ECOSYSTEM WORKGROUP REPORT ON FISHERY ECOSYSTEM PLAN INITIATIVE 3: CLIMATE AND COMMUNITIES

1.0 Introduction

At its September 2017 meeting, the Council recommended that its third Fishery Ecosystem Plan (FEP) initiative focus on an approach to help the Council better understand and plan for the potential effects of near-term climate shift and long-term climate change on the fish and fish stocks of the Council's fishery management plans (FMPs), and to look at the combined effects of different fisheries management programs on West Coast fishing communities – a Climate and Communities Initiative. Based on the Council's September 2017 direction, the Ecosystem Workgroup (EWG) proposes the following initiative goal statement for Council consideration:

The goal of a cross-FMP Climate and Communities Initiative is to consider strategies for improving the flexibility and responsiveness of our management actions to near-term climate shift and long-term climate change, and strategies for increasing the resiliency of our managed stocks and fisheries to those changes. This approach should better support West Coast fishing communities that depend on marine fishery resources.

To achieve that goal, our first objective is to build a collective understanding of what the best available climate science forecasts for change in the California Current Ecosystem (CCE) over the near- and long-term. The second objective would be for the Council to assess:

- How West Coast fisheries management systems may interact with each other to affect fisheries operations in different coastal communities;
- How Council decisions may be affected by climate science forecasts;
- How the results of Council decisions may (or may not) have unintended consequences as our climate shifts and changes; and,
- How Council decision-making might be modified to better account for the greater variability and uncertainty associated with near-term climate shift and long-term climate change.

Together, these two initial objectives would develop a baseline understanding of the potential future effects of the changing climate on managed stocks, fishing communities, and fisheries management processes. The third objective of the initiative would be for the Council to use that information to better characterize uncertainty and manage risk in its future decision-making, and

to improve the flexibility and responsiveness of our management actions to near-term climate shift and long-term climate change.

This initiative could improve our understanding of the combined effects of state, tribal, and Federal fisheries regulations, to assess how they might be better coordinated to promote coastwide fisheries management policies that address the robustness or vulnerabilities of fish stocks and fishing communities to climate shift and change. By considering climate effects and fisheries management strategies together, the Council may discover opportunities to: incorporate flexibility and manage risk in setting harvest limits, increase operational flexibility for fisheries participants, bring more stability across fisheries, better support fishing-related community infrastructure, and benefit West Coast fisheries' access to markets.

The Council first considered a climate-related FEP Initiative in 2015, but deferred that work to await the implementation of National Marine Fisheries Service's (NMFS') then-new national Climate Science Strategy (Link et al. (eds.) 2015). By November 2016, the Northwest and Southwest Fisheries Science Centers had developed a Western Regional Action Plan (WRAP) on climate and fisheries science specific to the CCE (NOAA Fisheries 2016). Some of the WRAP's proposed work will be implemented through the Centers' California Current Integrated Ecosystem Assessment program. The Council has seen some results of that work in the annual California Current Ecosystem Status Reports, with the 2017 report particularly responding to Council requests for information on the effects of short-term climate events and biological indicators within our ecosystem.

This initiative would build on the Council's past efforts with a more systematic and cross-FMP look at the potential effects of climate variability on our suite of managed fish stocks. This initiative is also intended to assess Council management processes for whether and how those processes provide flexibility to fisheries participants and fishing communities, so that they can adapt to climate change and to changes in stock productivity and distribution. The initiative could examine: the vulnerability of different coastal communities to both the physical and economic effects of climate change, whether Council management includes flexibility in fisheries permitting that will allow fishermen to transition between fisheries or gear types, the responsiveness of NMFS and Council management processes to the effects of climate anomalies or interannual shifts on target stock availability, and the responsiveness of NMFS and Council management processes to radical changes in stock status or distribution that may result in disaster declarations based on environmental factors.

