February 7, 2019

Mr. Phil Anderson, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, #101
Portland, OR 97220

RE: Agenda Item E.2: Climate and Communities Initiative Update

Dear Chair Anderson and Council Members:

The Nature Conservancy (TNC) and the Ocean Conservancy thank the Pacific Fishery Management Council (Council) for its work implementing the Fishery Ecosystem Plan (FEP) and taking steps forward on the Climate and Communities Initiative, preparing West Coast fisheries for climate change. We are excited to see the Council lead the way for scenario planning on the West Coast., we offer the following input on scenario planning and the attached.

Scenario planning is a structured process to examine if our current decision-making processes will be suitable in an uncertain future. The collective "we" are grappling with the impacts of climate change on a world-wide scale. Climate change presents serious challenges as it has the potential to drive species distribution shifts, alter stock productivity and cause unexpected fishing behavior. The impacts will be both biological and socio-economic.

The US Fish and Wildlife Service and the National Park Service both have extensive scenario planning programs. In the *Summary of Scenario Planning Process* report (attached), we summarize scenario planning guidance development and tested by the National Parks Service. There has be great interest in this process, specifically, and we felt that a short summary of the work would help the Council in developing their own scenario planning process. Additionally, we highlight a successful process that was conducted on the East Coast. This is not a recommendation of an exact process to move forward with. Rather, it is intended to provide considerations and lessons learned from a finished process.

We are looking forward to providing recommendations in additional public comment and are happy to share some perspectives as we move forward.

Sincerely,

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Summary of a Scenario Planning Process

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February 7, 2019

Introduction

Developing strategies to deal with an uncertain future is essential for natural resource management. The future is more than just a continuation of past trends as it exhibits unexpected shocks and non-linearities that are both unexpected and unpredictable (Shell 2008, NPS 2013, Meinert 2014). Regardless of the future situation that occurs, expected or unexpected, decisions need to be made to ensure the long-term sustainability of natural resources. Scenario planning is a means to develop effective strategies and actions for a range of potentially plausible futures (Rowland et al. 2014).

The Nature Conservancy has put together this document to aid the Pacific Fishery Management Council (Council) in moving forward with scenario planning in the Climate and Communities Initiative. The goal is to provide an overview of scenario planning, based on the broadly accepted guidance contained in *Using Scenarios to Explore Climate Change: A Handbook for Practitioners* by the National Parks Service (NPS 2013) combined with other resources. An example of the application of that guidance in also included in this report. It is important to note that the example is not a recommendation of a way forward with scenario planning on the West Coast, but a demonstration of successful scenario planning, which is very informative to the planning of the current initiative. The components of any process should be tailored to the needs of the group conducting the planning.

What is Scenario Planning?

Scenario planning is an iterative process used across a range of disciplines to plan for the future. It first became prominent as a military planning tool during World War II and has been used extensively in the business and financial sectors, most notably by the oil giant Royal Dutch Shell (Schoemaker 1995). In recent decades, scenario planning has been applied to natural resource management and programs exist within the US Fish and Wildlife Service (Rowland et al. 2014), and the National Park Service (NPS 2013). The process is well suited to fisheries and has already been used in several fishery applications (Badjeck et al. 2010, Davies et al. 2015, Schumann 2018b).

Planning for an uncertain future can be quite challenging. When thinking about the future, fishery drivers (i.e., the aspects that shape the fisheries landscapes) can be divided into two groups; things that are known with some amount of certainty (e.g., death and taxes) and things that are very uncertain (e.g., climate change, politics, the economy) (Schoemaker 1995, Meinert 2014). Scenario planning presents a structured process to evaluate fisheries through the lens of those drivers, e.g. climate change, and explore our underlying assumptions, ideas and perceptions as well as the range of uncertainty concerning the information we have about the future (Meinert 2014).

Scenario planning is a process for explicitly acknowledging and working with that uncertainty (Shell 2008). It does not try and predict the future, but simply examines the range of potential futures to determine effective ways to make decisions despite uncertainty. By working through the scenarios, participants are forced to identify and critically examine their own assumptions about the future and analyze the main factors driving potential outcomes, their connections and feedback loops (Rowland et al. 2014). Each scenario represents an narrative about the future that is plausible. It is not a forecast, but simply a visualization of one possible future. The process reduces two of the major problems when

planning: tunnel vision – a view of the future that's too narrow - and over confidence – belief that a single envisioned future is the most likely (Schoemaker 1995).

