

MARINE RESERVES PROGRAM SYNTHESIS REPORT

2009-2021



ACKNOWLEDGMENTS

Many thanks to all the past and current ODFW staff, fishing community members, academic researchers, NGOs, marine reserve community teams and groups, Fellows, students, and volunteers that have contributed to the implementation of Oregon's marine reserves and helped make our program a success over the last 10 years. We hope this report does justice to all that you have contributed.

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**Marine
Resources**

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ACRONYMS & ABBREVIATIONS

AAUS	American Academy of Underwater Science
ACS	US Census Bureau American Community Survey
BACI	Before-After-Control-Impact
BEA	US Bureau of Economic Analysis
BPUE	Biomass per Unit Effort
CA	Comparison Area
CDFW	California Department of Fish and Wildlife
CE	Choice Experiment
CI	Confidence Interval
CNS	Connectedness with Nature Scale
COSEE	Consortium for Ocean Science Exploration and Engagement
COVID-19	Coronavirus Disease 2019
CPI	Consumer Price Index
CPUE	Catch Per Unit Effort
DLCD	Department of Land Conservation and Development
DOGAMI	Department of Geology and Mineral Industries
DSL	Department of State Lands
ELWL	Extreme Low Water Line
ENSO	El Niño Southern Oscillation
EO	Executive Order
F.I.R.E	Finance, insurance, real estate, rental, and leasing industries
FEAM	Fisheries Economic Assessment Model
FERC	Federal Energy Regulatory Commission
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GIS	Geographic Information System
HB	House Bill
HRAP	Haystack Rock Awareness Program
IS	InterState
IGA	Inter-Governmental Agreement
IMPLAN	Impact Analysis for Planning, Economic Impact Assessment software
IO PAC	Input-Output model for Pacific Coast Fisheries
IUCN	International Union for Conservation of Nature
MARINE	Multi-Agency Rocky Intertidal Network
MPA	Marine Protected Area
MR	Marine Reserve
MSI	Marine Studies Initiative
NGO	Non Governmental Organization
NOAA	National Oceanographic and Atmospheric Administration
NRS	Natural Resource Specialist
NSAT	(Depot Bay) Near Shore Action Team
OAH	Ocean Acidification and Hypoxia
OAR	Oregon Administrative Rules
ODFW	Oregon Department of Fish and Wildlife
OFCC	Oregon Fishermen’s Cable Committee
OPAC	Ocean Policy Advisory Council
OPRD	Oregon Parks and Recreation Department
ORBS	Oregon Recreational Boat Survey
ORS	Oregon Revised Statutes
OSG	Oregon Sea Grant
OSP	Oregon State Police

OSU	Oregon State University
PacFIN	Pacific Coast Fisheries Information Network
PDO	Pacific Decadal Oscillation
PFMC	Pacific Fisheries Management Council
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PPGIS	Participatory GIS survey tool
PRIME	Promoting Research Investigations in the Marine Environment
PSU	Portland State University
REI	Regional Economic Impact
REU	Research Experience for Undergraduates
ROV	Remotely Operated Vehicle
RRCT	Redfish Rocks Community Team
SARIMA ITS/ARIMA	Seasonal Autoregressive Integrated Moving Average interrupted time series
SB	Senate Bill
SCUBA	Self-Contained Underwater Breathing Apparatus
SMURF	Standard Monitoring Units for the Recruitment of Fishes
SSWD	Sea Star Wasting Disease
STAC	Scientific and Technical Advisory Committee
SWB	Subjective Well-Being
SWG	State Wildlife Grants
TEV	Total Economic Value Framework
TRG	The Research Group LLC
USCG	U.S. Coast Guard





CHAPTER 1. INTRODUCTION

OREGON'S MARINE RESERVES & HOW TO USE THIS REPORT

- A. INTRODUCTION
- B. OREGON'S MARINE RESERVES AND THE ODFW MARINE RESERVES PROGRAM
- C. HOW TO USE THIS REPORT
- D. THE MANDATES: REQUIREMENTS AND GUIDING PRINCIPLES
- E. OF SPECIAL NOTE

A. INTRODUCTION

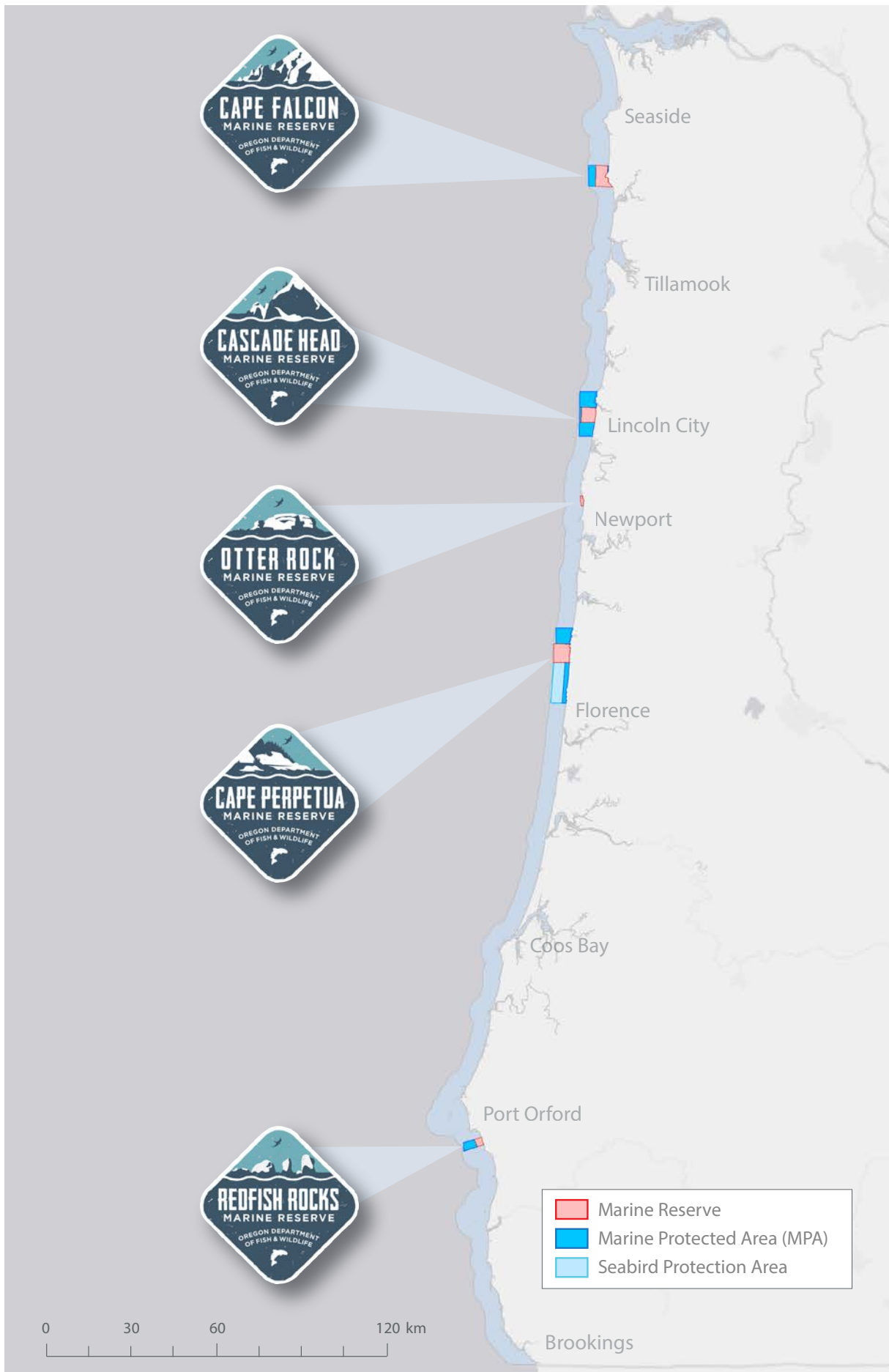
This report was prepared by the Oregon Department of Fish and Wildlife (ODFW) and provides a comprehensive overview of the ODFW Marine Reserves Program and the first 10 years of implementation of Oregon's marine reserves. Implementation of the marine reserve system is the first long-term, nearshore ocean conservation and monitoring program executed by the state of Oregon. It is currently the only ecosystem-focused, nearshore monitoring program designed to track and understand ocean changes in Oregon's state waters. It is also the first comprehensive human dimensions research program focused on examining the economic, social, and cultural dynamics of the Oregon coast and coastal communities.

This report serves as an important check-in on the development and execution of this relatively new nearshore conservation and monitoring program. It gives Oregonians a chance to reflect on the accomplishments, challenges, lessons learned, and contributions since the program's inception. This moment also serves as an opportunity to consider efficiencies that might be brought to the program in the future.

In this chapter you'll find an introduction to Oregon's marine reserves and the ODFW Marine Reserves Program; a guide on how to use this report; and the goals, objectives, and implementation mandates set by the Oregon Legislature and Ocean Policy Advisory Council (OPAC) for Oregon's marine reserves.

B. OREGON'S MARINE RESERVES AND THE ODFW MARINE RESERVES PROGRAM

Oregon's marine reserves are areas in our nearshore ocean waters dedicated to conservation and scientific research. In 2012, Oregon completed the planning and designation of five marine reserve sites. The Cape Falcon, Cascade Head, Otter Rock, Cape Perpetua, and Redfish Rocks sites are each named after local natural landmarks. All five sites have at



Map of the five marine reserve sites that comprise Oregon’s marine reserve system. The management and scientific monitoring of the sites is overseen by the Oregon Department of Fish and Wildlife.

their core a marine reserve where all extractive activities, including fishing and ocean development, are prohibited. Most of the sites also include one or more, less restrictive Marine Protected Area (MPA) adjacent to the reserve. All five of the sites are located within Oregon state waters (0-3 nautical miles from land). These sites are managed as a system by the State of Oregon, with the Oregon Department of Fish and Wildlife (ODFW) as the lead management agency.

The ODFW Marine Reserves Program is responsible for overseeing the management and scientific monitoring of Oregon’s marine reserve system. We are a six-person interdisciplinary team that brings together marine science, social science, communications, public policy, and resource management to implement the marine reserve sites and mandates set by the Oregon Legislature and OPAC. Our responsibilities include ecological monitoring, social and economic (human dimensions) research, outreach, community engagement, development of site management plans, and providing support for compliance and enforcement. Our team is based on the central Oregon coast in Newport, Oregon. We share marine reserve management responsibilities with three additional state agencies. We also work with a variety of partners and contractors from academia, the fishing industry, the private sector, non-governmental organizations, and local marine reserve community groups to carry out many aspects of marine reserves implementation.

C. HOW TO USE THIS REPORT

The *Marine Reserves Program Synthesis Report* provides a comprehensive overview of the ODFW Marine Reserves Program and the initial implementation of Oregon’s five marine reserve sites, from 2009-2021. This report can be used to understand:

- The goals, objectives, and implementation mandates for Oregon’s marine reserves.
- How our program has implemented the mandates.
- The costs of marine reserve implementation, what staff and funding resources have been available, and how ODFW has spent state resources.
- Results and takeaways from monitoring and research thus far.
- Challenges and lessons learned during initial marine reserves implementation.
- Contributions made by the program and efficiencies that might still be brought to the program in the future.

C.1 HOW THIS REPORT IS STRUCTURED: A GUIDE

This *Synthesis Report* is intended to be reviewed in its entirety, providing a comprehensive overview of the program and marine reserve sites. In addition, we provide links to appendices and supplemental documents that allow you to dive deeper into specific subjects or areas of the program.



Oregon Department of Fish and Wildlife (ODFW)

Lead agency responsible for overseeing the management and scientific monitoring of Oregon’s marine reserve sites. Regulates fishing, hunting and the take of fish, invertebrate, and wildlife species.



Oregon Parks and Recreation Department (OPRD)

Regulates shoreline activities, including removal of living (i.e. seaweed) and non-living natural products and other activities requiring an ocean shore permit. Provides interpretative and educational opportunities to enhance recreational experiences.



WHAT IS A MARINE RESERVE?

Marine reserves are areas in our nearshore ocean waters dedicated to conservation and scientific research. All removal of marine life is prohibited, as is ocean development.

AND A MARINE PROTECTED AREA?

Marine Protected Areas (MPAs) are adjacent to the reserves. Ocean development is still prohibited, but some fishing activities are allowed. The prohibited and allowed fishing activities are specific to each protected area.

HOW WERE THE LOCATIONS CHOSEN?

Local communities worked with state officials to site Oregon's reserves in areas that would provide ecological benefits while avoiding significant negative impacts to ocean users and coastal communities (following Governor's Executive Order 08-07). All sites are located within Oregon's state waters, within 3 nautical miles from land.

CHAPTERS 1-4. BACKGROUND: IMPORTANT CONTEXT FOR IMPLEMENTATION

- The goals, objectives, and implementation mandates for Oregon's marine reserves.
- A look at the 10+ year planning process that led to the designation of the current five marine reserve sites.
- Getting to know the sites: How long protections have been in place at each site. The prohibited and allowed activities at each site. When monitoring began. Characteristics of the site: size, depth range, habitats, prior fishing activities and fishing pressure. Towns and ports closely connected to the site. What makes the site unique. How does it compare with the other reserve sites. Based on the site characteristics, how likely are we to see ecological changes in the future due to protections.
- Funding and staff capacity over time. How the ODFW Marine Reserves Program is structured to carry out implementation. The role and contributions of partners and contractors.

CHAPTER 5. MARINE RESERVES IMPLEMENTATION: WHAT HAVE WE DONE AND WHAT HAVE WE LEARNED

A comprehensive overview of how the marine reserve mandates have been implemented, broken out into five sub-chapters: 1) management plans, 2) ecological monitoring, 3) human dimensions research, 4) outreach and community engagement, and 5) compliance and enforcement. Each sub-chapter reviews what has been accomplished, how, and with what resources. We highlight results and takeaways from our monitoring and research to date, and some of the challenges and lessons learned during initial implementation of the reserves.



Department of State Lands (DSL)

Rules demark marine reserve site boundaries. Regulates submerged and submersible land uses that require state authorization or a removal-fill permit, including harvest of subtidal kelp and the siting of ocean renewable energy projects and submarine cables.



Oregon State Police (OSP)

Provides enforcement of regulations associated with each marine reserve site. Provides information and education in support of voluntary compliance.

CHAPTER 6. PROGRAM CONTRIBUTIONS AND CONSIDERATIONS FOR THE FUTURE

A look at the contributions made by the program to nearshore ocean management decisions, understanding of emerging ocean issues, and education as well as to the advancement of marine, human dimensions, and MPA research both here in Oregon and beyond. As we begin planning the next phase of implementation for this long-term conservation and monitoring program, we consider future efficiencies that might still be brought to provide for a more sustainable program ensuring Oregon's marine reserves continue to support conservation, management, research, and Oregon's coastal communities and ocean users.

Take a deeper dive:

APPENDICES: Provided for those interested in diving deeper into any of the methods, analyses, results, or additional documentation. The appendices include the more technical and detailed plans, reports, and publications that underly the synthesis. These documents and files are stored on [Google Drive](#), with links provided throughout the Synthesis Report for you to easily access.

SUPPLEMENTAL DOCUMENTS: For some topics we also provide supplemental documents. These are documents that have complementary information produced outside of the program (not a collaborative project and no funding or staff time was provided by ODFW). These also include reports provided by partners that have not yet been reviewed by ODFW and from which results have not been incorporated into the synthesis.

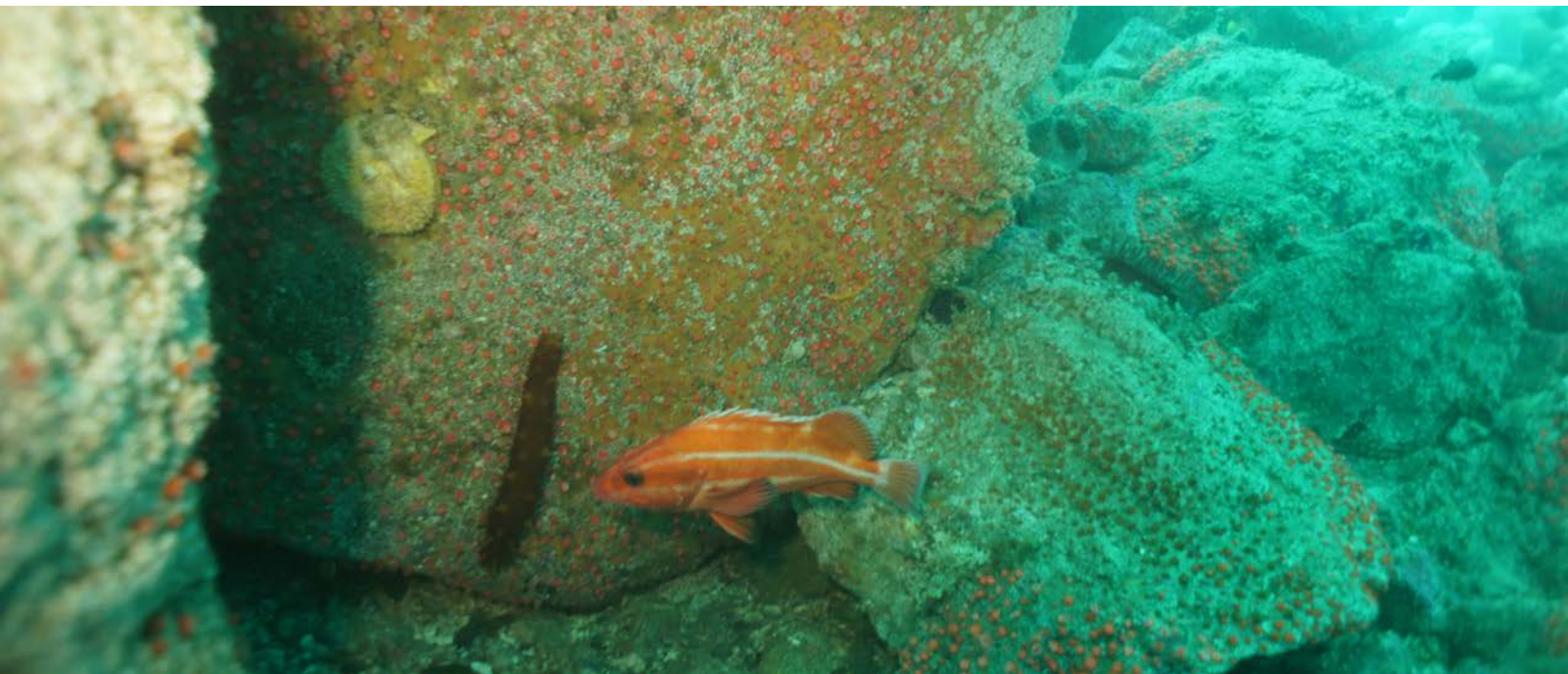
D. THE MANDATES: REQUIREMENTS AND GUIDING PRINCIPLES

Here we provide an overview of the mandates for Oregon's marine reserves. The mandates are the requirements and guiding principles for the planning and implementation of the reserves as conferred by state statute, administrative rule, or policy guidance.

D.1 WHERE ARE THE MANDATES FROM?

STATUTES

The Oregon Legislature has passed two marine reserves bills, [House Bill 3013](#) in 2009 and [Senate Bill 1510](#) in 2012. These statutes provide instructions to state agencies and lay out requirements for planning, siting, designation, and implementation of the Cape Falcon, Cascade Head, Otter Rock, Cape Perpetua, and Redfish Rocks sites. Senate Bill 1510 (2012) also requires an assessment and report on the Oregon Marine Reserves Program due to the Oregon Legislature in the year 2023.



WHAT DO YOU MEAN BY MANDATE?

Mandates are the requirements, as well as guiding principles, to be carried out for the planning and implementation of Oregon's marine reserves.



WHERE DO THE MARINE RESERVE MANDATES COME FROM?

- **STATUTES** – Passed by the Oregon Legislature
- **AGENCY ADMINISTRATIVE RULES** – Adopted by state agency Commissions and Boards
- **POLICY RECOMMENDATIONS** – Developed by the Ocean Policy Advisory Council (OPAC)

OREGON ADMINISTRATIVE RULES (OARs)

The site boundaries, as well as the prohibited and allowed activities for marine reserves and each MPA, are set in state agency administrative rules (OARs) by three state agencies. In 2009 and 2012, [OARs](#) were adopted for the Cape Falcon, Cascade Head, Otter Rock, Cape Perpetua, and Redfish Rocks sites by the State Land Board, the Fish and Wildlife Commission, and the Parks and Recreation Commission: OAR 141-142 (DSL), OAR 635-012 (ODFW), and OAR 736-029 (OPRD).

POLICY RECOMMENDATIONS - OCEAN POLICY ADVISORY COUNCIL (OPAC)

The Ocean Policy Advisory Council (OPAC) is a legislatively mandated body that advises the Governor, state agencies, and local governments on marine resource policy issues. The [Oregon Marine Reserve Policy Recommendations](#), developed by OPAC in 2008, stipulate the goals and objectives for Oregon's marine reserves and provide planning and implementation principles and guidelines.

D.2 THE MANDATES THAT GUIDE IMPLEMENTATION

Here we outline the marine reserve mandates, provided by OPAC, that guide our program and implementation of the marine reserve system and sites.

WHAT IS A MARINE RESERVE?

Oregon defines a marine reserve as:

... an area within Oregon's Territorial Sea or adjacent rocky intertidal area that is protected from all extractive activities, including the removal or disturbance of living and non-living marine resources, except as necessary for monitoring or research to evaluate reserve condition, effectiveness, or impact of stressors. (OPAC 2008)

... AND A MARINE PROTECTED AREA?

Marine Protected Areas (MPAs), which allow or prohibit specific extractive activities, are also included in Oregon's marine reserves system. Oregon defines an MPA as:

Any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. (OPAC 2008, adopted from Presidential Executive Order 13158 issued May 26, 2000).

The specific allowed and prohibited extractive activities of each MPA are defined in agency administrative rules.

OREGON'S MARINE RESERVE GOALS AND OBJECTIVES

Marine reserves and protected areas have been created around the world to achieve different goals. Oregon's goals are to conserve marine habitats and biodiversity, serve as scientific reference sites, and avoid significant negative impacts to ocean users and coastal communities.

GOALS: Protect and sustain a system of fewer than ten marine reserves in Oregon's Territorial Sea to conserve marine habitats and biodiversity; provide a framework for scientific research and effectiveness monitoring; and avoid significant adverse social and economic impacts on ocean users and coastal communities.

A system is a collection of individual sites that are representative of marine habitats and that are ecologically significant when taken as a whole (OPAC 2008).

OBJECTIVES: Marine reserve objectives help guide the siting, development, and implementation of Oregon's marine reserves (OPAC 2008).

1. Protect areas within Oregon's Territorial Sea that are important to the natural diversity and abundance of marine organisms, including areas of high biodiversity and special natural features.
2. Protect key types of marine habitat in multiple locations along the coast to enhance resilience of near-shore ecosystems to natural and human-caused effects.
3. Site fewer than ten marine reserves and design the system in ways that are compatible with the needs of ocean users and coastal communities. These marine reserves, individually or collectively, are to be large enough to allow scientific evaluation of ecological effects, but small enough to avoid significant adverse social and economic impacts on ocean users and coastal communities.
4. Use the marine reserves as reference areas for conducting ongoing research and monitoring of reserve condition, effectiveness, and the effects of natural and human-induced stressors. Use the research and monitoring information in support of nearshore resource management and adaptive management of marine reserves.
5. Although marine reserves are intended to provide lasting protection, individual sites may, through adaptive management and public process, later be altered, moved, or removed from the system, based on monitoring and reevaluation at least every five years.

PLANNING AND IMPLEMENTATION PRINCIPLES AND GUIDELINES

Additional guidance is provided in marine reserve planning and implementation principles and guidelines set by OPAC (2008).

OREGON'S MARINE RESERVE GOALS



CONSERVATION



Conserve marine habitats and biodiversity.

PLANNING PRINCIPLES AND GUIDELINES:

1. The public, including ocean users, coastal communities and other stakeholders, will be involved in the proposal, selection, regulation, monitoring, compliance and enforcement of marine reserves.
2. Outreach and public engagement will be an ongoing part of the marine reserves planning and implementation process. Available scientific and other information will be made available to the public through outreach and websites.
3. Science and local knowledge will be used in the planning process for marine reserves. Such information will also be used to monitor and adaptively manage them into the future.
4. The planning process will encourage coordinated and collaborative marine reserve proposals from communities of place or interest. Communities of place may include coastal counties, cities, and ports; communities of interest may include fishing organizations, fishery/ gear groups, governmental and inter-governmental organizations, and non-governmental organizations. Priority consideration will be given to proposals developed by groups comprised of coastal community members, ocean users and other interested parties.
5. The design and siting of marine reserves will take into account the existing regulatory regimes (e.g., fisheries management, ocean shore management, watershed management, land use planning, and water quality regulations) along with existing and emerging uses such as buried cables, ocean outfalls, wave energy, and proximity to ports.
6. Size and spacing guidelines developed by the Science and Technical Advisory Committee (STAC) will be used to help understand potential ecological benefits of marine reserve site proposals, rather than dictate minimums or maximums needed. The potential for adverse social and economic impacts will also be a key factor on the size and spacing of reserves recommended by OPAC for further evaluation.

IMPLEMENTATION PRINCIPLES AND GUIDELINES:

1. Marine reserves as a system and each individual marine reserve will have a plan that includes clearly defined objectives, monitoring protocols, compliance and enforcement provisions, effective management measures, and a commitment of long-term funding necessary to achieve its goals.
2. Marine reserves will be adequately enforced.
3. Marine reserves will be adequately monitored and evaluated in support of adaptive management. Cooperative and collaborative research will be encouraged as well as utilization of fishing vessels as research platforms. These activities will be compatible with the goal of conserving marine habitats and biodiversity.

RESEARCH



Serve as scientific reference sites, to learn about marine reserve protections and Oregon's nearshore ocean, to inform management.

COMMUNITIES

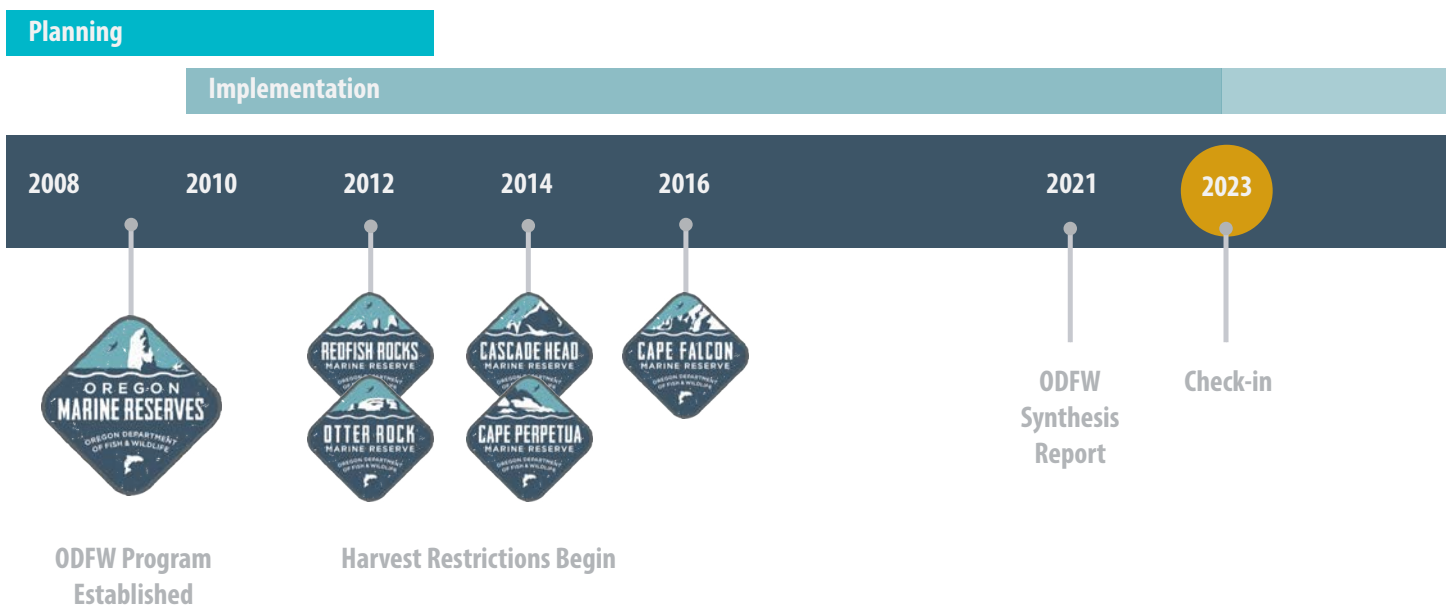


Avoid significant adverse social and economic impacts to ocean users and coastal communities.

4. Education and economic development opportunities that are compatible with the goal of conserving marine habitats and biodiversity will be encouraged.
5. Marine reserves are not intended to prevent marine transit, safe harbor, and beach access.
6. Significant adverse social and economic impacts of marine reserves on ocean users and coastal communities will be avoided and positive social and economic effects will be sought.
7. Adequate baseline data will be collected at each site prior to excluding extractive activities. The types and adequacy of baseline data, and the timing and methods of data collection will be driven by the research and monitoring objectives and sampling designs employed at each site.

D.3 MANDATED REPORT TO THE LEGISLATURE IN 2023: A CHECK-IN

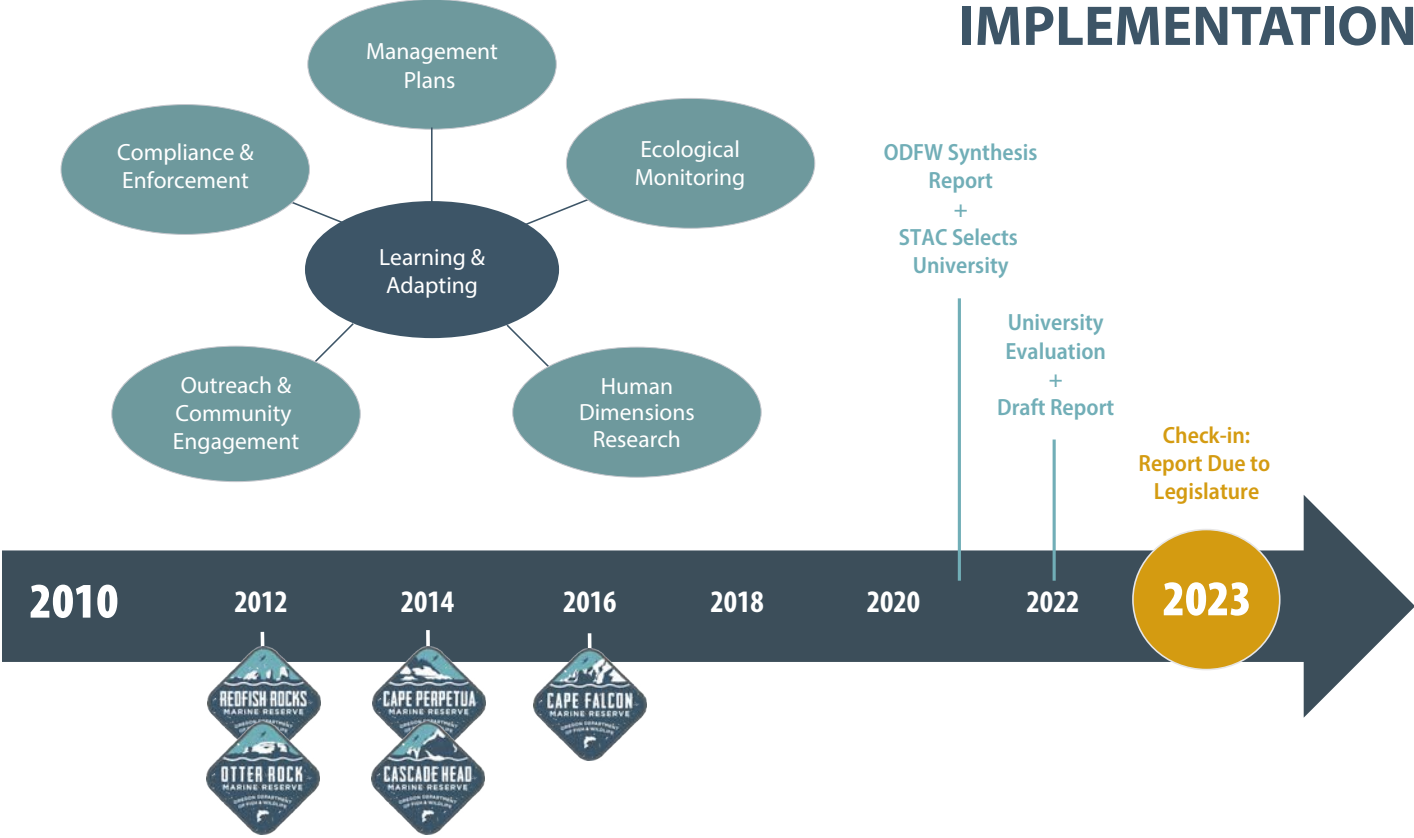
Marine reserves are a relatively new management tool here in Oregon. This first ten years of implementation has been focused on the initial start-up and execution of this nascent, long-term nearshore conservation and monitoring program. During the first five years the ODFW Marine Reserves Program was heavily focused on supporting marine reserves planning and designation as well as developing, testing, and adapting monitoring protocols and tools that could safely and reliably collect data in Oregon’s challenging nearshore environment; building collaborations with partners; and finding ways to navigate and streamline complex funding, staffing, and contracting administrative procedures. Central to the initial implementation of the ODFW Marine Reserves Program and sites has been learning and adapting.



As part of adaptive management, [Senate Bill 1510](#) (2012) calls for a check-in on the Marine Reserves Program and a report to the Oregon Legislature in 2023. The check-in includes evaluating the various aspects of the program including the development of management plans, ecological monitoring, human dimensions research, outreach, community engagement, and compliance and enforcement of the reserves. The bill requires the Scientific and Technical Advisory Committee (STAC) to select a university team, based at an Oregon public university, to research and prepare the report to the Legislature. A draft report will be delivered to the interim committees on environment and natural resources of the Legislature by October 1, 2022, and a final report delivered to the Legislature no later than March 1, 2023.

This *Marine Reserves Program Synthesis Report* is being provided to the university team as a source of information to aid them in their assessment and report to the Oregon Legislature.

IMPLEMENTATION



E. OF SPECIAL NOTE

GOALS – NOT ALL MARINE RESERVES ARE CREATED EQUAL: Marine reserves and protected areas have been created around the world to achieve different goals. Oregon’s goals are to conserve marine habitats and biodiversity, serve as scientific reference sites, and avoid significant negative impacts to ocean users and coastal communities.

A SYSTEM (NOT A NETWORK): Oregon’s marine reserve sites are not designed and placed to function as a scientific network. Instead, the sites are intended to serve as a system which OPAC has defined as “a collection of individual sites that are representative of marine habitats and that are ecologically significant when taken as a whole” (OPAC 2008).

EACH SITE IS UNIQUE – LIKELY TO SEE DIFFERENT OUTCOMES AND IMPACTS: Each of Oregon’s marine reserve sites is unique. They are different sizes and shapes. They have distinct habitats and biological characteristics. They each experienced different types and levels of fishing before closure. The demographics and socioeconomic characteristics of the coastal towns and communities most closely tied to each site are different. These unique characteristics mean we will likely see different conservation outcomes, ecological responses, and impacts on people and communities at each site.



HARVEST RESTRICTION START DATES WERE PHASED IN (2012-2016): The start date of harvest restrictions was phased in across the five sites to give ODFW sufficient time, with the available staff and funding resources, to collect two years of data at each site prior to closure in accordance with ODFW’s long-term ecological monitoring plans. The harvest restrictions were phased in at the sites as follows:

Site	Monitoring Began	Harvest Restrictions Began
Redfish Rocks	2010	2012
Otter Rock	2010	2012
Cape Perpetua	2012	2014
Cascade Head	2012	2014
Cape Falcon	2014	2016

WHAT IS HUMAN DIMENSIONS RESEARCH AND WHAT ARE WE STUDYING? Human dimensions research investigates the different ways humans use, experience, value, and depend on the natural environment. Oregon’s marine reserves are a staging ground for studying the human socioeconomic interactions that surround natural resource issues. This “natural laboratory” is valuable for understanding the current and long-term impacts of conservation and management decisions on people and communities, as well as the impacts that demographic shifts, gentrification, and socioeconomic changes have on the lives of Oregonians.

Our research focuses on understanding the different ways that people and communities may be affected by the marine reserves. When conservation strategies such as marine reserves are introduced, they can create positive changes – such as increased tourism dollars to small businesses; negative changes – such as increased feelings of distrust towards government or loss of income to fishers; or no changes at all. We work with academic and private sector research partners to study the human dimensions of the marine reserves using various research methods across multiple social science disciplines – including economics, sociology, social psychology, anthropology, and political science.

This is the state’s first comprehensive human dimensions research program focused on examining the economic, social, and cultural dynamics of the Oregon coast and coastal communities and the related effects of implementation of a state natural resource policy. Beyond Oregon, it is one of the most comprehensive human dimensions research programs ever to focus on MPAs.

CURRENT STATUS: DETECTING ECOLOGICAL CHANGES AND EXPECTATIONS:

- **OUR MONITORING IS ABLE TO DETECT AND TRACK NEARSHORE OCEAN CHANGES:** Our monitoring program has been set up to be able to detect and track nearshore ocean changes occurring in Oregon’s state waters over time. These include changes due to marine reserve protections, changing ocean conditions, or other external stressors such as impacts and recoveries from major marine disease outbreaks. In this first 10 years, our monitoring program has successfully been able to detect nearshore ocean changes occurring off Oregon.
- **TOO SOON TO ATTRIBUTE CHANGES TO MARINE RESERVE PROTECTIONS:** Monitoring at Oregon’s first two reserves started in 2010, and protections (i.e. cessation of fishing, no ocean development) have been in place less than 10 years at all the reserve sites. While we have been able to detect nearshore changes that have occurred during this time period, it is too soon to know what these changes mean long-term or to attribute changes to marine reserve protections (i.e. cessation of fishing). With Oregon’s temperate marine ecosystem where many species are long-lived, slow to grow and reach sexual maturity, scientists project a minimum of 10-15 years, and for some species as long as 40 years, after extractive activities (i.e. fishing) have ceased before we might begin to be able to scientifically detect and attribute any ecological changes due to protections (CDFW 2018, Kaplan et al 2019, Starr et al 2015).

- **EXPECTATIONS FOR THE FUTURE:** Oregon’s five marine reserves vary in their size, habitats, depths, and past fishing pressure – important characteristics that can influence the types of ecological responses to reserve protections and the magnitudes of those responses. In a relative comparison across the five reserves, based on their site characteristics, we expect that some of the sites are more likely to exhibit ecological responses due to protections (i.e. cessation of fishing) that we will be able to scientifically detect and attribute to protection. For instance, the Redfish Rocks and Cascade Head reserves are relatively large in size, have larger areas of rocky reef found at both shallow (< 25 m) and deep (> 25 m) depths, and experienced greater fishing pressure compared to the other three reserves.

This figure is a relative comparison of the reserves, based on the site characteristics: Which of the sites are more likely to elicit an ecological change due to protections (i.e. cessation of fishing) in the future, that can be scientifically detected and attributable to protections.



WHAT WE HAVE FROM THE FIRST 10 YEARS OF MONITORING: This first 10 years has provided sufficient time for the establishment and evaluation of: (a) long-term ecological and human dimensions monitoring programs, including the development of defensible methods; (b) robust datasets from which we can continue to track and understand current and future nearshore ocean changes; (c) information on the initial and short-term impacts of the marine reserves on regions, people, and communities; (d) information that furthers our knowledge about the design and placement of marine reserves in Oregon; and (e) contributions of data and information that have been used to support nearshore ocean management, policy decisions, and understanding of emerging ocean issues here in Oregon and beyond.

DISRUPTIONS TO THE SYNTHESIS REPORT DUE TO THE COVID-19 PANDEMIC: The COVID-19 pandemic impacted our ecological monitoring and human dimensions research, as well as our program budget and staffing levels, in 2020 and 2021. These disruptions created significant additional workloads on staff in 2021 during the development of this report. Final data collection, to be included in the analyses for the *Synthesis Report*, was to be conducted in 2020. This was disrupted due to safety concerns for staff, volunteers, interns, and contractors. We were able to safely conduct some limited ecological monitoring, that included rocky intertidal and oceanographic data collection, in 2020. Human dimensions research was also disrupted. For example, visitor intercept and business surveys that had been planned for summer of 2020 could only be safely conducted in 2021, as were interviews with fishers as part of studies being conducted by our research partners. However, this created a significant burden on our human dimensions research staff who had to simultaneously conduct surveys and gather new data, while also synthesizing the more than 15 research studies that had been conducted over the last 10 years. In addition, the pandemic impacted state General Funds, resulting in cuts to state agency budgets. We sustained a \$227,222 (11%) cut to our 2019-21 biennium program budget. As a result, our Outreach and Community Engagement position has remained vacant in 2020 and 2021. This has created significant additional workloads on existing staff, who have had to carry out ongoing communications and outreach work as well as develop the outreach and community engagement sections of this *Synthesis Report*.



CHAPTER 2. PLANNING & DESIGNATION HISTORY

- A. INTRODUCTION
- B. 2000-2007: EARLY PHASES
- C. 2008: GOVERNOR'S EXECUTIVE ORDER
- D. 2008: OPAC POLICY GUIDANCE
- E. 2008: PUBLIC PROPOSALS AND COARSE REVIEW
- F. 2009: LEGISLATIVE ACTIONS AND DESIGNATION OF PILOT SITES
- G. 2010: SITE EVALUATIONS AND FINAL RECOMMENDATIONS
- H. 2012: LEGISLATIVE ACTIONS AND DESIGNATION OF SITES

A. INTRODUCTION

A.1 HOW TO USE THIS CHAPTER

The planning and designation of Oregon's marine reserve system was over 10 years in the making, involving multiple phases and a combination of top down and bottom up processes. Coastal community members, ocean users, and other interested Oregonians worked with state decision makers to design and site marine reserves and protected areas in locations that would provide ecological benefits while minimizing adverse social and economic impacts to ocean users and coastal communities (Executive Order 08-07).

This chapter is a chronicle of Oregon's marine reserve planning and designation process, from 2000-2012. Links to additional documents and resources from the planning process are provided throughout the chapter for further reference. This chapter provides historical context for understanding:

- How Oregon arrived at the current five sites.
- The mandates that steered the planning process, the design and siting of sites, and site designations.
- What was delivered to the ODFW Marine Reserves Program and our state agency management partners for implementation.

A.2 LEADS IN THE PLANNING AND DESIGNATION PROCESS

Here we provide a brief overview of the entities involved in leading the planning and designation process.

- **GOVERNOR OF OREGON:** Governors Kitzhaber (1995-2003, 2011-2015) and Kulongoski (2003-2011).

- **OCEAN POLICY ADVISORY COUNCIL (OPAC):** A legislatively mandated body that advises the Governor, state agencies, and local governments on ocean policy and resource management issues. Voting members represent specific stakeholder interest groups. State agency representatives and the director of Oregon Sea Grant serve as non-voting members. ORS [196.438](#) and [196.443](#).
- **COASTAL LEGISLATORS:** Members of the Oregon Legislature that represent coastal constituencies. Collectively they form the bicameral, bipartisan Coastal Caucus.

State agencies provided staff support and were tasked with carrying out certain aspects of the planning and designation process. The main state agencies involved were:

- **OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW):** Manages and regulates the take of marine fish, invertebrate, and wildlife resources.
- **DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT (DLCD):** Administers Oregon’s land use planning program and the Oregon Territorial Sea Plan, which provides the legal and regulatory framework for management of the Territorial Sea. Provides staff support to OPAC.
- **OREGON PARKS AND RECREATION DEPARTMENT (OPRD):** Regulates shoreline activities, including removal of natural products and other activities requiring an ocean shore permit. Provides interpretative and educational opportunities to enhance recreational experiences. Manages state park lands, many of which are located along the coast.
- **DEPARTMENT OF STATE LANDS (DSL):** Regulates submerged and submersible land uses that require state authorization or a removal-fill permit, including harvest of subtidal kelp and the siting of ocean renewable energy projects and submarine cables.

Scientific and technical advice was provided at various stages, at the request of OPAC and ODFW, by:

- **SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE (STAC):** A legislatively mandated body that provides science and technical advice to OPAC and state agencies. The committee often acts as a broker, identifying and engaging appropriate experts, when advice on an issue is requested. ORS [196.451](#).

Outreach and community engagement support was provided to OPAC and ODFW by:

- **OREGON SEA GRANT:** [Oregon Sea Grant](#) is housed at Oregon State University and is one of 33 state programs within NOAA’s Sea Grant College Program. They address regional and national issues through research, public outreach and engagement, and education.

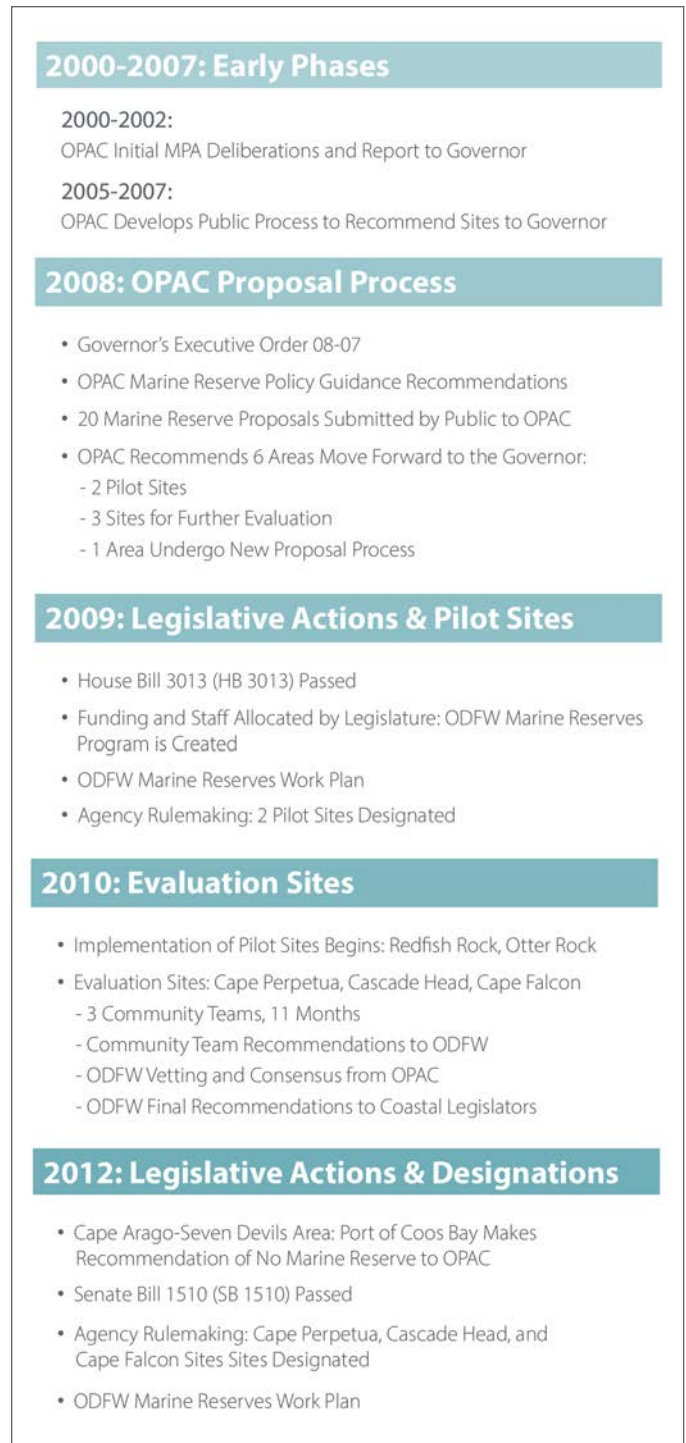


Figure 1: Overview of marine reserves planning phases and timeline

A.3 PHASES AND TIMELINE

Figure 1 is a brief overview of the timeline and various phases of marine reserve planning, from 2000 to 2012, that led to the designation of Oregon’s marine reserve system and the Redfish Rocks, Cape Perpetua, Cascade Head, Otter Rock, and Cape Falcon sites. The sections that follow provide a more detailed chronicle of the planning and designation process.

B. 2000-2007: EARLY PHASES

B.1 2000-2002: OPAC INITIAL MPA DELIBERATIONS AND REPORT ON FINDINGS TO GOVERNOR

Formal marine protected area (MPA) discussions begin at the state level starting in July 2000. Governor Kitzhaber tasks OPAC with gathering facts and engaging the public, fishing industry, and other interested parties on the subject of MPAs. OPAC is to provide recommendations to the Governor on MPAs and state policies before the state will make any future decisions about area-based management in Oregon state waters.

On August 16, 2002 OPAC issues their [*Report and Recommendation to the Governor: Oregon and Marine Reserves*](#) (OPAC 2002). OPAC’s recommendations include:

- Oregon establish a limited system of “fully-protected” marine reserves to test and evaluate their effectiveness in meeting marine resource conservation objectives.
- Before designating any specific marine reserves, Oregon acquire additional information and conduct additional study, analysis, and deliberation through an open, public process with extensive stakeholder involvement.

OPAC provides further recommendations on the goals for a marine reserve system, objectives for planning and evaluation, and a process for public stakeholder participation. OPAC also acknowledges that funding will be a significant factor in carrying out the recommendations.

B.2 2005-2007: OPAC DEVELOPS PUBLIC PROCESS TO RECOMMEND SITES TO GOVERNOR

In 2005, Governor Kulongoski tasks OPAC with developing and executing a public nomination process and recommending potential marine reserve sites, to create a limited system of marine reserves in Oregon state waters.

The **initial** timeline given to OPAC by the Governor’s Office is:

- **2008 – RECOMMEND SITES FOR DESIGNATION:** OPAC is to receive public nominations for marine reserve sites. OPAC is to select and recommend marine reserve sites for designation to the Governor.
- **2009 – REQUEST FUNDING AND DESIGNATE SITES:** The Governor and state agencies are to request funding to the 2009 Legislative Assembly for marine reserves implementation. Marine reserve sites are to be designated through state agency rulemaking.

From 2005 to 2007, OPAC works on developing policy guidance to shape the design and siting of marine reserves and guide the public nomination and site recommendations process. Concurrently during this time, there is growing interest in the development of renewable ocean energy off the Oregon coast. This includes multiple applications being submitted to the Federal Energy Regulatory Commission (FERC) for preliminary permits in both state and federal waters. This creates additional challenges to marine reserves planning in that:

- OPAC, state agency staff, and constituents are simultaneously engaged in marine reserve and renewable ocean energy planning and policy development.
- Additional areas may be closed to fishing due to renewable energy projects.

C. 2008: GOVERNOR'S EXECUTIVE ORDER

C.1 GROWING CONCERNS ABOUT THE PROCESS AND TIMELINE

By late 2007, there are mounting concerns from the public about the marine reserves planning process and timeline, along with concerns around renewable ocean energy development. OPAC also receives a written memo from STAC articulating concerns about the planning timeline and resource needs to scientifically vet nominations.

In January 2008, Governor Kulongoski dispatches his Chief of Staff to visit coastal communities over the course of three days, to listen and learn about concerns and approaches to marine reserves and renewable ocean energy development in Oregon.

In February 2008, at the request of OPAC, Oregon Sea Grant hosts a series of “listening and learning” forums in eight communities up and down the Oregon coast. The forums are for gathering input from a wide range of interests and viewpoints on the topic of marine reserves to inform outreach and engagement in the planning process going forward. Sea Grant issues a [report](#) to OPAC and Governor Kulongoski.

Consistently heard from constituents during the Chief of Staff's tour and Sea Grant forums was: mistrust (process appears unresponsive); timeline is too ambitious; there is insufficient social, economic, and biological data; and there is no funding for planning or implementation.

C.2 GOVERNOR RESPONDS

In March 2008, Governor Kulongoski issues a [letter to OPAC](#) and [Executive Order 08-07](#) (EO 08-07) making alterations to the marine reserves planning process. These include additional steps and extending the timeline, a commitment to funding, and sideboards for site recommendations. In addition, EO 08-07 establishes a process and timeline for addressing renewable ocean energy policy development and planning for Oregon state waters.

REVISED TIMELINE AND EXPECTATIONS FOR MARINE RESERVES

- **2008 – RECOMMEND SITES FOR FURTHER EVALUATION:** OPAC is to solicit proposals from the public, conduct an initial coarse review of proposals, and recommend sites for further evaluation to the Governor.
- **2009 – REQUEST FUNDING:** The Governor and state agencies are to request funding for site evaluations to the 2009 Legislative Assembly for the 2009-11 biennium.
- **2009-11 BIENNIUM – EVALUATE SITES AND REQUEST IMPLEMENTATION FUNDING:** A detailed evaluation of the sites recommended by OPAC is to be conducted and final recommendations for sites to be designated as marine reserves are to be forwarded to the Governor. The Governor and state agencies are to request funding for marine reserves implementation to the 2011 Legislative Assembly.
- **2011-13 BIENNIUM – DESIGNATE SITES:** Sites are to be designated through state agency rulemaking.

EO 08-07 SIDEBOARDS

- **NUMBER OF SITES:** Recommend not more than nine sites for consideration as marine reserves.
- **SIZE OF SITES:** Sites, individually or collectively, are to be large enough to allow scientific evaluation of ecological benefits, but small enough to avoid significant adverse economic or social impacts to ocean users and coastal communities.
- **GIVE PREFERENCE TO COLLABORATIONS:** Preference is to be given to site proposals developed collaboratively, by groups comprised of coastal community members, ocean users, and other interested parties.



ROLES AND RESPONSIBILITIES

- **OPAC:** Is to lead the public proposal process, develop a site proposal form, conduct the coarse review of proposals, and recommend sites for further evaluation to the Governor.
- **STAC:** Is to provide expertise to OPAC in development of the site proposal form.
- **STATE AGENCIES:** ODFW is designated the lead agency in the OPAC proposal process and is to provide staff support to OPAC. DLCD and OPRD are also to provide staff support to OPAC.
- **OREGON SEA GRANT:** Is to collaborate with ODFW in providing outreach and public education to facilitate community-driven marine reserve site proposals.

D. 2008: OPAC POLICY GUIDANCE

Into 2008, OPAC continues to develop the policy guidance that will be used to shape the design and siting of marine reserves, as well as guide the proposal, selection, and eventual implementation of sites.

D.1 OPAC REQUESTED GUIDANCE FROM STAC

OPAC requests guidance from STAC on the following topics, to guide proposals and the selection of sites.

SIZE AND SPACING

STAC convenes a workshop, with invited scientists and fishermen, to produce a consensus document for OPAC that provides recommended guidelines on the size, spacing, and configuration of marine reserves in Oregon based on a review of the existing science: [Size and Spacing of Marine Reserves Workshop Report](#) (STAC 2008a).

ECONOMIC DATA AND ANALYSES

STAC convenes a workshop, with invited economists and fisheries managers, to provide guidance on the types of economic data and analysis that would be useful to decision makers in considering economic aspects of the siting and implementation of marine reserves in Oregon: [Technical Workshop on Economic Data and Analysis of Marine Reserves](#) (STAC 2008b)

D.2 OPAC POLICY RECOMMENDATIONS THAT GUIDE PROPOSALS AND SELECTION OF SITES

OPAC finalizes the [Oregon Marine Reserve Policy Recommendations](#) report (OPAC 2008) which includes the goals and objectives for Oregon’s marine reserves, and provides planning and implementation principles and guidelines. The document also identifies key habitat types to be represented in marine reserves and provides definitions for key terms. The policy guidance that affects the design and siting of Oregon’s marine reserves, as well as guides the proposal and selection of sites, is as follows:

MARINE RESERVE GOALS

Oregon’s marine reserve goals are “to conserve marine habitats and biodiversity; provide a framework for scientific research and effectiveness monitoring; and avoid significant adverse social and economic impacts on ocean users and coastal communities” (OPAC 2008).

SYSTEM (NOT A NETWORK)

Oregon’s marine reserves are not intended to function as a scientific network. Instead, the sites are to serve as a system, which is defined as: “a collection of individual sites that are representative of marine habitats and that are ecologically significant when taken as a whole” (OPAC 2008).



OBJECTIVES

The following marine reserve objectives affect the design and siting of Oregon's reserves:

- **BIODIVERSITY:** Protect areas important to the natural diversity and abundance of marine organisms.
- **HABITATS:** Protect key types of marine habitat in multiple locations to enhance resilience of nearshore ecosystems.
- **SYSTEM:** Site fewer than 10 marine reserves. Design the system in ways that are compatible with the needs of ocean users and coastal communities. Reserves should be large enough to allow scientific evaluation of ecological effects, but small enough to avoid significant adverse social and economic impacts on ocean users and coastal communities.
- **RESEARCH:** Use marine reserves as reference areas for conducting research and monitoring of reserve condition, effectiveness, and the effects of natural and human-induced stressors.

