State of Washington
Department of Fish and Wildlife

Mailing Address: 600 Capitol Way N, Olympia WA 98501-1091, (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia WA

April 6, 2010

Dear Interested Parties:

The Washington Department of Fish and Wildlife (WDFW) has published a revised Draft Environmental Impact Statement (DEIS) titled: **Puget Sound Rockfish Conservation Plan (PSRCP)**. The Draft Plan was revised following an initial period of public comments. The revised Plan expands the geographical coverage of the plan to include the waters between Cape Flattery and the Sekiu River in the Strait of Juan de Fuca. This change was made in response to initial public comments. WDFW has prepared this revised Draft Environmental Impact Statement (DEIS) in compliance with the State Environmental Policy Act (SEPA) and other relevant state laws and regulations. The draft plan together with the revised DEIS is now available for a 45 day public review.

A Public Meeting for discussion of this Plan and DEIS is being held at the following location:

Place: Community Meeting Room, Port Angeles Public Library
2210 South Peabody Street, Port Angeles
Date: April 21, 2010
Time: 6:00 pm to 8:00 pm

Contact: Greg Bargmann
Phone: (360) 902-2825 E-mail: Gregory.Bargmann@dfw.wa.gov

Agencies, affected tribes, and members of the public are invited to review and comment on this DEIS. We must receive your comments within 45 days of the date of issuing this DEIS. ***This means we must receive your comments no later than 5 pm on May 21, 2010.***
See Fact Sheet for details on availability and commenting.

MAJOR CONCLUSIONS
This is a phased non-project review proposal. The goal of the PSRCP is to restore and protect our natural heritage of Puget Sound rockfish populations. To attain this goal, the Washington Department of Fish and Wildlife has

developed a range of policies, strategies, and actions that will help restore and maintain rockfish abundance, distribution, diversity, and long-term productivity in their natural habitats. The plan also offers a framework for state rockfish managers to follow in developing detailed regulations, establishing priorities, and providing guidelines for the development of additional plans with co-managers.

AREAS OF CONTROVERSY AND UNCERTAINTY

The PSRCP proposes eight categories of actions. The most controversial categories are:

1. Fishery management- the PSRCP proposes a strategy which could reduce fishing opportunities for rockfish and other species.
2. Habitat restoration enhancement- the PSRCP proposes a strategy to consider restoration of degraded rockfish habitat. This strategy could have adverse impacts on other animals.
3. Hatchery production of rockfish- the PSRCP proposes development of hatchery production that could be used to restore rockfish population. The plan does not propose a hatchery program that would be used to sustain fisheries for rockfish at levels higher than can be supported naturally.

WDFW believes this DEIS will assist decision makers to identify the key environmental issues, and options associated with this action. Based on comments received from agencies and interested parties during public review of this draft document and the comments received from the 2009 DEIS process, WDFW will prepare and distribute a Final Environmental Impact Statement (FEIS). The FEIS will be released in 2010.

If you provided comments on the initial draft Plan and DEIS, those comments are still in effect and do not need to be repeated. However, we welcome any additional comments you wish to make.

Sincerely,

Teresa A. Eturaspe

Teresa A. Eturaspe
SEPA/NEPA Coordinator
Agency Responsible Official
Regulatory Services Division
Habitat Program

REVISED
DRAFT

Environmental Impact Statement
for the
Puget Sound Rockfish Conservation Plan

Including Preferred Range of Actions





LEAD AGENCY

Washington Department of Fish and Wildlife
Fish Program
Olympia, WA

Revised Draft Issued: April 6, 2010

COVER PHOTOS: Clockwise from upper right: blue rockfish, China rockfish, quillback rockfish, canary rockfish, and tiger rockfish. Photos taken by Janna Nichols and used with permission.

FACT SHEET

Title: Puget Sound Rockfish Conservation Plan (PSRCP) and Revised Draft Environmental Impact Statement (DEIS).

Description: This is a phased non-project review proposal. Phased review allows agencies and the public to focus on issues that are ready for decision and excludes from consideration issues already decided or not yet ready. To ensure healthy stocks of rockfish populations in Puget Sound, the Washington Department of Fish and Wildlife (WDFW) proposes a PSRCP that includes policies, strategies, and actions that will help restore and maintain rockfish abundance, distribution, diversity, and long-term productivity in their natural habitats. The plan also offers a framework for state rockfish managers to follow in developing detailed regulations, establishing priorities, and providing guidelines for the development of additional plans with tribal co-managers.

The original draft EIS was issued in October 2009 for public review. Public comments received during the review process included requests to extend the geographical scope of the area covered by the Plan. As a result, this revised draft EIS was issued. The revised draft EIS extends the area covered by the Plan to the far western end of the Strait of Juan de Fuca at Cape Flattery and incorporates some of the public comments made during the first review period. If you commented on the original draft plan and EIS, your comments are still on file and will be considered in the final EIS. There is no need for you to resubmit your comments. However, if you have comments on the revised draft, you are invited to submit them at this time.

Location: Puget Sound, including Hood Canal, the San Juan Islands, and the Strait of Juan de Fuca (Thurston, Pierce, King, Snohomish, Skagit, Whatcom, Island, San Juan, Mason, Jefferson, and Clallam Counties).

Proponent and Lead Agency:

Washington Department of Fish and Wildlife (WDFW)
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Olympia, WA 98501-1091

EIS Project Manager:

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Permits and Licenses Required: None required.

Authors and Principle Contributors:

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Date Issued: The revised draft EIS is available for review and download beginning April 6, 2010, on WDFW's website at:

http://wdfw.wa.gov/hab/sepa/sepa.htm

If you prefer a printed copy or you would like a CD copy of the DEIS (supplies limited), please contact the Fish Program at (360) 902-2844.

DEIS Comment Period: Agencies, affected tribes, and members of the public are invited to review and comment on this DEIS. We must receive your comments within 45 days of the date of issuing this DEIS.

***This means we must receive your comments no later than 5:00 PM on May 21, 2010*.**

Method of Comment

The following procedures shall govern the method to comment on agency SEPA proposals. Comments received through these procedures are part of the official SEPA record for this proposal.

You can submit your comments any one of the following ways:

- Email to SEPAdesk2@dfw.wa.gov;
- Online at the WDFW SEPA website comment link at: http://www.wdfw.wa.gov/hab/sepa/sepa.htm;
- Fax to (360) 902-2946;
- Oral or written comments at the April 21, 2010 workshop; or
- Mail to the address below.

When you send us your comments, please include the name of the proposal and your name in the subject line of your comment, following this example:

"Puget Sound Rockfish Conservation Plan DEIS - J. Doe"

Mail comments to:
Responsible Official: Teresa A. Eturaspe, SEPA/NEPA Coordinator, 600 Capitol Way North, Olympia, WA 98501-1091

Meetings for Public Participation:

Contact: Greg Bargmann
Phone: (360) 902-2825 E-mail: Gregory.Bargmann@dfw.wa.gov

A public meeting for discussion of this Plan and DEIS is being held at the following location and date:

Place: Community Meeting Room, Port Angeles Public Library, 2210 South Peabody Street: Port Angeles, Washington
Date: April 21, 2010
Time: 6:00 p.m. to 8:00 p.m.

Date Final Action is Planned: The Final Environmental Impact Statement (FEIS) on the PSRCP will be released in 2010.

Date of Next Action and Subsequent Environmental Reviews:

The Final Environmental Impact Statement (FEIS) is a phased non-project action. The PSRCP will be provided to the Director of the Washington Department of Fish and Wildlife (WDFW) for action in 2010. Future phased agency actions are anticipated as detailed regulations and actions are developed.

Background Data and Materials Referenced in the DEIS are Available at:

Washington Department of Fish and Wildlife, Fish Program, Natural Resources Building, 6th Floor, 600 Capital Way North, Olympia, WA 98501-1091.

Distribution List:

Notice of the availability of this DEIS is posted on the WDFW SEPA website: http://wdfw.wa.gov/hab/sepa/sepa.htm. Copies have been sent to all local government planning departments (city and county); affected Tribes; all state and federal agencies with jurisdiction; selected environmental organizations, and interested parties.

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Chapter 1. Executive Summary

1.1 State Environmental Policy Act Process Overview

1.1.1 Introduction

The Washington Department of Fish and Wildlife (WDFW) recognizes the importance of the State Environmental Policy Act (SEPA) in the process of adopting the Puget Sound Rockfish Conservation Plan (PSRCP- Appendix 1). Puget Sound is considered as those inland marine waters of Washington east of Cape Flattery. The environmental impact statement (EIS) process provides opportunities for other agencies, stakeholders, tribal governments, and the public to participate in developing and analyzing information. This process, as detailed in WAC197-11, helps ensure that WDFW understands the environmental consequences of its decisions and considers mitigation of probable significant adverse environmental impacts when making decisions. The EIS process includes:

- Scoping;
- Preparing a draft EIS (DEIS), which analyzes the probable impacts of a proposal and reasonable alternatives;
- Issuing a DEIS for review and public comment;
- Preparing a final EIS (FEIS), which includes analyzing and responding to comments received on the DEIS;
- Issuing a FEIS; and
- Using the FEIS in decision-making.

State Environmental Policy Act processes have been used to ensure public input into policy development. Key steps in the policy development process have been:

1. A Scoping notice was sent to approximately 110 individuals and interested groups in August 2008;
2. A draft EIS and Plan were issued in October 2009, for a period of public review including a series of public workshops. As a result of public comments made during that review, the geographical scope of the Plan was increased and this revised DEIS developed; and
3. The revised DEIS is now being issued to provide opportunities for additional public comment.

1.1.2 Alternatives

Considering the current and anticipated factors affecting the rockfish resource, the PSRCP will consist of a set of strategies to address WDFW's mandate to conserve rockfish populations while secondarily providing opportunities to view rockfish in their natural setting and providing sustainable fishing opportunities where appropriate. This DEIS will focus on analyzing a range of reasonable alternatives to assess their risk of possible significant impact to elements of the environment and to identify mitigation measures that would avoid or minimize related adverse environmental impacts.

Alternative strategies are one of the required components of an EIS. They present meaningful options for the Department to consider in managing rockfish in Puget Sound. Policy proposals to be considered by WDFW are presented in the set of reasonable alternatives categorized in Table 3 and described in Chapter 3 of this DEIS. These alternatives present policy choices consistent with the purpose and need of the PSRCP as described in section 1.2 and relate each choice to the environmental impacts identified in this DEIS in Chapter 3. This process used the environmental checklist called for in WAC 197-11-444, and provided in WAC 197-11-960, as the basis for determining any potential environmental impacts resulting from the approval and implementation of the PSRCP non-project action.

The alternatives incorporate information gathered and issues raised through the SEPA scoping process. The specific alternatives discussed in Chapter 3 for the eight policy subject areas can be grouped across a spectrum from most conservative for rockfish to least conservative into four generalized alternatives (Table 3):

1) The **most-conservative** alternative seeks to provide maximum efforts to accelerate the rate of rebuilding populations to healthy levels of abundance. This could require significant reductions in fishing opportunities for other species including salmon, lingcod, and halibut. Research efforts would be increased, as would outreach and education efforts. Habitat protection and restoration efforts would increase. Significant efforts to develop rockfish culture and development of the use of artificial habits would be considered.

2) The **conservative** alternative seeks to provide increased rates of rockfish rebuilding and maintenance of healthy populations while providing limited fisheries for rockfish. Research, habitat protection, habitat restoration, and public education would be increased beyond present levels of effort. This alternative would require limited effort to develop the use of rockfish culture or artificial habitat in rockfish management.

3) The **status quo (**no action) alternative seeks to maintain our current approach and emphasis of achieving balance in conservation and utilization needs.

4) The **least-conservative** alternative addresses the feasibility of increasing harvest opportunity while preserving rockfish stocks. Emphasis would be placed on maintaining or increasing fishing opportunities for rockfish and other species. This alternative is predicted to increase the time and decrease the probability of meeting conservation and recovery objectives, when compared to the other alternatives.

A summary of each alternative, across all of the policy categories, is provided in Chapter 3.

1.1.3 Non-Project Proposal

The PSRCP is considered to be a "non-project action" under SEPA (WAC 197-11-442). Non-project actions include the adoption of plans, policies, programs, or regulations containing standards that will guide future actions. The probable significant adverse environmental impacts analyzed in a non-project EIS are those impacts foreseeable at this stage, before specific project actions are planned. If more specific actions are needed in the future, management decisions will be guided by the policies developed during this process.

1.1.4 Scoping

Scoping initiates public involvement in the SEPA process. Its three purposes are to:

- Narrow the focus of the EIS to significant environmental issues;
- Eliminate insignificant impact issues or those not directly related to the proposal; and
- Help identify reasonable alternatives, consistent with the purpose and need of the proposed action, to be analyzed in the EIS.

The scoping process alerts the public, the project proponent, and the lead agency to areas of concern and potential controversy early in the process. Here, WDFW is both the project proponent and the lead agency. The SEPA process for the PSRCP was formally initiated in 2008 with the publication of the Scoping Notice. In addition to the formal scoping process, Department staff met with tribal co-managers in May 2008 and October 2009 to discuss rockfish conservation strategies.

1.1.5 Next Steps

After issuing this revised DEIS, WDFW will hold a public meeting in Port Angeles, Washington. This meeting will allow the public to ask questions and give comments on the DEIS and the revised draft Plan. The public meeting is scheduled for April 21, 2010. It is anticipated that interested individuals and stakeholders will attend this public meeting and provide comments to WDFW on the DEIS. Those comments and the comments received in the original Draft EIS process will be reviewed and responded to in the FEIS, which is expected to be completed in 2010. The FEIS will include the necessary information to allow the director of WDFW to decide which policies will be adopted in the PSRCP. Upon approval of the PSRCP and FEIS, WDFW will have updated working policies to guide management of rockfish throughout Puget Sound.

1.2 Purpose and Need for the Non-Project Action

1.2.1 Purpose

Consistent with the Scoping Document, the purpose of the PSRCP is to restore and protect our natural heritage of Puget Sound rockfish populations. Increases in the abundance, distribution, diversity, and productivity of rockfish will help restore the Puget Sound ecosystem, provide opportunities to view rockfish in the marine environment, and, when appropriate, provide sustainable fishing opportunities.

The rockfish conservation plan is needed in order to protect and restore the diversity and long-term productivity of rockfish throughout Puget Sound. WDFW will accomplish this goal with the guidance from relevant state and federal legislation, treaties, the Department's mission statement, its strategic goals and objectives, and Washington Fish and Wildlife Commission policies, including the existing Puget Sound Groundfish Management Plan (Palsson et al. 1998). WDFW will work with tribal governments to ensure fish and wildlife management objectives are met, including sustaining ceremonial, subsistence, commercial, and recreational fisheries, and providing non-consumptive fish benefits and other cultural and ecological values.

Expectations are increasing for fish managers to balance varied public needs to maintain and restore natural stocks, provide sustainable fishing opportunities, fulfill treaty responsibilities with tribal governments, and support additional important environmental values such as a healthy marine ecosystem. WDFW will develop the PSRCP to guide the evaluation and development of WDFW's harvest, research, habitat, and outreach and education programs to aid in the conservation and restoration of natural rockfish stocks and provide harvest opportunity consistent with conservation objectives. WDFW must also identify information gaps and develop research and monitoring programs to improve rockfish management decisions.

The draft PSRCP specifies preferred range of actions to achieve the goal of the plan. There are eight policy categories to the plan, each with its preferred objective. The WDFW is now inviting comments from the public and others on each of the preferred objectives. The complete name of the plan is the "Draft Puget Sound Rockfish Conservation Plan with Preferred Range of Actions." However, for clarity, this document refers to the plan as the "Draft Puget Sound Rockfish Conservation Plan."

1.2.2 Plan Objectives

The objectives for the PSRCP *(*Appendix 1) are as follows:

1. Provide a framework of policies, strategies and actions for preserving healthy stocks of rockfish in Puget Sound by restoring and maintaining their abundance, distribution, diversity, and long-term productivity in their natural habitats;
2. Seek to maintain rockfish populations throughout Puget Sound to achieve cultural, economic, and ecosystem benefits for current and future residents of Washington State in a manner consistent with the primary conservation goal;

3. Meet all federal and state laws, including treaty obligations;
4. Ensure policies are succinct, relevant, and easily understood by the public and Department employees;
5. Seek productive partnerships that help the WDFW achieve policy objectives;
6. Use the best available science, sound fisheries management, and professional judgment to achieve excellence in stewardship of public resources; and
7. Monitor and periodically report to the Washington Fish and Wildlife Commission and the public on the implementation and outcomes of Commission-approved policies.

1.3 Issues Identified Through Scoping

WDFW received twelve responses to the Scoping Notice: three from organizations and nine from individuals. These comments contained a wide range of suggestions and are summarized in Table 1.

Table 1. Summary of Comments Made in Scoping Process.

COMMENT	NUMBER OF TIMES MADE	DEPARTMENT RESPONSE
Create underwater parks/marine protected areas as part of rockfish management	3	Considered in Plan
Consider climate change in recovery plan	5	Considered in Plan
Adopt a precautionary approach	1	Considered in Plan
Utilize adaptive management	1	Considered in Plan
Expand monitoring of rockfish to juvenile life stages	1	Considered in Plan
Review effectiveness of existing policies	1	Considered in Plan
Include outreach and education as part of management plan	1	Considered in Plan
Identify important rockfish habitat	1	Considered in Plan
Study rockfish discards (i.e., effect of 1 fish bag limit)	1	Considered in Plan
Consider bycatch in other fisheries	1	Considered in Plan
Restrict fishing gear (e.g., downriggers, lures and depth)	1	Considered in Plan
Restrict fishing for other species (e.g., lingcod and halibut)	1	Considered in Plan
Rely on natural production for stock rebuilding (i.e., no rockfish hatcheries)	1	Considered in Plan
Propagate plankton to increase food supply	1	Outside the range of the scoping notice and will not be considered
Restore eelgrass as rockfish habitat	1	Considered in Plan
Take no action (rockfish are doing fine)	1	A status quo alternative is considered
Do something!	1	Several alternatives are considered which include many action items

1.4 Summary of Initial Environmental Impact

The PSRCRP is a **non-project action** intended to provide guidelines for improving the management, status, and utilization of rockfish in Puget Sound, Washington. It develops policies that are intended to address WDFW's dual mandates to conserve the wild rockfish resource and to provide utilization opportunity to the citizens of the state (RCW 77.040.12). Considering the current and anticipated factors affecting the rockfish resource, a key element of the plan is to emphasize conservation and rebuilding of rockfish populations.

The establishment of new guidelines to manage rockfish populations and harvest opportunity is not expected to have direct adverse environmental impacts in itself. However, if the PSRCP is approved as proposed, it is likely that specific project actions will be recommended to achieve some of the strategies. This initial review was conducted to set the framework for the more detailed evaluation of potential environmental impacts associated with any subsequent actions. Environmental review of subsequent actions will refer to this document.

The review of the initial impact was conducted using the format provided by State Environmental Policy Act (WAC 197-11-960) which provides an environmental checklist of elements to be considered in an EIS. We reviewed the initial likely environmental impact on each of the elements (Table 2).

Table 2. Environmental Impact Potential Review Summarized By Element:

The elements in UPPER CASES (#5 and #12) are addressed in this DEIS because the intent of the PSRCP is to focus on strategies affecting rockfish populations, habitat, and harvest. Items in **bold,** but not in upper case, indicate other possible elements which may be affected by this plan but are judged to be non-significant. Items in bold may be impacted by future actions and may be included in future environmental reviews.

1. Earth
    a. No clearing, grading or filling. **Potential impacts to the seafloor of Puget Sound if habitat restoration or habitat construction activities are implemented.**
    b. No additional impervious surface due to construction activity.
    c. **Potential reduction of access and fishing related impacts in some areas.**

2. Air
    a. **Quantities of emissions from fishing related boating activity will likely decrease to a small degree.**

3. Water
    a. No dredge or fill operations in surface waters.
    b. In-channel monitoring and evaluation activities are conducted during normal stream flow and under established protocols.
    c. No groundwater withdrawal or discharges into ground.
    d. No activities to affect surface runoff flow or quality.

4. Plants
    a. No removal or alteration of existing vegetation.
    b. No additions to existing vegetation.

Table 3. Environmental Impact Potential Review Summarized By Element (continued):

5. ANIMALS

a. Some rockfish species are proposed to be listed under ESA as being Threatened or Endangered.
b. For all species, the plan will be in compliance with the ESA process to allow fisheries and incidental take. The process includes utilization of 4 (d) rules.
c. The primary purpose of the plan is the preservation and improvement of rockfish populations and their ecosystems.

6. Energy and Natural Resources
   a. No change in energy use requirements as a result of this plan.
   b. Will not affect alternative energy projects or potential use.

7. Environmental Health
   a. **Change in the amount and geographical distribution of fishing effort.**
   b. No new special emergency services required.
   c. **Reduced fishing or boating activity in some areas would decrease the overall noise level.**

8. Land Use and Shoreline Use
   a. No structures demolished.
   b. No introduction or displacement of people.

9. Housing
   a. No housing introductions or eliminations.

10. Aesthetics
    a. No aesthetics impact (degraded or blockage of views).

11. Light and Glare
    a. No light or glare impacts.

12. RECREATION

a. Fishing restrictions could reduce or modify recreational and commercial fishing opportunities.
b. **Recreational fishing would be allowed when/where appropriate as outlined in the plan.**

13. Historic and Cultural Preservation
    a. No environmental impacts.

14. Transportation
    a. Proposal will not affect existing state of Washington transportation infrastructure.
    b. Vehicular trip reduction possible to a minor degree.

15. Public Services
    a. No environmental impacts.

16. Utilities
    a. No environmental impacts.

1.5 Summary Table of Alternatives by Policy Area

The four alternatives discussed in section 1.1.2 were used to address each of the eight policy areas covered in the Plan:

1. Natural Production
2. Habitat Protection and Restoration
3. Fishery Management
4. Ecosystem Effects
5. Evaluation, Monitoring and Adaptive Management
6. Research
7. Outreach, Education and Ecotourism
8. Enhancement

The DEIS contains an analysis of all four alternatives for each of the eight policy areas resulting in a total of 32 alternate strategies. The DEIS indicates which of the four alternatives is the preferred alternative for each policy area. The selection of the preferred alternative was based on meeting plan objectives while considering adverse environmental impacts. While all of the policy areas further the goal of the PSRCP, none is sufficient by itself to address all of the objectives.

The 32 alternatives are shown in Table 3, and an analysis of each alterative is presented in Chapter 3. The approved option will be used to provide a framework to achieve the goal of the PSRCP.

Table 4. Range of Policy Options Proposed For Puget Sound Rockfish Conservation Plan. The preferred option is indicated in bold.

	RANGE OF ACTION			
POLICY CATEGORY	**ALTERNATIVE 1 MOST CONSERVA-TIVE**	**ALTERNATIVE 2 CONSERVATIVE**	**ALTERNATIVE 3 NO-ACTION/ STATUS QUO**	**ALTERNATIVE 4 LEAST CONSERVATIVE**
Natural Production	Rockfish management shall place the highest priority on the protection and restoration of the natural production of all rockfishes to healthy levels.	**Rockfish management shall place the highest priority on the protection and restoration of the natural production of indicator rockfishes to healthy levels.**	Limited priority is placed on protecting the natural production of some rockfish stocks.	All rockfishes will be managed passively, with little or no consideration to the natural production of any stocks of rockfish.
Habitat Protection and Restoration	**Protect and restore all marine habitat types for all rockfish species.**	Protect and restore rocky habitats for indicator rockfish species.	Rely primarily on the HPA process to protect priority rockfish habitats and conduct opportunistic activities to protect rockfish habitats. No activities to restore habitat will be conducted.	Rely entirely on the HPA process to protect rockfish habitats. No new or expanded activities will be conducted to protect rockfish habitat. No activities to restore habitat will be conducted.
Fishery Management	**All fisheries in Puget Sound waters will be managed to ensure the health and productivity of all rockfish stocks.**	All fisheries in Puget Sound marine waters will be managed to ensure the health and productivity of indicator rockfish stocks.	Some fisheries for bottomfish in Puget Sound waters will be managed to ensure the health and productivity of some rockfish stocks.	All fisheries in Puget Sound waters will be passively managed with respect to the status of rockfish stocks**.**
Ecosystem	Protect existing functions of all rockfishes and conduct activities to restore the functions of all rockfishes in the ecosystem and food web in Puget Sound.	**Protect existing functions of indicator rockfishes and conduct activities to restore the functions of indicator rockfishes in the complex ecosystem and food web in Puget Sound.**	Conduct opportunistic activities to protect and restore the function of some rockfishes in the complex ecosystem and food web in Puget Sound.	The ecosystem functions of rockfishes will not be considered in rockfish management.

POLICY CATEGORY	ALTERNATIVE 1 MOST CONSERVA-TIVE	ALTERNATIVE 2 CONSERVATIVE	ALTERNATIVE 3 NO-ACTION/ STATUS QUO	ALTERNATIVE 4 LEAST CONSERVATIVE
Monitoring, Evaluation, and Adaptive Management	Conduct monitoring, evaluation, and management of all rockfish stocks to provide the basis to evaluate stock status and the success of management actions**.**	**Conduct monitoring, evaluation, and management of indicator stocks to provide the basis to evaluate stock status and success of management activities.**	Some rockfish stocks will be monitored, primarily by using fishery dependent with some fishery-independent information.	Some rockfish stocks will be monitored using only fishery dependent information**.**
Research	Implement new and cooperative research to understand the diversity, biology and productivity of all rockfishes as well as needs for recovery.	**Implement new and cooperative research to understand the diversity, biology and productivity of indicator rockfishes as well as needs for recovery.**	Conduct rockfish research to examine growth, population structure and habitat requirements for some rockfish stocks.	Conduct no research on rockfish; only use information in the existing literature or studies in nearby areas to manage rockfish stocks.
Outreach, Education and Ecotourism	**Conduct a strategic outreach and education program to inform Washington citizens of the value of rockfish stocks and to promote ecotourism.**	Conduct a strategic outreach and education program to inform Washington's fishing public of the value of rockfish stocks in Puget Sound**.**	Write occasional popular articles, work with the media, use the rule-making process, and give public presentations on the importance of rockfish stocks.	Rely on others to inform the citizens of Washington of the value of rockfish stocks in Puget Sound.

POLICY CATEGORY	ALTERNATIVE 1 MOST CONSERVA-TIVE	ALTERNATIVE 2 CONSERVATIVE	ALTERNATIVE 3 NO-ACTION/ STATUS QUO	ALTERNATIVE 4 LEAST CONSERVATIVE
Enhancement (Artificial Reef and Hatchery Production)	**Promote the achievement of the natural production policy objective through the appropriate use of: a. Hatchery production to rebuild depleted rockfish stocks; and b. Artificial habitats consistent with the hierarchy of habitat protection and mitigation approaches.**	Develop plans to: 1. Utilize hatchery production to assist in recovery of depleted rockfish stocks consistent with natural production goals; and 2. Enhance habitat for indicator species of rockfish through the use of artificial habitat.	Hatchery production for rockfish may be used to recover depleted stocks and for research. Construction of artificial reef habitat will be considered on a case-by-case basis.	Hatchery production of rockfish will be limited to research-scale activities. Construction of artificial reef habitat will be considered on a case-by-case basis and limited to mitigation purposes**.**

1.6 Key Relationships Within the Plan

The PSRCP proposes a series of policies, strategies, and actions in eight categories. All of the categories are related and needed to achieve the goal of the PSRCP. For example, protecting and restoring rockfish populations will require protecting and restoring rockfish habitat and ensuring that fisheries management provides sustainable populations. Neither habitat protection or fisheries management alone will be sufficient to protect and restore rockfish in Puget Sound.