The Council has already begun to implement the first objective of this initiative, which is to build Council and public understanding of the available information on the potential effects of near-term climate shift and long-term climate change on our fish stocks and fishing communities. As discussed in Section 2.0, below, the EWG hosted a series of webinars over January-February 2018 in support of the initial education step of this FEP initiative.

2.0 Near-Term Initiative Schedule

December 2017 – EWG met to discuss major Council decision points that may benefit from enhanced scientific information on the effects of climate on fish stocks, fisheries, and fishing

communities. EWG planned to develop a draft initiative process and schedule for Council consideration at its March 2018 Council meeting.

January-February 2018 – Council-sponsored webinar series featuring speakers from NMFS fisheries science centers to address the best available science forecasts for change in the CCE over the near- and long-term. At the time of this EWG report's submission to the briefing book, the webinar series is ongoing and is intended to follow this schedule:

1. What do we expect to happen in the California Current under climate change? *January 25, 2018*.

2. The state of the art for ecological forecasting at short-, medium- and long-term time frames. *February 1, 2018*.

3. Distributional changes of West Coast species and impacts of climate change on species and species groups. *February 22, 2018*.

4. State and federally-managed fishery participation under different climate scenarios. *February 27, 2018*.

The EWG is holding a related webinar on February 26, 2018, to brief interested members of the Council, the Council's advisory bodies, and the public on progress on this initiative to date. We particularly hope that this webinar meeting will be useful to those advisory bodies that are either not meeting in March, or that have already-full schedules for the March Council meeting. During its March meeting, held concurrently with the Council's March 2018 meeting, the EWG plans to summarize the contents of the science webinars in a supplemental March report to the Council.

March 2018 – Advisory bodies and the public provide the Council with their initial ideas from and responses to: the proposed initiative goals and process, the initiative's educational webinars, and to this report's Section 3 discussion of Council decision types potentially affected by climate shift and change. The Council provides feedback on these ideas, provides guidance on further comment sought from advisory bodies and the public, and considers including further work on this initiative at its September 2018 meeting. In addition, the Nature Conservancy is sponsoring a workshop intended to aid progress on this initiative. March would be an opportunity for the Council and its advisors to request topics, questions, and outputs of interest from the workshop.

April-May 2018 – Those advisory bodies that do not meet in March, or that are fully subscribed in March (and/or April) may want to develop comments on the initiative after the March Council meeting.

May 15-16, 2018 (non-Council) – The Nature Conservancy plans to hold an invitational workshop in May 2018 to develop comment on and ideas for this initiative, with the intent of submitting comments to the Council's September 2018 meeting.

Summer 2018 – The EWG to meet to consider the Council's March 2018 direction, comments received to date from advisory bodies and the public, and to develop a proposal for the Council to

consider which of its decisions and decision-making processes may benefit from additional climate science support.

September 2018 – The Council receives comments from its advisory bodies and the public and provides guidance on the further development of a cross-FMP process to incorporate climate information into its decision-making.

3.0 Management Questions and Issues that Could Benefit from Increased Climate and Ecosystem Science Input

This section of this EWG report is intended to spur discussions on the second objective in this FEP initiative, which is to assess:

- *How West Coast fisheries management systems may interact with each other to affect fisheries operations in different coastal communities;*
- *How Council decisions may be affected by climate science forecasts;*
- *How the results of Council decisions may (or may not) have unintended consequences as our climate shifts and changes; and*
- *How Council decision-making might be modified to better account for the greater variability and uncertainty associated with near-term climate shift and long-term climate change.*

The types of changes to the marine environment that may result from shifts in our climate regime, and that have the potential to be addressed within a fisheries management process may be summarized as: 1) changes that may affect the abundance of managed species, including changes in life history characteristics such as growth, productivity, and natural mortality of managed species; 2) changes that may affect the distribution of managed species within and beyond the management area; 3) changes that may affect how managed species interact with other species (managed or unmanaged); and 4) changes that may affect physical habitat or habitat-forming organisms and between managed species and the changing habitat. Reflecting these changes to the marine environment, shifts in our climate regime may change how, when, and where fisheries participants prosecute Council-managed fisheries.