Scenario planning is well suited to situations in which the level of uncertainty around key drivers of future conditions is larger in scale than the one's ability to adjust or predict. Scenario planning is a particularly useful tool when considering situations where significant and dramatic changes have occurred in the past and are likely to occur again, and when such changes can have serious consequences on the resource and livelihoods. It can also help when effective long-term strategic planning is difficult due to limited planning resources and/or multi-institution governance complexity. Additionally, scenario planning can provide a collaborative context for airing and reconciling divergent views on the best way forward to achieve a common purpose (Schoemaker 1995).

Guiding principles

When developing scenarios there are a few guiding principles:

- Utilize a **time horizon** that is long enough that it considers the large-scale uncertainties that will shape the future. It should be of sufficient length to move beyond the day-to-day operational decisions, but short enough that it is still relevant and actionable.
- A popular term in the scenario planning process is "**Outside-in thinking**". In general, the participants should first consider how forces outside the Council (e.g. climate change, politics, economy, society) will impact the resource and the management process and then how the Council will navigate those changes.
- Always include **a diverse group of stakeholders** with multiple perspectives. The wider the array of views, attitudes, perspectives and experiences of the participants, the more fully the scenarios will be informed.
- As with all planning processes, establish **clear goals** to ensure everyone is striving for the same end, such as, "management actions to take in the face of climate change."
- Scenario planning is a process that should be **tailored to suit the needs** of the group conducting the planning. Within the framework, there is no single correct way to do things; implement it in a way that achieves the goals (NPS 2013).

Guidance for Scenario Planning

In general, the amount of time needed to conduct scenario planning can vary greatly. Ideally, the process would take no more than one year to complete. It involves a core team of individuals to lead the process, and participants (the number of participants should be tailored to the specific needs) to develop, shape and examine the scenarios over the course of one to three workshops.

There are a number of standard steps in the scenario planning process. Here we outline the five step procedure followed by the National Park Service (NPS 2013):

1. Orientation,
2. Exploration,

3. Synthesis,
4. Application, and
5. Monitoring.

The outline provides a general summary of the National Parks Service approach, but also includes information from other resources to provide a broad overview.

1. Orientation

Orientation is about getting the framework, the information and the people up and running. One of the first steps for the Council, were you to follow this process, is to bring on an experienced scenario planning facilitator.

A core team should be assembled; a small group of people that will lead all phases of the process. Core team responsibilities include inviting participants, setting the schedule, conducting interviews, organizing and facilitating workshops, and drafting scenarios and reports. The core team begins by developing the orientation materials such as defining critical challenges, key deliverables and the audience for the work.

The group should develop a clear goal such as, 'Developing an implementable strategy for managing fisheries in the face of climate change' and a time horizon. The time horizon represents the number of years into the future the process will explore.

As part of orientation, the core team plans a series of workshops that will be executed in future steps (i.e., step #3 Synthesis and step #4 Application). This includes the type and number of workshops, the identification of steering committees (if needed) to help with specific workshop planning, dates and locations, goals and objectives of workshops, facilitators, presenters, note takers, and participants from a range of backgrounds.

During this phase, the core team conducts one-on-one interviews with fishery interests who will be the participants in the workshops (i.e., commercial and recreational fishers, tribes, processors, supply chain experts, tourism staff, fishery related businesses, economists, local politicians, port authority, lawyers, natural and social scientists, town, state and federal managers and non-governmental organizations). The interviews are conducted with broad, open ended questions (e.g. What are the largest uncertainties that could impact fishing and fisheries management over the time-horizon?). The goal is to obtain background material from a range of perspectives on some of the major factors (physical, social, political, technological, or economic) that cause uncertainty in fisheries and to get a sense of the variation in assumptions and beliefs that are held across the industry. The interview results may help to reshape the initial goal, identify critical challenges, and hone the time-horizon.

2. Exploration

During the exploration phase the core team with input from the participants, additional background material, and literature review, identifies major factors shaping the future and their degree of uncertainty.

In parallel, the core team works with climate and fisheries experts to put together climate change projections for the physical and biological variables on the West Coast. This could include using the IPCC carbon dioxide emission scenarios and global earth system models to project factors such as changes in water temperature, storm frequency and sea level rise. Down-scaled regional climate models and species distribution models can also be used to get a sense of the factors driving change, the range of physical changes that could occur and the uncertainty associated with the changes.

The results of the exploration phase should be a list of factors that drive the future from a range of different disciplines and perspectives. A pragmatic approach is needed to ensure important factors are included, possibly in broad terms, but the list is not so long as to be impractical.