1.7 Significant Issues and Environmental Choices Among the Alternatives

1.7.1 Major Conclusions

During the preparation of this DEIS for this plan, an environmental checklist (Appendix 5) was used as an aid to determine the potential significant adverse impacts identified at the beginning of Chapter 3. Consistent with WDFW's dual mandates to conserve wild rockfish populations and provide utilization opportunities, the Department will address the potential impacts to animals and recreation through this DEIS (see Chapter 3 for the analysis.

It should be noted that the impacts evaluated in this DEIS relate to opportunity (fishing, observation, photography, etc.) and not impacts such as noise, transportation, energy use, etc., which are related to boat or other vehicle activity. Those impacts will be evaluated separately, for example, when evaluating existing road, infrastructure, marinas, and boat ramp construction projects.

1.7.2 Unavoidable Measures

The intent of the PSRCP is to protect and, when necessary, restore rockfish stocks to healthy levels. This intent may result in changes in the amount and geographical distribution of fishing effort.

1.8 Phased Review

SEPA review is required on proposals for project and non-project actions such as the PSRCP. "Phased review" means the coverage of general matters in broader environmental documents, with subsequent narrower documents concentrating solely on the issues specific to the later analysis. WDFW will propose future project and non-project actions related to implementing the plan, such as planning site specific construction proposals. These more detailed actions may or may not require additional SEPA review.

1.9 Alternatives Considered, But Not Analyzed

Under SEPA, a reasonable alternative is defined as "an action that could feasibly attain or approximate a proposal's objectives, but at a lower environmental cost or decreased level of environmental degradation. Reasonable alternatives may be those over which an agency with jurisdiction has authority to control impacts, either directly or indirectly" (WAC 197-11-786). For some policy subject areas, alternatives were considered, but not included in the detailed analysis, because they did not fully address the stated purpose and need of the PSRCP and were not considered to be "reasonable." Examples of alternatives which were considered but not analyzed include:

1. Maximizing harvest opportunities for rockfish;
2. Seeking methods to increase food supply of rockfish;
3. Transplanting rockfish from outside Puget Sound into Puget Sound;
4. Implementing catch-and-release fisheries for rockfish; and
5. Implementing a temporary prohibition on all types of fishing which impact rockfish.

Chapter 2 Background

2.1 The Natural Environment

The natural environment considered in this DEIS includes all of the water and associated intertidal and subtidal substrate within Puget Sound. The natural environment includes plants and animals which may interact with rockfish in Puget Sound. The natural environment is common to all elements considered in the PSRCP.

2.1.1 Puget Sound

In this document "Puget Sound" refers to the inland marine waters of Washington State east of the Bonilla-Tatoosh line in the proximity of Cape Flattery including Neah Bay and those waters south of the Canadian-United States border, including all waters south to Olympia and Hood Canal (Figure 1). Within this area, the PSRCP proposes to manage rockfish by three regions as follows:

> North Puget Sound: those waters of the Strait of Juan de Fuca and the San Juan Islands. The western boundary is the Sekiu River (which is east of Cape Flattery); the northern boundary is the U.S.-Canadian border, and the southern border is a line from Point Wilson (near Port Townsend) to Partridge Point on Whidbey Island.
>
> South Puget Sound: those marine waters south of the Point Wilson-Partridge Point line and east of Deception Pass. South Puget Sound includes the Whidbey Basin, Admiralty Inlet, Hood Canal, the central basin, and the southern basin of Puget Sound.
>
> Neah Bay: those marine waters east of the Bonilla-Tatoosh line east to the Sekiu River and north to the international border.

This geographical division is based largely on the stock identification of rockfish and by the major oceanographic patterns within the Sound (Palsson et al., 2009). This division into three regions represents a balance between the benefits and costs of managing rockfish by smaller water basin or by larger region.

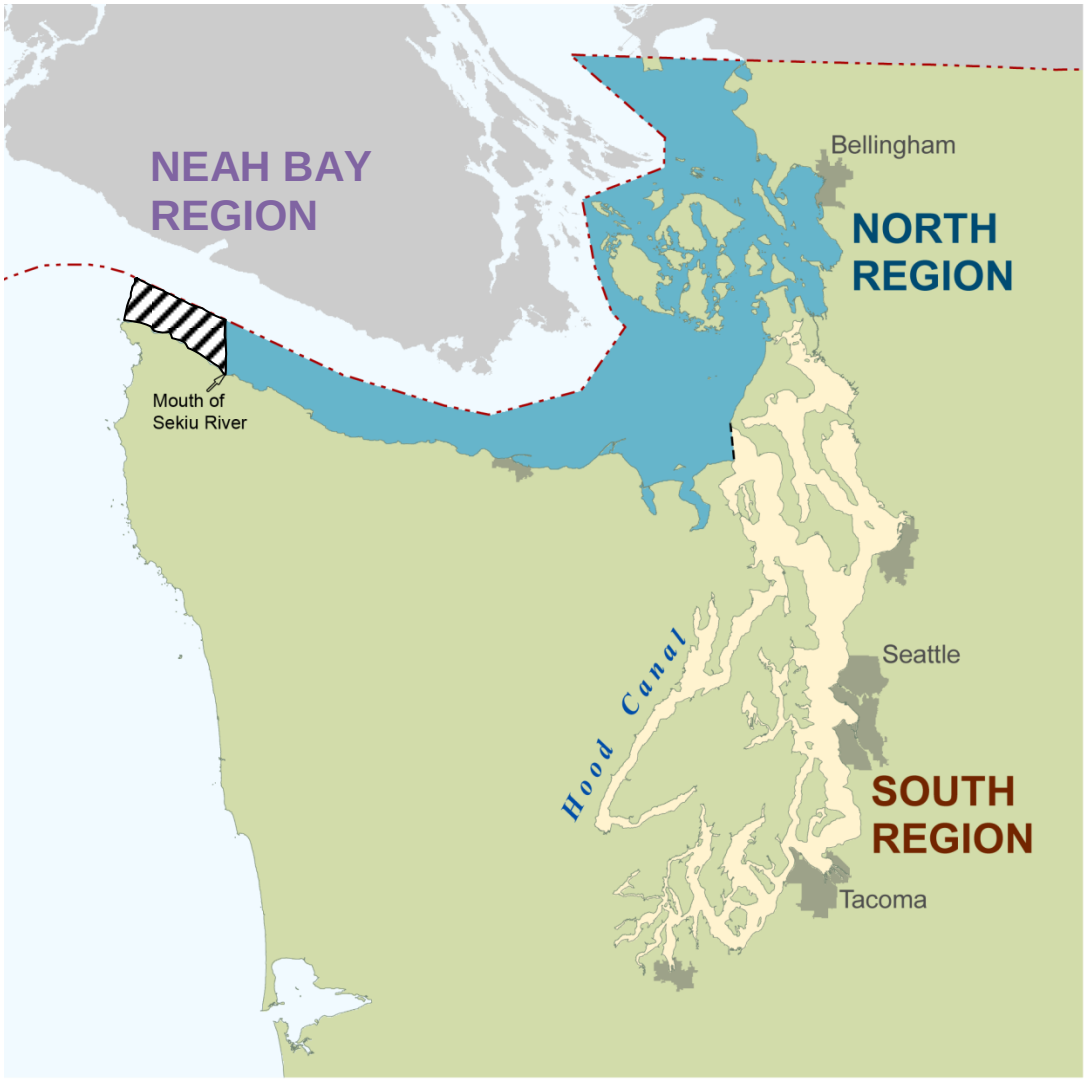

Figure 1. Map of Puget Sound showing management regions.

2.1.2 Sensitive, Threatened and Endangered Species

Puget Sound is home to a wide variety of animals whose continued existence may be in jeopardy. These species are listed under the federal Endangered Species Act (ESA) or the Washington State species of concern list (Table 4).

Table 5. Animals found in Puget Sound that are listed in the federal endangered species listing or in the list of Washington Department of Fish and Wildlife species of concern (WDFW 2009) with possible interaction with rockfish

COMMON NAME (STATUS[1])	SCIENTIFIC NAME	POSSIBLE INTERACTION WITH ROCKFISH
Southern Resident Killer Whale (E)	*Orcinus orca*	Rockfish are minor prey item
Humpback Whale(E. SE)	*Megaptera novaeangliae*	
Stellar Sea Lion (T,ST)	*Eumetopias jubatus*	Rockfish may be a minor prey item
Marbled murrelet(T,ST))	*Brachyramphus marmatus*	
Brown pelican (E,SE)	*Pelecanus occidentalis*	Minor competition for food
Chinook salmon (T)	*Oncorhynchus tshawytscha*	Rockfish are both prey and predators
Summer chum salmon (T)	*Oncorhynchus keta*	
Steelhead trout (T)	*Oncorhynchus mykiss*	
American white pelican (SE)	*Pelecanus erythrorhynchos*	Possible competition for food
Brandt's Cormorant (SC)	*Phalacrocorax penicillatus*	
Cassin's auklet (SC)	*Ptychoramphus aleuticus*	
Common murre (SC)	*Uria aalge*	
Black rockfish (SC)	*Sebastes melanops*	
Yelloweye rockfish (SC,PT)	*Sebastes ruberimmus*	
Bocaccio rockfish (SC, PE)	*Sebastes paucispinis*	
Brown rockfish (SC)	*Sebastes auriculatus*	
Canary rockfish (SC, PT)	*Sebastes pinninger*	
China rockfish SC)	*Sebastes nebulosus*	
Copper rockfish (SC)	*Sebastes caurinus*	
Greenstriped rockfish (SC)	*Sebastes elongatus*	
Pacific cod (SC)	*Gadus macocephalus*	Competition for food, predation, bycatch in rockfish fisheries
Pacific hake (SC)	*Merluccius productus*	Competition for food, predation, bycatch in rockfish fisheries
Pacific herring (SC)	*Clupea pallasi*	Rockfish prey on herring; herring prey on rockfish larvae
Quillback rockfish (SC)	*Sebastes maliger*	
Tiger rockfish (SC)	*Sebastes nigrocinctus*	
Walleye pollock (SC)	*Theragra chalcogramma*	Competition for food
Widow rockfish(SC)	*Sebastes entomelas*	
Yellowtail rockfish (SC)	*Sebastes flavidus*	
Gray Whale (SE)	*Eschrichtius robustus*	
Pacific harbor porpoise (SC)	*Phocoena phocoena*	
Northern abalone (SC)	*Haliotis kamschatkana*	
Olympia Oyster (SC)	*Ostrea conchaphila*	

[1] E or T means listed an Endangered or Threatened under the federal Endangered Species Act, if preceded by a "P" it indicates that the listing status is potential; SE, ST, SC and SS means the species is listed on the Washington State Endangered, Threatened, Candidate or Sensitive list.

2.2 The Governing Environment

Authority for regulating rockfish, their habitats, and threats to their health and human use in Puget Sound is divided among many federal, tribal, state, and local (city and county) governmental entities (Table 5). Different entities are responsible for fisheries management, habitat, and water quality. The diffuse nature of regulatory authority requires at least the cooperation and participation of many management agencies to ensure success.

Table 6. Agencies with authority affecting rockfish conservation and rebuilding efforts.

AGENCY	REGULATORY AUTHORITY
NOAA-Fisheries (federal)	Administers the Endangered Species Act (ESA) for fish, federal management in waters adjacent to Neah Bay, and marine mammals and the Marine Mammal Protection Act.
U.S. Fish and Wildlife Service (federal)	Administers the ESA for seabirds.
U.S. Army Corps of Engineers (federal)	Administers Section 10 and Section 404 permits which affect rockfish habitat.
Tribal governments	Manage treaty fisheries and habitat within reservation boundaries.
Dept of Fish and Wildlife (state)	Manages non tribal fisheries; has limited management authority over habitat.
Dept of Ecology (state)	Manages water quality.
Puget Sound Partnership	Coordinates the restoration of Puget Sound.
Dept of Natural Resources (state)	Manages state lands and marine vegetation and authorizes uses of rockfish habitat.
Dept of Health (state)	Issues consumption advisories, which affect demand. Current advisories are in effect in many portions of Puget Sound.
Local (city and county)	Manages substantial developments, growth management act, conditional use permits, shoreline development, critical areas, and issues consumption advisories.

2.3 Rockfish[2]

Rockfish are members of the family Scorpaenidae and are members of the *Sebastes* or *Sebastolobus* genera. Rockfish are characterized by having spines on their head (at least at some stage during their development), stiff dorsal fins, and venom glands at the base of fins, internal fertilization of eggs, and birth of live larvae. Over sixty species of rockfish exist in the Pacific northwest and exhibit a wide range of differences; some species are dull colored; others are brightly colored. Some species school, others are solitary. Some species can exceed thirty pounds in weight, others never exceed a pound.

[2] A detailed description of rockfish and their biology in Puget Sound is found in Palsson *et al.*, 2009.

Rockfish have a variety of local names. Perhaps the most common name applied to local rockfish is “rock cod.” Rockfish are also called “sea bass” (although they are not a member of the bass family) or “red snapper” (although they are not true snappers).

A total of 28 species of rockfish have been identified in Puget Sound east of the Sekiu River, (Palsson et al. 2009, Appendix 4), but some are very rare and uncommon (i.e., rougheye and silvergray). Others are found only in very specific areas of the Sound (i.e., blue and China rockfish). Other species are, or were, very common and provide valuable ecological functions and are included in commercial and recreational fisheries. Rockfish as a group are among the most common species of fish found in the Sound. They are year-round residents and can be found in nearly every area, depth, and habitat type. Many species of rockfish co-occur in the same habitats and depths (Moulton 1977, Love et al. 2002, Gunderson and Vetter 2006) and are similar in appearance, making species identification difficult. It is not unusual for a single fishing trip to land several species of rockfish, often caught at the same location and depth. The complex nature of the multi-species fishery and difficulties in identification makes fishery management challenging.

Since Neah Bay is adjacent to the Pacific Ocean, more rockfish species are likely to occur than in the nearshore environment of Puget Sound. Neah Bay falls within the geographic range of an additional eleven species of rockfish than have been documented in Puget Sound (Appendix 4, Love et al., 2005), but most of these species are likely to be uncommon in Neah Bay.

2.3.1 Rockfish Life History and Biology

Rockfish are some of the longest-lived fish known in Puget Sound, with maximum age for several species exceeding 50 years. Rockfish mature as early as age 2, but ages at first maturity from 6 to 11 years are common, and may be as old as 22 years for yelloweye rockfish.

Female rockfish give birth to free-swimming larvae, usually during the spring months. The larger the female, the greater the number of larvae produced. For example, female copper rockfish that are 8 inches (20 cm) in length produce 5,000 eggs while a female 20 inches (50 cm) in length may produce 700,000 eggs (Palsson et al. 2009). Recent research indicates that older female rockfish produce more competent larvae which have a greater chance of survival (Berkeley et al., 2004.) Currently, rockfish are commonly caught before they reach sexual maturity, eliminating their entire reproductive potential.

A dominant feature of rockfish reproduction is a pattern of infrequent and irregular successful recruitment and many years with poor recruitment (Hollowed et al., 1987, Hollowed and Wooster 1995, Ralston and Howard 1995). Reproductive success may occur only during narrow spatial and temporal windows when conditions are favorable for larval survival.

Rockfish have swim bladders which contain gas that is slowly regulated to allow the fish to maintain buoyancy at various depths. However rockfish, unlike other species such as salmon, do not have a mechanism to rapidly expel gas from the swim bladder. When rockfish are brought to the surface, the gas within the bladder expands, causing internal injuries or death. The effects of rapid decompression include: over-inflation and rupture of the swim bladder; inability to submerge when released; exposure to predation and solar radiation; abnormal or erratic swimming behavior; gas embolisms in the blood vessel, gills, skin, and eyes; distortion of internal organs through the mouth; internal and external hemorrhaging; cloacal protrusions; and death (Kerr 2001, Meyer 2006, Parker et al., 2006, Rogers et al., 2008. Berry (2001) found clouded or bulging eyes in a third to more than half of quillback rockfish captured causing permanent eye damage. Parker et al. (2006) found that all swim bladders of tested black rockfish were ruptured when brought to the surface, but most survived at least a short time when quickly recompressed back to depth. Meyer (2006) performed pressure experiments on copper rockfish captured from northern Puget Sound and examined similar aspects of physiology. He found signs of depressurization stress when fish were brought to the surface from 10-, 20-, and 30-meter (33 to 100 feet) simulated depths, and these signs included hyper-inflated swim bladder, hyper-inflated pericardial chambers, and gas bladder rupture. Injuries are more severe with increasing capture depths. Fish captured from a simulated 10 meters (33 feet) did not die and might be safely caught and released. Fish captured from greater depths have life-threatening injuries. One of three captured from 20 meters (65 feet) died, and all fish captured from 30 meters (100 feet) died. This facet of rockfish anatomy limits fishery management options due to the high mortality rates of released fish from depth.

A recent report to the Pacific Fishery Management Council (PMFC 2008) indicated that mortality rates for rockfish caught and released in recreational fisheries increased with increasing depth of capture and that the mortality rate differed considerably between species of rockfish. For Puget Sound rockfish, mortality rates of released rockfish from 120 feet (36 m) or less in depth ranged from 17% to 37%.

2.4 Rockfish Habitats

The term “habitat” refers to the physical, chemical, and biological conditions that support a species or species assemblage. The structural components of habitats are created and sustained by long-term physical processes such as tidal currents, human activities, and also by habitat forming species such as eelgrass meadows and kelp forests.

2.4.1 Nearshore Vegetated and Rocky Habitats

The primary habitat for nearshore rockfish is composed of pebble, cobble, boulder, bedrock, and hardpan substrates that are continuous or isolated and form crevices or other structures to protect rockfish from currents and predators (Matthews 1990a, b, c, Buckley 1997, Pacunski and Palsson 2002). In shallow waters of less than 18 meters (60 feet) in depth, rocky habitats are typically covered during the summer months with macroalgae including canopy and understory kelps, bladed and filamentous red and

brown algae, and in high energy environments, surf grasses (Mumford 2007). These formations are important to the health of juvenile and adult rockfish as described above. Demersal species that use these habitats include copper, quillback, brown, and tiger rockfish. Pelagic assemblage species also make use of these habitats, especially where there are steep drop offs. These species include black, yellowtail, and Puget Sound rockfish.

Copper, quillback, and brown rockfish have an affinity for natural rocky habitats with high relief. Most exhibit small home ranges of approximate 30 meters^2 (323 ft^2) and exhibit high site fidelity (Matthews 1990b, c). Less is known about the specific habitat associations and distributions of other adult rockfish species in Puget Sound.

2.4.2 Deep-Benthic Habitats

Deep-benthic habitats for rockfish primarily include boulder, bedrock, and hardpan outcroppings in waters deeper than 37 meters (120 feet). Deep-water habitats also include extreme slopes of unconsolidated substrates, or sand, shell, and cobble fields often located in the periphery of rocky outcroppings. These deep, unconsolidated habitats occur off many of the islands and points of the South Sound such as Camano Head, Possession Bar, Mukilteo, Jefferson Head, Point Edwards, Point Monroe, Skiff Point, Restoration Point, Blake Island, Southworth, Dalco Point, Tacoma Narrows, Fox and Ketron Islands, and along the steep walls of Hood Canal. In addition, quillback and other sedentary rockfish are found to lesser degrees on habitats composed of coarse and fine sediments. The more common occurrence of copper, quillback, and brown rockfish in the South Sound indicates that these species may make use of isolated shelters created by benthic debris, sunken logs, or benthic vegetation mats swept into deep basins from the nearshore.

2.4.3 Open-Water Habitats

Open-water habitats include the water column, both shallow and deep, and the surface waters that contain drift vegetation. This habitat may be segregated by the depth preferences of several rockfish species. Several schooling species such as yellowtail, redstripe, and widow rockfish characterize the deeper segments of this habitat. Schools of yellowtail rockfish occasionally occur in deep waters of the western Strait of Juan de Fuca, and widow rockfish were found once off the southwest corner of San Juan Island (Miller and Borton 1980). In shallower waters, near pinnacles and steep walls, black and Puget Sound rockfish occupy open-water habitats.

The juveniles of some rockfish species make use of floating mats of vegetation in open water (Buckley 1997). These tend to occur throughout the North Sound and the northern portions of the South Sound and are often associated with tidal and other oceanographic fronts.

2.4.4 Artificial Habitats

Artificial habitats include piles of boulders, concrete wastes, tires, sewer pipes, breakwaters, shipwrecks, pilings, and other jettisoned or anthropogenic material not of natural geological origin. These structures mimic natural features of relief, crevice spaces, and settlement substrates for vegetation and invertebrates, but may not provide equal functions as natural habitats. Artificial habitats include artificial fishing reefs that were deployed to enhance fishing in the South Sound and urban habitats where rocky habitats were naturally limiting (Buckley 1982). WDFW created nine offshore artificial reefs and four urban reefs and others were created by the Washington Department of Natural Resources (WDNR) and by illegal or accidental dumping. Some artificial habitats have been configured with smaller rock sizes than used on adult reefs in order to attract post-settlement rockfish (West et al., 1994, 1995, Buckley 1997).

Rockfish are found among artificial habitats (Matthews 1990a) and quickly colonize new artificial habitats soon after deployment. New habitats likely attract itinerant fish from the surrounding environment (Buckley and Hueckel 1985, Laufle and Pauley 1985), but how well the artificial reefs simulate the function of natural habitats is unclear. Matthews (1990b) found that home ranges are greater for rockfish living on artificial habitats than natural habitats, and fish living on artificial habitats are more likely to move to low-relief natural rocky habitats during the summer. In contrast, rockfish living on natural high-relief rocky habitats (vertical relief greater than two meters (6 feet) apparently have more suitable conditions because they remain in smaller home ranges throughout the year. Moreover, most rockfish displaced from natural high-relief rocky habitats return to them after being displaced to artificial reefs, but rockfish displaced from artificial reefs to high-relief natural reefs do not return and remain at the high-relief natural habitats. These findings indicate that artificial habitats may not provide habitat of the same quality as natural habitats.

Artificial habitats have been suggested as a habitat mitigation tool for the loss of natural habitats because they attract concentrations of rockfish and other rocky habitat species (Hueckel et al., 1989). But issues of habitat quality, function, and replacement of underlying natural habitats may limit their use as replacement habitats.

2.4.5 Neah Bay Region

Neah Bay is a transitional area set between the open, fully saline waters of the Pacific Ocean and the estuarine waters of Puget Sound. The shoreline west of the Sekiu River to Neah Bay consists of rocky shorelines interspersed with pocket beaches of coarse sands and cobble. Neah Bay itself is a wide, sandy bay bounded by sandy, rocky, and modified shorelines enclosed by a jetty from the west shore east to Waadah Island forming a protected boat basin. Farther to the west, the shoreline consists of rocky headlands to Cape Flattery that are interspersed with cobble beaches. Just offshore, the sea floor consists of sand, cobble, and rocky outcrops that support floating kelps of *Macrocystis integrifolia* and *Nereocystis leutkeana* and a wide variety of understory seaweeds. Prominent rocky ridges and boulder fields occur in both shallow waters and

offshore as the seafloor quickly slopes to a maximum depth of over 250 m. Offshore of Cape Flattery the prominent Duncan and Duntze Rocks protrude from the ocean surface, roughly due north of Tatoosh Island. The eastern face of this island forms the western boundary of Neah Bay and consists of steep rocky shorelines and subtidal slopes that give way to boulders, cobble, and sand.

2.5 Fisheries for Rockfish

Fisheries for rockfish have existed in Puget Sound for a long time, probably since humans first inhabited the region (Stewart 1977). Modern commercial fishing for rockfish and other species of bottomfish started in the 1920s and greatly increased in the 1970s and 1980s (Figure 2). This increase occurred in both northern and southern Puget Sound and in both recreational and commercial fisheries (Figure 3). The increase in landings was due to increased fishing effort, not to an increase in the abundance of rockfish (Palsson et al., 2009).

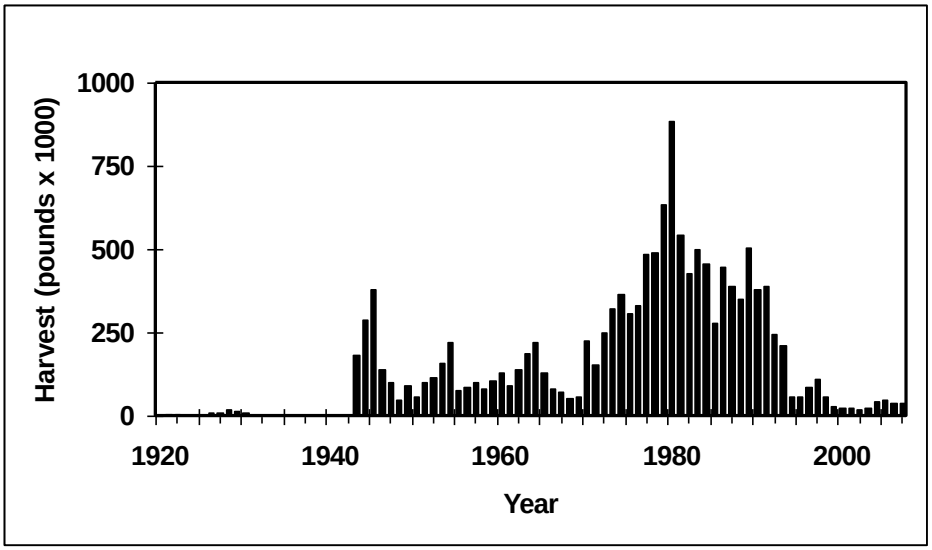

Figure 2. Estimated catch of rockfish in pounds from Puget Sound east of the Sekiu River, 1920-2008. Source: Palsson et al., 2009.

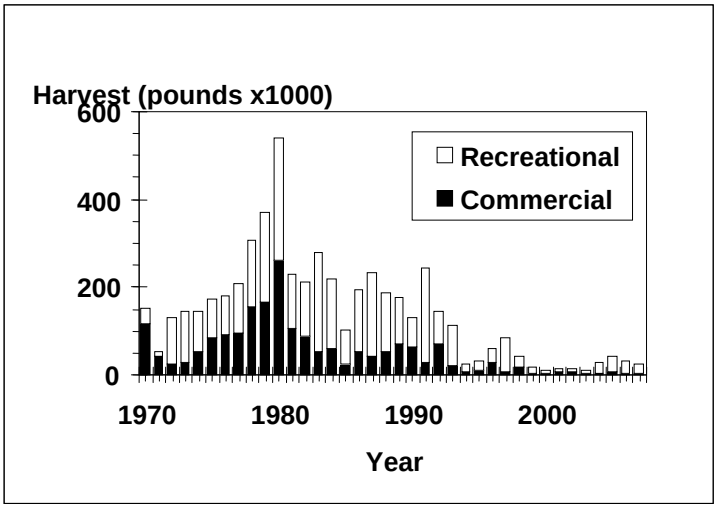

Figure 3. Annual catch of rockfish from Puget Sound east of the Sekiu River. Northern Puget Sound is shown above and South Puget Sound, below. Source: Palsson et al, 2009.

Since the 1980s, a series of management actions has been taken to reduce the impact of fishing on rockfish east of the Sekiu River. These actions include the prohibition of certain gear types, imposition of daily or trip catch limits, and establishment of no fishing areas. No annual catch limits for any species of rockfish have been established in Puget Sound. These actions have reduced the size of the rockfish catch. In 2009, the annual catches of rockfish by both commercial and recreational fisheries are low, the lowest since complete record keeping began in the 1970s (Palsson et al., 2009).