At its December 2017 meeting, the EWG discussed the range of Council decision types authorized under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), some of which may benefit from increased consideration of climate information. The Council is responsible for a variety of fisheries management decisions, some of which recur on a regular basis (like annual or biennial harvest setting), and some of which are single event regulatory decisions (like gear restrictions) – see this report's appendix for regularly scheduled decisions. What follows is a catalog of fishery management objectives and associated management tools that in part define the scope of the Council's decision-making.

From the MSA perspective, achieving optimum yield may be thought of as an overarching goal, because the optimum yield concept incorporates biological (or fish stock specific), ecological, and social objectives. Under its FMPs, the Council sets harvest specifications (overfishing limits, acceptable biological catches, annual catch limits, annual catch targets), which are stock-specific management objectives. Catch and effort control measures are then needed to achieve the annual

catch limits, which are risk-averse harvest limits set to prevent overfishing. Effort controls indirectly control catch and also may address socioeconomic objectives such as preventing economically inefficient levels of harvest capacity or reducing gear conflicts. Catch and effort controls include:

1. Catch control
    a. Quotas and harvest guidelines
    b. Trip limits, cumulative landing limits
    c. Recreational bag limits (including multi-day or cumulative limit)
    d. Gear restrictions
    e. Stock rebuilding plans
    f. Limited access privilege programs
    g. Time and area closures including depth-based closures

2. Fishing effort control
    a. Time/area closures
    b. Direct controls (e.g. limits on vessel days, or constraints on gear type)
    c. Fishing capacity
        i. Limited access (entry) permit programs
        ii. Operational capacity limits (e.g., purse seine well volume)

Management measures may also address the indirect effects of fishing on the ecosystem. Minimizing bycatch (per National Standard 9) can address stock-specific catch control if bycatch is a significant component of total catch. Bycatch controls can also address bycatch of non-target fish and non-fish covered by the MSA, the Endangered Species Act (ESA), and the Marine Mammal Protection Act (MMPA). Measures specifically intended to minimize bycatch include:

1. Retention prohibitions
2. Thresholds
3. Gear restrictions
4. Non-gear mitigation (e.g., bird scaring / tori lines)
5. Time and area closures

Social and economic objectives are most frequently addressed through the allocation of fishing opportunity. The MSA contains several social and economic factors for the Council to consider when making allocations, including efficiency in utilization, non-discrimination among residents of different states, fair and equitable treatment of fishing groups and individuals, and more. Allocations directly or indirectly establish fishery-specific objectives by setting limits, such as quotas or harvest guidelines, for a group of fishery participants (usually defined by similarities in targeting, gear used, and/or location). The catch and effort control measures outlined above may be used to hold the designated group to its allocation. Allocation, broadly defined, can be quite complex and involve mechanisms beyond specific or hard allocations in order to account for catch against the stock-wide catch limit. Allocations also may be achieved indirectly by using catch/effort control mechanisms to effectively limit fishing opportunity for a particular group of fishery participants without specifying an allocation objective.

Under the MSA, FMPs are to describe and identify essential fish habitat (EFH) for managed species. Councils may identify measures to reduce the adverse effects of fishing gear on habitat. Councils may (or, for anadromous species, shall) make recommendations concerning federally-permitted activities that affect habitat, including EFH. These authorities extend the Councils' role beyond the strict bounds of fishery management to encompass ecosystem-related functions.

Restrictions on gear use have a long history in fisheries management. Managers may prohibit certain gear types outright. Alternatively, they might place limitations or specifications on gear design, or the time, place, and manner in which certain gears can be used. Gear restrictions are aimed at many possible policy goals, including: targeting harvest of optimally-sized individuals, spreading out fishing opportunity, avoiding harm to habitat, limiting bycatch and improving survival chances of released fish and animals, promoting aspects of the recreational angling experience, and more.

