by a management intervention or external stressor.

Session Goal:

Identify specific stakeholder groups who are connected to the habitat and ecosystem services being examined. This will allow for a more detailed understanding of specific groups that will be affected by changes to the natural system, and provides a list of potential stakeholders to engage in future work.

Session Output:

A stakeholder list, and each group's connection to particular ESCM model endpoints.

Estimated Session Time:

1-2 hours

Preworkshop Prep:

You will need an ESCM prepared before this session. This could be a previously built model or one that was developed earlier in the workshop.

Materials:

ESCM and a way to project/show it to the full workshop group (either on a large screen, on print-outs, or on a whiteboard).

Format of Engagement:

This can be done as a whole group or in breakout groups. The group that you want present for this type of session may differ from those who you would bring together to build an ESCM, however, they may overlap. Use your best judgement to decide who you need to consult to get the best information possible about specific stakeholder groups' dependence on, or interaction with the focal system.

General Process:

- Familiarize the group with the ESCM (if they were not involved in building it).

- Make a list of the important model endpoints.

- For each endpoint, have the group brainstorm the stakeholder groups who are connected to that outcome in some way (brainstorm options discussed below).

  - It may help if you have prepared a draft list of potential stakeholders for the group to react to—they are then able to tell you who is missing from your list, or to specify the list.

Session Tips, Tricks, and Guidance:

- Specify the stakeholder groups as much as possible. Ask yourself the following questions to add specificity:

  - Can/should this group be broken down further into a more specific subset?

    - For example, if you listed "fishermen" as a stakeholder group, are you talking about all fishermen? Or is it commercial fishermen? Recreational fishermen? Subsistence fishermen? Fishermen who target a specific catch? A specific community of fishermen? Local fishermen, or tourists?

    - For example, if you listed "local communities" as a stakeholder group, are you talking about everyone in the community, or specific parts of the community? Locals living within 1 km of the coast? Locals in X neighborhood? Local women? Local children? Locals with breakwaters?

  - Continue asking yourself "who?"

    - For example, if the group lists "tourists" as a stakeholder group connected to a recreational fishing outcome, continue to prod about who in that group they specifically mean. You can see how tourists can be further specified as you continue to ask, "who?"

      Tourists –who$\rightarrow$ Tourists visiting march-Sep –who$\rightarrow$ are over 50

- Options for stakeholder brainstorm:

  - Option 1: Do an individual brainstorm first on sticky notes, writing one stakeholder group per sticky. Then have each person share their ideas by adding their sticky notes to an image of the model.

  - Option 2: Break into small groups, assign each group a subset of important model endpoints. Have each group brainstorm stakeholder groups associated with each outcome. Then share back with the whole group and add to each other's lists.

- Option 3: Work together as a whole group the entire time, walking through each endpoint one-by-one and making stakeholder lists.

- Option 4: Have the group react to a prepared stakeholder list, adding in missing groups and specifying the list further.

- If you conduct this session at a workshop with mostly ecological expertise in the room, you may want to consider doing targeted outreach to other groups to confirm the stakeholder lists generated. These should include representatives of the stakeholder groups you identified.

Process Agenda:

When planning a workshop it is helpful to plan out the day using a process agenda. The agenda provided below is an example, meant to help jump-start your workshop process. This should be modified and specified for each workshop depending on how you decide to run your activities. This is a static version, but but you can download an editable version on our website.

Session Type 5. *Beneficiary Assessment*		Length: 1–2 hours Time:
Objective(s): Think about specific stakeholder groups who are connected to the habitat and ecosystem services being examined. This will allow for a more detailed understanding of specific groups that will be affected by changes to the natural system, and provides a list of potential stakeholders to engage in future work.		
Outputs: A stakeholder list, and each group's connection to particular ESCM model endpoints.		
Session Details:	**Materials Needed**	**Person needs**
• Familiarize the group with the ESCM (if they were not involved in building it). • Make a list of the important model endpoints. • For each endpoint, have the group brainstorm the stakeholder groups who are connected to that outcome in some way.	–ESCM –Sticky notes (optional) –Whiteboard or flip chart paper	–Facilitator

Session Description:

Any workshop should close out with a session where the group comes back together to discuss next steps for the products created. This is also an opportunity to share with the group how the workshop organizers plan to move forward.

Session Goal:

To decide how to further refine the workshop outputs, to get them to a point that all agree on and are comfortable with. To create a common understanding of how workshop outputs will be used.

Session Output:

This could be many different things, but will depend on what the group wants to do with the ecosystem services products created. Outputs of this session could include:

- Ideas for resources/contacts who could help fill information gaps or advise on parts of the model that the group is unsure about.