2.5.1 Commercial Fisheries

Many different types of commercial fishing gear have been used in Puget Sound east of the Sekiu River to catch rockfish. Some of this gear is designed to catch rockfish, and other types are designed to catch other species of fish such as salmon and flatfish, but may catch rockfish incidentally. The major commercial gear types which have caught rockfish, but are no longer allowed in Puget Sound, are roller trawl, handline jig, and bottomfish troll. Existing gears that may encounter rockfish incidentally are bottom trawl, set net, and setline. Commercial fisheries are capable of operating at any depth in Puget Sound.

At present, the commercial catch of rockfish in southern Puget Sound is nearly zero and has been at that level since the early 1990s. In northern Puget Sound, a harvest of rockfish (primarily yellowtail) by trawl occurs regularly in the Strait of Juan de Fuca. During the period from 2004 to 2008, less than 2,000 rockfish have been harvested from Puget Sound east of the Sekiu River by commercial gears.

The catch estimates for commercial fisheries do not include estimates for rockfish encountered during commercial fishing operations and released at sea. No monitoring

program exists with which to estimate the magnitude of this release rate. The amount of this release is thought to be low, but the mortality rate high (Palsson et al., 2009).

2.5.2 Recreational Fisheries

Several different types of recreational fisheries have captured rockfish in Puget Sound east of the Sekiu River. While recreational fishers undoubtedly sought and harvested rockfish prior to 1968 (Buckley 1967, 1968; Buckley and Satterthwaite 1970), consistent statistical surveys were not implemented to estimate total recreational harvests in Puget Sound until 1970, and early estimates indicated that recreational harvests of rockfish were minimal (Palsson 1988). Targeted rockfish fisheries have included the boat-based, hook-and-line fishery for bottomfish, the spearfishery and the shore-based hook-and-line fishery. By far, boat-based anglers account for the majority of harvested rockfish. Typically, these anglers target rockfish on areas of high, rocky relief. Anglers can fish to depths of more than 122 meters (400 feet) often on deep pinnacles or artificial structures. Using modern fishing gear and electronic aids, anglers can effectively fish at any depth or location in the Sound.

Anglers who fish specifically for bottomfish encounter rockfish. In addition rockfish, are encountered while fishing for halibut, lingcod, and salmon (Table 6). Anglers fishing from shore occasionally catch rockfish using spinning gear and lures and baited hooks. However, the catch of rockfish tends to be minimal by shore anglers (Bargmann 1982). Divers spear rockfish, a sport that co-developed with the recreational diving. Divers using pole spears and spear guns have harvested rockfish in great numbers and can account for approximately a quarter of the total recreational harvest of rockfish in some areas and years (Bargmann 1984). More recent regulations restrict recreational fishing of rockfish with the imposition of a one-fish daily bag limit and the prohibition of spearfishing for rockfish.

In recent years (2004-2007), recreational anglers have encountered approximately 35,000 rockfish annually east of the Sekiu River. Most of these are encountered by people fishing for bottomfish. Smaller numbers of rockfish are encountered by anglers fishing for salmon, halibut, or other species of fish (Table 6). Considerable numbers of these rockfish are released. Of all rockfish encountered while recreational fishing in Puget Sound, nearly two-thirds are released. Anglers fishing for bottomfish released the largest number of rockfish, while salmon anglers released the highest proportion of their encountered rockfish (Table 6).

Table 7. Patterns of Rockfish Encounters in the Puget Sound Recreational Fishery, 2004-2007. Source: Palsson et al., 2009

TARGET SPECIES	AVERAGE NUMBER OF ROCKFISH ENCOUNTERED ANNUALLY	AVERAGE PERCENT OF ROCKFISH RELEASED
Bottomfish	21,490	64
Halibut	658	50
Salmon	8,742	77
Any Species	4,435	42
Total	35,325	64

Previous management strategy (prior to 2010) was designed to: 1) minimize the catch of rockfish by reducing the bag limit to one fish per day and establishing fishing seasons for rockfish; and 2) minimize wastage by allowing anglers to retain one rockfish per day. The ongoing high rate of release in the recreational fishery remains a concern (Palsson et al., 2009). In 2010 the Fish and Wildlife Commission adopted rules that prohibit recreational fishing for bottomfish in waters deeper than 120 feet in all of Puget Sound and prohibited retention of rockfish in most of the Sound.. These actions should reduce the mortality rates of released rockfish, and the amount of rockfish encountered in deep water will be reduced.

2.5.3 Treaty Fisheries for Rockfish

Rockfish bones have been found in native middens and archeological studies have shown that Native Americans historically harvested several species of rockfish (Stewart 1977). By treaty, several tribal governments have the authority to authorize fisheries for rockfish and other species in Puget Sound. However, the amount of rockfish harvested by persons fishing under the authority of a tribal government has been very small in recent years. Rockfish harvested by tribal fishers have contributed less than two percent to the total Puget Sound harvest for most years since 1991. The annual harvested poundage was the greatest in 1992 at 15,600 pounds and in 1998 when 1,371 pounds were landed. In both of these peak years, trawl gear was the primary gear of harvest. During other years, harvests have ranged from none to approximately 500 pounds with troll and other gear being the dominant source of the landings.

2.5.4 Fisheries for Rockfish in Neah Bay Region

In recent years, the recreational fishery has been the dominant fishery for rockfish in Neah Bay. Commercial fishing for bottomfish has been progressively restricted in Neah Bay, first with a prohibition of commercial jigging and trolling in 1998. Commercial trawling was later prohibited in 2000. Commercial harvests in Neah Bay ranged between 17 and 49 metric tons (mt) during the early 1990s and then decreased to less than 0.2 mt or 200 rockfish per year after 1997 when most commercial closures became effective (Figure 4). During the early 1990s, commercial jiggers harvested 80% of the rockfish, trawlers harvested 15%, and longliners harvested most of the remainder of the rockfish. Commercial fishing effort progressively declined from the early 1990s when 500 to 800 landings occurred per year to less than 150 landings per year for all groundfish.

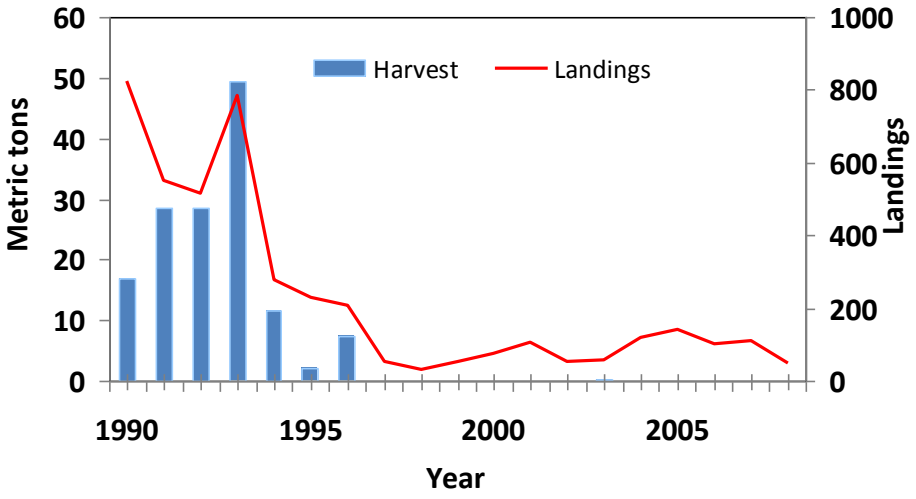

Figure 4. Commercial harvest of rockfish and fishing effort in the Neah Bay region, 1990-2008. Source: unpublished WDFW data.

Rockfish are primarily harvested in Neah Bay by recreational anglers targeting bottomfish including Pacific halibut, but rockfish fish are also harvested incidentally to fishing trips taken for salmon and combined or non-specific fish species. Harvest has ranged between 18,000 and 47,000 fish between the years 1990 and 2003 (Figure 5). Harvest amounts increased after 2006 to 70,000 in 2005. However, estimates after 2004 include harvest estimates of boat-based anglers who originate their trips from waters east of the Sekiu River that were not previously estimated. Scuba divers from Neah Bay target rockfish using pole spears and spearguns, but their rockfish harvest has never exceeded 3,000 fish and has averaged 4% of the total recreational harvest. During the past five years, black rockfish has comprised 84% of the angler harvest from Neah Bay, yellowtail rockfish has comprised 6%, and blue rockfish has comprised 3%. Most rockfish are retained by anglers, but of the total rockfish encounters, 24% are released back to the water. During the past five years, rockfish releases have averaged 2,200 fish with black rockfish constituting 64% of the released catch, canary rockfish 8%, yellowtail constituting 7%, and yelloweye rockfish constituting 6% (Source: WDFW unpublished data).

Treaty landings of rockfish have been small in this area, averaging less than 1 mt annually between 1990 and 2008.

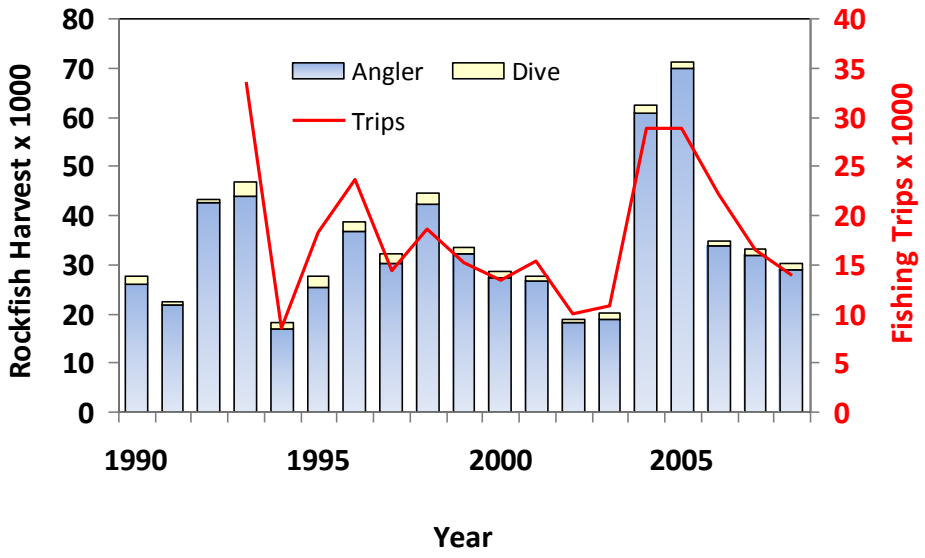

Figure 5. Recreational harvest of rockfish and fishing effort in the Neah Bay region, 1990-2008. Source: unpublished WDFW data.

2.6 Current Stock Status for Rockfish in Puget Sound East of the Sekiu River

The PSRCP concludes that many stocks of rockfish are in poor condition east of the Sekiu River. This conclusion is based on previous analysis conducted by WDFW staff (Palsson et al., 2009). The PSRCP proposes to utilize three categories of stock status (Appendix A). These three categories are based on assessments by the Pacific Fishery Management Council and by WDFW as follows:

Healthy Stock Status: A healthy stock is one that has a biomass at or above $B_{50\%}$. The data-limited definition of a Healthy Stock is one that shows a long-term trend that is stable, increasing, or varies without trend at or above historic levels.

Precautionary Stock Status: Precautionary Stocks are those that have stock biomasses between $B_{25\%}$ and $B_{50\%}$. The data-limited definition is a stock that demonstrates instability, is decreasing, or has no information to establish condition.

Depleted Stock Status: A Depleted Stock is one that is at or below $B_{25\%}$. The data-limited definition of a Depleted stock is one that has negative indices exceeding AFS vulnerability thresholds corresponding to its population productivity. This category includes the Vulnerable status previously used by Palsson et al., (2009).

The stock status of each species was evaluated for both regions of Puget Sound east of the Sekiu River. The majority of rockfish stocks or populations in Puget Sound are in the Precautionary status, and several species once important to recreational fisheries are in Depleted status (Table 7). The patterns of stock status are generally similar

between the two regions. Fewer than 20% of the populations present in either North or South Sound are in Healthy status.

Table 8. Summary of the Status of Rockfish Populations in Puget Sound east of the Sekiu River. Source: modified from Palsson et al., 2009

SPECIES	NORTH SOUND	SOUTH SOUND
Copper rockfish	Precautionary	Depleted
Quillback rockfish	Depleted	Depleted
Brown rockfish	Precautionary	Precautionary
Black rockfish	Precautionary	Precautionary
Yelloweye rockfish	Depleted	Depleted
Yellowtail rockfish	Precautionary	Precautionary
Canary rockfish	Depleted	Depleted
Bocaccio	Precautionary	Precautionary
Redstripe rockfish	Healthy	Healthy
Greenstriped rockfish	Healthy	Healthy
Splitnose rockfish	Precautionary	Precautionary
Shortspine thornyhead	Healthy	Healthy
Tiger rockfish	Precautionary	Precautionary
China rockfish	Precautionary	Not Present
Blue rockfish	Precautionary	Not Present
Vermilion rockfish	Precautionary	Precautionary
Puget Sound rockfish	Precautionary	Healthy
Number Healthy	3	4
Number Depleted	3	4
Total Stocks Examined	17	15

Stock condition is closely related to the frequency of a species entering the recreational catch with the more commonly caught species being in poor condition, and smaller species, which are seldom caught, being in the healthiest conditions. Copper and quillback rockfish have been the two most important species in the recreational fishery, but three of four stocks are in Depleted condition. Throughout Puget Sound, yelloweye and canary rockfish are in Depleted condition. Eleven species in North Sound and seven species in South Sound are in Precautionary status. These species, such as black, yellowtail, splitnose, and bocaccio, have been secondary species of importance in recreational and commercial fisheries.

This evaluation of stock status has many limitations, most notably the lack of complete recreational catch estimates between 1994 and 2003, the lack of information on the released portion of the rockfish encounters and the poor quality of species composition data from the commercial fishery, unknown influences of changing bag limits on the interpretation of the recreational catch rate trend, and the lack of age and other biological data. Additionally, the analysis of stock status presumes that rockfish stocks in the early 1970s were at maximum levels and declines are measured from that time. However, almost certainly rockfish populations were not at their maximum in the 1970s, since harvest of rockfish had occurred for at least fifty years prior to that time. Thus, this analysis of stock condition may underestimate the real decline in abundance (Palsson et al., 2009).

2.7 Status of Stocks in the Neah Bay Region

A number of rockfish species may occur in the Neah Bay region, but not in the other regions of Puget Sound. (Appendix 4). These species are typically deepwater fish associated with the open ocean.

Stock assessments have not been made for rockfishes occurring specifically in Neah Bay. Because Neah Bay is a transitional area adjacent to the open coast, rockfishes are expected to have greater affinities to coastal rockfish stocks than rockfish farther to the east. For example, NOAA Fisheries has identified distinct population segments to the east of Port Angeles for canary, yelloweye, and bocaccio rockfishes, and genetically distinct populations of copper, quillback, and brown rockfishes have been found south of Port Townsend (Federal Register 2009). Stock status in Neah Bay will likely be influenced by population processes and fisheries in coastal waters, therefore, stock assessments for coastal species conducted under the auspices of the Pacific Fishery Management Council (PFMC) will be used to provide a baseline for managing stocks and fisheries in Neah Bay. Federal management guidelines designate that any stock at or below 25% of the unfished biomass is overfished, a comparable level for depleted stocks in Puget Sound. Six coastal stocks of rockfish have been declared overfished including the southern stocks of bocaccio, canary, darkblotched, Pacific Ocean perch, widow, and yelloweye rockfishes. Species with status assessments by the PFMC in ocean waters are listed in Table 8.

Table 8. Stock status for rockfish in coastal waters (Source: adapted from PFMC, 2008)

ROCKFISH SPECIES	PFMC DEPLETION* (year of most recent assessment)	Equivalent WDFW stock status
Black (north of Cape Falcon)	53% (2007)	Healthy
Canary	24% (2009)	Depleted
Darkblotched	20% (2009)	Depleted
Greenstriped	81% (2009)	Healthy
Pacific Ocean Perch	29% (2009)	Precautionary
Splitnose	66% (2009)	Healthy
Widow	38% (2009)	Precautionary
Yelloweye	20% (2009)	Depleted
Yellowtail	57% (2005)	Healthy
Shortspine thornyhead	63% (2005)	Healthy
Longnose thornyhead	71% (2005)	Healthy

* **Depletion means the % of the original unfished spawning biomass remaining (e.g., current biomass divided by biomass prior to the start of fishing).**

2.8 Stressors and Limiting Factors

Potential stressors and limiting factors can negatively impact rockfish populations. Many stressors or threats to rockfish have been identified by West (1997). Those stressors and their potential to limit productivity and recovery of rockfish populations in Puget Sound are discussed in this section (Table 9). The likely known impact on

productivity is rated as High, Moderate, or Low (Palsson et al., 2009). The definitions for each of the risk categories are as follows:

- High: The stressor has been documented to dramatically limit rockfish populations in Puget Sound or along the West Coast.
- Moderate: The stressor has been identified to cause direct mortality on local scales or to be a persistent factor but on a restricted scale.
- Low: The stressor has some potential to limit rockfish populations on a small scale or large scale, but the stressor has not been documented in Puget Sound.

Table 9. Likely Stressors Limiting Rockfish Populations in Puget Sound.

FACTOR	LIKELY IMPACT
Past Fishery Removals	High
Habitat Disruption	Low
Derelict Gear	High
Climate Change	Low
Water Quality Dissolved oxygen Nutrients Chemical Contamination	 Moderate Low Moderate
Species Interactions Food Web Competition Salmon Hatchery Practices	 Moderate Low Low
Diseases	Low
Genetic Changes	Low

2.8.1 Past Fishery Removals

Fishing affects rockfish in both time and space, affecting sustainable populations. In Puget Sound east of the Sekiu River, past fishing practices have decreased both the number of fish and the average age and size of fish. Recent studies clearly show declines in abundance of many species of rockfish, and several of the most commonly fished species show an average declining size as well. The comparison of rockfish densities and sizes in marine reserves to fished areas in Puget Sound shows that removals by fishing activities affect the abundance and size structure of rockfish populations (Palsson et al., 2009). We conclude that past fishing practices have been a major factor affecting the abundance and size structure of rockfish in Puget Sound.

Age truncation, the removal of older fish, can occur at even moderate levels of fishing for rockfish (Berkeley et al., 2004b). A study of black rockfish revealed that age truncation occurs along the central coast of Oregon, and that older fish release their young earlier in the spring than younger fish (Bobko and Berkeley 2004). Further, older fish produce better quality embryos with larger oil globules and have higher absolute fecundities (Berkeley et al., 2004a, Bobko and Berkeley 2004). These and other results

led Berkeley et al. (2004a) to conclude that older rockfish produce high quality larvae which are better able to withstand starvation and grow faster than the offspring of younger fish. The magnitude of the effect of age truncation on reproductive success may vary by species (O'Farrell and Botsford 2006, Longhurst 2002).

Age truncation as a result of fishing may affect rockfish populations in Puget Sound by reducing the number of larvae produced, decreasing the fitness of the larvae produced, and the decreasing the time period during which larvae are produced. All three of these factors may act to diminish the chances of successful recruitment in Puget Sound, although this effect has not been confirmed.

Rockfish often experience severe injury and death (e.g., "barotrauma") when brought to the surface from depth. Recent studies have revealed the potential for high mortality of fish caught at depth and subsequently released, and studies have shown mixed results in ameliorating the effects of barotrauma injuries. The mortality rate increases with depth of capture and can vary by species. The estimated mortality rates for released fish which were caught in depths of 120 feet or shallower range from 17% to 37%. are less than 50%. At depths of 180 feet or greater, the estimated mortality rates for most species was 100% (PFMC 2008).

Techniques aimed at minimizing barotrauma have focused on reeling fish up slowly, venting, or deflating the swim bladder and rapid re-submergence.

- **Speed of retrieval**- The speed of reeling and the ascent rate does not lessen the effects of barotrauma on rockfish. The low speed of reeling does not improve the survival of copper rockfish (Meyer 2006), and holding experiments of quillback rockfish brought to the surface slowly and those brought to the surface rapidly do not differ in their survival following four to six weeks in captivity (Berry 2001). Berry (2001) did find a higher incidence of eye damage by fast reeling with power reels in quillback rockfish.

- **Venting**- Venting (or "fizzing") involves puncturing the swim bladder to remove pressure on the organs by allowing the captured gas to escape (Berry 2001, Kerr 2001, Meyer 2006, Wilde 2009). The puncture is usually performed with a hypodermic needle or other sharp object along the side of the fish. In an analysis of 17 studies among 22 species or species groups, Wilde (2009) found little support that venting improves the survival of fish. Venting might be slightly beneficial to fish caught in shallow water, but is increasingly detrimental to fish captured in deeper water. Studies of quillback rockfish held in underwater cages following capture found no difference in survival rates between vented fish and unvented fish (Berry 2001). A study in California found similar results for blue rockfish (Gotshall 1964). Autopsies of vented and unvented fish four to six weeks following capture indicate that vented fish have a lesser rate of swim bladder lesions than unvented fish (Berry 2001). Following release, differences in behavior were noted between vented and unvented rockfish (Gotshall 1964).

- **Rapid submergence**- Reducing the time held at the surface or out of the water is more important in increasing survival than venting rockfish (Berry 2001, Parker et al., 2006, Hannah and Matteson 2007, Jarvis and Howe 2008). Parker *et al*. (2006) tested the effect of re-submerging captured black rockfish immediately after capture and found that after 21 days, rapidly submerged rockfish only suffer 3.3 % mortality. Hannah and Matteson (2007) found the success of recompression depends upon the species of rockfish, with blue rockfish showing more behavioral impairment than black, canary, and yelloweye rockfish. For copper rockfish, the increasing depth of capture results in greater external signs of barotraumas, but artificial deflation and recompression offer potential benefits for minimizing the mortality of rockfish (Meyer 2006). Berry (2001) found quillback rockfish rapidly recompressed to a depth of 15 meters (50 feet) suffered less mortality and appeared more "normal" than fish slowly re-submerged to 15 meters (50 feet) during the course of two days.

Considerable research on methods to reduce the effects on barotrauma is currently underway and, if successful, offers the potential to reduce the mortality rates of released rockfish. An example in Oregon can be found at:

http://www.dfw.state.or.us/MRP/research/

2.8.2 Habitat Disruption

Habitat disruption and loss includes naturally occurring and human caused activities that temporarily or permanently alter existing natural habitats. Habitat disruption results from filling, dumping dredge spoils, sedimentation, trawling, constructing beach bulkheads, installing pipelines and cables, sunken vessels, and constructing artificial habitats. The most vulnerable rockfish habitats are shallow-water vegetated areas and deeper rocky habitats.

Juvenile rockfish are highly associated with submerged and floating aquatic vegetation including eelgrass and kelp, while kelp is prevalent in the shallow portions of adult rockfish habitats. The disruption of submerged aquatic vegetation could pose a threat to the habitat quality of rockfish. Surveys conducted by the WDNR indicate that eelgrass abundance hasn't changed during recent years, but localized increases and decreases have occurred (Berry et al., 2003, Dowty et al., 2005, PSAT 2007). The amount of kelp beds along the Strait of Juan de Fuca varies greatly from year-to-year and some specific areas, such as near Protection Island, has shown long-term declines (Berry et al., 2002). In other areas of Puget Sound, kelp beds are increasing, due in part, to kelp growing on manmade structures (Levings and Thom 1994).

One-third of the Puget Sound's shoreline has been modified by human activities such as bulkheading, filling, overwater structures, and boat ramps (Bailey et al., 1998). Shoreline structures that extend over or through the subtidal zone alter fish communities compared to shore zones consisting of sand, cobble, or shallow rip-rap (Toft et al., 2004).

Another potential threat to rockfish is habitat disruption resulting from the introduction of exotic aquatic vegetation into Puget Sound. *Sargassum muticum*, an exotic brown algae, was accidentally introduced into Puget Sound from oyster aquaculture activities, and now is ubiquitous in the extreme nearshore where rocks and cobbles are present (Britton-Simmons 2004). These are the same habitats that post-larval copper rockfish settle in, but whether *S. mutium* affects rockfish settlement is not known. In North Sound, settling juvenile copper rockfish transition to *S. mutium* as the first substrate-associated recruitment in areas with minimal kelp habitat (Buckley 1997).

Adults of many species are closely associated with rocky habitats. The amount of this habitat is naturally limited, especially in Southern Puget Sound. A WDFW study (Pacunski and Palsson 1998) estimated 207 square kilometers (51,150 acres) of rocky habitat exists in North Puget Sound and only 10 square kilometers (2,471 acres) occurs in South Puget Sound. This rocky habitat may be affected by the deployment of mobile fishing gear, cables and pipelines, construction of bridges, sewer lines, and other submerged structures, and burying by sediments from dredge spoils, dam removal, and natural subtidal slope failures.

In Puget Sound, some commercial bottom trawl activities have targeted rockfish living on rocky habitats. Around the world, mobile fishing gear reduces physical and biological structure on the seafloor, leaving long-lasting impacts (Auster 1998, Dorsey and Pederson 1998, Kaiser 1998). In Puget Sound, trawling is presently limited to the Strait of Georgia, the San Juan Islands, and the western Strait of Juan de Fuca. Roller gear, which can enhance the ability of trawls to fish on rocky habitats, is prohibited in Puget Sound. The extent of habitat disruption by bottom trawling in Puget Sound is not clear, but it is thought to be minimal (Bargmann et al., 1985).

The likely impact of large scale habitat disruption for rockfish in Puget Sound is low at present. However, localized habitat degradation may be impacting rockfish stocks.

2.8.3 Derelict Fishing Gear

Abandoned or lost fishing gear, especially gillnets, used for fishing for salmon and marine species is a threat to rockfish. Lost nets used for salmon fishing or trawling are distributed throughout Puget Sound. These nets have either become entangled on rocky habitats or obstructions, or cut loose to sink to the seafloor. Up to 61,000 rockfish may be caught in this derelict fishing gear per year (Palsson et al., 2009); a magnitude of mortality greater than, or comparable to, recent annual recreational harvests and bycatch of rockfish in Puget Sound. Based upon the documented extent of derelict gear on rockfish mortality, food webs, and habitats, there is a high risk to rockfish populations by derelict fishing gear in Puget Sound.

2.8.4 Climate Change

The survival and recruitment of marine fish, including rockfish, may be affected by climate-related oceanic conditions. The oceanography of Puget Sound and adjacent coastal waters are interlinked and affected by patterns that operate on seasonal, annual, decadal, and intermittent scales. Already, an increase in sea surface temperature of 1.7^{o} Centigrade has been detected at Race Rocks (near Victoria, British Columbia) since the early 1970s (Mantua et al., 2007). Potential climatic patterns that affect biological processes include upwelling (Hsieh et al., 1995), changes in water currents, upwelling and temperatures such as the Pacific Decadal Oscillations (Ebbesmeyer et al., 1991, Hare and Mantua 2000), El Niño or Southern Oscillation events (Pearcy and Schoener 1987, Newton 1995), droughts (Newton et al., 2003), and climate change (Mantua et al., 2007). If waters become warmer due to climate change, one logical expectation is that species from warmer southern waters may invade Puget Sound while cold-tolerant species may become less common due to differential recruitment and mortality, advection of recruits, or even direct movement of adults (Mantua et al., 2007). Projected alterations in Puget Sound due to climate change during the 21st century are (PSAT 2005):

- Continued increases in water temperature.
- Continued alteration of river flows.
- Accelerated rates of sea level rise.
- Loss of nearshore habitat.
- Increased likelihood of algal blooms.
- Increased likelihood of low oxygen conditions in bottom waters.