Communications by the core team can help ensure stakeholders are informed of the process and help bring everyone up to speed so that the workshops in steps #3 and #4 can move efficiently.

3. Synthesis

The synthesis phase involves creating different scenarios based on the factors identified in phase 2. A workshop format is recommended to engage participants in discussion and dialogue.

The first step is to review the list of factors as a group, combining or eliminating as many as possible and potentially adding any missing ones. Participants then sort the factors into two groups: 1) Factors that are considered reasonably well known and/or likely to follow their current patterns into the future (e.g. population growth, age of fishing captains), and 2) Factors that are considered largely unknown (e.g. frequency of oceanographic events, seafood market dynamics). When selecting factors, there are no single correct answers and the process is a product of the particular group of people in the room. That is one of the reasons it is so important to have a diversity of people and opinions at the workshop.

The second step is developing the critical uncertainties, which form the basis for building the scenarios. This is done by ranking the unknown factors, or groups of factors, to determine the top two to five. It may be that a bundle of related factors becomes one of the critical uncertainties. It is important that the number of critical uncertainties is limited, that they are significantly different, and that they could impact the future within the specified time horizon.

Finally, the scenarios are built. There are a range of methods for building scenarios, we review two methods:

a) Matrix method

In the matrix method, small break out groups cross two of the critical uncertainties. It is best to select critical uncertainties from two different disciplines (e.g. an economic factor and an environmental factor as opposed to two environmental factors). As each critical uncertainty has two end members, crossing two critical uncertainties perpendicularly creates four quadrants and thus four potential scenarios. The break out group then reviews each quadrant, first determining if a scenario based on that quadrant is plausible (e.g. can sea level rise be maximum and port infrastructure be unaffected?) and then determining if a useful, compelling narrative could be developed. The goal is to find plausible scenarios that challenge participants, forcing

them to examine the main drivers in the system, the underlying causal relationships, considering the range of possible futures while focusing on the challenges that fisheries management might face. At this initial stage, the small groups create short bulleted lists about how the future might unfold in each of the different quadrants and then mix and match the different critical uncertainties, creating new matrices to develop abridged story lines for each quadrant. After working through several different crosses with different critical uncertainties, the small group should select their top two to four plausible scenarios that express the range of potential challenges in fisheries and fishery management in the face of climate change.

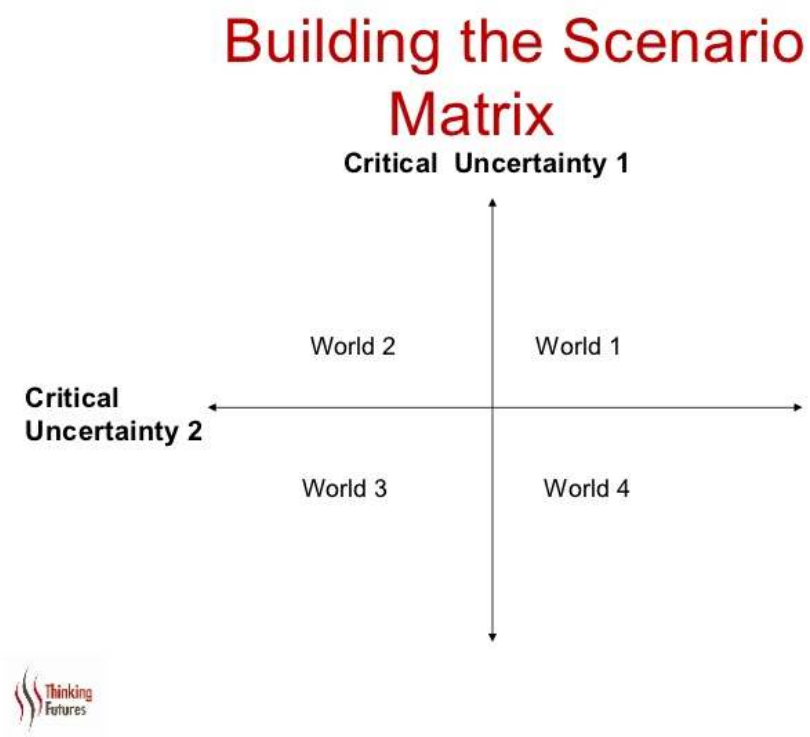

Figure 1. Schematic of a scenario matrix (from (Conway 2007)).

b) Incremental approach

The incremental approach begins with the same two to five critical uncertainties established by the participants. The critical uncertainties are written down on separate cards with one side of the card indicating one extreme value or lowest level of change for the critical uncertainty and the other side, the maximum level of change. In break out groups, the cards are laid down such that each critical uncertainty is at the lowest level of change. The small group determines if that combination of critical uncertainties is plausible and then puts together a bulleted narrative of what might occur in the future given those realities. The small group then turns over two or more cards and works through an abbreviated story line based on the new value of the critical uncertainty. The goal is the same as in the matrix method above to determine the major factors shaping the future, the different possible realities they could take, and how they could impact

fisheries. Again, the small group works through several different iterations and eventually selects the top two to four scenarios.