The Pacific Council is supported by large data gathering and analysis efforts. Various models and quantitative and qualitative procedures are used to estimate current conditions and predict future conditions and outcomes across a range of potential courses of action. Yet fisheries management is management under uncertainty. The degree to which recommended conservation and management measures will achieve their intended social, economic, and ecological goals is unknown.

Using adaptive management, managers can adjust course in response to changing conditions and new information. Such adjustments depend on having resources for monitoring and feedback. The Council is supported by relatively good monitoring resources, although monitoring needs far exceed available resources, especially for meeting economic, social, and ecological goals. Current monitoring programs are focused on fishery-dependent and fishery-independent data collection systems that support basic catch accounting and stock assessment activities. Stock assessments are fundamental to fisheries management, but resource intensive. Despite being relatively well-funded, there are many important stocks that would benefit from additional stock assessment and monitoring activities.

As fishery management moves towards ecosystem-based fishery management and takes on issues of climate impacts, the demands on monitoring and research only grow. A broader suite of methods and models may be deployed up to and including end-to-end ecosystem models such as the Atlantis model of the CCE. The Council is a consumer of scientific research, rather than a producer. However, through its Scientific and Statistical Committee, the Council identifies research needs related to its activities, oversees peer-review processes for scientific products used as a basis for scientific decision-making, and makes recommendations on specific research activities, such as for exempted fishing permits.

4.0 References

Link, J.S., R. Griffis, S. Busch (Editors). 2015. NOAA Fisheries Climate Science Strategy. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-F/SPO-155, 70p.

NOAA NW/SW Fisheries Science Centers. 2016. Western Regional Action Plan (WRAP), NOAA Fisheries Climate Science Strategy. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-565. 75 p.

Appendix – Council Decision Points and Schedule

Each of the Council's fishery management plans (FMPs) describes the Council's decision-making processes for its fisheries. Issues the Council must consider and decisions the Council must make dictate much of the Council's schedule for its five yearly meetings. Some decisions, like adopting ocean salmon management measures, must occur on an annual basis. Other required decisions are on longer and sometimes more flexible time-frames, but still must be considered and made, like essential fish habitat (EFH) reviews. Finally, the Council must meet ongoing requirements necessary to comply with the MSA (i.e., its National Standards) like minimizing bycatch, that may not have set places in the Council's schedule, but which require continuing effort from the Council and public for West Coast fisheries management. Table 1 details known annual and biennial Council decision points for each Council meeting, as provided in the FMPs, the FEP, and the Pacific Halibut Catch Sharing Plan (CSP). Table 2 lists required Council decisions scheduled for longer rotation periods, such as every 3-10 years.

Table 1: Annual and Biennial Required Council Decision Points and Schedule

Council Meeting	Decision Point	Authority
March		
Ecosystem	Receive annual California Current Ecosystem Status Report; Review progress to date on ecosystem initiatives and, in odd-numbered years, decide whether to begin any new initiatives.	FEP
Pacific Halibut	Receive report on annual meeting of the International Pacific Halibut Commission; Consider draft salmon troll and fixed gear sablefish incidental halibut catch management measures.	CSP
HMS	In odd-numbered years, Council adopts biennial management measures and submits to NMFS (here and following, per Amendment 4). Consider management recommendations to US delegations to Regional Fisheries Management Organizations.	HMS FMP
Salmon	Review prior year's fisheries and current year's stock abundance forecasts; Identify current year's management objectives and preliminarily define management alternatives.	Salmon FMP 50 CFR 660.408
CPS, Groundfish: N/A		