Another change projected to be caused by changing climate is increased levels of carbon dioxide in the water of Puget Sound. This increased level will change the pH of the water to make it more acidic. Changes in pH are likely to have a smaller impact of fish than on invertebrates, but studies have indicated changes in pH can alter the physiology, metabolism, and reproductive biology of fish (Rijnsdorp et al., 2009) with changes in egg fertilization and survival of early life stages being most affected (Ishimatsu et al., 2005).

In addition, the ecosystem and food web of rockfish in Puget Sound may change in an unknown manner as primary and secondary productivity changes due to changes in the physiological rate of species, the availability of nutrients, changes in species composition of zooplankton, and increase in wind speeds (Rijnsdorp et al., 2009)

How climatic changes directly affect rockfish in Puget Sound is unclear, but biological effects of climate change can affect the year-to-year success of reproduction for rockfish, other bottomfish, and salmonids. For example, successful year classes for different rockfish appear to be linked to warm, intermediate, and cold oceanographic conditions (Hollowed et al., 1987, Hollowed and Wooster 1995). Moser et al., (2000) found that juvenile rockfish abundance of several species was negatively correlated with warm water and El Niño events in the California current system. Major perturbations

have been observed with many extreme El Niños affecting the northeastern Pacific (Pearcy and Schoener 1987). A common pattern of rockfish recruitment, observed along the West Coast, is infrequent and irregular years of successful recruitment with many years of poor recruitment (Parker et al., 2000). The synchronous recruitment event of 2006 in Puget Sound observed for copper and quillback rockfish in South Sound and black and yellowtail rockfish in North Sound (LeClair et al., 2007), suggests rockfish productivity is affected by sporadic recruitment events, which are likely related to broad-scale climatic events. Many rockfish species along the West Coast exhibit sporadic recruitment over many decades (Hollowed et al., 1987, Moser et al., 2000). Synchrony of rockfish recruitment in the California Current System appears to predominate on coast-wide rather than smaller regional scales, suggesting that large-scale climatic factors are affecting rockfish recruitment (Field and Ralston 2005). In contrast, different California regions can show different patterns in catch per unit effort for rockfish in response to El Niño conditions (Bennett et al., 2004). For example, as El Niño conditions developed, or as ocean climate turned warm after 1977, catch rates for rockfish declined in southern California and increased in the north.

A limited amount of information indicates that fishing may increase a species' sensitivity to the effects of climate change. Heavily fished stocks of cod in the Atlantic, which are at low levels of abundance, show a strong link between water temperature and recruitment. However this link was weak or non-existent in earlier years when the stock was larger (Rijnsdorp et al., 2009).

A recent survey of potential impacts of climate change in fish populations (Rijnsdorp et al., 2009) hypothesized that:

- Populations at the limits of the latitudinal ranges will exhibit a stronger response than those occurring at the center of their range.
- Northerly species at the southern limits of the distribution will decrease in abundance and southerly species will increase at their northerly limits.
- Deep water species will be less affected by climate change than shallower species.
- Fish species with narrow dietary preferences will be more sensitive to climate change than generalists.
- Species with restricted habitat requirements will be more sensitive to climate change than those with less specific habitat requirements.

Overall, how climate change will affect rockfish in Puget Sound is unknown. A recent study of climate change by the University of Washington concluded that profound changes have occurred in the Puget Sound environment over the past century and that the next several decades will see even more changes (Snover et al., 2005). Projected changes that could impact rockfish include increases in water temperature, flooding, lowering of pH, accelerated rates of sea level rise, loss of nearshore habitat, changes in plankton, and increased likelihood of algae blooms and low levels of dissolved oxygen. Each of these potential changes could adversely impact rockfish populations in Puget Sound, but at present the known impact on rockfish is low.

None of these hypothesized impacts of climate change have yet been observed in rockfish in Puget Sound, so they remain hypothetical. However changes due to climate change, if they do occur, may be abrupt (Rijnsdorp et al., 2009).

2.8.5 Water Quality

Throughout most of Puget Sound, the water quality (temperature, salinity, dissolved oxygen) is suitable for rockfish survival and growth. Most waters of Puget Sound are classified as "Excellent" by the Department of Ecology, with Hood Canal remaining a glaring exception. Other areas including Budd Inlet, Discovery Bay, and Penn Cove, may have waters that limit fish populations, especially due to warm summer temperatures.

2.8.5.1 Water Quality- Hypoxia

In Hood Canal, persistent and increasing areas of low levels of dissolved oxygen (hypoxia) have been noted during the past decade (Newton et al., 1995, 2005, Warner et al., 2002). This exposure to low oxygen results in abnormal behavior by rockfish in Hood Canal. For instance, rockfish avoid waters with less than 2 mg/L of oxygen by moving to nearshore, shallow waters less than 9 meters (20 feet) in depth (Palsson et al., 2008). In some years, extreme hypoxia results in massive fish kills in Hood Canal (Palsson et al., 2008). In 2003, hypoxia resulted in a 26% direct mortality of the copper rockfish at the Sund Rock Conservation Area (Palsson et al., 2008). In addition to mortality, rockfish exposed to low levels of dissolved oxygen may experience decreased growth rates and decreased reproductive success.

Overall, the impact of hypoxia represents a moderate risk to rockfish at present, but the risk appears to be increasing. The impact of hypoxia on rockfish is greatest in Hood Canal.

2.8.5.2 Water Quality- Changes in Nutrients

Nutrients are chemical compounds needed by organisms for metabolism, growth, and other functions. Nutrients in Puget Sound come from rivers, streams, and the Pacific Ocean. Humans can add nutrients to the waters of Puget Sound through sources such as sewage, agricultural runoff, and storm water (Paulson et al., 2006). The nutrients are not utilized directly by rockfish, but could impact rockfish populations indirectly. The addition of relatively small amounts of nutrients could increase rockfish prey such as crustaceans, which feed on the organic material while the addition of larger amounts could reduce water quality by causing hypoxia. The addition of nutrients can stimulate the growth of algae during the summer months through a process called eutrophication. The algae dies, sinks to the bottom and decomposes, a process that utilizes dissolved oxygen. Therefore, increased levels of nutrients may lead to lower levels of dissolved oxygen in places such as Hood Canal. Increased nutrients from septic systems may be exacerbating naturally-caused hypoxia in Hood Canal (Newton et al., 2007), and this

human source, as well as natural sources of nitrogen, may be causing the hypoxia that adversely affects rockfish populations (Palsson et al., 2008).

There is a lack of long-term monitoring information for nutrients in Puget Sound. The Puget Sound Action Team (PSAT 2002) identified several water bodies that are susceptible to eutrophication including portions of the Whidbey Basin, Sinclair Inlet, southern Hood Canal, and portions of southern Puget Sound. In addition, several freshwater sources have high concentrations of total nitrogen and phosphorus including Skagit Bay, the Puyallup River, and the Deschutes River in Olympia. This risk is judged to be low.

2.8.5.3 Water Quality- Chemical Contamination

Risks to rockfish health associated with their exposure to toxic contaminants can occur at all life history stages where the pollutants occur. Demersal adults and juveniles, and pelagic larvae and juveniles can all be exposed to a wide range of toxic contaminants in their habitat. Larvae, in particular, face unique additional risks associated with maternal transfer of toxics via the nutrients they receive during gestation.

Many rockfish are long-lived and exhibit relatively strong site fidelity and high trophic position as adults. These factors increase the risk of exposure to persistent bioaccumulative toxics (PBTs) for populations that reside in contaminated habitats. Demersal rockfishes in urban or industrialized areas have exhibited some of the highest tissue concentrations of mercury, PCBs, and DDTs of any species monitored in Puget Sound (West et al., 2001). On a larger spatial scale, rockfishes residing in southern Puget Sound may experience greater exposure than populations in other Puget Sound Basins because Pacific herring, an important rockfish prey, exhibit unusually high levels of PBTs in the South Puget Sound Region (West et al., 2008).

PBT exposure may affect rockfish growth in Puget Sound. Male quillback rockfish exhibit a lower growth rate than females in Elliott Bay, a pattern that is unique to that urban location, compared to samples from 98 other locations in Central Puget Sound, Admiralty Inlet, Georgia Basin, and the Strait of Juan de Fuca (personal communication, Jim West, WDFW). This unique sex-specific disparity in growth pattern correlates with higher levels of toxics that accumulate in male rockfish in Elliott Bay (females can “depurate” their PBTs to their developing embryos).

Impairment of rockfish reproduction may occur when PBTs are maternally transferred to developing embryos. Rockfish larvae from urban females are probably born with a pre-existing body burden of PCBs, thereby increasing the risk that fitness of this sensitive life stage is compromised. In addition, English sole (*Parophrys vetulus*) studies suggest that exposure to certain pollutants may cause feminization of males and unusual spawn timing in females (Johnson et al., 2008) of benthic species living in contaminated habitats.

The contribution of rockfish living in urban, contaminated areas to the full reproductive output of all Puget Sound populations is unknown and needs to be quantified. For some rockfish species, the oldest individuals are typically found in urbanized habitats. Such areas may act as *de facto* refuges, because it is either difficult to fish the habitats (e.g., habitats near ferry lanes) or access is restricted to fishers (i.e., at military bases like Sinclair Inlet's Puget Sound Naval Shipyard). The greatest pollutant-related risks to the conservation and recovery of rockfish in Puget Sound relate to reproductive dysfunction of rockfish populations due to exposure to contaminants. At present, this risk is judged to be moderate due to its localized impacts.

2.8.6 Species Interactions

Rockfish have naturally evolved to persist and thrive in the presence of other species in Puget Sound. However, the perturbations in community structure caused by fishing, habitat alteration, and other stressors may negatively affect or create an imbalance in the natural structure of marine communities. This impact has not been demonstrated in Puget Sound and the risk is judged to be low.

2.8.7 Food Web Dynamics

Rockfish function as both predators and prey in the complex food web of Puget Sound. Some of these linkages have been examined through diet studies, and only recently are food web interactions for rockfish and other species in Puget Sound (PSP 2008) being integrated into a conceptual and quantitative model of food web structure. Simenstad *et al*. (1979) identified copper rockfish as an important carnivore of rocky, subtidal habitats in northern Puget Sound.

Harbor seals are year-round residents of Puget Sound, whose population has expanded greatly since the 1970s, increasing from a few hundred to over 12,000 in 1999 (Schmitt et al., 1995, Jefferies et al., 2003) and 14,000 recently (PSAT 2007). There are indications that the growth rate of the seal population is decreasing, and that the population may be reaching its maximum carrying capacity in Puget Sound (Jefferies et al., 2003). The average weight of harbor seals in Puget Sound is approximately 63 kg (140 pounds) and daily food consumption rates are approximately 4% of body weight (Schmitt et al., 1995). Based on these numbers, the estimated consumption of food by harbor seals in Puget Sound is approximately 28 million pounds (12,700 mt) annually. There is insufficient information to directly estimate the annual consumption of rockfish by harbor seals. In the San Juan Islands, where there are approximately 7,000 seals, rockfish occurred in 12% of seal diets annually and 23% during the winter (Lance and Jeffries 2007). However, these statistics were based upon the frequency of occurrence and not weight. They also could not distinguish species of rockfish, but found that most were subadult or ages 1 or 2. The possibility remains that these younger rockfish may have been the numerous Puget Sound rockfish that area abundant in the San Juan Islands. Lance and Jefferies (2007) concluded that the consumption patterns of seals may have an important impact on reduced stocks of rockfish in the San Juans. These estimates cannot be applied to other regions where rockfish are not as abundant. In

Hood Canal and southern British Columbia, rockfish comprised 1% or less of seal diets (Olesiuk 1993, London et al., 2002).

Like harbor seals, California sea lions have not been common until recently in Puget Sound (PSAT 2007). The first large aggregation was observed in 1979. Since then, the abundance of California sea lions has been in the hundreds and occasionally over 1,000 animals (Schmitt et al., 1995). California sea lions are seasonal migrants in Puget Sound, occurring primarily from September through June. The average weight per animal is between 180 and 277 kg (450 to 700 pounds). Antonelis and Perez (1984) estimated daily food consumption to be 5 to 10 percent of their body weight. Therefore, a 225 kg (500-pound) California sea lion would eat 11 to 23 kg (25 to 50 pounds) per day. In a review of predation by marine mammals in Puget Sound, no evidence was found of a significant consumption of rockfish by California sea lions (Schmitt et al., 1995). However, because California sea lions consume rockfish off California, the observed lack of rockfish in the diet of California sea lions in Puget Sound may reflect low rockfish abundance, or poor seasonal and geographic data on California sea lion diets. The great numbers of harbor seals and some aggregations of sea lions in Puget Sound may result in significant natural morality of depleted rockfish stocks.

Consumption of rockfish by orca whales in Puget Sound is thought to be a rare event and the impact is likely low, even at low levels of rockfish abundance (Palsson et al., 2009).

Steller sea lions inhabit Puget Sound, especially in the entrance waters at Tatoosh Island and in the San Juan Islands, where dozens are present during the spring (S. Jeffries, WDFW, personal communication). Steller sea lions have increased in abundance in the northern portion of the western United States; currently, 800 to 1,000 animals inhabit northern Puget Sound during the fall and winter months (PSAT 2007). The impact of these large mammals on rockfish is unknown. In the San Juan Islands, rockfish occurred in 8.3% of Steller sea lion scats (Lance and Jeffries 2007).

Rockfish are an important prey for several species of marine birds. Juvenile rockfish can be especially important for birds feeding their young. There has been no known increase in populations of marine birds that would likely affect rockfish stocks, and several species of marine birds are in decline in Puget Sound (PSAT 2002).

Rockfish, especially juvenile rockfish, are important prey for lingcod and may even be their primary food (Matthews 1987, Beaudreau and Essington 2007). Abundances of lingcod was low in Puget Sound prior to the mid 1990s but has increased in recent years (PSAT 2007), suggesting that lingcod may have an increasing negative effect on rockfish abundance. In marine reserves, lingcod may cause a “tropic cascade” which changes the structure of the marine fish community (Salomon 2002, Salomon et al., 2002). The high densities of lingcod observed in the long-term marine reserves in Puget Sound may reduce the abundance of rockfish through predation upon adult and juvenile rockfish (Palsson et al., 2004). Rockfish were three times more likely to occur

in the diets of lingcod captured from marine reserves in the San Juan Islands than from fished areas (Beaudreau and Essington 2007). Therefore, increased abundances of lingcod and management practices promoting lingcod conservation may impact the abundance and recovery of rockfish stocks in Puget Sound.

The likely importance of predation limiting rockfish stocks in Puget Sound is moderate.

2.8.8 Competition

Rockfish have been shown to have competitive interactions, or to partition their environment to avoid competition with other rockfish species (Larson 1980, Hallacher and Roberts 1985). In southern Puget Sound, the increase in brown rockfish may be a result of the removal of the larger copper and quillback rockfish by the fishery, allowing for brown rockfish to invade an open niche. The impacts of competition may also be exacerbated or caused by the availability of prey. The present known impact of competition on rockfish stocks is low.

2.8.9 Hatchery Practices

West (1997) suggested that a potential stress to rockfish in Puget Sound was predation of larval and juvenile rockfish by "delayed-release," hatchery-reared salmon. Delayed-release salmon are Chinook salmon and coho salmon which have been held longer in hatcheries or net pens, so they are less likely to migrate to sea and more likely to remain in Puget Sound. Since Chinook and coho salmon consume rockfish, especially in the larval and juvenile stage (Buckley 1997), releases of larger hatchery salmon may impede the productivity of rockfish stocks in Puget Sound (West 1997). The number of delayed release salmon released into Puget Sound averaged 21.2 million fish annually from 1983 to 2001 and has declined by over 33% since. Hatchery releases of salmon into Puget Sound increased by a factor of four between 1972 and 1990 (Palsson et al., 2009). The number of hatchery-released salmon declined from a peak of 8.5 million in 1990 to 4 million salmon in 2005. Overall, there is a lack of information on the direct impacts of hatchery releases on rockfish stocks in Puget Sound and the risk is judged to be low.

2.8.10 Disease

Rockfish are susceptible to diseases and parasites (Love et al., 2002), but the effect on rockfish populations in Puget Sound is not known. Extensive scale loss has occurred on individuals living in high densities or in poor water quality. Sub-adult quillback rockfish living on the Boeing Creek Artificial Reef had a disease causing scale loss attributed to a protozoan parasite (W. Palsson, WDFW, unpublished data). Copper rockfish concentrated in dense schools during events of low dissolved oxygen in Hood Canal had extensive scale loss (W. Palsson, WDFW, unpublished data). Conboy and Speare (2002) found the eggs of a nematode infesting rockfish in a British Columbia fish market, but the pathology to the fish was not known. A wide variety of parasites and diseases affect rockfish (Love et al., 2002) and stress, such as in Hood Canal during

low dissolved oxygen events, may exacerbate the incidence and severity of naturally occurring diseases to the point of sub-lethal or lethal effects.

Overall, diseases are likely naturally occurring and pose a low risk impact to rockfish stocks in Puget Sound.

2.8.11 Genetic Change

Fishing can alter the genetic characteristics of fish populations by lowering genetic diversity and by artificial selection (Kenchington 2003). Fishing can artificially select larger and typically faster growing individuals thus promoting the survival of individuals with slower growth rates (Biro and Post 2008). Overall population growth rates may decrease, and other effects such as smaller size at maturity, smaller size at age, and smaller maximum sizes can occur (Law 2000).

The impacts of genetic change are likely subtle and need at least 30 generations to be expressed for long-lived rockfish. Thus, it may require several hundred years to identify any genetic changes. However, genetic change may be exacerbated when population sizes are low or naturally limited. Demonstrated genetic threats are lacking, and the impacts of genetic change to rockfish stocks are low.

Chapter 3 Alternatives and Analysis

3.1 Overview

WAC 197-11-444 provides a comprehensive list of subjects that must be considered in this analysis with the caveat that the EIS must only study the elements that apply to this proposal. The alternatives introduced in section 1.1.2 of this Programmatic DEIS for the Puget Sound Rockfish Conservation Plan have been examined in the context of WAC 197-11-144 and found not to have a likely significant adverse impact to the environment except for the following two elements:

1) Plants and Animals - Habitat for and numbers or diversity of species of plants, fish, or other wildlife, unique species and fish or wildlife migration routes.
2) Land and Shorelines Use – Recreation.

3.2 Analysis of Alternatives to the Suggested Policy

This section provides an analysis of reasonable alternatives to each of the eight major policy areas proposed in the PSRCP. The alternatives are evaluated on their potential impact on stocks of rockfish in Puget Sound. The concept of stock is important or evaluating the success of the plan.

3.2.1 Affected Environment

The affected environment for all of the policy options and alternatives includes all of Puget Sound east of the Sekiu River that is utilized by larval, juvenile, and adult rockfish. The environment includes the water column, intertidal and subtidal substrate, aquatic vegetation, and animals that feed on rockfish or provide food for rockfish. The human environment is included as well: fishing; habitat alteration, pollution, and construction activities.

3.3 Alternatives

The PSRCP proposes eight areas of policy action to achieve the goals. As described in Chapter 1 of this document, we developed a range of four alternatives for each of the action areas. These alternatives are described in Table 3.

The PSRCP relies heavily on the concept of “indicator” species in many of the policy elements. As explained in the Plan, an indicator species is a species of rockfish which will receive heightened monitoring and management attention and will serve an a proxy for the other species which were not selected as an indicator species. A total of eight species of rockfish are proposed to serve as indicator species. Each of the indicator species will serve as proxy for more than one other species. The choice to use indicator species in certain circumstances is based on the cost and technical difficulties associated with attempting to actively manage every species of rockfish in Puget

Sound, some of which are uncommon. The use of indicator species generally increases the environmental risk associated with this Plan. The use of indicator species concept does not add any risk to the indicator species but rather increases the risk to non-indicator species. A critical assumption implicit in the use of indicator species is that the indicator species do indeed serve as accurate proxies for the non-indicator species. If not, the risk to non-indicator species could be great and stocks could decline without the declines being detected by management. For the indicator species concept to function as intended, it is critical that non-indicator species receive some level of management attention and monitoring so that declines in population can be detected and that the assumption that the indicator species serves as a proxy is verified.

Climate change has the potential to alter the environment experienced by rockfish in Puget Sound. While the possible effects are many and varied, an approach to dealing with the effects of climate change was developed by the Puget Sound Action Team in 2005, and the draft PSRCP incorporates all of the suggested approaches (Table 10).

Table 10. Suggested approaches to preparing for climate change climate change.

SUGGESTED APPROACH (PSAT 2005)	PSRCP POLICY ELEMENT
Recognize the past may not be a dependable guide to the future	-Monitoring, Evaluation and Adaptive Management -Research
Take actions to increase the adaptability to the ecosystem to change	-Monitoring, Evaluation and Adaptive Management -Habitat Protection and Restoration
Monitor climate and ecosystem for ongoing change	-Monitoring, Evaluation and Adaptive Management -Research
Expect surprises and design for flexibility to changing conditions	-Monitoring, Evaluation and Adaptive Management -Research

3.3.1 Natural Production

The goal of the PSRCP to restore and maintain the abundance, diversity, and productivity of rockfish implies that stocks of wild rockfish will be maintained or restored to a healthy condition. By wild, we mean naturally produced rockfish regardless of parentage. By healthy, we mean rockfish stocks that have sufficient abundance, productivity age, and spatial diversity to maintain populations through environmental fluctuations, climate change, and prolonged periods of low reproductive success. Since many stocks of rockfish are at low levels of abundance with a scarcity of larger fish, realizing these goals will translate into higher numbers of rockfish with an increase in larger fish.

There are several potential environmental impacts if these goals are achieved. Increased numbers of rockfish and more, larger fish will mean increased demand and competition with other predators for forage. This increased demand could result in increased natural mortality rates for herring, shrimp, and other food items. Conversely increased populations of rockfish, especially younger, smaller individuals will act to increase the forage base of Puget Sound, because many other species, including birds and marine mammals, feed on rockfish.

While the goals of using natural production will act to increase the number of rockfish present in Puget Sound, we do not plan to utilize natural production to create unnaturally high populations of rockfish. Thus the environmental impact is predicted to remain at, or less than, historical levels of rockfish abundance.

Alternative 1 (Most Conservative):

Rockfish management shall place the highest priority on the protection and restoration of the natural production of all rockfishes to healthy levels.

All rockfish species will be managed in an ecosystem context that considers the natural capacity of a population to sustain itself in relation to food web dynamics, targeted and bycatch fishery removals, other human induced stressors and limiting factors, and climatic factors. Stocks will be managed to assure intact genetic structure, sustainable production, age diversity, and ecosystem services. The management of other marine species will consider fishery, habitat, population, and other impacts on the integrity and sustainability of natural rockfish populations.

Alternative 2 (Conservative): Preferred Option

Rockfish management shall place the highest priority on the protection and restoration of the natural production of indicator rockfishes to healthy levels.

All fishery and ecosystem management protects and recovers indicator rockfish species to healthy levels and considers the management and ecosystem impacts of other marine species.

This alternative has a narrower scope than Alternative 1 in that it limits activities to indicator species of rockfish rather than all species. Only indicator species will be managed in an ecosystem context that considers the natural capacity of a population to sustain itself in relation to food web dynamics, targeted and bycatch fishery removals, other human-induced stressors and limiting factors, and climatic factors. Stocks will be managed to assure intact genetic structure, sustainable production, age diversity, and ecosystem services. The management of other marine species will consider fishery, habitat, population, and other impacts on the integrity and sustainability of natural rockfish populations of indicator species.

Alternative 3 (No Action):

Limited priority is placed on protecting the natural production of some rockfish stocks.

Natural production of rockfish will be considered as a complex of species, rather than individual species, with attention to those species commonly harvested in recreational fisheries (i.e., copper, quillback, brown, and black rockfish).

Alternative 4 (Least Conservative):

All rockfishes will be managed passively, with little or no consideration to the natural production of any stocks of rockfish.

This option substantially increases the risk to rockfish. Adoption of this alternative would result in rockfish being managed without consideration to other components of the Puget Sound ecosystem. Little or no management activity to protect rockfish would occur.

3.3.2 Habitat Protection and Restoration

The management intent of this proposal is to protect and restore habitat important to rockfish. Habitat could be protected by enforcing existing rules and creating new rules encouraging other agencies (state, federal, local and tribal) to do the same. Research and surveys could be conducted to identify and protect rockfish habitat. Restoration could be accomplished by physical projects to improve the functioning of existing but degraded habitat, or new habitat which mimics natural habitat could be constructed. These projects could have a wide variety of approaches. Examples include removing derelict nets that are located on rocky reefs, improving water quality by removal of contaminants, minimizing habitat damage caused by fishing, restoring degraded vegetation beds, removing invasive species, and improving levels of dissolved oxygen.

As is the case with other options discussed in this document, the intent is to restore and maintain rockfish habitat to natural levels. This means that rockfish populations on protected and restored habitats will likely not exceed historical levels.

Protecting existing habitat means continued recreational opportunities for rockfish, both consumptive and non-consumptive. As degraded habitat is restored, recreational opportunities should increase as well.

Because this DEIS addresses a non-project activity, specific restoration proposals are not addressed. Any such proposal would be addressed separately as the details are developed, with reference to this plan and EIS as appropriate (WAC 197-11-442).

Under the hydraulic code (WAC 220-110), WDFW has the authority to regulate construction in marine waters of Puget Sound, including all rockfish habitat. The code, commonly referred as “HPA” (hydraulic project approval), is designed to protect fish life by regulating certain activities. While not designed specifically for rockfish, the code identifies three rockfish habitats of special concern (WAC 220-110-250):

Rockfish settlement and nursery areas
Eelgrass meadows
Kelp beds

However, the HPA code does not emphasize rocky marine habitat, the habitat type most commonly associated with rockfish in Puget Sound.

Alternative 1 (Most Conservative): Preferred Option
Protect and restore all marine habitats types for all rockfish species.

This alternative provides the maximum habitat protection to all fish and wildlife species. Restoring rockfish habitat will provide benefits to other animals because the restored and protected habitat will improve their habitats as well. Of all the alternatives, this one places greatest emphasis on restoration. Activities under this alternative include: 1) increased regulatory authority; 2) partnerships with other agencies which can influence rockfish habitat; and 3) active on-the-ground projects within the authority of WDFW to restore habitat.

Alternative 2 (Conservative):
Protect and restore rocky habitats for indicator rockfish species.

The intent of this alternative is to protect and restore rock habitats for indicator rockfish spaces. It differs from Alternative 1 by limiting efforts to habitats of indicator species and to rocky habitats only**.** This alternative would fully implement and enforce current authorities, and increase participation in effective external conservation processes and encourage other agencies to follow suit.

Alternative 3 (No Action):
Rely primarily rely on the HPA process to protect priority rockfish habitats and conduct opportunistic activities to protect rockfish habitats. No activities to restore habitat will be conducted.

This alternative would seek to protect habitat through the current HPA process, and maintain involvement in state and federal protection and restoration processes. Compared to Alternatives 1 and 2, this option places more emphasis on protecting existing habitat. Restoration may occur but at a lower priority and scope. Instead, emphasis will be placed on protecting existing habitat through the regulatory process. The impacts on fish and wildlife will be to maintain current levels or show slight improvement.

Existing HPA authority would be utilized to evaluate proposed construction projects for their impact on rockfish. Existing staff would continue to evaluate habitat requirements for rockfish and suggest modifications to the HPA code as needed to provide additional protection.