In both methods it is important to explore and document first order impacts for each scenario (e.g. if the warm blob persists for ten years then…). While scenarios that are implausible should be removed, unlikely scenarios should not necessarily be eliminated. Examination of low probability, unexpected scenarios can often reveal major insights.

After selecting the top scenarios in each small group, the large group reconvenes, works through the scenarios together to ensure they are internally consistent, have a broad perspective and enable the creation of real actions or strategies. The group combines and eliminates some and then selects the overall top three to five scenarios. **The goal is not to select the correct future, or to predict the most likely future, but to select scenarios representing futures that are relevant, challenging, divergent, and cover the concerns facing fisheries management.** Finally, working with the core team, the participants fully flesh out the story in each scenario, working through the narrative development, the causal chain of events, the interconnections and outcomes for the different aspects (e.g. biological, economic). Creating a story around each scenario is often considered crucial as it one of the main ways humans understand and connect with abstract concepts such as future uncertainty.

4. Application

During the application phase, participants work through the scenario narratives from phase 3 to develop actions and strategies to ensure successful fisheries given the manner in which the scenarios unfold. Often in small groups, in a workshop setting (one or more, depending on the needs of the group), the participants work through the scenario narratives attempting to understand second and third order impacts, how the scenarios would impact specific areas and what the scenario would imply for specific stakeholders.

During this exploration, the participants develop draft actions and evaluate their implications. Questions such as, “If we knew this was the actual future, what actions would we take now? Are there actions we should stop taking? What is needed to meet our objectives under this set of conditions?” can help shape the process. Participants can trial run different ideas and strategies and work through the thought experiment of how they might play out under the different scenarios. The participants explore whether different ideas will work or not and determine the conditions under which certain concept will be effective. The goal is to develop ideas for what actions the stakeholders and the Council could or should take to be successful under the future scenario.

One of the key components of scenario planning is that the process is not trying to predict the actual future and plan for that single outcome. It is not trying to build a single consensus. The goal is to develop a range of scenarios that specify a broad array of potential futures forcing the participants to plan for all of them. **The actions developed across the full set of scenarios can then be evaluated to determine what strategies could work across a broad array of potential futures and thus be prepared regardless of which future actually happens.**

Working as a large group, the participants and core team review the actions and strategies developed for the different scenarios. The group is looking for patterns or suites of actions that cut across scenarios. This can include actions to take and actions to stop taking. It is also important to determine if the recommended actions diverge widely across the different scenarios indicating that different course of action are needed for the different realizations of the future. Different actions for different futures suggest an adaptive strategy is needed. Based on the potential actions, the participants can determine if there are certain actions that make sense across all scenarios (e.g. maintain healthy spawning stock biomass) or if there are sets of actions that are useful within certain reoccurring situations. The participants must then determine if the recommended actions represent gaps in the current strategy and if additional resources/data would be needed to execute them.

Monitoring

Monitoring is essential to know what actions to take when to maintain natural marine resources. Within the scenario planning process, it is important to determine what indicators can be used to determine if certain scenarios are becoming a reality, if there are bifurcation points and how the critical uncertainties are tracking. There is already a robust data collection program for fisheries on the West Coast. The program covers a wide range of indicators from physical and biological data to aspects of social and economic status. Many of the indicators are provided to managers by the NOAA IEA team in various formats, including the Annual Ecosystem Report given the PFMC. It is likely that most of the raw data, particularly for the physical and biological factors, are already collected, but may need to be processed in additional ways to track changes. Within the scenario planning process, the group should have a conversation about the desired indicators, current data streams and their ability to track the needed indicators as well as the allocation of time and resources for collecting and processing data.

5. Outputs

Scenario planning should have four products:

1) A series of bulleted scenario narratives
2) A list of actions to be taken to meet Council objectives within each scenario.
3) A list of strategy/action that cut across all scenarios that are the recommendations from the scenario planning process, and
4) A monitoring plan.