- A list of stakeholders for further outreach to further refine the model or who could provide feedback or potential data sources for brainstormed metrics (these could be people with expertise in a variety of areas, including ecology, social sciences, economics, health, education, etc.).

- A list of concrete next steps and who is responsible for each.

Estimated Session Time:

Depends on group needs. Plan for at least 20 minutes.

Preworkshop Prep:

Whoever is running the workshop should spend a bit of time thinking about what they believe next steps to the workshop should be. This will help spur the conversation, especially if this is at the end of the day when participants are tired.

Materials:

Projected list, large paper, or whiteboard to document the group's major points of discussion.

Format of Engagement:

Full group discussion.

General Process:

There is no prescriptive process for this session type. Workshop organizers will need to decide what type of information they want from the group to decide on next steps, and to share how they plan to use the products generated during the workshop.

Session Tips, Tricks, and Guidance:

- Give people the opportunity to raise questions and concerns—do they have any hesitations about what was produced or discomfort with how the products might be used?

- Asking the group to generate a list of specific people (and their contact information) to follow up with about questions is helpful—this jump-starts the next steps process.

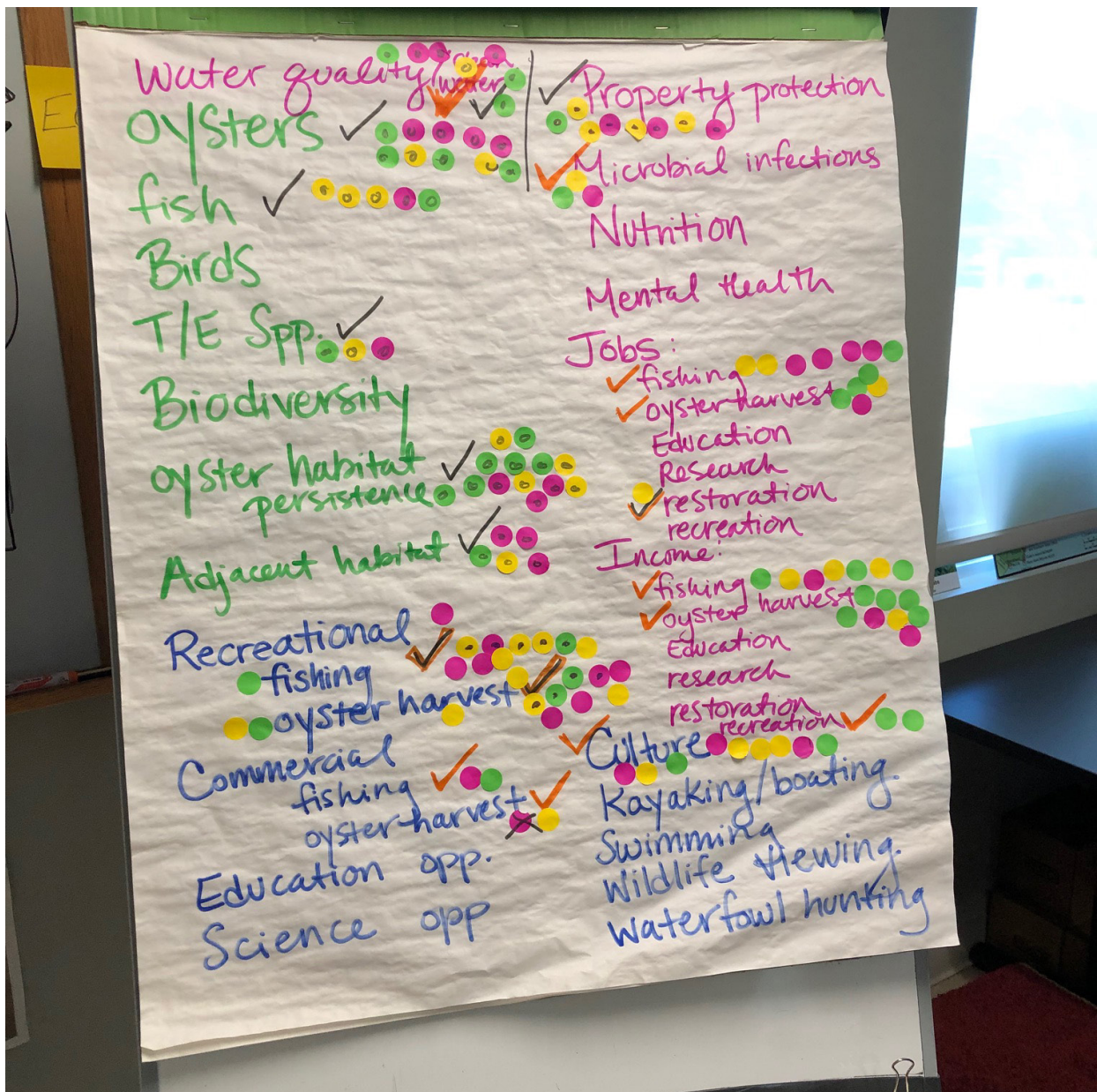- Ask the participants what their personal next step will be.