PLANNING PRINCIPLES AND GUIDELINES

The following principles and guidelines steer the proposal and selection of sites:

- **USE SCIENCE AND LOCAL KNOWLEDGE:** Science and local knowledge will be used in the planning process for marine reserves.
- **PRIORITY GIVEN TO COLLABORATIVE PROPOSALS:** The planning process will encourage coordinated and collaborative marine reserve proposals from communities of place or interest. Priority consideration will be given to proposals developed by groups comprised of coastal community members, ocean users, and other interested parties.
- **TAKE INTO ACCOUNT EXISTING MANAGEMENT AND USES:** The design and siting of marine reserves will take into account the existing ocean and terrestrial management/regulations along with existing and emerging uses such as buried cables, ocean outfalls, wave energy, and proximity to ports.
- **SIZE AND SPACING GUIDELINES ARE ADVISORY:** The size and spacing guidelines developed by STAC will be used to help understand potential ecological benefits of marine reserve site proposals, rather than dictate minimums or maximums needed.
- **SIZE AND SPACING WILL ACCOUNT FOR ADVERSE SOCIAL AND ECONOMIC IMPACTS:** The potential for adverse social and economic impacts will also be a key factor on the size and spacing of reserves recommended by OPAC for further evaluation.

E. 2008: PUBLIC PROPOSALS AND COARSE REVIEW

E.1 OPAC INVITES PUBLIC TO SUBMIT PROPOSALS

In June 2008, OPAC releases the [Public Proposal Packet](#) that includes: a) a letter of invitation to the public that describes the process and timeframe for creating marine reserves, b) a site proposal form, and c) the criteria to be used in the coarse review of proposals. The coarse review criteria, developed by OPAC, are based on the marine reserve goals and objectives in the *Oregon Marine Reserve Policy Guidance* report (OPAC 2008), EO 08-07, and what is reasonably achievable. The deadline for proposals is September 30, 2008.

E.2 20 PROPOSALS ARE RECEIVED

At the end of September, OPAC has received [20 proposals](#) from the public. Many of the proposals include less restrictive MPAs, in combination with a marine reserve, as part of the site proposal. In early October, all submitted proposals are posted on the marine reserves planning website (managed by DLCD) and are made available to OPAC and the public.

E.3 AGENCY ANALYSIS OF PROPOSALS

In October, state agencies conduct an analysis of site proposals. The purpose of the analysis is to describe the strengths and weaknesses of each proposal in meeting each of the coarse review criteria, to assist OPAC in determining which proposed sites are appropriate for further evaluation. The analysis incorporates agency information and experiential knowledge along with information contained in the site proposals. The [agency analysis](#) is then delivered to OPAC and posted on the planning website for the public.

E.4 OPAC COARSE REVIEW AND RECOMMENDATIONS TO GOVERNOR

In October, OPAC meets for two days to be briefed on the agency analysis, hear presentations from individuals and groups who submitted proposals, hear public comment, and begin initial review and deliberation of the 20 site proposals. OPAC urges proposers to continue conducting outreach on their site proposals and to report back to them with an update at the November OPAC meeting.

In November, OPAC meets for two days, with the first day dedicated to hearing updates on outreach efforts from proposers and for public comment. The second day is dedicated to OPAC deliberations on site proposals followed by motions put forth and voted on by OPAC.

OPAC then forwards their final recommendations to the Governor in a [letter](#) on November 29, 2008 that includes:

- **2 PILOT SITES:** Redfish Rocks and Otter Rock are recommended to be designated immediately as pilot sites. The local community groups nominating each of these two sites represent diverse interests, had worked on developing their proposals for more than two years, and had provided multiple opportunities for public input and comment on their proposals. The proposals are considered the most developed in terms of community collaboration, support, and baseline information. The recommended Redfish Rocks site includes a marine reserve and one MPA. The site recommended at Otter Rock is a marine reserve only.
- **3 SITES FOR FURTHER EVALUATION:** Sites at Cape Perpetua, Cascade Head, and Cape Falcon are recommended to undergo further evaluation and community discourse as potential marine reserves.
- **1 AREA UNDERGO NEW PROPOSAL PROCESS:** A recommendation that the Port of Coos Bay lead a local community process to consider developing a new marine reserve proposal for the Cape Arago-Seven Devils area.
- **POLICY RECOMMENDATIONS:** Enclosure of the [Oregon Marine Reserve Policy Recommendations](#) report (OPAC 2008).

See a [map](#) of the original 20 proposals and sites recommended by OPAC.

E.5 OPAC RECOMMENDATIONS AND FUNDING REQUEST SENT TO THE OREGON LEGISLATURE

In January 2009, the Governor responds in a [letter to OPAC](#) and forwards the OPAC recommendations to Coastal Legislators. The Governor's 2009-11 recommended budget to the Legislature also provides for marine reserves funding and agency staff positions.

F. 2009: LEGISLATIVE ACTIONS AND DESIGNATION OF PILOT SITES

F.1 HOUSE BILL 3013 (HB 3013)

During the 2009 Legislative Assembly, Coastal Legislators work with conservation, commercial fishing, and recreational fishing interests and ODFW in developing marine reserves legislation. The Oregon Legislature passes [HB 3013](#) which directs state agencies to implement the OPAC recommendations, provides stipulations on funding, and directs ODFW to develop a work plan to implement the OPAC recommendations.

F.2 MARINE RESERVES FUNDING AND STAFF: ODFW MARINE RESERVES PROGRAM IS CREATED

The 2009 Legislative Assembly approves an austerity program and budget for ODFW to implement the OPAC recommendations and mandates set forth in HB 3013. They approve \$1 million of one-time monies to go to ODFW and

approve five limited duration and three seasonal staff positions for the 2009-11 biennium.

F.3 MARINE RESERVES WORK PLAN

As required by HB 3013, ODFW develops a [Marine Reserves Work Plan](#) that outlines the work ODFW and other state agencies will conduct over the 2009-11 biennium. The work plan covers: a) marine reserves implementation – for the Redfish Rocks and Otter Rock pilot sites, b) marine reserves evaluation – for the Cape Perpetua, Cascade Head, and Cape Falcon evaluation sites, and c) participation in marine reserve proposal process – for the Cape Arago-Seven Devils area.

F.4 AGENCY RULEMAKING – PILOT SITES DESIGNATED

HB 3013 instructs state agencies to adopt rules to establish the pilot sites at Redfish Rocks and Otter Rock. The site boundaries, and the prohibited and allowed activities, are set in state agency administrative rules (OARs) by three state agencies: ODFW, DSL, and OPRD.

Starting in July 2009, the three agencies undergo a [coordinated rulemaking](#) effort. Final OARs are adopted by their respective Boards and Commissions in December 2009 and January 2010. The OARs stipulate that the ODFW and OPRD harvest restrictions will not take effect until a later specified date to allow for baseline data collection prior to harvest cessation.

G. 2010: SITE EVALUATIONS AND FINAL RECOMMENDATIONS

G.1 THE ROLE OF COMMUNITY TEAMS, OPAC, AND ODFW (HB 3013)

As directed in HB 3013 (2009), ODFW is to implement the recommendations made by OPAC to further evaluate marine reserve site proposals at Cape Falcon, Cascade Head, and Cape Perpetua. The statute requires ODFW to form a community team for each site and specifies the balance of stakeholder representation on the teams. The teams are to further evaluate the three sites forwarded by OPAC and to make recommendations to ODFW at the conclusion of their work.

The starting point for the community team’s evaluation is the site boundaries recommended for further evaluation by OPAC. Each community team is to consider biological and socioeconomic information and determine if modifications are needed to meet the sideboards set in EO 08-07: 1) the site is large enough to allow scientific evaluation of ecological benefits, but 2) small enough to avoid adverse significant economic or social impacts to ocean users and coastal communities. Each team is to refine and make a final marine reserve recommendation to ODFW. The community team may consider including a less restrictive MPA as part of their recommendation if it helps achieve a better balance within the two sideboards.

HB 3013 provides that the data and recommendations from the community teams are then to be used by ODFW, in consultation with OPAC, to recommend to the Legislature potential marine reserve sites for designation. The bill stipulates that the recommendations need to be consistent with EO 08-07 and are to be reported to the Legislature before the 2011 Legislative Session.

G.2 EVALUATION PROCESS AND RECOMMENDATIONS BY COMMUNITY TEAMS COMMUNITY TEAM STRUCTURE AND REPRESENTATION

In November 2009, ODFW solicits team members for the three evaluation site community teams. The [application packet](#) outlines expectations as well as the team member selection criteria and process, and includes a nomination form. ODFW and Oregon Sea Grant compile a list of team member nominees and meet with Coastal Legislators for input on team selections. In December 2009, ODFW finalizes team selections. Through a competitive bidding process, ODFW hires a contractor to provide third-party, neutral facilitation of meetings for the three community teams.



TEAM STRUCTURE: Each community team is comprised of 16 voting representatives and 16 non-voting alternates; with each representative having an assigned alternate. All three teams decide upon electing co-chairs to work with the facilitator, ODFW, and Sea Grant staff in setting meeting agendas.

COMMUNITIES OF INTEREST REPRESENTED: HB 3013 states that each team must include representation from eight specified interest groups: 1) local government, 2) recreational fishing industry, 3) commercial fishing industry, 4) nonfishing industry, 5) recreationalists, 6) conservation, 7) coastal watershed councils, and 8) relevant marine and avian scientists. Each team includes two representatives and two alternates for each of the eight specified interest groups.

COMMUNITIES OF PLACE REPRESENTED: Each team includes members from communities of place with an interest in, and who may be affected by, a marine reserve designation within the evaluation site. All three evaluation sites straddle or are in close proximity to two counties. Members reside in or represent the following communities:

- *Cape Falcon Team* – Clatsop and Tillamook Counties. Astoria, Cannon Beach, Arch Cape, Manzanita, Nehalem, Garibaldi, Bay City, Tillamook, Cloverdale, Oceanside, Netarts, Portland, Corvallis.
- *Cascade Head Team* – Tillamook and Lincoln Counties. Garibaldi, Tillamook, Hebo, Pacific City, Neskowin, Otis, Lincoln City, Gleneden Beach, Otter Rock, Siletz, Newport, Yachats, Portland, Vancouver (WA).
- *Cape Perpetua Team* – Lincoln and Lane Counties. Otter Rock, Newport, Toledo, Eddyville, Corvallis, Seal Rock, Waldport, Yachats, Florence, Mapleton, Walton, Eugene.

OUTREACH

ODFW and Oregon Sea Grant lead outreach efforts during the evaluation process. Outreach is primarily focused on informing the public about the process for considering marine reserve sites at Cape Falcon, Cascade Head, and Cape Perpetua and how the public can participate. Main outreach activities and channels include:

- Regular posting of meeting announcements and meeting materials on the Oregon marine reserves planning website.
- Media coverage of the marine reserves planning process by coastal, Portland, Salem, and Eugene newspapers and radio stations.
- An email distribution list, with 606 subscribers. Subscribers receive a weekly email from ODFW announcing upcoming marine reserve related meetings.
- Outreach being conducted by community team members to their constituents.

MAJOR COMMUNITY TEAM ACTIVITIES

35 MEETINGS: Between January and November 2010, 35 community team meetings are conducted. Each team holds one to two meetings per month. Meeting locations are rotated between different communities, including communities adjacent to the site or that could be affected by a marine reserve designation within the area.

All community team meetings are open to the public. Opportunities for written and verbal public comment are provided for at each meeting. The public plays a significant role in bringing certain issues and information forward to the community teams and ODFW. A large portion of the public's comments speak to either general support for or opposition to marine reserves. Average public attendance at meetings is: Cape Falcon – 31, Cascade Head – 19, and Cape Perpetua – 15. ODFW estimates that community team members collectively put in over 25,000 volunteer hours during this time period.



WORKING WITH CONSTITUENTS: Community team members are expected to spend, on average, eight hours each month outside of meetings speaking with their constituents, working with other members of their interest group, and reaching out to other team members. Many team members also engage with their counterparts on the other evaluation site community teams. The co-chairs of each team work closely with the facilitator, ODFW, and Sea Grant staff to determine the scope and set the agenda for each meeting, and to resolve any conflicts or concerns of community team members.

COMMUNITY TEAM STEPS AND TIMELINE

All three community teams follow a similar process and operate on similar timelines. Through facilitated public meetings, the steps taken include:

(JANUARY – FEBRUARY 2010) BACKGROUND INFORMATION AND TEAM CHARTER: The [roles, responsibilities, and expectations](#) of community team members are made explicit and team members commit to a [team charter](#). Team members are provided background information on Oregon’s marine reserves process and the site forwarded for further evaluation by OPAC. Co-chairs are elected by team members.

(MARCH – APRIL 2010) DETERMINE DECISION POINTS AND INFORMATION NEEDS: The community team identifies ecological, social, and economic [information needs](#) and agree upon the [decision points](#) that their evaluation and final recommendation will focus on.

(MAY – JUNE 2010) GATHERING EXISTING DATA AND LOCAL EXPERT KNOWLEDGE: During and in-between meetings, community team members work with ODFW staff to gather information on the ecological, economic, and social attributes of their respective sites. There are limitations in regard to the amount of existing spatially explicit ecological, economic, and social data available for each site. ODFW staff, community team members, and outside academic experts gather what existing data are available in the timeframe allotted. Experiential knowledge is provided by team members as a valuable source of additional information for each site. Group discussions to gather local experiential data are used as a way for team members to learn about their respective sites and to get to know other team members.

ODFW staff compile the experiential and existing data, conduct analyses, and provide a summarized report of the data and information for each site to the teams.

(JULY – AUGUST 2010) DEVELOPMENT OF PRELIMINARY SCENARIOS: Each team develops several marine reserve/MPA scenarios for consideration. Each team forwards their scenarios to ODFW for an analysis to gain a better understanding of where different sized sites, configurations, and levels of protection are strong and weak in meeting and striking a balance within the two EO 08-07 sideboards, compared to the original site forwarded by OPAC. The scenarios are intended to help inform each team’s final deliberations and recommendations.

(SEPTEMBER – OCTOBER 2010) AGENCY ANALYSIS OF PRELIMINARY SCENARIOS: ODFW, with the assistance of other state agencies, conducts an analysis of the scenarios forwarded by the teams. The framework for the analysis is the community teams’ agreed upon [decision points](#) and the STAC [size and spacing guidelines](#) (STAC 2008). ODFW hosts a [workshop](#) to consult with STAC and other invited natural and social scientists on the analysis. Feedback and new information gathered at the workshop is incorporated into the agency’s final analysis of scenarios.

ODFW presents each team with the [agency analysis of scenarios](#) at their respective October team meetings.

(NOVEMBER 2010) COMMUNITY TEAMS MAKE FINAL RECOMMENDATIONS TO ODFW: Community teams make final deliberations and vote on final recommendations at their November meetings. The recommendations for the Cape Perpetua and Cascade Head sites include modifications to the original site forwarded by

OPAC and are made with strong support of the community teams (15:1 and 12:4 vote in support, respectively). Each site is a compromise that includes a combination of a marine reserve plus multiple less restrictive protected areas. All voting members of the Cape Falcon community team vote in support of some type of modified marine reserve at the site, but cannot reach full agreement on the exact size, shape, and configuration. In the end, the Cape Falcon team narrowly votes to recommend the original site forwarded by OPAC (9:7 vote in support). Minority reports are also provided to ODFW, from each team. *(To view the site recommendations and minority reports, please follow the link to the analysis of final community team recommendations for OPAC in section G.3).*

G.3 CONSULTATION WITH OPAC

Agencies perform an [analysis of the community team site recommendations](#), with feedback from STAC and invited scientists. ODFW then consults with OPAC on December 6-7, 2010, to develop final recommendations to be sent to the Legislature.

The ODFW recommendations for Cape Perpetua and Cascade Head mirror the community team's site recommendations. Given the lack of strong support by the Cape Falcon community team for the final team recommendation, ODFW works with OPAC and individual members of the Cape Falcon community team during the OPAC meeting to modify the proposal to reduce negative social and economic impacts while maintaining the ecological footprint.

ODFW also presents to OPAC additional recommendations for marine reserve implementation regarding: review and evaluation, commitment to funding, community engagement, monitoring and research, and mitigation. These recommendations are based on concerns raised by community team members and the public during the community team process and are further fleshed out during consultation with OPAC.

After deliberation and discussion, OPAC reaches a consensus supporting ODFW's recommendations for marine reserve sites plus the additional implementation recommendations. OPAC forwards a [letter of support](#) to ODFW on December 15, 2010.

G.4 ODFW PROVIDES RECOMMENDATIONS TO COASTAL LEGISLATORS

ODFW updates the agency analysis and posts the final recommendations and [agency analysis](#) on the marine reserves planning website for the public. ODFW then forwards the OPAC supported [recommendations to Coastal Legislators](#) in a letter on January 25, 2011.

G.5 CAPE ARAGO-SEVEN DEVILS RECOMMENDATION: NO MARINE RESERVE

The local community process to consider a new marine reserve proposal for the Cape Arago-Seven Devils area, led by the Port of Coos Bay, was started in May 2009. In April of 2012, the Port forwards a [final recommendation to OPAC](#) of no new marine reserve for the Cape Arago-Seven Devils area.

H. 2012: LEGISLATIVE ACTIONS AND DESIGNATION OF SITES

H.1 SENATE BILL 1510 (SB 1510)

During the 2012 Legislative Assembly, Coastal Legislators work with conservation, commercial fishing, and recreational fishing interests and ODFW to develop marine reserves legislation. The Oregon Legislature passes [SB 1510](#) which stipulates:

- State agencies are to implement the ODFW site recommendations for Cape Perpetua, Cascade Head, and Cape Falcon as well as the 2008 recommendations from OPAC on marine reserves including the [Oregon Marine Reserve Policy Recommendations](#) (OPAC 2008)
- ODFW is to report on a marine reserve work plan, and marine reserves funding and expenditures, to the Legislature on or before February 1, 2013.

- STAC is to submit a report, prepared by an Oregon public university, on the marine reserves program to the Legislature in 2023.

H.2 AGENCY RULEMAKING – SITES DESIGNATED

SB 1510 instructs state agencies to adopt administrative rules to establish the Cape Perpetua, Cascade Head, and Cape Falcon sites. Starting in June 2012, state agencies undergo a [coordinated rulemaking](#) effort. [Final OARs](#) are adopted by their respective Boards and Commissions in July and August of 2012.

The OARs set the harvest restrictions to take effect in 2014 for the Cape Perpetua and Cascade Head sites, and 2016 for the Cape Falcon site. This is to allow for two years of baseline data to be collected at each site prior to harvest cessation, consistent with ODFW’s long-term monitoring plans as required in marine reserves legislation.

H.3 ODFW MARINE RESERVES PROGRAM: FUNDING, STAFF, WORK PLAN, AND REPORT **FUNDING AND STAFF TRANSITION FROM LIMITED DURATION TO PERMANENT**

The 2011 Legislative Assembly approves \$1.56 million of state funds and continuation of five limited duration and one seasonal marine reserve staff positions for ODFW, for the 2011-13 biennium.

In 2013, the Legislative Assembly approves \$1.67 million of state funds for the 2013-15 biennium and authorizes making the program funding and the five full-time and one seasonal staff positions a permanent component of the ODFW Agency Budget.

2013 MARINE RESERVES WORK PLAN AND REPORT TO LEGISLATURE

In January 2013, as required by SB 1510, ODFW submits a [report](#) to the Legislature that includes a Marine Reserves Work Plan and an account of marine reserves funding and expenditures.

The [work plan](#) provides a 10-year outlook for implementation of Oregon’s marine reserve system, up until the 2023 report to the Legislature. The plan outlines the work to be led by ODFW, that includes developing and implementing: a) marine reserve administrative rules, b) site management plans, c) ecological monitoring, d) social and economic (human dimensions) research, e) outreach, f) community engagement, g) enforcement in partnership with Oregon State Police, h) implementation review, and i) report to the Oregon Legislature.





CHAPTER 3. MARINE RESERVE SITE SNAPSHOTS

- A. INTRODUCTION
 - B. CAPE FALCON
 - C. CASCADE HEAD
 - D. OTTER ROCK
 - E. CAPE PERPETUA
 - F. REDFISH ROCKS
 - G. HABITAT REPRESENTATION
-

A. INTRODUCTION

A.1 HOW TO USE THIS CHAPTER: GET TO KNOW THE SITES

Oregon's five marine reserve sites comprise 9% of the 3,251 km² of our state waters, with the marine reserves encompassing 3% and MPAs encompassing an additional 6%. In this chapter we highlight the general characteristics of each marine reserve site and the system. You'll find information on when protections and monitoring began at each site, what activities are prohibited or allowed, and site characteristics including the size, depth range, habitats, prior fishing activities and relative fishing pressure as well as the towns and ports most closely connected to each site. We highlight what makes each site unique, provide relative comparisons amongst the sites, and highlight how much area and what habitats are represented in the marine reserve system.

A.2 OF SPECIAL NOTE

Several items worth noting from the marine reserves planning process affecting the design, siting, and designation of the five marine reserve sites.

CAPE BLANCO DEMARCATES TWO BIOGEOGRAPHIC REGIONS: Biogeographic regions are areas identified to have distinct physical and/or biological characteristics. Oceanographers and biologists studying genetics of fishes and the ranges of different species have identified the Columbia River and Cape Blanco as significant physical barriers affecting currents and the movement of various organisms ([STAC 2008](#)). The area south of Cape Blanco extends into Northern California, down to Cape Mendocino.

Guidance during the planning process recommended reserves be represented in each biogeographic region. Oregon's marine reserve system includes four sites north of Cape Blanco and one site south of Cape Blanco. In this chapter, for the southern biogeographic region we only present information on habitats represented in state waters from Cape

Blanco to the Oregon/California border. We do not account for habitats represented or marine reserve/MPA sites found in California state waters in this region.

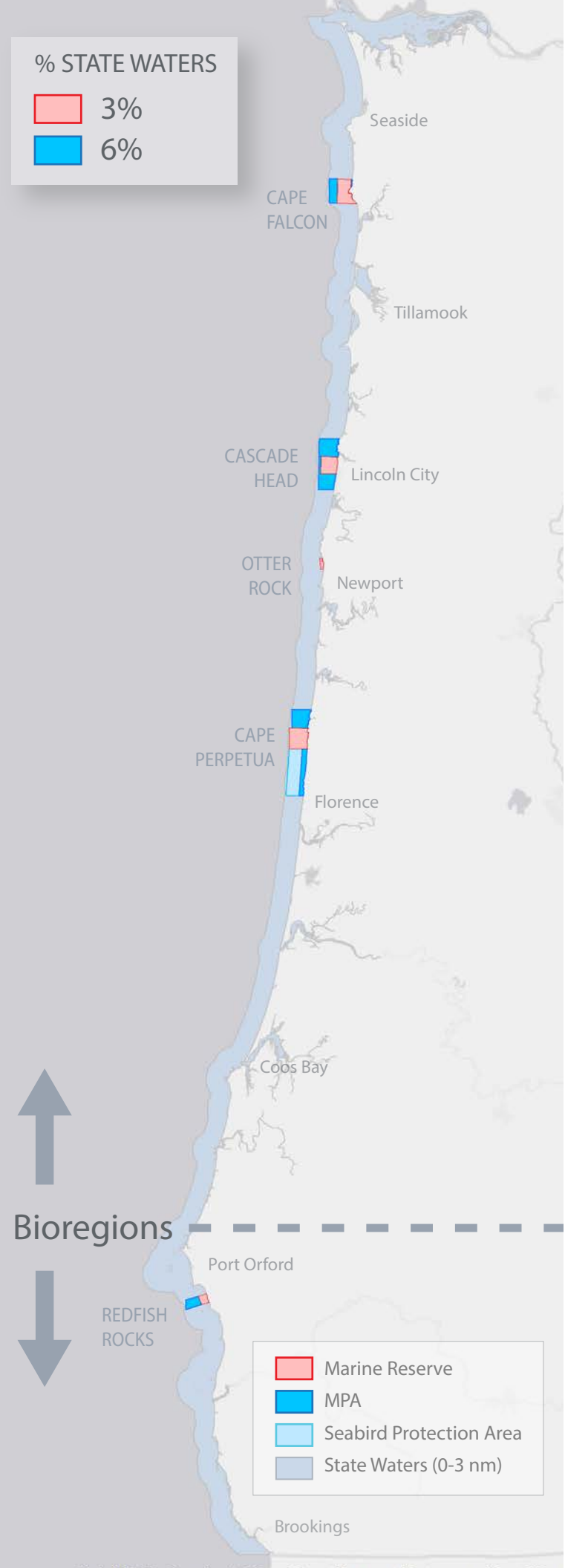
HABITATS: The marine reserve objectives ([OPAC 2008](#)) stated that the reserves were to protect key types of marine habitat in multiple locations to enhance resilience of nearshore ecosystems. OPAC identified the key subtidal habitats to be represented as rock and soft bottom substrates and distinguished between habitats at shallow (0-25 m) and deep (> 25 m) depths. Canopy forming kelp beds and rocky intertidal habitats were also identified as key habitat types to be represented.

SIDEBOARDS SET IN THE GOVERNOR'S EXECUTIVE ORDER:

The Cape Falcon, Cascade Head, Otter Rock, Cape Perpetua, and Redfish Rocks sites were deemed by OPAC, the Governor, and the Oregon Legislature to strike the best balance between the siting sideboards set in the Governor's [Executive Order 08-07](#) (2008): less than 10 marine reserve sites, individually or collectively large enough to allow scientific evaluation of ecological benefits, but small enough to avoid significant economic or social impacts to ocean users and coastal communities.

A.3 WHERE TO FIND MORE INFORMATION

You can find more in-depth information on the marine reserve sites in the Ecological Monitoring chapter and appendices (see Chapter 5.2), the Human Dimensions Research chapter and appendices (see Chapter 5.3), in the marine reserve site [management plans](#), as well as in the state [agency analyses](#) that were conducted in 2008 and 2010 during the marine reserves planning process (see Chapter 2).



B. CAPE FALCON

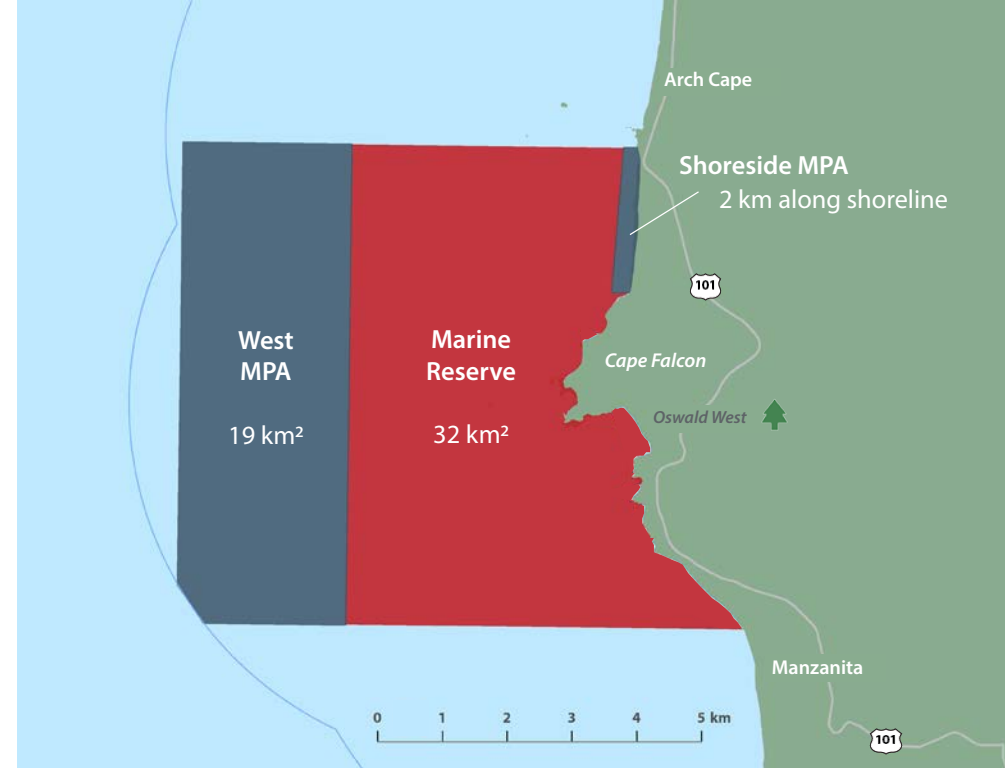
2016 Harvest Restrictions Began



Reserve Stats

(Reserve only - does not include MPAs)

Monitoring Began	2014
Size	Reserve: 32 km ² Alongshore: 7.5 km Offshore: 6.1 km
Depth Range	Reserve: 0-56 m
Habitats	Mostly soft sediment with isolated patches of rock habitat in shallow (< 25 m) depths. Stretches of rocky intertidal habitats associated with the two headlands, dominated by cliffs.
Habitat Connectivity	Isolated, low-relief rock habitat in shallow (< 25 m) depths
Prior Fishing Pressure	Relatively low fishing pressure on groundfish in rocky habitat areas. Relatively moderate fishing pressure on crab in sand habitat areas.
Proximate Counties, Towns, and Ports	Clatsop and Tillamook Counties, Arch Cape, Falcon Cove, Manzanita, Nehalem, Wheeler, and Garibaldi. Other nearby towns and affected ports include Astoria, Warrenton, Hammond, Cannon Beach, and Tillamook.



Prohibitions and Allowances

Marine Reserve:

All extractive activities prohibited.

West MPA:

Take of salmon (by troll) and crab is *allowed*.

Shoreside MPA:

Angling from shore is *allowed*. Intertidal take above the low tide line is *allowed*.

Shoreline/Intertidal Area:

Take above the low tide line is prohibited along rocky shores south of the Shoreside MPA.

What Makes This Reserve Unique?

Marine Habitats: The reserve has some of the only shallow rocky reef habitat in the nearby vicinity.

Oceanographic Features: This is the only marine reserve site off the northern Oregon coast, giving the best representation of the highly productive oceanographic area influenced by the Columbia River. The Columbia River is the largest flow of freshwater into the eastern Pacific Ocean.

In Comparison To The Other Reserve Sites: The reserve at Cape Falcon:

- Is considered moderate in size.
- Has a moderate diversity of habitats. The site is dominated by soft sediment sand and gravel/mixed habitats. There are small patches of low-relief rock habitat in shallow waters. Some small stretches of rocky intertidal habitats are also included.
- Has low habitat connectivity. The site has some small, low-relief, rock patches in shallower waters that are isolated from other rocky habitat in the nearby area.
- Includes a broad range of depths, but subtidal rock habitat is only found in shallow portions of the reserve.
- Experienced low fishing pressure on groundfish in rocky reef areas, moderate fishing pressure on crab in sand habitat areas.

Prior Fishing Pressure

(Reserve only)

High Medium Low

Commercial

- Nearshore groundfish
 Crab
 Salmon

Charter (Garibaldi & Nehalem)

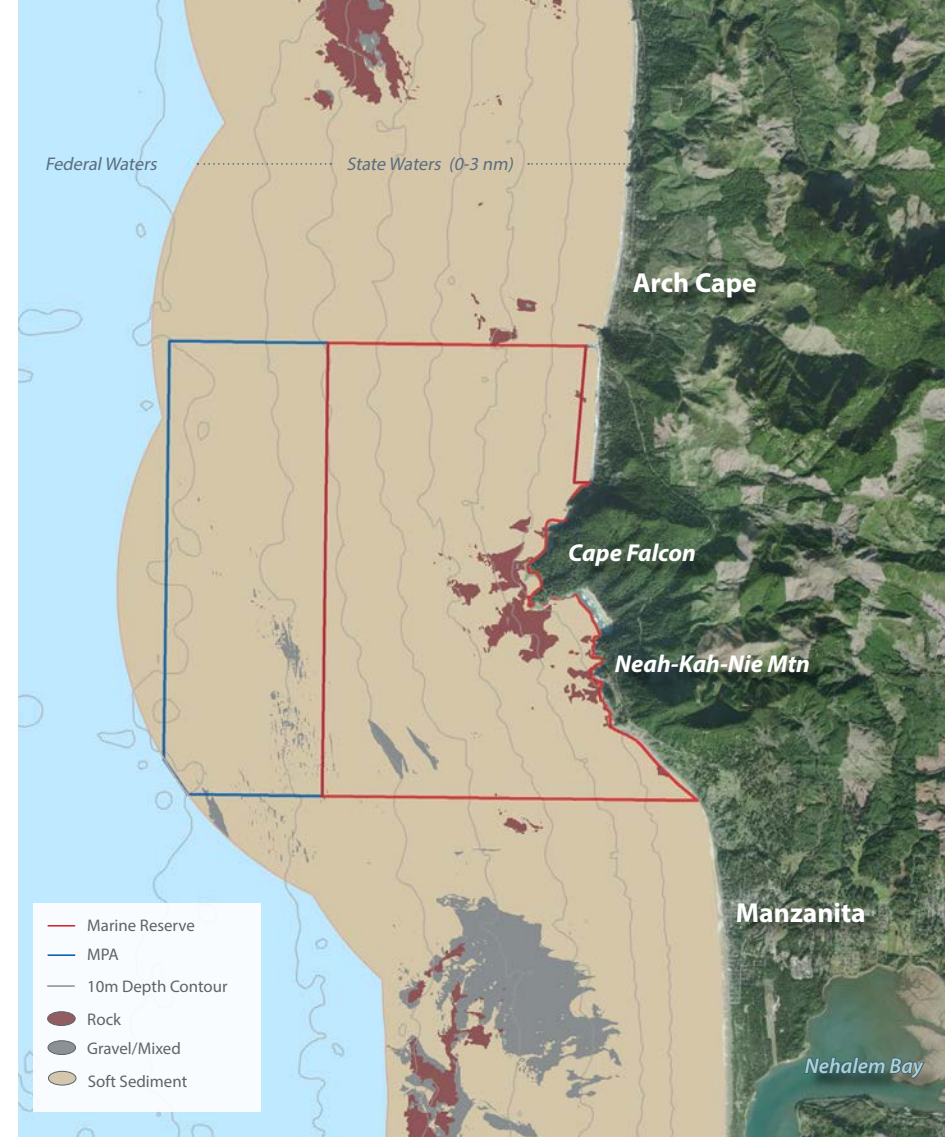
- Groundfish
 Crab and salmon

Shoreside Recreational

- Groundfish and surfperch

Recreational

- Groundfish
 Crab and salmon



Habitat Representation (Reserve only)

Subtidal habitats

% rock, mixed, and soft sediment habitats

Total area: **32 km²**

0 5 10 15 20 25 30 35



Canopy forming kelp beds? No

Rocky intertidal? Yes **7.9 km** of rocky intertidal habitats

C. CASCADE HEAD

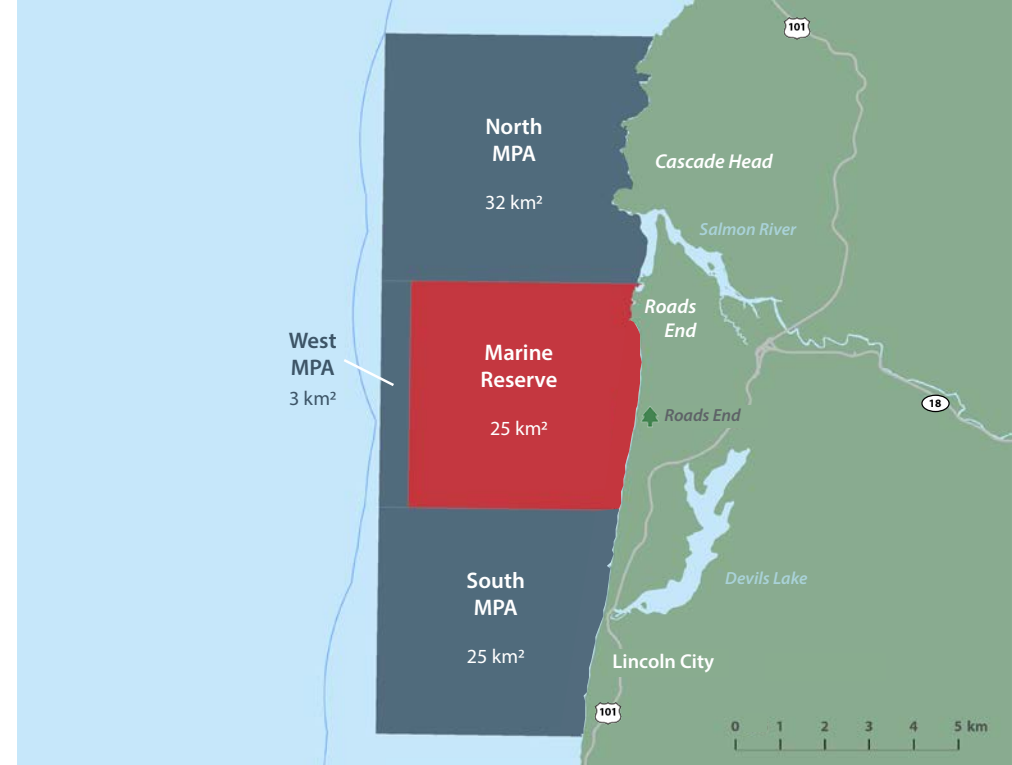
2014 Harvest Restrictions Began



Reserve Stats

(Reserve only - does not include MPAs)

Monitoring Began	2012
Size	Reserve: 25 km ² Alongshore: 5.1 km Offshore: 5.2 km
Depth Range	Reserve: 0-58 m
Habitats	Shallow (< 25 m) and deep (> 25 m) rocky habitats including large boulders and flat bedrock, as well as emergent rocks. Soft bottom habitats both shoreward and offshore of the rocky reef. Small stretch of rocky intertidal habitats around the Roads End headland.
Habitat Connectivity	Rocky reef habitats extend north and south, beyond the reserve.
Prior Fishing Pressure	High fishing pressure prior to closure, particularly for groundfish species associated with rock habitat. Moderate fishing pressure shoreside by recreational anglers.
Proximate Counties, Towns, and Ports	Lincoln and Tillamook Counties, Lincoln City and Depoe Bay. Other nearby towns and affected ports include Pacific City, Otis, Newport, and the small boat launch from the Salmon River.



Prohibitions and Allowances

Marine Reserve:

All extractive activities prohibited.

North MPA:

Take of salmon (by troll) and crab is *allowed*.

Take of groundfish, while recreationally angling from a non-chartered boat, is *allowed*.

West MPA:

Take of salmon (by troll) and crab is *allowed*.

South MPA:

No use of net fishing gear. All other legal take is *allowed*.

Shoreline/Intertidal Area:

Take above the low tide line is severely restricted in the North MPA and in the Marine Reserve from the Roads End Headland north.

What Makes This Reserve Unique?

Marine Habitats: The **reserve** includes a variety of habitats including the northern segment of Siletz Reef, an extensive rocky reef complex that spans approximately 71 km², extending offshore two to three miles and to depths up to 50 m. This rocky reef habitat extends beyond the reserve into the North MPA, as well as the South MPA and beyond.

Oceanographic Features: Just north of the **reserve**, the Salmon River flows out into the ocean providing a freshwater input into the marine environment. The area around Cascade Head is also a major upwelling center that creates productive waters that influence areas to the south.

In Comparison To The Other Reserve Sites: The **reserve** at Cascade Head:

- Is considered large in size.
- Includes a broad range of depths.
- Has a diversity of habitats, including rocky intertidal habitats and large areas of subtidal rock habitat. Rocky reef habitat extends beyond the reserve.
- Experienced high fishing pressure prior to closure, particularly for groundfish species associated with rock habitat.

Prior Fishing Pressure

(Reserve only)

High ● Medium ● Low ○

Commercial

- Nearshore groundfish
- Crab
- Salmon

Charter (Depoe Bay)

- Groundfish
- Crab and salmon

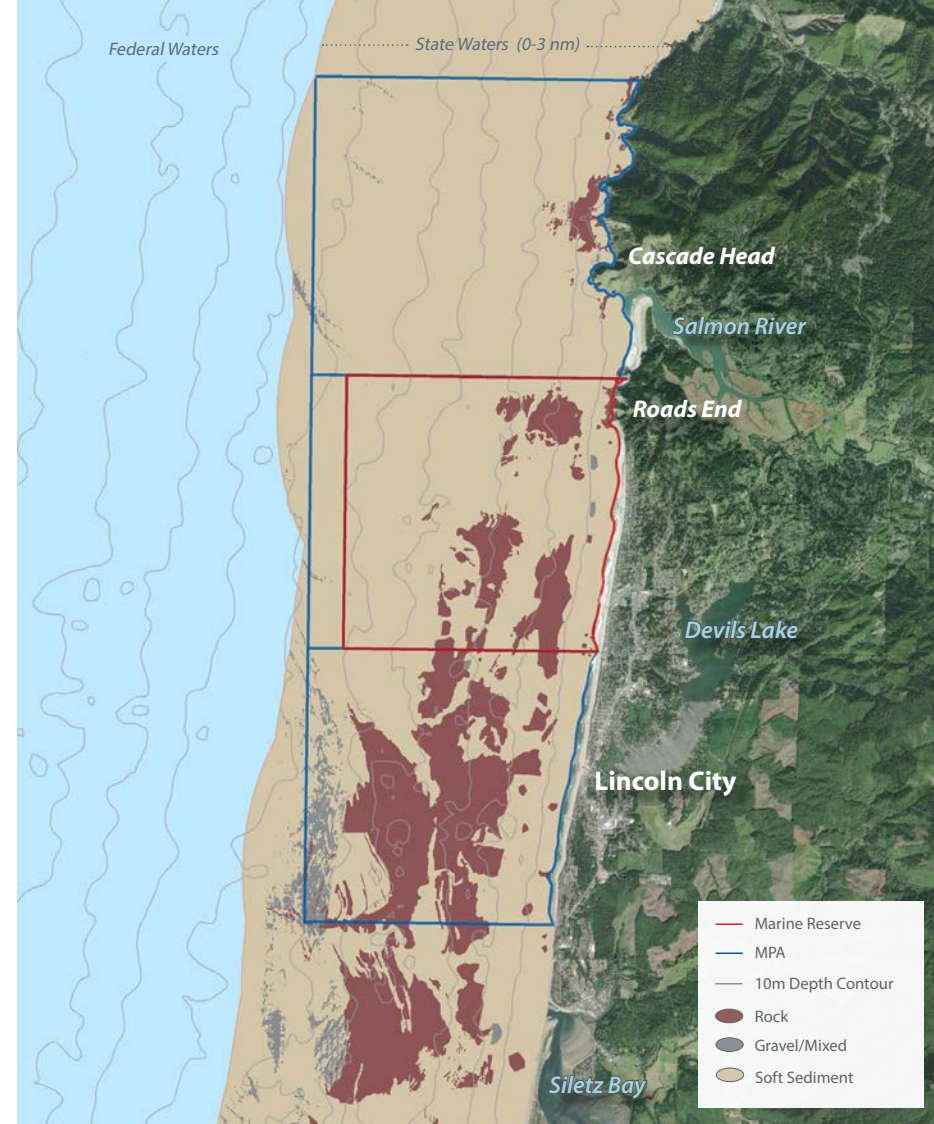
Shoreside Recreational

- Groundfish and surfperch
- Rocky intertidal harvest

Recreational

- Groundfish
- Surfperch
- Crab and salmon

Note: In recent years, commercial squid fishing has begun to regularly occur in this region (this fishery was not known to occur here previously). The reserve and MPAs at Cascade Head all prohibit commercial squid fishing.



Habitat Representation (Reserve only)

Subtidal habitats

% rock, mixed, and soft sediment habitats

Total area: **25 km²**



Canopy forming kelp beds? No

Rocky intertidal? Yes **1.1 km** of rocky intertidal habitats

D. OTTER ROCK

2012 Harvest Restrictions Began



Reserve Stats

Monitoring Began	2010
Size	Reserve: 3 km ² Alongshore: 3.5 km Offshore: 1.2 km
Depth Range	Reserve: 0-14 m
Habitats	Shallow rocky habitats including bedrock and boulders, and patches of kelp beds, as well as emergent rocks and islands. Areas of soft sediment. Rocky intertidal habitats from Devils Punchbowl north.
Habitat Connectivity	Rocky habitats extend north and south, and slightly farther offshore, beyond the reserve.
Prior Fishing Pressure	Relatively low fishing pressure due to shallow depths and small area, with exception for red urchin that experienced relatively high pressure and moderate fishing pressure shoreside by recreational anglers.
Proximate Counties, Towns, and Ports	Tillamook County, Otter Rock, Depoe Bay, and Newport.



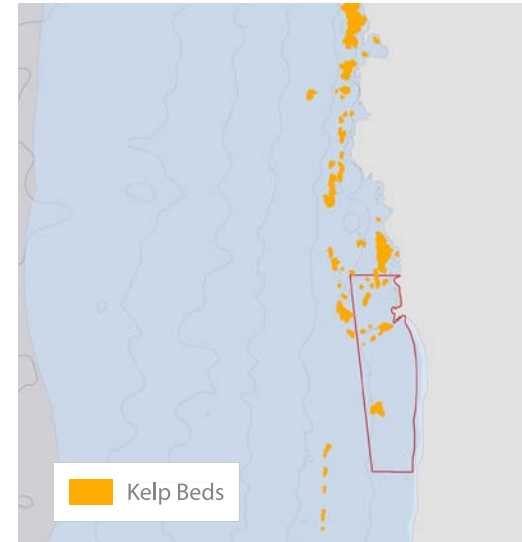
Prohibitions and Allowances

Marine Reserve:

All extractive activities prohibited.

Shoreline/Intertidal Area:

Take above the low tide line is severely restricted in the Marine Reserve from the Devils Punchbowl north.



Kelp beds at Otter Rock Marine Reserve

What Makes This Reserve Unique?

Marine Habitats: This is one of only two marine reserve sites that has canopy forming kelp beds. Emergent rocks and islands are another prominent feature. The reserve includes a long stretch of rocky intertidal habitat that is biologically diverse. Sand dollar beds have also been observed in the reserve, providing a unique biogenic habitat.

In Comparison To The Other Reserve Sites: The **reserve** at Otter Rock:

- Is considered small in size.
- Has a moderate diversity of habitats.
- Had rocky intertidal protections in place prior to reserve designation. The protections extend beyond the reserve, north to the Otter Crest headland, in the Otter Rock Marine Garden which has prohibited invertebrate harvest since 1962.
- Experienced relatively low fishing pressure, with the exception of red urchins harvested in the commercial urchin fishery in the northern portion of the site. Some angling from shore, considered moderate when compared to the other reserves.

Prior Fishing Pressure

High Medium Low

Commercial

- Nearshore groundfish
 Crab
 Urchin

Charter (Depoe Bay & Newport)

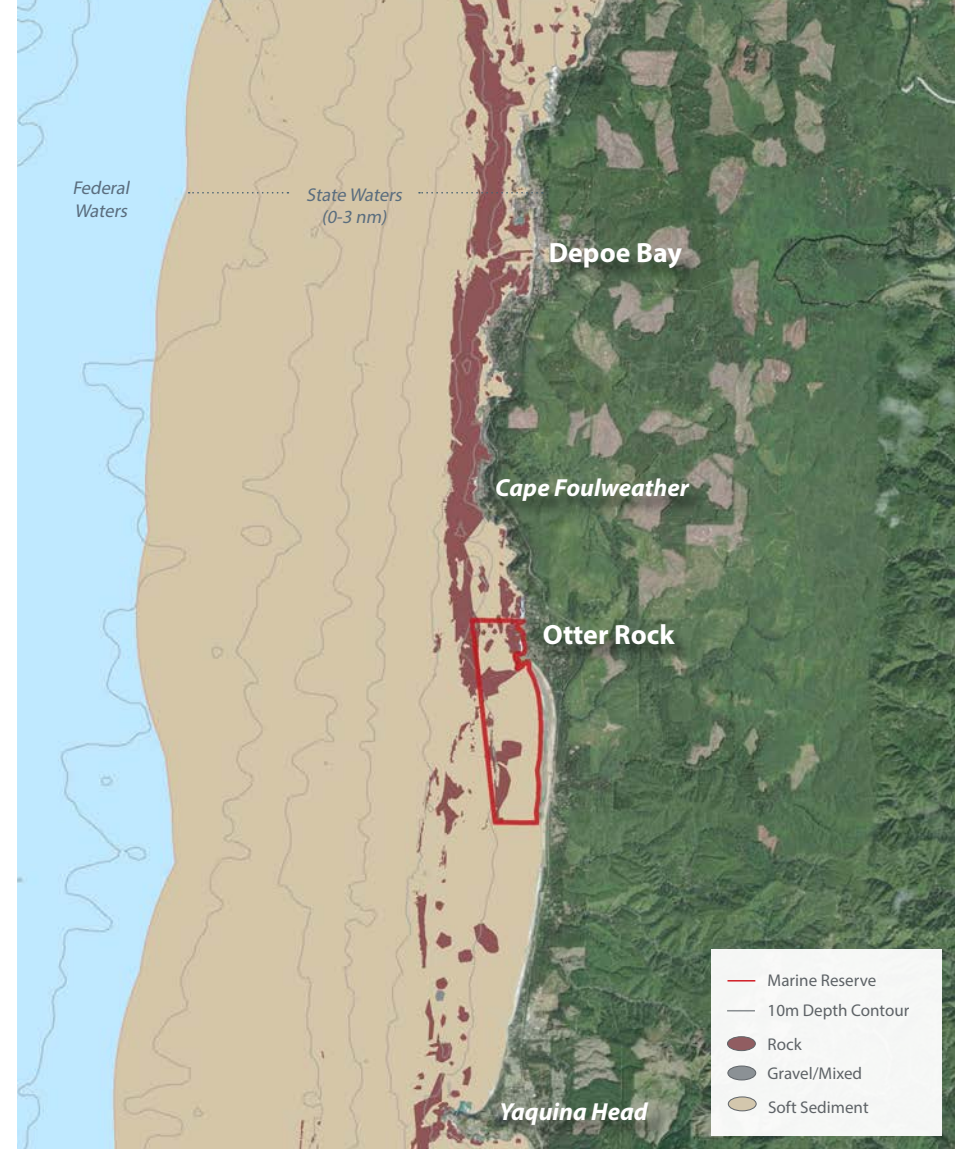
- Groundfish
 Crab and salmon

Shoreside Recreational

- Groundfish and surfperch

Recreational

- Groundfish
 Surfperch
 Crab



Habitat Representation

Subtidal habitats

% rock, mixed, and soft sediment habitats

Total area: **3.4 km²**



Canopy forming kelp beds? Yes

Rocky intertidal? Yes **1.6 km** of rocky intertidal habitats

E. CAPE PERPETUA

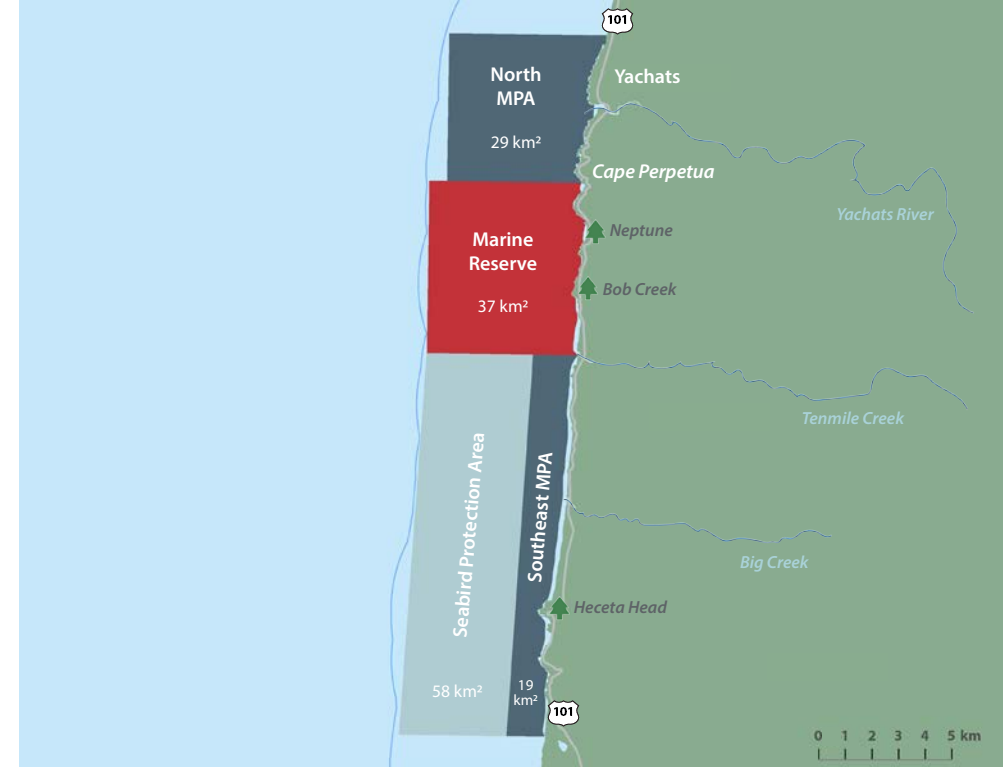
2014 Harvest Restrictions Began



Reserve Stats

(Reserve only - does not include MPAs)

Monitoring Began	2012
Size	Reserve: 37 km ² Alongshore: 6.5 km Offshore: 6.0 km
Depth Range	Reserve: 0-53 m
Habitats	Dominated by soft sediment, as well as deep (> 25 m) gravel/mixed habitats. Small, isolated, patchy, low-relief rocky reef in deeper water (> 25 m). Extensive stretches of rocky intertidal habitats.
Habitat Connectivity	Majority of rocky reef habitat is inside the reserve, with some small patches in the North MPA and Seabird Protection Area. No other subtidal rocky habitat found in the nearby region.
Prior Fishing Pressure	Moderate fishing pressure on groundfish in rocky habitat areas. High fishing pressure on crab in sand habitat areas. Additional fishing pressure on halibut, salmon, and squid. Moderate fishing pressure shoreside by recreational anglers.
Proximate Counties, Towns, and Ports	Lincoln and Lane Counties, Newport, Yachats, and Florence. Other nearby towns and affected ports include Waldport, Winchester Bay, and Coos Bay.



Prohibitions and Allowances

Marine Reserve:

All extractive activities prohibited.

North MPA:

Take of salmon (by troll) and crab is *allowed*. Angling from shore is *allowed*.

Southeast MPA:

No use of trawl gear. No take of herring, smelt, sardines, anchovies, sand lance, mackerels, or market squid.

Seabird Protection Area:

No take of herring, smelt, sardines, anchovies, sand lance, or mackerels.

Shoreline/Intertidal Area:

Take above the low tide line is severely restricted along rocky shores in the North MPA and in the Marine Reserve from Bob Creek north.

What Makes This Reserve Unique?

Marine Habitats: The **reserve** includes extensive stretches of rocky intertidal habitats. There is a deep (> 25 m), isolated rocky reef which is considered unique as sand and gravel tend to be the dominate habitat types in this region. Even though the reef is patchy and low relief, the fish and invertebrate community is quite diverse. There is no rocky reef habitat at a similar depth, with similar oceanographic conditions and fishing pressure, anywhere in the nearby vicinity.

Oceanographic Features: This is the only marine reserve site within the unique and highly productive oceanographic area shoreward of Heceta Bank. Heceta Bank and other nearby banks deflect the strong north-south summertime flow offshore creating an area of slowed or reversed currents in this area. As a result, the area retains nutrient-rich upwelled water, leading to higher primary production and often hypoxic water conditions. In the last two decades, the nearshore waters around Cape Perpetua have been experiencing episodes of hypoxia (low oxygen) as well as acidification (a lowering of pH). These have been associated with strong summer upwelling activity and are considered signs of a changing climate and ocean conditions.

In Comparison To The Other Reserve Sites: The **reserve** at Cape Perpetua:

- Is considered large in size.
- Has a diversity of habitats including rocky intertidal habitats; sand, gravel, and mixed soft sediment subtidal habitats; and an isolated subtidal rocky reef.
- Has rocky reef habitat almost exclusively contained within the reserve boundaries.
- Includes a broad range of depths, but subtidal rock habitat is only found in deeper portions of the reserve.
- Prior rocky intertidal protections in the reserve at Cape Perpetua Marine Garden since 1981 and Neptune Research Area since 1962, and in the North MPA at Yachats Marine Garden since 1998 .
- Experienced low to moderate fishing pressure on groundfish in rocky reef areas, high fishing pressure on crab in sand habitat areas.