The core team is responsible for compiling all the information and producing the final report. The bulleted scenarios should be turned into written stories to ensure that they are accessible to those outside the workshops and so they can promote critical and creative strategic planning across the Council. The recommended actions or strategies will largely be derived from the workshop discussion surrounding actions developed for each individual scenario. Additional discussion with participants after the workshop as well as discussion with other stakeholders can also be used to develop additional strategies in the future.

The process can be completed in three to twelve months if the core team has dedicated time for the exercise. It may be possible to complete most of the work in one workshop, but two or three workshops

are frequently seen. It is best if the same participants are part of all phases of the process and it is highly recommended to hire a facilitator with experience in scenario planning.

A Scenario Planning Example: Rhode Island Commercial Fisheries

A good example of using this process to develop scenarios and responses in fisheries can be found in Rhode Island (Schumann 2018b). It is important to note that this is not a recommendation to follow this exact process. Rather, it is a demonstrative example of the successful use of scenario planning in fisheries.

In 2015, 12 Rhode Island fishermen were awarded a NOAA Saltonstall Kennedy grant to develop collective thinking on future environmental change, known as the Resilient Fisheries RI Project. They developed a Project Oversight Team and hired a Project Coordinator. They contracted with the Future Strategy Group to facilitate scenario development and undertook a process to develop scenarios that evaluated four different climate scenarios, combined with four difference socio-political scenarios (Schumann 2017):

- A period of high climate variability ("Global Weirding") and a "Do It Yourself" governance structure;
- A period of global cooling and increased eutrophication (greater anoxic events and acidification) and period of new technological innovation (i.e., artificial intelligence, micromanufacturing, and robotics) with a growing U.S. economy;
- An "Anthropogenic Warming" period, with increased temperatures, lower salinity and dissolved oxygen levels, and increasing ocean acidification, combined with a sluggish economy and tough protectionism and government programs; and
- A "Natural Warming" period with the same results to the environment as the previous scenario, but the drivers are natural, rather than human caused. This is combined with a new economy based on cheap renewable energy, creating profound economic uncertainty globally.

These scenarios were developed and evaluated through a multi-phase process that consisted of one-on-one interviews with fishery participants, and a series of facilitated workshops to determine the critical uncertainties that would form the basis of the scenarios and develop goals, strategies, and opportunities for Rhode Island's commercial fisheries in a changing climate.

During the first phase, the project coordinator conducted one-on-one interviews with fishery participants. The interviews were developed to solicit an understanding of how the environment is changing and how fishery participants are adapting to these changes, and to understand barriers that limit fishery participants' adaptive capacity and resilience. Discussions were not limited to environmental changes, rather they were open to all factors that affect fisheries.

The information collected in the interviews formed the basis for a series of workshops in the second phase that evaluated several topics that were identified as areas of uncertainty for fisheries in the future, including: ecosystem-based fisheries management and warming waters, ocean acidification, ecological changes and water chemistry in Narragansett Bay, changes in the seaweed community, squid

in a variable climate, socio-ecological community vulnerability, the expansion of black sea bass, the pros and cons of diversified versus specialized business portfolios, and models for combating the low level of new entry into Rhode Island's fishing industry. Political climate and climate change uncertainty were identified as the critical uncertainties and formed the four scenarios that would be evaluated in the next phase.

In the final interactive phase, a full day facilitated workshop was held with the focus on strategies that would achieve a thriving fishing industry in 2025-2030, under four distinct scenarios developed from the critical uncertainties identified above. Strategies that held promise in multiple scenarios were identified as the most winning strategies to attain future goals. This information was compiled in the *Rhode Island Commercial Fisheries Blueprint for Resilience* (Schumann 2018b).

This process was based on that developed by the National Parks Service (described previously;(NPS 2013)), and follows the five-step procedure of orientation, exploration, synthesis, application, and monitoring. The results of this process include a well-constructed vision for the future, an exploration of the challenges fishermen face (e.g., mounting regulatory strain, regulatory discards, time lags in data, regulatory fragmentation, business specialization, withering of the waterfront, rising business expenses, market stagnation and volatility, public apathy, shortened planning horizons, graying of the fleet, individual isolation, environmental variability and change, habitat degradation, and competing ocean uses) and an identification of future opportunities (e.g., Rhode Island's local foods commitment, collaborative marketing, new attitudes in management, emerging species, and new ecosystem models for managing fisheries). Through the workshops and planning exercised, fishermen identified core strategies and goals that can inform their own business practices or future fishery management actions.

The group developed their own "how-to" guide that could be very informative to the work currently being undertaken by the Council in the Climate and Communities Initiative (Schumann 2018a).

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