Alternative 4 (Least Conservative):
Rely entirely on the HPA process to protect rockfish habitats. No new or expanded activities will be conducted to protect rockfish habitat. No activities to restore habitat will be conducted.

Existing HPA authority would be utilized to evaluate proposed construction projects for their impact on rockfish.

3.3.3 Fishery Management

Past fishing practices have been a major stressor affecting the abundance and size structure of rockfish stocks. Harvest levels have decreased in recent years, but fishing remains a risk to rockfish. Establishing proper harvest controls will greatly strengthen conservation and restoration efforts. Rockfish fishery management is complicated because of the widespread distribution of most rockfish species in Puget Sound, the high rates of mortality of released fish, the co-occurrence of many species, the limited ability of anglers to distinguish one species from another, and the large number of fishing gears which can unintentionally capture and kill rockfish.

Alternative 1 (Most Conservative): Preferred Option
All fisheries in Puget Sound will be managed to ensure the health and productivity of all rockfish stocks.

This alternative will provide the greatest benefit to rockfish because all stocks of rockfish will be considered in management decisions. All fisheries will be analyzed for their potential impact on rockfish stocks. Fishing opportunities for species other than rockfish (i.e., salmon, lingcod, and halibut) may be limited or modified to reduce or eliminate their impact on rockfish. For example, lingcod fishing may be prohibited or restricted in areas or depths with high potential to encounter yelloweye or silvergray rockfish. Because some species of rockfish may be infrequently encountered, management precision may be low.

The initial impact on recreational fishing and recreation could be negative and substantial. Substantial numbers of rockfish are caught in fisheries for other species. Some of these species are in need of stock rebuilding and the fisheries may be constrained to keep meet rebuilding needs. These constraints could include reducing fishing seasons, restricting fishing areas, and changing allowable fishing gear (i.e., minimum hook sizes for angling).

Alternative 2 (Conservative):
All fisheries in Puget Sound marine waters will be managed to ensure the health and productivity of indicator rockfish stocks.

This alternative differs from the first alternative in that only indicator stocks of rockfish will be considered in management decisions. When fisheries are examined for their potential impact on rockfish, the analysis will consider only the indicator species. In comparison to the example given in the first alternative, lingcod fishing will be examined for potential bycatch of yelloweye rockfish but not silvergray rockfish because the latter is not an indicator species.

This alternative will provide less protection to rockfish in that only indicator species will be considered, but it will have a reduced negative impact on recreational fishing for the same reason. This alternative will have a positive impact on rockfish populations, but less than the first alternative. The initial impact on recreational angling will likely be negative as fishing opportunities are constrained. However, the long-term impact on recreational activity could be positive compared to the third and fourth alternatives.

Alternative 3 (No Action):
Some fisheries for bottomfish in Puget Sound waters will be managed to ensure the health and productivity of some rockfish stocks.

Fisheries for bottomfish will be examined for their impact on rockfish populations and conservation. For example, recreational fishing for salmon will not be modified to help meet rockfish conservation goals. The positive impact on rockfish will be much less than the impact of the first two alternatives. The initial impact on recreational fishing will be minor but could be substantially major and negative in the future if rockfish populations do not respond favorably to the PSCRP.

Alternative 4 (Least Conservative):
All fisheries in Puget Sound waters will be passively managed with respect to the status of rockfish stocks.

This alternative provides limited positive benefit to fish populations. Fishing seasons, areas, and gear specifications would be set without regard to conservation needs of rockfish. Instead, fishing would be allowed to continue uninterrupted. There is no benefit to rockfish under this alternative. While recreational fishing initially would be restricted, and may even see increased fishing opportunities, the long-term prediction is that the impact would be negative for the same reasons listed in Alternative 3.

This alternative substantially increases the risk to rockfish by minimizing fishery management. Past fisheries have been identified as a high level stressor for rockfish and this alternative does not address the stressor.

3.3.4 Ecosystem

Rockfish, as a group, occur throughout Puget Sound and provide a vital component of the food web in the Sound. Rockfish are major consumers of other fish and invertebrates and, in turn, provide food to a variety of other fish species, marine mammals, and birds. Changes in rockfish abundance could have important effects throughout the food web in varied ways. For example, declines in abundance of juvenile rockfish could mean less food for other animals while decline in the abundance of larger rockfish could mean a lower rate of predation on other species.

Understanding the dynamics of food webs is difficult in Puget Sound (and in all other marine waters). This understanding requires detailed knowledge of food consumption patterns as well as understanding of biology and physiology of many types of

organisms. At present, the Puget Sound Partnership and NOAA-Fisheries are developing an ecosystem model of portions of Puget Sound (Levin et al., 2009). At this time we conclude that insufficient information currently exists to manipulate rockfish populations in Puget Sound or the populations of other animals with the intent to restore ecosystem functions of rockfish. Efforts may be made to obtain additional information in this category, but would be conducted under the Research category (3.3.6).

The ecosystem functions of rockfish are largely unquantified. Since the functioning of healthy rockfish populations is largely undefined, it is not possible to chart a path to restore such functions or to know when they have been restored.

Efforts to restore all rockfish populations to healthy levels provide the best way to achieve proper ecosystem functioning with Puget Sound. However, many other species in Puget Sound are not at healthy levels, and restoration of rockfish species alone will not assure a healthy functioning ecosystem.

Alternative 1 (Most Conservative):
Protect existing functions of all rockfishes and conduct activities to restore the functions of all rockfishes in the ecosystem and food web in Puget Sound.

This alternative would seek to maintain or restore food web dynamics (e.g., predator-prey relationships). This may involve increasing or decreasing rockfish populations in attempts to meet forage requirements of other animals or to reduce predation. At this point, insufficient knowledge exists to accomplish these goals and there is a danger of unintended consequences of such effort.

Alternative 2 (Conservative): Preferred Option
Protect existing functions of indicator rockfishes and conduct activities to restore the functions of indicator rockfishes in the complex ecosystem and food web in Puget Sound.

This alternative would maintain functioning at present levels or increase the levels of function by increasing populations of rockfish.

Alternative 3 (No Action):
Conduct opportunistic activities to protect and restore the function of some rockfishes in the complex ecosystem and food web in Puget Sound.

A limited number of activities would be conducted, focusing on relationships to determine the proper ecological functioning of rockfish in Puget Sound. This option poses little risk of unintended negative consequences to the ecosystem of Puget Sound, but continues research activities. If these research activities are successful, ecosystem measures could be implemented.

Alternative 4 (Least Conservative):
The ecosystem functions of rockfishes will not be considered in rockfish management.

Under this alternative there is no direct management of rockfish function in the complex marine ecosystem and food web in Puget Sound. No attempt to maintain or conserve functions would occur. No attempt to gain additional information would occur.

3.3.5 Monitoring, Evaluation and Adaptive Management

Monitoring, evaluation, and adaptive management are the activities required to produce successful management and to judge the success of current management efforts. They are defined as follows:

- Monitoring — collecting data on rockfish catch, abundance, life history characteristics.
- Evaluation — analyzing the data to make inferences on the health of rockfish stocks.
- Adaptive management — making changes in management practices as the result of the monitoring and evaluation to judge the success of current management efforts.

All three activities are required to produce successful management and to judge the success of current management efforts.

Fishery-dependent monitoring means collecting information from various fisheries, both commercial and recreational. Information typically collected includes amount of rockfish caught, the amount of effort required to make that catch, location of catch, and biological data on the catch such as age, length, and sex. The advantage is that information from fishery-dependent monitoring is relatively inexpensive to collect, and the techniques for evaluating the data are well established. However, fishery-dependent monitoring for rockfish may be inaccurate because of changing fishery and management patterns (Palsson et al., 2009).

Fishery-independent monitoring means systematic collection of rockfish data independent of commercial or recreational fishing activities by professionals or trained observers. These surveys generally consist of measuring the density of rockfish (number per unit of area) at selected locations. These surveys can be conducted by divers, use of electronic equipment, or use of scientific sampling devices. Certain types of fishery-independent data can be relatively expensive to collect, thus limiting the number of surveys that can be conducted. Additionally, some types of fishery-independent monitoring involve mortality of fish collected during the monitoring. However, the results can be precise and free of potential bias.

Alternative 1 (Most Conservative):
Conduct monitoring, evaluation and management of all rockfish stocks to provide the basis to evaluate stock status and the success of management actions.

Some populations of rockfish are small and have always been so. Monitoring of small rockfish populations will be difficult and expensive. Additionally the ability to scientifically detect changes in population size or diversity will be very limited. This alternative has the greatest benefit to rockfish and associated animals because population changes in any population will be rapidly detected and adaptive management utilized. This alternative addresses the risk of climate change on rockfish. By monitoring stocks of all rockfish in Puget Sound, we increase the likelihood of detecting climate changes on non-indicator species

Alternative 2 (Conservative): Preferred Option
Conduct monitoring, evaluation and management of indicator stocks to provide the basis to evaluate stock status and success of management activities.

As the indicator stocks are most commonly encountered in fisheries and fishing is judged to be the greatest threat to rockfish, limiting monitoring and evaluation to indicator stocks will likely increase the benefit to the indicator stocks at a lower cost than Alternative 1. However, risks to stocks other than indicator stocks will be increased. This alternative contains considerable more risk to non-indicator stocks of rockfish due to the effects of climate change. These non-indicator stocks will receive no or little monitoring which will decrease the likelihood of detecting possible changes in non-indicator stocks. For this alternative to be successful, it is important that the assumption that changes in indicator stocks will reflect changes in non-indicator stocks as well is critical.

Alternative 3 (No Action):
Some rockfish stocks will be monitored, primarily by using fishery dependent with some fishery-independent information.

Monitoring will be limited to fisheries important to recreational fisheries. Both fishery independent and fishery dependent monitoring will occur. Monitoring will be largely fishery-dependent means with some fishery- independent monitoring occurring. This technique will pose risk to all rockfish stocks and limit the ability of management agencies to respond to changes in population or diversity.

Alternative 4 (Least Conservative):
Some rockfish stocks will be monitored using only fishery dependent information.

This option poses the greatest risk to rockfish. Limiting monitoring to fishery dependent means will decrease the cost of monitoring but increase the risk to rockfish. Fishery-dependent monitoring is not sensitive to changes in rockfish populations and may mask declines in abundance of rockfish. The ability of management agencies to respond to changing rockfish population will be severely curtailed.

Alternative 4 increases the risk to rockfish over the status quo. Fishery dependent information often is not sensitive to changes in fish populations. Relying entirely on fishery dependent methods to assess rockfish stocks will degrade the ability to detect

changes in the stocks. This will be especially true when fisheries are greatly reduced or regulations changed. Changing regulations can degrade fishery dependent information and will limit the useful of data collected over several years.

3.3.6 Research

Research consists of collecting data relating to rockfish fisheries and the rockfish resources within Puget Sound, analyzing the data, drawing conclusions, and publishing the results. Research may be conducted by WDFW staff acting alone or in collaboration with scientists from other state, federal, tribal governments, non-governmental organizations or universities. As is the case with monitoring (3.3.5) there are two general categories of research: fishery-dependent and fishery-independent. However, research differs from monitoring by addressing problems and developing solutions. Monitoring serves to evaluate the success of the solutions.

Research can address a wide variety of topics such as determining the impact of climate change on rockfish, developing artificial production techniques, and developing methods to reduce mortality of released rockfish. Research proposed in this plan will be directed to problems of rebuilding rockfish and maintaining healthy populations and habitats.

Alternative 1 (Most Conservative):
Implement new and cooperative research to understand the diversity, biology and productivity of all rockfishes as well as needs for recovery.

Both fishery-dependent and fishery-independent activities will be conducted. This option will provide the most benefit to fish and recreational opportunities. Changes in fish population or environmental quality will be rapidly detected and WDFW will have the ability to respond rapidly. This ability will help lessen the decline in abundance of selected species to minimize the changes of a rockfish stock falling into the vulnerable category and reducing the number of rockfish in the precautionary category as more information is collected.

This will foster the development of sustainable fishing opportunities more than any of the other alternatives.

Alternative 2 (Conservative): Preferred Option
Implement new and cooperative research to understand the diversity, biology, and productivity of indicator rockfishes as well as needs for recovery**.**

This alternative will have less favorable impact to fish and wildlife and to recreation. Research efforts will focus on indicator species but none will be conducted on the other species of rockfish. This will increase the risk that other species will decline to vulnerable status resulting in reduced recreational fishing opportunity for rockfish and other species of fish.

This alternative will foster sustainable fisheries for indicator species of rockfish.

Alternative 3 (No Action):
Conduct rockfish research to examine growth, population structure, and habitat requirements for some rockfish stocks.

Limited research, both fishery-dependent and fishery-independent, will be conducted on a few selected species and will focus on shallow-water rocky habitats for adults only. While providing some information, risk to fish will remain high as many species will be placed in the precautionary category due to lack of information. This could result in decreased or unsustainable fishing opportunities.

Alternative 4 (Least Conservative):
Conduct no research on rockfish; only use information in the existing literature or nearby studies to manage rockfish stocks.

Fishery-independent research only will be conducted, making it difficult to detect changes in abundance or habitat in a timely manner. Only when large changes in fish abundances have occurred or habitat deteriorated will the changes become evident.

3.3.7 Outreach, Education and Ecotourism

The intent of this category of action is to educate Washington residents and others of the special management needs of rockfish in Puget Sound and the present need for strong conservation efforts. The most obvious target group for this education is those who engage in harvest activities in Puget Sound because their activities have a direct link to mortality of rockfish. However, even people who do not fish can contribute to rockfish recovery by altering their personal activities. The purpose of conducting an education effort to the non-fishing public is: 1) emphasize the detrimental impacts of human activity on rockfish; and 2) link their personal actions to the health of Puget Sound and rockfish recovery. Outreach efforts to the fishing public would be directed at collaboratively identifying solutions such as placement of Rockfish Recovery Areas and methods to reduce the mortality rate of released rockfish.

With all alternatives, the short-term impact on fish and wildlife and recreation would be indirect and minimal. We do not envision any education or outreach activities that would harm or kill fish and wildlife or impact recreation opportunities. Rather, the activities would be conducted via WDFW's web site, on printed materials, and through speaking arrangements.

Alternative 1 (Most Conservative): Preferred Option
Conduct a strategic outreach and education program to inform Washington citizens of the value of rockfish stocks and to promote ecotourism.

Efforts would target the entire population of Washington as well as non-residents who visit the state and fish in Puget Sound. Emphasis will be placed on rockfish biology and the connection between individual action and the health of Puget Sound and the impact of individual harvest practices.

Alternative 2 (Conservative):
Conduct a strategic outreach and education program to inform Washington's fishing public of the value of rockfish stocks in Puget Sound.

Efforts would be limited to people who engage in harvest activities and also be limited to the impact of harvest practices on rockfish populations.

Alternative 3 (No Action):
Write occasional popular articles, work with the media, use the rule-making process, and give public presentations on the importance of rockfish stocks.

Scientific and management staff would engage in education and outreach activities only as opportunities arise. Focus would be placed on people who fish in Puget Sound.

Alternative 4 (Least Conservative):
Rely on others to inform the citizens of Washington of the value of rockfish stocks in Puget Sound.

No WDFW staff would be involved in outreach activities. Instead, we would rely on the efforts of other agencies (*e.g.*, the Puget Sound Partnership), magazines, web sites, and interested individuals and organizations). Focus would be on topics chosen by outside groups.

3.3.8 Enhancement (Artificial Habitat and Hatchery Production)

This set of alternatives relies heavily on technology to restore and maintain populations of rockfish in Puget Sound. The two techniques proposed in the PSRCP are hatchery production and creation of artificial habitat.

Hatchery production entails gathering females from the wild and allowing them to produce larvae within a hatchery environment. The young fish would be raised in the hatchery and then released into Puget Sound. Existing Commission Policy (C3611) limits the use of hatchery production of rockfish to research and the restoration of depleted populations. We do not plan to utilize hatchery culture of young rockfish exclusively to provide recreational fishing opportunities. We would utilize rockfish hatcheries only to restore populations to a healthy level. Once populations are restored, the hatchery production would end. Additionally research may be conducted to prepare culture techniques prior to their use. Collection of wild adult rockfish for culture may have a detrimental impact of rockfish populations. Some of the captured fish may die during capture or captivity. This impact is anticipated to be very minor.

An artificial habitat could be constructed to increase the amount of functioning rockfish habitat. Initial new artificial habitat will seek to mimic the functions of rocky substrate as rockfish habitat or vegetated areas and will be used to replace lost or degraded habitat. Construction of artificial habitat will have impacts on fish and wildlife. Positive impacts include increasing the amount of rocky habitat that will benefit species such as lingcod and rockfish and some species of shellfish. The new artificial habitat will cover existing habitat and be detrimental to species utilizing the area. An example is bivalve clams inhabiting a soft bottom which is covered by rocks to provide rockfish habitat. While the new habitat may be beneficial to rockfish, it will be detrimental to the bivalves. The impacts of such construction are not included in the EIS as they are project related. These impacts would be evaluated when a construction project is proposed; the impacts are likely to vary for each project and will be considered on a project-by-project basis and any such construction project will be evaluated individually for its environmental impact (WAC 197-11-442).

Construction of new habitat may have unintended consequences which should be evaluated. These consequences may include increasing predation by lingcod on salmon, and disrupting salmon migration corridors.

As needed, artificial habitat will be constructed to enhance, or increase available habitat for rockfish populations. Initial emphasis will be on constructing rocky habitat. In the future, efforts may be conducted to increase the amount of vegetated areas in Puget Sound or to increase the amount of habitat needed by juvenile rockfish.

Alternative 1 (Most Conservative): Preferred Option
Promote the achievement of the natural production policy objective through the appropriate use of:

a. Hatchery production to rebuild depleted rockfish stocks; and

b. Artificial habitats consistent with the hierarchy of habitat protection and mitigation approaches.

Hatchery production for rockfish will be used to recover depleted populations and for research. Research will be conducted to develop techniques for the culture of rockfish. This research will include development of hatchery techniques to raise fish in a hatchery environment and include small scale release of cultured fish. The releases will be designed to investigate the survival and movements of released fish as well as their impact of naturally produced rockfish. If the research is successful, rockfish will be cultured and released to speed the recovery of selected stocks.

WDFW will use artificial habitats to restore degraded rockfish habitats. Degraded habitat includes, but is not limited to, habitat damaged by construction activities, habitat in areas of poor water quality, and areas damaged by the presence of derelict fishing gear. Artificial habitats for rockfish have been constructed in Puget Sound to enhance

recreational opportunities and to mitigate for damaged habitat. If artificial habitat is created, some mitigation for loss of existing habitat may be required.

Alternative 2 (Conservative):
Develop plans to: 1) utilize hatchery production to assist in recovery of depleted rockfish stocks consistent with natural production goals; and 2) enhance habitat for indicator species of rockfish through the use of artificial habitat.

Hatchery production for rockfish will be used to recover depleted populations of indicator species of rockfish and for research. Artificial reef habitats will be used to restore available habitat for indicator rockfish populations.

The hatchery component will be identical to that of Alternative 1. Construction of artificial reefs will be limited to benefit indicator species of rockfish. We anticipate that fewer, smaller artificial structures will be constructed compared to Alternative 1. Artificial habitats will be constructed only to replace lost or degraded natural rockfish habitats.

Alternative 3 (No Action):
Hatchery production for rockfish may be used to recover depleted stocks and for research.

Construction of artificial reef habitat will be considered on a case-by-case basis.

Research and releases limited to indicator species will be limited to research purposes only. Construction of rockfish habitat will be limited to rocky artificial reef habitat. Enhancement activities will be considered on a case-by-case basis with limited assessment.

Alternative 4 (Least Conservative):
Hatchery production of rockfish will be limited to research- scale activities.

Construction of artificial reef habitat will be considered on a case-by-case basis and limited to mitigation purposes.

Hatchery production will be much reduced compared with other options. Adult fish will still be captured and their progeny raised in a hatchery environment, but only a few will be released annually. No effort will be made to construct artificial reefs unless an unanticipated opportunity arises. It is likely that no artificial habitat will be constructed under this alternative.

Appendix 1. Revised Draft Puget Sound Rockfish Conservation Plan

REVISED
D R A F T
PUGET SOUND ROCKFISH CONSERVATION PLAN

Policies, strategies and actions

Including

Preferred Range of Actions

prepared by

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Original draft issued October, 2009
Revised draft issued April, 2010

ACKNOWLEGEMENTS

The Department thanks the following persons for their support and guidance during the development of the Puget Sound Rockfish Conservation Plan and associated Environmental Impact Statement.

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Special thanks are given to the citizens who participated in the rockfish advisory group which provided invaluable assistance in revising the Plan and EIS.

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INTRODUCTION

Rockfish in Puget Sound are in trouble. Many, but not all, rockfish species have declined in abundance, some quite severely, over the past two decades. These declines have resulted in increased scientific, economic, and social concerns about the status of the resource and the viability of fisheries for rockfish in Puget Sound. This concern has manifested itself in several forums. In 1999, a petition was presented to the federal government to list several species of rockfish in Puget Sound under the federal Endangered Species Act (ESA). A scientific conference held in the San Juan Islands in 2003 concluded that the outlook for rockfish was "grim" (Mills and Rawson, 2004). A special review by the American Fisheries Society found several species of rockfish to be "vulnerable" in Puget Sound. A review of marine life in Puget Sound concluded that demersal rockfish were in decline, largely as a result of overharvest (West 1997). Another review of marine fish concluded that marine fish in Puget Sound were among the most threatened stocks of fish in North America (Musick et al., 1998). In 2007, another petition was received by the federal government. This petition requested that five species of rockfish in Puget Sound receive protection under the ESA; in 2009 the Department of Commerce concluded that two of these species (canary and yelloweye rockfish) warranted protection as threatened and one species (bocaccio rockfish) warranted protection as endangered.

These declines have largely been caused by historical fishing practices, although several other stress factors play a part in their decline. Rockfish in urban areas are exposed to high levels of chemical contamination, which may be affecting their reproductive success. Poor water quality in Hood Canal has resulted in massive periodic kills of rockfish as well as other species. Lost or abandoned fishing nets trap and kill large numbers of rockfish. This Puget Sound Rockfish Conservation Plan (PSRCP) provides a plan for rebuilding rockfish populations and providing sustainable fisheries when appropriate.

This plan was prepared by the Washington Department of Fish and Wildlife (WDFW) in response to these declines and threats. The goal of the plan is to provide a pathway to protect existing stocks of rockfish, rebuild depleted stocks, and provide sustainable fishing and other economic and harvest benefits to our citizens. The WDFW recognizes the Puget Sound tribes also have conservation concerns associated with rockfish populations. Rockfish co-management plans will be developed with appropriate Indian tribes. The tribes' and state's fishery jurisdictions and authorities significantly overlap. To promote effective and efficient management of fisheries resources and to minimize potential conflict, the Department and tribes have developed a cooperative management approach to exercise their respective authorities and to achieve shared conservation objectives. This approach will be reflected in co-management agreements as the various tribes contribute their knowledge and expertise to support rebuilding wild rockfish stocks. The PSRCP will be the foundation to manage non-tribal fisheries and will be used to develop tribal co-managers to develop fishery management plans.

WDFW has concluded that the adoption of this plan falls under the authority of the State Environmental Protection Act (SEPA). Accordingly, a draft Environmental Impact Statement (EIS) has been completed to accompany this plan. After undergoing a period of public review, the draft EIS and draft plan will be reviewed and revised as necessary and a final EIS and plan issued. After the completion of the final EIS and plan, the Department will consider formal adoption of the plan.

Once adopted, this plan will be used as the Department's basis for developing co-management plans with tribal governments, establishing priorities for funding and staff assignments, and making specific regulation changes. WDFW will develop a schedule within available resources to implement the Plan's strategies and actions. WDFW will seek additional resources and partnerships to fully implement the plan.

Guiding Documents

The development of this plan was guided by:

1. State law defining the duties and powers of the Department of Fish and Wildlife (RCW 77) which can be found at:
   http://apps.leg.wa.gov/rcw/default.aspx?Cite=77

2. Relevant polices adopted by the Fish and Wildlife Commission which include:
   Puget Sound Groundfish Management (C3003);
   http://wdfw.wa.gov/commission/policies/c3003.html

   Marine Fish Culture (C-2611);
   http://wdfw.wa.gov/commission/policies/c3611.html

   Marine Protected Areas (C-3013;
   http://wdfw.wa.gov/commission/policies/c3013.html

3. The Department's 2009-2015 Strategic Plan, which is located at:
   http://wdfw.wa.gov/about/strategic_plan/

4. Relevant rulings by the federal court regarding the role of tribal governments in resource management in Puget Sound which includes:

   Amendment to Paragraph G of "Order to Implement Interim Plan" entered May 8, 2001 in United States v Washington, Sub proceeding No. 96-2.

Time Period of Plan:

Indefinite; once formally adopted, the plan will remain in existence until changed. Due to the long life spans of many species of rockfish, recovery can be expected to require several decades. For example, the stock rebuilding plan for canary rockfish in coastal waters is over fifty years (Methot 2005) and for yelloweye rockfish is approximately ninety years (Tsou and Wallace 2006).

Geographic Area Covered By Plan: Puget Sound

In this document, Puget Sound refers to the marine waters of Washington State east of Cape Flattery and south of the Canadian-United States border, including all waters south to Olympia, the San Juan Islands, and Hood Canal.

Figure 1. Puget Sound, with three management regions

Definition of Rockfish

By rockfish, we mean any species of fish in Puget Sound east of Cape Flattery belonging to the family Scorpaenidae and members of the *Sebastes* or *Sebastolobus* genera. While Palsson et al. (2009) identified 28 species of rockfish occurring in Puget Sound east of the Sekiu River, and these species are also those found in Neah Bay (Table 1). Other species may occur in Neah Bay including aurora, shortraker,

greenspotted, chilipepper, shortbelly, blackgill, yellowmouth, bank, pygmy, and harlequin rockfishes and longspined thornyhead (Love et al., 2005). However, these species are generally offshore or rare species and have not been verified to occur in Neah Bay. If additional species are found in Puget Sound, they will be managed under the auspices of this plan.

Species can be divided into stocks based upon their population structure. Several patterns of genetic structuring have been found in Puget Sound. For management, each species will be defined to have one stock throughout Puget Sound unless indications of genetic structuring have been found. Potential stock units are identified in Table 1. As more information becomes available, finer-scale stock units may be defined and require smaller-scale management.

Rockfish species can be grouped into several assemblages, or general categories, based on their life histories and habitat associations (Palsson et al., 2009). Species in the **nearshore sedentary** assemblage that lives in close association with rocky habitats usually in nearshore waters less than 40 meters (120 feet) in depth and, as adults, have high site fidelity. These species are commonly taken in hook and line fisheries in Puget Sound and include copper, quillback, and brown rockfish. A second category of rockfish is the **deepwater assemblage** which is composed of large, deep-bodied fish such as canary and yelloweye rockfish. As adults, these fish live in deeper water greater than 40 meters and are often associated with rocky habitats. A third category is the **pelagic assemblage,** which are the species that live higher in the water column and may move longer distances as adults. Species that fit this general description include the black, blue, yellowtail and widow rockfish.

While there are many species of rockfish found in the Sound, some are very rare and have apparently never been common (i.e., rougheye and silvergray). Others are found only in very restricted areas of the Sound (i.e., blue and China rockfish). Other species are, or were, very common and provide valuable ecological functions as well as inclusion in commercial and recreational fisheries. Because it would be expensive or impossible to assess and manage every species of rockfish, WDFW will use the concept of an **indicator species** to represent one or several species within each assemblage. A species may be classified as an indicator species due to one or more of the following factors:

1. Is, or was, very common in Puget Sound;
2. Is, or was, important to recreational and/or commercial fisheries;
3. Provides important ecological functions; and/or
4. Has been identified at extreme low levels of abundance.