Prior Fishing Pressure (Reserve only) High ● Medium ● Low ○

Commercial

- Crab
- Salmon
- Halibut
- Squid

Charter (Newport)

- Groundfish
- Crab and salmon

Shoreside Recreational

- Groundfish and surfperch



Habitat Representation (Reserve only)

Subtidal habitats

% rock, mixed, and soft sediment habitats

Total area: **37 km²**



Canopy forming kelp beds? No

Rocky intertidal? Yes **7.7 km** of rocky intertidal habitats

F. REDFISH ROCKS

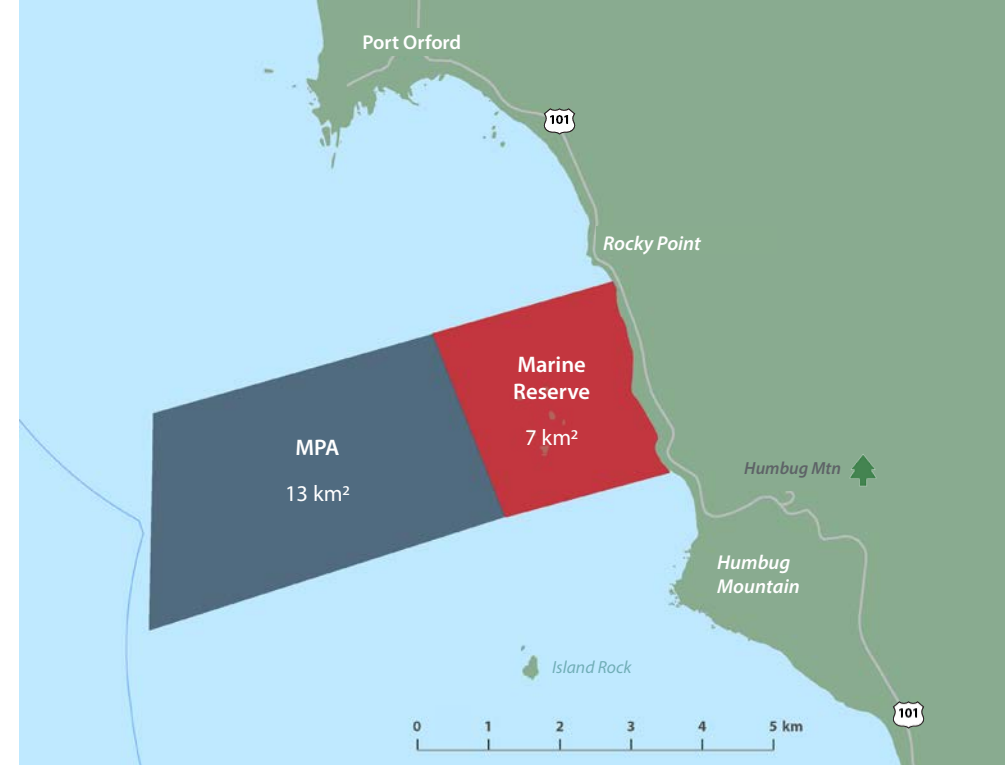
2012 Harvest Restrictions Began



Reserve Stats

(Reserve only - does not include MPAs)

Monitoring Began	2010
Size	Reserve: 7 km ² Alongshore: 2.8 km Offshore: 2.7 km
Depth Range	Reserve: 0-40 m
Habitats	Emergent rocks and islands, kelp beds, large boulders, complex high-relief rocky reef, and soft sediment habitats.
Habitat Connectivity	Rocky reef habitats extend north and south beyond the reserve.
Prior Fishing Pressure	Relatively high fishing pressure on groundfish and red urchins in rocky habitat areas. Relatively low fishing pressure on crab.
Proximate Counties, Towns, and Ports	Curry County, Port Orford, and Gold Beach. Other nearby towns and affected ports include Brookings, Bandon, and Coos Bay.



Prohibitions and Allowances

Marine Reserve:

All extractive activities prohibited.

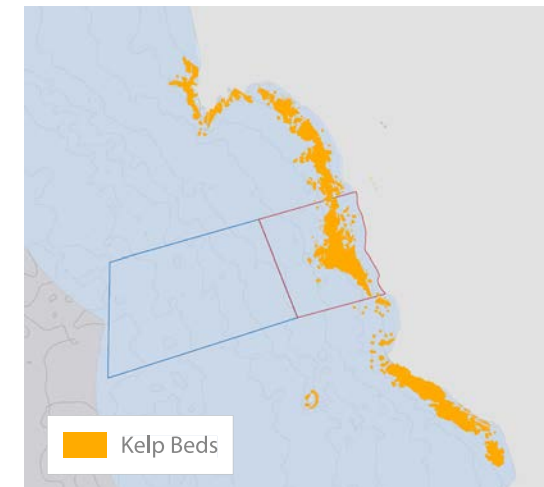
MPA:

Take of salmon (by troll) and crab is *allowed*.

Shoreline/Intertidal Area:

None

Note: The shoreward boundary of the reserve is the ELWL, so the adjacent rocky intertidal shoreline



Kelp beds at Redfish Rocks Marine Reserve

What Makes This Reserve Unique?

Marine Habitats: The **reserve** includes emergent rocks and islands surrounded by high-relief rocky reef and bedrock, intermixed with cobble and boulder fields. Kelp beds are found in between the islands and the shore. These habitats support a wide diversity of fish, invertebrates, and seaweeds.

Biogeographic Features: This is Oregon’s only marine reserve site located south of Cape Blanco, a known biogeographic break — where the north-south extent of some species begin or end — within the California Current System. This biogeographic region extends south down to Cape Mendocino in California. This southern region of Oregon’s state waters has twice the amount of rocky reef habitat per area as the region that extends from north of Cape Blanco up to the Columbia River. This region of the coast is also where the majority of Oregon’s canopy forming kelp beds are found.

In Comparison To The Other Reserve Sites: The **reserve** at Redfish Rocks:

- Is considered small in size.
- Has a high diversity of habitats, and includes a broad range of depths.
- Is one of only two reserves with canopy forming kelp beds.
- Experienced high fishing pressure on groundfish and urchins, by the local commercial fishery out of Port Orford, in rocky reef areas.

Prior Fishing Pressure

(Reserve only)

High Medium Low

Commercial

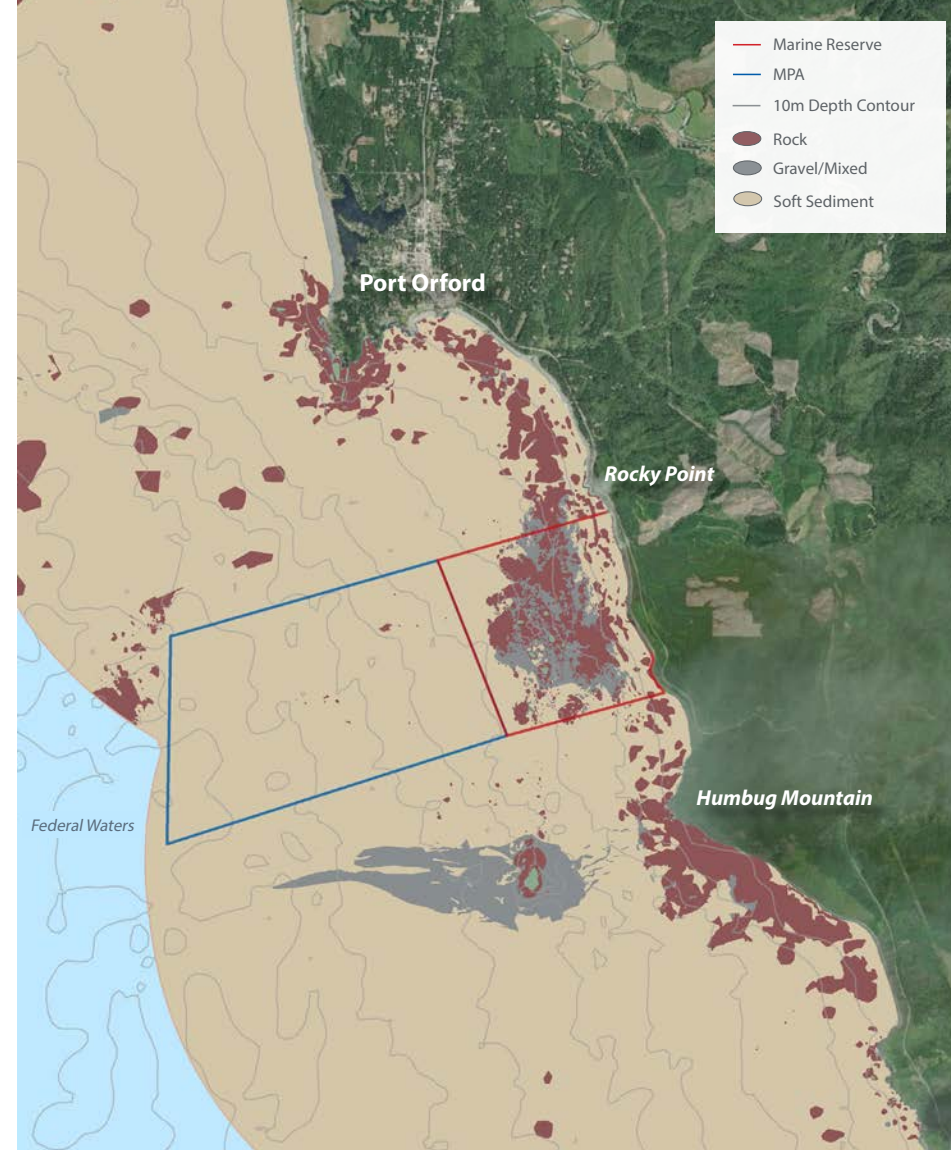
- Nearshore groundfish
- Urchin
- Crab

Charter (Gold Beach)

- Groundfish

Recreational

- Groundfish



Habitat Representation (Reserve only)

Subtidal habitats

% rock, mixed, and soft sediment habitats

Total area: **7 km²**



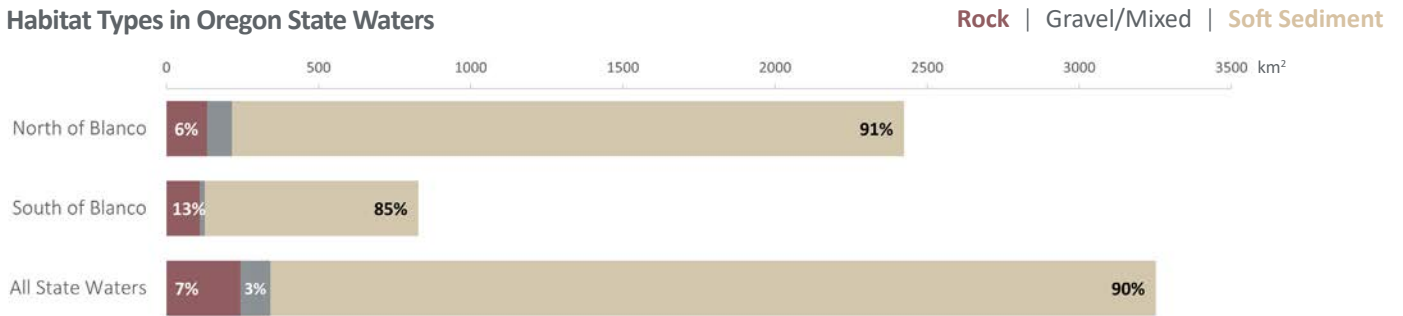
Canopy forming kelp beds? **Yes**

Rocky intertidal? **No**

G. HABITAT REPRESENTATION

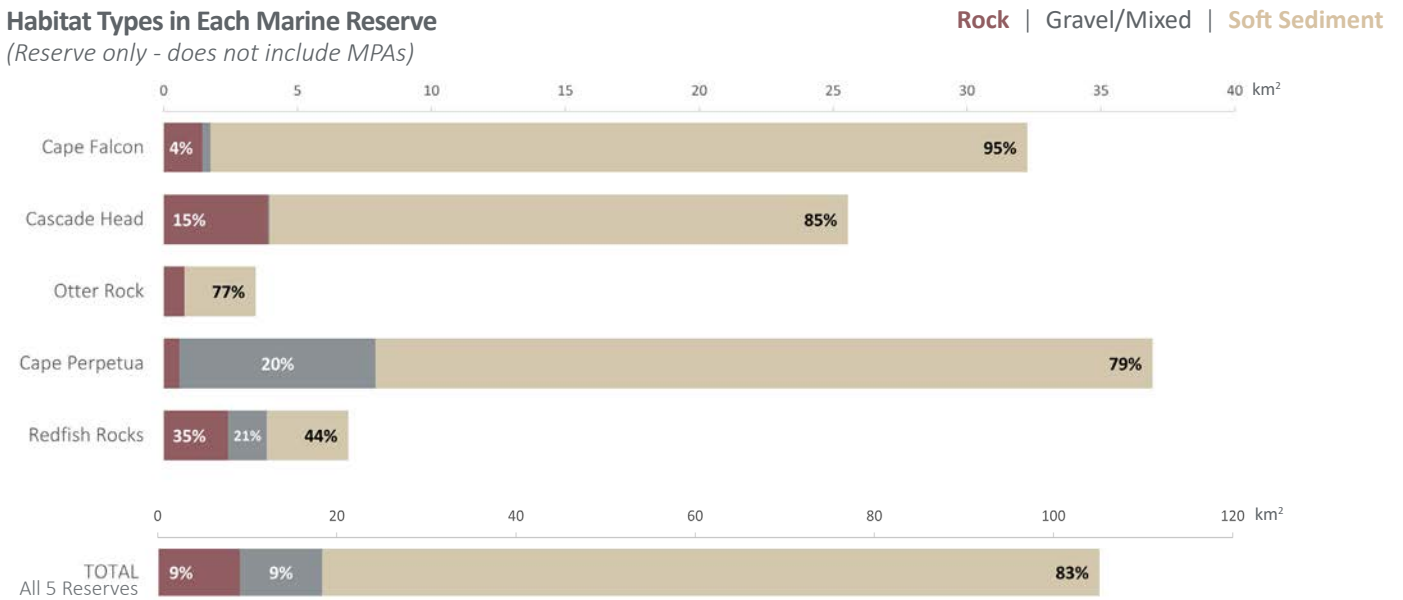
Here we highlight the habitat types represented in Oregon state waters in comparison to the representation of habitat types in each reserve. More information on habitat types, areas, and representation can be found in [Appendix A](#).

Habitat Types in Oregon State Waters

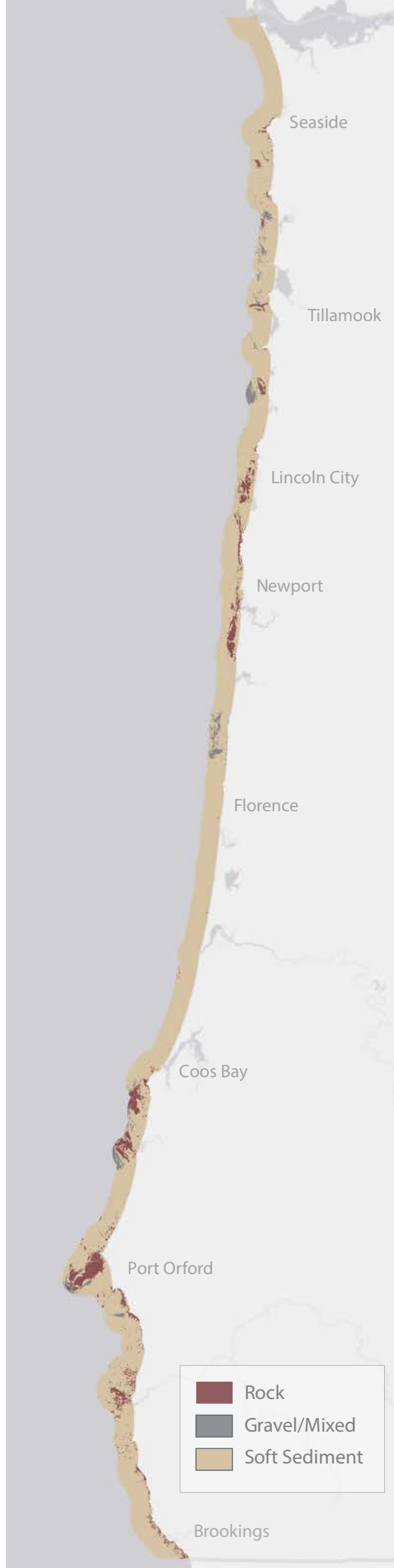
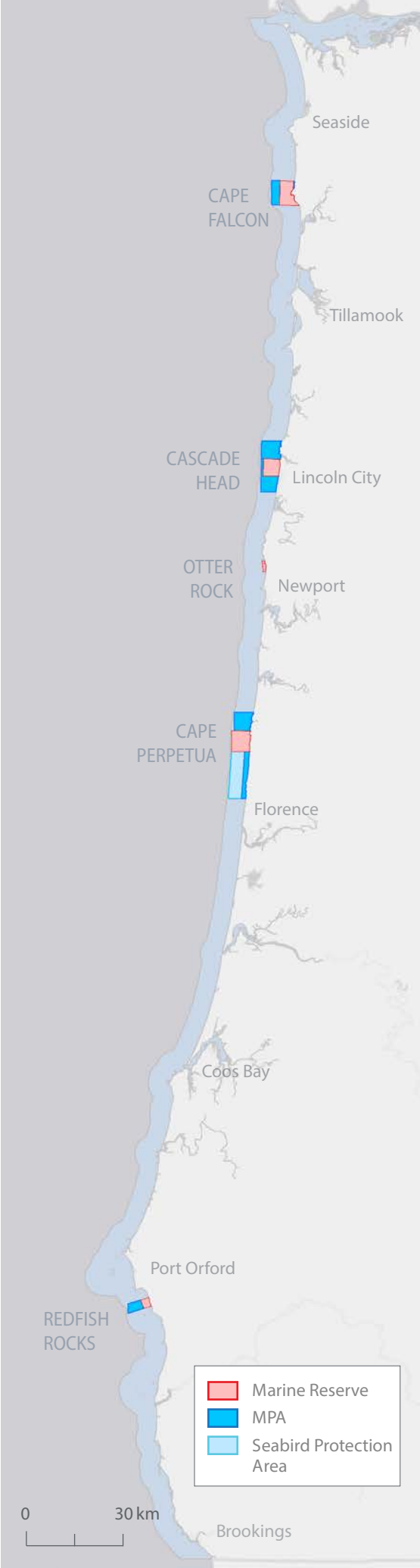


Habitat Types in Each Marine Reserve

(Reserve only - does not include MPAs)



Rocky Intertidal Habitats **10%** of Oregon's 380 km of rocky intertidal habitat is protected in the reserves and MPAs





CHAPTER 4. ODFW MARINE RESERVES PROGRAM

- A. INTRODUCTION
 - B. PROGRAM GOVERNANCE AND STRUCTURE
 - C. STAFF CAPACITY AND FUNDING RESOURCES OVER TIME
 - D. CHALLENGES, LESSONS LEARNED, AND CONSIDERATIONS FOR THE FUTURE
-

A. INTRODUCTION

The Oregon Department of Fish and Wildlife (ODFW) is the lead agency responsible for overseeing the implementation of Oregon’s marine reserves. The ODFW Marine Reserves Program was established in 2009 by the Oregon Legislature, providing state staff and funding resources dedicated to supporting marine reserves implementation. We are a six-person interdisciplinary team that brings together marine science, social science, communications, public policy, and resource management to implement the marine reserve sites and mandates. Our team is based on the central Oregon coast in Newport, Oregon. We share marine reserve management responsibilities with three other state agencies. We also work with a variety of partners and contractors from academia, the fishing industry, the private sector, non-governmental organizations, and local marine reserve community groups to help carry out many aspects of marine reserves implementation. Additionally, we have been successful in leveraging state resources through grants, partners, contracts, and intergovernmental agreements to further support marine reserves implementation.

A.1 HOW TO USE THIS CHAPTER

In this chapter you’ll find how the Marine Reserves Program has been structured to carry out the marine reserve mandates, what state resources have been provided, how ODFW staff and funding levels have evolved over time, and how the program has leveraged state resources to support marine reserves implementation. We also describe some of the challenges experienced by the program, lessons learned during initial marine reserves implementation, and considerations for the future. This chapter can be used to understand:

- **THE STRUCTURE OF THE MARINE RESERVES PROGRAM:** How the program is structured to implement the marine reserve mandates. Who is responsible to carry out the various aspects of marine reserves implementation.
- **ODFW STAFF AND FUNDING RESOURCES OVER TIME:** The staff and funding resources provided by the state to support marine reserves implementation. The variation in staff capacity over time and what has contributed to enhancement or hindrance of staff capacity. How ODFW has leveraged state resources over time.

- **HOW ODFW HAS USED STATE RESOURCES:** ODFW’s use of state staff and funding resources. How grant funds have been used. How expenditures have aligned with the marine reserve mandates.
- **HOW CONTRIBUTIONS OF PARTNERS ARE CRITICAL TO MARINE RESERVE IMPLEMENTATION:** Beyond the resources provided by the state, implementation of Oregon’s marine reserves has been supported by contributions of staff and funding by partners from academia, non-governmental organizations (NGOs), and local marine reserve community groups. How federal and other grants have also contributed to marine reserves implementation.
- **CHALLENGES, LESSONS LEARNED, AND CONSIDERATIONS FOR THE FUTURE:** What have been challenges and lessons learned during the start-up and initial implementation of the program. How we might address some of the ongoing program challenges and provide greater efficiencies through administrative actions. How might the current austerity program be adapted to provide for a more sustainable program and better support implementation of this long-term, nearshore conservation and monitoring program.

This information can be used to inform adaptive management of the program in the future. It also serves as a valuable case study on governance and capacity that can be used by other MPA or long-term monitoring programs to learn from or for comparison.

B. PROGRAM GOVERNANCE AND STRUCTURE

Marine reserves implementation is governed by the mandates set by the Oregon Legislature and OPAC ([Chapter 1.D](#)) and is carried out through a centralized management structure led by ODFW. The ODFW Marine Reserves Program provides state staff and funding resources dedicated to supporting marine reserves implementation. Our responsibilities include overseeing ecological monitoring, social and economic (human dimensions) research, outreach, community engagement, development of site management plans, and support for compliance and enforcement (Figure 1).

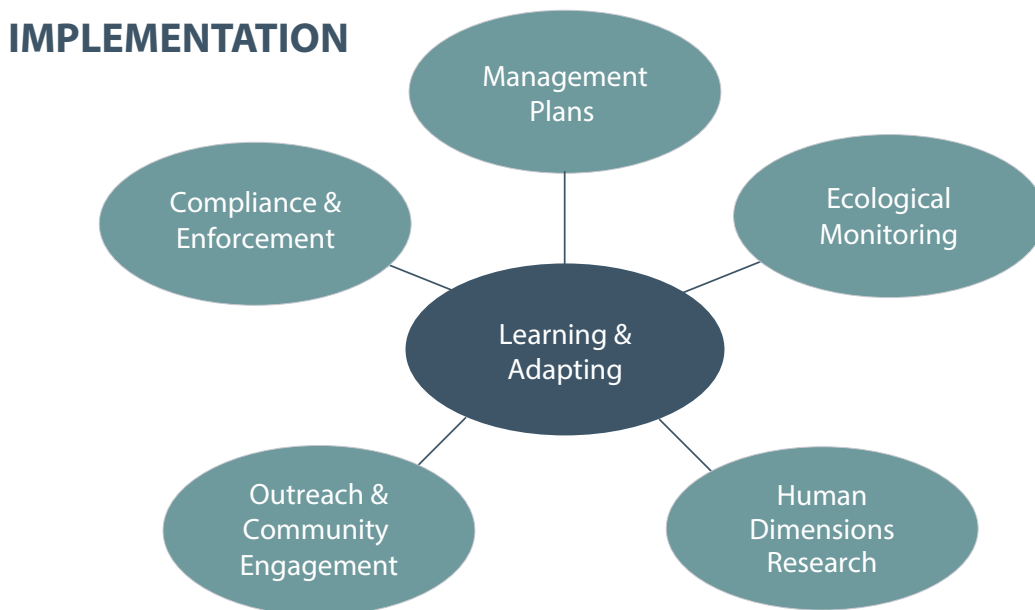


Figure 1. The marine reserve mandates provide that implementation include ecological monitoring, social and economic (human dimensions) research, outreach, community engagement, enforcement of the sites, and development of site management plans.

We have structured our program to carry out the marine reserve mandates, following the work outlined in the subsequent plans, with the available staff and funding resources. These plans were developed in consultation with the Scientific and Technical Advisory Committee (STAC), other invited scientists, state management agencies, ocean users including fishers and non-consumptive users, coastal community members, and other interested Oregonians.

- **2009-2011 WORK PLAN (2009):** Required by House Bill 3013 (HB 3013), this first [Work Plan](#) outlined the work to be carried out by ODFW and state agency management partners during the 2009-11 biennium. The plan covered: a) marine reserves implementation – for the Redfish Rocks and Otter Rock pilot sites, and b) marine reserves planning for the evaluation sites.
- **2012-2023 WORK PLAN (2013):** Required by Senate Bill 1510 (SB 1510), this second [Work Plan](#) outlines the marine reserves implementation work to be carried out from 2012 up until the 2023 report to the Legislature. The plan covers the actions, tasks, and timeframes for the development and implementation of: a) administrative rules, b) site management plans, c) ecological monitoring, social and economic (human dimensions) research, d) outreach, e) community engagement, f) enforcement, g) implementation review, and h) the 2023 report to the Oregon Legislature.
- **ECOLOGICAL AND HUMAN DIMENSIONS MONITORING PLANS (2012, 2015, 2017):** Long-term [monitoring plans](#) that describe our research questions, study designs, and sampling activities for tracking and understanding nearshore ocean changes over time and investigating the different ways that people and communities are affected by the marine reserve sites. Each plan has been reviewed and updated at least every five years.
- **SITE MANAGEMENT PLANS (2012, 2013, 2017, 2020, 2021):** [Management plans](#) developed for each marine reserve site. The plans outline the management priorities and management strategies that ODFW and state agency management partners are committed to carrying out to support scientific monitoring and research, outreach, community engagement, compliance, and enforcement for the sites.

B.3 PROGRAM STRUCTURE: HOW IMPLEMENTATION IS CARRIED OUT

Implementation of Oregon’s marine reserves is carried out through a centralized management structure led by the ODFW Marine Reserves Program. In this section we provide a brief overview of the program structure and how implementation work is delegated among ODFW staff, partners, contractors, and volunteers (Figure 2).

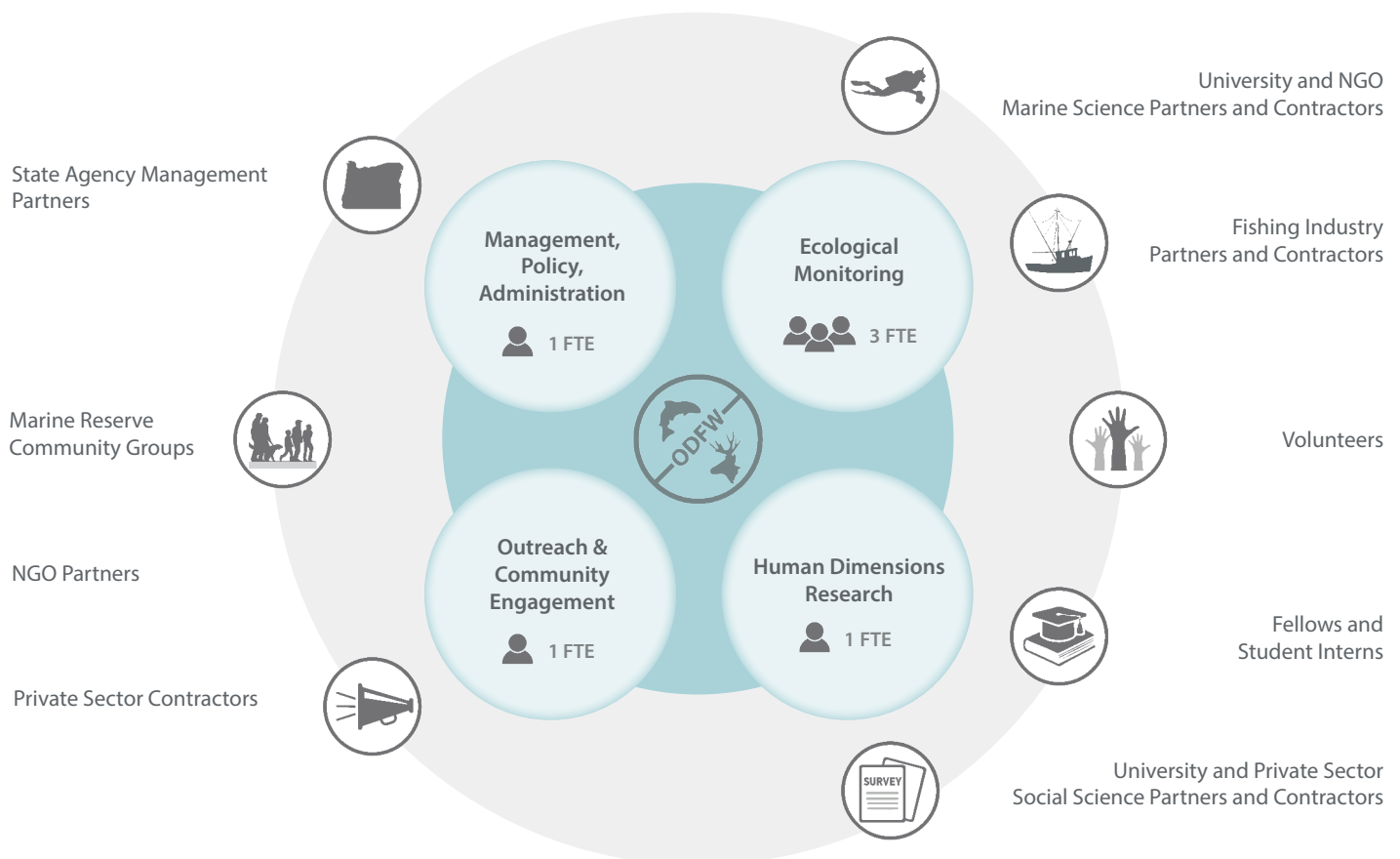


Figure 2. Structure of the Marine Reserves Program

PROGRAM PRINCIPLES: The following principles serve as a guide to our work, help us learn and adapt over time, and ensure that we focus and stay true to the tasks that Oregonians have entrusted to us. Our program principles hold that we are committed to:

- **MEETING OREGON’S MARINE RESERVE MANDATES:** Our work is dedicated to implementing the marine reserves mandates as defined by the Oregon Legislature and OPAC.
- **PRODUCING ROBUST SCIENTIFIC INFORMATION:** We do rigorous scientific monitoring and research that provides information to support marine reserves and nearshore ocean management.
- **PROVIDING DIVERSE WAYS FOR PEOPLE TO ENGAGE:** We foster and support a diversity of ways for people with different interests to engage in marine reserves implementation.
- **BUILDING PARTNERSHIPS AND COLLABORATIONS TO SUPPORT IMPLEMENTATION:** We build partnerships with academic institutions, conservation organizations, the fishing industry, local community groups and beyond to support and bolster implementation efforts.
- **PROVIDING TRANSPARENCY AND SHARING AS WE GO:** We document and clearly communicate our work and how it ties to our mandates. We are transparent in our program’s activities and operations.

ODFW MARINE RESERVES PROGRAM STAFF

Our program is responsible for overseeing implementation of the marine reserve sites and mandates. We are a six-person interdisciplinary team with staff focused and organized around the following program areas: a) management, policy, and program administration; b) ecological monitoring; c) human dimensions (socioeconomic) research; and d) outreach and community engagement. We direct our state staff and funding resources toward the priorities, actions, and tasks outlined in the previously described marine reserve work plan, monitoring plans, and site management plans. While much of this work is carried out internally by program staff, a substantial portion of state funds are directed to partners, contractors, students, and post-graduate fellows to carry out many aspects of marine reserves implementation work.

Our agency also regulates the take of fish, invertebrate, and wildlife species within the marine reserve sites.



Marine Resources

STATE AGENCY MANAGEMENT PARTNERS

ODFW shares marine reserve management responsibilities with three state agencies. ODFW is responsible for leading coordination among these state agencies.



PARKS AND RECREATION DEPARTMENT (OPRD)

Regulates shoreline activities, including removal of natural products and other activities requiring an ocean shore permit. Provides interpretative and educational opportunities to enhance recreational experiences.



DEPARTMENT OF STATE LANDS (DSL)

Regulates submerged and submersible land uses that require state authorization or a removal-fill permit, including harvest of subtidal kelp and the siting of ocean renewable energy projects and submarine cables.



OREGON STATE POLICE (OSP)

Provides enforcement of the regulations associated with each site. Provides information and education in support of voluntary compliance.

PARTNERS AND CONTRACTORS: ACADEMIA, FISHING INDUSTRY, PRIVATE SECTOR, NGOS, AND LOCAL MARINE RESERVE COMMUNITY GROUPS

ODFW depends on partnerships and contracts with local commercial and charter fishers, academics, private sector consultants, non-government organizations (NGOs), and local marine reserve community groups to carry out many aspects of marine reserves implementation. Our partners and contractors provide advice and disciplinary expertise, and they contribute additional staff, volunteer, and funding resources. These contributions are crucial to successful marine reserves implementation and help us expand our monitoring, research, outreach, and community engagement.

How we work with partners and contractors in monitoring, research, outreach, and community engagement:

- **COLLABORATIVE PROJECTS:** These are projects, designed in collaboration between ODFW and partners, that are led by the partner. ODFW provides seed money from the state through a contract or Inter-Governmental Agreement (IGA), and often provides some in-kind staff support. Our partner contributes additional staff, funding, volunteers, and/or equipment to the project. Projects must follow all state contracting policies and procedures to receive state funds provided by ODFW.

To help foster collaborative projects with universities, we have formalized partnerships with some academic institutions. Examples include establishment of long-term IGAs or agency staff courtesy faculty appointments. These arrangements help cultivate ongoing relationships between academic and ODFW researchers, providing continuity across numerous projects, and thus facilitating engagement with graduate students. These arrangements have also helped streamline administrative procedures allowing ODFW to provide state funds to support research, support post-graduate fellows, and the sharing of resources between the agency and universities.

- **CONTRACTED PROJECTS:** These are projects in which ODFW develops a statement of work and provides funding, and the contractor executes all work specified in the related contract. Contracts must follow all state contracting policies and procedures.
- **COMPLEMENTARY PROJECTS CONDUCTED BY PARTNERS:** These are projects developed and led by partners that complement the state's marine reserves implementation efforts. The partner typically provides all funding for the project, as well as staff, volunteers, and/or contract administration. The partner will often consult with ODFW on the project. ODFW may provide a letter of support and/or in-kind contributions to augment grant proposals connected to the project. These projects include research, monitoring, outreach, and community engagement, as well education and local economic development projects.

FELLOWS, STUDENT INTERNS, AND RESEARCH SCHOLARSHIPS

ODFW hosts fellows and interns who assist our program in carrying out monitoring, research, and outreach activities.

- **POST-GRADUATE FELLOWS:** Post-graduate fellows have provided critical support in the initial development and execution of our ecological monitoring and human dimensions research programs. Fellowships last 1-2 years and are meant as an early career development opportunity with our program providing mentorship and applied research experience. The fellows provide added analytical support to our program, as well as contribute to research design, fieldwork, technical reports, peer reviewed publications, and outreach.

Fellows are considered non-ODFW staff. We have hosted fellows through two programs: the Natural Resources Policy



Fellowship administered by Oregon Sea Grant and the joint ODFW-Marine Studies Initiative (MSI) Fellowship administered through Oregon State University (OSU).

We have hosted **5 post-graduate fellows** since our program inception.

- **UNDERGRADUATE STUDENT INTERNS:** Student interns assist our program with specific projects, typically for 10 weeks during the summer. These internships provide educational experiences in marine science, social science, and science communications for current and recent undergraduate students.

Student interns are either hired as temporary ODFW staff or are considered non-ODFW staff. We have hosted students through several internship programs: Oregon Sea Grant Summer Scholars, NSF Research Experiences for Undergraduates (REU), Marine Studies Initiative (MSI) Summer Internship, COSEE Promoting Research Investigations in the Marine Environment (PRIME) Internship, and the Doris Duke Conservation Scholarship Program.

We have hosted **19 undergraduate student interns** since our program inception.

- **RESEARCH SCHOLARSHIPS:** Our program also supports graduate student research through research scholarships. The research must be focused on marine reserves/MPAs or conducted at one or more of Oregon's marine reserve sites. Scholarship recipients are required to present their research and findings at a brown bag seminar to ODFW program staff.

We have awarded a total of **\$45,000 in scholarships**, supporting the research of **15 graduate students**.

VOLUNTEERS

We work with volunteer anglers, volunteer biological assistants, volunteer scientific SCUBA divers, and rocky intertidal survey volunteers who are critical to the execution of our ecological monitoring program. Learn more about our volunteers in [Chapter 5.4](#).

C. STAFF CAPACITY AND FUNDING RESOURCES OVER TIME

In this section we provide an overview of the state staff and funding resources that have been available for marine reserves implementation, from the 2009-11 biennium through the most recent 2019-21 biennium. We document how our program has leveraged state resources through additional grants and fellowship programs. We provide an overview of how state resources have been spent over time, including funds that have been directed to partners and contractors. We also acknowledge the contributions of our long-term partners and the additional resources they have provided to marine reserves implementation.

C.1 ODFW STAFF AND FUNDING

Levels and sources of state funding, as well as ODFW staff numbers and position types, have moderately evolved over time. The ODFW Marine Reserves Program was first established after the 2009 Legislative Assembly passed House Bill 3013 (HB 3013) and approved the 2009-11 ODFW Agency Budget, which included a policy option package requesting state funding and staff positions to support marine reserves planning and implementation. The Legislature approved an austere program, providing one-time state funding and limited duration ODFW staff positions. A policy option package was subsequently approved by the legislature for the 2011-13 biennium, providing limited duration state funding and re-approval of limited duration ODFW staff positions. Beginning in the 2013-15 biennium, the Oregon Legislature approved permanent state General Funds and permanent ODFW staff positions dedicated to marine reserves implementation as an ongoing program within the ODFW Agency Budget.

STAFFING AND CAPACITY

The austere program approved by the Oregon Legislature allocated ODFW the minimum number staff identified as necessary for carrying out implementation of the marine reserve sites and mandates. Constraints on staffing capacity over time have included staff turnover, hiring freezes, vacancies due to budget cuts, and extended staff

leave (leave > 2 months). Our program has been able to modestly enhance capacity, within the confines of state government hiring, through fellowship programs administered by our partners and the occasional hiring of temporary staff. Establishment of new permanent or limited duration positions must be approved by the Legislature through a policy option package, even if there are funds available in the existing program budget. Aside from the program staff positions that have been approved by the Legislature, our program's ability to hire additional staff is not guaranteed.

Our staff capacity has been sustained with reliance on the following:

- **ODFW PROGRAM STAFF:** Limited duration or permanent staff positions approved and allocated by the Oregon Legislature to the ODFW Marine Reserves Program. Current allocation of staff to our program includes six full-time permanent positions.
- **ODFW TEMPS AND STUDENT INTERNS:** Hiring of temporary ODFW staff positions for up to six months in a one-year period. Temporary staff may be hired to assist with one time needs or to backfill staff on extended leave, if approved by ODFW Human Resources and if program funds are available. Student interns may also be hired for up to 10 weeks as temporary ODFW staff.
- **NON-ODFW FELLOWS AND STUDENT INTERNS:** These are post-graduate fellow and undergraduate student intern positions, hosted by ODFW, but administered and/or employed by our academic partners. These positions may be funded by ODFW, funded by our partner, or jointly funded. Any ODFW program funds used to support these positions are facilitated through an IGA with the academic institution.

In Figure 3 you can see our program staff capacity over time, by biennium. 1 FTE is equivalent to one full-time staff in place for the entire 24 months of the biennium (no vacancies or leave > 2 months). For example, a full-time position that was vacant for six months during the biennium would equate to 0.75 FTE staff capacity and a temporary ODFW staff who worked full-time for six months during the biennium would equate to 0.25 FTE. In [Chapter 5](#) you can find staff capacity over time for specific program areas (e.g. ecological monitoring, human dimensions research, outreach and community engagement).



STAFF CAPACITY (FTE)

ODFW Program Staff | ODFW Temps & Student Interns | Non-ODFW Fellows & Student Interns



Figure 3. Program staff capacity over time, by biennium. 1 FTE is equivalent to one full-time staff in place for the entire 24 months of the biennium (no vacancies or leave > 2 months)

Figure 4 depicts funding of staff capacity over time, by biennium. It shows what capacity has been funded by the ODFW program budget, by our partners, or was jointly funded. You can see that partners have made a significant contribution to our staff capacity, which has been critical to our program’s work.

STAFF CAPACITY (FTE)

ODFW Funded | Jointly Funded | Partner Funded

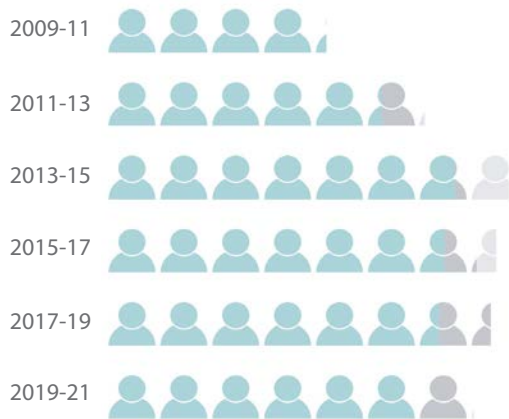


Figure 4. Funder of program staff capacity, by biennium. Jointly funded means ODFW provided some program funds to our partner to help support the position.

BUDGETS AND EXPENDITURES

The levels and sources of state funding and grants that comprise the ODFW Marine Reserves Program budget have modestly evolved over time, with the overall biennial (two-year) program budget being in the proximity of \$1.8 million over the last four biennia. We have been successful in securing some grant funds, through federal and other (non-government) grants, each biennium to supplement funds provided by the state.

Slightly more than half of our biennial program budget is allotted to staff. These staff are allocated between the four areas of our program to conduct ecological monitoring; human dimensions research; outreach and community engagement; and management, policy, and program administration. Personnel expenditures from our budget include ODFW Program staff, Temp ODFW staff, student interns, and post-graduate fellows.

A significant portion of our supplies and services expenditures each biennium are for partners and contractors to help implement marine reserves ecological monitoring, human dimensions research, outreach, and community engagement projects. Our program also provides a set amount of funding each biennium to Oregon State Police (OSP) for marine reserves enforcement, used by OSP to support staff overtime and patrol equipment. Figure 5 is an overview of our program budget and funding sources (state funds vs. grants) over time, by biennium.

ODFW BUDGET (MILLIONS)

State Funds | Grant Funds

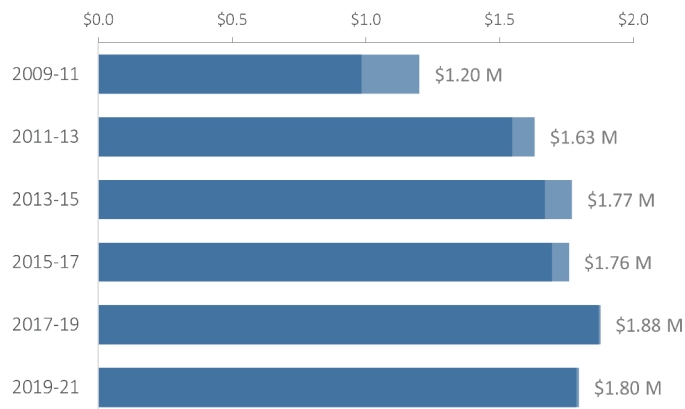


Figure 5. ODFW Marine Reserves Program budget each biennium. Budget includes State General Funds and any grant funds received and spent by the program.

Figure 6 is an overview of our program Supplies and Services expenditures each biennium. Figure 7 is the program's Personnel expenditures each biennium. Personnel expenditures are for ecological monitoring, human



dimensions research, outreach/community engagement, and policy/administrator staff (expenditures do not include Non-ODFW staff funded by partners).

SUPPLIES & SERVICES EXPENDITURES (MILLIONS)

Ecological Monitoring | Human Dimensions Research | Outreach & Engagement | Enforcement | Operations

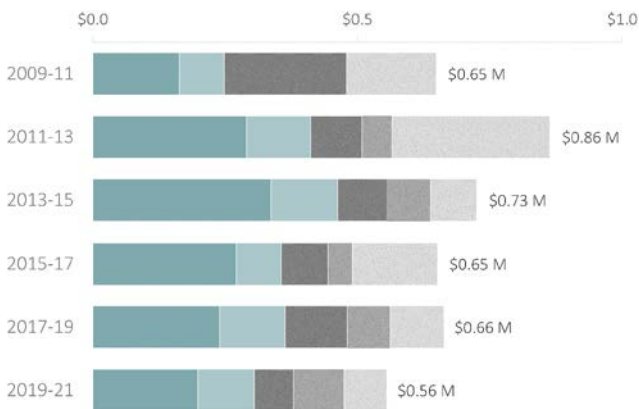


Figure 6. ODFW Marine Reserves Program Supplies and Services expenditures, by biennium.

PERSONNEL EXPENDITURES (MILLIONS)

Staff (FTE): Ecological Monitoring | Human Dimensions Research | Outreach & Engagement | Policy & Administration

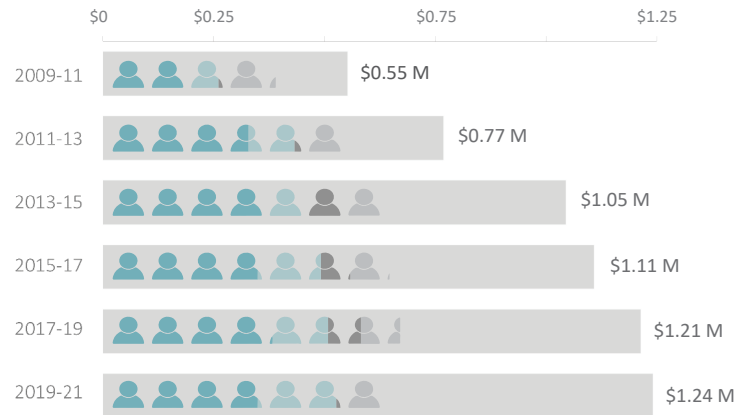


Figure 7. ODFW Marine Reserves Program Personnel expenditures, by biennium.

More detailed overviews of our program budget and expenditures each biennium are provided in [Appendix D](#).

C.2 PARTNERS PROVIDING RESOURCES CRITICAL TO MARINE RESERVES IMPLEMENTATION

We have successfully built collaborative partnerships and leveraged state resources through grants, partnerships, contracts, and intergovernmental agreements (IGAs) to support implementation of the sites and legislative mandates. Our partners have contributed critical additional expertise, personnel, funding, volunteers, and equipment to support marine reserves implementation. Oregon’s current five marine reserve sites and our program are very reliant on this additional funding and capacity. Below we highlight partners’ contributions that have been instrumental in providing additional resources to support or complement the work executed by the agency. Additional contributions of partners are reviewed in [Chapter 5](#).

ACADEMIC PARTNERS

Our partners from academia have been instrumental in providing additional staff, volunteers, and equipment as well as securing grants in support of our human dimensions research and ecological monitoring. Academic partners have also conducted complementary research projects and provided undergraduate and graduate student educational opportunities related to the reserves. Our long-term academic partners have included:

- Oregon State University
- Oregon State University- Cascades
- Portland State University
- University of California Santa Cruz
- University of Oregon
- University of Michigan
- Multi-Agency Rocky Intertidal Network (MARINe)
- Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

FISHING INDUSTRY PARTNERS

Commercial and charter fishing industry partners have brought additional expertise and equipment to support marine reserves ecological monitoring. We have partnered with local fishing vessels and captains out of six home ports: Garibaldi, Depoe Bay, Newport, Coos Bay, Port Orford, and Gold Beach. Fishers have also partnered with academic researchers and helped [fund complementary research](#) projects at some of the marine reserve sites.



NON-GOVERNMENTAL ORGANIZATIONS (NGOs)

We work with a number of NGO partners that have contributed additional staff, funding, and volunteer resources to collaborative projects. They have also conducted complementary ecological monitoring, human dimensions research, outreach, community engagement, and community science projects over the years. Our long-term partners have included:

American Cetacean Society
[Cascade Head Biosphere Collaborative](#)
[Coast Range Association](#)
[CoastWatch- Oregon Shores](#)
[Oregon Coast Aquarium](#)
[Portland Audubon](#)
[Surfrider Foundation](#)
[The Nature Conservancy](#)

LOCAL MARINE RESERVE COMMUNITY GROUPS

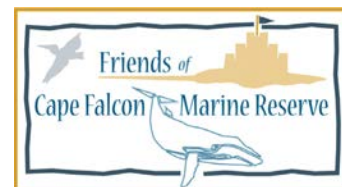
Local marine reserve community groups have formed organically over time in their respective communities in association with each of the marine reserve sites. These groups promote stewardship and serving as liaisons between their community and ODFW. They have been instrumental in developing and carrying out outreach, community engagement, community science, education, and economic development projects that complement and expand beyond the implementation efforts by the agency. Each group is structured differently to reflect and meet the needs and interests of their local community. These groups are largely comprised of volunteers. They actively apply for grants and conduct fundraising to carry out projects and, in some cases, provide staff support to the group. You can learn more about these groups, including the additional funds and capacity they have provided, in the overview of community group activities provided in [Appendix E](#). Additional information on the community groups and their contributions to marine reserves implementation is highlighted in [Chapter 5.4](#).

Our long-term partners have included:

[Cape Perpetua Collaborative](#) (CPC)
Depoe Bay Near Shore Action Team (NSAT)
[Friends of Cape Falcon Marine Reserve](#) (FCFMR)
[Redfish Rocks Community Team](#) (RRCT)

More recent partners have included:

Friends of Otter Rock
Friends of Cascade Head Marine Reserve



D. CHALLENGES, LESSONS LEARNED, AND CONSIDERATIONS FOR THE FUTURE

In this section we highlight some of our biggest challenges and lessons learned regarding funding, program structure, and capacity. We consider how some of the ongoing challenges might be addressed through administrative actions to provide greater efficiencies to the program. We also provide some recommendations on how the current austerity program might be adapted to provide for a more sustainable program and better support implementation of this long-term, nearshore conservation and monitoring program moving into the future.



STATE FUNDING AND STAFF ARE NECESSARY FOR ATTRACTING ADDITIONAL RESOURCES:

Without core state funding and staff, we lose the ability to attract partners and additional grant funds. Continuity of state funds and staff, sufficient to carry out the basic marine reserve management and monitoring functions, are the minimum necessary for attracting additional resources. This level of state support demonstrates a commitment by the state, allows us to provide seed money to partners for projects which they can then leverage, and allows us to provide sufficient match for grants sought by ODFW or our partners. We have found that in most instances granters are not interested or willing to fund staff or long-term monitoring activities. Therefore, state resources are extremely important to cover these core functions. Grants allow our program or our partners to pilot new tools, methods, or studies, and may fund shorter-term research investigations, graduate student assistance on projects, or post-graduate fellowships. A demonstration of sufficient commitment by the state has also, in many instances, been necessary to help our collaborative partners successfully secure grants.

WORKING WITH PARTNERS IS KEY TO SUCCESSFUL MARINE RESERVES IMPLEMENTATION BUT ALSO COMES WITH CHALLENGES:

The additional capacity, funding, and expertise brought by partners is essential to the success of marine reserves implementation. While the ODFW Marine Reserves Program is focused and held to implementation of the marine reserve sites and mandates, our partners often have additional obligations, mandates, and incentives beyond that of the marine reserves. For example, academic partners may be incentivized to focus on novel research methods, providing research experiences for students, or publishing their findings in a peer reviewed journal which may not always be pertinent or timely to an applied research and management program. Another example is outreach and community engagement led by NGOs or local marine reserve community groups which may be targeted at their constituencies and may not therefore reach or serve the broad range of constituents for which ODFW is obligated. We have found that building collaborative partnerships and projects requires time, frequent interactions, and consistency in personnel to build relationships and projects that meet the needs of both our program and our partner and meaningfully contribute to an applied research and management program administered by the state for Oregonians. We have also found that clearly defining roles and responsibilities, and initial establishment of firm goals for data management and deadlines for deliverables or final reports, provides a strong foundation for the success of our collaborations.

WE USE A VOLUNTEER SCIENTIFIC SCUBA DIVE TEAM:

ODFW does not have a dive program and current agency policy does not allow staff to dive. However, we recognized at the outset of our monitoring program that SCUBA surveys are an effective research method for collecting data in shallow, subtidal rocky reef environments. In addition, SCUBA surveys are an ongoing tool used in monitoring of MPAs in California and would provide complementary data collection in Oregon. For our first two years of monitoring, we were assisted by PISCO divers from UC Santa Cruz to conduct surveys at Redfish Rocks and Otter Rock. As a longer-term solution, starting in 2012, we have partnered with the Oregon Coast Aquarium and Oregon State University (OSU) who have established scientific diving programs and dedicated dive safety officers. These partners provide staff divers and help us recruit and train volunteer American Academy of Underwater Science (AAUS) certified divers to conduct our SCUBA monitoring surveys. We provide some funds, via a research contract, to the Aquarium to support their dive staff who assist with conducting the surveys and training volunteers. These partners also provide in-kind support for

our SCUBA surveys and trainings, as well as use of the Oregon Coast Aquarium vessel. Additionally, all three of our ODFW-MSI Fellows have been AAUS divers who, as non-ODFW staff, have participated as members of the dive team and provided critical support to this monitoring effort.

CONTRACTING CHALLENGES AND CONSIDERATIONS FOR THE FUTURE:

There are frequent administrative hurdles that must be overcome in contracting and providing ODFW program funds to partners achieve our marine reserves mandates. During each biennium, we administer an average of 28 contracts and IGAs. A significant portion of ODFW staff time is spent working through administrative procedures and overcoming mismatches between the State of Oregon business practices, policies, and procedures versus those of academic institutions, the fishing industry, or of NGOs. The most significant regularly occurring administrative challenges include:

- **INSURANCE REQUIREMENTS:** Some partners face hurdles when trying to meet the State of Oregon insurance requirements, predominately small businesses/fishing industry partners, in particular for Marine Protection and Indemnity coverage. This has deterred some small business owners and vessel owners from bidding on contracts. One way we have helped alleviate this obstacle is writing our vessel contracts to allow the contractor to include any additional costs they have incurred to meet the state's insurance requirements in their fees. The additional costs of insurance have typically added \$1,600-\$2,600 to the contract.
- **APPLYING FOR STATE CONTRACTS - EQUITY AND ACCESSIBILITY HURDLES:** The state bidding process and requirements are complex and have deterred some fishers who were initially interested from submitting bids/proposals. In addition, the State of Oregon has recently moved to a new contracts and procurement system in which all proposals and bids for contracts over \$10,000 must be done electronically online. The Oregon coast is comprised of small, rural communities. Many individuals in these communities face issues with access to computers or the internet, or in some instances are not computer literate. We note that this new administrative process may prevent or disincentivize some local fishing vessel owners from bidding on research vessel contracts with our program. For the future, we will be looking at ways to overcome these administrative difficulties.
- **SERVICE CONTRACTS VS GRANT AWARDS - MISMATCHES BETWEEN ODFW AND UNIVERSITY BUSINESS PRACTICES:** ODFW funds provided to public universities for research projects or student research scholarships must be provided through an IGA. Most of our projects with academic partners are in the range of a few thousand dollars to \$70,000. Payments cannot be made to the university until services or products are rendered and an invoice has been submitted to ODFW. Alternatively, most universities that we have worked with are operationally set-up to receive grant awards for research projects, with funds provided upfront once a contract/grant award is in place. Issues we encounter due to these mismatches include:
 - Significant staff time is required to establish contracts/IGAs for a project.
 - Issues may exist concerning data ownership at the end of the project. Additional staff time is required to negotiate the appropriate legal language in the contract.



- ODFW often does not receive invoices in a timely manner, or there are administrative errors on invoices with respect to when the work was performed. In instances when this has occurred during a transition between two biennia, payments had to come out of the subsequent biennium budget, and the use of the funds in the biennium for which they had been planned were then lost to our program. This situation significantly impacts the staff time devoted to research contract management.
- Delays and issues have occurred in providing program funds to the university for research scholarships for students.

Lessons learned and considerations for the future:

- Through the creation of a Nearshore Ocean Research Master Agreement between ODFW and Oregon State University (OSU), we have been able to streamline some administrative procedures. This master agreement has helped alleviate the time typically required to review and negotiate legal language of a new project IGA. However, these types of formalized partnerships and agreements take significant time to put in place. For instance, the development of the ODFW-OSU Master Agreement required over 18 months of review and negotiation before it was finalized.
- In 2023, ODFW-OSU Master Agreement must be renewed, creating an opportunity to collaboratively develop new mechanisms to address some of the ongoing issues identified above.
- We do not currently have a Master Agreement in place with any other university we work with. Depending on the number and frequency of projects conducted, this could be a consideration in the future.