April		
CPS	Adopt final Pacific sardine harvest specifications and management measures for July 1 – June 30 fishing year, beginning current year.	CPS FMP 50 CFR 660.508
Groundfish	In even-numbered years, identify range of new management measures to be analyzed for inclusion in next biennial specifications and management measures for January 1 – December 31 fishing year, beginning subsequent year. Review U.S.-Canada coastwide total allowable whiting catch, set whiting yield set-asides for current year research activities and incidental catch.	Groundfish FMP 50 CFR 660.60
Halibut	Adopt final salmon troll and fixed gear sablefish incidental halibut catch management measures.	CSP
Salmon	Adopt final Ocean Salmon Management Measures for current year ocean salmon fisheries and submits to NMFS.	Salmon FMP 50 CFR 660.408
HMS: N/A		
June		
CPS	In odd-numbered years, adopt biennial Pacific mackerel harvest specifications and management measures for July 1 – June 30 fishing year, beginning current year.	CPS FMP 50 CFR 660.508
Groundfish	In even-numbered years, adopt biennial groundfish specifications and management measures, including exempted fishing permits (EFPs), for January 1 – December 31 fishing year, beginning subsequent year.	Groundfish FMP 50 CFR 660.60
HMS	Consider EFP proposals and advisory body recommendations on those proposals for preliminary action. Consider management recommendations to US delegations to Regional Fisheries Management Organizations	HMS FMP 50 CFR 660.709
Salmon: N/A		
September		
Groundfish	In odd-numbered years, receive new stock assessments and Council approve stock assessment recommendations for upcoming biennium.	Groundfish FMP 50 CFR 660.60
Halibut	Receive preliminary catch data for current calendar year and draft a range of CSP revisions and management measure regulations for upcoming calendar year.	CSP
HMS	In even-numbered years: Council updated on status of HMS fisheries and, as appropriate, receives proposed adjustments to the numerical estimates of maximum sustainable yield (MSY), optimum yield (OY), and status determination criteria (SDC) in preliminary Stock Assessment and Fishery Evaluation report. If needed, Council directs HMS Management Team to prepare draft regulatory analysis to implement revised estimates of reference point values, annual catch limits (ACLs) or other harvest objectives and/or management measures. Final action on EFPs.	HMS FMP 50 CFR 660.709
Salmon	Preliminary annual methodology review for analyzing impacts of fisheries on salmon stocks.	Salmon FMP
CPS: N/A		

November		
CPS	Methodology review	CPS FMP
Groundfish	In odd-numbered years, outstanding stock assessments and rebuilding analyses – SSC reviews and makes recommendations. In odd-numbered years, EFPs proposals reviewed for upcoming biennium.	Groundfish FMP
Halibut	Adopt final CSP revisions and management measure regulations for upcoming calendar year.	CSP
HMS	Receive annual SAFE document and, if necessary, Council directs HMS Management Team to prepare a draft regulatory analysis to implement revised estimates of reference point values, ACLs or other harvest objectives, and/or management measures. Council adopts for public review proposed actions addressing concerns from current and previous SAFE reports. Consider management recommendations to US delegations to Regional Fisheries Management Organizations	HMS FMP 50 CFR 660.709
Salmon	Completed annual methodology review for analyzing impacts of fisheries on salmon stocks.	Salmon FMP

Table 2: Longer Time Frame Required Council Decision Points and Schedule		
Council Decision Point	**Time Frame**	**Requiring Authority**
Research and Data Needs Document, Review and Update	Every 5 years, next due 2018	MSA, §302(h)(7)
CPS EFH, Review and Update	Every 5 years, overdue since 2015	50 CFR 600.815(a)(10)
Groundfish EFH, Review and Update	Every 5 years, currently ongoing	50 CFR 600.815(a)(10)
HMS EFH, Review and Update	Every 5 years, overdue since 2009	50 CFR 600.815(a)(10)
Salmon EFH, Review and Update	Every 5 years, next due 2019	50 CFR 600.815(a)(10)
5-year review of groundfish trawl rationalization program	Every 5-7 years, next due 2024	MSA, §303A(c)(1)(G)
5-year review of groundfish fixed gear tier program	Every 5-7 years, next due 2021	MSA, §303A(c)(1)(G)
FEP Review	Every 5 years, begin 2018	FEP

PFMC
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