Management actions will focus on indicator species with the intent of imparting conservation benefits to those species and the other species within the assemblage. While management actions will focus on indicator species, other species will be considered as well. There are risks that other species within each assemblage may have different productivity patterns or ecological needs that are unlike the

corresponding indicator species. These species may act as "weak" stocks that may not respond like indicator species. Several management strategies will be needed to ensure that non-indicator species are linked to indicator species and are not impeded by fishery, habitat, or other management actions. Many rare species are included in the deepwater assemblage. The actions taken for the indicator species for this assemblage will likely provide protection for the rare species.

We propose that eight species of rockfish in Puget Sound be classified as an indicator species (Table 1). This list of indicator species may change as more information is obtained or through the co-management process with tribal governments. Each species in Puget Sound will be assigned to one of the three assemblages and receive management. All assemblages will have more than one indicator species. While we recognize that juvenile rockfish may occupy different habitats as they grow, the indicator species focus on adult assemblage characteristics. This approach to fishery management is used to manage other fisheries (Smith et al., 2009).

WDFW intends to manage rockfish in Puget Sound by geographical stocks. By "stock," we mean a group of one or more populations of fish of one species that is large enough to be essentially self-reproducing with members exhibiting similar patterns of growth and migration. Movement of individuals between stocks should be minimal (Hillborn and Walters 1992).

Table 1. Rockfish assemblages, indicator species and stock units of rockfish in Puget Sound.

Assemblage	Species	Stock Units
Nearshore Sedentary	Copper rockfish Quillback Brown Tiger Vermilion China	North Sound & South Sound
Pelagic	Black Puget Sound Yellowtail Blue	Puget Sound

Assemblage	Species	Stock Units
Deepwater	Yelloweye Canary Bocaccio	Western Strait of Juan de Fuca & Puget Sound East of Port Angeles
	Greenstriped Redstriped	North Puget Sound & South Puget Sound
	Splitnose Shortspined Thornyhead Rougheye Redbanded Darkblotched Pacific Ocean Perch Rosethorn Rosy Stripetail Sharpchin Silvergray Halfbanded Widow	Puget Sound

Assemblage	Species	Stock Units
Deepwater (continued)	*Aurora* *Shortraker* *Greenspotted* *Chilipepper* *Shortbelly* *Blackgill* *Yellowmouth* *Bank* *Pygmy* *Harlequin* *Longspine thornyhead*	Neah Bay

- Indicator species for the assemblage are underlined..
- Species in *italic*s are likely to occur in the Neah Bay Region but their presence has not been confirmed.

Summary of Life History Factors Relating to Rockfish Management and Recovery

This management plan is based on the following life history and biological characteristics of rockfish. These characteristics will limit management flexibility and focus management effort.

1. Rockfish, as a group, are very vulnerable to the effects of fishing. Once populations are at a low level, recovery requires a great deal of time. Fishing strategies must be very protective of rockfish and allow only very low levels of exploitation.

2. Mortality of rockfish which are caught and released is very high due to barotrauma.
3. Management goals for rockfish should include more than maintaining a specified level of biomass. A successful management plan should consider the genetic structure, age, and size composition of the stocks as well.
4. Several species of rockfish are similar in appearance and can be caught at the same location. It is very difficult for recreational anglers and commercial fishers to distinguish one species from another, resulting in limited management flexibility to selectively harvest most species and a general lack of public ability to identify species.
5. Rockfish occupy similar habitat and depths as lingcod and halibut and are commonly taken as bycatch in these fisheries and, less frequently, in fisheries for salmon.
6. Annual reproductive success is very variable and marked by numerous years of poor recruitment and occasional years of high recruitment. Maintenance of many ages of rockfish in the population is important to buffer the impacts of a sustained period of poor recruitment.

GOALS AND POLICIES

This document is intended to provide a framework of policies, strategies, and actions that will lead to the achievement of the following goal:

> **The goal of the PSRCP is to restore and protect our natural heritage of Puget Sound rockfish populations. Increases in the abundance, distribution, diversity and productivity of rockfish will help restore the Puget Sound ecosystem, provide opportunities to view rockfish in the marine environment and, when, appropriate, provide sustainable fishing opportunities.**

By natural heritage, we mean that rockfishes occur in their natural habitats and distributions throughout Puget Sound, the genetic structure of populations will remain intact within Puget Sound, portions of stocks will be protected that resemble unfished size and age distributions, and that rockfishes will provide for intact ecosystem functions in Puget Sound. WDFW recognizes that the people of Washington value an intact Puget Sound ecosystem, enjoy viewing rockfish and other wildlife, and seek fishing opportunities when stocks are at levels that can provide sustainable fisheries.

This plan considers the following eight different, but interlocking, policy elements:

1. Natural Production
2. Habitat Protection and Restoration
3. Fishery Management
4. Ecosystem effects
5. Evaluation, Monitoring and Adaptive Management
6. Research
7. Outreach, Education and Ecotourism

8. Enhancement

To meet this goal, this plan includes a set of strategies that:

- Recognizes the multi-species nature of the rockfish harvest.
- Considers the high mortality rates of released rockfish.
- Reduces the mortality of released rockfish.
- Acknowledges the public's difficulty in distinguishing one species of rockfish from another.
- Recognizes the lack of detailed information needed for more precise management.
- Increases our knowledge of rockfish population status.
- Implements methods to achieve goals in a cost effective manner.
- Fosters likely acceptance and support by the public.
- Provides opportunities for utilization consistent with conservation of the rockfish stocks.
- Develops co-management plans with tribes and forms partnerships with other organizations to further rockfish conservation.

POLICY CATEGORY: NATURAL PRODUCTION

OBJECTIVE: Rockfish management shall place the highest priority on the protection and restoration of the natural production of indicator rockfishes to healthy levels.

Natural production means producing rockfish that are born in the wild from naturally occurring stocks in Puget Sound. Natural production integrates the management of habitat, fisheries, and enhancement activities under one cohesive policy. Because the ability to monitor and assess all species of rockfish is limited, the reliance on indicator species will provide similar information and conservation benefits for other species within each assemblage. There is some risk that individual species may have other productivity and limiting factors that may not be demonstrated by the indicator species for that assemblage. WDFW will examine whether the conservation actions taken for indicator species also benefit other species within the assemblage.

Indicator species will be managed in an ecosystem context that considers the natural capacity of a population to sustain itself in relation to food-web dynamics, fishery impacts, habitat alteration, water quality, other human-induced stressors and limiting factors, and climatic factors. Stocks will be managed to ensure the existence of intact genetic structure, sustainable production, age and size diversity, and ecosystem services. A healthy stock will have these characteristics (see Appendix A for details). The management of other marine species will consider fishery, habitat, population, and other impacts on the integrity and sustainability of natural rockfish populations of indicator species.

Multiple tools are used throughout the world to protect and restore natural production of marine resources, including marine protected areas. In Washington we define marine protected area as a "geographical marine or estuarine area designated by a state, federal, tribal, or local government in order to provide long-term protection for part or all of the resources within that area" (Van Cleve et al., 2009).

This definition is quite broad, and can include a wide variety of measures ranging from complete prohibition of harvest activities to no special rules pertaining to harvest. WDFW has established both complete and partial, no-take areas which are designed to: protect and conserve habitats; exclude fisheries to increase species abundance and biodiversity; protect ecosystem functions; and provide recreational, scientific, and educational opportunities[3]. These reserves amount to approximately 1% of the subtidal area of Puget Sound. Terminologies can be confusing as WDFW has used the terms marine protected areas, marine refuges, conservation areas, and preserves to impart complete and partial protections from harvest activities and other agencies and entities have used other terms (See Van Cleve et al., 2009).

To avoid the confusion of past usage of terms and for the purposes of rockfish conservation in Puget Sound, we propose to use two types of protected areas: Marine Reserves and Rockfish Conservation Areas:

> A **Marine Reserve** is a tool intended to allow permanent protection of a site specific, marine area. Depending on the site and corresponding needs, a marine reserve may be established to protect marine habitats, provide research opportunities and protect a variety of natural functions including fish reproduction. Full harvest restrictions will occur in marine reserves.
>
> A **Rockfish Conservation Area** (RCA) is a tool that can be used to rebuild rockfish stocks to healthy levels and to protect the genetic, size and age diversity of portions of rockfish populations. Depending on the site and corresponding needs, an RCA may be established as a permanent or temporary feature and will have specific harvest restrictions intended to meet the goal of rockfish protection at the site.

WDFW defines in the Washington Administrative Code "Conservation Areas" which are complete no-take areas and "Marine Preserves" which are partial-take areas. In terms of the PSRCP, these areas correspond to Maine Reserves and Rockfish Conservation Areas, respectively. Establishment of either type of area by WDFW does not prohibit the harvest by persons fishing under the authority of tribal regulations.

Strategies

1. **Protect and restore the genetic, size, and age diversity of indicator species.**

[3] WDFW Policy C-3013 on Marine Protected Areas.

2. **Identify and reduce stressors on indicator rockfish species within an ecosystem perspective.**
3. **Implement holistic, integrated management strategies.**

Actions

1. Develop standards, especially in data-limited situations, to establish stock status and restoration standards for discussion with tribal co-managers. The Department will use, as a foundation, the concepts of stock status as discussed in Appendix A.
2. Establish benchmarks for indicator species to meet the natural production objective and strategies and use governmental accountability and other procedures to monitor success at meeting benchmarks.
3. Assess the status of indicator species of rockfish on a 5-year, or more frequent, basis.
4. Evaluate that the management of indicator species imparts conservation benefits to other rockfish species.
5. Develop a science-based system of marine reserves and rockfish conservation areas that, with other actions, achieves the natural production objective by protecting significant amounts of rockfish stocks, their habitats and ecosystems. Use scientists, fishers, and interested parties to develop goals and objectives for a system of marine reserves and RCAs. Marine Reserves and RCAs will be developed and adopted in a transparent public process. Current Marine Reserves and RCAs and new sites will be evaluated to determine if they are meeting goals or need modification (See Monitoring, Evaluation, and Adaptive Management).
6. WDFW will implement an agency process to integrate habitat management, fisheries management, ecosystem research, and enhancement activities to coordinate and account for all activities across agency programs. WDFW will identify key stressors and reduce their effects by involving and working with the Puget Sound Partnership, NOAA-Fisheries, other state agencies, the Northwest Straits Commission and other local organizations.

POLICY CATEGORY: HABITAT PROTECTION AND RESTORATION

Objective: Protect and restore all marine habitat types for all rockfish species.

Most species of rockfish are highly dependent upon rocky habitats as adults. However, some species occur on sand, cobble, and open-water habitats, and as younger life stages depend upon a variety of open-water, vegetated, nearshore, sandy, or cobble habitats. WDFW intends to protect and, where needed, restore degraded habitats to natural levels. This will ensure that the physical spaces and pathways needed for rockfish to thrive are available.

Several approaches and regulations can be used to protect and restore rockfish habitats. WDFW has instituted a hierarchy of protection and mitigation approaches for habitat. Recognizing that at times, the needs of society will result in habitat degradation, the agency has pursued a policy of avoiding, rectifying, minimizing, and compensating for the impacts. Impacts will be monitored and alterations made to achieve habitat protection objectives. Rockfish habitat could be protected by enforcing existing rules and creating new rules encouraging other agencies (state, federal, local and tribal) to do the same. Under the hydraulic code (WAC 220-110); WDFW has the authority to regulate construction in marine waters of Puget Sound, including all rockfish habitat. The code, commonly referred as "HPA" (hydraulic project approval), is designed to provide general protection for fish life and specifically protects certain activities and identifies rockfish settlement and nursery areas, eelgrass meadows, and kelp beds as special habitats of concern. However, the HPA code does not emphasize rocky marine habitat, the habitat type most commonly associated with rockfish in Puget Sound. These protections will need to be strengthened along with those offered by other authorities.

Rockfish habitats have been degraded by chemical contamination, derelict fishing gear, dredge disposal, and filling of marine habitats, mobile fishing gears, and poor water quality. Restoration efforts can be focused on removing derelict gears, improving water quality, constructing artificial habitats in permanently damaged areas, or removing deleterious man-made materials. The relationship between rockfish, especially juvenile stages, and their habitats is still poorly understood and needs further research.

Strategies

1. **Enhance the effectiveness of WDFW habitat protection measures and programs to protect all rockfish habitats.**
2. **Provide technical expertise to other agencies and interested groups to promote identification and protection of rockfish habitats.**
3. **Restore degraded rockfish habitats including those impaired by poor water quality.**
4. **Use marine reserves as tools to protect and restore rockfish stocks, habitats, and ecosystems.**

Actions

1. Incorporate all rockfish habitats as Habitats of Special Concern to the Hydraulic Project Approval criteria, the Priority Habitats and Species, the Habitat Conservation Plans, and other WDFW habitat conservation initiatives.

2. Provide updated information on rockfish habitat requirements and the distribution of these habitat types to tribal co-managers and agencies to evaluate projects that modify rockfish habitats.
3. Promote cooperative projects to inventory and map sea floor and identify habitats through high-resolution imagery.
4. Identify degraded rockfish habitat, including those impacted by derelict gear and degraded water quality including pollution from endocrine disruptors, carcinogens, and other deleterious compounds, and develop a long-range restoration program.
5. Develop a science based system of marine reserves that, with other actions, achieves the natural production objective by protecting significant amounts of rockfish stocks, their habitats and ecosystems.
6. Work with the Department of Natural Resources, Puget Sound Partnership, Department of Ecology, NOAA Fisheries, the US Fish and Wildlife Service, Canada, non-governmental organizations, and other agencies to protect rockfish habitats and restore habitats degraded or lost due to pollution, disruption, and derelict fishing gear.

POLICY CATEGORY: FISHERY MANAGEMENT

OBJECTIVE: All fisheries in Puget Sound waters will be managed to ensure the health and productivity of all rockfish stocks.

Fisheries management is the process and actions to provide public benefits from natural resources including sustainable fishing opportunities, watchable wildlife, and ecosystem functions. Fishing can impact fish that are intentionally harvested, or are encountered as unintended catch, often called bycatch. WDFW seeks to manage all species of rockfish harvested and encountered by commercial and recreational fishers by focusing on indicator species. We will improve methods to collect detailed information on the indicator species, including amount of catch, length and age composition of the catch, and depth of capture. By concentrating on the indicator species, we can make the best use of scarce agency resources and improve our knowledge of population and fishery changes for these species. WDFW recognizes that weaker or less common stocks or species may be affected by fisheries and will seek to assure that those weaker or less common stocks are not overharvested.

Past fishing practices have been a major factor affecting the abundance and size structure of rockfishes. While other stressors such as marine mammal predation, derelict gear, climate, and pollution may affect rockfish stocks, these stressors act both in marine protected areas and fished areas. The greater sizes and densities observed in many marine protected areas in Puget Sound indicate that fishing is the most

significant factor contributing to the observed differences between protected and fished areas.

Strategies

1. **Work with tribal co-managers to establish and implement fishery management guidelines that promote healthy rockfish stocks and restoration of the Puget Sound ecosystem.**
2. **Manage commercial and recreational fisheries consistent with fishery management guidelines for all rockfish species.**
3. **Minimize disruptions to other fisheries when possible.**

Actions

1. Use the PSRCP to develop fishery management plans with tribal co-managers.
2. Manage all fisheries to ensure that fishery management guidelines for rockfish are not exceeded.
3. Use gear, depth, time, and other restrictions to achieve fishery management guidelines.
4. Develop a science based system of Rockfish Conservation Areas that, with other actions, achieves the natural production objective by protecting significant amounts of rockfish stocks, their habitats and ecosystems.
5. Provide for fishing opportunities for other species consistent with rockfish fishery management guidelines.
6. Account for all rockfish encountered in all fisheries through fishery monitoring and estimation programs.
7. Develop and implement measures to increase the survival of released rockfish such as identifying the best handling practices and re-submergence techniques, educating fishers about these techniques, or, if needed, requiring fishers to use rockfish release equipment and procedures.
8. Improve the system to report, and account for fishing gears lost during active fishing operations and remove derelict gear. Evaluate the potential effectiveness of voluntary and mandatory reporting and marking systems to prevent the accumulation of derelict gear to reduce rockfish mortality.

POLICY CATEGORY: ECOSYSTEM

Objective: Protect existing functions of indicator rockfishes and conduct activities to restore the functions of indicator rockfishes in the complex ecosystem and food web in Puget Sound.

Rockfish, as a group, occur throughout Puget Sound and are a vital component of the ecosystem in Puget Sound. While ecosystem science is still developing, we know that rockfish are both important predators and prey in the food web, are affected by climatic and oceanographic factors, die from natural mortality, compete as important members of fish communities, and are affected by a variety of human-caused stressors. Human-caused stressors already identified in habitat and fishery management sections can amplify natural stressors further impairing the health of rockfish populations. As climate changes occur, we can expect that the abundance and productivity of rockfish species will change, likely favoring more warm-tolerant species and perhaps limiting some species that are presently common.

The ecosystem functions of rockfish are poorly understood and not quantified. NOAA Fisheries and their partners, including WDFW, are developing a food-web and ecosystem model of Puget Sound that will help identify data gaps and major limiting factors of rockfish and other marine populations. As these models develop, WDFW and its partners will identify the ecosystem needs, benefits, and limitations of the indicators species of rockfish in order to inform and improve the ability to manage for natural production, habitat, and fisheries.

Strategies

1. **Ensure that the abundance, distribution, and structure of indicator rockfish stocks provide benefits to other species and ecosystem components.**
2. **Identify and address the limiting ecosystem factors affecting the indicator species of rockfish, such as human-caused stressors, predation, and disease.**
3. **Incorporate new information on the effects of climate change on the management of rockfish and their ecosystems.**

Actions

1. Investigate and reduce the impacts of human-caused stressors, such as pollution, habitat degradation, and fisheries that impair the productivity of indicator rockfish stocks.
2. Consider and, where necessary, reduce fishery harvests and implement marine reserves to provide intact food-webs, and ecosystem functions so biological communities can thrive.
3. Develop a science based system of marine reserves that, with other actions, achieves the natural production objective by protecting significant amounts of rockfish stocks, their habitats and ecosystems.
4. Partner with state, federal, and Canadian agencies and scientists to improve existing food-web and ecosystem models to identify and take actions to restore rockfish stocks.

5. Minimize introductions of aquatic invasive species that may negatively impact rockfish.
6. Partner with agencies and scientists to predict and react to climate change including increases in water temperature, changing pH, and rises in sea surface level.

POLICY CATEGORY: MONITORING, EVALUATION AND ADAPTIVE MANAGEMENT

Objective: Conduct monitoring, evaluation and management of indicator stocks to provide the basis to evaluate stock status and the success of management actions.

Monitoring, evaluation, and adaptive management are the integrated activities that result in the successful management of resources and programs. There are several types of environmental monitoring that can be applied to rockfish management: long-term baseline monitoring to determine stocks status and trends, impact monitoring to test whether management actions are effective, and compliance monitoring to determine whether individuals and agencies are complying with or implementing required actions. Evaluation of these monitoring activities and other research findings provides the analysis of the health of rockfish stocks and whether management actions, rules, and agreements are effective. Adaptive management is the process of making changes in management practices as the result of the monitoring and evaluation. Monitoring, evaluation, and adaptive management are required to produce successful management and to judge the success of current management efforts.

WDFW will monitor indicator stocks of rockfish, the integrity of rockfish habitats, fisheries, and important ecosystem functions. These data will be analyzed and evaluated in terms of meeting healthy stock criteria, effectiveness of Marine Reserves and Rockfish Recovery Areas, fishery management guidelines, habitat protection initiatives, and improving and understanding ecosystem benefits. WDFW rules and programs will be examined periodically to understand whether they are effective or need to be changed and adapted to existing or emerging concerns.

Strategies

1. **Use fishery dependent and independent monitoring and other information to periodically assess indicator rockfish stocks.**
2. **Work with tribal co-managers, citizens, agencies, Canada, and scientists in monitoring, evaluating, and managing rockfish stocks.**
3. **Adopt flexible management and regulatory programs that will allow rapid change of regulations or policies in response to new information or altered environmental conditions.**

4. **Regularly review progress towards the objectives and modify strategies or actions which are not producing desired results.**
5. **Ensure species within an assemblage are receiving the desired benefits of the representative indicator species.**
6. **Enforce rules and regulations that protect rockfish.**

Actions

1. Collaborate with tribal co-managers and other scientists to monitor and evaluate indicator rockfish stocks. Develop common standards and practices to maximize the use of the data and findings.
2. Define quantifiable goals and benchmarks for healthy stock levels and sustainable fishery harvests using the Government, Management Accountability and Performance (GMAP) or other accountability systems to assure goals and benchmarks are being achieved.
3. Conduct fishery-dependent programs to account for all catch and fishing effort and to monitor species composition and biological characteristics of indicator rockfish stocks.
4. Conduct trawl, acoustic, video, scuba and other fishery-independent surveys so all regions are visited at least every five years to monitor indicator rockfish stock abundance, habitat quality, and ecosystem functions.
5. Evaluate indicator stocks with assessments and models that integrate fishery dependent, fishery independent, and biological information on a 5-year (or more frequent) basis.
6. Conduct studies that address non-indicator rockfish species to ensure their stocks are receiving the desired benefits of the representative indicator rockfish species. Use information on non-indicator species collected during surveys targeting indicator species when available to evaluate their status.
7. Use scientists, fishers, and interested parties to develop goals and objectives for a system of Marine Reserves and RCAs. Evaluate current sites and new sites on a 5-year or more frequent basis to see if they are meeting goals and need modification. Establish baseline conditions before reserves are established.
8. Involve citizens to conduct monitoring and to evaluate the success of the strategies and actions, and use information provided by fishers, divers, beach watchers and other organized groups such as Coastal Conservation Association, Puget Sound Anglers, REEF (Reef Environmental Education Foundation), Washington State University, and other non-governmental sources to evaluate the strategies and actions.
9. Strengthen our partnerships with Canada in the Technical Subcommittee of the Canada-United States Groundfish Committee (appointed by the Conference on Coordination of Fisheries Regulations between Canada and the United States)

and other venues to provide mutual benefits regarding rockfish management and rebuilding across transboundary waters.

10. Work with enforcement authorities to provide information and tools needed to effectively enforce regulations protecting rockfish.

11. Work with partners to clearly mark Marine Reserves and RCAs, and work with enforcement authorities and volunteers to improve compliance.

POLICY CATEGORY: RESEARCH

OBJECTIVE: Implement new and cooperative research to understand the diversity, biology and productivity of indicator rockfishes as well as needs for recovery.

Rockfish research uses the scientific process to discover new information about the biology, management, and monitoring effectiveness of the strategies and actions taken for indicator rockfish stocks in Puget Sound. Science relies upon the peer-review process to independently confirm the validity of new research results. Efforts to understand the Puget Sound ecosystem, model populations, evaluate Marine Reserves and Rockfish Conservation Areas, protect habitat, manage for climate change, enhance populations, and manage fisheries will all benefit from a vigorous research program.

Strategies

1. **Identify data gaps and research needed to successfully implement this plan.**
2. **Increase partnerships with tribal co-managers, universities, Canadian scientists, non-governmental organizations and state and federal agencies.**
3. **Rely upon a peer-review process to independently confirm the validity of research findings.**
4. **Proceed with other actions in this Plan while research is being conducted.**

Actions

1. Convene a workshop to identify the key research needs for rockfish in Puget Sound.
2. Promote cooperative rockfish research by forming a standing work group of rockfish scientists.
3. Secure funding through grants, foundations, and other sources to support key rockfish research.
4. Conduct research to address key needs for rockfish.
5. Implement a process to ensure peer review of key agency findings.

POLICY CATEGORY: OUTREACH, EDUCATION AND ECOTOURISM

OBJECTIVE: Conduct a strategic outreach and education program to inform Washington citizens of the value of rockfish stocks and to promote ecotourism.

There is a substantial need to inform Washington residents and others about the status of rockfish in Puget Sound and the need for strong conservation efforts. The purpose of conducting an education effort is to inform the public about the important role of rockfish in the ecosystem and actions individuals can take to protect and restore the health of rockfish in Puget Sound.

Ecotourism for rockfish provides the experience to observe rockfish in their natural environment. Ecotourism promotes environmental awareness and low impact on natural resources.

Strategies

1. **Educate Washington residents about the efforts to conserve and restore rockfish populations in Puget Sound.**
2. **Educate anglers about rockfish identification, methods of reducing the incidental encounters, and the use of release techniques that minimize mortality.**
3. **Promote ecotourism by providing information about viewing opportunities for rockfish in Puget Sound.**
4. **Regularly inform the public on the implementation of new initiatives, and progress towards achieving plan objectives.**

Actions

1. Develop a webpage and utilize other media to feature the Puget Sound Rockfish Conservation Plan and the Department's effort to protect and restore rockfish in Puget Sound.
2. Work with the Puget Sound Partnership, agencies, and groups to increase public involvement in efforts to protect and restore rockfish in Puget Sound and to identify and reduce stressors such as pollution.
3. Establish partnerships with aquariums, marine science centers, and other groups to teach children and adults about the importance of rockfish in the Puget Sound ecosystem.

4. Work with advisory and fishing groups to: 1) improve identification of rockfish (both out of and in the water); 2) reduce encounters of rockfish while fishing for other species; and 3) effectively release rockfish.
5. Include within WDFW's *Fishing in Washington* pamphlet information on identifying rockfish, reducing encounters of rockfish while fishing for other species, and methods of effectively releasing rockfish.
6. Promote underwater viewing opportunities and ecotourism for rockfish in Puget Sound by working with organizations promoting tourism, distributing maps and brochures, and developing websites.
7. Education will feature all policy elements of the plan, but will focus initially on new or controversial elements.

POLICY CATEGORY: ENHANCEMENT (Artificial Habitat and Hatchery Production)

OBJECTIVE: Promote the achievement of the natural production policy objective through the appropriate use of:

a. Hatchery production to rebuild depleted rockfish stocks; and

b. Artificial habitats consistent with the hierarchy of habitat protection and mitigation approaches.

These tools will be implemented in a manner that preserves the ecological balance of the marine community and avoids negative impacts on the recovery of any species listed as endangered or threatened under state or federal statutes.

Culture - WDFW will rely on natural production to meet its rockfish conservation objectives unless a stock is designated as depleted and meets the conditions and constraints outlined under the terms of Fish and Wildlife Commission Policy on Marine Fish Culture (C3611). If a stock is designated as depleted, hatchery techniques may be employed as a rebuilding tool. Hatchery techniques include collection of brood stocks, fertilization and rearing of young in the hatchery, and release of larvae or juveniles into the environment. We do not plan to utilize hatchery culture of rockfish exclusively to provide recreational fishing opportunities. Production of cultured rockfish would cease when the stock has recovered to a healthy level. Additionally, research may be conducted to prepare culture techniques prior to their use. Culture may be used to produce rockfish for research purposes.

Artificial Habitats - WDFW will use artificial habitats to restore and mitigate for degraded rockfish habitats. Degraded habitat includes, but is not limited to, habitat damaged by construction activities, habitat in areas of poor water quality and areas damaged by the presence of derelict fishing gear. Artificial habitats for rockfish have

been constructed in Puget Sound to enhance recreational opportunities and to mitigate for damaged habitat. If artificial habitat is created, some mitigation for loss of existing habitat may be required.