ENHANCEMENTS AND HINDERANCES TO FUNDING, STAFFING, AND CAPACITY:

The three most important developments that have added capacity and made our program more sustainable are:

- **THE SHIFT FROM A LIMITED DURATION TO A PERMANENT PROGRAM:** Starting with the 2013-15 biennium, our limited duration program was approved by the Legislature as a permanent program within the agency. This shift provided multiple efficiencies as we no longer had to recruit and rehire staff every biennium. In addition, we did not need to wait for a new biennium to start before executing contracts, and contracts could now span biennia, eliminating these potential disruptions to our ecological monitoring field season. Permanent positions also helped attract a greater number of qualified applicants for vacant positions.
- **CREATION OF A JOINT ODFW-MARINE STUDIES INITIATIVE (MSI) FELLOW POSITION AT OSU:** This position has been instrumental in providing additional analytical and research design expertise and capacity to our ecological monitoring program, with additional contributions to data management, scientific report writing, and journal article publication. Fellows have also played a critical role in supporting our SCUBA monitoring surveys. Additional contributions by Fellows have included helping build collaboration with academic partners, serving as a liaison between our program and academia, and an initial scoping for developing sustainable opportunities for engaging students. This position was developed in collaboration between ODFW and OSU, and from 2014-2021 we have hosted three ODFW-MSI Fellows. Over the years, OSU has secured substantial grants and provided additional administrative and funding support for this position. We are currently exploring how this position might look in the future and how we can sustainably fund this position moving forward.
- **CONVERTING OUR SEASONAL POSITIONS INTO A FULL-TIME PERMANENT NRS1 POSITION:** Over time, the seasonal staff positions originally allocated by the Legislature to our program were insufficient to meet our ecological monitoring fieldwork and analytical needs. Our seasonal (6 months per year) positions did not allow us to fully cover the nine months of our field season, took additional staff time to hire and train each year, and the position classification limited the types and amounts of analytical and writing tasks that could be assigned and conducted by seasonal staff. We underwent an 18-month process to convert our seasonal positions into one full-time, permanent technician position at the Natural Resource Specialist 1 (NRS1) classification level. Our first staff, hired for this position in 2015, brought greater continuity and support to our ecological fieldwork. Staff hired for this position in 2019 added additional analytical and data management expertise, as well as significant contributions to our scientific report efforts.

The biggest losses or challenges to our program include:

- **CANCELLED AT-SEA FIELDWORK DUE TO POOR OCEAN CONDITIONS AT THE END OF A BIENNIUM RESULTS IN LOST USE OF FUNDS:** Our biennium ends on June 30, during the middle of our ecological monitoring field season. At-sea fieldwork planned for April-June, at the end of a biennium, may get pushed into the new biennium when poor sea states or underwater visibility force us to cancel at-sea days and delay surveys. Any State General Funds we have encumbered for vessel contracts for those at-sea days not spent by June 30 (services rendered or products in hand by June 30) revert to the General Fund. Any at-sea days that are pushed into the new biennium must now be paid out of our new biennium budget and may affect planned surveys in the new biennium. This issue has occurred at the end of several biennia, and the lost use of funds has ranged from \$20,000-\$45,000, depending on the number of days and type of survey (e.g. hook and line vs. ROV) not completed by June 30.
- **LOSS OF STATE WILDLIFE GRANTS (SWG) FUNDING OPPORTUNITY:** The majority of our ecological monitoring budget comes from state funds, but the program has been able to capitalize on federal [State Wildlife Grants](#) that have been awarded to ODFW through the US Fish and Wildlife Service. In some biennia, these funds have greatly enhanced the monitoring budget. For instance, during the 2013-15 biennium, these grant funds constituted 20% of the monitoring budget and resulted in our largest monitoring budget to date. This allowed us to conduct field work at all five reserves during that timeframe. These grant funds are not a guaranteed source of funding, and since 2018 have not been made available to our program.
- **OUTREACH AND COMMUNITY ENGAGEMENT POSITION VACANT FOR TWO YEARS DUE TO BUDGET CUT:** The COVID-19 pandemic impacted State General Funds, resulting in cuts to state agency budgets. We sustained a \$227,222 (11%) cut to our 2019-21 biennium program budget. As a result, our Outreach and Community Engagement position remained vacant in 2020 and 2021. This has created significant additional workloads on existing staff, who have had to carry out our ongoing communications, outreach, and community engagement work. This temporary cut has reinforced how important this position is for carrying out communications and outreach, providing transparency of our program, and helping keep our constituents informed and engaged. Our current 2021-23 program budget includes funds for this position, and we will be looking to fill the position in 2022.
- **STRAINS ON AND LIMITATIONS OF CURRENT STAFF CAPACITY:** The austere staffing levels approved by the Legislature did not account for staff turnover, hiring freezes, or extended staff leaves, all of which have strained our program capacity and frequently created extra workloads for staff. Current staff capacity provides little time for staff to be able to focus on data analysis, report writing and publications, or providing pertinent data and information for use in other nearshore management decision-making.

How the current austerity program might be adapted in the future to provide for a more sustainable program, provide greater continuity, and better support implementation of this long-term, nearshore conservation and monitoring program:

- **A SECOND HUMAN DIMENSIONS RESEARCH POSITION WITH A FOCUS ON ECONOMICS:** There is a significant need both in our program and in the larger Marine Resources Program at ODFW for in-house marine resource/fisheries economics expertise. With our long-time marine fisheries economist research partner and contractor, Shannon Davis of The Research Group (TRG), retiring, there is a large gap to fill for marine reserves and for marine commercial and recreational fisheries economics reporting for the State of Oregon. Academic researchers are not readily available or incentivized to be able to focus on this type of applied research or in updating the existing economic models that have been built for economic analyses of Oregon's fisheries. Other consultants have lacked the on-the-ground knowledge of Oregon's shoreside fisheries infrastructure supporting the fishing industry. The result is an inability to routinely update existing models or produce thorough and accurate economics reports on Oregon's fishing industry. ODFW has one economics staff in Salem that serves the entire agency and is therefore unable to provide these necessary economics studies. Our existing Human Dimensions Research position must be able to stay focused on the overall coordination of this research program, managing our various research contracts, and fostering our existing and new collaborations with partners, as well as carrying out some in-house social science research projects and surveys. A position that is at least equivalent to the project leader (NRS3) level would be needed to carry out this important economics work.

- **AN ADDITIONAL ECOLOGICAL MONITORING POSITION AT THE PROJECT LEADER (NRS3) LEVEL:** This additional capacity would provide the program with more time to focus on data analysis, producing scientific reports and publications, continued improvements to our data management, and enable us to make better use of the limited weather and ocean condition windows for conducting at-sea fieldwork. The position would allow greater focus on fostering existing collaborations with partners and in developing new collaborations. The increased capacity would also provide us with the time and attention necessary for working with fisheries stock assessors, marine resource managers, and decision-makers to increase our program's contributions of data and information for use in nearshore management decisions.
- **CONTINUATION OF A JOINT ODFW-MSI POSITION:** We are currently exploring if or how this position might look in the future, including whether this should remain a two-year fellowship program or be a permanent position, providing more continuity for working with academic collaborators and building out student engagement opportunities. We are also looking at ways to sustainably fund this position moving forward. Our current program budget is able to sustain \$55,000 of support each biennium (approximately 1/3) for this position. We will need additional funds to continue this joint position.
- **ABILITY TO CARRY OVER ENCUMBERED FUNDS FOR VESSEL CONTRACTS INTO THE NEXT BIENNIUM:** An administrative mechanism is needed that would allow retention of funds that are encumbered under a vessel contract, but are not used at the end of the biennium due to poor ocean conditions delaying the survey. A solution that would allow such funds to be carried over and used in the next biennium for the vessel contract would bring much greater stability to our program budget.



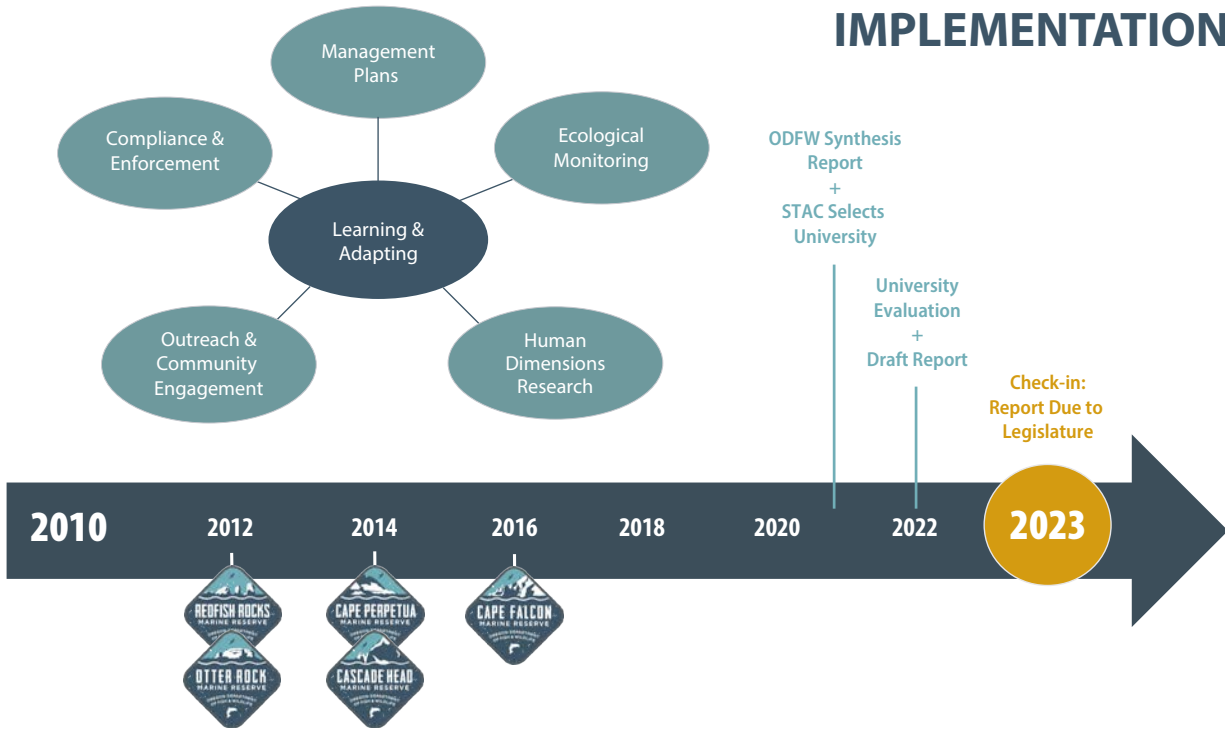


CHAPTER 5. MARINE RESERVES IMPLEMENTATION

- 5.1 MANAGEMENT PLANS & RESEARCH PERMITTING
- 5.2 ECOLOGICAL MONITORING
- 5.3 HUMAN DIMENSIONS RESEARCH
- 5.4 OUTREACH & COMMUNITY ENGAGEMENT
- 5.5 COMPLIANCE AND ENFORCEMENT

A. INTRODUCTION

This chapter is focused on the management and scientific monitoring of Oregon’s marine reserve sites, providing a comprehensive overview of how the ODFW Marine Reserves Program has carried out implementation and what has been learned since implementation began in 2010.



A.1 DIVING INTO MARINE RESERVES IMPLEMENTATION

The chapter is broken out into five sub-chapters, based on the implementation mandates and our programmatic areas of work:

1. Management plans and research permitting
2. Ecological monitoring
3. Human dimensions research
4. Outreach and community engagement
5. Compliance and enforcement

In each sub-chapter we review our approach, what has been accomplished, how, and with what resources. We highlight results and takeaways from our analyses. We also reflect on some of the challenges and lessons learned and highlight some efficiencies and adaptations that might still be brought to the different areas of our program to provide for a more sustainable program and better support implementation moving into the future.

A.2 TAKE A DEEPER DIVE IN THE APPENDICES

Links to appendices and supplemental documents are provided in each sub-chapter for anyone interested in diving deeper into any of the methods, analyses, results, or additional documentation. The appendices include the more technical and detailed plans, reports, and publications that underly the syntheses presented in this report.





5.1 MANAGEMENT PLANS & RESEARCH PERMITTING

PROGRAM RESOURCES



ODFW STAFF

Marine Reserves Program Leader (NRS4-M)



STATE AGENCY MANAGEMENT PARTNERS

Oregon Parks and Recreation Department (OPRD)

Department of State Lands (DSL)

Oregon State Police (OSP)

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- A. INTRODUCTION
 - B. MANDATES AND TAKEAWAYS
 - C. MANAGEMENT PLANS
 - D. SCIENTIFIC RESEARCH PERMITTING
 - E. ADMINISTRATIVE RULE (OAR) ADAPTATIONS: ADAPTIVE MANAGEMENT
 - F. LESSONS LEARNED AND MOVING FORWARD



Authors:

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Laurel Hillmann – OPRD, Ocean Shore and Scenic Waterways Specialist

A. INTRODUCTION

A.1 HOW TO USE THIS CHAPTER

This chapter can be used to see the mandates pertaining to management plans and how ODFW and our state agency management partners have implemented these mandates to date. You'll find how communities were engaged in the development of the site management plans, and how the plans have been used to encourage cooperative and collaborative research as well as education and economic development opportunities.

This chapter can also be used to see the policies and permitting procedures developed by the state agencies for scientific research involving scientific take or habitat disturbance. We also report on the research permits issued to date by the state agencies for research activities in the marine reserve sites.

You may also use this chapter to see the adaptations that have been made to the marine reserve Oregon Administrative Rules (OARs), based on lessons learned during initial implementation, to clarify allowances and prohibitions and to better support enforcement as part of adaptive management.



B. MANDATES AND TAKEAWAYS

Here we provide an overview of the pertinent marine reserve mandates and key takeaways with regards to management plans, allowed scientific research, and adaptive management. We also highlight the scientific research permitting policies, provided in marine reserve administrative rules (OARs), and how the state agencies have implemented those policy mandates.

Mandates	Takeaways
<p>OPAC, Implementation Principle and Guideline (1) Marine reserves as a system and each individual marine reserve will have a plan that includes clearly defined objectives, monitoring protocols, compliance and enforcement provisions, effective management measures, and a commitment of long-term funding necessary to achieve its goals.</p> <p>OPAC, Implementation Principle and Guideline (3) Cooperative and collaborative research will be encouraged as well as utilization of fishing vessels as research platforms. These activities will be compatible with the goal of conserving marine habitats and biodiversity.</p> <p>OPAC, Implementation Principle and Guideline (4) Education and economic development opportunities that are compatible with the goal of conserving marine habitats and biodiversity will be encouraged.</p> <p>OPAC, Implementation Principle and Guideline (5) Marine reserves are not intended to prevent marine transit, safe harbor, and beach access.</p> <p>OPAC, Marine Reserve Definition A marine reserve ... is protected from all extractive activities, including the removal or disturbance of living and non-living marine resources, except as necessary for monitoring or research to evaluate reserve condition, effectiveness, or impact of stressors.</p>	<p>Commitment to Funding</p> <ul style="list-style-type: none"> • The 2013 Legislative Assembly committed to providing permanent, ongoing state General Funds and staff to support marine reserves implementation. • State resources are leveraged through grants and partnerships each biennium to create a diversified funding portfolio. See Chapter 4. <p>Management Plans</p> <ul style="list-style-type: none"> • Management plans have been developed for each of the five marine reserve sites. • Site management plans include: <ul style="list-style-type: none"> – Marine reserve goals, objectives, and mandates. – Overview of ecological monitoring and human dimensions research approaches and activities for the site. – Management strategies to be carried out by ODFW that support outreach, community engagement, compliance, enforcement, monitoring, and research. – Policies and permit procedures for researchers. – Procedures for fishermen who have lost fishing gear inside a reserve/protected area. – Non-regulatory management strategies for addressing site specific management issues. – Opportunities and the local communities’ interests for outreach, education, community engagement, economic development, research, and monitoring activities and projects above and beyond what is being carried out by ODFW. – Timeframes for review of management strategies and updates to the plan.

Mandates (continued)	Takeaways (continued)
<p>Oregon Administrative Rules (OARs) – Scientific Research <i>OAR 635-012-0070 (ODFW)</i></p> <p>(3) ... person(s) may ... (b) Take fish and wildlife species if authorized by a valid scientific taking permit as required by OAR divisions 635-007 and 635-043.</p> <p><i>OAR 141-142-0020 (DSL)</i></p> <p>(1) The Department will only grant an authorization or a removal-fill permit ... if the use, or removal, fill or alteration of material is necessary to study, monitor, evaluate, enforce or protect or otherwise further the studying, monitoring, enforcement and protection of the marine reserve, marine protected area or seabird protection area.</p> <p>(2) Applicants for an authorization ... must provide evidence suitable to the Department and other reviewing agencies that their proposed use meets the requirements of OAR 141-142-0020(1) and the management plan adopted and in force for the area at the time the application is submitted.</p> <p>(6) ... no person may harvest or remove any kelp or other seaweed for any purpose ... unless expressly authorized by the Department to do so in order to study, monitor, evaluate, enforce or otherwise further the purpose of the marine reserve, marine protected area or seabird protection area.</p> <p><i>OAR 736-029-0040 (OPRD)</i></p> <p>(3) The Director may issue a written permit to a person ...(a) If the person seeks to engage in a prohibited activity for scientific research or monitoring purposes that are consistent with the purposes of the Marine Reserve or Marine Protected Area.</p>	<p>Long-term Monitoring Plans</p> <ul style="list-style-type: none"> • Ecological and human dimensions monitoring plans have been developed for the long-term monitoring of Oregon’s marine reserve system. • Monitoring plans have been reviewed and updated at least every five years (adaptive management). <p>Allowance of Transit, Safe Harbor, and Beach Access</p> <ul style="list-style-type: none"> • There are no provisions in the marine reserve OARs or management plans that prevent transit, safe harbor, or beach access. <p>Scientific Research Permitting</p> <ul style="list-style-type: none"> • Policies and procedures for scientific research permitting have been developed by ODFW and our state agency management partners to ensure any research activities conducted are compatible with marine reserve goals and compliant with marine reserve OARs. • Policies and procedures are provided in the Procedures for Researchers document and included in management plans. <p>Administrative Rule (OAR) Adaptations: Adaptive Management</p> <ul style="list-style-type: none"> • Lessons learned during initial implementation prompted several adaptations to the marine reserve OARs to clarify allowances and prohibitions and better support enforcement of the sites.



C. MANAGEMENT PLANS

In this section we describe the purpose, development process, and key elements of the site management plans developed by ODFW for the [Cape Falcon](#) (2021), [Cascade Head](#) (2017), [Cape Perpetua](#) (2020), [Otter Rock](#) (2013), and [Redfish Rocks](#) (2012) sites.

C.1 HOW TO USE THE SITE MANAGEMENT PLANS

We developed the site management plans for anyone to be able to see and understand the:

- **MARINE RESERVE MANDATES:** The state’s mandates guiding the implementation of Oregon’s marine reserve system, sites, and ODFW Marine Reserves Program.
- **MANAGEMENT PRIORITIES:** The state and local community priorities for management of the site.
- **MANAGEMENT STRATEGIES:** The management strategies that ODFW and our state agency management partners are committed to carrying out for the system and each site. The management strategies support scientific monitoring and research, outreach, community engagement, compliance, and enforcement.
- **LOCAL COMMUNITY INTERESTS:** Local community interests and opportunities for outreach, education, community engagement, economic development, research, and monitoring above and beyond what is being carried out by ODFW or our state agency management partners. These are to encourage and attract additional resources and research, and to foster community led education, outreach, economic development, and community engagement projects at each site.

C.2 DEVELOPMENT PROCESS: COMMUNITY ENGAGEMENT AND PUBLIC INPUT

Here we provide a brief overview of the public process and different methods used by ODFW to engage communities in the development of the site management plans.

REDFISH ROCKS AND OTTER ROCK (PILOT SITES)

ODFW worked on developing the first two pilot site management plans from 2010-12. These plans were developed with assistance and collaboration from two local marine reserve community groups and our state agency management partners.

- **LOCAL MARINE RESERVE COMMUNITY GROUPS:** The [Redfish Rocks Community Team](#) (RRCT) is a local group that developed out of the Port Orford Ocean Resource Team who originally nominated the Redfish Rocks site in 2008. The Depoe Bay Near Shore Action Team (NSAT) is the local group that originally



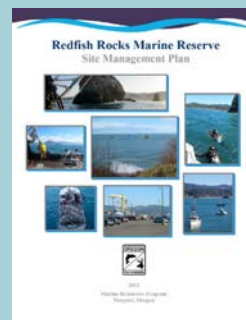
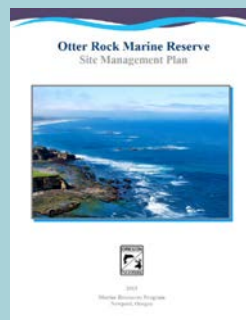
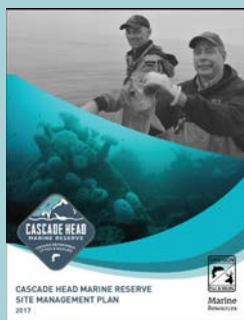
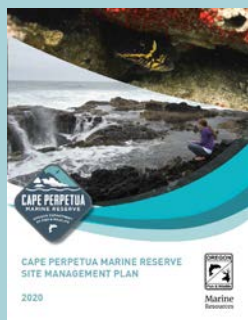
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Online Survey for Cape Falcon

Have an idea about how we can better communicate with north coast communities? Or an idea on a project you'd like to see happen a Cape Falcon? We're currently developing a site management plan for the Cape Falcon Marine Reserve and want to hear from you. [Read More](#)

Filed under: [Cape Falcon](#), [Announcements](#)

MANAGEMENT PLANS



nominated the Otter Rock site in 2008. The RRCT and NSAT assisted ODFW in developing management strategies by bringing local perspectives on community needs and opportunities surrounding implementation of the Redfish Rocks and Otter Rock sites. Their input included identifying local community priorities for monitoring and research, developing outreach strategies tailored to their local community, and identifying opportunities and projects that could engage local community members. ODFW worked with RRCT and NSAT on development of management strategies at their respective monthly team meetings and through team sub-committees. All team meetings were open to the public and provided opportunities for public comment.

- **WORKSHOPS WITH FISHERS:** The RRCT and NSAT helped ODFW host research and monitoring workshops with local fishers in their respective communities. The workshops were focused on engaging fishers, tapping into their local knowledge and expertise, to help ODFW develop an ecological monitoring approach for the marine reserve site. The workshops also helped ODFW develop strategies for soliciting local fishing vessel bids to assist with monitoring and research, and to understand administrative hurdles that fishers face with regards to state contracting.

Initial draft management plans were provided to the RRCT and NSAT for review and comment. ODFW reviewed and made edits based on comments received, before releasing draft site management plans for public comment.

CAPE PERPETUA, CASCADE HEAD, AND CAPE FALCON

The site management plans for Cascade Head, Cape Perpetua, and Cape Falcon were developed successively over time by ODFW with assistance and collaboration from local community members, state and federal agencies, and other interested stakeholders.

The public input process for each site management plan included:

- **PUBLIC WORKSHOPS:** A series of public workshops, held in communities near the marine reserve site. Workshops were designed for ODFW staff to listen and learn from local communities about:
 - Ways to improve communication about the site, including what topics or issues were of greatest interest.
 - Best ways to share monitoring and research information and results with the local community.
 - Compliance or enforcement issues.
 - Non-extractive, human induced stressors that may be affecting the site and potentially warrant future management consideration.
 - Opportunities and interests for outreach, education, community engagement, economic development, research, and monitoring projects above and beyond what is being carried out by ODFW.
- **ONLINE SURVEY:** An online survey to additionally collect input on the topics covered in workshops.

- **CONVERSATIONS WITH STAKEHOLDERS:** One-on-one and small group conversations with specific communities of interest (e.g. fishing industry, tourism industry).
- **WRITTEN COMMENT:** Written comments submitted during workshops or via email to ODFW staff.
- **CONSULTATION WITH GOVERNMENT AGENCIES:** Consultations with local State Parks, U.S. Fish and Wildlife Service, and U.S. Forest Service staff.

HOW PUBLIC INPUT WAS USED

The gathered input was used to formulate management strategies to be carried out by ODFW and our state agency management partners. Strategies were developed that support outreach, community engagement, compliance, enforcement, monitoring, and research for each site. We also used the input to identify and address non-regulatory, site-specific management issues and identify non-extractive, human induced stressors that may warrant future management consideration.

The input we received was also used to develop a chapter focused on local community interests and additional opportunities for research, outreach, education, community engagement, and economic development projects above and beyond what is being carried out by the state agencies for the site.

PUBLIC REVIEW, COMMENT, AND FINALIZATION

Draft management plans were released to the public for review and comment. The public comment period for each plan was a minimum of one month. Announcements were made via email to all workshop participants, in our monthly [Marine Reserves News](#) electronic newsletter, in ODFW press releases, and on the oregonmarinereserves.com website. The announcements were also shared by local marine reserve community groups via their communications channels. We accepted feedback on draft management plans via email or phone calls to ODFW staff.

All public comment received was reviewed and considered. Final edits and adjustments to management strategies were made based on feedback received. Finalized management plans were posted on the [website](#), announced via our electronic newsletter, and emailed to community groups and workshop participants.

C.3 CRITERIA FOR MANAGEMENT STRATEGIES

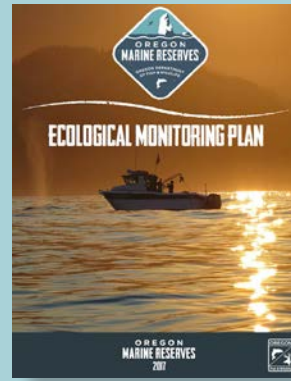
Management strategies ultimately included in the site management plans are those that meet the following three criteria:

1. Can be carried out by ODFW or our state agency management partners with the resources available.
2. Have local community and stakeholder support or interest.
3. Best meet the marine reserve mandates.



LONG-TERM MONITORING PLANS

ODFW has developed long-term [monitoring plans](#) for the Oregon marine reserve system in consultation with STAC, invited scientists, and technical experts including commercial and charter fishers. The plans describe our ecological and human dimensions research questions, sampling designs, sampling activities, and sampling frequencies through the year 2023. Monitoring plans are reviewed and updated at least every five years.



C.4 MANAGEMENT PLAN ELEMENTS

Here we highlight the key elements provided in the site management plans. Each management plan includes management strategies that are to be applied across the marine reserve system as well as site-specific strategies.

INTRODUCTION TO OREGON’S MARINE RESERVES AND THE ODFW MARINE RESERVES PROGRAM: A brief introduction to Oregon’s marine reserve system, the ODFW Marine Reserves Program, and our state agency management partners. We also outline our program’s principles, describe how the management plans can be used, and highlight where people can find more information on Oregon’s marine reserves.

GOALS, OBJECTIVES, AND MANDATES: An overview of the state’s marine reserve goals, objectives, and mandates that shape our management and where those mandates are derived, including statutes (ORS) passed by the Oregon Legislature, Oregon Administrative Rules (OARs) adopted by state management agencies, and policy guidance provided by the Ocean Policy Advisory Council (OPAC).

HOW WE IMPLEMENT THE RESERVES: An overview of how Oregon’s marine reserves are used, how we will review and adapt management strategies for the site over time, and what the Oregon Marine Reserves Program evaluation and report to the Oregon Legislature in 2023 is to entail.

SITE CHARACTERISTICS AND DESIGNATION HISTORY: An overview of the site location, rules, and characteristics. We provide a description of the local geology and marine environment. We provide general stats on the site including when harvest restrictions began, when monitoring began, size of the site, depth range, habitats, habitat connectivity, and prior fishing pressure. We highlight what makes the site unique including a relative comparison to the other reserve sites, unique ecological and conservation features, and highlight the human connections to the site. We also include a brief history of the designation process.

ECOLOGICAL MONITORING AND HUMAN DIMENSIONS RESEARCH: An overview of the ecological monitoring and human dimensions research programs developed for the marine reserve system. We describe and provide links to our [long-term monitoring plans](#), how we prioritize our monitoring and research activities, and the role of research partners. We state our dedication to learning and adapting (adaptive management) of our monitoring and research programs to produce robust long-term datasets to best answer our research questions. We commit to producing monitoring and research reports or journal publications at least every two years and making them available on our [website](#).

- **ECOLOGICAL MONITORING OVERVIEW:** An overview of the ecological monitoring approach for the marine reserve system, as well as the site-specific study design and long-term monitoring surveys being conducted by ODFW and our research partners at the site.
- **HUMAN DIMENSIONS RESEARCH OVERVIEW:** An overview of the human dimensions research approach including what is being studied, what research questions are being answered, and what types of research projects are being conducted by ODFW and our research partners.



- **PROCEDURES FOR RESEARCHERS:** A notice to researchers that scientific take of organisms or disturbance of habitats is only permitted if deemed necessary and the research contributes to the evaluation of marine reserve site condition, effectiveness, or the impact of stressors (OPAC 2008). We refer researchers to the “Procedures for Research Permitting” in the plan’s compliance and enforcement chapter. We urge researchers to review the wildlife disturbance issues, guidelines, and best practices included in the management plan. We encourage researchers to contact ODFW staff with any questions or interests in collaborations.
- **OUTREACH AND ENGAGEMENT STRATEGIES FOR MONITORING AND RESEARCH:** An outline of the strategies ODFW is committed to carrying out for engaging communities and sharing information about marine reserves monitoring and research work.
 - **KEEPING TABS ON MONITORING AND RESEARCH:** An outline of the strategies being used by ODFW to keep constituents, partners, and decision makers regularly informed about the ecological and human dimensions science being performed, what we are learning along the way, and how that information is being used to support management.
 - **USING LOCAL FISHING VESSELS FOR RESEARCH:** A statement of ODFW’s commitment to using local fishing vessels as research platforms when and where feasible. We outline the vessel contract process, ways in which fishers can be notified of contract opportunities, and where to get proposal/bid applications.
 - **COMMUNITY SCIENTIST OPPORTUNITIES:** A note of the community science opportunities provided by ODFW for the site. We also note that additional opportunities are hosted by other researchers and organizations, including local marine reserve community groups. We direct readers to view the chapter on “Opportunities Beyond the Agency” to find a list of current projects. We also provide links to local marine reserve community groups’ websites to find additional upcoming opportunities.

MARINE RESERVE COMMUNICATIONS AND OUTREACH STRATEGIES: An overview of the marine reserve communications and outreach objectives, target audiences, and focus. We outline the strategies ODFW is committed to carrying out for the marine reserve system and the site, including communications products and outreach events. We identify local communications pathways and information hubs to best reach local community members.

COMPLIANCE AND ENFORCEMENT STRATEGIES AND MANAGEMENT PROCEDURES: An outline of the management strategies being implemented by ODFW, OSP, OPRD, DSL and the U.S. Coast Guard that support compliance and enforcement of the marine reserve system and site.

- **STRATEGIES:** An outline of enforcement patrol methods, a commitment by the agencies to meet and review compliance and enforcement two times per year, as well as outreach and education strategies for providing compliance assistance to commercial fishers, sport fishers, and the public with regards to marine reserve site prohibitions and allowances.

- **PROCEDURES FOR FISHERS TO REMOVE LOST FISHING GEAR:** An outline of the procedures to be followed to stay in compliance with marine reserve administrative rules (OARs) for removing lost fishing gear.
- **PROCEDURES FOR RESEARCH PERMITTING:** An overview of the marine reserve policy mandates with regards to allowed scientific research, take, and habitat disturbance including what types of research require a permit. We outline procedures for researchers to follow to determine if a permit is needed and how to apply for permits.

SITE SPECIFIC MANAGEMENT ISSUES - NON-REGULATORY MANAGEMENT STRATEGIES: A recognition of non-extractive activities that may negatively impact marine reserve goals. We identify wildlife disturbance issues specific to the site and provide non-regulatory management strategies to address those issues. In addition, we outline non-extractive human induced stressors specific to the site identified during management plan workshops, surveys, and public comment that may warrant future management consideration.

OPPORTUNITIES BEYOND THE AGENCY - REPRESENTING LOCAL COMMUNITY INTERESTS: Local community interests in additional research, monitoring, outreach, education, community engagement, and economic development projects above and beyond what is being carried out by ODFW and state agency management partners at the site. These were identified by local community members and other interested stakeholders in management plan workshops, surveys, and public comment. By highlighting the community interests in the management plans we hope to attract additional research and resources, and to foster community led projects at each site.

D. SCIENTIFIC RESEARCH PERMITTING

Oregon’s marine reserve mandates provide that scientific take of organisms or disturbance of habitats is only allowed and permitted if deemed necessary and the research contributes to the evaluation of marine reserve site condition, effectiveness, or the impact of stressors (OPAC 2008, OAR 141-142, 635-012, and 736-029). These policies are implemented through existing permitting programs established by ODFW, DSL, and OPRD.

Here we report on the procedures, developed for researchers looking to conduct research activities in a marine reserve site, by ODFW and our state agency management partners. We also provide a report on the permits that have been issued to date by the state agencies.

D.1 POLICIES AND PROCEDURES FOR RESEARCHERS

ODFW worked with DSL and OPRD to create a [Procedures for Researchers](#) document that guides researchers who may be interested in conducting research in a marine reserve site. The document provides researchers with the following information:

- **RESEARCH POLICIES:** The marine reserve policy mandates related to scientific research, take, and habitat disturbance.
- **WHAT ACTIVITIES REQUIRE A PERMIT:** What types of activities require a permit or state authorization for conducting research and how to apply for the respective permit from either ODFW, DSL, or OPRD. Some research projects may require a permit from more than one agency, depending on the types of proposed activities.
- **REQUIRED INFORMATION IN PERMIT APPLICATIONS:** What additional information is required to be provided in their permit application to help agency staff in their review of proposed activities to determine whether the research meets marine reserve research policies. This includes providing information on:
 - How the project will contribute to the monitoring or scientific study of the marine reserve site(s).
 - Rationale for why the take or habitat disturbance activity is necessary for monitoring or scientific study to evaluate reserve condition, effectiveness, or impact of stressors. Or, why the study cannot be performed at another location (e.g. something unique about this particular location).
 - Why alternative no-take or no habitat disturbance methods are not practicable.
 - Measures that will be taken to minimize impacts to species and habitats located within the site(s).

- **REQUIRED NOTIFICATION OF RESEARCH ACTIVITY BY PERMIT HOLDERS:** For research that is approved and issued a permit or state authorization, we outline the notification of research procedure. The permit holder must send an email notification to the listed ODFW/DSL/OPRD and OSP staff at least 24 hours prior to conducting research within a marine reserve site. We also outline what information should be included by the permit holder in their email notification.

Research that does not involve take, habitat disturbance, or an otherwise prohibited activity does not require a permit or state authorization, but researchers are encouraged to contact ODFW Marine Reserves Program staff for any questions or interest in exploring possible collaborations. Researchers are also urged to review the guidelines and best practices, outlined in the document, that are established by the U.S. Fish and Wildlife Service to avoid or minimize human disturbance to wildlife using offshore islands and rocks in reserve sites that are a part of the Oregon Islands National Wildlife Refuge.

D.2 OVERVIEW OF PERMITS ISSUED BY STATE AGENCIES

ODFW and OPRD research permits are issued on an annual basis. Researchers who conduct long-term monitoring projects, or research projects that include sampling in more than one year, must apply for a permit each year. DSL permits and state authorizations are either issued annually or as a longer-term agreement, depending on the type of research activity. Permit applications received by OPRD and DSL are frequently reviewed with consultation from ODFW before a permit decision is decided. Some research projects require permits from more than one agency. In addition, some permits cover research in more than one marine reserve site.

Long-term monitoring or research projects led by ODFW staff that include take of any fish or invertebrates (e.g. marine reserves hook-and-line surveys) do not require an ODFW scientific take permit but have been reviewed to ensure they meet marine reserves research policies and that the take and any mortality is minimal.

TYPES OF RESEARCH PROJECTS AND PERMITS ISSUED

There are generally three categories of projects for which research permits have been issued by the state management agencies: 1) marine reserve monitoring projects led by our collaborative partners, considered part of our long-term ecological monitoring program (e.g. SMURF juvenile fish surveys), 2) research projects, and 3) other surveys. The third category includes large state-wide or west coast-wide monitoring surveys, such as acoustic population surveys of coastal pelagic species, or long-standing monitoring projects independent of our monitoring program and for which ODFW does not provide any monetary or staff support.

ODFW: “Take” as defined in OAR 635-012 means to “fish for, hunt, pursue, catch, capture or kill or attempt to fish for, hunt, pursue, catch, capture or kill.” Take includes the use of all fishing gear and methods that affect an animal’s behavior or movement. Between 2016-2020, ODFW has issued an average of 5.4 scientific take permits each year for projects that involve take activities within one or more marine reserve site. Of the 27 total annual permits issued between 2016-2020, 26% (7) have been for monitoring projects, 56% (15) have been for research projects, and 19% (5) have been for other surveys. Of the 27 permits, 41% (11) of them are an issued renewal of a previous permit. A little over half of the permits, 52% (14), have been for projects conducted in the intertidal, while 48% (13) have been for subtidal projects. More permits have been issued for projects focused on invertebrate species and communities, 59% (16), compared to 41% (11) focused on fish species and communities. Of the 27 permits, only 78% (21) included some level and type of intentional lethal take or permanent removal of organisms.

The majority of permits were for research activities conducted at the Redfish Rocks, Cape Perpetua, and/ or Otter Rock sites. Forty-four percent (44%) of the permits issued involved research activities at the Redfish Rocks site, 56% at Cape Perpetua, and 52% at Otter Rock. Only 15% of the permits have involved research activities at the Cascade Head site and 11% at the Cape Falcon site.

The scientific researchers who have been issued a scientific take permit to date have been from six (6) institutions: Oregon State University, University of Oregon, UC Davis, UC Santa Cruz, California State University Northridge, and NOAA Fisheries.



OPRD: Since 2016, OPRD has issued an average of three scientific research and education permits annually for ocean shore projects in marine reserve sites. Each year, multiple permit applications were re-directed from marine reserve sites to other sections of the ocean shore in accordance with the management plans to reduce unnecessary disturbance. Research requests that did not need to occur in the reserve site that involved either plant/animal collection or habitat disturbance and did not benefit the reserves were diverted to other areas of the ocean shore. Of the 18 total permits that were issued within reserve sites between 2016-2021, 28% (5) have been for monitoring projects, 50% (9) have been for research projects, and 22% (4) have been for “other”, which includes primarily education-related projects. All the projects were for activities in the rocky intertidal. The projects range from research of the rocky shore communities (e.g., invertebrates, algae), to coastal erosion research and monitoring, to installation of equipment for nearshore oceanographic research and monitoring.

The majority of permits issued involved research at Cape Perpetua and Otter Rock. Forty percent (40%) of the permits involved research at Cape Perpetua and 23% involved work at Otter Rock. Fourteen percent (14%) of permits involved research at both Redfish Rocks and Cascade Head and only 7% occurred at Cape Falcon.

Researchers obtaining these permits were from a variety of research institutions including: Oregon State University, University of Oregon, UC Irvine, DOGAMI, Western Oregon University, UC Santa Cruz, California State University Northridge, and Central Oregon Community College.

DSL: Since 2016, DSL has issued a small number of permits and state authorizations for monitoring and research projects in marine reserve sites. This includes a long-term authorization issued to ODFW for marine reserve monitoring and pilot projects that require equipment being bolted into rock habitat or moorings deployed in soft bottom habitats. In addition, several similar authorizations have been issued to research collaborators at OSU for equipment related to oceanographic monitoring, juvenile fish (SMURF) surveys, and fish and crab movement studies. A recent permit was issued in 2021, for a new SCUBA survey project by Reef Check, that will include some bolts being mounted into rock habitat for marking permanent transects.

E. ADMINISTRATIVE RULE (OAR) ADAPTATIONS: ADAPTIVE MANAGEMENT

Marine reserve and MPA site boundaries, and the prohibited and allowed activities, are set in state agency administrative rules (OARs) by ODFW, OPRD, and DSL. Lessons learned during the initial implementation of the marine reserve [OARs](#) prompted several adaptations to clarify allowances and prohibitions and to better support enforcement of the sites. Here we provide an overview of the adaptations that have been made to date to the OARs.

E.1 DELAYED START TO HARVEST RESTRICTIONS TO PROVIDE FOR BASELINE DATA COLLECTION

The start date of harvest restrictions was delayed to provide for two years of baseline data collection at each site be-

fore fishing prohibitions began, to be consistent with ODFW’s long-term marine reserve monitoring plans as mandated in Senate Bill 1510 (2012).

The harvest restriction start date, set in OARs passed in [2009](#) for the Redfish Rocks and Otter Rock pilot sites, was postponed from the original start date of June 30, 2011 to January 1, 2012. The postponement was adopted by the Oregon Fish and Wildlife Commission (OFWC) in 2011 by temporary rule. OARs adopted in [2012](#) provided for staggered harvest restriction start dates at the Cape Perpetua, Cascade Head, and Cape Falcon sites. This was to give ODFW the time necessary for collecting two years of baseline data at each site with the staff and funding resources available. The Cape Perpetua and Cascade Head restrictions began in 2014 and Cape Falcon in 2016.

E.2 CLARIFICATION OF PROHIBITED ACTIVITIES: USE OF LIGHT BOATS IN THE SQUID FISHERY

Take of squid is prohibited in marine reserves and take of squid or use of common squid fishing gears, such as purse seine, is prohibited in most of the MPAs at each site. The market squid fishery is unique among Oregon fisheries in its use of independent light boats. The light boats do not typically catch or land squid themselves, but use powerful lights to attract squid for capture by purse seine vessels.

Since 2016, there has been a large uptick in directed effort and harvest of market squid off Oregon. During the 2020 market squid fishery, ODFW and OSP received inquiries about the legality of using light boats within the Cascade Head South MPA, which prohibits the use of net gear. The light boats were being used to draw squid outside the MPA boundaries to then be taken by purse seine nets. ODFW fisheries management and marine reserves staff evaluated the issue and believed the activity violated the intent of the Cascade Head South MPA prohibition on take by net gear. ODFW staff went before the OFWC to recommend that current regulations be modified to make prohibitions more explicitly clear. In [March 2021](#) (Exhibit F), the OFWC adopted the following OAR changes:

- Light boats (or any other device) is prohibited from being used inside the Cascade Head South MPA to attract or lure squid or other animals outside of the MPA to be caught by net gear.
- Based on recommendation by OSP, the definition of “take” is updated to confirm that it includes attracting any species of squid by light.

E.3 MARINE RESERVES FIXED FISHING GEAR DEFINITION CLARIFICATION

Marine reserve OAR 635-12-0050(3)(c) states that “fishing gear shall not be deployed in the water at any time within the marine reserve.” In 2020, during a biannual marine reserves compliance and enforcement meeting, OSP brought forth the growing issue of commercial fixed fishing gear, predominately Dungeness crab pots, being set on the boundary edge of marine reserves frequently resulting in surface buoys drifting into the marine reserve. This was making it difficult for OSP to determine if gear was inside the reserve, requiring OSP to pull the gear to try and determine location.

OSP worked with ODFW marine reserves and fisheries management staff to evaluate the issue and determined the best means of addressing the issue, and supporting OSP’s enforcement of the marine reserve sites, was by a rule clarification. In [October 2021](#) (Exhibit C), the OFWC adopted the following OAR changes:

- The definition of “fishing gear” was modified to include surface buoys of bottom contact gear, thereby prohibiting surface fishing gear in marine reserves.

F. LESSONS LEARNED AND MOVING FORWARD

Lessons learned during the development of the site management plans and our plans moving forward include:

- **MANAGEMENT PLAN DEVELOPMENT TIME SIGNIFICANTLY GREATER THAN PLANNED:** The ODFW [Marine Reserves Work Plan](#) (2013) intended the management plan for each site to be completed in the year that harvest restrictions began. During initial marine reserves implementation, we learned this was an unrealistic timeframe given staff capacity. At a minimum, the amount of time needed to design and execute a public

engagement process that adequately provides a variety of ways in which constituents can engage and provide input, to coordinate with state and federal management agencies, and to write each plan is one year. However, unanticipated interruptions to an austere program – including staff vacancies, hiring freezes, and extended staff leaves – frequently created additional workloads placed on staff, extending the amount of time needed to execute each plan.

- **MARINE RESERVE COMMUNITY GROUPS CATALYZE LOCAL ENGAGEMENT:** Working with local marine reserve community groups in the design and execution of the management plan public engagement process was of great assistance and benefit. These groups were able to develop local strategies for soliciting participation and were successful in amplifying announcements made by ODFW. This strategy will be used again during future reviews and updates to the site management plans. Marine reserve community groups have also played a significant role in helping carry out some of the strategies outlined in the management plans (see Chapter 5.4).
- **REVIEW AND UPDATE OF MANAGEMENT PLANS EVERY 10 YEARS:** As stated in the two initial pilot site management plans, our original intent was to conduct reviews and updates to the management plans every five years. We have now adjusted that timeframe to every 10 years. Reviews and updates to the Redfish Rocks and Otter Rock management plans will begin after the report to the Oregon Legislature in 2023. Management plan reviews and updates will include input and assistance from local communities and other interested stakeholders.



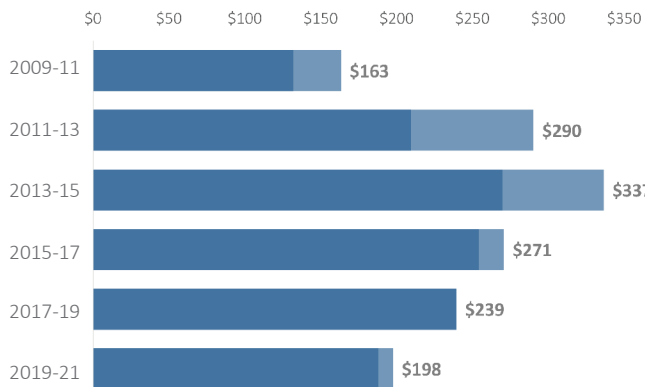
5.2 ECOLOGICAL MONITORING

PROGRAM RESOURCES



SUPPLIES & SERVICES BUDGET (THOUSANDS)

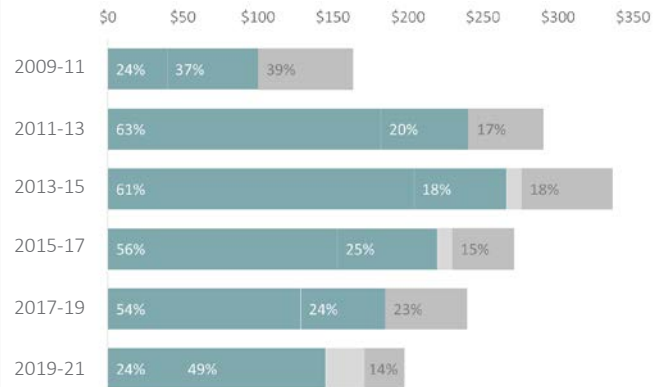
State Funds | Grant Funds



NOTE: Budget does not include staff

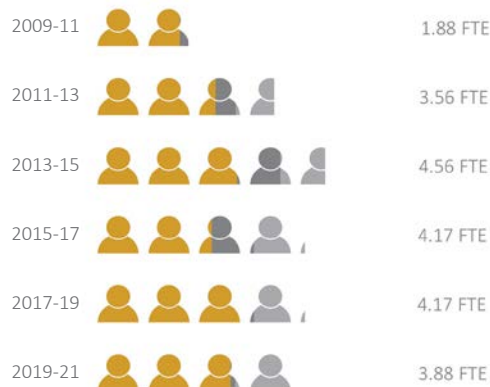
EXPENDITURES (THOUSANDS)

Fishing Vessel Contracts | Research Contracts | Student Research Scholarships | Equipment, Supplies, Other Services



STAFF CAPACITY (FTE)

ODFW Program Staff | ODFW Temps & Student Interns | Non-ODFW Fellows & Student Interns



FISHING VESSEL CONTRACTS (2010 - 2020)



47
Vessel Contracts
\$750 k

Home Port		No. of Contracts
Garibaldi	\$ 80,870	6
Depoe Bay	\$ 119,702	7
Newport	\$ 238,637	11
Coos Bay	\$ 15,000	1
Port Orford	\$ 227,793	17
Gold Beach	\$ 68,144	5
TOTAL	\$ 750,146	47



PARTNERS

- Oregon Coast Aquarium
- Oregon Fishing Industry
- Oregon State University (OSU)
- University of California Santa Cruz (UCSC)
- ODFW Marine Habitat Project
- ODFW Shellfish Program
- Multi-Agency Rocky Intertidal Network (MARINe)
- Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)

A.	INTRODUCTION
B.	MANDATES AND TAKEAWAYS
C.	HOW WE GOT HERE: METHODS OVERVIEW
D.	RESULTS AND CONCLUSIONS
E.	CONTRIBUTIONS, LESSONS LEARNED, CHALLENGES
F.	MOVING FORWARD

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A. INTRODUCTION

Oregon’s marine reserves are living laboratories where we track nearshore ocean changes, learn more about Oregon’s nearshore ocean environment, and about the effects that protections — no fishing and no ocean development — have over time on species and habitats. This is the first ecosystem-focused, nearshore monitoring program designed to track and understand ocean changes in Oregon’s state waters. We conduct robust, long-term monitoring and novel research that supports management of the reserves and nearshore resources. In this chapter we report on the long-term Ecological Monitoring Program developed by ODFW for Oregon’s marine reserve system and what we have learned to date.

A.1 HOW TO USE THIS CHAPTER

This chapter can be used to explore the data collection methods and results from the first 10 years of monitoring. You’ll find out about our core monitoring tools and long-term collaborative partnerships. We highlight results and takeaways from our analyses. We also report on the main challenges and lessons learned during the start-up and initial implementation of this long-term monitoring program.

Additionally, this chapter can be used to see the contributions made by the program to support nearshore management decisions, understand emerging ocean issues, and advance marine science and MPA research both here in Oregon and beyond. We conclude this chapter by discussing our plans for moving forward with long-term monitoring at the marine reserve sites. Appendices are provided for anyone interested in diving deeper into the methods, analyses, or results. They include the more technical and detailed plans, reports, and publications that underly the synthesis presented in this chapter.

A.2 DETECTING ECOLOGICAL CHANGES

- **OUR MONITORING IS SET UP TO DETECT AND TRACK NEARSHORE OCEAN CHANGES:** Our monitoring program has been set up to detect and track nearshore ocean changes occurring in Oregon’s state waters over time. These include changes attributable to marine reserve protections, changing ocean conditions, or other external stressors such as impacts and recoveries from major marine disease outbreaks. In this first 10 years, our monitoring program successfully detected nearshore ocean changes occurring off Oregon.




- **TOO SOON TO ATTRIBUTE CHANGES TO MARINE RESERVE PROTECTIONS:** Monitoring at Oregon’s first two reserves started in 2010, and protections (i.e. cessation of fishing, no ocean development) have been in place less than 10 years at all the reserve sites. While we have detected nearshore [changes](#) that occurred during this time period it is too soon to know what these changes mean long-term or to attribute them to marine reserve protections. With Oregon’s temperate marine ecosystem where many species are long-lived, slow to grow and reach sexual maturity, scientists project a minimum of 10-15 years, and for some species as long as 40 years, after extractive activities (i.e. fishing) have ceased before we might begin to scientifically detect and attribute any ecological changes to protections (CDFW 2018, Kaplan et al. 2019, Starr et al. 2015).
- **WHAT WE HAVE FROM THE FIRST 10 YEARS OF MONITORING:** This first 10 years has provided sufficient time for the establishment and evaluation of:
 - A long-term monitoring program, including the methods appropriate for use in Oregon nearshore conditions.
 - Robust datasets from which we can continue to track and understand current and future nearshore ocean changes.
 - Information that furthers our knowledge about the design and placement of marine reserves in Oregon.
 - Contributions of data and information that have been used to support nearshore ocean management and policy decisions and understanding of emerging ocean issues here in Oregon and beyond.

B. MANDATES AND TAKEAWAYS

Here we provide an overview of the pertinent marine reserve [mandates](#) (OPAC 2008) and key takeaways with regards to ecological monitoring of the marine reserves. We also highlight how the research conducted by ODFW is in alignment with stated goals and objectives of the Marine Reserves Program.

Mandates	Takeaways
<p>OPAC, Objective 1 (O1) Protect areas within Oregon’s Territorial Sea that are important to the natural diversity and abundance of marine organisms, including areas of high biodiversity and special natural features.</p>	<p>Ecological monitoring results show marine reserves are protecting a range of different fish and invertebrate communities.</p>
<p>OPAC, Objective 2 (O2) Protect key types of marine habitat in multiple locations along the coast to enhance resilience of nearshore ecosystems to natural and human-caused effects.</p>	<p>We are tracking changes through time at 14 different nearshore sites along the Oregon coast and have documented change in key species and ecological communities. Our biological datasets can be used to explore examples of ecosystem change such as changes attributable to marine reserve protections, changing ocean conditions, or other external stressors such as major marine disease outbreaks.</p>
<p>OPAC, Objective 4 (O4) Use the marine reserves as reference areas for conducting ongoing research and monitoring of reserve condition, effectiveness, and the effects of natural and human-induced stressors. Use the research and monitoring information in support of nearshore resource management and adaptive management of marine reserves.</p>	<p>Our ecological monitoring program has generated new knowledge in support of nearshore ocean resource management in four key areas:</p> <ul style="list-style-type: none"> • Nearshore Groundfish Stock Assessments • Listing of the Sunflower Sea Star (<i>Pycnopodia helianthoides</i>) on the IUCN Red List of Endangered and Threatened Species • Oregon Nearshore Strategy Species • Ocean Acidification and Hypoxia (OAH). <p>Additionally, the marine reserves have generated research opportunities and new knowledge to address emerging nearshore ocean issues including:</p> <ul style="list-style-type: none"> • sea star wasting disease • microplastics • marine noise pollution • ecosystem impacts of multiple stressors. <p>We adapted our ecological monitoring at each marine reserve based on lessons learned, and shared methods development helping advance nearshore and MPA research.</p>



Mandates	Takeaways
<p>OPAC, Implementation Principle & Guideline 7 (IPG7) Adequate baseline data will be collected at each site prior to excluding extractive activities. The types and adequacy of baseline data, and the timing and methods of data collection will be driven by the research and monitoring objectives and sampling designs employed at each site.</p> 	<p>Some of the marine reserve sites had a decade or more of long-term monitoring data collected at the site before being designated as a reserve.</p> <p>Our program began data collection at each reserve site two years prior to harvest restrictions taking effect, consistent with the research design laid out in our Ecological Monitoring Plan (ODFW 2012).</p> <p>These initial monitoring efforts provided important information about the species, communities, and relative abundances vital to assessing the condition of the marine reserves and comparison areas prior to closure (ODFW 2014, ODFW 2015a).</p> <p>As monitoring continued, we gained a valuable understanding of the natural variation in these communities, observed rare species, and added and adjusted monitoring tools and comparison area sites to optimize our program.</p>

C. HOW WE GOT HERE: METHODS OVERVIEW

Our program has developed a long-term [Ecological Monitoring Plan](#) (ODFW 2017) for the monitoring of Oregon’s marine reserve system. The plan describes the research questions, sampling designs, and sampling activities and frequencies at each site. Due to the unique site characteristics at each reserve, we tailored our study design and monitoring tools at each site in order to sample the communities present and to track and understand nearshore ocean changes over time.

The monitoring plan was developed in [2012](#) in consultation with the Scientific and Technical Advisory Committee (STAC), other invited scientists, and technical experts including commercial and charter fishers. Updates to the plan were made in [2015b](#) and [2017](#), in consultation with scientific experts.

C.1 WHAT HAVE WE FOCUSED ON?

ODFW began ecological monitoring at Oregon’s first two marine reserve sites in 2010. The first 10 years of the program focused on the initial start-up and execution of this nascent, long-term monitoring program. Our efforts included:

- **METHODOLOGY DEVELOPMENT AND REFINEMENT:** Building upon advances in sampling technology and gear to design robust and contemporary survey tools that effectively sample in Oregon’s challenging nearshore ocean environment.
- **LONG-TERM MONITORING OF MARINE COMMUNITIES:** Conducting long-term monitoring of fish, invertebrate, and macroalgal (seaweed) communities. We track changes over time in organism size, organism abundance, and community composition inside and outside of the reserves.
- **NEARSHORE RESEARCH:** Supporting research that expands our understanding of Oregon’s nearshore ocean that can be used to inform management of marine resources. This approach ensures we establish robust long-term datasets for detecting ecological changes over time, use the best available methods, uncover new discoveries and better understand Oregon’s nearshore ocean.

Method development and adaptation has guided us to develop the rigorous long-term monitoring program in use today. This process involved refining [sampling methods](#) and tools, evaluating alternative study designs, increasing data collec-

tion over space and time, and working with partners to expand monitoring efforts.

C.2 TRACKING CHANGES OVER TIME

Our monitoring program has been set up to detect and track nearshore ocean changes occurring in Oregon’s state waters over time. These include changes attributable to marine reserve protections (i.e. cessation of fishing and no ocean development), larger ocean changes or other external stressors such as impacts and recoveries from major marine disease outbreaks. The removal of fishing pressure in the marine reserve and protection from ocean development are the impacts we are looking to understand with our monitoring, and these impacts take a minimum of 10-15 years to accrue and may take as long as 40 years (CDFW 2018, Kaplan et al. 2019, Starr et al. 2015). Currently, our monitoring has successfully detected variability in the nearshore ocean environment attributable to larger ocean changes, external stressors, or known differences in site characteristics.