APPENDIX A: HELPFUL RESOURCES

Blank process agenda template: https://coast.noaa.gov/digitalcoast/training/process-agenda-template.html

NOAA guide on planning and facilitating effective meetings: https://coast.noaa.gov/digitalcoast/training/effective-meetings.html

NOAA meeting engagement tools: https://coast.noaa.gov/digitalcoast/training/met.html

APPENDIX B: SPECIFICATION WORKSHEET

Find an editable version of this worksheet here.

This example worksheet helps guide participants to organize how some common general nodes can be specified for a site-specific model. Participants can fill out this worksheet in small groups and then find points of consensus on which specifications are most relevant for the specified model.

Example: Specifying the mangrove model to the Fruit Farm Creek Restoration Site

1. Brainstorm *species that will be most influenced* by the Fruit Farm Creek restoration project in the following categories: (You don't have to fill in all five lines if there are only a few species that will be most influenced).

Species related to fishing:

Recreational Fishing	Commercial Fishing	Subsistence Fishing
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
5. _____	5. _____	5. _____

Other Species:

Species important for wildlife viewing (could include birds)	Birds	Threatened and Endangered Species
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
5. _____	5. _____	5. _____

2. Using a highlighter, highlight only the parts of the general model applicable at the Fruit Farm Creek restoration site.
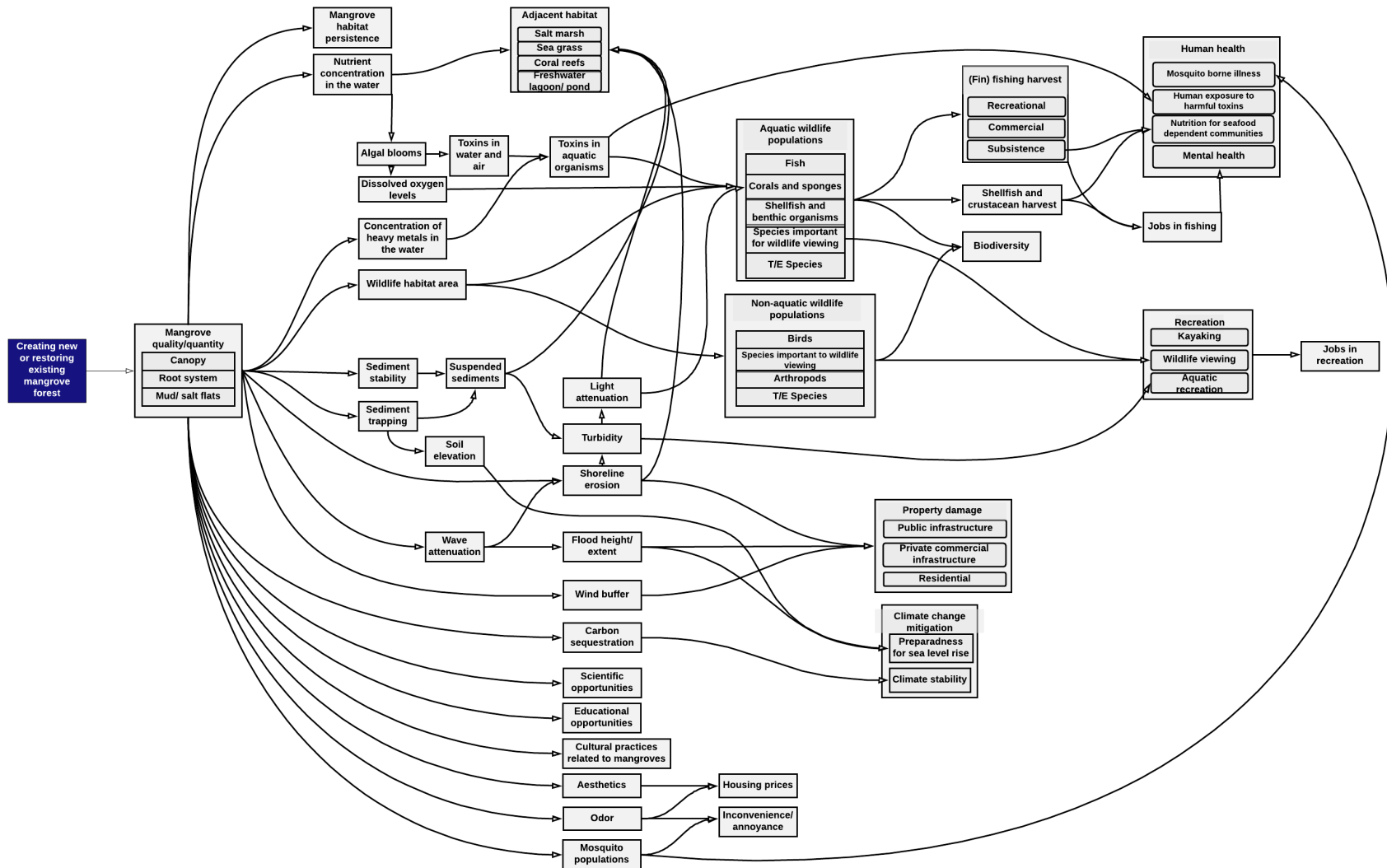
3. Now take a minute to **add anything to the model on the previous page that is specific to the site**—are there specific site features that require additional nuance? Can you specify any of the nodes further? For example, scientific opportunities for whom? What property is being protected from damages? The questions provided in the table below might be helpful:

Outcome category	Details and questions
Health impacts (water quality)	Health impacts could include illness from exposure to contaminated water by swimming or drinking. Is this exposure important or relevant in this location? Which contaminants should we focus on?
	Which contaminants introduce the greatest health risks? Are Florida populations more vulnerable to certain contaminant risks because of other prevalent health conditions?
Health impacts (dietary)	Health impacts could include dietary changes based on changing fish/shellfish populations and availability. Are these changes relevant for certain populations in the southwest Florida?
	Which groups of people rely on fish/shellfish? What portion of their protein or micronutrient needs are met by local fish/shellfish? Do residents depending on wild local fish/shellfish have access to dietary alternatives with similar nutritional qualities?
Existence	Existence value represents the value that people place on the existence of elements of the ecosystem. Often endangered, threatened, or charismatic species have high existence value. Which species should we be considering? Are there groups of people who value the marsh for its existence?
	Which population's existence values do we care about capturing (local residents, U.S. residents, global residents)? Which species are valued by those focal populations?
Commercial fishing	Commercial fishing represents the amount (or value) of fish/shellfish extracted locally. Which commercially harvested species (if any) are most important?
	Which commercially harvested species are economically important? Which commercially harvested species are culturally important? Which commercial stocks are most likely to be affected by possible interventions?
Aesthetics	Aesthetic value represents the value that people place on the beauty or scenery provided by the site. What scenic elements do people value most?
	Do different groups of people value different scenic elements? Do property values reflect aesthetics in the area?
Culture and heritage	Cultural value represents any value provided that is an element of culture. This element could include an historic site, a species with specific cultural meaning, or a site with religious/spiritual importance. Are there any cultural sites or species of note in the site that would be relevant?
	Are important cultural sites or species different for different populations?
Recreation	We have included kayaking, wildlife viewing, and aquatic as important recreational activities in this area. Are there recreational activities that should be added or removed from this list?
	Are there certain activities that are of particular importance to certain populations?

APPENDIX C: METRICS WORKSHEET

Find an editable version of this worksheet here.

Distribute this worksheet to either each participant or to the individual facilitating breakout sessions. One worksheet needs to be made for *every outcome* (or for every dominant outcome). Prior to the workshop, potential metrics based on academic review can be drafted. For each suggested metric, they should be identified as ecological, monetary, or benefit relevant (demonstrably and directly relevant to human welfare). We generally aim to identify metrics that measure benefit relevant indicators as those are most closely associated with the ecosystem services that are most relevant to people and communities, but this is not always possible. Also, some metrics cannot be measured at the project scale, and should be identified as such in the third column. These lists are not meant to limit the participants, but rather to act as a starting point from which they can refine the suggested metrics or decide on new ones based on their knowledge of available datasets and data collection approaches.

Metric Prioritization

On the following pages you will see metric lists for the dominant outcomes the group prioritized. Using the criteria to walk through the metric list, please **choose the top three metrics** that you think would be best for monitoring the dominant ecosystem services outcomes of that restoration project.

For each outcome, choose two metrics that take feasibility of data collection into account, and select one "dream" metric that ignores the feasibility criteria.