Strategies

1. **Use hatchery culture in combination with habitat, fishery and ecosystem strategies to restore depleted rockfish stocks to healthy levels.**
2. **Develop and evaluate culture techniques with the NOAA Fisheries and other partners for restoring depleted rockfish stocks.**
3. **Use artificial habitats to restore and mitigate for degraded rockfish habitats.**
4. **Balance the goal of utilizing natural production for rockfish with any proposed enhancement activity.**

Actions

1. Conduct research to evaluate the risks and uncertainties associated with the release of cultured rockfish.
2. Identify degraded habitats, develop requirements for artificial habitat construction, and construct new habitats to restore degraded natural habitats.
3. Develop and adopt requirements in WAC for construction and placement of artificial habitats in state waters.
4. Monitor and evaluate culture techniques and artificial habitat construction to ensure they are successfully restoring depleted rockfish stocks and restoring degraded rockfish habitat.
5. Implement and evaluate rockfish culture techniques and artificial habitat construction actions that also restore other marine species and ecosystem functions.
6. Develop partnerships with NOAA Fisheries, universities, and other organizations to implement these activities.
7. Prioritize species for hatchery culture, establish specific goals for any proposed enhancement activity and evaluate risks and benefits of the enhancement activity relative to the goals of this plan.
8. Use scientists, fishers, and interested parties to review the risks and benefits of specific enhancement activities. Conduct research to determine if the enhancement activity achieved the stated goal.

APPENDIX A

Stock Status

Stock assessment is the analysis of biological and statistical data used to determine the changes in abundance of fish stocks and, if possible, to predict the future trends of abundance. When detailed information is lacking, we will use data-limited measures and indices to determine stock status. Data-limited information includes catch-per-effort, indices of stock abundance from surveys, distributional information, and size of fish from catches or surveys. Past fishery and survey information has been applied to determine rockfish stock status by Palsson et al., (2009), but new criteria will be needed to establish future stock status, clear rebuilding targets and recovery goals.

When detailed stock information is available, we will use the unfished biomass of the stock as an absolute measure of stock abundance. Similar to Pacific Fishery Management Council (PFMC) objectives, we will seek to maintain rockfish stocks at least at 50% of their unfished biomass ($B_{50\%}$) in order to maintain the stock at the biomass of maximum sustainable yield (B_{msy}). The PFMC also defines an overfished state when stocks are at or below 25% of their unfished biomass ($B_{25\%}$). These guidelines are similar to those criteria established by Palsson (2009) to define four stocks status conditions for Puget Sound rockfishes using the same theoretical framework but modified with other criteria for data-limited situations. Due to lack of data, especially from early years in the fishery, it will be difficult or impossible to accurately calculate the size of the unfished biomass of any species or any stock of rockfish in Puget Sound.

In data-limited situations, The North Pacific Fishery Management Council has adopted a harvest policy that establishes reduced harvest levels to account for risk and uncertainty (Thompson 1996).

WDFW will use the following are three stock status conditions to assess the health of rockfish in Puget Sound. The three status conditions are based on both PFMC definitions and data-limited conditions collapsed from (Palsson et al., (2009):

Healthy Stock Status: A Healthy Stock is one that has a biomass at or above $B_{50\%}$. The data-limited definition of a Healthy Stock is one that shows a long-term trend that is stable, increasing, or varies without trend at or above historic levels.

Precautionary Stock Status: Precautionary Stocks are those that have stock biomasses between $B_{25\%}$ and $B_{50\%}$. The data-limited definition is a stock that demonstrates instability, is decreasing, or has no information to establish condition.

Depleted Stock Status: A Depleted rockfish Stock is one that is at or below $B_{25\%}$. The data-limited definition of a Depleted stock is one that has negative indices exceeding AFS vulnerability thresholds corresponding to it population productivity. This category includes the Vulnerable status used by Palsson et al., (2009).

In addition to traditional stock assessment approaches; we propose the use of Marine Reserves and RCAs to serve as reference areas resembling healthy and intact habitats

for use as unfished reference points for healthy stocks. As Marine Reserves mature in Washington, British Columbia, and in nearby waters, they may provide baseline measures of unfished biomass in terms of abundance, size and age structure, and reproductive output. Information from Marine Reserves, historical catch and biological data, and new modeling efforts may provide the most likely tools and benchmarks for designating the criteria for a healthy rockfish stock. For example, copper rockfish density observed from the oldest marine reserves and in the area could define the goal for half of the nearshore rockfish habitat in Puget Sound. In addition, the size frequency of copper rockfish from long-term reserves or historical fishery monitoring to evaluate stock status could be used as size-based goal for a significant portion of the copper rockfish stock.

Appendix 2. Definitions

The following are definitions of terms as used in the Puget Sound Rockfish Management Plan. They are presented here to prevent confusion with how these or similar terms are used in other efforts.

Artificial Production: The rearing and release of fish from an artificial culture setting such as a hatchery.

Biomass: The weight of a stock of fish. Often limited to the weight of the spawning population.

Bottomfish: A group of fishes that is closely associated with the bottom. Examples include rockfish, Pacific cod, greenling, lingcod, sharks, sculpins, soles and flounders. Bottomfishes are legally defined by WDFW (WAC 220-16-340) and the definition excludes Pacific halibut.

Bycatch: Encounters of one species that is taken incidentally while fishing for another species. For example, a person may be fishing for Chinook salmon and incidentally catch a rockfish. This fish may or may not be retained by the angler.

Catch (Encounters): A rockfish that is caught by a commercial or recreational fishery. Encountered rockfish may be harvested retained by the fisher or released back to the Sound. Released fish may be dead or alive.

Catch-and-Release: A non-retention hook-and-line fishery.

Diversity: Variation among individuals in age, size, life history, or genetic characteristics.

Ecosystem services: Benefits provided to humans by rockfish. The benefits include, food, recreation, contributing to the health and diversity of Puget Sound, scientific discovery, and maintaining cultural values.

Groundfish: Fish that are associated with or live near the bottom including bottomfish, Pacific halibut, and unclassified marine fishes.

Harvest: The total number of fish caught and retained by a fisher. These fish are landed on shore and are all dead. In this document “catch” means the same as ”landed catch.”

Incidental catch: See bycatch

Indicator Species: A species of rockfish identified as important by the WDFW. Indicator species may receive more intense monitoring, research, and protection than other species of rockfish in Puget Sound.

Landed Catch (Harvest): The portion of the encountered rockfish which is brought to shore at the end of a fishing trip.

Marine Reserve: A tool intended to allow permanent protection of a site specific, marine area. Depending on the site and corresponding needs, a marine reserve may be established to protect marine habitats, provide research opportunities and protect a variety of natural functions including fish reproduction. Full harvest restrictions will occur in marine reserves.

Maximum Sustainable Yield (MSY): The largest average catch (including released fish) that can be taken from a stock under existing environmental conditions.

Natural Production: Fish that spawn or rear entirely in the natural environment. These fish may be the offspring of natural or hatchery production.

Natural Stock: Fish that are produced by spawning and rearing in their natural habitat, regardless of parentage.

Non-Treaty: All fishers except those with reserved rights identified in treaties.

Productivity: A stock's intrinsic rate of increase. The higher the productivity, the better the population will fill the habitat and the more resilient it will be to harvest and to survive other sources of mortality.

Released catch: Fish are returned to the sea by the angler. These fish may be dead or alive at the time of release. Fish may be released because retention is prohibited, the species is undesirable, or the individual fish is too small to be of interest.

Revised Code of Washington (RCW): Laws enacted by the Legislature and signed by the Governor which direct the activities of the WDFW. Many of the laws affecting the agency are found in Chapter 77 of the Code.

Rockfish Conservation Area (RCA): A tool that can be used to rebuild rockfish stocks to healthy levels and to protect the genetic, size and age diversity of portions of rockfish populations. Depending on the site and corresponding needs, an RCA may be established as a permanent or temporary feature and will have specific harvest restrictions intended to meet the goal of rockfish protection at the site.

Precautionary Approach: A management approach which acknowledges uncertainty and the need to exercise caution in the face of uncertainty.

Stock: A group of fish within a species, which is substantially reproductively isolated from other groups of the same species.

Target Species: The species that is a fisher's intended catch during a fishing trip.

Wild: See Natural Stock.

WAC: Washington Administrative Code- A listing of rules enacted by state agencies to implement state laws (RCWs). WACs may be found at: http://apps.leg.wa.gov/wac/default.aspx.

Appendix 3. Literature Cited

Antonelis, Jr., G., and Michael Perez. 1984. Estimated annual food consumption by northern fur seals in the California current. Cal COFI Reports XXV: p 135-145.

Auster, P. 1998. A conceptual model ofA the impacts of fishing gear on the integrity of fish habitats. Conservation Biology 12: 1198-1203.

Bailey, A., H. Berry, B. Bookheim, and D. Stevens. 1998. Probability-based estimation of nearshore habitat characteristics. In: Proceedings of Puget Sound Research '98 Conference. 13 p.

Bargmann, G. 1982. Recreational angling from piers, docks, and jetties in Puget Sound, Washington during 1981. Washington Department of Fisheries Technical Report No. 73. 37 p.

Bargmann, G.. 1984. Recreational diving in the state of Washington and the associated harvest of food fish and shellfish. Washington Department of Fisheries Technical Report No. 82. 66 p.

Bargmann, G., M. Pedersen, and R. Trumble. 1985. Final environmental impact statement for the continued harvest of bottomfish in Puget Sound by commercial otter trawl gears. Washington Department of Fisheries, Olympia, WA 1988 p.

Beaudreau, A., and T. Essington. 2007. Spatial, temporal, and ontogenetic patterns of predation on rockfishes by lingcod. Transactions of the American Fisheries Society 136:1438-1452.

Bennett, W., K. Rolnestad, L. Rogers-Bennett, L. Kaufman, D. Wilson-Vandenberg, and B. Heneman. 2004. Inverse regional responses to climate change and fishing intensity by the recreational rockfish (*Sebastes* spp.) fishery in California. Canadian Journal of Fisheries and Aquatic Sciences 61: 2499-2510.

Berkeley, S., C. Chapman, and S. Sogard. 2004. Maternal age as a determinant of larval growth and survival in a marine fish, *Sebastes melanops*. Ecology 85: 1258-1264.

Berkeley, S., M. Hixon, R. Larson, and M. Love. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations. Fisheries 29: 23-32.

Berry, H, A. Sewell, and B. Van Wagenen. 2002. Temporal trends in the areal extent of canopy-forming kelp beds along the Strait of Juan de Fuca and Washington's outer coast. In: Puget Sound Research '01. Puget Sound Water Quality Action Team, Olympia, WA.

Berry, H., A. Sewell, S. Wyllie-Echeverria, B. Reeves, T. Mumford, Jr., J.Skalski, R. Zimmerman, and J. Archer. 2003. Puget Sound Submerged Vegetation Monitoring Project: 2000-2002 Monitoring Report. Washington Department of Natural Resources. 165 pp.

Berry, M. 2001. Area 12 (Inside) rockfish selective fishery study, SCBA Project No. FS00-05. Final report for Fisheries Renewal BC and Science Council of BC. Inner Coast Natural Resource Centre, Alert Bay, British Columbia. 19 pages plus appendices.

Biro, P., and J. Post. 2008. Rapid depletion of genotypes with fast growth and bold personality traits from harvested fish populations. PNAS 2008 105:2919-2922.

Bobko, S., and S. Berkeley. 2004. Maturity, ovarian cycle, fecundity, and age-specific parturition of black rockfish (*Sebastes melanops*). Fishery Bulletin 102: 418-429.

Britton-Simmons, K. 2004. Direct and indirect effects of the introduced alga *Sargassum muticum* on benthic, subtidal communities of Washington State, USA. Marine Ecology Progress Series 277: 61-78.

Buckley, R. 1967. 1965 bottomfish sport fishery. Supplemental Progress Report. Sport Fishery Investigations 1965. Washington Department of Fisheries. 40 p.

Buckley, R. 1968. 1966 bottomfish sport fishery occurring in Washington marine punch card areas 2 through 12. Supplemental Progress Report. Sport Fishery Investigations 1966. Washington Department of Fisheries. 41 p.

Buckley, R.. 1982. Marine habitat enhancement and urban recreational fishing in Washington. Marine Fisheries Review 44:28-37.

Buckley, R. 1997. Substrate associated recruitment of juvenile Sebastes in artificial reef and natural habitats in Puget Sound and the San Juan Islands, Washington. Wash. Dept. Fish and Wildlife Technical Report No. RAD97-06. 320 p.

Buckley, R., and G. Hueckel. 1985. Biological processes and ecological development on an artificial reef in Puget Sound, Washington. Bulletin of Marine Science 37:50-69.

Buckley, R., and K. Satterthwaite. 1970. 1967 bottomfish sport fishery. Supplemental Progress Report. Sport Fishery Investigations. Washington Department of Fisheries. 41 p.

Conboy, G., and D.Speare,. 2002. Dermal nematodosis in commercially captured rockfish (*Sebastes* spp.) from coastal British Columbia, Canada. Journal of Comparative Pathology 127:211-213.

Dorsey, E., and J. Pederson, eds. 1998. Effects of fishing gear on the sea floor of New England. Conservation Law Foundation, Boston, MA. 160 p.

Dowty, P., B. Reeves, H. Berry, S. Wyllie-Echeverria, T. Mumford, A. Sewell, P. Milos, and R. Wright. 2005. Puget Sound Submerged Vegetation Monitoring Project 2003-2004 Monitoring Report. Washington Department of Natural Resources. 95 p.

Ebbesmeyer, C., D. Cayan, D. Mc Lain, F. Nichols, D. Peterson, and K. Redmond, 1991. 1976 step in the Pacific climate: Forty environmental changes between 1968–1975 and 1977–84. Proc. Seventh Annual Pacific Climate (PACLIM) Workshop, Pacific Grove, CA, California Dept. of Water Resources. Pages 115–126.

Federal Register 2009 Endangered and threatened wildlife and plants: proposed Endangered, Threatened, and Not Warranted status for distinct population segments of rockfish in Puget Sound. Vol. 74 No. 77 pp 18516-18542. Published April 23, 2009

Field, J., and S. Ralston. 2005. Spatial variability in rockfish (*Sebastes* spp.) recruitment levels in the California Current System. Canadian Journal of Fisheries and Aquatic Sciences 62: 2199-2210.

Gotshall, D. 1964. Increasing tagged rockfish (Genus *Sebastodes*) survival by deflating the swim bladder. California Fish and Game 50:253-260.

Gunderson, D., and R. Vetter. 2006. Temperate rocky reef fishes. In: Marine Metapopulations, J. P. Kritzer and P. E. Sale, eds. Elsevier.

Hallacher, L., and D. Roberts. 1985. Differential utilization of space and food by the inshore rockfishes (Scorpaenidae: *Sebastes*) of Carmel Bay, California. Environmental Biology of Fishes 12: 91-110.

Hannah, R., and K. Matteson. 2007. Behavior of nine species of Pacific rockfish after hook-and-line capture, recompression, and release. Transactions of the American Fisheries Society 136: 24-33.

Hare, S., and N. Mantua. 2000. Empirical evidence for North Pacific regime shifts in 1977 and 1989. Progress in Oceanography 47:103-145.

Hayden-Spear, J. 2006. Nearshore habitat associations of young-of-the-year copper (*Sebastes caurinus*) and quillback rockfish in San Juan Channel, Washington. Master of Science Thesis, University of Washington, Seattle.

Hillborn, R. and C. Walters 1992. *Quantitative Fisheries Stock Assessment Choice, Dynamics and Uncertainty* Chapman and Hall 570 pp

Hollowed, A. .K. Bailey, and W. Wooster. 1987. Patterns in recruitment of marine fishes in the northeast Pacific Ocean. Biological Oceanography 5: 99-131.

Hollowed, A. and W. Wooster. 1995. Decadal-scale variations in the eastern subarctic Pacific: II. Response of northeast Pacific fish stocks, p 373-385. In: R.J. Beamish (ed.) Climate Change and Northern Fish Populations. Canadian Journal of Fisheries and Aquatic Sciences 121:81-86.

Hsieh, W., D. Ware, and R. Thomson. 1995. Wind-induced upwelling along the west coast of North America, 1899-1988. Canadian Journal of Fisheries and Aquatic Sciences 52: 325-334.

Hueckel, G., R. Buckley, and B. Benson. 1989. Mitigating rocky habitat loss using artificial reefs. Bulletin of Marine Science 44:913-922.

Ishimatsu, A., M. Hayashi, K-S Lee, T. Kikkawa, and J. Kita, 2005. Physiological effects on fishes in a high-CO_2 world. *Journal of Geophysical Research* 110: 10.1029/2004JC002564.

Jarvis, E. and C. Lowe. 2008. The effects of barotrauma on the catch-and-release survival of southern California nearshore and shelf rockfish (Scorpaenidae, *Sebastes* spp.). Canadian Journal of Aquatic and Fishery Sciences 65: 1286-1296.

Jeffries, S., H. Huber, J. Calambokidis, and J. Laake. 2003. Trends and status of harbor seals in Washington state: 1978-1999. J. Wildlife Management 67:208-219.

Johnson, L., D. Lomax, M. Myers, O. Olson, S. Sol, S. O'Neill, J. West, T. Collier. 2008. Xenoestrogen Exposure and Effects in English Sole (*Parophrys vetulus*) from Puget Sound, WA. Aquatic Toxicology, 88:29-38.

Kaiser, M. 1998. Significance of bottom-fishing disturbance. Conservation Biology 12: 1230-1235.

Kerr, S 2001. A review of “fizzing”- a technique for swim bladder deflation. Master of Science Thesis, Ontario Ministry of Natural Resources, Peterborough, Ontario.

Kenchington, E. 2003. The effects of fishing on species and genetic diversity. In Responsible Fisheries and in the Marine Ecosystem, Chapter 14, pp. 235–253. Ed. by M. Sinclair, and G. Valdimarsson. Food and Agriculture Organization of the United Nations/CABI Publishing, Rome. 426 pp.

Lance, M. and S. Jeffries. 2007. Temporal and spatial variability of harbor seal diet in the San Juan Islands. Contract Report. Washington Department of Fish and Wildlife. 21 p.

Larson, R. 1980. Competition, habitat selection, and the bathymetric segregation of two rockfish (*Sebastes*) species. Ecological Monographs 50: 221-239.

Laufle, J. and G. Pauley. 1985. Fish colonization and materials comparison on a Puget Sound artificial reef. Bulletin of Marine Science 37:227-243.

Law, R. 2000. Fishing, selection, and phenotypic evolution. ICES Journal of Marine Science 57: 659-668.

LeClair, L., R. Buckley, W. Palsson, R. Pacunski, T. Parra, O. Eveningsong, J. Beam, and M. McCallum. 2007. A remarkable settlement of young-of-the-year rockfishes in Puget Sound and the Strait of Juan de Fuca in 2006. In: Proceedings of the 2007 Georgia/Basin Research Conference. Puget Sound Action Team, Olympia, WA.

Levin, P., M. Fogarty, S. Murawski, and D. Fluharty. 2009. Integrated Ecosystem Assessments: Developing the scientific basis for ecosystem-based management of the ocean. LLoS Biol 7(1)e1000014.doi 10.1371 p 23-28.

Levings, C. and R. Thom. 1994. Habitat changes in Georgia Basin: implications for resource management and restoration. Pages 330-351. In. Wilson, R. C. H., R. . Beamish, F. Aitkens, and J. Bell. (eds.). Review of the Marine Environment and Biota of Strait of Georgia, Puget Sound, and Juan de Fuca Strait. Proc. BC/Washington Symposium on the Marine Environment, January 13-14, 1994. Canadian Technical Report of Fisheries and Aquatic Sciences 1948. 390 p.

London, J., M. Lance and S. Jeffries 2002. Observations of harbor seals predation on Hood Canal salmonids from 1998 to 2000. Final Report. Studies of Expanding Pinniped Populations, NOAA Grant No. NA 17FX1603, Washington Department of Fish and Wildlife PSMFC Contract No. 02-15. 20 pp.

Longhurst, A . 2002. Murphy's law revisited: longevity as a factor in recruitment to fish populations. Fisheries Research 36: 125-131.

Love, M.S., C.W. Mecklenburg, T.A. Mecklenburg, and L.K. Thorsteinson. 2005. Resource inventory of marine and estuarine fishes of the west coast and Alaska: A checklist of North Pacific and Arctic Ocean species from Baja California to the Alaska-Yukon border. U.S. Department of the Interior, U.S. Geological Survey. OCS Study MMS 2005-030 and USGS /NBII 2005-001, 276 p.

Love, M., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press. 404 p.

Mantua, N., S. Moore, R. Palmer, and W. Palsson. 2007. Climate change and Puget Sound. Pages 51-56. In: Sound Science: Synthesizing Ecological and Socioeconomic Information about the Puget Sound Ecosystem. 93 p.

Mathews, S. and M. Barker. 1983. Movements of rockfish (*Sebastes*) tagged in northern Puget Sound, Washington. Fishery Bulletin 82:916-922.

Matthews, K. 1987. Habitat utilization by recreationally-important bottomfish in Puget Sound: An assessment of current knowledge and future needs. Washington Department of Fisheries Progress Report No. 264. 57 p.

Matthews, K. 1990a. A comparative study of habitat use by young-of-the-year, subadult, and adult rockfishes on four habitat types in central Puget Sound. Fishery Bulletin 88:223-239.

Matthews, K. 1990b. An experimental study of the habitat preferences and movement patterns of copper, quillback, and brown rockfishes (*Sebastes* spp.). Environmental Biology of Fishes 29:161-178.

Matthews, K. 1990c. A telemetric study of the home ranges and homing routes of copper and quillback rockfish on shallow rocky reefs. Canadian Journal of Zoology 68: 2243-2250.

Methot, R. 2005. Updated rebuilding analysis for canary rockfish based on stock assessment in 2005. Pacific Fishery Management Council 36 p.

Meyer, D. 2006. Depressurization stress in copper rockfish, *Sebastes caurinus*. Master of Science Thesis, Western Washington University. 44 p.

Miller, B. and S.Borton. 1980. Geographical distribution of Puget Sound fishes: Maps and data source sheets. University of Washington Fisheries Research Institute, 3 vols.

Mills, C. and K. Rawson. 2004. Outlook grim for North Pacific Rockfish: Rockfish Symposium, Friday Harbor Laboratories, University of Washington, USA September 25-26, 2003. Fish and Fisheries 5:178-180.

Moser, H., R. Charter, W. Watson, D. Ambrose, J. Butler, S. Charter, and E. Sandknop. 2000. Abundance and distribution of rockfish (Sebastes) larvae in the southern California Bight in relation to environmental conditions and fishery exploitation. Reports of California Cooperative Oceanic Fisheries Investigations [CalCOFI Rep.]. Vol. 41, pages 132-147.

Moulton, L. 1977. An ecological assessment of fishes inhabiting the rocky nearshore regions of northern Puget Sound, Washington. Ph.D. Dissertation, Univ. Washington, Seattle. 181 p.

Mumford, T. Jr. 2007. Kelp and eelgrass in Puget Sound. Puget Sound Nearshore Partnership Technical Report 2007-05. Olympia, WA.

Musick, J. 1999. Criteria to define extinction risk in marine fishes. Fisheries 24: 6-14.

Musick, J. 1998. Endangered marine fishes: criteria and identification of North American stocks at risk. Fisheries 23(7):28–30.

Newton, J. 1995. El Niño weather conditions reflected in Puget Sound temperatures and salinities. Pages 979-991. In: Puget Sound Research '95, Volume 2, Puget Sound Water Quality Authority, Olympia, WA. 1038 p.

Newton, J. , C. Bassin, A. Devol, M. Kawase, W. Ruef, M. Warner, D. Hannafious, and R. Rose. 2007. Hypoxia in Hood Canal: An overview of status and contributing factors. Proceedings of the 2007 Georgia Basin Puget Sound Research Conference. Puget Sound Action Team, Olympia, WA.

Newton, J., E. Siegel, and S. Albertson. 2003. Oceanographic changes in Puget Sound and the Strait of Juan de Fuca during the 2000-1 drought. Canadian Water Resources Journal 28: 715-728.

Newton, J. D. Hannafious, J. Bos, and M. Warner. 2005. Hypoxia in Hood Canal: status and contributing factors. In: 2005 Puget Sound Georgia Basin Research Conference, Seattle. Puget Sound Action Team, Olympia, WA.

Newton, J., A. Thompson, L. Eisner, G. Hannach, and S. Albertson. 1995. Dissolved oxygen concentrations in Hood Canal: Are current conditions different from those 40 years ago? Pages 1002-1008. In: Puget Sound Research '95, Volume 2, Puget Sound Water Quality Authority, Olympia, WA. 1038 p.

O'Farrell, M and L. Botsford 2006. The fisheries management implications of maternal-age-dependent larval survival. Can J. Aquat. Sci 63:2249-2258.

Olesiuk, P. 1993. Prey consumption by harbor seals (*Phoca vitul*ina) in the Strait of Georgia, British Columbia. Fishery Bulletin 91: 491-515.

Pacunski, R. and W. Palsson. 1998. The distribution and abundance of nearshore rocky-reef habitats and fishes in Puget Sound. Volume 2, pages 545-554, In: Puget Sound Research '98 Proceedings. Puget Sound Water Quality Action Team, Olympia, WA. 948 p.

Pacunski, R. and W. Palsson. 2002. Macro- and micro-habitat relationships of adult and sub-adult rockfish, lingcod and kelp greenling in Puget Sound. In: Puget Sound Research '01. Puget Sound Water Quality Action Team, Olympia, WA.

Palsson, W. 1988. Bottomfish catch and effort statistics from boat-based recreational fisheries in Puget Sound, 1970-1985 (Revised). Washington Department of Fisheries Progress Report No. 261. 104 p.

Palsson, W, T. Northup, and M. Barker. 1998. Puget Sound Groundfish Management Plan (Revised). Washington Department of Fish and Wildlife, Olympia, WA 43 p.

Palsson, W, T. Tsou, G. Bargmann, R. Buckley, J. West, M. Mills, Y. Cheng, and R. Pacunski. 2009. The biology and Assessment of Rockfishes in Puget Sound. Washington Department of Fish and Wildlife. Draft Report FPT-09-04

Palsson, W. R. Pacunski, and T. Parra. 2004. Time will tell: Long-term observations of the response of rocky habitat fishes to marine reserves in Puget Sound. In: 2003 Georgia Basin/Puget Sound Research Conference Proceedings, T. W. Droscher and D. A. Fraser, eds. Puget Sound Action Team, Olympia.

Palsson, W., R. Pacunski, T. Parra, and J. Beam. 2008. The effects of hypoxia on marine fish populations in southern Hood Canal, Washington. American Fisheries Society Symposium Series 64: 255-280.

Paulson, A., D.. Konrad, L. Frans, M. Noble, C. Kendall, E. Joshberger, R. Juffman, and T. D. Olsen. 2006. Freshwater and saline loads of dissolved inorganic nutrients to Hood Canal and Lynch Cove, western Washington. U.S. Geological Survey Scientific Investigations Report, 2006-5106. 92 p.

Parker, S., S. Berkeley, J. Golden, D Gunderson, J. Heifetz, M. Hixon, R. Larson, B. Leaman, M. Love, J Musick, V. O'Connell, S Ralston, H. Weeks and M. Yoklavich. 2000. Management of Pacific rockfish. Fisheries 25: 22-29.

Parker, S., H. McElderry, P. Rankin, and R. Hannah. 2006. Buoyancy regulation and barotrauma in two species of nearshore rockfish. Transactions of the American Fisheries Society 125: 1213-1223.