We used a Before-After-Control-Impact (BACI) study design approach to guide our monitoring of Oregon’s marine reserve system. Our goal is to evaluate how marine organisms respond to marine reserve protections (cessation of fishing and no ocean development) by comparing monitoring trends in the marine reserve to trends in comparison areas that are still open to fishing and ocean development. To the extent possible, [we chose comparison areas](#) that were in close proximity with [similar characteristics](#) to those of the reserve. At some sites we have more than one comparison area per reserve to strengthen our study design. Monitoring occurs both inside the reserve and outside in the comparison areas using identical sampling methods through time. This allows us to compare ecological changes inside the reserve to those occurring in areas still open to fishing and ocean development. There are no monitoring efforts in marine protected areas because of the program’s austerity budget. We are currently [monitoring at 14 sites](#): at the five reserves and in nine comparison areas.

Although the BACI concept has guided our monitoring approach, we have had to make several reserve specific modifications because of the unique characteristics of each site ([ODFW 2015c](#)). For example, Cape Falcon Marine Reserve had historically low fishing pressure, so we use multiple comparison areas to represent different gradients of fishing pressure. At the Cape Perpetua Marine Reserve there is no appropriate comparison area nearby because of the unique oceanography, depths and habitat at this site. We monitor at another nearby reef despite known differences to evaluate if changes we see at the reserve are part of regional changes. At this site it is inappropriate to use the comparison area as a site to evaluate the effectiveness of marine reserve protections.

Sampling started two years prior to implementation (i.e. harvest restrictions) at each reserve, both inside the reserve and outside in the comparison area sites, to quantify the initial conditions of these areas; this period of monitoring was referred to in the [OPAC Policy Mandates](#) as the ‘baseline’ period (Redfish Rocks, Otter Rock, Cape Perpetua, Cascade Head, Cape Falcon). These monitoring efforts provided a snapshot of the differences and similarities between the marine reserve and its associated comparison area(s), while we learned how to reliably survey unexplored areas of Oregon’s nearshore. We have continued to track how these differences and similarities changed over time to better understand the natural variability to the nearshore ocean ecosystem. Our timeseries will allow us to track and understand nearshore ocean changes attributable to marine reserve protections, natural or human stressors, or known differences in site characteristics as we continue monitoring into the future.

C.3 ODFW’S FOUR CORE MONITORING TOOLS

The ODFW Marine Reserves Program is focused on four core sampling tools for collecting long-term monitoring data. These include: (1) fishery-independent hook-and-line surveys, (2) SCUBA surveys, (3) Remotely Operated Vehicle (ROV) surveys, and (4) video lander surveys (Figure 1). At Redfish Rocks, our hook-and-line surveys use two types of fishing gear: rod and reel gear as used at the other sites and a supplemental bottom longline fishing gear ([Huntington and Watson 2017](#)). These four tools build upon the existing capacity and expertise at ODFW to survey fish, invertebrate, and macroalgal communities and habitats within Oregon’s nearshore environment and are commonly used in other [U.S. west coast MPA monitoring programs](#). Our sampling is predominately focused in areas of rocky and transitional subtidal habitats. These habitats were prioritized because the species that are most likely to be afforded direct protec-

tion in the current reserve sites, and species that are most likely to show an ecological response over time, are affiliated with rocky habitats ([STAC 2008](#), [ODFW 2008](#)).

More detailed [methods documents](#) are available, summarizing each core monitoring survey method and documenting the evolution of sampling over time. The methods documents are living documents that supplement our [Ecological Monitoring Plan](#) by providing more in-depth information on study design, sampling activities, and databases as well as explore which, and how, confounding factors could affect datasets.

Because each marine reserve has unique habitat and depth characteristics, we do not use every monitoring tool at each site. For a list of which monitoring tools we use at each site see [here](#).

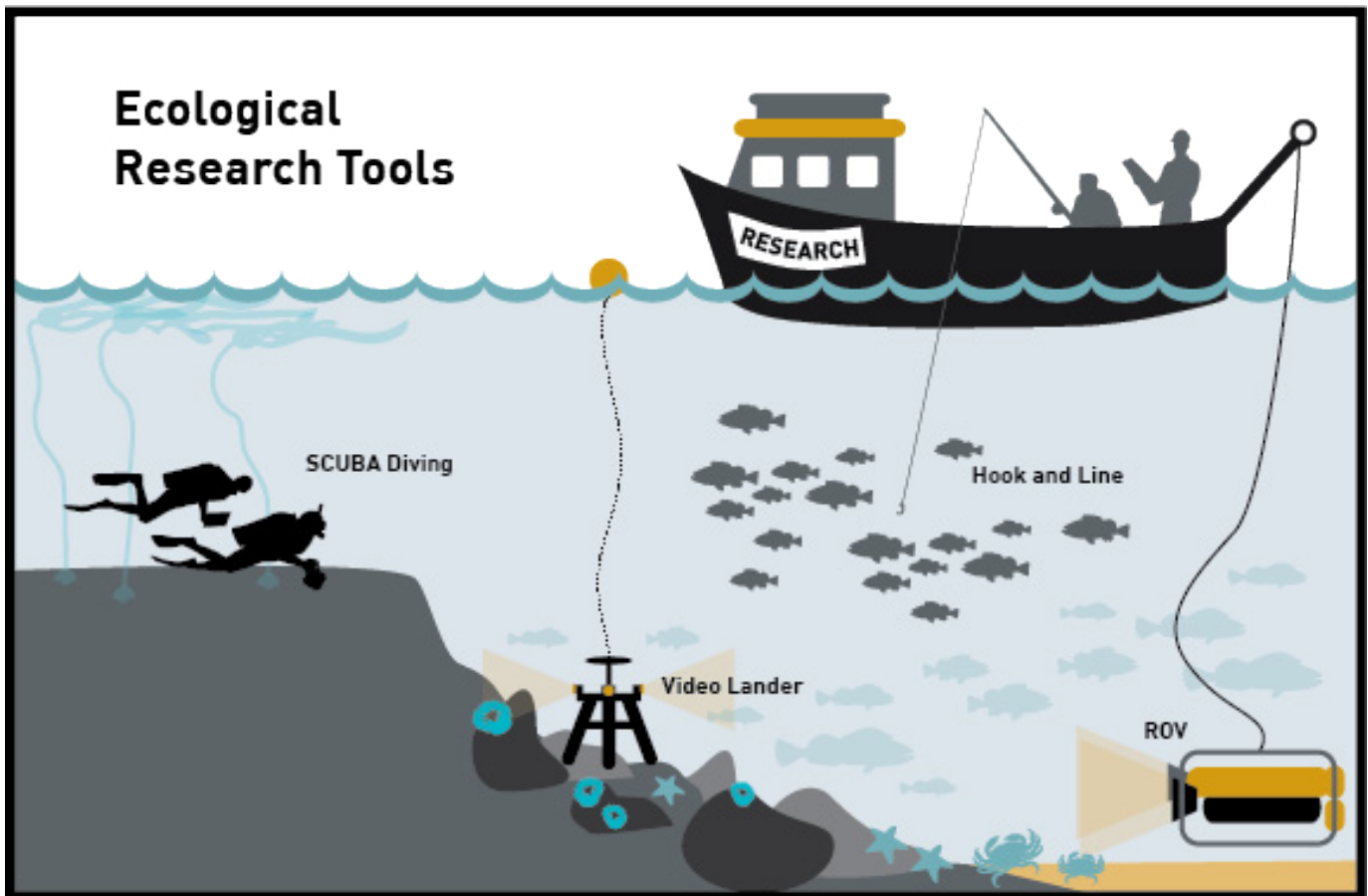


Figure 1: The ODFW Marine Reserve Program focuses monitoring efforts on four core tools: fishery-independent hook-and-line surveys, subtidal SCUBA surveys, remotely-operated vehicle (ROV) surveys, and video lander surveys.

C.4 EXPANDING OUR KNOWLEDGE AND LONG-TERM MONITORING THROUGH COLLABORATIONS

ODFW has sought to encourage expanded research and monitoring efforts through partnerships and collaboration. These collaborations help expand ODFW’s limited team and budget reach. As part of our long-term monitoring program, we have worked with collaborators to develop the following five long-term monitoring surveys focused on:

- Juvenile fish settlement
- Sea urchin populations
- Intertidal biodiversity
- Intertidal sea stars
- Oceanography

Similar to our core tools, we do not conduct all of these surveys at every site. For a list of which monitoring tools we use at each site, see [here](#).

JUVENILE FISH SETTLEMENT

Since 2013, ODFW has partnered with Drs. Kirsten Grorud-Colvert and Su Sponagle at Oregon State University (OSU) in an on-going [study](#) to quantify the abundance and diversity of pelagic juvenile fishes settling into nearshore habitats. Standard Monitoring Units for the Recruitment of Fishes (SMURFs) are devices attached to moorings used to sample these juvenile fishes. [Monitoring efforts](#) occur at both Redfish Rocks and Otter Rock and their associated comparison areas. This research helps us understand if marine reserve protections are providing maximum conservation benefits by protecting both juvenile and adult habitats.

SEA URCHIN POPULATION SURVEYS

ODFW began subtidal surveys of sea urchin populations to guide fishery management of Oregon's Red Sea Urchin fishery in the early 1990s. [Surveys of sea urchin populations](#) consisted of monitoring densities and size structure at a network of sites over time, targeting locations that were important to both sea urchin populations and the fishery. These sites included several locations that what would later (2012) become the Redfish Rocks Marine Reserve and Otter Rock Marine Reserve. This is a collaborative effort across multiple programs within ODFW and ensures continuity of monitoring data at the marine reserve sites to inform how this spatial closure impacts previously fished sea urchin areas.

INTERTIDAL BIODIVERSITY SURVEYS

ODFW has partnered with one of the largest rocky intertidal monitoring programs on the West Coast – the Multi-Agency Rocky Intertidal Network ([MARINE](#)) – to [monitor intertidal biodiversity](#) at three of Oregon's Marine Reserve sites with accessible intertidal habitat: Cape Perpetua, Otter Rock and Cascade Head. The monitoring at Cape Perpetua builds on MARINE's long-term dataset at this site that began prior to reserve implementation. Tracking intertidal biodiversity changes provides an understanding for how changes in Oregon's marine reserves compare to other sites in Oregon as well as other locations West Coast wide.

INTERTIDAL SEA STAR SURVEYS

In response to the emerging issue of sea-star wasting disease (SSWD), ODFW partnered with the Partnership for Interdisciplinary Studies of Coastal Oceans ([PISCO](#)) - to [monitor intertidal sea stars and communities](#) at three of Oregon's Marine Reserve sites with accessible, intertidal habitat: Cape Perpetua, Otter Rock and Cascade Head. PISCO is a West-Coast wide monitoring program that has been working in the intertidal and subtidal, including a site that would become part of the Cape Perpetua Marine Reserve, for more than 20 years. Sea stars are monitored along permanent transects at all sites to track changes in abundance, size, and health. We also monitor community responses to SSWD – specifically sea star prey (mussels), sea star competitors (predatory snails), and community structure to see if the reduction in intertidal sea stars resulted in changes to the intertidal community.

OCEANOGRAPHY

Oceanographic [data collection](#) and collaborations have varied over the years based on staff capacity and expertise, changing research priorities, staff turn-over and budget limitations. PISCO researchers at OSU have maintained oceanographic moorings in the Cape Perpetua region for more than 20 years, including in what is now the marine reserve. Initial oceanographic efforts made by ODFW included data collection from 2010-2013 at Redfish Rocks, Otter Rock and Cascade Head ([Buckley 2013](#), [ODFW 2014](#), [ODFW 2015a](#)). In 2015, ODFW decided to phase out oceanographic monitoring to refine our sampling based on staff capacity and expertise. However, some oceanographic data collection continued as part of the juvenile fish surveys at Otter Rock and Redfish Rocks. With increasing reports of hypoxia in 2018, PISCO researchers provided advice to ODFW to bolster oceanographic data collection efforts, which resulted in renewed efforts to gather oceanographic data at all marine reserve sites. Oceanographic data collection efforts started at the Cape Falcon Marine Reserve as part of a collaborative crab research project funded by the commercial fishing industry but have continued through 2020.

There is limited oceanography data analysis included in this report as data management and reporting collaborations are still under development. However, we have provided a summary of oceanographic data collection efforts to date by reserve in the [research appendix reports](#). The baseline monitoring reports for Redfish Rocks, Otter Rock and Cascade Head (ODFW 2014, ODFW 2015a) also include some oceanographic analyses. For this report, we have provided some preliminary data summaries at [Cascade Head](#) and [Cape Falcon](#), and two research appendix reports exploring the potential for combining oceanographic and biological datasets.

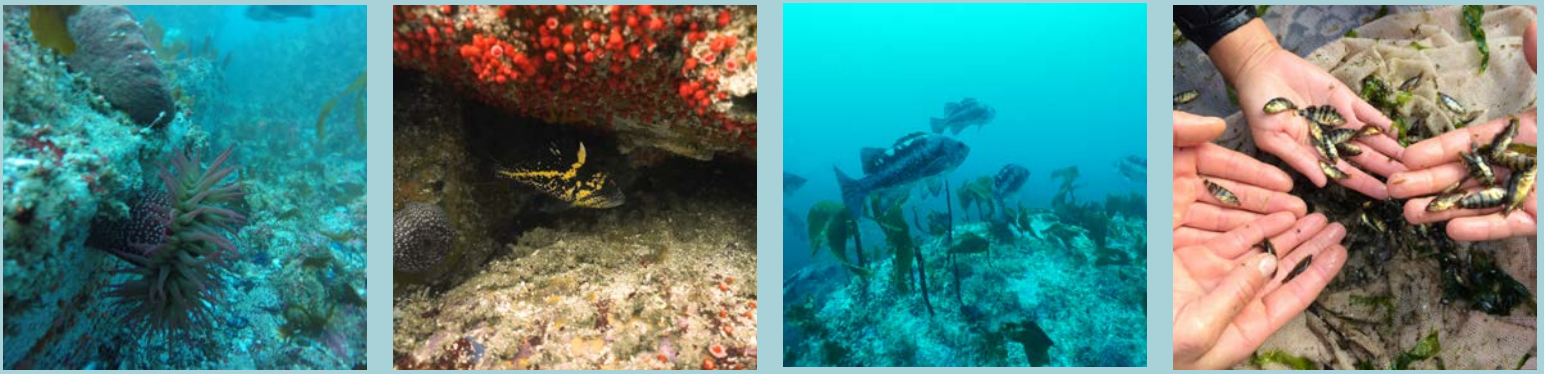
Our program is uniquely positioned to collect spatially explicit, co-located biological and oceanographic data that will provide important context to ongoing ocean and climate changes in the nearshore environment. Moving forward, ODFW will be exploring the best ways to address continued oceanography capacity issues to further oceanographic data collection, data management and analyses, and to more fully integrate oceanographic data with biological data being collected in marine reserves monitoring. As climate and ocean changes continue to occur in Oregon nearshore waters, our program is uniquely positioned to provide an in-depth understanding of the impact of these climate and ocean changes on nearshore communities.

D. RESULTS AND CONCLUSIONS

The last 10 years of ecological monitoring efforts have tested methods and generated new biological datasets across 14 different sites (five reserves and nine comparison areas) in Oregon nearshore waters. From these data we've detected nearshore ocean changes, identified system and site-specific differences and similarities, identified consistently effective methods and have an increased understanding of what is being protected with the creation of the Oregon Marine Reserves Program. This section shares the highlights of our ecological monitoring results at both a system and site-specific level. The conclusions presented below are supported by a series of [Appendices](#) and [Supplemental Reports](#); in these reports are detailed analyses of communities and [key focal species](#), and conclusions from monitoring efforts over the last ten years.

Table 1: A list of marine reserve focal fish, invertebrate and algae species. Focal species were selected based on evaluation of ecological (Eg), economic (En) or management (M) importance, including their likelihood to show a response to marine reserve protections.

Category	Common Name	Species	Indicators
Fish	Black Rockfish	<i>Sebastes melanops</i>	En, M
	Blue/Deacon Rockfish	<i>Sebastes mystinus/diaconus</i>	M
	Cabezon	<i>Scorpaenichthys marmoratus</i>	Eg, En
	China Rockfish	<i>Sebastes nebulosus</i>	En, M
	Lingcod	<i>Ophiodon elongatus</i>	Eg, En
	Yelloweye Rockfish	<i>Sebastes ruberrimus</i>	En, M
Invertebrate	California Sea Cucumber	<i>Parastichopus californicus</i>	Eg, En
	Short Red Gorgonian	<i>Swiftia spauldingi</i>	Eg
	Ochre Sea Star	<i>Pisaster ochraceus</i>	Eg; M
	Purple Sea Urchin	<i>Strongylocentrotus purpuratus</i>	Eg, En, M
	Red Sea Urchin	<i>Mesocentrotus franciscanus</i>	Eg, En, M
	Rock Scallop	<i>Crassadoma gigantea</i>	Eg, En, M
	Sunflower Star	<i>Pycnopodia halianthoides</i>	Eg; M
	White Plumose Anemone	<i>Metridium farcimen</i>	Eg
Algae	Articulated coralline algae	Species group	Eg
	Bull Kelp	<i>Nereocystis luetkeana</i>	Eg, En, M
	Crustose coralline algae	Species group	Eg
	Woody-stemmed Kelp	<i>Pterygophora californica</i>	Eg



D.1 MARINE RESERVES ARE PROTECTING A RANGE OF DIFFERENT FISH AND INVERTEBRATE COMMUNITIES

We can now say with confidence that Oregon’s Marine Reserves are protecting a range of different fish and invertebrate communities supporting the marine reserve mandates to protect biodiversity and key types of marine habitat. During the planning and siting process (see [Chapter 2](#)) for Oregon’s Marine Reserves, there was a lack of coast-wide, spatially explicit data available to truly evaluate the site proposals with respect to meeting the program’s ecological mandates. The Marine Reserve Ecological Monitoring efforts have resulted in new knowledge documenting distinct intertidal, subtidal invertebrate, and subtidal rocky reef fish communities across the marine reserves, in part due to the different habitats encompassed in each reserve.¹⁻⁴² We now have a better understanding of how each reserve is unique, and what that means from an ecological perspective.

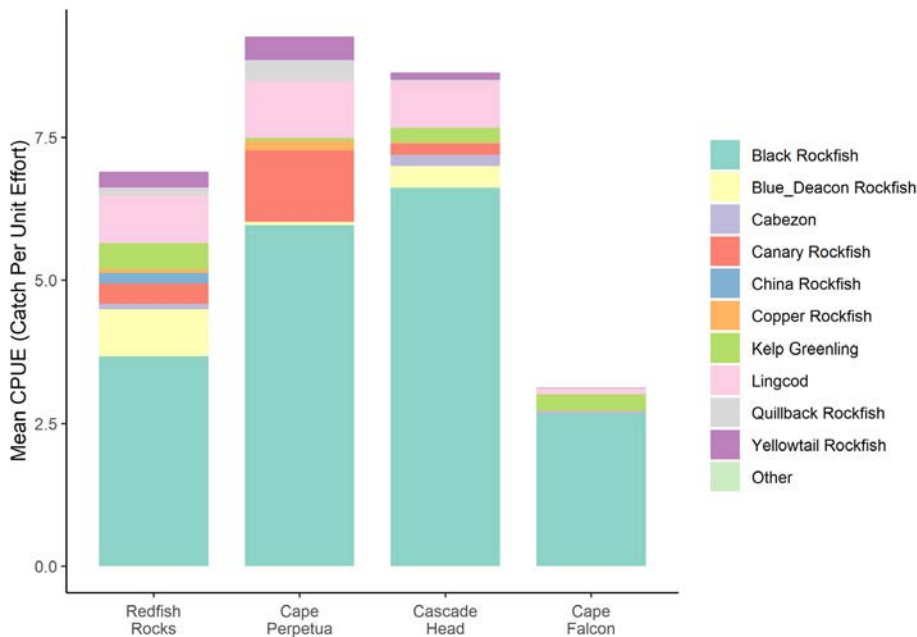


Figure. 2: The different fish communities protected by the four marine reserves sampled with hook-and-line surveys. Relative abundance is represented by mean CPUE (catch per unit effort) for the top 10 most common species.²⁹

D.2 WE ESTABLISHED A LONG-TERM MONITORING PROGRAM TO SUCCESSFULLY AND RELIABLY SAMPLE OREGON’S NEARSHORE ENVIRONMENT.

Developing an ecosystem-focused, long-term monitoring program for studying Oregon’s nearshore environment was a new endeavor for the state of Oregon. Oregon’s nearshore waters are a cold, high energy environment that frequently has poor underwater visibility. We trialed a variety of sampling methods previously used in waters further offshore or used by other monitoring programs in neighboring West Coast states, that more regularly experience calmer sea states and better underwater visibility conditions. We discovered that not all tools were able to adequately survey Oregon’s nearshore rocky reefs³³. Some tools required too much effort (otolith sampling), were too

big for ease of use (video lander), were too costly (benthic extraction), or not capable of surveying in murky, green waters (video sled). We modified PISCO [SCUBA methods](#) to account for challenging sea states, underwater visibility, and diver safety. We reengineered the [video lander](#) using a smaller, light-weight design, that is readily deployable from a small boat, and piloted its use as a monitoring tool ([Watson and Huntington 2016](#)). Our [hook-and-line](#) sampling design was modified to include local fishermen knowledge of target fishing locations, ocean conditions and nearshore reefs, as well as in the selection of comparison areas. Local fishermen input also led to the modification of Hook-and-line monitoring at Redfish Rocks to include [supplemental longline gear](#). We explored, adapted, and refined a large suite of monitoring tools that resulted in the four core monitoring tools in use today (see [Methods Appendix](#)).

D3. WE ARE TRACKING CHANGES THROUGH TIME AT 14 SITES ALONG THE OREGON COAST AND HAVE DOCUMENTED CHANGE IN KEY SPECIES AND ECOLOGICAL COMMUNITIES.

Our established [monitoring methods](#) are tracking ecological changes through time at 14 different sites along the Oregon coast, providing information about reserve conditions and effectiveness.¹⁻⁴² Although there is general agreement

that it is too soon to attribute ecological changes to marine reserve protections (CDFW 2018, Starr et al. 2015), our monitoring efforts are detecting changes through time in fish, invertebrate, and benthic habitat cover both at community and species-specific levels in our marine reserve and comparison area sites. We’ve documented important differences and similarities among the marine reserves and comparison area sites providing a foundation to evaluate future changes to reserve conditions and effectiveness.

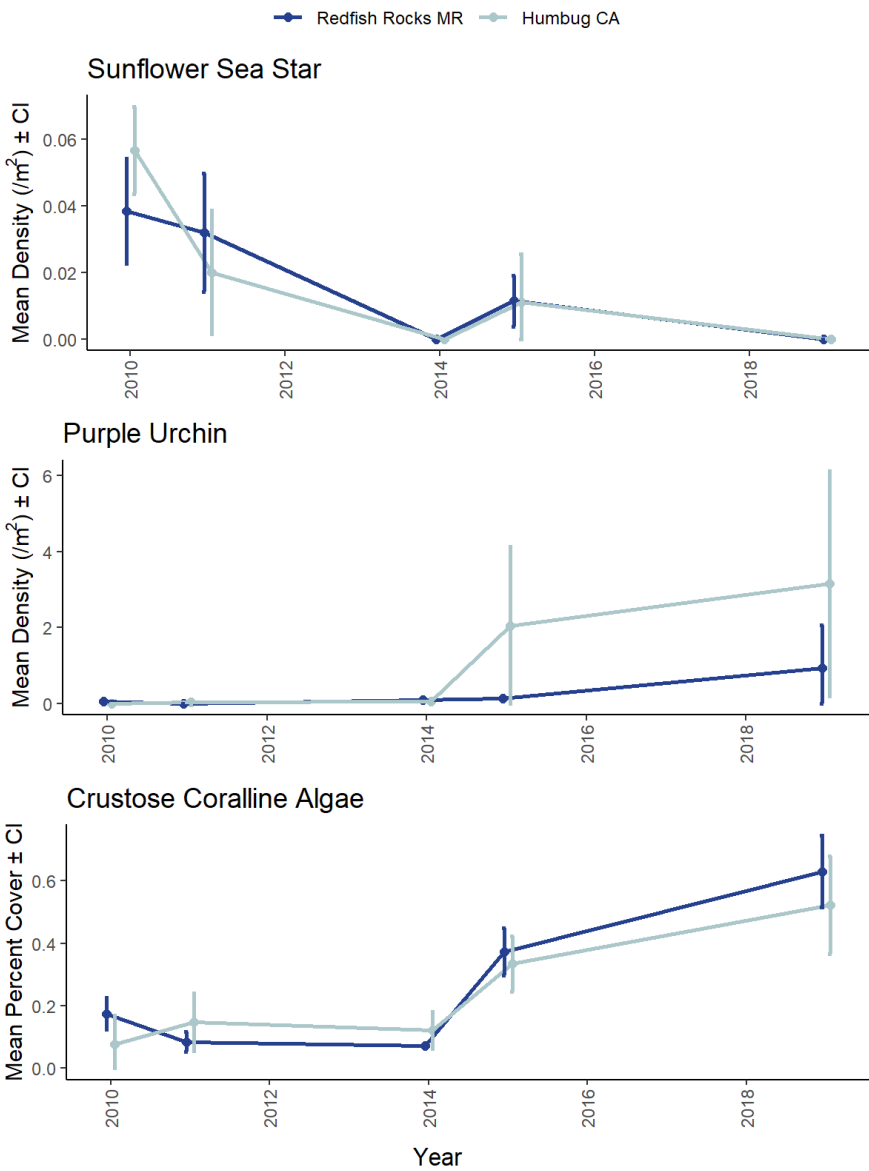


Figure 3. Changing trends through time in Sunflower Sea Star and Purple Urchin mean densities, and crustose coralline algae mean percent cover from 2010-2019 at Redfish Rocks Marine Reserve (dark blue) and Humbug Comparison Area (light blue)^{4,5}. Error bars indicate 95% confidence intervals (CI).

D.4 WE ARE LEARNING ABOUT SPECIES AND ECOSYSTEM RESPONSE TO NATURAL AND HUMAN-CAUSED STRESSORS.

Our research appendix reports¹⁻⁴² document how species and ecosystems have responded to natural stressors, like sea star wasting disease (SSWD) or changing ocean conditions, and to the cessation of fishing pressure, a direct human

impact. We've learned that SSWD impacted sea stars intertidally^{37,38} and subtidally^{4,7,10,15,18,25,30,32} and affected species differently. We documented recovery^{37,38} and subsequently lack of community response^{37,39,40} to the die-off of a keystone predator in the intertidal, suggesting not only did we detect these important changes but we also documented resilience.* Importantly, these results were not observed subtidally^{4,7,10,15,18,25,30,32}, and we also documented increasing sea-urchin populations at several sites^{4,7,10,15,18,25,30,36}. We're beginning to learn about the impacts of changing ocean conditions (i.e. nearshore hypoxia) on fish populations at Cape Perpetua^{21,22,41} and Cape Falcon^{27,41} and are set up to explore similar fish and invertebrate impacts at other marine reserve sites.^{6,7,17,18,21,29,30,35,41} ROV surveys and oceanographic monitoring at Cape Perpetua are built on long-term historic datasets that have documented hypoxia and fish community responses and subsequent recovery at this site.²¹ Together these monitoring efforts demonstrate that the current ecological monitoring program has already documented recovery from change and can detect signs of resilience in nearshore ecosystems.

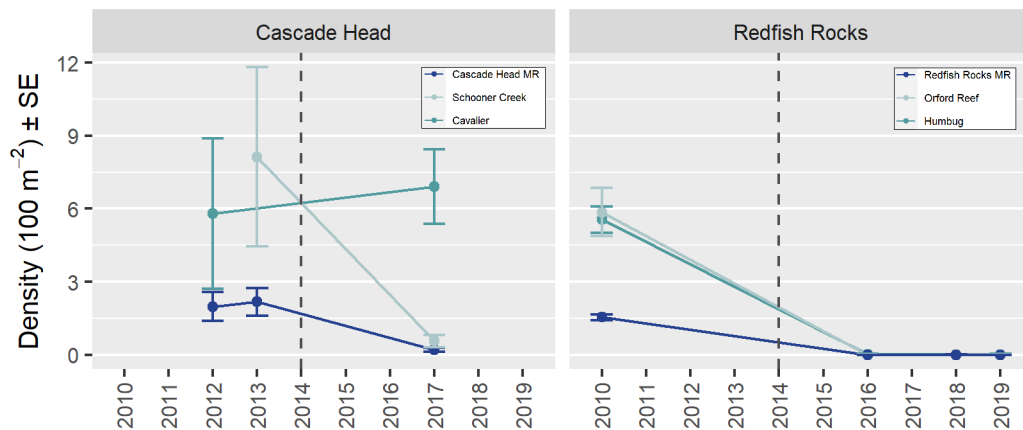


Figure 4. Density of the Pink Star, in remotely operated vehicle (ROV) video surveys of rocky substrates at the Cascade Head and Redfish Rocks Marine Reserves and their associated comparison areas. The assumed onset of sea star wasting syndrome in Oregon is indicated by the dashed line at 2014.

Our *Synthesis Report analyses* support our expectations that we have yet to see changes attributable to the cessation of fishing pressure. At Redfish Rocks, our oldest marine reserve, we have eight years of data post-closure that document similar change occurring inside the reserve and outside in the comparison areas.^{1,2,6,36} This suggests that the reserve and comparison areas are both responding similarly to regional influences, and we are not yet able to separate out an effect attributable to the cessation of fishing pressure. We have documented important differences between marine reserves and comparison areas (e.g. Cascade Head¹³) that provide valuable context for interpreting future change and its link to marine reserve protections. The ecological monitoring program is set up to detect change associated with natural and human-caused stressors allowing us to continue learning about marine reserve effectiveness and Oregon's nearshore ecosystem.

D.5 OUR SURVEYS GENERATED MULTIPLE, ROBUST DATASETS THAT WILL BE VALUABLE IN FUTURE ANALYSIS.

Our monitoring efforts generated biological datasets for the rocky intertidal community, subtidal rocky reef invertebrates, subtidal rocky reef fishes, and rocky reef benthic cover at 14 different sites in Oregon's nearshore environment.^{1-33,35-41} These monitoring efforts have taken place during a decade which has seen increasing frequency and severity of hypoxic events, unprecedented marine heatwaves, changing kelp cover, and large-scale marine diseases. These are in addition to changes in fishery management decisions, market supply and demand, and fishing effort. The ecological monitoring conducted by our program has generated valuable datasets and the analytical infrastructure (databases, analysis scripts) that can now be used to explore additional examples of resilience to or impacts from natural or human-caused stressors.

* Resilience is defined in the Oregon Marine Reserve Policy Recommendations (OPAC 2008) as the amount of natural or manmade disturbance an ecosystem can absorb while retaining the same function, structure, and feedbacks.

D.6 CLIMATE / OCEAN CHANGE IS OREGON’S BIGGEST RESOURCE MANAGEMENT CHALLENGE, AND THE MARINE RESERVE PROGRAM IS UNIQUELY POSITIONED TO TRACK BIOLOGICAL NEARSHORE RESPONSES TO SUCH CHANGE.

The start-up of the Oregon Marine Reserves Program began not long after climate/ocean changes began to be detected in Oregon’s nearshore environment, thus providing valuable documentation to understand future impacts on marine natural resources. Ten years later, the program is set-up and operating, allowing efficient data collection and monitoring into the future. We know that our ecological monitoring efforts can detect change in key species and ecological communities at 14 sites coast wide.¹⁻⁴² The use of consistent monitoring methods through time and applied into the future will enable the program to track biological responses to climate / ocean variability. The Oregon Marine Reserves Program is currently the only long-term nearshore monitoring program established in Oregon to track biological responses to climate/ ocean change in both intertidal and subtidal marine communities over time.

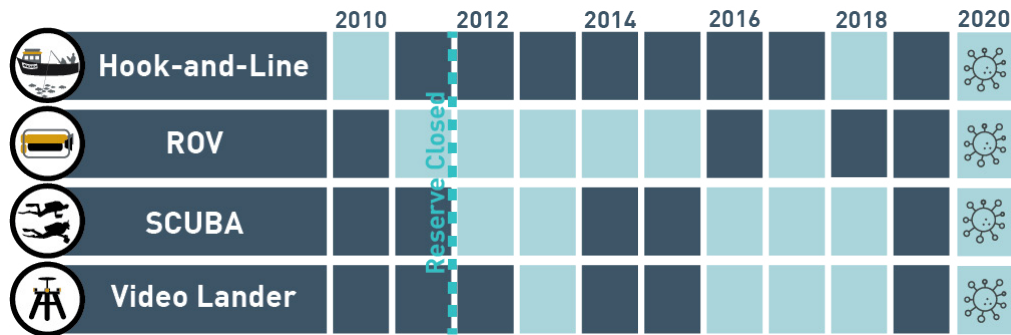
D.7 OUR ECOLOGICAL MONITORING PROGRAM BUILT UPON BASELINE MONITORING EFFORTS THAT BEGAN PRIOR TO CLOSURE AT EACH SITE, TO CHARACTERIZE THE NEARSHORE COMMUNITIES OF THE MARINE RESERVES AND COMPARISON AREAS AND UNDERSTAND NATURAL VARIABILITY IN THIS DYNAMIC ENVIRONMENT.

Our program began data collection at each reserve site two years prior to harvest restrictions taking effect, consistent with the research design laid out in our Ecological Monitoring Plan (2012). Some sites additionally had a decade or more of long-term monitoring data collected at the site before being designated as a reserve.^{21, 36, 37, 39, 41} These early monitoring efforts provided important information about the species, communities, and relative abundances vital to assessing the condition of the marine reserves and comparison areas prior to closure ([ODFW 2014](#), [ODFW 2015a](#)). As monitoring continued, we gained a valuable understanding of the natural variation in these communities, observed rare species, and added and adjusted monitoring tools and comparison area sites to optimize our program. This in-depth characterization, contained in the [Research Appendix Reports](#), now allows us to better detect and understand future changes.



Redfish Rocks Marine Reserve

A case study for exploring future ecological changes due to marine reserve protections (e.g. no fishing or ocean development)



The Redfish Rocks Marine Reserve and its two comparison areas – Humbug and Orford Reef – were mostly similar, with no current differences attributable to marine reserve protections.

Up to eight years of monitoring support results of the [baseline monitoring report of 2010/2011](#) that the Redfish Rocks Marine Reserve is similar to its two comparison areas. There are similar habitats, fish, invertebrate and algal species and communities at these three sites, and differences in abundance of certain key species are minimal. We have also detected similar yearly trends through time across the marine reserve and at least one comparison area, which suggest factors other than marine reserve protections are attributable to changes seen through time.

We tailored our monitoring at this site to include the use of a supplemental longline survey, which provides valuable insight on fisheries targeted species.

Based on the local expert knowledge and recommendation of a local fisherman, we piloted and then tailored our hook-and-line sampling to also include supplemental longline gear as our hook-and-line rod and reel sampling had limited observations of several species targeted by the local fishery in this region (e.g. solitary benthic rockfish). This new sampling effort was developed in collaboration with local fishermen to target China, Canary, Copper, Quillback, Yellow-eye and Vermilion Rockfish, and Cabezon. Monitoring results found similar catch rates for many species between the marine reserve and its comparison areas. More yearly trends in species catch, biomass, and size were identified at the reserve than its comparison areas.

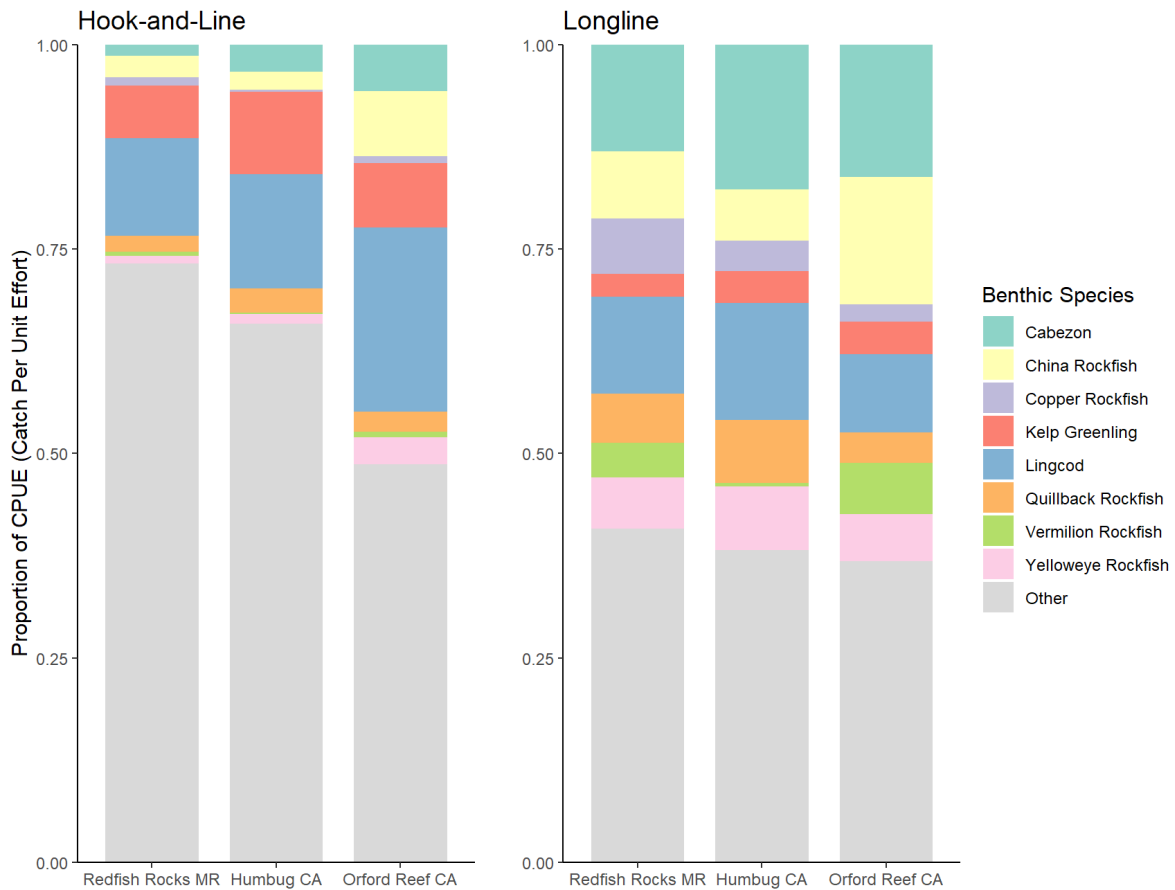


Figure 5. Comparison of proportions of CPUE (catch per unit effort) of benthic fish species between hook-and-line and longline fishing surveys at Redfish Rocks Marine Reserve and its associated comparison areas.^{1,2} The ‘Other’ species category contains schooling and rare species.

Our monitoring detected declines in multiple sea star species attributable to sea star wasting disease, and observed subsequent increases in sea urchin densities and crustose coralline algae.

At both shallow and deep reef areas, in both the marine reserve and comparison areas, our monitoring detected declines in multiple sea star species attributable to sea star wasting disease (SSWD), including the complete disappearance of the Sunflower Star. Overall, nine different subtidal sea star species experienced declines at all sites. We observed a subsequent increase in both Red and Purple Sea Urchin densities with multiple monitoring tools, corresponding with strong sea urchin recruitment that occurred during the mid-2010s. We also observed increases in crustose coralline algae, a functional group of red algae often associated with sea urchin barrens. Important to note is that not

all sea star species responded the same to SSWD; for example the Leather Star and the Fish-Eating Star both sustained an overall increase in density after the disease outbreak.

As the southern-most marine reserve, Redfish Rocks protects distinct fish and invertebrate communities.

Redfish Rocks is distinct as Oregon’s southern-most marine reserve and the only reserve located south of the biogeographical break at Cape Blanco. This site experiences different oceanographic conditions than other marine reserves on the Oregon coast. Redfish Rocks had the highest total species richness for rocky reef fish species and was the only site with observations of the Brown Irish Lord and the Gopher Rockfish, the latter of which has its northern-most range in southern Oregon. Of all the marine reserve sites, China Rockfish were found almost exclusively at Redfish Rocks. Although the fish community was most similar to Cascade Head, likely because of similarly large amounts of protected rocky habitat, the invertebrate community was distinct from all other marine reserve sites. Both Red and Purple Sea Urchin densities increased to a greater degree at Redfish Rocks than at the other marine reserves.

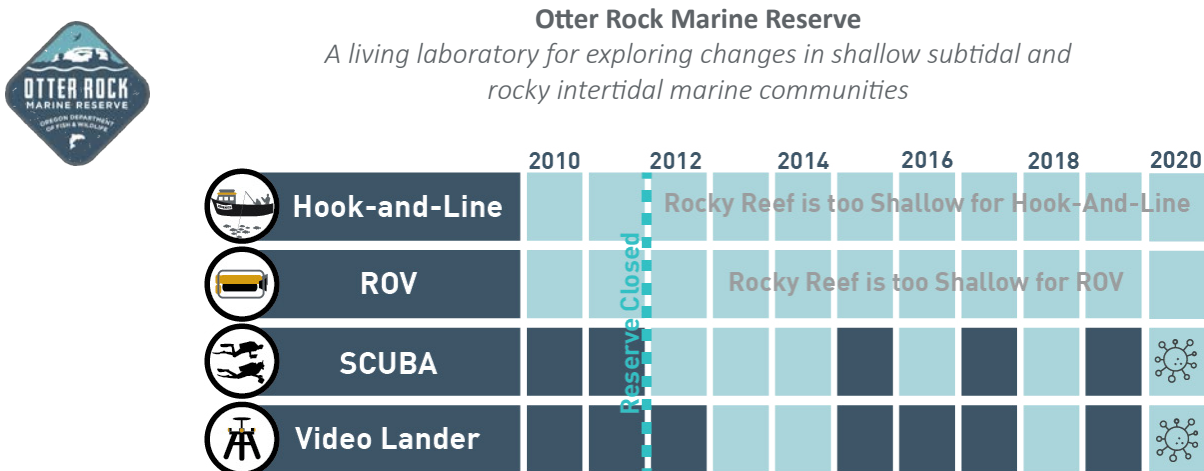
ROV monitoring provided new information about fish and invertebrate species-habitat relationships.

Our most complex monitoring tool, the ROV, gathered spatially explicit data on fish and invertebrate species densities and habitat variables. We learned that the relationship with species-specific fish and invertebrate densities with depth varied between the marine reserve and comparison areas with the exception of Yelloweye, Blue/Deacon and Quillback Rockfish, where the relationship with density and depth was the same at all sites. Many invertebrate species also had site specific density relationships with percent of boulder substrate, whereas fish density relationships with percent of hard bottom substrate resulted in inconsistent trends by species and site.

Collaborative contributions at this site included research on juvenile fish, fish movement, sea urchin densities and oceanography.

Collaborative research projects at Redfish Rocks have generated new knowledge on juvenile fish recruitment, fish movement, sea urchin densities, and oceanography. A unique collaborative research project at this site involved partnering with OSU and local commercial fishermen to study the movement patterns of China, Quillback and Copper Redfish at the Redfish Rocks Marine Reserve. The results demonstrate that this small marine reserve provides refuge for a substantial portion of these local fish populations, which had high site fidelity to the rocky reef habitat found within the reserve.

Footnote: The conclusions above for Redfish Rocks are supported by the following Research Results Appendix Reports: 1-8, 29-36, ,41-42



The Otter Rock Marine Reserve and its comparison area – Cape Foulweather – were mostly similar, with no current differences attributable to marine reserve protections.

Up to seven years of monitoring results support the conclusions from [baseline monitoring](#) that the Otter Rock Marine Reserve is similar to its comparison area. There are similar habitats, fish, invertebrate and algal species and communities at these two sites, and differences in abundance of certain key species are minimal. We have also detected similar yearly trends in Sunflower Sea Stars and red algae through time at both the marine reserve and Cape Foulweather, which suggest factors other than marine reserve protections are attributable to changes seen through time.

Otter Rock is our shallowest marine reserve allowing us to document several unique species and contains high diversity of algae both intertidally and subtidally.

As our shallowest marine reserve, Otter Rock is unique because it is the only reserve with seagrass. Gumboot Chitons are commonly found here, as are several shallow water surfperch species. The rocky intertidal habitat, located on the north end of the reserve, has the highest diversity of primary producers as compared to the rocky intertidal habitats protected at Cascade Head and Cape Perpetua. In the subtidal, this reserve has three times higher algal biomass than its comparison area, and there is more lacy red and articulated coralline algae found here than at any other marine reserve site.

Otter Rock is our most accessible site, supporting the most opportunities for cooperative and collaborative ecological research.

Although it's our smallest reserve, Otter Rock is close to two ports, Depoe Bay and Newport, providing ready access to its subtidal habitat and has ample parking and footpaths to support intertidal access; this makes Otter Rock our most accessible research site. Otter Rock is the only marine reserve where all five of our long-term collaborative monitoring tools are used, expanding our knowledge of this site. This site has provided numerous training opportunities for scientific divers, research opportunities for students and citizen science, and hands-on experiences for university associated field classes.

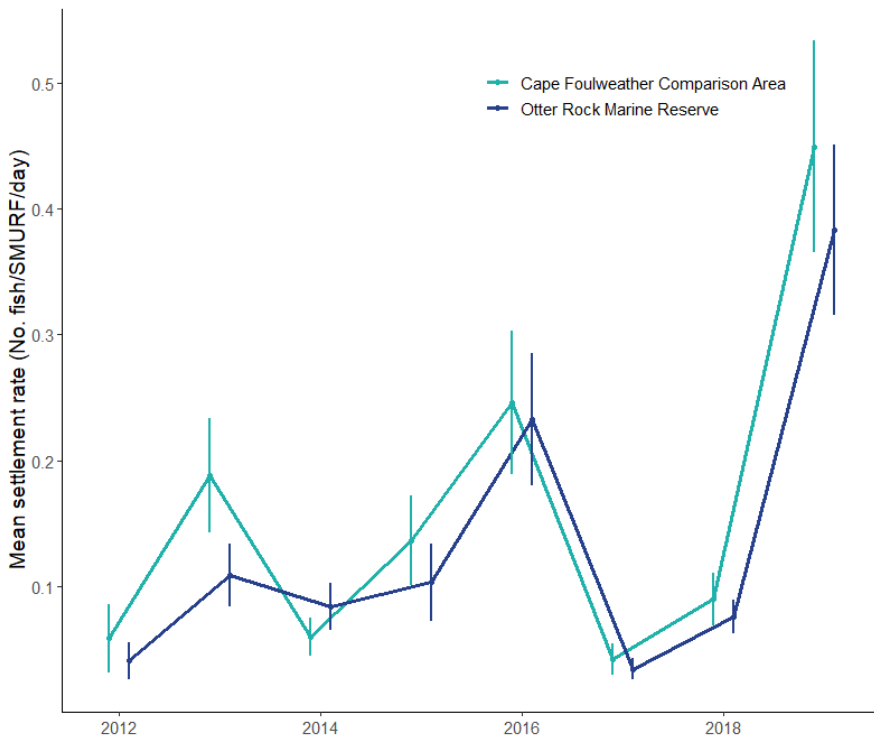
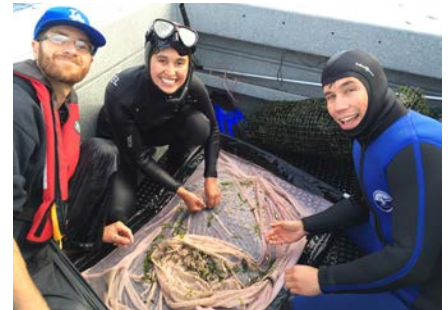


Figure 6. An example of data collected from our long-term juvenile fish (SMURF) collaboration led by OSU. The above plot depicts the mean settlement rate for Cabezon at Otter Rock Marine Reserve and Cape Foulweather Comparison Area over eight years.³⁵ Error bars indicate the standard error. Photos at right are from SMURF surveys at Otter Rock.

We see different responses to sea star wasting disease with intertidal and subtidal Ochre Sea Stars at Otter Rock.

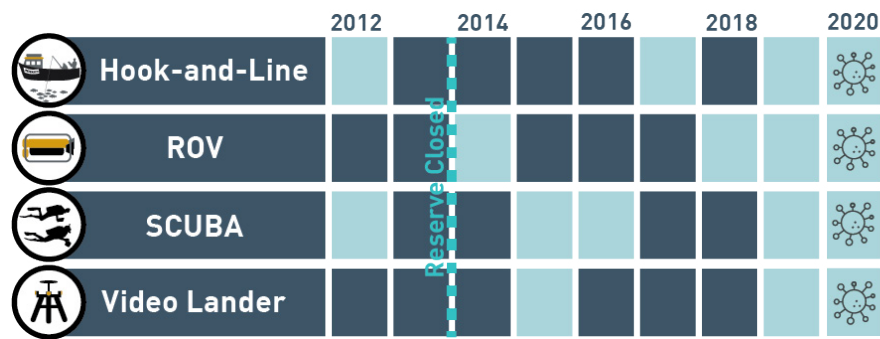
Ochre Sea Stars were impacted by the sea star wasting disease outbreak that was documented on the Oregon coast in 2014. Unlike other reserve sites, at Otter Rock our subtidal monitoring showed relatively stable populations of Ochre Sea Stars through 2015, followed by increasing densities through 2019. Intertidally, Otter Rock had the lowest densities of Ochre Sea Stars, as compared to the reserves at Cape Perpetua or Cascade Head. From 2015 onwards, intertidal densities have remained stable but low – even though prevalence of the disease has also been low at this site. At other marine reserve sites, there was a documented sea star recruitment event in the intertidal that was not seen at Otter Rock. Long-term monitoring at this site will be a valuable tool to understand the differences between intertidal and subtidal recovery of Ochre Sea Stars.

Footnote: The conclusions above for Otter Rock are supported by the following Research Results Appendix Reports: 9-12, 30-31, 33- 42.



Cascade Head Marine Reserve

A case study for exploring future ecological changes due to marine reserve protections (e.g. no fishing or ocean development)



Ecological monitoring documented important differences in fish catch rates between the marine reserve and comparison areas, important for understanding reserve conditions and effectiveness.

We found consistently higher aggregate fish catch rates** in the Cascade Head Marine Reserve than in the comparison areas with our hook-and-line surveys, for all years of monitoring. Our monitoring documented the importance of

schooling species at the reserve and Schooner Creek Comparison Area (e.g. Black, Yellowtail or Canary Rockfish), and relatively low abundance of benthic rockfish species (e.g. China or Yellow-eye Rockfish) at all sites. Black Rockfish, Lingcod and Kelp Greenling were the most common species. We also documented higher abundance of Lingcod in the reserve as compared to the Cavalier

** Hook-and-line surveys measure catch rate in terms of catch per unit effort (CPUE) or biomass per unit effort (BPUE).

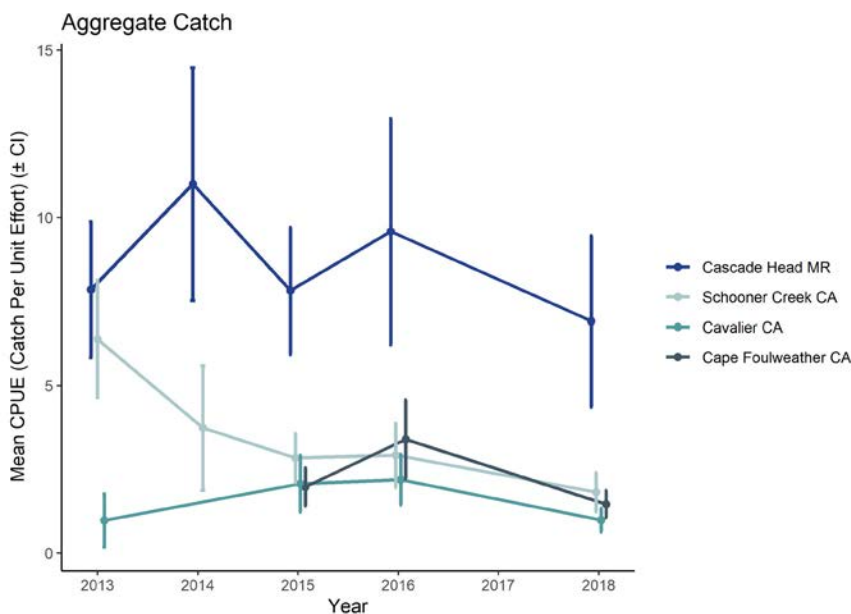


Figure 7. Mean aggregate CPUE (catch per unit effort) of fish at the Cascade Head Marine Reserve and its associated comparison areas, from 2013-2018 with hook-and-line sampling.¹³ Error bars indicate 95% confi-

or Cape Foulweather Comparison Areas. Documenting consistently higher fish abundance inside the marine reserve before reserve implementation as well as afterwards is critical to understanding whether future ecological changes are attributable to marine reserve protections (i.e. cessation of fishing).

We have seen different responses to sea star wasting disease for Ochre Sea Stars in the intertidal vs. subtidal.

Ochre Sea Stars were impacted by sea star wasting disease starting in 2014 along the Oregon coast. At the Cascade Head Marine Reserve in the intertidal, we found prevalence of the disease in 2016 when monitoring started, that subsided by 2018. Since then, intertidal Ochre Sea Star populations for both juveniles and adult have increased, and the population is growing at this site. Subtidal monitoring results document stable trends through time, with no change in Ochre Sea Star populations documented at the reserve or its comparison areas. Long-term monitoring will be a valuable tool to understand the differences between intertidal and subtidal populations of Ochre Sea Stars at this site.

We have seen diverse responses to sea star wasting disease, documented by the ROV for nine subtidal sea star species, at the Cascade Head Marine Reserve and its comparison areas.

The subtidal response to sea star wasting disease, as documented by ROV monitoring at the Cascade Head Marine Reserve, varied depending on species and monitoring location. Two species exhibited density decreases at all sites, the Blood Star and the Sunflower Star, while two species (the False Ochre Star and the Fish-Eating Star) exhibited increasing trends at all sites. The Leather Sea Star exhibited no overall change in density across the sampling period. Four sea star species (the Pink Star, Cushion Star, Sun Star, Rainbow Star) exhibited substantially differing abundance trends among the multiple sites sampled. One of the most abundant stars, the Pink Star largely disappeared from the reserve and Schooner Creek Comparison Area but was observed in abundance at the Cavalier Comparison Area. Together these trends suggest that although there were dramatic changes in sea star densities associated with sea star wasting disease, not all species responded the same, and an individual species response was not necessarily uniform across all sites. Long-term ROV monitoring at this site will be a valuable tool to understand the variation and longer-term impacts of this marine disease on the deep reefs of the central Oregon coast.

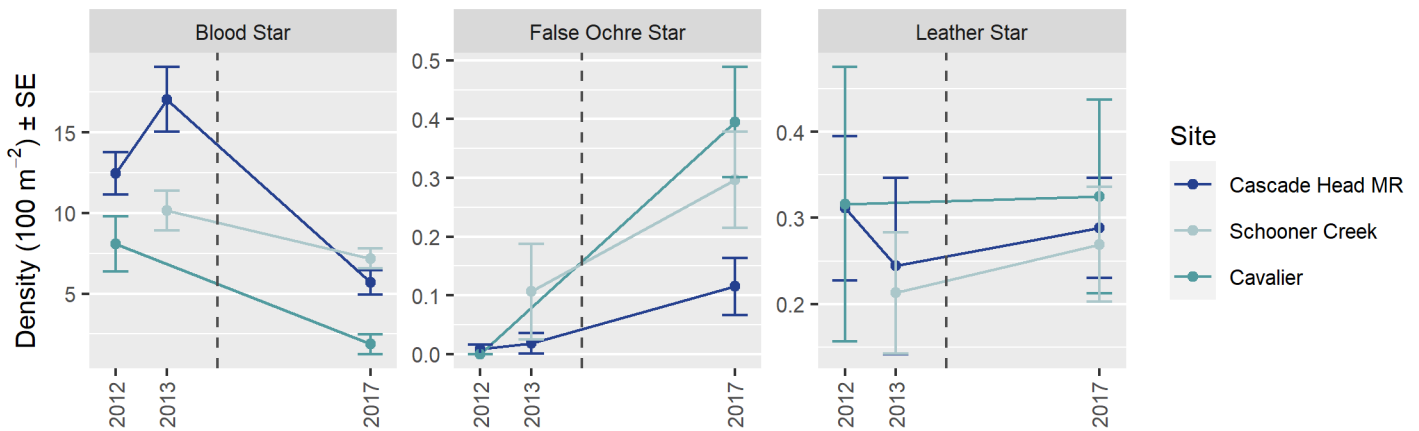


Figure 8. Select sea star species densities in remotely operated vehicle (ROV) video surveys of rocky substrates at the Cascade Head Marine Reserve and associated comparison areas. The assumed onset of sea star wasting disease (SSWD) in Oregon is indicated by the dashed line at 2014. The example species illustrate a range of responses to SSWD including decreases at all sites, increases at all sites, site-dependent responses, and no change.

The Cascade Head Marine Reserve protects a range of different fish and invertebrate communities and provides redundancy and uniqueness in the ecological communities it protects.