Tips to help as you walk through the metrics lists:

- As you are selecting metrics, keep in mind the criteria that we agreed on. A top-three metric does not need to meet all the criteria, but the criteria will be able to help you identify which metrics meet our needs.

- Some metrics are quite specific, some are more general. If you feel like you need to specify a metric to make it work for this site, feel free to do so.

- These metric lists are meant to spark conversation and give you ideas, but they are by no means all-inclusive! There are blank spaces on every metric list page so that your group can create new metric options.

- Some species-related metrics refer to "important species." As natural resource managers and scientists, we know that all species are important! But in this context, important species refer to species that are meaningful to some stakeholder group for a particular reason.

- The metrics are coded to help you walk through the criteria.

  - Each metric is marked to show if it is ecological (E), human-activity (H), or socioeconomic (S).

  - Each metric is also marked to show if it is relevant at the site (S) or the regional (R) level.

Find an example database of draft metrics here.

(Example) Outcome: Recreational Fishing

1. Circle the group's top three metrics, and put a star next to the group's "dream" metric.

	Possible Metrics	Ecological, human activity, or socioeconomic (E, H, S)	Site or regional level metric (S/R)
1	Number of recreational fishermen using the site/unit time	H	S
2	Abundance of a particular fish species at the site	E	S
3	Fish catch per unit effort at the site (#fish/ trip; #fish/ hour)	H	S
4	Number of recreational fishing trips at the site	H	S
5	Quality of fishing experience at the site (catch rate per trip; fish size caught on trip)	H/S	S
6	Number of recreational fishing licenses sold	S	S
7	Number of charter trips to the site	H	S
8	Travel cost to fish at the site	S	S
9	Fish catch per unit effort in the project region (#fish/ trip; #fish/hour)	H	R
10			
11			
12			

2. Which criteria do the top three metrics meet?

Metric 1:

Metric 2:

Metric 3:

Notes:

APPENDIX D: METRIC CRITERIA

Find an editable version of the criteria here.

We have used different criteria depending on the goals of our workshop participants. We provide two possible criteria lists below, but these lists can be adapted to align with project goals.

Criteria Assessment 1:

(Adapted from the SMART criteria, first written about in the 1981 *Management Review* article by George Doran called, "There's a SMART Way to Write Management's Goals and Objectives.")

Specific

- A single variable that accurately describes the outcome.

Measurable and repeatable

- Has the capacity to be counted, is consistent, and transferable.
- Are others considering it or actively measuring it in ongoing monitoring programs?

Attainable

- Collecting the data should be straightforward and cost-effective.
- Verified according to local workshop participants and project team.

Relevant

- Tightly connected with the logic model impacts outcomes.
- Needed/wanted by stakeholders.

Time bound

- Data can be gathered at the appropriate time or time-frame to reflect what the indicator is attempting to show.

Spatial scale

- Can be measured at project or regional scale (and track which one).

Criteria Assessment 2:

(1) Could be collected across the country

(2) Feasibility of data collection

(3) The metric accurately and directly captures the aspect of the ES outcome of interest (or is a good proxy)

(4) Changes in the metric could be attributed to the intervention

(5) Changes in the metric could be detected within (X time frame)

(6) Data on this metric would resonate with important stakeholders

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Nicholas Institute for Environmental Policy Solutions

The Nicholas Institute for Environmental Policy Solutions at Duke University is a nonpartisan institute founded in 2005 to help decision makers in government, the private sector, and the nonprofit community address critical environmental challenges. The Nicholas Institute responds to the demand for high-quality and timely data and acts as an "honest broker" in policy debates by convening and fostering open, ongoing dialogue between stakeholders on all sides of the issues and providing policy-relevant analysis based on academic research. The Nicholas Institute's leadership and staff leverage the broad expertise of Duke University as well as public and private partners worldwide. Since its inception, the Nicholas Institute has earned a distinguished reputation for its innovative approach to developing multilateral, nonpartisan, and economically viable solutions to pressing environmental challenges.

National Ecosystem Services Partnership

The National Ecosystem Services Partnership (NESP) engages both public and private individuals and organizations to enhance collaboration within the ecosystem services community and to strengthen coordination of policy and market implementation and research at the national level. The partnership is an initiative of Duke University's Nicholas Institute for Environmental Policy Solutions and was developed with support from the U.S. Environmental Protection Agency and with donations of expertise and time from many public and private institutions. The partnership is led by Lydia Olander, director of the Ecosystem Services Program at the Nicholas Institute, and draws on the expertise of federal agency sta , academics, NGO leaders, and ecosystem services management practitioners.