Pearcy, W. and A. Schoener. 1987. Changes in the marine biota coincident with the 1982-1983 El Niño in the northeastern subarctic Pacific Ocean. Journal of Geophysical Research 92: 14417-14428.

PMFC (Pacific Fishery Management Council) 2008 Groundfish Management Team (GMT) report on the development of a discard mortality matrix for ocean and estuary recreational fisheries MS report 15 pp.

PMFC (Pacific Fishery Management Council) 2008 Pacific coast groundfish fishery management plan for the California, Oregon, and Washington groundfish fishery 167 p.

PSAT (Puget Sound Action Team) 2005 Uncertain Future: Climate change and its effects on Puget Sound. October 2005 35pp.

PSAT (Puget Sound Action Team). 2002. 2002 Puget Sound update, eighth report of the Puget Sound Ambient Monitoring Program. Puget Sound Water Quality Action Team, Olympia, WA. 144 p.

PSAT (Puget Sound Action Team). 2007. 2007 Puget Sound update, ninth report of the Puget Sound Ambient Monitoring Program. Puget Sound Action Team, Olympia, WA. 260 p.

PSP (Puget Sound Partnership). 2008. Biennial science work plan 2009-2011. Puget Sound Partnership, Olympia, WA. 33 p.

Ralston, S., and D. F. Howard. 1995. On the development of year-class strength and cohort variability in two northern California rockfishes. Fishery Bulletin 93: 710-720.

Rijnsdorp, A. M. Peck, G. Engelhard, C. Mollmann, and J. Pinnegar. 2009. Resolving the effect of climate change on fish populations. ICES J. of Marine Science 66:1570-1583.

Rogers, B., C. Lowe, E. Fernandez-Juricic, and L. Frank. 2008. Utilizing magnetic resonance imaging (MRI) to assess the effects of angling-induced barotrauma on rockfish (*Sebastes*). Canadian Journal of Fisheries and Aquatic Sciences 65: 1245-1249.

Salomon, A. 2002. Ecological interactions and indirect effects in marine reserves: Expect the unexpected. pp. 8-12 In: Puget Sound Notes 46. Puget Sound Action Team, Olympia, Washington. 12 p.

Salomon, A., N. Waller, C. McIlhagga, R. Yung, and C. Walters. 2002. Modeling the trophic effects of marine protected area zoning policies: A case study. Aquatic Ecology, 36: 85-95.

Schmitt, C., S. Jeffries, and P. Gearin. 1995. Pinniped predation on marine fish in Puget Sound. Pages: 630-637. In: Puget Sound Research '95 Proceedings. Puget Sound Water Quality Authority, Olympia, WA. 1038 p.

Simenstad, C., B. Miller, C. Nyblade, K. Thornburgh, and L. Bledsoe. 1979. Food web relationships of northern Puget Sound and the Strait of Juan de Fuca, A synthesis of the available knowledge. U.S. EPA Report EPA-600/7-79-259. 335 p.

Smith, D, A Punt, N. Dowling, A. Smith, G. Tuck and I. Knucky 2009. Reconciling approaches to the assessment and management of data-poor species and fisheries with Australia's harvest policy. Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science 1:244-254

Snover, A, P. Mote, L. Whitney Binder, A. F. Hamlet, and N. Mantua. 2005. Uncertain future: climate change and its effects on Puget Sound. A report for the Puget Sound Action Team by the Climate Impacts Group (Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Oceans, University of Washington Seattle.

Stewart, H. 1977. Indian fishing: early methods on the northwest coast. University of Washington, Seattle, WA. 181 p.

Toft, J., C. Simenstad, J. Cordell, and L Stamatiou. 2004. Fish distribution, abundance, and behavior at nearshore habitats along the City of Seattle marine shoreline, with emphasis on juvenile salmonids. University of Washington School of Aquatic and Fishery Sciences Report SAFS-UW-0401. 52 p.

Tsou, T and F. Wallace 2006. Updated rebuilding analysis for yelloweye rockfish based on stock assessment in 2006.Pacific Fishery Management Council 32 p.

Thompson, G 1996 The precautionary principle in North Pacific groundfish Management AFSC Quarterly review July-August-September pp1-7.

Van Cleve,.. F.B., G Bargmann, M Culver and the MPA Work Group. 2009. Marine Protected Areas in Washington. Recommendations of the Marine Protected Areas Work Group to the Washington State Legislature, Washington Department of Fish and Wildlife 112 pp.

Warner, M., M. Kawase and J. Newton 2002. Recent studies of the overturning circulation in Hood Canal. In: Proceedings of the 2001 Puget Sound Research Conference. T. Drosher, editor. Puget Sound Action Team. Olympia, WA.

WDFW (Washington Department of Fish and Wildlife) 2009 Species of Concern List downloaded from: http://wdfw.wa.gov/wildlife/management/endangered.html

WDNR (Washington Department of Natural Resources). 1998. Our Changing Nature: Natural Resource Trends in Washington State. Wash. Dep. Nat. Res., Olympia, WA. 75 p.

West, J. 1997. Protection and restoration of marine life in the inland waters of Washington state. Puget Sound Water Quality Action Team, Puget Sound/Georgia Basin Environmental Report Series No. 6. 144 p.

West, J. R. Buckley, and D.Doty. 1994. Ecology and habitat use of juvenile rockfishes (*Sebastes* spp.) associated with artificial reefs in Puget Sound, Washington. Bulletin of Marine Science 55: 344-350.

West, J. ,R. Buckley, D.Doty, and B. Bookheim. 1995. Ecology and habitat use of juvenile rockfishes (*Sebastes* spp.) associated with artificial nursery habitats in Puget Sound. Pages 191-202. In: Proceedings Puget Sound Research '95. Puget Sound Water Quality Authority, Olympia, WA. 1038 p.

West, J., S. O'Neill, G. Lippert and S. Quinnell 2001. Toxic contaminants in marine and anadromous fishes from Puget Sound, Washington: Results of the Puget Sound Ambient Monitoring Program, Fish Component 1989-1999. Washington Department of Fish and Wildlife, Olympia, WA. 52 pp plus appendices.

West, J., S. O'Neill, D. Lomax, and L. Johnson . 2001. Implications for reproductive health in quillback rockfish (*Sebastes maliger*) from Puget Sound exposed to polychlorinated biphenyls. Puget Sound Research '01. Puget Sound Water Quality Action Team, Bellevue, WA.

West, J., S. O'Neill, and G. Ylitalo. 2008. Spatial extent, magnitude, and patterns of persistent organochlorine pollutants in Pacific herring (*Clupea pallasi*) populations in the Puget Sound (USA) and Strait of Georgia (Canada). Science of the Total Environment 394: 369-378.

Wilde, G. 2009. Does venting promote survival of released fish? Fisheries 34: 20-28.

Appendix 4. List of Rockfish Species Found in Puget Sound

Source: Palsson *et al*. 2009; Love *et al*. 2005

COMMON NAME	*SCIENTIFIC NAME*
Known from Puget Sound East of the Sekiu River	
Rougheye rockfish	*Sebastes aleutianus*
Pacific ocean perch	*Sebastes alutus*
Brown rockfish	*Sebastes auriculatus*
Redbanded rockfish	*Sebastes babcocki*
Silvergray rockfish	*Sebastes brevispinis*
Copper rockfish	*Sebastes caurinus*
Darkblotched rockfish	*Sebastes crameri*
Splitnose rockfish	*Sebastes diploproa*
Greenstriped rockfish	*Sebastes elongatus*
Puget Sound rockfish	*Sebastes emphaeus*
Widow rockfish	*Sebastes entomelas*
Yellowtail rockfish	*Sebastes flavidus*
Rosethorn rockfish	*Sebastes helvomaculatus*
Quillback rockfish	*Sebastes maliger*
Black rockfish	*Sebastes melanops*
Vermillion rockfish	*Sebastes miniatus*
Blue rockfish	*Sebastes mystinus*
China rockfish	*Sebastes nebulosus*
Tiger rockfish	*Sebastes nigrocinctus*
Bocaccio	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Redstripe rockfish	*Sebastes proriger*
Rosy rockfish	*Sebastes rosaceus*
Yelloweye rockfish	*Sebastes ruberrimus*
Stripetail rockfish	*Sebastes saxicola*
Halfbanded rockfish	Sebastes semicinctus
Sharpchin rockfish	*Sebastes zacentrus*
Shortspine thornyhead	*Sebastolobus alascanus*
The Following Additional Species Are Likely to Occur in Neah Bay Region	
Aurora rockfish	*Sebastes aurora*
Shortraker rockfish	*Sebastes borealis*
Greenspotted rockfish	*Sebastes chlorostictus*

Chilipepper	*Sebastes goodie*
Shortbelly rockfish	*Sebastes jordani*
Blackgill rockfish	*Sebastes melanostomus*
Yellowmouth rockfish	*Sebastes reedi*
Bank rockfish	*Sebastes rufus*
Pygmy rockfish	*Sebastes wilsoni*
Harlequin rockfish	*Sebastes variegatus*
Longspine thornyhead	*Sebastolobus altivelis*

Appendix 5. Environmental Checklist

ENVIRONMENTAL CHECKLIST
(WAC 197-11-960)

A. BACKGROUND

1. Name of proposed project, if applicable:

PUGET SOUND ROCKFISH CONSERVATION PLAN

2. Name of applicant:

WASHINGTON DEPARTMENT OF FISH & WILDLIFE

3. Address and phone number of applicant and contact person:

600 CAPITOL WAY N.
OLYMPIA, WA 98504
(360) 902-2725

4. Date checklist prepared:

AUGUST 7, 2009

5. Agency requesting checklist:

WASHINGTON DEPARTMENT OF FISH & WILDLIFE

6. Proposed timing or schedule (including phasing, if applicable):

PLAN ADOPTION DURING 2010

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. THE PROPOSAL IS A NON PROJECT PROPOSAL WHICH MAY BE FOLLOWED BY SITE SPECIFIC PROPOSALS TO RESTORE OR CREATE HABITAT FOR ROCKFISH IN PUGET SOUND. ANY SUCH PROPOSAL WOULD UNDERGO A SEPARATE SEPA REVIEW.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

PALSSON, W, T. TSOU, G. BARGMANN, R. BUCKLEY, J. WEST, M. MILLS, Y. CHENG AND R. PACUNSKI 2009 THE BIOLOGY AND ASSESSMENT OF

ROCKFISHES IN PUGET SOUND. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE DRAFT REPORT FPT-09-04

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. NOT APPLICABLE

10. List any government approvals or permits that will be needed for your proposal, if known.
APPROVAL OF PUGET SOUND ROCKFISH CONSERVATION PLAN AND FINAL EIS BY WASHINGTON DEPARTMENT OF FISH & WILDLIFE

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

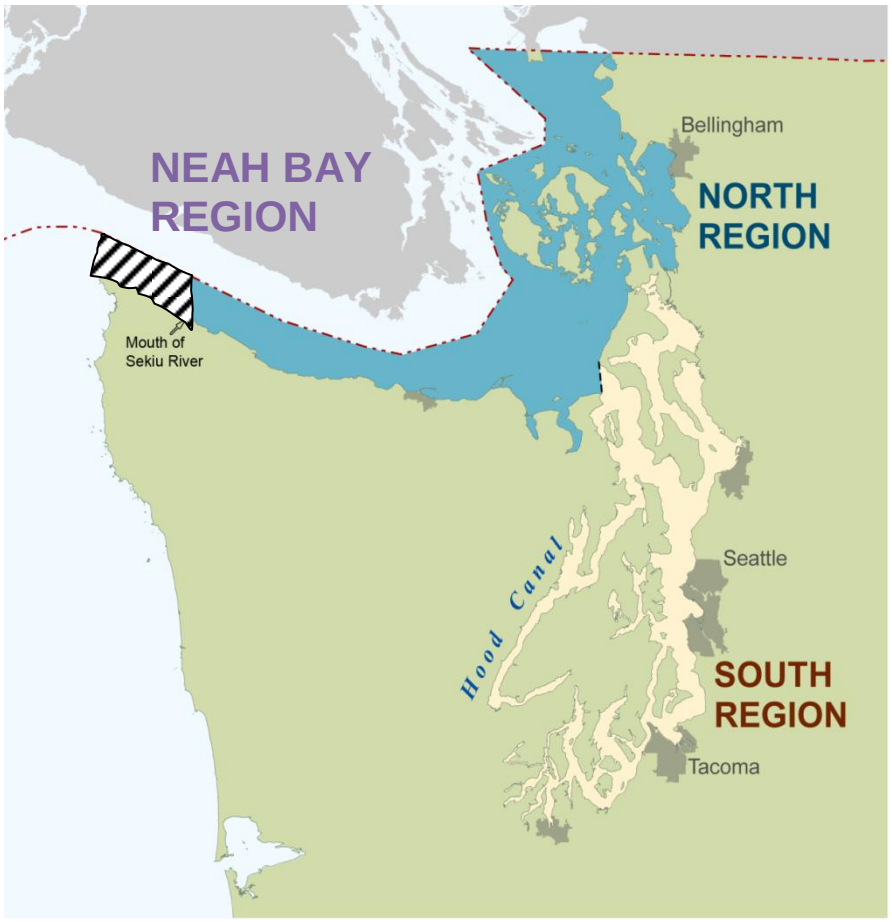
THE PLAN ADDRESSES THE MANAGEMENT AND RESTORATION OF ROCKFISH IN ALL AREAS OF PUGET SOUND. THE GOAL OF THE PLAN IS TO RESTORE AND MAINTAIN THE ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF ROCKFISH AND THEIR HABITATS IN PUGET SOUND. CONSISTENT WITH THIS GOAL, THE DEPARTMENT OF FISH AND WILDLIFE (WDFW) WILL UTILIZE ROCKFISH TO PRODUCE SUSTAINABLE ECOSYSTEM BENEFITS.

TO ACHIEVE THIS GOAL, THE PLAN PROPOSES EIGHT DIFFERENT BUT INTERLOCKING POLICY ELEMENTS AS FOLLOWS:

- NATURAL PRODUCTION
- HABITAT
- FISHERY MANAGEMENT
- ECOSYSTEM EFFECTS
- EVALUATION MONITORING AND ADAPTIVE MANAGEMENT
- RESEARCH
- OUTREACH AND EDUCATION
- ENHANCEMENT

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

PUGET SOUND, INCLUDING THE STRAIT OF JUAN DE FUCA (WEST TO CAPE FLATTERY), THE SAN JUAN ISLANDS, HOOD CANAL, ADMIRALTY INLET, THE WHIDBEY BASIN AND INNER PUGET SOUND SOUTH TO OLYMPIA. THE PLAN DIVIDES THE PROJECT AREA INTO THREE REGIONS: 1) SOUTH OF PORT TOWNSEND; 2) NORTH AND WEST OF PORT TOWNSEND AND EAST TO THE SEKIU RIVER; AND 3) FROM THE SEKIU RIVER WEST TO CAPE FLATTERY.



B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other . . . . . .NOT APPLICABLE

b. What is the steepest slope on the site (approximate percent slope)? NOT APPLICABLE

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland. NOT APPLICABLE

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. NOT APPLICABLE

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill. NONE

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. NO

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings) NO CHANGE FROM EXISTING LEVELS

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
NONE

2. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known. NO CHANGE FROM EXISTING LEVELS.

b. Are there any offsite sources of emissions or odor that may affect your proposal? If so, generally describe. NONE

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
NONE

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. YES, THE ENTIRE PUGET SOUND IS COVERED BY SALT WATER.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. NO

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
NONE

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. NONE

5) Does the proposal lie within a 100-year flood plain? If so, note location on the site plan. NOT APPLICABLE

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
NONE

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known. NONE

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. NONE

c. Water runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. NOT APPLICABLE

2) Could waste materials enter ground or surface waters? If so, generally describe. NO

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any: NONE

4. **Plants**

a. Check or circle types of vegetation found on the site:
— Deciduous tree: Alder, maple, aspen, other
— Evergreen tree: Fir, cedar, pine, other
— Shrubs
— Grass
— Pasture
— Crop or grain
— Wet soil plants: Cattail, buttercup, bullrush, skunk cabbage, other
X— Water plants: Water lily, eelgrass, milfoil, other
— Other types of vegetation

b. What kind and amount of vegetation will be removed or altered? NONE

c. List threatened or endangered species known to be on or near the site. NONE

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: NONE

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

Birds: Hawk, heron, eagle, songbirds,

other: . ALMOST ALL BIRD SPECIES FOUND IN WESTERN WASHINGTON ARE FOUND IN OR OVER PUGET SOUND. . . . . .

Mammals: Deer, bear, elk, beaver,

other: .SEALS, OTTERS, AND WHALES. . . . . .

Fish: Bass, salmon, trout, herring, shellfish,

other: . . OVER 212 SPECIES OF FISH ARE KNOWN TO OCCUR IN PUGET SOUND AS WELL AS THOUSANDS OF SPECIES OF INVERTEBRATES . . . . . .

b. List any threatened or endangered species known to be on or near the site.

COMMON NAME (STATUS[4])	**SCIENTIFIC NAME**	**POSSIBLE INTERACTION WITH ROCKFISH**
Southern Resident Killer Whale (E)	*Orcinus orca*	Rockfish are minor prey item

[4] E or T means listed an Endangered or Threatened under the federal Endangered Species Act, if preceded by a "P" it indicates that the listing status is potential; SE, ST, SC and SS means the species is listed on the Washington state Endangered, Threatened, Candidate or Sensitive list.

Humpback Whale(E. SE)	*Megaptera novaeangliae*	
Stellar Sea Lion (T,ST)	*Eumetopias jubatus*	Rockfish may be a minor prey item
Marbled murrelet(T,ST))	*Brachyramphus marmatus*	
Brown pelican (E,SE)	*Pelecanus occidentalis*	Minor competition for food
Chinook salmon (T)	*Oncorhynchus tshawytscha*	Rockfish are both prey and predators
Summer chum salmon (T)	*Oncorhynchus keta*	
Steelhead trout (T)	*Oncorhynchus mykiss*	
American white pelican (SE)	*Pelecanus erythrorhynchos*	Possible competition for food
Brandt's Cormorant (SC)	*Phalacrocorax penicillatus*	
Cassin's auklet (SC)	*Ptychoramphus aleuticus*	
Common murre (SC)	*Uria aalge*	
Black rockfish (SC)	*Sebastes melanops*	
Yelloweye rockfish (SC,PT)	*Sebastes ruberrimus*	
Bocaccio rockfish (SC, PE)	*Sebastes paucispinis*	
Brown rockfish (SC)	*Sebastes auriculatus*	
Canary rockfish (SC, PT)	*Sebastes pinninger*	
China rockfish SC)	*Sebastes nebulosus*	
Copper rockfish (SC)	*Sebastes caurinus*	
Greenstriped rockfish (SC)	*Sebastes elongatus*	
Pacific cod (SC)	*Gadus macocephalus*	Competition for food, predation, bycatch in rockfish fisheries
Pacific hake (SC)	*Merluccius productus*	Competition for food, predation, bycatch in rockfish fisheries
Pacific herring (SC)	*Clupea pallasi*	Rockfish prey on herring; herring prey on rockfish larvae
Quillback rockfish (SC)	*Sebastes maliger*	
Tiger rockfish (SC)	*Sebastes nigrocinctus*	
Walleye pollock (SC)	*Theragra chalcogramma*	Competition for food
Widow rockfish(SC)	*Sebastes entomelas*	
Yellowtail rockfish (SC)	*Sebastes flavidus*	
Gray Whale (SE)	*Eschrichtius robustus*	
Pacific harbor porpoise (SC)	*Phocoena phocoena*	
Northern abalone (SC)	*Haliotis kamschatkana*	
Olympia Oyster (SC)	*Ostrea conchaphila*	

c. Is the site part of a migration route? If so, explain.
PUGET SOUND IS USED FOR MIGRATION FOR JUVENILE SALMON ENTERING SALTWATER AND ALSO BY ADULT SALMON RETURNING TO NATAL STREAMS TO SPAWN. PUGET SOUND IS PART OF A MAJOR FLYWAY FOR MIGRATING BIRDS.

d. Proposed measures to preserve or enhance wildlife, if any:
PART OF THE PROPOSED PLAN IS TO DEVELOP RESTRICTIVE FISHING

REGULATIONS WHICH WILL PROTECT FISH LIFE. ADDITIONALLY THE PLAN CONSIDERS THE ECOSYSTEM NEEDS OF AQUATIC LIFE SUCH AS FORAGE AND CREATES AREAS WHERE FISHING WILL NOT BE ALLOWED.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. NOT APPLICABLE

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. NO

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: NOT APPLICABLE

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe. NONE

1) Describe special emergency services that might be required. NONE

2) Proposed measures to reduce or control environmental health hazards, if any: NOT APPLICABLE

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? NONE

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. NONE

3) Proposed measures to reduce or control noise impacts, if any: NOT APPLICABLE

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties? NOT APPLICABLE

b. Has the site been used for agriculture? If so, describe. NOT APPLICABLE

c. Describe any structures on the site. NONE

d. Will any structures be demolished? If so, what? NONE

e. What is the current zoning classification of the site? NOT APPLICABLE

f. What is the current comprehensive plan designation of the site? NOT APPLICABLE

g. If applicable, what is the current shoreline master program designation of the site? NOT APPLICABLE

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

WAC 220-110-250
Saltwater habitats of special concern.

In the following saltwater habitats of special concern, or areas in close proximity with similar bed materials, specific restrictions regarding project type, design, location, and timing may apply as referenced in WAC 220-110-270 through 220-110-330.

(a) Surf smelt (*Hypomesus pretiosus*) spawning beds are located in the upper beach area in saltwater areas containing sand and/or gravel bed materials.

(b) Pacific sand lance (*Ammodytes hexapterus*) spawning beds are located in the upper beach area in saltwater areas containing sand and/or gravel bed materials.

(c) Rock sole (*Lepidopsetta bilineata*) spawning beds are located in the upper and middle beach area in saltwater areas containing sand and/or gravel bed materials.

(d) Pacific herring (*Clupea pallasi*) spawning beds occur in lower beach areas and shallow subtidal areas in saltwater areas. These beds include eelgrass (*Zostera* spp.) and other saltwater vegetation and/or other bed materials such as subtidal worm tubes.

(e) Rockfish (Sebastes spp.) settlement and nursery areas are located in kelp beds, eelgrass (*Zostera* spp.) beds, other saltwater vegetation, and other bed

materials.

(f) Lingcod (*Ophiodon elongatus*) settlement and nursery areas are located in beach and subtidal areas with sand,

eelgrass (*Zostera* spp.), subtidal worm tubes, and other bed materials.

(2) Juvenile salmonid (Family Salmonidae) migration corridors, and rearing and feeding areas are ubiquitous throughout shallow nearshore saltwater areas of the state.

(3) The following vegetation is found in many saltwater areas and serves essential functions in the developmental life history of fish or shellfish:

(a) Eelgrass (*Zostera* spp.);

(b) Kelp (Order laminariales);

(c) Intertidal wetland vascular plants (except noxious weeds).

i. Approximately how many people would reside or work in the completed project? NOT APPLIABLE

j. Approximately how many people would the completed project? NOT APPLIABLE

k. Proposed measures to avoid or reduce displacement impacts, if any: NOT APPLICABLE

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: NONE

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. NONE

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. NONE

c. Proposed measures to reduce or control housing impacts, if any: NOT APPLICABLE

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? NOT APPLICABLE

b. What views in the immediate vicinity would be altered or obstructed? NONE

c. Proposed measures to reduce or control aesthetic impacts, if any: NONE

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? NONE

b. Could light or glare from the finished project be a safety hazard or interfere with views? NO

c. What existing offsite sources of light or glare may affect your proposal? NONE

d. Proposed measures to reduce or control light and glare impacts, if any: NONE

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity? BOATING, FISHING, DIVING, PHOTOGRAPHY, BIRD WATCHING, WHALE WATCHING

b. Would the proposed project displace any existing recreational uses? If so, describe.

THE PLAN COULD CHANGE EXISTING RECREATIONAL FISHING ACTVITIES

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: CHANGES IN RECREATIONAL FISHING ACTVIITIES WOULD OCCUR ONLY AFTER PERIODS OF SCIENTIFIC STUDY AND PUBLIC COMMENT.

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe. NOT APPLICABLE

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site. NOT APPLICABLE

c. Proposed measures to reduce or control impacts, if any: NONE

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any. NOT APPLICABLE

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop? NOT APPLICABLE

c. How many parking spaces would the completed project have? How many would the project eliminate? NONE

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private). NONE

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. NOT APPLICABLE

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur. NOT APPLICABLE

g. Proposed measures to reduce or control transportation impacts, if any: NONE

15. **Public services**

a. Would the project result in an increased need for public services (for example: Fire protection, police protection, health care, schools, other)? If so, generally describe. NOT APPLICABLE

b. Proposed measures to reduce or control direct impacts on public services, if any. NONE

16. **Utilities**

a. Circle utilities currently available at the site: Electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. NOT APPLICABLE

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. NONE

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: . . . . . .

Date Submitted: . . . . . .

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise? THE PLAN MAY AFFECT RECREATIONALFISHING OPPORTUNITIES, CAUSING SMALL INCREASES OR DECREASES IN BOATING ACTIVITY AND ASSOCIATED EMISSIONS.

   Proposed measures to avoid or reduce such increases are: THE PLAN PROPOSES TO CREATE SUSTAINABLE FISHING OPPORTUNITES. ACHIEVEMENT OF THIS GOAL WILL PRODUCE MORE STABLE FISHERIES, MINIMIZING INTER ANNUAL CHANGES IN EMMISSIONS FROM FISHING VESSELS AND LIMITING THE GROWTH OF EMISSIONS

2. How would the proposal be likely to affect plants, animals, fish, or marine life? POSITIVE FOR FISH AND MARINE LIFE

   Proposed measures to protect or conserve plants, animals, fish, or marine life are: THE PLAN WILL PRODUCE MORE RESTRICTIVE FISHING REGULATIONS, CONSIDER ECOSYSTEM NEEDS OF MARINE LIFE, RESTORE DEGRADED HABITATS AND INCREASE AREAS WHERE FISHING IS NOT ALLOWED OR GREATLY RESTRICTED

3. How would the proposal be likely to deplete energy or natural resources? THE PROPOSAL WILL HAVE NO EFFECT ON ENERGY USE AND PROVIDE POSITIVE BENEFITS TO NATURAL RESOURCES

Proposed measures to protect or conserve energy and natural resources are: THE PLAN WILL PROTECT AND CONSERVE MARINE LIFE BY PRODUCING MORE RESTRICTIVE FISHING REGULATIONS, CONSIDERING ECOSYSTEM NEEDS OF MARINE LIFE, RESTORING DEGRADED HABITATS AND INCREASING AREAS WHERE FISHING IS NOT ALLOWED OR GREATLY RESTRICTED

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, flood plains, or prime farmlands? THE PROPOSAL WOULD BENEFIT THESE AREAS

   Proposed measures to protect such resources or to avoid or reduce impacts are: THE PROPOSAL WILL RESTORE DEGRADED HABITATS AND CREATE NO FISHING AREAS IN PUGET SOUND.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans? NO CHANGE IN SHORELINE USE IS ANTICIPATED

   Proposed measures to avoid or reduce shoreline and land use impacts are: NONE

6. How would the proposal be likely to increase demands on transportation or public services and utilities? NO CHANGE FROM EXISTING LEVELS

   Proposed measures to reduce or respond to such demand(s) are: NOT APPLICABLE

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment. NO KNOWN CONFLICTS