Comparing monitoring results across the marine reserves reveals that the Cascade Head Marine Reserve has a similar subtidal fish community to the Redfish Rocks Marine Reserve but is different from the reserves at Cape Perpetua and Cape Falcon. From the subtidal invertebrate perspective, Cascade Head is most similar to Otter Rock but is different

from Redfish Rocks and Cape Falcon. Intertidally our monitoring revealed that the Cascade Head Marine Reserve is unique from Otter Rock and Cape Perpetua in that it has a rare balance of invertebrate and algae species not seen at other sites. These monitoring results demonstrate that the Cascade Head Marine Reserve protects both a unique range of ecological communities but also provides some redundancy in subtidal community protection.

We detected numerous yearly changes for many subtidal invertebrate or benthic cover categories, but the reason for these changes remains unclear, highlighting the importance of long-term monitoring.

Our subtidal ecological monitoring detected yearly changes through time in many invertebrate species or benthic cover categories. For example, we found similar yearly changes at all sites with increasing percent cover of crustose coralline algae or declining densities of the Short Red Gorgonian and Basket Stars. We also documented different yearly trends by site, such as with increasing Red Sea Urchin densities at the reserve and Schooner Creek Comparison Area, but not at the Cavalier Comparison Area. The reason behind these changes remains unclear and underscores the importance of long-term monitoring to understand which changes are part of natural variability, and which may be related to natural or human stressors.

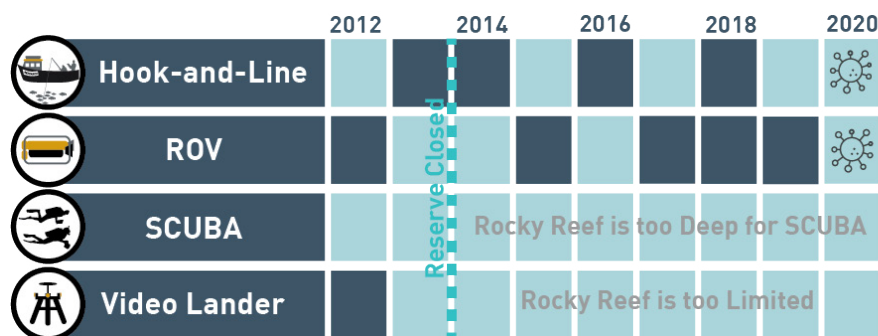
Collaborative contributions at this site included research on intertidal sea star health and community response to sea star wasting disease, intertidal biodiversity, and oceanography.

Footnote: The conclusions above for Cascade Head are supported by the following Research Results Appendix Reports: 13-19, 29-34, 37-42



Cape Perpetua Marine Reserve

A case study for exploring how deep isolated marine communities respond to changing ocean conditions (i.e. hypoxia or ocean acidification)



Cape Perpetua Marine Reserve has a unique subtidal fish community attributable to the deep, isolated patch reef at this reserve.

Ecological monitoring results from Cape Perpetua highlight the unique subtidal fish community at this reserve. Brown Rockfish and Bocaccio Rockfish are unique, rare, species associated with this deep, patchy, rocky reef, and of all the marine reserves it has the highest number of commonly observed species. This reserve has higher densities of Canary, Yellowtail, Copper, Quillback and Yelloweye Rockfish than the other reserves. Cabezon and China Rockfish are absent from our sampling in this marine reserve.

Distinct intertidal communities in the marine reserve are linked to the unique oceanographic features at Cape Perpetua.

The Cape Perpetua Marine Reserve is distinct from an intertidal perspective because it is dominated by sessile invertebrates, associated with high rates of barnacle and mussel recruitment and growth at this site. The recruitment of these invertebrates is a product of the intermittent upwelling regime and wide continental shelf at this site, as docu-

mented by our long-term monitoring collaborators. Upwelling brings high chlorophyll concentrations and algae blooms to Cape Perpetua, which provides favorable conditions for the recruitment and growth of sessile invertebrates.

Cape Perpetua is uniquely positioned to provide information about how nearshore ecological communities respond to climate and ocean changes.

The Cape Perpetua area has been a hotspot for marine science research for over 20 years. Long-term surveys in this area have include Remotely Operated Vehicle (ROV) surveys conducted by ODFW as well oceanographic and rocky intertidal surveys led by collaborators at OSU, UCSC, and PISCO. These efforts led to the first documentation of near-shore anoxic and hypoxic conditions off the Oregon coast, which have continued to be periodically detected in this area, as well as ecological changes associated with these conditions. More recently, we have begun to explore combining some of the biological data, from our hook-and-line surveys, with oceanographic data at this site revealing how changing ocean conditions can influence short-term fish biological responses. Maintaining coupled oceanographic and biological monitoring is critical to understanding future climate and ocean changes and their impacts on nearshore ecological communities.

The Cape Perpetua Marine Reserves provides the backbone of our understanding for the impacts and recovery of sea star wasting disease in intertidal marine reserve communities.

The Cape Perpetua Marine Reserve is the only marine reserve where our long-term collaborators fully captured the impact of sea star disease on intertidal populations of the Ochre Sea Star. There was an abrupt and dramatic increase in sea star wasting disease in 2014 at this site, where over 60% of individuals showed signs of the disease. All size classes of Ochre Sea Stars were similarly affected by the outbreak. Since then, a substantial recruitment pulse of young sea stars occurred in the years following wasting disease; adult densities of Ochre Sea Stars have since recovered at the Cape Perpetua Marine Reserve and are now more abundant than before sea star wasting disease. The long-term monitoring of sea stars at this reserve and other sites along the Oregon coast, allow us to evaluate the frequency of wasting disease and recovery trajectories at Otter Rock and Cascade Head, where monitoring began after sea-star wasting.

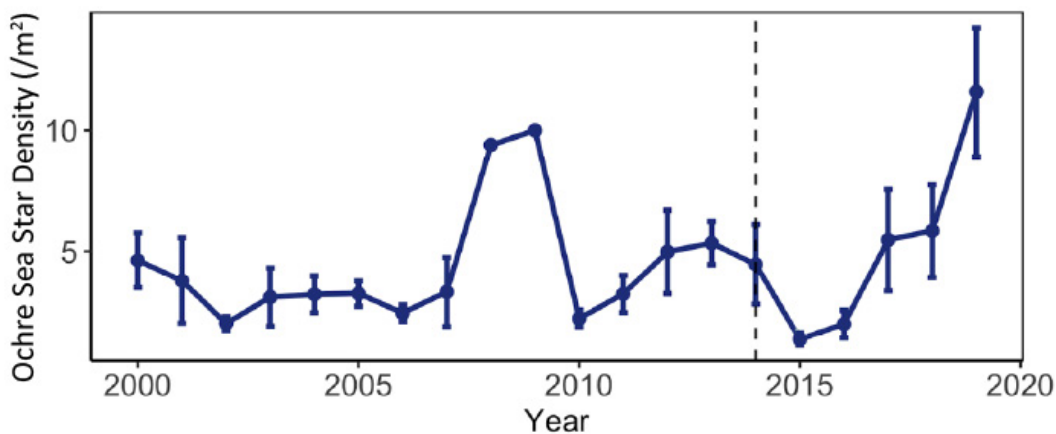


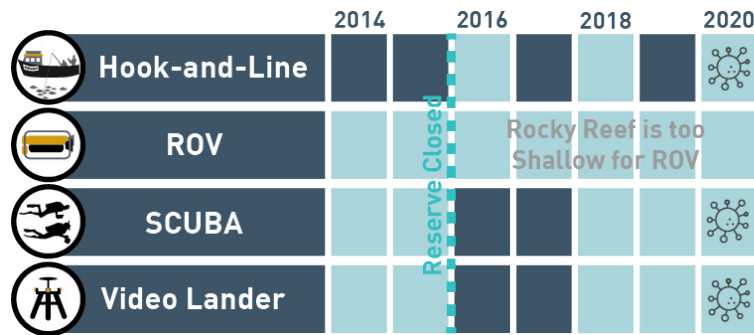
Figure 9. Timeseries of the mean density (/m²) of Ochre Sea Stars at the Cape Perpetua Marine Reserve intertidal habitat. Sea star wasting disease was documented on the Oregon Coast in 2014 (vertical dashed line).³⁸

Footnote: The conclusions above for Cape Perpetua are supported by the following Research Results Appendix Reports: 20-22, 29, 34,37-42.



Cape Falcon Marine Reserve

A case study for exploring how marine communities with different fishing pressures respond to changing ocean conditions



This is the first monitoring report to analyze data from the Cape Falcon Marine Reserve.

Ecological monitoring at our newest marine reserve site, Cape Falcon, provided a first snapshot of benthic cover, fish, invertebrate and algal communities. Prior to marine reserves monitoring, there was limited fishery-independent ecological data for what is now the Cape Falcon Marine Reserve or its three comparison areas off the northern Oregon coast. We learned that Cape Falcon has distinct subtidal invertebrate and fish communities different from other marine reserves, and these differences are likely attributable to known habitat differences.

Cape Falcon has the lowest aggregate and species densities for many nearshore rocky reef fish species, likely attributable to the small area of protected rocky habitat at this reserve. The most dominant fish species at Cape Falcon was the Buffalo Sculpin, whereas other reserves were dominated by Black Rockfish and Lingcod. The Cape Falcon Marine Reserve also had the lowest densities of sea urchins than other reserves.

Hook-and-line monitoring efforts have documented differences in species diversity and relative abundance between the Cape Falcon Marine Reserve and its associated comparison areas, likely attributable to known habitat differences.

The Cape Falcon Marine Reserve is most similar to the Low Fishing Pressure Comparison Area, with multiple differences in species diversity and relative abundance detected between the marine reserve and the Moderate and High Fishing Pressure comparison areas. Both of these comparison areas had higher aggregate fish abundances than the marine reserve, likely driven by higher Black Rockfish and Lingcod abundances. The low fish abundances in the reserve were similar to those found in the Low Fishing Pressure Comparison Area; both sites also had similar numbers of observed species and low diversity indices. These results support local fishermen knowledge that minimal habitat in the Cape Falcon Marine Reserve is associated with lower catch rates than at other fishing locations.

Little change through time detected at the Cape Falcon Marine Reserve with hook-and-line data; more change over time detected at the comparison areas but with no clear patterns.

We detected little to no change over time at Cape Falcon Marine Reserve in fish abundance with four years of hook-and-line monitoring data. We did observe more change over time in the comparison areas but with no clear patterns. Surprisingly, the greatest temporal shifts in abundance were detected at the Low Fishing Pressure Comparison Area where relative abundance declined through time. This observed decline appears correlated with decreases in Black Rockfish at the Low Fishing Pressure Comparison Area though additional monitoring will help us understand whether this is a long-term trend for this schooling species.

The Cape Falcon Marine Reserve is providing valuable oceanographic data, expanding our spatial understanding of changing ocean conditions, setting the stage to track future climate and ocean changes at this site.

Despite the fact that Cape Falcon is Oregon’s youngest marine reserve, it is currently set-up to track future climate and ocean changes and their response on subtidal fish communities. Even though oceanographic monitoring at this site did not begin until late 2018, we still explored short-term changes in fish response to changing ocean conditions. While we did not observe any hypoxic conditions in 2019 or 2020, these are the first oceanographic monitoring data from north of Cascade Head in Oregon state waters measuring dissolved oxygen.

We found no correlation between dissolved oxygen and fish response. We detected some evidence of aggregate and Lingcod CPUE response to wind-stress as a proxy for upwelling conditions and observed the warmest bottom temperatures in 2019. These warm temperatures may be a signal of the 2019 marine heatwave, which recorded anomalously warm waters and low levels of upper ocean mixing. Cape Falcon is positioned to make valuable contributions to how fish respond to future climate and ocean changes.

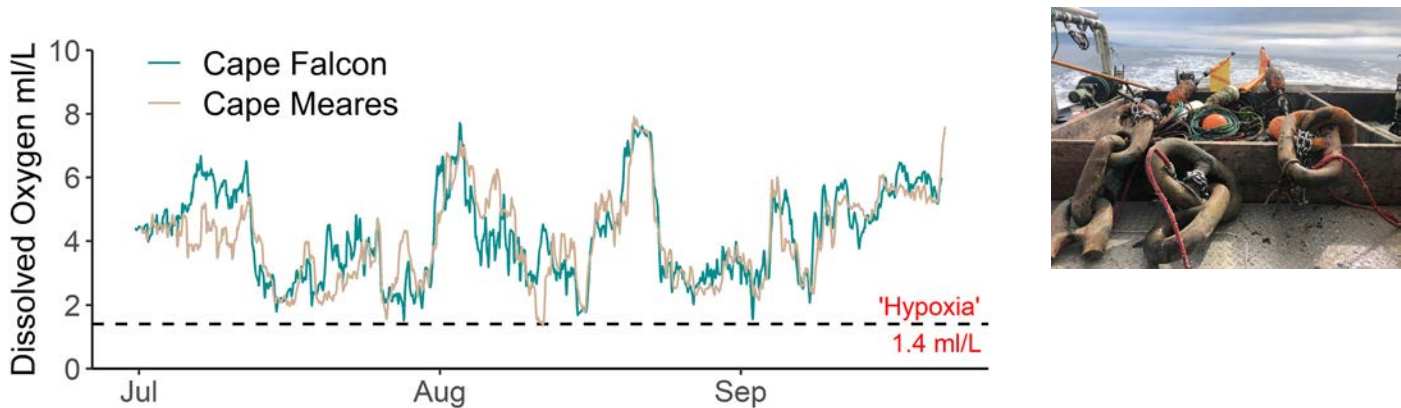


Figure 10. Dissolved oxygen levels (ml/L) at Cape Falcon Marine Reserve and nearby comparison area off Cape Meares during the summer and fall of 2020. No observations of low oxygen or hypoxic (oxygen < 1.4 ml/L) conditions were observed in either location in 2020.

As our newest reserve, the monitoring efforts at Cape Falcon are still in a phase of learning and adapting and we’re working to gather robust datasets from these sites.

The Cape Falcon Marine Reserve is our newest marine reserve, with implementation (i.e. harvest restrictions) starting in 2016, and we are still in a phase of learning and adapting our monitoring efforts at this site. Hook-and-line surveys have been our most successful sampling tool, in part because of supporting infrastructure (i.e. charter fishing vessels) in the nearby port of Garibaldi. There is a lack of supporting infrastructure (i.e. dive shop and dive vessel) to support SCUBA surveys at Cape Falcon and its surrounding sites. This creates access challenges resulting in limited sample sizes and the lack of nearby location to fill SCUBA tanks further restricts the efficiency of this monitoring tool. Our lander video tool is currently paired with SCUBA survey efforts, and therefore has suffered from access challenges, limited sample sizes, and poor visibility of this nearshore area. An unexpected monitoring success at Cape Falcon has been with oceanography, where a collaboration with a local fishing vessel has resulted in the successful deployment and retrieval of moorings to collect data on temperature, salinity and oxygen. These monitoring efforts began in 2018 and have since continued through 2020.

Collaborative and cooperative research projects at this site have generated new knowledge on great white sharks, sturgeon, crabs and oceanography.

Collaborative research projects at Cape Falcon have generated new knowledge on great white sharks, sturgeon, crabs, and oceanography. OSU collaborators tagged crab in the Cape Falcon Marine Reserve to track their movement, in a [study](#) funded by members of the fishing industry, to determine if crabs living closer to a reef area stay closer to home. The results of the crab research suggest that yes, crabs found closer to a reef tend to stay in the vicinity longer than

those found in sandy areas. This research used special acoustic tags and moorings that could also detect other animals with similar acoustic tags and resulted in the identification of seven great white sharks and 35 green sturgeon that passed through the Cape Falcon Marine Reserve. This collaboration connected us with a local fisherman who partnered with us to deploy oceanographic moorings to gather the first oceanographic data from these northern-most monitoring sites.

Footnote: The conclusions above for Cape Falcon are supported by the following Research Results Appendix Reports: 23-31,34,41-42.

E. CONTRIBUTIONS, LESSONS LEARNED, CHALLENGES

E.1 WE'VE GENERATED NEW KNOWLEDGE IN SUPPORT OF NEARSHORE RESOURCE MANAGEMENT.

The ecological monitoring of Oregon's Marine Reserves has generated new knowledge in support of nearshore ocean resource management in four key areas:

- Nearshore Groundfish Stock Assessments
- Listing of the Sunflower Sea Star on the IUCN Red List of Endangered and Threatened Species
- Oregon Nearshore Strategy
- Ocean Acidification and Hypoxia (OAH)

NEARSHORE GROUND FISH STOCK ASSESSMENTS

The data from our ROV, hook-and-line and juvenile fish surveys have been used in the nearshore groundfish stock assessment process of the Pacific Fishery Management Council (PFMC) for Cabezon (2019), Blue/Deacon Rockfish (2017), and Kelp Greenling (2015). Ecological monitoring data from the marine reserves were also included as part of a PFMC Science and Statistical Committee methodology review for Oregon's ROV data (2020).

IUCN RED LISTING OF THE SUNFLOWER SEA STAR (*PYCNOPODIA HELIANTHOIDES*)

Oregon Marine Reserves data from SCUBA, ROV and Sea Urchin surveys contributed to the listing of the Sunflower Sea Star, *Pycnopodia helianthoides* as critically endangered on the [IUCN Red List of Threatened and Endangered Species](#). This became an emerging subtidal ecosystem issue after sea star wasting disease hit the Oregon coast in 2014, and other West Coast wide locations in 2013. Our monitoring documented severe declines in this subtidal sea star species, with no observations recorded in marine reserves after 2016.



OREGON NEARSHORE STRATEGY

The [Oregon Nearshore Strategy](#) is an ODFW conservation and management planning tool to support the long-term sustainability of nearshore resources in Oregon. The Nearshore Strategy provides conservation and policy priorities that can guide the investment of time and funding in a manner consistent with public interest, on priority nearshore issues that are not specifically addressed by existing processes. It provides a list of priority species and highlights key areas for research. Oregon Marine Reserves monitoring data generated new knowledge and biological data for 24 different Nearshore Strategy Species. These species include 17 fish, 6 invertebrate and 1 algae species.

Table 2. Marine Reserve ecological monitoring generated new knowledge and biological data on 24 Oregon Nearshore Strategy Species.

Catagory	Common Name	Species
Fish	Black Rockfish	<i>Sebastes melanops</i>
	Blue Rockfish	<i>Sebastes mystinus</i>
	Cabazon	<i>Scorpaenichthys marmoratus</i>
	Canary Rockfish	<i>Sebastes pinniger</i>
	China Rockfish	<i>Sebastes nebulosus</i>
	Copper Rockfish	<i>Sebastes caurinus</i>
	Deacon Rockfish	<i>Sebastes diaconus</i>
	Kelp Greenling	<i>Hexagrammos decagrammus</i>
	Lingcod	<i>Ophiodon elongatus</i>
	Pile Perch	<i>Rhacochilus vacca</i>
	Quillback Rockfish	<i>Sebastes maliger</i>
	Shiner Perch	<i>Cymatogaster aggregata</i>
	Striped Perch	<i>Embiotoca lateralis</i>
	Tiger Rockfish	<i>Sebastes nigrocinctus</i>
	Vermilion Rockfish	<i>Sebastes miniatus</i>
	Yelloweye Rockfish	<i>Sebastes ruberrimus</i>
Yellowtail Rockfish	<i>Sebastes flavidus</i>	
Invertebrate	California Mussel	<i>Mytilus californianus</i>
	Ochre Sea star	<i>Pisaster ochraceus</i>
	Purple Sea Urchin	<i>Strongylocentrotus purpuratus</i>
	Red Sea Urchin	<i>Mesocentrotus franciscanus</i>
	Rock Scallop	<i>Crassadoma gigantea</i>
	Sunflower Sea Star	<i>Pycnopodia helianthoides</i>
Algae	Bull Kelp	<i>Nereocystis luetkeana</i>

OCEAN ACIDIFICATION AND HYPOXIA (OAH)

Ocean Acidification and Hypoxia (OAH) are [newly prioritized resource management issues](#) for the State of Oregon with the passage of the 2017 Oregon Senate Bill 1039. Oregon was one of the first places in the world to observe the direct impacts of ocean acidification when oyster hatchery production collapsed in 2007. Hypoxia events continue to intensify along the coast and Oregon’s iconic fisheries and the coastal communities that depend on them are at risk. The Marine Reserves Ecological Monitoring Program has now generated biological timeseries of fish, invertebrate and benthic habitat communities at 14 locations throughout Oregon’s nearshore. This rich dataset is now available to combine with increasing spatial coverage ⁴¹ of ocean conditions in Oregon’s nearshore to better understand the impacts to nearshore communities from this emerging threat. Our work has just begun to scratch the surface of our understanding of these issues in coastal waters and highlights the value of spatially explicit, coast-wide, biological timeseries data.

E.2 THE MARINE RESERVES HAVE GENERATED RESEARCH OPPORTUNITIES AND NEW KNOWLEDGE TO ADDRESS EMERGING NEARSHORE OCEAN ISSUES.

Over the first 10 years of the Marine Reserves Program, several emerging issues have come to light in Oregon's near-shore environment that has generated research opportunities and new knowledge from Oregon's Marine Reserve sites in five key areas:

- Sea Star Wasting Disease
- Microplastics
- Marine Noise Pollution
- Ecosystem Impacts of Multiple Stressors

INTERTIDAL SEA STAR WASTING DISEASE

When sea star wasting disease hit the Oregon coast, the marine reserves ecological monitoring program responded by conducting surveys at multiple intertidal sites on the Oregon coast to contribute to our understanding of the breadth of impact along the coast. The program established sea star intertidal monitoring activities at the Otter Rock and Cascade Head Marine Reserves in addition to the monitoring by PISCO at the Cape Perpetua Marine Reserve ³⁷⁻⁴⁰.

SUBTIDAL SEA STAR WASTING DISEASE

Our program also contributed new knowledge about sea star wasting disease in the subtidal habitats of Oregon's nearshore with ROV ³² and SCUBA ^{4,10,15,25} monitoring. We learned that not all subtidal sea star species responded the same to sea star wasting disease, and species' responses were not uniform across the coast. Variation among species in the timing and extent of population changes adds a new element to the overall understanding of the impacts of sea star wasting disease.

MICROPLASTICS IN FISH

In 2018, we were approached by Dr. Susanne Brander at OSU to work on her pilot project studying microplastics in nearshore rockfish. For the next two years, we collected nearshore rockfish samples during our hook-and-line monitoring surveys. The study found that ~12% of the fish collected had microplastics in their gastrointestinal (GI) tract, providing the first documentation of microplastics in nearshore rockfish populations on the Oregon coast. The study also found 25% of particles in the GI tract included dyed and processed cotton from laundered items or broken-down fishing rope. Fish collected near Cape Falcon and Cascade Head had more particles found per fish per site than fish caught off the coast of Newport, or near Cape Perpetua or Redfish Rocks (Lasdin et al., in prep.).



MARINE NOISE POLLUTION

Noise in the ocean can stem from multiple sources, including anthropogenic activities, natural processes and biological sources. Anthropogenic underwater noise is now recognized as a world-wide problem, and recent studies have shown a broad range of negative effects in a variety of taxa. There is limited information on shallow water underwater noise levels in state waters. A recent collaboration at the Redfish Rocks and Otter Rocks Marine Reserves between NOAA and Oregon State University began to address this knowledge gap by recording summer seasonal ambient sound at these marine reserve sites and south of the port of Newport. Char-

acterization of the underwater sound recordings found more ship generated noise just south of Newport than at either the Otter Rock or Redfish Rocks Marine Reserves. There was also a steady contribution of snapping shrimp noise at the Redfish Rocks Marine Reserve. This study helps to inform the current threat of anthropogenic noise to organisms at both marine reserves is reduced in comparison to chronic levels near active ports along the coast.

ECOSYSTEM IMPACTS OF MULTIPLE STRESSORS

Recent literature from northern California highlights a phase shift from species-rich, macroalgal-dominated kelp forests to species-poor urchin-dominated barrens, in response to multiple ecosystem stressors including the reduction of Bull Kelp, the decline of predatory sea stars, and marine heat waves (Rogers-Bennett and Catton 2019). The documentation of such changes extends from just north of San Francisco to the Oregon border, raising concerns about changing nearshore ecosystem conditions on the Oregon coast. Our ecological monitoring at 14 sites along the Oregon coast provides multiple lines of evidence about the changes in rocky reef communities in the nearshore and suggests that the response to multiple ecosystem stressors in Oregon has been varied.¹⁻⁴¹ Some of those observations include declines in many predatory sea star species, but not all species, and not at all sites, and varying magnitudes of change in sea urchin densities across the Oregon coast. Increases in crustose coralline algae appear to be similarly dominant at many sites. These observations are supported by recent work by Hamilton et al. (2020) on Bull Kelp beds in Oregon, documenting heterogeneous coverage over the years, including declines, increases and stability in population trends across the coast. There has not been the large-scale emergence of sea urchin barrens on the Oregon Coast, as there has been in California. Continued long-term monitoring at multiple sites will provide a more complete understanding about spatial heterogeneity and broad patterns in the disturbance and resiliency of dynamic nearshore marine communities to multiple stressors.



E.3 WE ADAPTED OUR ECOLOGICAL MONITORING AT EACH MARINE RESERVE BASED ON LESSON LEARNED AND SHARED METHODS DEVELOPMENT, HELPING ADVANCE NEARSHORE AND MPA RESEARCH.

The staggered implementation of Oregon’s Marine Reserves provided an opportunity for the ecological monitoring program to [adapt](#) monitoring at each site based on lessons learned. Initial monitoring efforts at Redfish Rocks and Otter Rock included tools or comparison areas that were eventually discontinued.³³ Some tools were modified to be more efficient (e.g. SCUBA, ROV, Video Lander surveys), and these [modifications](#) were incorporated into monitoring at other reserve sites. Several of our efforts to develop monitoring tools resulted in [peer reviewed publications](#) and [ODFW informational reports](#) allowing us to share our methods development with others, helping advance nearshore and MPA research. For example, analysis of initial data at Redfish Rocks from hook-and-line surveys highlighted that our surveys were missing species commonly caught in the local longline fishery, which accounts for 1/3 of local commercial fish landings. We then collaborated with the local fishing fleet to develop a [supplemental bottom longline survey](#) to pair along with our rod and reel hook-and-line surveys at that specific reserve. This is the first [documentation](#) of the use of modified commercial longline gear as a catch-and-release method for marine reserve monitoring.

E.4 WE RELY ON VOLUNTEERS TO HELP SUPPORT OUR HOOK-AND-LINE AND SCUBA MONITORING EFFORTS.

With limited ODFW ecological monitoring staff, we have developed several monitoring tools to incorporate the support of volunteers and built a strong volunteer base to support our monitoring efforts. We recruit, train, and maintain a list of experienced volunteer anglers to support our Hook-and-Line surveys. These volunteers help us increase our sample sizes of fish species, counts and sizes during survey days. We also provide local training opportunities for graduate students as our Hook-and-Line biological assistants, to gain valuable Pacific Northwest fieldwork experience. ODFW does not have a SCUBA program and current agency policy does not allow staff to dive. However, we recognized early on that SCUBA surveys are an effective research method for collecting data in shallow, subtidal rocky reef

environments. To overcome this hurdle, we partnered with the Oregon Coast Aquarium and Oregon State University (OSU), who have established scientific diving programs and dedicated dive safety officers, to recruit and train volunteer American Academy of Underwater Science (AAUS) certified divers to conduct our SCUBA monitoring surveys. Hook-and-line and SCUBA monitoring efforts rely on the generosity and dedication of fellow Oregonians to support monitoring of nearshore resources.

E.5 WE HAVE FOSTERED COLLABORATIVE ECOLOGICAL RESEARCH COMPATIBLE WITH THE GOAL OF CONSERVING MARINE HABITATS AND BIODIVERSITY.

Our program fostered collaborative ecological research in three ways. First we partnered with programs and research groups with already established long-term datasets at marine reserve locations such as the Redfish Rocks ³⁶, Otter Rock ³⁶ and Cape Perpetua Marine Reserves. ^{21,37-38,41} Second, we built new collaborations to study juvenile fish settlement ³⁵ with academic, non-academic and community partners at Redfish Rocks and Otter Rock, and we opportunistically expanded our oceanographic monitoring efforts to encompass marine reserve sites beyond Cape Perpetua. ⁴¹ We also built new collaborations with the Oregon Coast Aquarium and the OSU Scientific Diving Program to create a volunteer dive program (that recruits, trains, and retains divers) in support of marine reserve SCUBA monitoring. Third, we collaborated with the fishing community to improve monitoring gear design (e.g. moorings), determine sampling locations, and to trial new monitoring methods to better represent targeted species. On the recommendation of one of our captains out of Port Orford, we collaborated to design a pilot study to expand our hook-and-line efforts to include the use of longline gear at the Redfish Rocks Marine Reserve. He helped design the project, collect the data, and the study resulted in a [journal publication](#) along with the inclusion of longline gear as a supplemental tool to our typical rod and reel hook-and-line surveys.

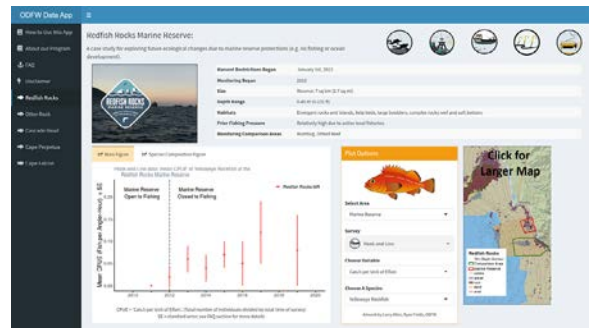


E.6 AS LIVING LABORATORIES, THE MARINE RESERVES CREATE OPPORTUNITIES FOR SUPPORTING EDUCATION AND COLLABORATIVE RESEARCH WITH STUDENTS AND UNIVERSITIES.

Our program has created opportunities for students ⁴², classes, and academic researchers alike to use the marine reserves as living laboratories. Our program provided \$45,000 in support of student scholarships in support of research that supports the evaluation of marine reserve conditions, effectiveness or generates new knowledge in support of nearshore resource management. In addition to scholarship support, we've worked with students to support their thesis work providing data collection opportunities, fieldwork support and/or mentorship for their projects. ⁴² We've provided data in support of class projects at universities including the University of Oregon, Portland State University, Oregon State University, and California State University Monterey Bay. We've worked to support student internships (e.g. Oregon Sea Grant Scholars, OSU Marine Studies Initiative Internship) and class fieldtrips, and provided opportunity for college students to be trained as hook-and-line biological assistants and gain fieldwork experience on the Oregon Coast. We've also partnered with professors and research associates in support of short-term nearshore research projects.

E.7 WE DEVELOPED ANALYTICAL INFRASTRUCTURE TO FACILITATE MORE EFFICIENT DATA MANAGEMENT AND REPORTING.

In the first 10 years of the Ecological Monitoring Program, we accumulated significant methodological and analytical infrastructure that will facilitate more efficient cycles of data collection and reporting in the future. This analytical infrastructure includes well-developed protocols, databases, video review skill, quality assurance and control procedures, statistical and interpretive skill and computer code. Additionally, we created an online [data dashboard](#) to facilitate knowledge sharing and allow for preliminary exploration of trends in ecological monitoring data. One silver lining of the COVID-19 pandemic was that dedicated staff time



for fieldwork was instead focused on advancing analytical infrastructure; without this focused time in the office there would be fewer analyses included in this report. All these efforts have increased our programmatic capacity for data management and reporting, which will reduce lag times between data collection and reporting research results back to stakeholders.

E.8 WE SHARED HOW OUR PROGRAM LEARNED AND ADAPTED THROUGH NUMEROUS PUBLICATIONS, INCLUDING PEER REVIEWED JOURNAL ARTICLES, AND PRESENTATIONS.

We shared our process of learning and adapting as we established Oregon’s Marine Reserves Monitoring Program through many types of publications and presentations. We have posted our ecological monitoring plan documents on our website, and generated [peer-reviewed scientific journal publications](#) and [ODFW Informational Reports](#). We created [infographics](#) related to our monitoring and research. We have shared updates from the field and summaries of research findings in our [Reserves News](#) posts on our website and in our annual [hook-and-line volunteer newsletter](#) as well as in presentations to community groups, at scientific conferences, in formal and informal meetings with partners and collaborators, and at outreach events. Sharing data collection efforts and research results back to interested stakeholders is an important contribution from our program.

E.9 BUILDING LONG-TERM PARTNERSHIPS TAKES SUBSTANTIAL TIME AND EFFORT.

We have found that long-term partnerships and collaborations take substantial time and effort to develop. Many partnerships start enthusiastically but struggle to stay focused throughout the duration of the project to produce final products. Collaborators are willing to devote time to initial data collection and sampling refinement; however, it has been consistently difficult to sustain engagement during data management and report writing. Challenges such as staff turn-over, new project priorities, and/or shifts in budgets are to be expected and have forced us to adapt our relationships through time. These natural setbacks have at times strained partnerships or placed an undue burden on ODFW staff as data management and reporting responsibilities are deprioritized in favor of maintaining data collection efforts. We found that successful collaborations start with clearly defined roles and responsibilities that set firm goals for data management and final reporting deadlines upfront. The keys to maintaining long-term partnerships/ collaborative efforts to date have included good lines of communication, commitment (of funding or personnel), and flexibility as unforeseen challenges arise.

E.10 DEVELOPING DATA MANAGEMENT AND REPORTING PROCEDURES (ANALYTICAL INFRASTRUCTURE) TAKES TIME.

The startup of ecological monitoring activities typically focuses on data collection efforts, with the intent of developing data management and reporting at a later date. For the Ecological Monitoring team, the time to focus on data management and reporting is during the “off-season” in parts of the year not focused on data collection efforts (Nov-Feb). Historically, it has been difficult to complete data management and reporting procedures while also allowing staff recovery time from a busy field season. Analytical and reporting procedures during initial survey years were typically focused on one-tool or exploratory data analysis to refine data collection efforts the following field season. A significant effort was dedicated to completing database design and building analytical infrastructure as part of the Synthesis Report, in part supported by the lack of fieldwork caused by the COVID-19 pandemic. Now that this foundational infrastructure has been developed, future data management and basic reporting will be more efficient and better facilitate sharing the results of monitoring efforts.

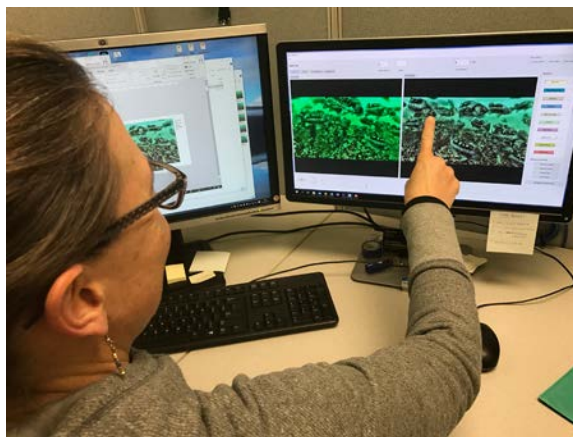
E.11 IN OREGON’S NEARSHORE OCEAN, FAVORABLE SEA STATES (INCLUDING VISIBILITY) ARE LIMITED. THEREFORE, SAMPLING DESIGNS MUST CAREFULLY CONSIDER STAFF CAPACITY AND CHALLENGING LOGISTICS FOR ACHIEVING DESIRED SAMPLE SIZES NEEDED TO DETECT CHANGE.

Throughout the 10 years of ecological monitoring efforts, our program was particularly limited by favorable sea states in the nearshore. The result was reduced sample sizes or useable data, despite staff efforts to adjust monitoring activities to accommodate favorable sea states. With three permanent staff, 14 different monitoring sites, and four core tools, we partitioned capacity among workable sea state days. Prioritizing multiple methods or monitoring sites limited the ability to obtain desired sample sizes to detect small changes, i.e. changes smaller than a doubling of population size.³⁴ We were able to detect large changes despite having to partition capacity amongst sites and tools such as with increases in Black Rockfish, Lingcod or sea urchin densities, or declines in sea stars associated with sea star wasting

disease.³⁴ Future monitoring priorities should consider the trade-off in partitioning capacity among sites and monitoring tools with the desire for detecting different amounts of change.

E.12 SUSTAINABLE LONG-TERM ECOLOGICAL MONITORING EFFORTS NEED TO FIND THE RIGHT BALANCE OF DATA COLLECTION, DATA MANAGEMENT AND REPORTING.

For an ecological monitoring program to be sustainable it should find the right balance of data collection needed to detect change and data management and reporting requirements given capacity (funding and personnel). There are [many steps](#) involved with developing a long-term monitoring program. The first five to six years of the ecological monitoring program were mainly focused on data collection efforts, learning, and adapting what tools and methods would reliably collect data and developing partnerships to build monitoring capacity at each of the reserves. The last few years leading up to the Synthesis Report focused more on data management and reporting, while determining the right balance of managing fieldwork at 14 different sites with staff burn-out. Now is the time for reflection on the sustainability of the ecological monitoring program developed to date. As the ecological monitoring program moves forward, it will look to better balance staff workloads among these tasks by 1) exploring adjustments to monitoring efforts to reduce redundancy and/or sample sizes needed to detect future changes and 2) building on current analytical infrastructure to facilitate easier data management and reporting requirements.



E.13 CURRENT ECOLOGICAL MONITORING EFFORTS CAN BE MORE EFFICIENT BY FOCUSING ON THE MOST EFFICIENT TOOLS TO DETECT CHANGE AT EACH SITE AND BY ANALYZING CURRENT DATA.

Developing a nearshore monitoring program was a new marine resource management approach for the State of Oregon. As such, the program went through a period of learning and adapting, developing, and revising different monitoring tools to track ecological changes at the reserves and comparison areas. Based on the analyses done for this Synthesis Report it is now clear that current monitoring efforts can be more efficient by focusing on the most efficient tools to detect change at each site and continuing to analyze current data. For example, there are currently four monitoring tools at the Redfish Rocks Marine Reserve used to monitor fish populations – the ROV, lander, SCUBA, and hook-and-line/longline. However, in assessing their strengths and weaknesses as the program developed and in part for this report, the ROV and hook-and-line/longline monitoring tools were more efficient at detecting smaller changes in fish populations than the lander or SCUBA efforts.³⁴ For some visual surveys such as SCUBA, harsh weather conditions along the Oregon coast can severely restrict the available survey days in a season, and some survey sites are consistently difficult to reach. It may be beneficial to consider prioritizing tools supporting more consistent access (e.g. hook-and-line) at these sites. Furthermore, there is more to be learned from the data already collected such as exploring species-habitat relationships or pairing biological and oceanographic data with additional species, tools and sites.

E.14 DESCRIBING THE NATURAL VARIABILITY FOUND IN OREGON'S NEARSHORE TOOK 10 YEARS OF EFFORT TO DETERMINE THE APPROPRIATE SAMPLING TECHNIQUES AND INTERPRET DATA TRENDS TO PROVIDE A SOLID FOUNDATION FOR FUTURE CHANGES.

While our baseline monitoring efforts at each marine reserve documented snapshot differences and similarities between the marine reserve and comparison area sites, we had no way of knowing whether these documented differences were biologically relevant, or part of natural variability typically observed in the nearshore. Conducting methods development while also tasked with baseline monitoring was challenging and resulted in excluding some methods from future use and some baseline data from future analysis. Furthermore, marine reserves are established into broader oceanographic contexts that can include decadal cyclic trends in ocean and atmospheric patterns (e.g. Pacific Decadal Oscillation or ENSO), short-term, pulse events such as the 2014-2015 marine heatwave (i.e. 'The Blob'), or secular trends in warming due to climate change. These ongoing oceanographic and ecological patterns necessarily mean that describing a base state of natural variability will take multiple years, and that a rigid BACI design and

analysis are not feasible in a complex marine environment. As our monitoring continued after restrictions were put in place, we gained confidence in our ability to survey the nearshore and detect trends. We prioritized our modeling approach in this synthesis to focus on detecting changes by site and through time, allowing us to consider our entire time series of data collection and have greater power to detect trends. The process of developing the appropriate tools to sample the nearshore in Oregon, developing the analytical infrastructure, and analyzing and interpreting the results from 14 different sites took time. Ten years after the implementation of the marine reserves ecological monitoring, we feel confident our efforts have provided a solid foundation to evaluate future changes.

E.15 WHILE WE DISCONTINUED SEVERAL SAMPLING TOOLS BECAUSE THEY DID NOT GENERATE COST-EFFICIENT DATA; EACH TOOL IDENTIFIED INTERESTING BIOLOGICAL PATTERNS THAT MAY NOT HAVE BEEN CAPTURED OTHERWISE.

There were three tools that ODFW initially focused on at several of the early marine reserve sites, including benthic extraction, the video sled and otolith sampling, that were discontinued.³³ The resolution of the biological datasets generated from these baseline data collection efforts, did not meet ecological monitoring goals and/or was not sufficient to justify the operational costs or time investment. However, each of these tools resulted in new biological knowledge that would not have otherwise been captured. For example, our benthic extraction surveys documented the occurrence of three species of brown macroalgae never before reported in Oregon waters.³³ The development of each tool, which included data collection pre-closure and lessons learned from fieldwork and data analysis, enables the Marine Reserves Program to easily reinstate the tools to address future research questions, if warranted.³³

E.16 ECOLOGICAL MONITORING DATA BY TOOL, BY SPECIES, BY SITE WERE INHERENTLY MESSY, AND A FOCAL SPECIES APPROACH TO REPORTING MAY NOT HAVE BEEN THE BEST APPROACH.

This is the first time the concept of focal species was included in reporting for ecological monitoring data. Reporting on a select number of species provides efficiency for analysis and reporting and is a common approach in other marine reserve monitoring programs (CDFW 2018). [Focal species](#) were chosen based on ecological, management and/or economic importance, in addition to seeking input from experts and the potential for long-term monitoring. Each survey tool has its own strengths and biases in species detection, and this led to some analytical and reporting challenges. For example, monitoring data for several species such as Yelloweye Rockfish²⁹, the California Sea Cucumber³⁰, and Woody-stemmed Kelp³¹, were often zero heavy, with limited observations spread out amongst sites, and the data violated assumptions of our modeling framework. In such cases we presented raw data summaries and did not pursue alternative statistical strategies since it was unclear if they would yield interpretable results. Had we instead reported on the top four or five most abundant species per site per tool, this would likely have resulted in the statistical analyses for a larger suite of species. We also discovered that Bull Kelp was not well represented in ecological monitoring data, despite its potential for observation in SCUBA or Lander Video surveys. The Ochre Sea Star and Purple Sea Urchin were not well suited as focal species with the ROV^{7,18}, since these species reside in habitats typically shallower than those targeted by ROV surveys. The Red Gorgonian could only be reported on by the ROV, because it was not observed by any other monitoring tool, and typically occurs at depths deeper than SCUBA or Lander Video surveys.

F. MOVING FORWARD

The ecological monitoring of Oregon's marine reserves will continue with minor, site-specific adjustments based on lessons learned from the analyses supporting the Synthesis Report. We reflect on how we can improve monitoring and what our expectations of change are at each site.

F.1 HERE'S HOW WE CAN BE BETTER

After the first 10 years of ecological monitoring, our program has identified several ways in which we can improve ecological monitoring at Oregon's five marine reserve sites. Improving the current ecological monitoring program could occur with one of two scenarios: the first assumes funding and staff capacity remain the same; the second assumes an increase to funding or staff capacity. A third scenario of reduced funding would mean the program could not be improved but would need to be scaled back.

STAFF AND/OR FUNDING REMAIN THE SAME:

- Focus monitoring with the most efficient tools at each marine reserve
- Consider ways to increase detection of change:
 - Move to higher intensity sampling at greater intervals
 - Focus some monitoring efforts to only a single season
 - Develop permanent transects for SCUBA surveys
- Prioritize continued analysis, reporting results, and sharing back to local communities

The top three ways the ecological monitoring program can improve if funding and staffing remain the same have to do with both data collection and reporting. First, if we focus monitoring efforts on the most efficient tools at each marine reserve, this will reduce the number of fieldwork days requiring favorable sea states for most sites. This reduction of effort can either allow staff to focus on data management and reporting or allow for a potential increase in sampling intensity for these tools. Second, there are a few different options for our program to consider if we want to focus on increasing our ability to detect change. We could shift the timing of sampling for some tools or sites to one single season or move to higher intensity sampling at greater intervals among sites. We also plan to shift our SCUBA monitoring design to focus on permanent transects, and comparing rates of change, now that we have a better understanding of the spatial variability of shallow rocky reef communities. Third, we can continue to improve by prioritizing analysis and reporting of monitoring data and sharing results back to local communities. The results underlying this Synthesis Report, have led to additional research questions and next steps for analysis. We can continue to learn about the dynamics of Oregon's nearshore ecosystems by prioritizing these analyses and reporting results back to local communities.

INCREASE TO STAFF OR FUNDING:

- Fourth permanent ODFW ecological staff member
- Increased frequency and reporting of ROV surveys
- Support for reporting by long-term collaborators

The top three ways the ecological monitoring program can improve with an increase in staff and funding focus on staff capacity and additional money in support of ROV surveys. A fourth permanent ecological staff member would enable our program to make better use of limited weather windows on the Oregon coast while additionally providing support for analysis and reporting. ROV sampling occurs at infrequent intervals because of the high cost of chartering vessels for ROV sampling and the small budget of the Marine Reserves Program. Much of the ROV sampling was supported by successfully pursuing external funding for various research topics and conducting that research at marine reserve and comparison area sites. The Marine Reserves and Marine Habitat programs that collaborate to conduct ROV surveys have also struggled with reporting results also because of small budget and staff of both programs. Additional funding to increase the frequency and/or reporting of ROV surveys would capitalize on the valuable data streams gathered from ROV monitoring, while providing new information about the status of dynamic nearshore communities. One of the challenges shared from several long-term collaborative partners relates to full-time funding of research staff. Many research technicians or research associates are on grant-funded salaries and do not have the time or the funding to take on reporting on marine reserves' data. Additional money from the Marine Reserves Program to support report writing by collaborators would reduce lag times between data collection efforts and technical reports summarizing the latest knowledge on resource status.

F.2 EXPECTATIONS OF FUTURE CHANGE

The expectation for the Marine Reserves Ecological Monitoring Program is that it will detect future nearshore ocean changes in biological communities that are attributable to either natural or human stressors, while contributing new knowledge to marine reserve effectiveness. This assumes that capacity and funding remain at current levels, and therefore monitoring continues at all sites at a frequency that can detect change. There are different types of [change](#) that can occur, including those associated with marine reserve protections, and the interpretation of these changes is linked to the unique characteristics of each marine reserve site.

Oregon’s five marine reserves vary in their size, habitats, depths, and past fishing pressure – important characteristics that can influence the types of ecological responses to reserve protections and the magnitudes of those responses. In a relative comparison across the five reserves, based on their site characteristics, we expect that some of the sites are more likely to exhibit ecological responses due to protections (i.e. cessation of fishing) that we will be able to scientifically detect and attribute to protection. For instance, the Redfish Rocks and Cascade Head Marine Reserves are relatively large in size, have larger areas of rocky reef found at both shallow (< 25 m) and deep (> 25 m) depths, and experienced greater past fishing pressure compared to the other three reserves. Therefore, we are more likely to see changes attributable to marine reserve protections at these sites. For more information comparing attributes of the marine reserves see our [Ecological Monitoring Plan](#).



Figure 11. Relative comparison of the reserves: Based on site characteristics, which of the sites are more likely to elicit an ecological change due to protections (i.e. cessation of fishing) in the future, that can be scientifically detected and attributable to protections.

HOW QUICKLY WILL WE SEE CHANGE ATTRIBUTABLE TO MARINE RESERVE PROTECTIONS? With Oregon’s temperate marine ecosystem where many species are long-lived, slow to grow and reach sexual maturity, scientists project a minimum of 10-15 years, and for some species as long as 40 years, after extractive activities (i.e. fishing) have ceased before we might begin to scientifically detect and attribute any ecological changes due to protections (CDFW 2018, Kaplan et al. 2019, Nichols et al. 2019, Starr et al. 2015). We also know that not every marine reserve will show the same response through time (Lester et al. 2009; Caselle et al. 2015; STAC 2008). Currently our two oldest reserves, Otter Rock and Redfish Rocks have the most recent monitoring data from eight years (2019) after harvest restrictions began (2012). Cape Falcon Marine Reserve, the newest marine reserve, has its most recent monitoring data from four years (2019) after harvest restrictions began (2016). Cape Perpetua and Cascade Head Marine Reserves have their most recent biological data collections from five years (2018) after harvest restrictions began (2014). To date, we have not observed changes that we can attribute to marine reserve protections at any site, which matches our expectations as documented elsewhere in temperate marine ecosystems (CDFW 2018, Kaplan et al. 2019, Nichols et al. 2019, Starr et al. 2015). The site characteristics of the Redfish Rocks and Cascade Head Marine Reserves suggest that we would likely detect changes attributable to marine reserve protections at these sites sooner than at our other marine reserve sites; however, the staggered implementation of marine reserve sites in Oregon means that these timelines are slightly different for each reserve.

INVALUABLE DATA TO UNDERSTAND FUTURE CLIMATE AND OCEAN CHANGES. Long-term monitoring helps us understand and attribute changes in dynamic nearshore communities at 14 different sites along the Oregon coast. Just as the marine reserves themselves are unique, so too are their ecological responses to changing ocean conditions, be they from natural, human, or cumulative stressors. The ecological monitoring program is set up to provide detailed observations of nearshore ocean changes and has documented its ability to do so. Therefore, it is uniquely positioned to provide valuable information on future climate and ocean change stressors, as well as nearshore ocean management and emerging ocean issues.

For scientific names of species referred to in this chapter, please see [Table 3](#) for reference.



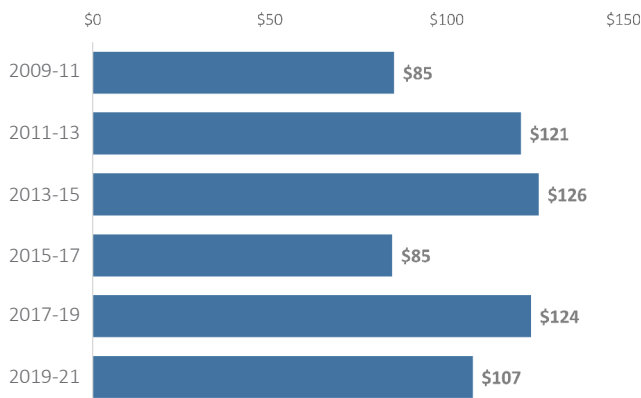
5.3 HUMAN DIMENSIONS RESEARCH

PROGRAM RESOURCES



SUPPLIES & SERVICES BUDGET (THOUSANDS)

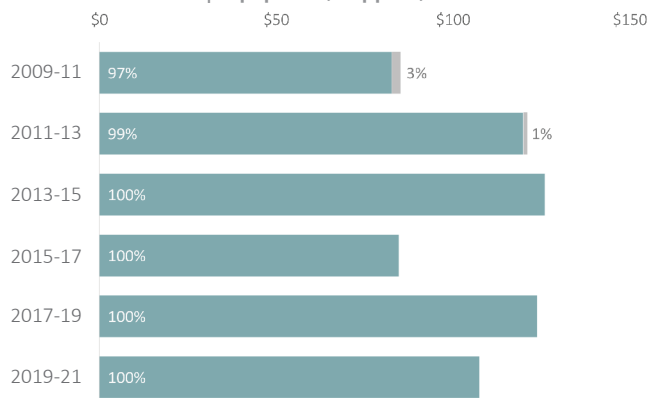
State Funds



NOTE: Budget does not include staff

EXPENDITURES (THOUSANDS)

Research Contracts | Equipment, Supplies, Other Services



STAFF CAPACITY (FTE)

ODFW Program Staff | ODFW Temps & Student Interns | Non-ODFW Fellows & Student Interns



PARTNERS

- Oregon State University
- Oregon State University- Cascades
- Portland State University
- The Research Group, LLC
- University of Michigan

-
- A. INTRODUCTION**
 - B. MANDATES AND RELATED HUMAN DIMENSIONS RESEARCH**
 - C. HOW WE GOT HERE: FROM MONITORING PLANS TO RESEARCH METHODS**
 - D. KEY HUMAN DIMENSIONS RESEARCH PROJECTS**
 - E. AN OVERVIEW OF RESEARCH RESULTS AND CONCLUSIONS**
 - F. MARINE RESOURCE MANAGEMENT AND RESEARCH CONTRIBUTIONS**
 - G. LESSONS LEARNED AND MOVING FORWARD**
-

Authors: Dr. Thomas (Tommy) Swearingen – ODFW Human Dimensions Research Project Leader (NRS3)
Haley (Epperly) Fox- Oregon Sea Grant Natural Resources Policy Fellow

A. INTRODUCTION

In this chapter, we will examine the research and monitoring activities of the Human Dimensions Project. We'll consider the mandate for this exploration and how this body of research was designed to respond to that mandate. In the process, we'll highlight the broad range of interdisciplinary studies conducted to assess the socioeconomic effects of the marine reserves. Some of the most important studies will be reviewed, and then a brief synthesis of the results of this research will be examined. Our discussion will then point to several studies that were designed to also provide information of relevance to nearshore marine resource management. Some methodological and educational contributions will also be briefly illustrated. Finally, we will offer some reflections on the implications of this decade of work in relation to lessons learned and future marine reserves socioeconomic research in Oregon.

We should note that the Human Dimensions Project is one full-time position with a modest budget. We have been fortunate to have also worked with one individual as a Summer Scholar/temp staff/graduate fellow for many years. As a result, the breadth of the research has required a large number of external collaborators who lent their respective disciplinary expertise, time, and support to execute this range of interdisciplinary research projects. We could not have succeeded in accomplishing our research objectives without these collaborators' contributions.



B. MANDATES AND RELATED HUMAN DIMENSIONS RESEARCH

The following table includes an overview of the human dimensions elements of the marine reserve mandates and related human dimensions research and monitoring projects. Additional details about some key studies and results will follow. This body of research is reviewed in greater detail in the [Human Dimensions Technical Appendix](#) and in much greater detail in the various original [project reports and articles](#).

Mandates	Related Project Research and Monitoring
<p>OPAC, Objective 3 Site fewer than ten marine reserves and design the system in ways that are compatible with the needs of ocean users and coastal communities. These marine reserves, individually or collectively, are to be large enough to allow scientific evaluation of ecological effects, but small enough to avoid significant adverse social and economic impacts on ocean users and coastal communities.</p> 	<ul style="list-style-type: none"> • Meeting with STAC and other expert advisors, we developed the Human Dimensions Monitoring Plan in 2012, updated in 2017. Baseline data collection was initiated from 2009 to 2016. • We then adapted our research focus after 2017 to emphasize comparative longitudinal studies, with less emphasis on baseline characterization of ocean users and coastal communities. • Various research projects included academic and consultant collaborators in natural resource management and policy, fisheries economics, rural and natural resource sociology, social psychology, and anthropology. • Our series of baseline studies to characterize nonconsumptive ocean users and coastal communities included visitor pressure counts, visitor surveys, business surveys, and coastal community economic and demographic profiles. • A series of ethnographic and sociological case studies were conducted to investigate community social identity related to fishing, the resilience of coastal communities, and how the reserves might affect those communities. • Broadscale economic summaries of the fishing industry included both commercial and recreational economic contributions, disaggregated by numerous criteria to identify relevant and more vulnerable fisheries, and their economic contributions at the state, coast region, and county/port group levels. • Related community fisheries economic engagement, dependence, and social vulnerability indices were developed to identify critical fisheries and communities for further study. • An additional economics project involved developing, improving, and updating a spatial model of nearshore fisheries economic contributions, allowing assessment of the potential impacts of marine reserves fishing displacement. • Multiple quantitative and qualitative studies were initiated to investigate the effects of the marine reserves on commercial and charter fisheries and individual fishers, with particular attention to the most vulnerable fisheries and communities. • Our survey research included numerous studies of marine reserve perceptions, knowledge, and support among coastal residents, communities of place, and communities of interest, including perceived impacts and fishing effort shift among commercial, charter, and recreational fishers. Coastal visitor surveys included assessing trip motives to gauge marine reserve impacts on travel decisions.

Mandates (continued)	Related Project Research and Monitoring (continued)
	<ul style="list-style-type: none"> • Comparative longitudinal surveys were conducted in 2021 among coastal visitors and business owners, coastal residents, marine reserve proximate residents, and Interstate 5 (I5) corridor residents. One of these 2021 studies also included a panel sample design comparing the same individual respondents from the 2013/2016 baseline surveys. • We used times series analyses to investigate potential marine reserve effects on charter, commercial, and recreational fishers, the coast region, and coastal communities, using secondary data streams from prior to reserve implementation up to the present. • Data analyzed included commercial fisheries landings and employment, catch per unit effort on charter fishing trips, recreational fishing license sales, and community social welfare indices and related Census data.
<p>OPAC, Objective 4</p> <p>Use the marine reserves as reference areas for conducting ongoing research and monitoring of reserve condition, effectiveness, and the effects of natural and human-induced stressors. <i>Use the research and monitoring information in support of nearshore resource management</i> and adaptive management of marine reserves.</p>	<p>Whenever possible as we initiated studies, there was an effort to collect information of broader implications for nearshore management. Examples included:</p> <ul style="list-style-type: none"> • The fisheries spatial economic model, which encompasses the entire Oregon nearshore (state) waters and most important nearshores fisheries. It can be used to assess the related economic impacts for any nearshore spatial management decision. • Coastal community demographic and economic profiles. • Survey research on visitor ocean awareness and resident ocean acidification and hypoxia (OAH) awareness. • Survey research on commercial fishers’ familial successional planning, to provide quantitative data on the impacts of the “greying” of the fleet. <p>Methodological contributions included development of scales of community and individual resilience, subjective well-being (SWB) scales and related SWB contingent vignette applications for policy analyses, and the use of numerous secondary data in time series analyses to assess the socioeconomic effects of marine reserves.</p>

C. HOW WE GOT HERE: FROM MONITORING PLANS TO RESEARCH METHODS

The Marine Reserves Human Dimensions Project was charged with monitoring the socioeconomic effects of marine reserve implementation. Our specific responsibilities were to determine if the marine reserves had adverse socioeconomic impacts on coastal communities and ocean users. To the extent possible, we were also to conduct research activities that could contribute to nearshore marine resource management. To assess the socioeconomic impacts of the marine reserves required a broad-based interdisciplinary research agenda. As a result, the research conducted has been highly collaborative, involving research partners from several institutions and many social science disciplines.

To address the research objectives identified in the enabling legislation and subsequent Oregon Ocean Policy Advisory Council (OPAC) interpretations, we worked with members of the OPAC Science and Technical Advisory Committee (STAC) and other social science professionals to devise the Marine Reserves Human Dimensions Monitoring Plan ([2012](#), [updated 2017](#)). There were numerous additional meetings over the ensuing years with an expanded team of technical advisors that helped refine this research agenda. The monitoring plans identified four main areas of research focus:

A. GENERAL SOCIAL AND ECONOMIC CHARACTERIZATION OF THE AREA

Baseline information was collected to develop social, cultural, and economic characterizations of the geographic and occupational communities located on the coast and in proximity to marine reserves. Subsequent community studies and related secondary data then provided the information needed to assess trends in social welfare and economic conditions of coastal communities.

B. DIRECT USE OF THE AREA

Data were collected over time to allow assessment of trends related to the marine reserves among commercial fisheries, recreational fisheries, and nonconsumptive ocean users.

C. ATTITUDES AND PERCEPTIONS OF IMPLEMENTATION AND MANAGEMENT

Studies were conducted to advance understanding of the knowledge, attitudes, and perceptions of residents of communities of place (geographic coastal communities), communities of interest (stakeholders) and the general public (Oregon residents) toward marine reserves. Subsequent iterations of these studies allowed comparisons with the earlier baseline data.

D. ASSESSMENT OF NON-MARKET VALUES OF THE AREA

Data were collected to identify the non-market values connected to the marine reserve sites and other coastal areas. These data will increase understanding of the potential economic and social effects, both positive and negative, of these protected areas.

In response to the monitoring plans and expert advice, we developed a long-term data collection strategy. Some of the objectives were longitudinal and comparative, identifying changes in constructs or metrics over time. Other objectives were more descriptive, such as characterization of coastal communities and communities of place and of interest. To design the related research that would provide the data to meet these objectives, we, with collaborating partners, utilized a range of social science research methods and tools including:

- Surveys (mixed methods surveys, intercept surveys, participatory GIS surveys)
- Pressure counts (observational surveys)
- Economic modeling and related data aggregation
- Community studies (ethnographies, community case studies)
- Analyses of secondary data (time series analyses)
- Individual interviews

Logically much of the data that were collected would be compared over time, with baseline data compared to the latest available data. For that reason, several studies were repeated in 2021 immediately prior to the submission of this report. Some of these data were continuous data streams, such as secondary demographic and economic data (e.g., fisheries data, Census data). Comparisons across these types of data were accomplished using time series analyses. Many of our studies were a series of discrete research projects, such as visitor intercept surveys repeated over time. Still other studies were based on qualitative data.

The six research tools were employed to provide data to address all of the ODFW human dimensions research questions identified in the monitoring plan. However, the studies also frequently provided information that relates more broadly to nearshore marine resource management. The latter implications are discussed in the last section of this chapter pertaining to contributions. How this disparate body of quantitative and qualitative research can be organized into a coherent whole is discussed subsequently.

D. KEY HUMAN DIMENSIONS RESEARCH PROJECTS

Presenting these various studies across several social science disciplines in a coherent manner is a challenge. A simple review of each study independently might cover the implications for the coast region (e.g., economic impact analyses) or specific coastal communities (e.g., community social welfare data time series analyses) or individuals (e.g., qualitative interviews). Many of these studies, however, relate to several different levels or units of analysis. Since numerous studies might provide some evidence of marine reserve impacts at any given unit of analysis, the reader would be hard pressed to see the logical connections across myriad studies.

To address this challenge, this review will be organized by level of aggregation (i.e., unit of analysis), from the largest aggregations (state and region, the general public) to progressively smaller units of analysis (port groups and counties, geographic communities, stakeholder groups) to the level of individual subjects (personal interviews). At each stage of the discussion, several different studies and disciplines might offer insight into understanding of marine reserve effects at that unit of analysis.

All of the studies discussed in this chapter were either conducted by the Human Dimensions Project or by collaborators under contract*. However, not all of our studies are reviewed here. As space permitted in this synthesis, we wanted to focus only on the most important results that broadly informed our discussion of this decade of research. [The Human Dimensions Technical Appendix](#) presents a more complete picture of these study designs and results. A list of the most important studies follows, with links provided to access the relevant chapter of the Technical Appendix for greater detail**. For consistency, we have organized the lists of studies within each unit of analysis in a systematic manner by type of research method, from quantitative to qualitative projects. The most common sequence will be economic projects and data, then time series analyses of secondary data, followed by survey research, and then qualitative studies. Not all levels of this research review by units of analysis will have all of these types of studies and data. Following this review of the research, we then offer reflections on lessons learned and thoughts on the future of this component of the Oregon Marine Reserves Program.

[Chapter II](#)- State Level Marine Reserves Studies***

1. The 2017 – 2019 Economic Contributions of the Fishing Industry ([TRG 2021a](#))
2. Nearshore Fisheries Spatial Economic Model ([TRG 2021b](#))
3. Time Series Analyses of Commercial Fisheries Data (internal ODFW analysis)
4. PSU Statewide Survey Research ([Manson et al. 2021](#))
5. PSU Perceived Values of the Marine Reserves ([Scully-Engelmeyer et al. 2021](#), [Scully-Engelmeyer et al. 2020](#))

* The few studies funded by multiple entities are noted.

** The links to the technical appendix chapter numbers highlighted in blue start at Chapter II because Chapter I was an introduction without any discussion of specific research results.

*** In the following synopses of research results, the superscript numbers appearing throughout refer to the numbered lists of relevant studies that open each section of the discussion.

Key results from state level studies (superscript numbers below refer to study number in above list):

Economic contributions of the commercial and recreational nearshore fisheries operating in state waters account for \$208M in annual income, representing 3,414 equivalent jobs. However, the fishery potentially most affected by the reserves is the nearshore groundfish fishery. This fishery is most vulnerable because the target groundfish species are highly habitat dependent, and the ports most dependent on the nearshore groundfish fishery are also the most vulnerable small communities. At the statewide (coastwide) level in 2019, that fishery contributed \$3.3M (\$2.6M) in income, equivalent to 54 jobs.¹

To assess potential impacts of implementation of the marine reserves across the entire commercial and recreational fishing industry, a nearshore spatial economic model was created to estimate the potential for economic displacement. This potential economic effect was quite small, representing less than 1% of the regional economic impact (REI) of total marine commercial and recreational fishing in Oregon.² This figure does not include fishing effort shift to substitute fishing grounds. Using interrupted time series analyses of aggregate fisheries data from 1981 to 2019, we found no discernable adverse impacts on fisheries landings.³

A statewide survey indicated that 59% of the public would support marine reserve expansion. Coastal residents (44%) were significantly less supportive of expansion than the rest of the state (61%).⁴

In a related participatory GIS study where respondents placed values pins on a map of the Oregon coast, respondents placed more biodiversity and wildlife pins within the marine reserves than other areas of the territorial sea. Other reserve values cited were wilderness, non-motorized recreation, and aesthetic/scenic values.⁵

[Chapter III](#)- Regional Marine Reserves Studies

1. Coast Regional and Community Characterization ([Epperly et al. 2018](#))
2. Quantitative Time Series Analyses of Coastal Region Secondary Data ([Fox and Swearingen 2021](#))
3. OSU Baseline and Comparative Regional Surveys ([Needham et al. 2013](#), [2016a](#), [2016b](#), 2022)
4. OSU Study of Coastal Resilience and Subjective Well-being (Lindberg et al. 2016, [2019a](#), [2019b](#), [2020](#))

Key results from regional studies (superscript numbers below refer to study number in above list):

A review of Census data highlighted differences between the coast and the rest of the state including the coasts' high number of natural resource and tourism jobs, lower income, high rate of vacant second homes, and older population.¹

Analyses of Census data comparing towns proximate to and distant from the reserves demonstrated significantly greater increases in tourism employment post reserve implementation in proximate towns. A significant increase in Supplemental Nutrition Assistance Program (SNAP) benefits post implementation in towns near Cape Falcon was also observed, but was not correlated to any other changes pertaining to community social welfare.²

A series of baseline (2013, 2016) and comparative (2021) OSU surveys assessed various regional residents' perceptions related to the marine reserves and found significant increases in favorable voting intentions, attitudes towards the reserves, and agreement that the government should do more to protect marine areas in Oregon. These studies also found that perceived understanding of marine reserve purposes, the role of science, and factual knowledge concerning the agency role have increased among many of the respondents, though general factual knowledge scores barely changed and remained low, ranging from 42% to 62% in subsamples.³

An OSU survey of coastal residents found that most respondents thought the total reserve area should increase (50%) or remain the same (39%). Only 11% of respondents thought the marine reserves should be reduced to any degree, and only 5.5% thought the reserves should be substantially reduced. Marine reserves size (area) preference was predicted by environmental worldview, with the high anthropocentric, low biocentric worldview cluster of respon-

dents most in favor of reduction in the aggregate size of the marine reserves. Expectations of reserve impacts was also predicted by respondents' preference for marine reserve size, with more positive expectations predicting support for increasing reserve area.⁴

Chapter IV- Marine Reserves Studies of Coastal Communities

1. Fisheries Economic Importance ([TRG 2021a](#))
2. Turnover in Permits over Time ([TRG 2018a](#))
3. NOAA Indices of Fishing Engagement and Reliance (NOAA 2020)
4. Additional Indices More Relevant to Marine Reserves ([TRG 2018a](#), [2021a](#))
5. Port Orford Marine Research and Management Economic Impact Study ([TRG 2013a](#))
6. OSU and ODFW Community Profiles ([Package and Conway 2010a](#), [2010b](#), [2010c](#), [Eardley and Murphy 2013](#), [Hall and Murphy 2013](#), [Murphy and Hall 2013](#))
7. University of Michigan Case Studies of Coastal Community Resilience ([Ackerman et al. 2016](#), [Fischer 2018](#))

Key results from community studies (superscript numbers below refer to study number in above list):

An analysis of turnover in commercial nearshore fishing permits by port group did not find a decrease in nearshore permittees operating in proximate ports after marine reserve implementation.²

Based on analyses of NOAA data, there was not a significant marine reserve impact on aggregate commercial fishing engagement or reliance in proximate communities.³

Based on analyses of additional fishing related indices more relevant to the marine reserves, Port Orford is both less economically diverse and highly dependent on nearshore fisheries, making it potentially more vulnerable to marine spatial closures in state waters.⁴



Census demographic data indicate that both Garibaldi and Port Orford are more vulnerable to economic disruptions than other coastal communities due to a lack of economic diversity and higher poverty rates.⁴

A pilot study of the economic impact of marine research and management activities found that the economic contributions in Port Orford were substantial.⁵

Qualitative studies of community resilience and cultural fishing identity point out that marine fishing is exceptionally important to coastal residents.^{6,7} These studies also highlight that this identity is threatened by numerous external stressors, but that marine reserves are not the most salient concern. More salient stressors included concerns about the decline in natural resource industry employment and the social and economic impacts of increasing tourism and retirement in their communities.⁷ The communities all had adapted to prior economic disruptions with varying degrees of success depending on several internal institutional factors.⁷

Chapter V.1- Marine Reserves Studies of Communities of Interest

1. Recreational Fishing License Demand in Proximate Coastal Communities ([Fox et al. in review](#))
2. Catch Per Unit Effort (CPUE) on Charter Fishing Trips (internal ODFW analysis)
3. Marine Reserve Visitor Surveys: 2010 – 2021 ([Swearingen et al. 2016](#), [2017a](#), [2019](#), [Fox et al. 2022b](#))
4. Understanding Cape Perpetua Visitors: A Two-Year Survey (2017 – 2019) ([Epperly et al. 2020](#))
5. Whales & Marine Reserves: Education and Awareness Project (2016 – 2021) (American Cetacean Society 2016, 2017, 2018, 2019, 2020, 2021)
6. 2016 ODFW Coastwide Visitor Intercept Study of Ocean Awareness ([Epperly et al. 2017a](#))
7. ODFW Business Owner Surveys: 2010 – 2021 ([Epperly et al. 2017b](#), [French et al. 2022](#))
8. Economic Impact of Marine Recreational Fishing: Oregon Pilot Survey ([TRG 2013b](#)).
9. 2021 ODFW Statewide Survey of Recreational Fishers ([Fox et al. in review](#), [Fox et al. 2022a](#))

Key results from communities of interest studies (superscript numbers below refer to study number in above list):

The marine reserves did not adversely impact sales of daily recreational fishing licenses in communities near four of the five reserves. There was a drop in license sales in Port Orford following the implementation of Redfish Rocks, which may be attributable to the reserve. However, the number of license sales in this location are quite small.¹

The implementation of Cascade Head and Cape Falcon did not adversely impact aggregate charter CPUE in Newport, Depoe Bay, or Garibaldi. CPUE in Depoe Bay significantly declined following the 2012 implementation of Otter Rock, but this decline began in 2010, and is likely not a result of reserve implementation.²

A total of 839 observation periods were conducted that were used to characterize marine reserve nonconsumptive uses (i.e., visitation patterns), that resulted in logging a total of 33,264 observations of marine reserve visitor group characteristics, perceived demographics, and recreational behaviors.³

A total of 3,010 visitor intercept interviews were conducted to characterize visitors' knowledge of and support for the marine reserves.³

Awareness among coastal visitors that they are at a marine reserve (site-specific) has steadily increased among coastal visitors, from 15% (2012) to 40% (2021).³ Related survey efforts by collaborators found similar results.^{4,5} General awareness of the Oregon marine reserve system among visitors was 60% in 2021.³

Nearly all visitors (99.6%) did not identify marine reserve visitation as a primary trip motive relating to their trip to the Oregon coast.³

Coastal visitor respondents who visited the coast more often, were older, and fished or crabbed more often off the Oregon coast, were significantly more likely to be aware of the reserves, and perceive themselves as more knowledgeable about Oregon's marine reserves.³

Negative opinions of the reserves among coastal visitors have declined with only one out of 1,482 respondents in the 2021 survey opposing the reserves. Most visitors (76%), including those who have fished on the coast, supported the marine reserves, while all others had no opinion.³

Coastal visitor respondents who were older, more educated, and more familiar with Oregon's marine reserve system were significantly more likely to support Oregon's marine reserves.³

Negative expectations of the impact of the marine reserves on business demand among coastal business owners and managers significantly decreased from 33% (2010 – 2015) to 1.5% (2021).⁷

Over half (57.6%) of Oregon recreational fishers surveyed in 2021 were aware of the marine reserves, though reserve name recognition and spatial knowledge were low.⁹

Only 9.9% of Oregon recreational fishers surveyed in 2021 opposed the reserves. More avid saltwater fishers or those who fished on the southern coast were significantly less likely to support the reserves.⁹

Among all respondents aware of the reserves, 509 recreational fishers out of 7,638 total respondents (6.7%) indicated a reserve caused them to change their angling behavior.⁹ Among those who had recently fished in saltwater (within 5 years, N = 4,225), 449 respondents (10.6%) indicated they had engaged in fishing effort shift due to the reserves.

Among recreational fishers who engaged in effort shift due to marine reserve establishment, most respondents found substitute fishing grounds, indicating they still fished in the ocean either within five miles of where they previously fished (45.7%) or more than five miles from where they used to fish (30.3%).⁹



Chapter V.2- Marine Reserves Studies Pertaining to the Fishing Occupational Community

1. Commercial Nearshore Groundfish Permit Data related to Port Groups ([TRG 2018a](#))
2. Economic Data related to Marine Reserve Effects among Commercial Fisheries (internal ODFW analysis)
3. Time Series Analysis of Commercial Fishing Employment Data (internal ODFW analysis)
4. Preliminary Study of Anticipated Fishing Effort Shift ([Swearingen et al. 2017b](#))
5. 2017 PSU Effort Shift Survey ([Hudson et al. 2018](#))
6. Pilot Study Related to Perceived Impacts on the Fishing Community ([Marino 2015](#))
7. OSU Coastwide Study of Perceived Fisheries Impacts: 2015 – 2017 ([Marino 2020](#))
8. Affected Individual Fishers' Perceptions of the Marine Reserve Impacts ([Robison 2022](#))
9. Fishers' Value Perceptions in Relation to Identity, Occupation, and the Marine Reserves ([Robison 2022](#))

Key results from fishing occupational community studies (superscript numbers below refer to study number in above list):

A review of turnover in related permits between and across ports from 2006 to 2016 found no evidence of significant permit exchanges or relocation between ports related to the marine reserves.¹

Aggregate data from 1981 to 2019 indicated that the value of commercial landings was not adversely impacted by marine reserves implementation.²

Time series models indicated that long term landings trends were not adversely impacted by marine reserve implementation.²

Using Oregon Employment Department estimates of commercial fishing employment from 2005 to 2019, we found no significant differences in annual employment before and after reserve implementation between proximate and distant ports.³

Related interrupted time series analyses using monthly employment data for Newport, Port Orford, and Garibaldi/Tillamook found that marine reserve implementation did not impact commercial fishing employment near Newport or Port Orford. Garibaldi/Tillamook experienced a short-term decrease in commercial fishing employment in 2016; however, that port group thereafter experienced a small proportional increase in longer term fishing employment.³



Structured qualitative interviews among Newport, Depoe Bay, and Port Orford commercial fishers and charter operators in 2010 before reserve implementation indicated that most expected to continue fishing in the same area and port, but 27% of the commercial fishers thought they would shift their fishing effort to a different location. Most expected negative impacts on their businesses and communities.⁴

In a 2017 survey of nearshore commercial fishers, when asked directly about implementation of the marine reserve system in Oregon, a majority (63%) of the respondents said the reserves had not had any clear impact on their fishing operations in terms of profitability or fishing effort.⁵

A plurality of nearshore commercial fisher respondents (42%) indicated no individual reserve had affected their fishing operation. When disaggregated by port, the respondents tended to cite the marine reserve nearest their port as having the greatest impact on their operation.⁵

A qualitative study among these quantitative survey respondents⁸ supported the general conclusions of an earlier pilot study⁷ that economic impacts were nominal because the reserves are not large and alternative fishing grounds are available.

Charter operators in Depoe Bay and Port Orford were concerned that effort shift entailed using substitute fishing grounds, which required longer and more risky travel with associated costs.⁸

Many commercial fishers and charter operators think that the marine reserves are a contentious flash point, exacerbating tensions between fishers, managers, environmental advocates, and scientists, but they also have created the opportunity for a constructive dialogue among the various parties.⁸

An additional set of 2021 interviews specifically focused on individual fishers who self-assessed to have been affected by the reserves found that most fishers were able to adapt to the reserves without direct financial loss.⁹

These 2021 interviewees' concerns regarding the reserves included unmet expectations for research contracts, increased ecotourism, or increased fisheries productivity.⁹

A few fishers noted specific instances of recreational fishers being displaced because of the reserves. However, some interviewees mentioned that most customers are not aware of the reserves, so there would be little impact on demand regardless.⁹

Additional fisher concerns were related to increased travel distances and concentration of fishing pressure in the alternate fishing grounds.⁹

Many fishers interviewed cited apprehensions that the marine reserves introduce new economic uncertainties for fishers, a sense of uncertainty evident in the earlier studies.^{8,9}

E. AN OVERVIEW OF RESEARCH RESULTS AND CONCLUSIONS

In this section of our discussion, we summarize the results of these studies in reference to a few key research questions. Key considerations included are the effects of the marine reserves on the fishing industry, coastal communities, and coastal tourism. We also discuss how public awareness of and support for the reserves have evolved over time since the first reserves were implemented. An incidental purpose of this discussion will be to illustrate how the multiple lines of interdisciplinary inquiry will offer corroboration for our conclusions.

E.1 MARINE RESERVES AND COMMERCIAL, CHARTER, AND RECREATIONAL FISHERIES

The first section of our research summary pertains to the potential economic effect of the marine reserves on the Oregon fishing industry. A habitat based nearshore fisheries spatial economic model assessed the *potential* displacement of fishers across the fishing industry due to marine reserve implementation. This potential effect is quite small, representing less than 1% of the regional economic impact of total marine commercial and recreational fishing in Oregon. Furthermore, this figure *does not* include fishing effort shift to substitute fishing grounds. To investigate whether this potential displacement might have resulted in actual reductions in commercial fishing, numerous secondary data sets were examined:

1. Using interrupted time series analyses of aggregate fisheries data from 1981 to 2019, we found no discernable adverse impacts on fisheries landings related to the implementation of the various reserves over time.
2. Should marine reserve closures affect the viability of commercial fishing in a specific port, one might expect permittees operating out of that port to change locations. An analysis of turnover in commercial nearshore groundfish fishing permits was conducted at the state and port levels for the period from 2006 to 2016. This review of turnover in related permits between and across ports found no evidence of significant permit exchanges or relocation between ports related to the marine reserves.
3. Using Oregon Employment Department estimates of commercial fishing employment from 2005 to 2019, we found no significant differences in annual employment before and after reserve implementation between proximate and distant ports.
4. Related interrupted time series analyses used more detailed monthly employment data, only available in four ports: Newport, Port Orford, and Garibaldi/Tillamook. The analyses suggested that marine reserve implementation did not impact commercial fishing employment near Newport or Port Orford, with a short-term decrease in commercial fishing employment in Garibaldi/Tillamook in 2016. However, Garibaldi/Tillamook thereafter experienced a small proportional increase in longer term fishing employment.
5. There was no reserve impact on charter CPUE discernable within available ODFW Oregon Recreational Boat Survey (ORBS) data for Newport, Depoe Bay, or Garibaldi. There was a significant decline in CPUE in Depoe Bay post 2012, but this decline began in 2010 and is likely not attributable to the reserves.
6. Based on analyses of indices created by NOAA, there was not a significant marine reserve impact on aggregate commercial fishing engagement or reliance in proximate communities.
7. Analyses of coastal community Census data did not identify substantive adverse impacts on various measures of community social welfare in comparisons between marine reserves proximate and distant coastal communities nor between the coast region and a comparable synthetic control representing other similar areas of the state. There was an increase in SNAP benefits in the 2016 model, with no parallel changes in other poverty measures. We also noted a decrease in natural resource employment in some communities. However, these results were probably related to small sample sizes.

Thus, using multiple sources of secondary data to assess marine reserve impacts over time, we were not able to discern any significant or substantive adverse economic impacts on commercial or charter fishing in aggregate fisheries related data. In addition, we did not find any such adverse socioeconomic impacts in Census measures of community social welfare (e.g., income, poverty) for proximate coastal communities or for the coast region as a whole.

To corroborate whether these secondary data analyses were an accurate assessment of the impact of the marine reserves on commercial fisheries, working with PSU in 2017, we initiated a study of fishing effort among all permit holders in the most relevant nearshore fisheries (Hudson et al. 2018). In this survey of nearshore commercial fishers, when asked directly about the impact of the Oregon Marine Reserve System, a majority (63%) of the respondents said the reserves had not had any clear impact on their fishing operations in terms of profitability or fishing effort. When prompted to identify a specific reserve of concern, a plurality of these nearshore fishing respondents (42%) indicated no individual reserve had affected their fishing operation. Among the remaining respondents who did identify a marine reserve of concern, these individuals tended to cite the marine reserve nearest their port.

We knew in advance that some commercial fishers would decline to participate in this survey research, which obtained a response rate of 21.2% (N = 229). There is some degree of distrust and historic antagonism toward ODFW (Taylor 2019, Marino 2015, 2020, Package and Conway 2010a, 2010b, 2010c). In addition, some resistance to participation was expressed during project planning meetings, whether grounded in distrust of science or government, work responsibilities, or some other reason. We were concerned whether this nonresponse would affect the accuracy of this research. Some investigations (c.f. Himes-Cornell et al. 2015, Ordoñez-Gauger et al. 2018) have extensively used in-person surveys and other techniques to boost response rates among the fishing occupational community. We lacked such resources.

To address these concerns, we worked with TRG to conduct a study of the representativeness of respondent characteristics in relation to the sample (TRG 2018c). The criteria for assessing representativeness were related to business sector characteristics: vessel size, average landings, trip counts, delivery ports, and permittee residence. The conclusion of that analysis was that the respondents were characteristic of the fisheries of concern. This is a critically important point because our most important research questions related to these fisheries were about the potential for adverse socioeconomic impacts. In aggregate fisheries data, these concerns would play out in reference to fleets with common ports, target species of interest, investments, gear, and fishing grounds. Assessment of the economic impacts related to the marine reserves are most relevant to the business sector in which one is engaged. A specific type of fishing operation in a given port within reach of specific relevant fishing grounds faces the same set of conditions created by a spatial closure and restrictions as the next similar fishing business. Thus, as long as our respondents are representative of the fishing business sectors, we have achieved our primary research objectives. While some variables, such as reserves support or opposition, might change with greater response rates, there is little argument that description of the economic impacts would be particularly affected by a larger proportion of respondents. As one related example, the fishery sector data used to derive the FEAM and IO PAC derivative economic impact models are based on substantial efforts to derive representative estimates of operating expenses and profitability per sector. Such estimates do not require an exhaustive amount of data from a very large sample of respondents.

Working with OSU beginning in 2014, we initiated a series of qualitative studies to further investigate individual fishers' perceptions of marine reserve effects. A parallel qualitative study (Marino 2020) among the quantitative effort shift survey respondents (Hudson et al. 2018) supported the general conclusions of an earlier pilot study (Marino 2015), that economic impacts were nominal because the reserves are not large and alternative fishing grounds are available. There were specific individual concerns. Many were concerned that effort shift entailed substitute fishing grounds which required longer and more risky travel. Charter operators in Depoe Bay were concerned about substitute fishing ground pressure. Many commercial fishers and charter operators think that the marine reserves are a contentious flash point, exacerbating tensions between fishers, managers, environmental advocates, and scientists, but they also have created the opportunity for a constructive dialogue among the various parties.

Just prior to the submission of this report, an additional set of interviews was conducted specifically focused on individual fishers who self-assessed to have been affected by the reserves. These interviews indicated that most of these individuals were able to adapt to the reserves without direct financial loss. These 2021 interviewees' concerns included what they perceived to be unmet personal expectations for research contracts, increased ecotourism, or increased fisheries productivity. A few fishers noted specific instances of recreational fishers displaced because of the reserves. However, most interviewees cited lack of reserves awareness as a reason why charter customers have not been reduced. As before, there were concerns related to increased travel distances and concentration of fishing pressure in the alternate fishing grounds. Many fishers interviewed cited apprehensions that the marine reserves introduce new economic uncertainties for fishers, a sense of uncertainty also evident in the earlier studies.

Some of the most insightful comments from this series of qualitative interviews of commercial fishers include (Marino 2020):

"Marine reserves are just a tiny, most recent part, one little brushstroke in the corner someplace of this big picture."

"I mean for the last 30 years all we've gotten is more and more and more restrictions... Everybody jokes, you almost need to be a lawyer to be able to go fishing anymore."

"If you drill down into their [fishers] rhetoric, and you get beneath their talking points ... most of them are conservationists at heart. They want this to continue. They don't want to catch the last fish. They want to be able to keep going, and have their children keep going."

Another series of studies were conducted to ascertain if there were marine reserve effects related to recreational fishing. A series of time series analyses were conducted to gauge whether the reserves had an impact on recreational daily (i.e., not annual) fishing license sales in proximate communities (Fox et al. in review). The marine reserves did not adversely impact sales of daily recreational fishing licenses in communities near four of the five reserves. There was a drop in daily license sales in Port Orford following the implementation of Redfish Rocks, which may be attributable to the reserve. However, the number of daily recreational license sales in Port Orford is quite small.

During the summer of 2021, we conducted a large-scale online survey among a statewide random sample of 48,814 ODFW recreational fishing licensees (Fox et al. 2022a, Fox et al. in review). Adjusted for undeliverables, the survey received 7,638 responses, a 16.2% response rate. Since ODFW does not have a marine endorsement, this survey is representative of all anglers in the state of Oregon. Over half (57.6%) of all recreational fishers in Oregon were aware of the marine reserves, though reserve name recognition and spatial knowledge were low. Only 9.9% of all recreational fishers opposed the reserves. More avid saltwater fishers and those who fished on the southern Oregon coast were significantly less likely to support the reserves. Among recent saltwater recreational fishers aware of the reserves (N = 4,225), 449 respondents (10.6%) indicated a reserve prompted a change in their fishing behavior. Among all respondents aware of the reserves (n = 7,638), 509 respondents (7%) indicated a reserve caused them to change their angling behavior. Among recreational fishers who engaged in any effort shift due to marine reserve establishment, most respondents found substitute fishing grounds, indicating they still fished in the ocean either within five miles of where they previously fished (45.7%) or more than five miles from where they used to fish (30.3%, Figure 1). Only 84 respondents (1% of all respondents) indicated they had ceased fishing in saltwater.

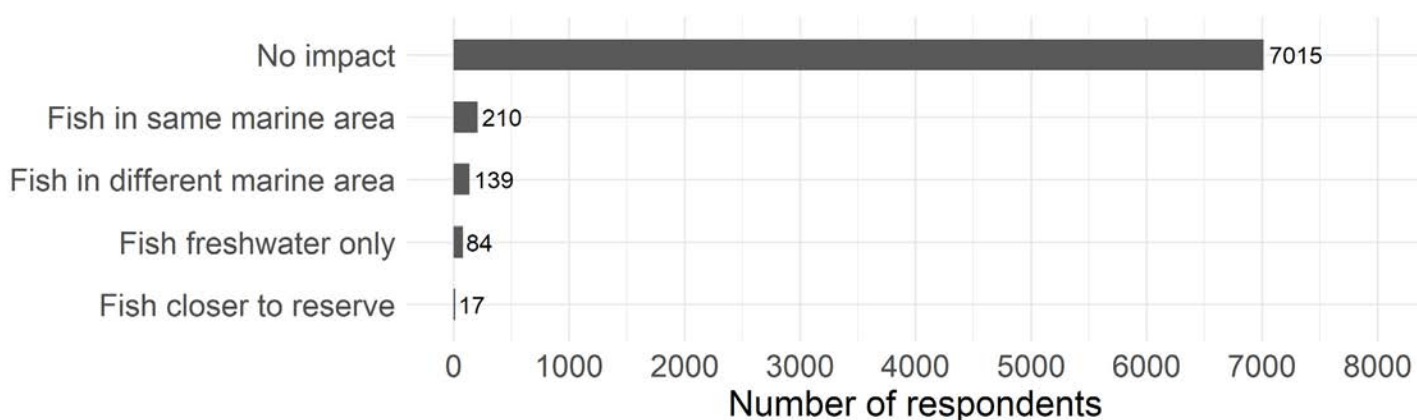


Figure 1. Number of recreational fishing respondents whose fishing behavior was impacted by marine reserve establishment.

E.2 MARINE RESERVES AND TOURISM DEMAND

If the marine reserves have had a very limited effect on the fishing industry, the other most important economic question is whether the marine reserves have affected tourism to the Oregon coast. Time series analyses of Census employment data comparing towns proximate to and distant from the reserves demonstrated significant increases in tourism employment post reserve implementation (2012, 2014, and 2016) in all groupings of relevant proximate towns (Fox and Swearingen 2021). Whether this was a reserve effect or a location effect independent of marine reserve proximity could not be established given these data and analytical methods. So, additional corroborative data are required for interpretation. Awareness of the marine reserves was initially quite low among visitors in the earliest studies, although it had slightly increased over time (Swearingen et al. 2016, 2017a, 2019). Therefore, in our most recent 2021 visitor intercept study (N = 1,482), when we sought to assess whether this increasing awareness among visitors had impacted tourism demand, participants were asked to identify a trip purpose (i.e., a motive that can be used for attribution of the economic impacts of tourism, Fox et al. 2022b). Respondents were asked to indicate a primary trip purpose and to indicate a secondary and tertiary trip



purpose only if that was relevant. Those respondents who cited the marine reserves as a trip purpose listed them as their primary (N = 6, 0.4%), secondary (N = 28, 1.9%), or tertiary (N = 57, 3.8%) trip purpose. Regardless, from a total of 3,627 total responses to this question, only 91 respondents (2.5%) cited marine reserves as having any degree of economically relevant impact on their trip motives. It is clear that visiting the marine reserves has not been a significant trip motive among Oregon visitors to date.



Additional tourism related data pertaining to the marine reserves are found in the comparative series of surveys we conducted from 2010 to 2021 among business owners and managers in communities proximate to the marine reserves (French et al. 2022). During this long-term series of interviews, the participants were asked if they thought the reserves will affect (baseline) or had affected (comparative) their business demand. During the initial community engagement process, business owners were apprehensive of potential adverse impacts of the reserves. Thereafter, as the reserves were implemented, negative expectations among business owners significantly diminished. In the final iteration of this series of interviews (N = 341), negative expectations of the impact of the marine reserves on business demand among coastal business owners and managers in reserves proximate communities had significantly decreased from 33% to 1.5% (six total respondents). This change in results over time was similar to changes previously observed in Yachats and Depoe Bay between 2010 and 2014 (Epperly et al. 2017b). However, the proportion of respondents who thought business demand would not change because of marine reserve implementation or who were unsure about marine reserve impacts increased from 54.5% to 90.0%. The key interpretation of these results is that, while negative expectations among business owners/managers had almost completely ceased in the communities proximate to the marine reserves, the expectation that the reserves would actually increase tourism demand for the respondents' businesses was minimal.

The tourism industry is quite diffuse, and tourism impacts occur across a broad range of business sectors. Our business survey methods focused specifically on related brick and mortar businesses most likely to be affected by changes in tourism demand within those communities closest to the marine reserves. A very large proportion of all related business owners or managers in those communities were interviewed. In our most recent iteration of this survey, most (90%) did not think the marine reserves have affected business demand (or were unsure about marine reserve impacts). In addition, several other analyses we conducted are relevant to the investigation of potential tourism impacts of the marine reserves. Perhaps the most important considerations were the effect of the reserves on tourism demand among visitors and recreational fishers. Our most recent visitor intercept survey (N = 1,482) indicated that, in aggregate, visitors have not chosen to come to the coast specifically to visit the marine reserves. Our recent survey of recreational fishers (N = 7,638) found that the marine reserves have not had a substantial effect (positive or negative) on saltwater recreational fishing (Fox et al. 2022a, Fox et al. in review). The PSU survey (Hudson et al. 2018) and a series of interviews with commercial and charter fishers (Marino 2015, 2020, Robison 2022) also found evidence that the marine reserves have not significantly affected demand for charter fishing. Thus, we can conclude that there is not any current evidence that there has been any statistically significant or practically substantive impact on tourism demand in the aggregate related to the marine reserves.

Most of our studies of tourism related constructs are studies of central tendency with aggregate data. There are certainly important limitations to any study of aggregate data. In particular in this context, some tourism dependent businesses might not be represented in these "brick and mortar" data collected during the business intercept surveys. As was the case in our studies of the fishing industry, there may be specific individual exceptions to our conclusions derived from aggregate data. As we related herein, qualitative efforts to understand individual impacts across the fishing industry involved several iterations of studies over many years, from 2014 to 2021. For critical perspective, our quantitative assessments of potential effects of the marine reserves on tourism demand were just completed during the summer of 2021. An analogous effort to elicit narratives of individual tourism business owners' experiences pertaining to the marine reserves would be a worthwhile future study. While a constructive study, we should point out that at present in reference to our research mandate, such a small effect on aggregate regional tourism would likely not be substantial at this time. We can state with a high degree of certainty that the marine reserves have not currently had a significant effect on tourism demand.

E.3 PUBLIC AWARENESS OF AND SUPPORT FOR THE OREGON MARINE RESERVES

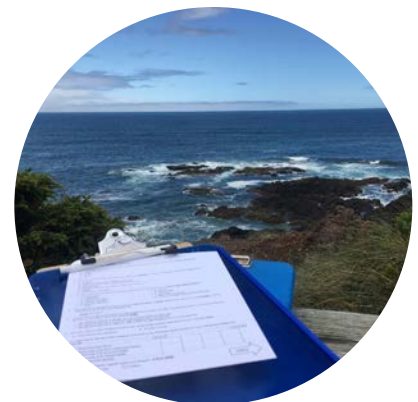
MARINE RESERVES AWARENESS. Awareness of the Oregon Marine Reserve System and site-specific awareness have been addressed in multiple surveys with different groups of interest (Figure 2). These groups discussed herein broadly include coastal visitors, coastal residents, Oregon residents, recreational fishers, and business owners/managers. The sample sizes and exact question phrasing differ among studies, but general trends of increasing awareness are often still present.

To assess whether visitors contacted at sites adjacent to marine reserves were aware of the reserves, we conducted 3,010 visitor intercept interviews from 2012 to 2021 (Swearingen et al. 2016, 2017a, 2019, Fox et al. 2022b). Awareness among coastal visitors that they were at a marine reserve (site-specific awareness) steadily increased from 15% in 2012/13 to 20% in 2014/2015 to 40% in 2021. We added another question in the 2021 survey to gauge general, rather than site-specific, awareness of the entire marine reserve system. We found that 60% of respondents were aware of the reserve system, which was higher than the 40% of those who were aware they had been contacted at a specific reserve. A collaborative study conducted by the Cape Perpetua Collaborative from 2017 – 2019 found that 37% of visitors contacted at sites adjacent to Cape Perpetua were aware of that reserve (N = 919, Epperly et al. 2020). This 37% site-specific awareness is similar to the 40% site-specific awareness found in the 2021 ODFW visitor intercept study. The American Cetacean Society also conducted small scale surveys using an opportunity sample design at tabling events during summers from 2016 – 2021 (American Cetacean Society 2016, 2017, 2018, 2019, 2020, 2021). These surveys also found increasing awareness over time, from 30% in 2016 to 50% in 2021, although it should be noted that sample sizes each summer ranged from only 20 – 25 respondents.

To assess whether awareness of the marine reserves was influenced by geographic location of residence, OSU conducted a series of baseline (N = 1,126) and comparative (N = 824) mixed methods (i.e., mail and Internet) surveys (Needham et al. 2013, 2016a, 2022). The comparative surveys used both a random sample of respondents (i.e., longitudinal sample) and a panel sample (i.e., contacting original respondents). Rather than specifically asking about awareness, this survey asked respondents if they were familiar with the reserves phrased as a Yes/No question. There was no significant change in familiarity (70% vs. 68%) among residents living in proximity to a reserve (i.e., communities of place). Surprisingly, there was a significant decrease in reserve familiarity (71% vs. 57%) among residents living distant from a reserve (i.e., rest of coast). However, familiarity increased significantly (35% vs. 45%) among I5 corridor residents. In the panel sample, familiarity increased by 5% in communities of place to a total of 91% familiar with the reserves. Another mixed mode survey of coastal residents contacted by OSU in 2017 (N = 1,172) found that 84% indicated they had some level of awareness about Oregon’s marine reserves (a four-point scale from not aware to extremely aware, Lindberg and Williams 2019). While 84% awareness among coastal residents seems high, this result is consistent with the 86% awareness among all coastal residents found in the 2021 panel sample (Needham et al. 2022). In addition, a phone survey of all Oregon residents conducted by PSU in 2016 – 2017 (N = 459) asked respondents to rank, on a four-point scale, how informed they were about Oregon Marine Reserves (Manson et al. 2021). This study found that 41% of Oregon residents considered themselves to be informed about the reserves to some degree.

Additional studies of communities of interest included surveys of coastal business owners or managers and statewide recreational fishers. We conducted in-person surveys of coastal business owners or managers of businesses most likely to be impacted by marine reserve implementation (e.g., lodging, retail, French et al. 2022). Reserve awareness among business representatives did not significantly change, decreasing slightly from 48% during baseline data collection in 2010 – 2015 (N = 320) to 46% in the comparative data collected in 2021 (N = 341). An online survey of recreational fishers conducted in 2021 (N = 7,638) found that 58% of recreational fishers were aware that Oregon has marine reserves (Fox et al. in review, Fox et al. 2022a).

These studies demonstrate that awareness of Oregon’s marine reserves has increased among coastal visitors, though still remains relatively low for site-specific awareness. Compared to coastal visitors, residents along the I5 corridor have a lower level of awareness of the marine reserve system. However, recreational



fishers and coastal visitors have a very similar level of awareness of the reserve system. Coastal residents, especially those living proximate to a reserve, are the most aware of the reserves. However, despite most business representatives probably residing on the coast, only approximately half of those sampled were aware of the reserves.

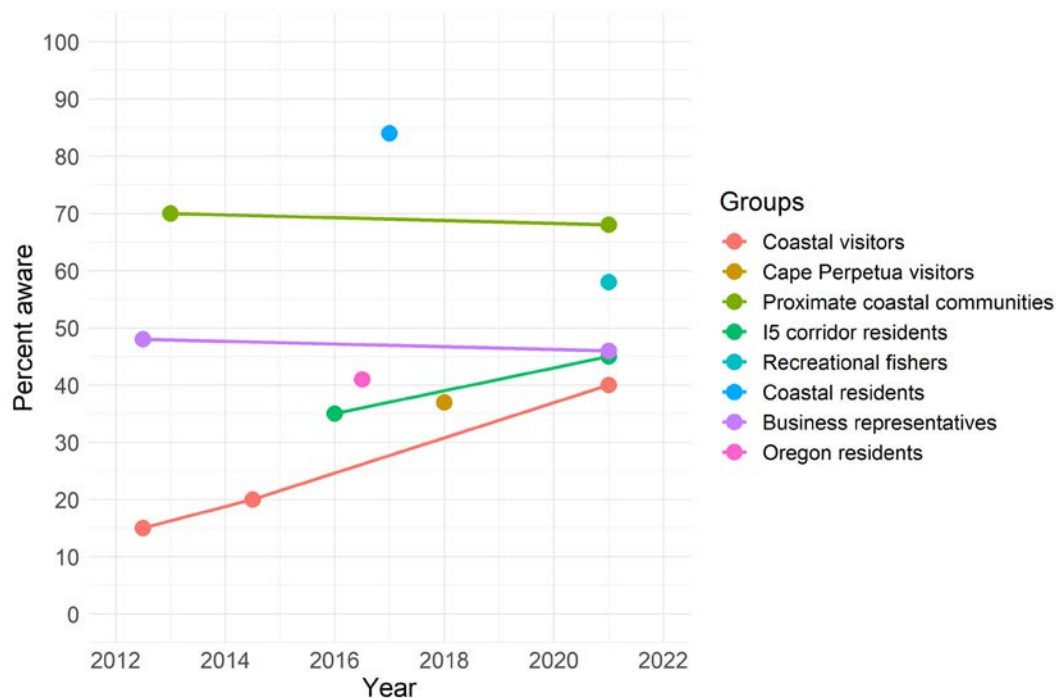


Figure 2. Percentage of survey respondents aware of marine reserves.

MARINE RESERVES SUPPORT AND OPPOSITION: Public support of the Oregon marine reserves has also been addressed in multiple surveys among various communities of interest. The groups discussed herein broadly include coastal visitors, coastal residents, Oregon residents, and recreational fishers. Questions pertaining to marine reserve opinions across all of these various studies can be difficult to directly compare. For example, one study may ask for opinion as a binary variable (e.g., opposed or supportive). Another may assess support as a scale with a neutral mid-point, while yet another may ask about reserve voting intentions (e.g., reduce, status quo, or expand). The nuances of such questions make a definitive assessment of positive support problematic. Therefore, to make these diverse studies’ results more comparable, we discuss proportions of respondents who are specifically opposed to the reserves (Figure 3). The general trend observed was a reduction in opposition over time.

In the earliest baseline visitor intercept surveys conducted by ODFW, respondents were asked whether they felt marine reserves were a “good thing” for Oregon (Swearingen et al. 2016, 2017a, 2019). In the 2012 and 2013 surveys, 3.5% of the respondents thought that was not the case, while in the 2014 and 2015 surveys, 3.9% thought the reserves was not a positive outcome for the state. This phrasing was deemed to be a leading question, and the sentence structure was changed in the 2021 visitor intercept survey. That survey asked respondents their opinion of Oregon’s marine reserves on a five-point scale, from strongly opposed to strongly supportive (Fox et al. 2022b). In this comparative survey, *only 1 respondent* out of 1,482 indicated that they were in any way opposed to Oregon’s marine reserves.

To assess how marine reserves support varied by geographic region, the OSU studies (Needham et al. 2013, 2016a, 2022) used a question pertaining to voting intentions in the baseline (2013, 2016) and comparative (2021) surveys sent to random samples of coastal and I-5 residents.* In all residential subsamples of these respondents (i.e., communities of place, rest of coast, and I-5 corridor), opposition to marine reserves decreased between the baseline and comparative surveys. When asked if they would vote for or against establishing marine reserves in Oregon, only 11% of the 2021 respondents

* To understand the effect of residential proximity to the reserves (i.e., a community of place, as specified in the monitoring plans), the OSU Needham surveys used a stratified random sample of coastal residents, those living proximate to the reserves were 50% of the coast sample, and those living along the rest of the coast were the balance of the sample. In contrast, the 2017 Lindberg study used a random sample of all Oregon coast residents, and the resulting data were further weighted to ensure geographic representativeness across the coast.

from communities of place (residents proximate to a reserve) said they would vote against establishment. The comparable proportion among the 2013 respondents was 18% in opposition to the reserves. Similarly, the proportion of respondents residing along the rest of the coast who would vote against reserve establishment decreased from 35% in 2013 to 22% in the 2021 comparative survey. Among the I-5 corridor residents, those opposed to the reserves decreased from 10% to 6% during that time frame. In another mixed mode survey of a random sample of residents across the entire coast by OSU in 2017, respondents were asked if the area dedicated to marine reserves should be reduced, left unchanged, or expanded (Lindberg and Williams 2019). Only 12% of respondents indicated the reserve area should be slightly or significantly reduced.

In an online survey of a random sample of recreational fishers, when asked if they support or oppose the current Oregon Marine Reserve System on a five-point scale, only 10% of respondents indicated some level of opposition (Fox et al. in review, Fox et al. 2022a). In addition, while it is not a metric of opposition, negative expectations of the marine reserves decreased among business owners and managers. When asked whether they thought a marine reserve would affect (baseline) or had affected (comparative) their business demand, 33% of the respondents in the baseline survey indicated the reserves would decrease demand, while this proportion of respondents decreased to 2% (N = 6) in the comparative survey (French et al. 2022).

These studies demonstrate that opposition to Oregon’s marine reserves was initially fairly low and has decreased further over the ensuing decade. Even among recreational fishers, one of the communities of interest most likely to be impacted by reserve implementation, a quite substantial majority were not opposed to reserves. In addition, residents of communities of place, another cohort potentially affected by reserve implementation, were generally not opposed to reserves in 2021.

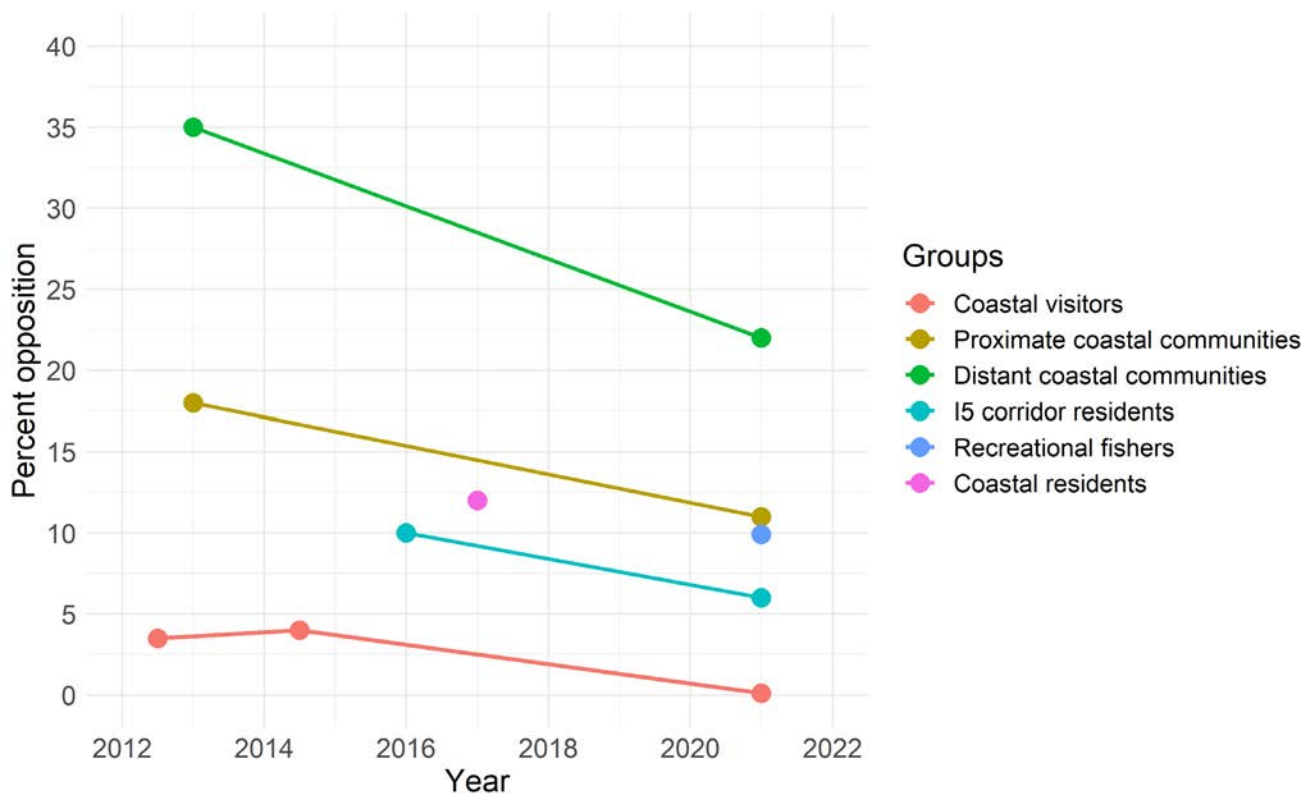


Figure 3. Percentage of survey respondents opposed to Oregon Marine Reserves.

F. MARINE RESOURCE MANAGEMENT AND RESEARCH CONTRIBUTIONS

The Human Dimensions Project was charged with assessment of the socioeconomic effects of the reserves. Given our broad mandate, we also intended to leverage our research and monitoring activities to provide additional managerially relevant contributions, when such an objective was compatible with our primary research responsibilities. Some of our related efforts were specific to the marine reserves mandate to contribute, as possible, to nearshore resource management. Other contributions were related to scientific methodological contributions, such as the development of new economic models or social science scales. We also explored the use of existing research methods in a new applied socioeconomic context with several of our time series analyses. Still other contributions of our research project pertain to the social and educational benefits derived from our involvement with students and community groups. As we conclude this chapter, we will reflect on these efforts.

Whenever possible as we initiated studies, there was an intentional effort to collect information of broader implications for nearshore management. Examples include:

- The fisheries spatial economic model ([TRG 2021b](#)) encompasses the entire Oregon nearshore (state) waters and includes most important nearshore fisheries current (2017 to 2019) economic impact data. It can be used to assess the related economic implications of any nearshore spatial management decision. The area closures related to the marine reserves only comprise 3% of that area.
- The coastal community indices of nearshore fishery engagement, dependence, and community vulnerability ([TRG 2018a](#)) are quite relevant to nearshore management, to port management authorities, and municipalities, often more so than the related NOAA indices.
- Coastal community demographic and economic profiles ([Epperly et al. 2018](#)) are quite relevant to state agencies and local government entities. This report provides considerable insight into the coast region, and the format can be routinely updated and improved.
- Several of our survey research projects were related to wide-ranging marine issues, and were not specific to the marine reserves:
 - a. The coastal visitor ocean awareness study ([Epperly et al. 2017a](#)) has broad implications for coastal management, planning, and communications.
 - b. The Oregon resident ocean acidification and hypoxia (OAH) awareness study (Insinga 2021), funded by our project, was the first large random survey to address this issue.
 - c. The survey research on commercial fishers' familial successional planning ([Hudson et al. 2018](#)) provides quantitative data on the impacts of the "greying" of the fleet for marine natural resource management and planning purposes.
- The coastal community case studies in community resilience ([Ackerman et al. 2016](#), [Fischer 2018](#)) are relevant to both coastal planning in Oregon and to many other rural contexts.
- Our large-scale survey of recreational fishing licensees offers a substantial amount of new information about this community of interest, with considerable relevance to the agency responsibilities to serve this constituent group.

After our baseline studies were completed, there was a brief period before we initiated the comparative studies that inform much of this report. During the opportunity created by this interlude, we explored coastal residents' spatial preferences related to the marine reserves, and we concurrently investigated several new research methods, including:

- The development of scales of individual and community resilience to improve assessment of these constructs ([Lindberg and Swearingen 2020](#)).
- The development of scales to assess subjective well-being (SWB) across multiple dimensions ([Lindberg et al. 2019b](#)).

- An investigation of the utility of SWB vignettes to derive subjects' policy preferences in a manner similar to choice experiments (CE) ([Lindberg et al. 2019b](#), [Lindberg and Williams 2019](#)).

The similarity of the results using SWB vignettes and CE methods lends credence to the value of SWB as a measure of total utility, theoretically including nonmarket ecosystem services (Lindberg et al. 2019b). A constructive next step in this exploratory investigation would be a focused methodological study with a random split sample design using contingent SWB with one subsample and a parallel CE with a second subsample, both pertaining to the same policy question. This study was a first step with important methodological implications, and more methodological development is indicated.



In addition, the application of interrupted time series and synthetic methods to the assessment of the effects of marine reserves is unique. The synthetic control approach creates a weighted synthetic control that best matches the characteristics of a treatment unit prior to intervention. This approach was used to analyze social and economic impacts of marine reserves and compared with the more traditional difference-in-differences approach for impact evaluation techniques ([Fox and Swearingen 2021](#)). Seasonal Autoregressive Integrated Moving Average (SARIMA) interrupted time series are also not typically used in socioeconomic impact evaluations in the marine field. We used this approach with appropriate regulatory covariates to analyze the impacts of marine reserves on recreational fishing license sales in proximate communities ([Fox et al. in review](#)). The SARIMA interrupted time series approach was also used in other analyses of secondary data discussed in this report (e.g., CPUE on charter trips).

Since our program was quite commonly involved in research with academic collaborators, we often used these projects to provide financial support and an opportunity for students to obtain the data necessary for their (usually graduate) educational purposes. More details about some of these students' efforts are provided in the [Human Dimensions Technical Appendix](#). We have also hosted numerous undergraduate student interns, most commonly Oregon Sea Grant (OSG) Summer Scholars. In addition, we have recently hosted an OSG Natural Resource Policy Fellow for two years in a research position, an individual who is a co-author of this research review and numerous other articles and reports from our research program. A brief summary of these academic contributions (since 2013) includes:

- Data and support for doctoral research at PSU (Manson et al. 2021, Scully-Engelmeyer et al. 2021)
- Data and support for five MS theses at OSU and PSU (Perry 2013, Johnston 2017, Hudson 2018, McAlpine, forthcoming, Robison, forthcoming)
- Academic contributions for an additional PSU thesis project (Comet 2018)
- Data for an OSU Honors College undergraduate senior thesis (Insinga 2021)
- Support and data for seven University of Michigan masters' students in a non-thesis capstone project (Ackerman et al. 2016)
- Agency host for eight Oregon Sea Grant (OSG) Summer Scholars, one Doris Duke Conservation Fellow, and one COSEE summer intern
- Agency host for a two-year postgraduate OSG Natural Resource Policy Fellow
- In conjunction with the Marine Reserves Ecological Project, technical advising and data for an OSU National Science Foundation Research Traineeship scholarship team of four masters and doctoral graduate students

Our recent community contributions include working remotely with an OSG Summer Scholar during the summer of 2019 to design, execute, and complete a visitor intercept study and other related research for the Haystack Rock Awareness Program (HRAP) in Cannon Beach. As previously related, we also worked extensively with the Cape Perpetua Collaborative to conduct a visitor intercept study to provide data both to our project and to the City of Yachats.

G. LESSONS LEARNED AND MOVING FORWARD

There are many ways we could describe the lessons learned while working to understand the socioeconomic effects of marine reserve implementation in Oregon. The research contributions of our collaborators and the teamwork involved is frankly impressive. Interdisciplinary research is far more robust and illuminating than any singular disciplinary silo. Oregon has a great academic community; the intellectual contributions of this community, to our specific research agenda and beyond, are exceptional.

Reflecting on this decadal effort, we offer the following observations:

RESEARCH LESSONS LEARNED - THE VALUE OF INTERDISCIPLINARY WORK: Given the scope of the mandate for this project, we developed our research agenda to be comprehensive and interdisciplinary. Our mantra was “leave no stone unturned”, and that path sometimes led to dead ends amidst a pile of stones. Nevertheless, what we found through this experience was very constructive.

- a. There is a rich abundance of secondary data collected within ODFW (e.g., Ocean Recreational Boat Survey recreational harvest data) and by other agencies (e.g., NOAA community related fisheries dependence and social welfare indices) that could be used to inform nearshore management and for evaluation of state management policies. Collaborating with these other teams and agencies to collate their already collected data is quite constructive. A corollary is that there is no such thing as a perfect time series of secondary data, and the nuances and caveats for each dataset must be well understood and considered.
- b. Our research is far more robust and relevant when we use inquiry involving multiple lines of complementary disciplinary evidence to investigate the same question. As one example drawn from this body of research, when investigating the effects of marine reserves on nearshore commercial fisheries, we considered potential impacts (a nearshore fisheries spatial economic model), perceived impacts (both quantitative surveys and qualitative interviews of the potentially affected fishers), and demonstrable quantitative impacts (changes in fisheries metrics such as permit turnover, elapsed time-based CPUE, and the value of fishery landings over time).
- c. All statistically significant results should be considered in context; in an applied context, one result is seldom the accurate complete answer to your research question. Using time series analyses of secondary Census data, we found significant increases in employment in the tourism industry in towns near marine reserves after reserve implementation. However, based on consistent visitor intercept surveys results involving a large number of respondents over time, we also know that most visitors aren’t aware that they are visiting a marine reserve. In addition, the reserves did not factor into their decision to visit the Oregon coast. Furthermore, most potentially affected business owners in proximate communities also don’t think reserves have positively impacted their business demand. Therefore, we can conclude that this increase in tourism employment is probably not related to marine reserve implementation. What the future may hold related to marine reserve impacts on tourism is an open question. We are only ten years into the study of the policy implications of these marine reserves in Oregon.

CULTURAL LESSONS LEARNED - A COMMON CONCERN FOR THIS OCEAN: Two common themes emerge from these studies. First, Oregon coast residents are exceptionally proud of a culture with strong connections to the ocean. Second, a recurring outcome of all of these studies is that the Oregon public is highly supportive of marine conservation and the marine reserves. These are not incompatible perspectives. Understandably, some coastal residents, particularly those associated with commercial fisheries, are wary of agency management and the political influence of Oregonians residing elsewhere. And quite appropriately, these stakeholders question policies that affect their livelihoods, families, and communities. An important dynamic of this situation is that there is a substantial amount of miscommunication or lack of communication about state marine resource management, and somewhat tangentially, the marine reserves. Realistically, the reserves are more a symbolic flashpoint related to conflicts concerning state marine resource management policies; the actual social and economic impacts, *whether positive or negative*, are nominal. Ironically, all parties acknowledge that there is a shared goal of sustainable management of ocean resources for the common good. Communication is the key to moving forward. Not without conflict, the marine reserves may actually have helped make that consideration more salient among all parties involved.

LOOKING FORWARD - HOW CAN WE DO BETTER? Despite our best intentions, the Marine Reserves Program has not made appreciable inroads among the Oregon public inspiring curiosity about our ocean or knowledge of state marine resource management policy. Since inception of the reserves, public awareness of this marine spatial management designation has gradually increased; factual knowledge of policy and purpose has not. We need to communicate better with the public about our science, our legal mandates, and our conservation and research objectives. We also need to talk more to our partners in conservation, the commercial, charter, and recreational marine fishers.

One prominent message of this decade of research is that the mandate to assess the socioeconomic impacts of the marine reserves (or any state marine managerial policy) is far more than one person can address. Engaging our Oregon academic partners is constructive, and we need to ensure that this relationship is mutually beneficial. One particular consideration is that there is an ongoing need for fisheries economics expertise in relation to the Marine Reserves Program and, more broadly, in the ODFW Marine Resources Program. The Marine Resources Program is a part of the agency that engages extensively with commercial businesses.

INTEGRATING ECOLOGICAL AND SOCIOECONOMIC RESEARCH IN NEARSHORE MANAGEMENT, MONITORING, AND PLANNING. This last point is something of a cliché. Nevertheless, the marine reserves research agenda has created a decadal body of work that is both ecological and socioeconomic. These research efforts have focused on a specific marine resource management policy and managerial objectives that have uniquely employed a comprehensive range of tools of interdisciplinary research. This effort at ecological research and policy analysis is a rare opportunity to pursue integration of scientific disciplines in a practical applied context of statewide importance. As we face enormous stressors related to a shifting baseline- climate change and OAH – we face ocean management issues that have unprecedented implications for human society and our Oregon coast.





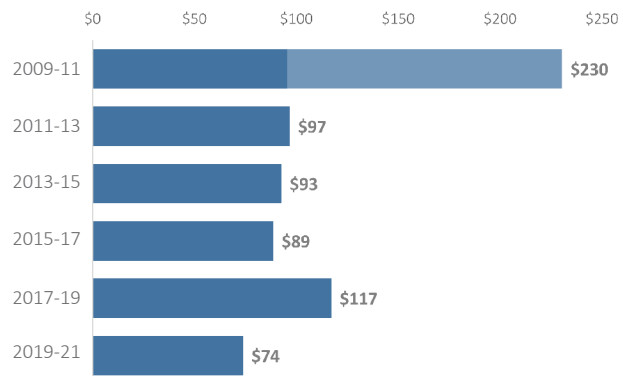
5.4 OUTREACH & COMMUNITY ENGAGEMENT

PROGRAM RESOURCES



SUPPLIES & SERVICES BUDGET (THOUSANDS)

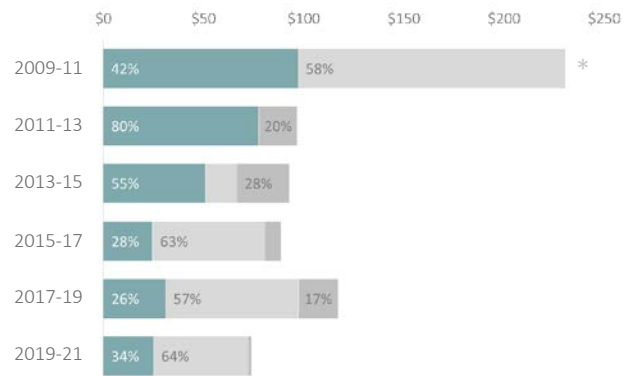
State Funds | Grant Funds



NOTE: Budget does not include staff

EXPENDITURES (THOUSANDS)

Community Contracts & Support | Outreach Contracts | Equipment, Supplies, Other Services



* Outreach Contract to Oregon Sea Grant during marine reserves planning.



STAFF CAPACITY (FTE)

ODFW Program Staff | ODFW Temps & Student Interns | Non-ODFW Fellows & Student Interns



PARTNERS

- Oregon State Parks- OPRD
- Cape Perpetua Visitor Center – USFS
- American Cetacean Society
- [Cascade Head Biosphere Collaborative](#)
- [Coast Range Association](#)
- [CoastWatch- Oregon Shores](#)
- [Oregon Coast Aquarium \(OCAq\)](#)
- [Portland Audubon](#)
- [Surfrider Foundation](#)
- [The Nature Conservancy \(TNC\)](#)
- [Cape Perpetua Collaborative \(CPC\)](#)
- Depoe Bay Near Shore Action Team (NSAT)
- Friends of Cascade Head Marine Reserve
- [Friends of Cape Falcon Marine Reserve \(FCFMR\)](#)
- Friends of Otter Rock Marine Reserve
- [Redfish Rocks Community Team \(RRCT\)](#)

-
- A. INTRODUCTION**
 - B. MANDATES AND TAKEAWAYS**
 - C. HOW WE GOT HERE**
 - D. COMMUNICATIONS AND OUTREACH ACTIVITIES**
 - E. COMMUNITY ENGAGEMENT ACTIVITIES**
 - F. OUTREACH AND ENGAGEMENT LED BY PARTNERS**
 - G. CHALLENGES, LESSONS LEARNED, AND MOVING FORWARD**
-

Authors: Cristen Don – ODFW Marine Reserves Program Leader (NRS4-M)

A. INTRODUCTION

A.1 HOW TO USE THIS CHAPTER

Here we report on the outreach and community engagement conducted as part of marine reserves implementation. You'll see what resources have been available; our goals, objectives, and target audiences; and the variety of methods and activities our program has used to engage communities and keep the public informed. We highlight the impacts of our outreach from communications assessments and analysis of pertinent data. In addition to the outreach and community engagement work carried out by our program, our partners have made significant contributions well beyond the capacity of our program. We showcase examples of the variety of outreach, community engagement, community science, education, and economic development projects that have been led and primarily funded by our partners. We also point you to where you can find more information on the additional resources and activities contributed by our partners. We conclude the chapter with some reflections on challenges, lessons learned, and considerations for the future.



B. MANDATES AND TAKEAWAYS

Here we provide an overview of the pertinent marine reserve mandates and key takeaways with regards to outreach and community engagement.

Mandates	Takeaways
<p>OPAC, Planning Principle and Guideline (2) Outreach and public engagement will be an ongoing part of the marine reserves ... implementation process. Available scientific and other information will be made available to the public through outreach and websites.</p> <p>OPAC, Implementation Principle and Guideline (3) Cooperative and collaborative research will be encouraged as well as utilization of fishing vessels as research platforms. These activities will be compatible with the goal of conserving marine habitats and biodiversity.</p> <p>OPAC, Implementation Principle and Guideline (4) Education and economic development opportunities that are compatible with the goal of conserving marine habitats and biodiversity will be encouraged.</p>	<p>Outreach and Public Engagement</p> <ul style="list-style-type: none"> • A variety of outreach methods and activities have been developed for sharing information with the public. Methods include digital media, collateral materials, social media, outreach events, public presentations, reports, and peer reviewed journal publications. • In 2016 the state developed an official marine reserves website, oregonmarinereserves.com, to better share information with the public. • The ODFW Data Dashboard was launched in 2020 as a way for people to explore marine reserves ecological data collected by ODFW. • Volunteer and community science opportunities have been developed by ODFW, local marine reserve community groups, NGOs, and academic partners. • Local marine reserve community groups and NGO partners make significant contributions to outreach and community engagement. <p>Cooperative and Collaborative Research. Use of Fishing Vessels.</p> <ul style="list-style-type: none"> • We used fishing vessels as research platforms and incorporated local knowledge to monitor marine reserves and comparison areas. We have had 47 contracts with local fishing vessels from 6 different home ports. • Collaborations with fishers resulted in a peer reviewed publication. • We have built and supported collaborative ecological and human dimensions research projects with academic researchers through IGAs. <p>Encouragement of Education and Economic Development</p> <ul style="list-style-type: none"> • Engagement and support for undergraduate and graduate students has been provided through internships, scholarships, as graduate student committee members, provision of data, and on class projects. • ODFW has provided funding and in-kind support for several local economic development projects led by marine reserve community groups.



C. HOW WE GOT HERE

Prior to 2014, our marine reserves outreach was largely focused on compliance and regulations (see [Chapter 5.5](#) for compliance outreach). Early community engagement primarily centered around opportunities related to ecological monitoring, development of site management plans (see [Chapter 5.1](#)), or through work with the two established marine reserve community groups – Redfish Rocks Community Team (RRCT) and Depoe Bay Near Shore Action Team (NSAT). We began to consistently hear from stakeholders that they were largely unaware or had received misinformation about the reserve sites, the activities of our program, and the research being conducted. In 2014, our program made a deliberate decision to undergo strategic communications planning and to dedicate more time and resources to communications and outreach.

C.1 OUTREACH GOALS, OBJECTIVES, AND SCOPE

GOALS

Improve understanding of the marine reserve system and the objectives of the Marine Reserves Program through 2023, while increasing awareness and support for ODFW’s impartial scientific and management role.

OBJECTIVES

Our constituents:

- Understand what Oregon’s marine reserves are, why (goals), and where
- Trust that ODFW is fulfilling the mandate given them by the Oregon Legislature
- Trust that the science being produced by ODFW and partners is rigorous and robust
- Feel ODFW is a trusted source of information

Coastal decision makers and ocean policy advisors:

- Understand the scope of the 2023 program evaluation, timeline, and process

SCOPE

Our communications and outreach predominately focuses on:

RAISING AWARENESS ABOUT OREGON’S MARINE RESERVES	MARINE RESERVES PROGRAM ACTIVITIES
<p>EMPHASIS IS ON:</p> <ul style="list-style-type: none"> • What are marine reserves • Why marine reserves • Where are the marine reserve sites • What can and can’t I do in a marine reserve or MPA 	<p>EMPHASIS IS ON:</p> <ul style="list-style-type: none"> • Connecting people to what lies below the surface of the ocean • The scientific research being conducted by ODFW scientists and our research collaborators • Sharing what we’re learning from Oregon’s marine reserves and how that information is being used in management <p>SECONDARY EMPHASIS IS ON:</p> <ul style="list-style-type: none"> • Program evaluation scope, timeline, and process
<p>PRIMARY REACH</p>	<ul style="list-style-type: none"> • Coastal residents • Fishermen and other extractive users • Conservation organizations • Scientists and marine resource managers • Coastal leaders • Coastal visitors who may be visiting at or near a marine reserve site
<p>SECONDARY REACH</p>	<ul style="list-style-type: none"> • Ocean policy advisory groups (e.g. OPAC, STAC) • Scientists and marine resource managers • Local marine reserve community groups • Coastal decision makers

C.2 COMMUNICATIONS PLANNING

Since 2014, our program's communications and outreach activities have been guided by four phases of communications [planning](#). We were assisted in each of these planning efforts by communications consultants.

- **[PHASE 1 \(2015\) - BRANDING AND AWARENESS BUILDING](#)**: Focused on establishing our program brand, messaging, and communications channels.
- **[PHASE 2 \(2017\) - CULTIVATING RELATIONSHIPS](#)**: Focused on cultivating relationships with fishers while maintaining a strong connection with the conservation community.
- **[PHASE 3 \(2019\) - COMMUNICATIONS NEEDS ASSESSMENT](#)**: Conducted an evaluation and needs assessment of the program's communications and outreach efforts as they relate to the marine reserve mandates. Included recommendations
- **[PHASE 4 \(2019\) - HUMAN DIMENSIONS RESEARCH SCIENCE COMMUNICATIONS](#)**: Focused on messages, strategies, and channels to improve and increase the frequency of the program's communications on the Human Dimensions Research being conducted by our staff and research partners.

Additionally, marine reserve site management plans outline the outreach and community engagement strategies our program is committed to carrying out, both for the marine reserve system and each site. These include communications products, outreach events, as well as local communications pathways and information hubs to best reach local community members.

We have also developed a [Strategic Communications Overview](#) that serves as a useful reference guide summarizing our communications goals, objectives, focus, scope, and key messages for staff when developing communication products or conducting outreach.

C.3 ASSESSMENTS OF COMMUNICATIONS, OUTREACH, AND COMMUNITY ENGAGEMENT

Included in [Appendix E](#) are two reports that provide assessments of our program's communications, outreach, and community engagement activities. These include:

- [Communications needs](#) assessment, conducted by Kearns and West (2019), as part of Phase 2 planning. The assessment included development and distribution of a survey to key stakeholders and community members to receive their feedback on the effectiveness of the Program's communications and outreach efforts. The survey was sent to 54 people and Kearns and West received 28 survey responses.
- Summary of results from [human dimensions research survey analyses](#) pertinent to communications and outreach.

We also provide in the Appendix, a report produced by our program that examines [best practices for communication evaluation](#) with application to a science communication program. There is a paucity of information about biological science communication program evaluations for science practitioners. Given the political nature of marine reserves in Oregon, the vast amount of technical communication, Legislative mandates and a limited budget, strategic communication is necessary to maximize limited resources and navigate polarized stakeholder groups. This effort serves as a model to apply communication theory, and implement and evaluate communication efforts in the emerging field of science communication.

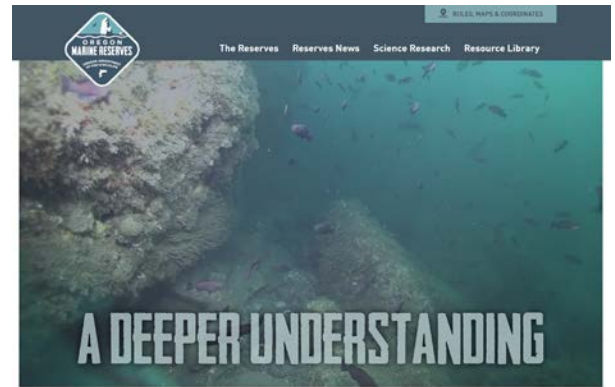
D. COMMUNICATIONS AND OUTREACH ACTIVITIES

In this section we review the main communications and outreach strategies and activities that have been implemented by our program. These activities were prioritized based on the marine reserve mandates, our communications objectives, and the staff time and funding resources available. We also highlight some of the impacts of our communications and outreach, based on analysis of our digital media metrics and the assessments found in [Appendix E](#).

D.1 DIGITAL MEDIA

WEBSITE: OREGONMARINERESERVES.COM

Websites allow government agencies to reach a large audience and communicate a range of information in visually engaging ways to enhance public engagement. We created an official state website for Oregon’s marine reserves, launched in the Spring of 2016. The website communicates information about the marine reserve sites, rules, news, ecological monitoring, and human dimensions research. We regularly post stories on the [Reserves News](#) page of the website featuring current research, program activities, upcoming events, and ocean related topics. The website also includes a [Resource Library](#) where folks can download scientific reports, management plans, infographics, outreach materials, and more.



Our [human dimensions research surveys](#) showed the internet to be the most common source, used by survey respondents, to obtain information about ocean related issues (Epperly et al. 2017). Also, 75% of respondents in the [communications needs assessment survey](#) said the oregonmarinereserves.com website was the most common place they got their information about the program from (Kearns and West 2019). A strong majority of stakeholders (71%) indicated they find the information on the website to be useful, indicating that survey respondents generally find what they are looking for when they visit the website.

These results confirm that the website is one of the best methods we have for providing information to the public and that devoting time and resources into keeping the website a strong component of our outreach and engagement program is a high priority.

eNEWSLETTER: MARINE RESERVES NEWS

Electronic newsletters are a way for government agencies to distribute information directly to interested stakeholders in a convenient and visually engaging format. Our “Marine Reserves News” eNewsletter is an outbound electronic email newsletter that we send to over 1,300 people each month. The newsletter is a way for interested stakeholders to keep tabs on current research, find out about reports and upcoming events, dive into interesting ocean topics, and hear perspectives from scientists, fishermen, volunteers, and community members. We always feature photos or videos from our work. All [past issues](#) of the newsletter are posted and available in the Resource Library on our program’s website.



The main impetus for the newsletter was to address feedback received from stakeholders that they were unaware of and concerned that no research and monitoring was being conducted at the marine reserve sites, as was mandated. The newsletter was a way for us to provide regular updates directly to interested stakeholders on our program’s research and other activities. It began as a weekly newsletter in 2015, that had short announcements about current research activities, but has since transformed into a monthly newsletter that serves as a much more comprehensive and engaging source of information for readers.

We use the platform GovDelivery to distribute the electronic newsletter, manage our listserv, and track metrics. Interested stakeholders can sign up for the newsletter at community events or [directly](#) on our program’s website. The total number of subscribers has more than doubled since the newsletter began in 2015, from 556 subscribers to 1320 as of May 2021 (Figure 1).



Figure 1. The total number of newsletter subscribers from 2015 through May 2021.

Both the open rate (% of subscribers that open the newsletter) and click rate (% of subscribers that click on a link within the newsletter) show small but steady trends upward over time (Figures 2 and 3). In the last year, between June 2020 and May 2021, the average open rate was 39% and the average click rate was 9%, both substantially above the government industry standards of 29% and 4% respectively. These metrics indicate continued interest and engagement by subscribers in the newsletter.

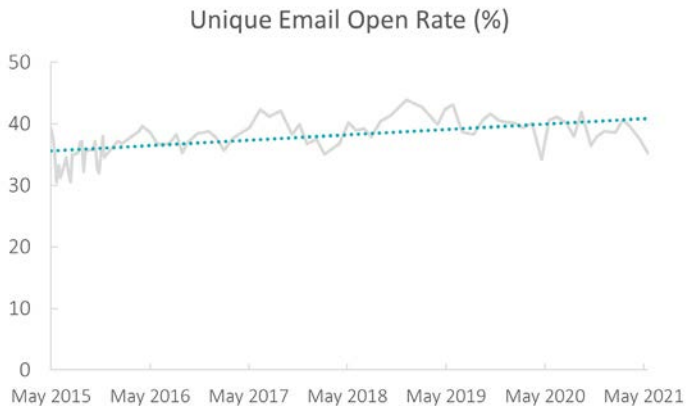


Figure 2. Open rate over time of the eNewsletter.

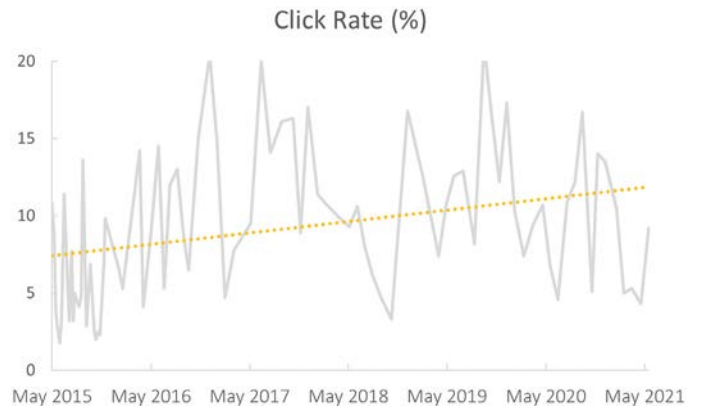


Figure 3. Click rate over time of the eNewsletter.

In addition, the majority of the stakeholders who participated in the communications needs assessment survey (Kearns and West 2019) overwhelmingly supported the content of the electronic newsletter. Many survey respondents found the electronic newsletter relevant and a place to learn new information about the program.

The assessments indicate that the newsletter is a successful communication channel and that devoting time and resources into keeping the newsletter a strong component of our outreach and engagement program is a high priority.

ODFW DATA DASHBOARD

We created a data dashboard as a means of sharing with the public, marine reserves ecological monitoring data collected by ODFW. The [ODFW Data Dashboard](#) is a website with drop down menus for users to navigate through and explore the data collected in the first ten years of monitoring. The dashboard was created using Shiny, an R package (an extensions to the R statistical programming language) that makes it easy to build interactive web apps straight from R. We launched the dashboard in November 2020. We promoted the dashboard via our eNewsletter and in a press release issued by ODFW. We also created a short 5 minute tutorial [video](#) providing a demonstration on how to use the dashboard.

Dashboard Users, as of December 2021:

1,100 page views

people in **29** states (USA)

people across **25** countries

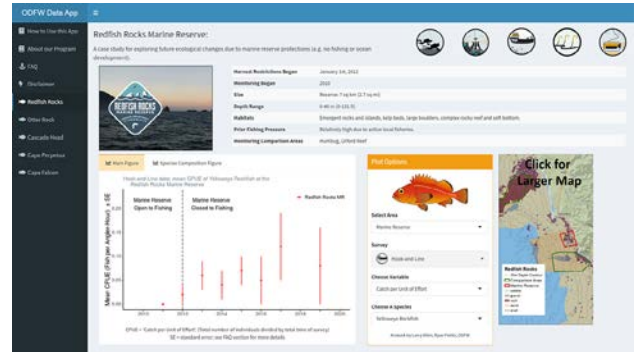


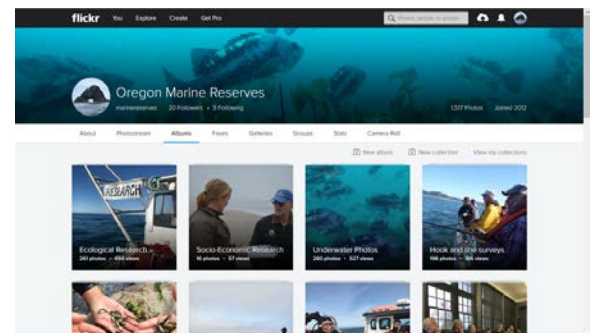
PHOTO AND VIDEO REPOSITORIES

Our program maintains [Flickr](#) and [YouTube](#) accounts, created in 2012 and 2015 respectively, to store and share images and videos of our program's work. Uploads on Flickr and YouTube include pictures and videos of the marine reserve sites, photos and videos of researchers working in the reserves, underwater wildlife images, yearly highlight videos, and videos on nearshore ocean topics.

As of December 2021:

Flickr: **1,722** photos and videos posted

YouTube: **34** videos posted



D.3 COLLATERAL MATERIALS

The use and availability of collateral materials such as brochures, flyers, or infographics are another way to convey program goals, key information, and news. These materials provide a helpful way to communicate updates and recent information to community members, stakeholders, and partners.

We develop and use collateral to raise awareness about our program, communicate highlights from our and partner's scientific research, and provide various updates. Updates include topics such as what is being studied and where, new research projects, perceptions of the marine reserves, number of fish caught for research, and more. We use collateral material during outreach events and in our digital media and social media activities (i.e. eNewsletter, Reserves News posts, social media posts). Most collateral material is also available for download from our website. We also frequently provide collateral materials (hardcopy and digital) for use by partners in their outreach and community engagement activities.

Our most frequently used or produced collateral materials include:

- **BROCHURES and FAQ:** Statewide brochure and brochures developed for each marine reserve site. A marine reserve FAQ handout. Access [here](#).

- **MARINE RESERVES HIGHLIGHTS INFOGRAPHICS:** Annual infographics highlighting program accomplishments, beginning in 2015. Access [here](#).
- **HUMAN DIMENSIONS RESEARCH INFOGRAPHICS.** Access [here](#).
- **ECOLOGICAL MONITORING RESEARCH INFOGRAPHICS AND LEAFLETS.** Access [here](#).
- **FISH ON! HOOK-AND-LINE SURVEY VOLUNTEER NEWSLETTER:** An annual newsletter developed for our volunteer anglers and biological assistants who participate in our hook and line surveys, summarizing the contributions they have made to our research. The newsletter is emailed to all volunteers, as well as featured in our eNewsletter and posted on our website. Access [here](#).



D.4 PRESENTATIONS AND EVENTS

Hosting and participating in events and presentations are useful ways to disseminate information and form relationships with interested stakeholders and community members. Each of our staff are committed to participating in 1-2 presentations or outreach events each year to inform people about the existence of the marine reserves and the research underway. We prioritize events with audiences of 20+ people or that include audiences that may not otherwise be reached.

We have been keeping track of event attendance since 2017. Since that time, we have participated in over 76 outreach events and activities including presentations, tabling events, guest lectures at universities, marine reserve boat tours, and other miscellaneous events. The most common locations we attend events are in coastal towns near the marine reserve sites and in Portland, Salem, Corvallis, and Eugene.



76 Presentations and Outreach Events Since 2017

Since 2017, we have hosted several events – [Science on the Grill](#) and Slice of Science- aimed at engaging and strengthening relationships with fishers. The events were designed to informally engage fishers and ODFW staff in dialogue about the science and research at the reserves and to listen to fishers perspectives and feedback. We will be revisiting if or how we might continue these types of events with fishers post the COVID-19 pandemic and once our Outreach and Community Engagement position has been filled again.

D.6 REPORTS AND PUBLICATIONS

Our program has committed to producing monitoring and research reports or journal publications at least every two years. To date, our Human Dimensions Research and Ecological Monitoring staff have published 14 peer-reviewed journal publications and have an additional five currently in review. We have produced five ODFW informational reports, and our staff and research partners have generated over 30 human dimensions research reports. All reports and publications can be accessed from the [Resource Library](#) on our website.

Our Program Has Produced Over:



- 14** Journal Publications (+ 5 in Review)
- 5** ODFW Technical Reports
- 30** Research Reports



D.5 SOCIAL MEDIA

Per agency policy, our program does not have its own dedicated Facebook, Instagram or Twitter accounts. We do, however, work with the agency’s social media coordinator to occasionally post marine reserves related content using the agency’s social media accounts.

E. COMMUNITY ENGAGEMENT ACTIVITIES

Here we provide an overview of the different ways our program has engaged communities in marine reserve implementation and supported economic development.

E.1 FISHING VESSEL CONTRACTS AND COLLABORATIONS

We have been able to improve our ecological monitoring efforts by collaborating with local fishers and learning from their years of experience and expert local knowledge of the ocean and marine resources. Fishers additionally bring expertise in vessel operations, working with different gear types, and equipment building. We have incorporated local expert knowledge of fishers in our:

- Selection of research comparison areas
- Placement of sampling locations for hook and line surveys
- Construction and placement of oceanographic moorings
- Development of a supplemental longline survey at Redfish Rocks



We regularly contract with local fishing vessels to assist in our ecological monitoring surveys. Since 2010, we have had 47 contracts with local fishing vessels from ports near marine reserve sites, totaling over \$750,000 (Figure 4). These contracts have supported our hook and line and Remotely Operated Vehicle (ROV) surveys, as well as oceanographic mooring deployments and juvenile fish research.

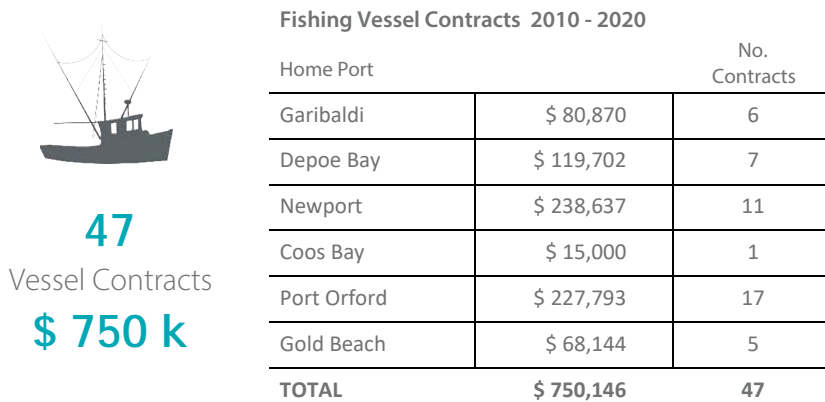


Figure 4. A summary of the vessel contracts we have had with fishers between 2010 and 2020, broken out by vessel home port.

Our collaborations with fishers have even resulted in a [peer reviewed publication](#) based on a pilot study comparing hook and line vs longline gear-- initially proposed and conducted in close cooperation with a [local commercial fisher](#) from Port Orford. The outcomes from this pilot study resulted in us supplementing our hook and line surveys with longlining at the Redfish Rocks Marine Reserve.

E.2 ENGAGEMENT IN SCIENCE THROUGH VOLUNTEER OPPORTUNITIES

Our program has created several volunteer opportunities, providing Oregonians an opportunity to engage in ecological research.

HOOK AND LINE SURVEY VOLUNTEER ANGLERS AND BIOLOGICAL ASSISTANTS

We use volunteer anglers to help us collect groundfish in our hook and line surveys. These volunteers are experienced saltwater anglers willing to spend a full day out on the water helping us catch and sample fish, often in rough ocean conditions. We also provide opportunities for graduate students to participate in our surveys as biological assistants, gaining valuable Pacific Northwest fieldwork experience. Volunteer anglers and biological assistants all go through a hook and line training at the start of the field season.

On average **87** volunteer anglers participate in our hook and line surveys each year.

Between 2016-2020 we have trained **76** biological assistants.

At the end of the year, volunteers receive our “Fish On!” hook and line newsletter. Volunteers also receive a marine reserves hook and line patch, with a different fish species each year, as a thank you and symbol of their service.

VOLUNTEER SCIENTIFIC DIVERS

We use volunteer scientific divers to conduct SCUBA diving surveys in shallow rocky reef areas. These are American Academy of Underwater Science (AAUS) certified scientific divers who must then undergo a special survey method training, developed by the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO). The method includes collecting data on fish, invertebrates, and algal communities. The volunteer divers, trainings, and surveys are a collaborative effort between ODFW, the Oregon Coast Aquarium, and Oregon State University.

We currently have a roster of **26** volunteer scientific divers.



Don Sarver is Serving Science with His Fishing Skills

From beach cleanups to family fishing events to research surveys, it's almost impossible to attend a volunteer event on the central Oregon coast without crossing paths with Don Sarver. Join us as we talk with this stalwart fisherman and avid volunteer as he shares his reasons for volunteering, some of his most memorable moments and what he's learned about the reserves in the process. [Read](#)

[More](#)



Volunteer Diana Hollingshead: Deep Commitment To Discovery & Safety

With decades of experience under her dive belt, Diana Hollingshead is no stranger to the challenges of scientific diving or the discoveries they can bring to the surface. Join us as we talk with this SCUBA instructor, as she reflects on her volunteer experiences as a scientific diver helping ODFW with marine reserve monitoring SCUBA surveys. [Read More](#)

ROCKY INTERTIDAL SURVEY VOLUNTEERS

Our rocky intertidal monitoring surveys of sea stars is the most accessible monitoring activity for volunteers as the research sites can be accessed on foot, from land. Tide-pooling is a favorite past-time of many Oregonians, and this volunteer opportunity provides the chance to learn more about our local sea star populations and tidepool organisms.

E.3 SUPPORTING EDUCATION THROUGH STUDENT ENGAGEMENT

The ODFW Marine Reserves Program has supported students and student projects through funding, fieldwork, data sharing, and by staff serving on graduate student committees. We also participate in university research seminars and are invited to give several class lectures each year. Since 2012, we have provided support to more than 30 graduate students engaged in ecological, human dimensions, and policy research.

We have also:

Hosted **19** undergraduate student interns since our program inception.

Awarded a total of **\$45,000** in scholarships, supporting the research of **15** graduate students.

A brief list of students and projects provided support by our Human Dimensions Research program and an overview of the student projects provided support by our Ecological Monitoring program is provided in [Appendix C](#).



E.4 LOCAL COMMUNITY ENGAGEMENT

The partnerships we have built with NGOs and local marine reserve community groups have fostered community engagement in marine reserves implementation at the local level. These groups promote stewardship, serve as liaisons between their community and ODFW, and have been instrumental in developing and carrying out outreach, community engagement, community science, education, and economic development projects at each of the marine reserve sites.

COLLABORATIVE PROJECTS AND ODFW FUNDING SUPPORT

In [Chapter 5.1](#) we describe working with local marine reserve community groups to design and execute the public engagement process for each of the marine reserve site management plans. These groups developed local strategies for soliciting participation and were successful in amplifying announcements made by ODFW.

We have also collaborated and provided funding support for numerous local community outreach, engagement, and economic development projects with NGO and local marine reserve community group partners over the years. Examples include:

- Annual marine reserve outreach events such as Redfish Rocks on the Docks hosted by the Redfish Rocks Community Team (RRCT) and the Land-Sea Symposium hosted by the Cape Perpetua Collaborative (CPC).
- Development of marine reserve [hospitality packets](#) for distribution and use by local hotels and businesses. Led by CPC and Friends of Cape Falcon Marine Reserve (FCFMR) staff, in collaboration with local hotels, businesses, the Oregon Coast Visitors Association (OCVA), and ODFW.
- Translation of the marine reserve brochure for Cape Falcon into Spanish, led by FCFMR.
- [Interpretive signs](#) at marine reserve sites led by community groups, NGOs, and watershed councils.
- Work with the CPC and City of Yachats to conduct a two-year visitor intercept study at Cape Perpetua ([Epperly et al. 2020](#)).
- Work with an Oregon Sea Grant Summer Scholar to design, execute, and complete a visitor intercept study Haystack Rock Awareness Program (HRAP) in Cannon Beach.
- Development of a SCUBA air fill station at the OSU Port Orford Field Station, to attract and provide services for recreational and scientific divers. Led by the RRCT with support from OSU, Travel Oregon, and ODFW.

Figure 5, below, shows funding support provided by our program each biennium to local marine reserve community groups and NGOs to support community projects.

ODFW Funding Support for Community Projects

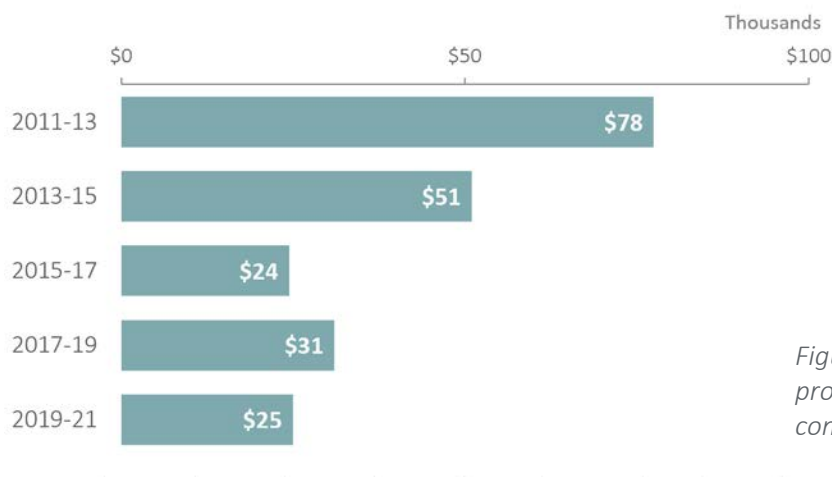


Figure 5. ODFW Program funding provided each biennium for local community projects led by partners.

COMMUNITY ADVISORY COMMITTEE (CAC)

In addition to working with individual groups, we are a member of the Community Advisory Committee (CAC). This committee was formed by NGOs to coordinate between groups involved in supporting marine reserve implementation at the local level. The CAC is comprised of members from the five, currently active marine reserve community groups, NGOs, and state agencies tasked with managing the reserves—namely ODFW and Oregon State Parks. The CAC has monthly virtual meetings that are facilitated by the Surfrider Foundation and The Nature Conservancy. Workshops are held twice yearly to plan for more involved outreach activities and to develop strategic communications.



F. OUTREACH AND ENGAGEMENT LED BY PARTNERS

Our NGO and marine reserve community group partners have been instrumental in developing, funding, and carrying out projects that complement and expand far beyond the outreach and community engagement led by our program. In [Appendix D](#) you'll find overviews produced by each of the marine reserve community groups highlighting contributions, activities, and impacts of their efforts. In this section we showcase some examples of the work led and funded by NGOs and marine reserve community groups. These examples illustrate the types, breadth, and importance of outreach and community engagement that partners have contributed to marine reserves implementation.

RAISING MARINE RESERVES AWARENESS

Our partners have helped raise awareness about Oregon's marine reserves through their organization's websites, social media, local radio and newspapers, interpretive signs, development and distribution of collateral materials and [videos](#), marine reserve exhibits at visitor centers, and hosting marine reserve focused events and speaker series, and more.

REDFISH ROCKS ON THE DOCKS

Seeking a way to engage with the local community and particularly commercial fishermen in Port Orford, the Redfish Rocks Community Team (RRCT) began Redfish Rocks on the Docks seven years ago. The dockside gathering features research and monitoring work by ODFW and partners with survey gear displayed on the docks for visitors, residents, and the local fishing community. The event also features kayak tours and tours of local commercial fishing vessels. The team provides food and entertainment that has become an anticipated event every summer.



THE LAND-SEA SYMPOSIUM

Honoring the connectivity between the Cape Perpetua Scenic Area and the Cape Perpetua Marine Reserve, the Land-Sea Symposium melds the protected areas through an evening of short talks, discussions, and local food and drink. The Symposium is produced by the Cape Perpetua Collaborative and held in the late fall in Yachats. ODFW, partners, and other groups host tables to discuss their work in the area. Food is donated by local businesses and turnout always tops 100 persons.

CONNECTING PEOPLE TO THE MARINE RESERVE SITES

Our partners have developed a variety of ways to bring and connect people to each of Oregon's marine reserve sites. These have included guided hiking and tidepool tours, kayak tours, K-12 class field trips, and beach clean-up events to name just a few. They have also implemented a number of community science projects including seabird and [shorebird surveys](#), BioBlitz surveys, visitor intercept surveys, and whale surveys as well as collaborating with OSU on [ocean acidification and hypoxia \(OAH\) intertidal monitoring](#).

DEVIL'S CAULDRON SEABIRD MONITORING

The Friends of Cape Falcon Marine Reserve has organized community science seabird monitoring on the cliffs above the marine reserve for 4 years with support from Portland Audubon. The monitoring has engaged over 25 people who record eggs laid, birds hatched and fledged for Brandt and Pelagic cormorants. Seabird monitoring coordinated by Audubon has also occurred at Cape Perpetua Marine Reserve and other coastal sites. It has engaged countless visitors and enhanced their awareness of seabird ecology and the importance of coastal protection.



ECONOMIC STIMULUS AND DEVELOPMENT

Outreach events developed by our partners are often designed to help attract and bring economic stimulus within the local community. Partners have also collaborated and developed projects with local business in their communities. In some instances partners have helped build infrastructure in their communities to attract additional business and economic stimulus.

CHARTER TOURS AT CAPE FALCON MARINE RESERVE

A unique joint venture with Garibaldi Fishing Charters brought invited guests on several cruises to the Cape Falcon Marine Reserve and included discussions by ODFW and other local experts on the site. The charters allowed for guests to charter fish as well, outside the boundary of the marine reserve. Allowing charter fishing operators to tell their story alongside marine reserve conservation was well received by participants, built a relationship with the charter fishing company and helped expand charter opportunities in Garibaldi as well.



G. CHALLENGES, LESSONS LEARNED, AND MOVING FORWARD

IMPORTANCE OF HAVING A DEDICATED ODFW OUTREACH AND COMMUNITY ENGAGEMENT POSITION: Having a full-time dedicated staff focused on marine reserves communications, outreach and community engagement is critical to our ability to provide frequent and quality information to the public.

MARINE RESERVE COMMUNITY GROUPS AND NGOs CATALYZE LOCAL ENGAGEMENT: Our partners have been instrumental in developing and carrying out outreach, community engagement, community science, education, and economic development projects in local communities. These efforts expand far beyond the capacity of the agency. The additional funding resources these groups bring are substantial. The successful implementation of Oregon's marine reserves would not be possible without these efforts.

AWARENESS OF OREGON'S MARINE RESERVES IS INCREASING: Awareness of Oregon's marine reserves system and sites has been addressed in multiple human dimensions research surveys conducted by our program and our partners. Groups surveyed have included coastal visitors, coastal residents, Oregon residents, recreational fishers, and business owners/managers. The sample sizes and exact question phrasing differ among studies, but all show general trends of increasing awareness (Figure 6). This suggests that the outreach and community engagement conducted by our program and partners has had some positive impact and is helping us reach our goal of raising awareness. Once our program Outreach and Community Engagement position is filled, we will be looking again at the recommendations from the communications needs assessment (Kearns and West 2019) to lay out our next strategic communications plan and address some of the gaps identified.

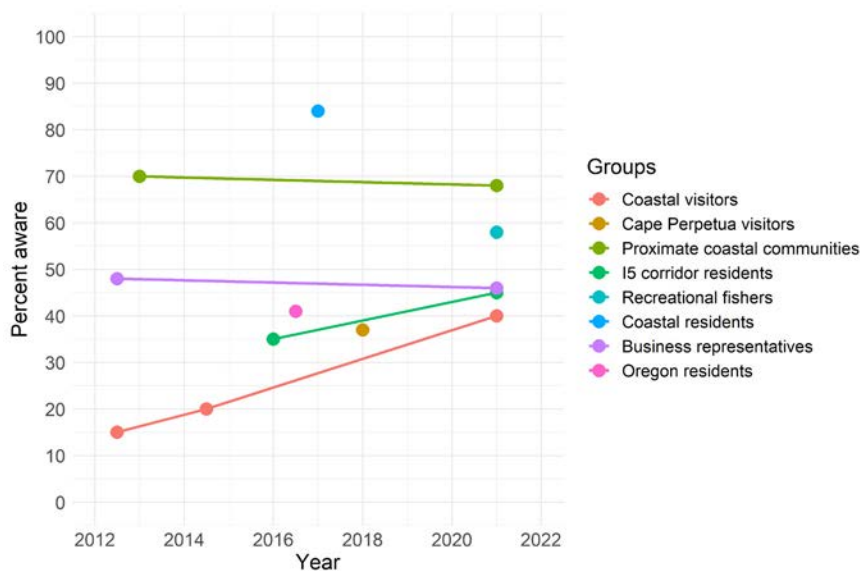


Figure 6. Groups surveyed in different marine reserve human dimensions research studies that were asked questions about their awareness of Oregon's marine reserves. There is a general trend of increasing awareness.



5.5 COMPLIANCE AND ENFORCEMENT

PROGRAM RESOURCES



STATE AGENCY LEAD
Oregon State Police (OSP) Fish and Wildlife Division- Marine Fisheries Team



STATE AND FEDERAL AGENCY PARTNERS
Oregon Department of Fish and Wildlife (ODFW)
Oregon Parks and Recreation Department (OPRD)
U.S. Coast Guard (USCG)



ODFW PROGRAM FUNDS TO SUPPORT ENFORCEMENT
ODFW Marine Reserves Program funds are provided to OSP each biennium to help support enforcement of marine reserve sites (Figure 1).



ENFORCEMENT: ODFW BUDGET (THOUSANDS)

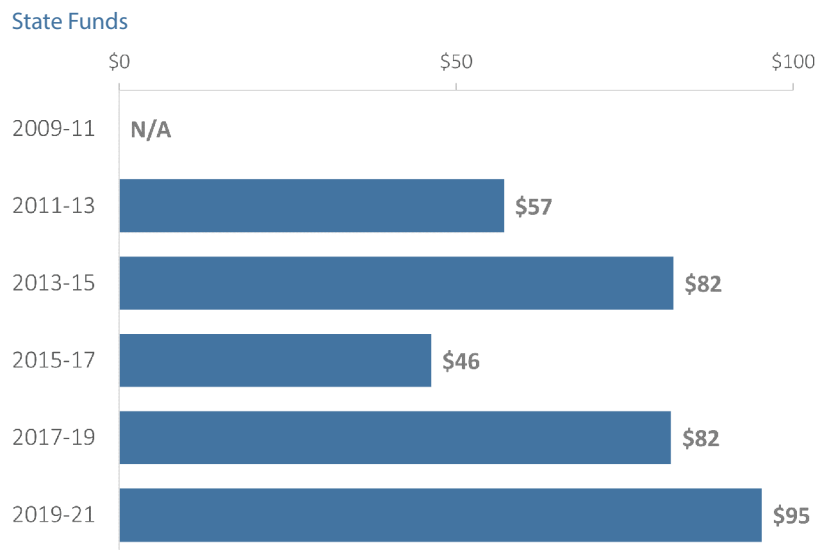


Figure 1. ODFW Marine Reserves Program funds provided to OSP each biennium to help support enforcement.

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- A. INTRODUCTION
 - B. MANDATES AND TAKEAWAYS
 - C. WHO CARRIES OUT AND SUPPORTS ENFORCEMENT
 - D. MANAGEMENT PLANS: COMPLIANCE AND ENFORCEMENT
 - E. REVIEW AND ADAPTATION: ADAPTIVE MANAGEMENT
 - F. HOW: ENFORCEMENT
 - G. HOW: COMPLIANCE ASSISTANCE
 - H. COMPLIANCE AND ENFORCEMENT BY THE NUMBERS
 - I. CHALLENGES, LESSONS LEARNED, AND CONSIDERATIONS FOR THE FUTURE
-

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 Ryan Howell – OSP Fish and Wildlife Division (Lieutenant)
 Heather VanMeter – OSP Fish and Wildlife Division, Marine Fisheries Team (Senior Trooper)

A. INTRODUCTION

A.1 HOW TO USE THIS CHAPTER

Here we report on the compliance and enforcement of Oregon’s marine reserve sites. This chapter can be used to see the compliance and enforcement mandates and how Oregon State Police (OSP), ODFW, and our state and federal agency partners have implemented these mandates to date. You’ll see the enforcement strategies used to monitor and patrol the marine reserve sites and the outreach and education strategies used to support compliance. You’ll find reports on enforcement effort, compliance rates, and number of violations. We highlight several examples from the field to further illustrate the breadth and complexity of enforcement. The appendices include more detailed enforcement data as well as enforcement summaries from the field logged by OSP Troopers, to provide additional context to the compliance and enforcement numbers. We conclude the chapter with reflections on enforcement challenges, lessons learned, and considerations for the future.



B. MANDATES AND TAKEAWAYS

Here we provide an overview of the pertinent marine reserve mandates and key takeaways with regards to compliance and enforcement.

Mandates	Takeaways
<p>OPAC, Implementation Principle and Guideline (1) Marine reserves as a system and each individual marine reserve will have a plan that includes ... compliance and enforcement provisions.</p> <p>OPAC, Implementation Principle and Guideline (2) Marine reserves will be adequately enforced.</p>	<p>Management Plans: Compliance and Enforcement</p> <ul style="list-style-type: none"> • Management plans outline strategies for compliance and enforcement for the marine reserve system and each site. <p>Enforcement</p> <ul style="list-style-type: none"> • Sites are being enforced by OSP with patrol assistance from U.S. Coast Guard and OPRD beach rangers and park staff. • Local community members and fishers play a critical role by reporting possible violations to OSP and ODFW. • Between 2012-2020, OSP has logged 3,943 marine reserve enforcement hours, made contact with 1,077 individuals or vessels presumed to be engaged in a prohibited activity, and issued a total of 75 citations and warnings for recreational and commercial violations. <p>Enforcement Funding</p> <ul style="list-style-type: none"> • The ODFW Marine Reserves Program provides a set amount of funding to OSP each biennium used to support OSP staff overtime and patrol equipment. <p>Compliance Assistance</p> <ul style="list-style-type: none"> • Compliance assistance is provided through outreach and education conducted by OSP, ODFW, and OPRD. <p>Learning and Adapting: Adaptive Management</p> <ul style="list-style-type: none"> • OSP, ODFW, OPRD, and U.S. Coast Guard staff meet two times per year to review marine reserve compliance and enforcement. Strategies are adapted to address issues and gaps. • Adaptive strategies have included shifting additional resources to certain locations, targeting education and outreach efforts, piloting new patrol equipment, and adopting changes to marine reserve administrative rules (OARs).



C. WHO CARRIES OUT AND SUPPORTS ENFORCEMENT

The following state and federal agencies work together to carry out and support compliance and enforcement of Oregon's marine reserves.

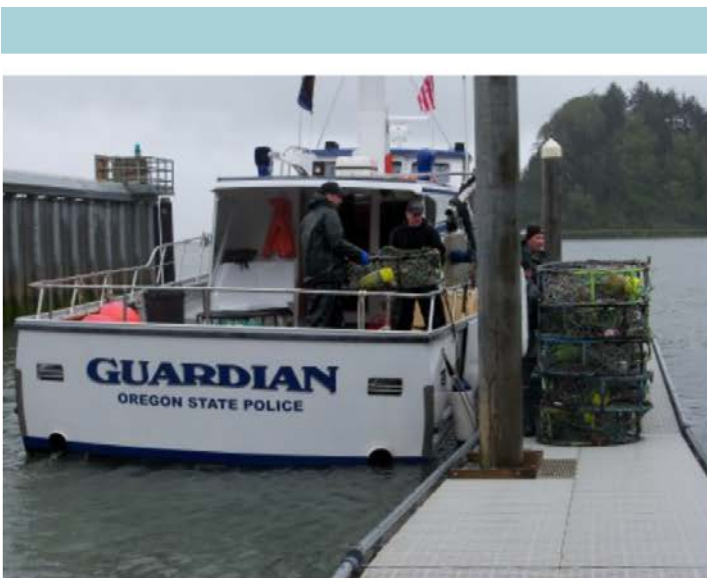
- **OREGON STATE POLICE (OSP):** The [OSP Fish and Wildlife Division](#) is responsible for the enforcement of Oregon's fish and wildlife laws including rules pertaining to marine reserve sites. Within the Division, the Marine Fisheries Team carries out enforcement efforts and provides compliance assistance through outreach and education.
- **OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW):** The ODFW Marine Reserves Program provides compliance assistance through outreach and education and leads coordination between the agency partners.
- **OREGON PARKS AND RECREATION DEPARTMENT (OPRD):** OPRD staff provides compliance assistance through outreach and education. OPRD beach rangers and park staff also assist with the patrol of marine reserve sites.
- **U.S. COAST GUARD (USCG):** USCG assists with the patrol of marine reserve sites.

In addition, local community members and fishers have had a large influence and play an important role in supporting compliance and enforcement of the marine reserve sites, including the reporting of possible violations to OSP and ODFW. See our [Reserves News](#) post from September 2020, to see how a local commercial fisher was instrumental in helping catch poachers at Cape Falcon Marine Reserve.

The ODFW Marine Reserves Program also provides a set amount of funding from its budget each biennium to OSP for marine reserves enforcement (see Figure 1). These funds are used by OSP to support staff overtime and patrol equipment.

D. MANAGEMENT PLANS: COMPLIANCE AND ENFORCEMENT

Each marine reserve [site management plan](#) includes a chapter on compliance and enforcement. The plans outline the strategies to be implemented by the state and federal agencies to support compliance and enforcement of the marine reserve system and site. They include methods for monitoring and patrolling of sites, periodic reviews of compliance and enforcement, and compliance assistance through outreach and education. The strategies were developed by the ODFW Marine Reserves Program in consultation with OSP, OPRD, and USCG along with input from local community members. We report on the implementation of compliance and enforcement strategies below in sections F and G.



09.22.20

Poachers Caught Setting Stolen Crab Pots in Reserve Await Trial

Two men caught setting stolen crab pots in Cape Falcon Marine Reserve on the north Oregon coast await trial following a joint effort of citizen reporting and solid detective work. [Read More](#)

Filed under: [Cape Falcon](#), [Enforcement](#)



E. REVIEW AND ADAPTATION: ADAPTIVE MANAGEMENT

OSP, ODFW, OPRD, and USCG staff are committed to meeting twice per year to review compliance and enforcement. OSP collects data on enforcement efforts carried out for the marine reserve sites. The agency partners use this information along with observations from OSP and OPRD staff in the field, and frequently asked questions or issues raised by constituents, to review compliance and enforcement efforts and adjust strategies. Adjusted strategies may include shifting additional resources to certain locations, targeting education and outreach efforts, or piloting new patrol tools. In some instances, adaptations to marine reserve OARs may be needed to provide further clarification of allowances and prohibitions and to better support enforcement of the sites.

F. HOW: ENFORCEMENT

Monitoring and patrol of marine reserve sites is conducted using the following methods:

- **BY LAND:** Observation from land by OSP and OPRD beach rangers and park staff.
- **BY AIR:** Via airplane operated by OSP and helicopter in cooperation with USCG.
- **ON THE WATER:** By vessels owned and operated by OSP and USCG. The main enforcement vessel is the PV Guardian operated by OSP.
- **REPORTING BY MEMBERS OF THE PUBLIC:** OSP has a tip line for anyone to call and report possible fish or wild-life violations at 1-800-452-7888. We highly promote the public calling the OSP tip line to report any suspected violations at marine reserve sites. Local community members and fishers who have established working relationships with OSP or ODFW staff will often directly contact staff.

G. HOW: COMPLIANCE ASSISTANCE

Compliance assistance is provided through outreach and education strategies. We have developed a variety of strategies to reach different target audiences including commercial fishers, charter fishers, recreational fishers fishing from a boat, and shoreside recreational fishers/harvesters/beachgoers. The following outreach and education strategies have been implemented to date by OSP, ODFW, and OPRD.

G.1 MAPS AND RULES

ON THE OREGON MARINE RESERVES WEBSITE: The following are available from the “Rules, Maps and Coordinates” page on the state’s Oregon Marine Reserves website (oregonmarinereserves.com/rules) or by contacting the ODFW Newport office.

- **MAPS AND RULES:** One-page handouts that can be viewed and downloaded. Best for fishermen who may be fishing offshore from a boat. The handouts provide a map of the site overlaid onto a nautical chart, the site boundary coordinates, and a summary of the prohibitions and allowances in the marine reserve and in any MPAs associated with the site.
- **SHORESIDE MAPS AND RULES:** One-page handouts that can be viewed and downloaded. Best for folks who may be accessing the marine reserve or an associated MPA via the shore. The handout provides a schematic map of the site that includes landmarks and a summary of the prohibitions and allowances in the marine reserve and in any MPAs.
- **OREGON ADMINISTRATIVE RULES (OARs):** The complete set of official OARs for Oregon’s marine reserves and protected areas (OARs 141-142, 635-012, and 736-029) can be viewed and downloaded.

The “Rules, Maps and Coordinates” page is the third most visited page on the website with over 15,109 page views (10,107 unique page views) since we launched the website in April 2016.

IN THE SYNOPSIS OF COMMERCIAL FISHING REGULATIONS: Booklet printed annually for Oregon commercial fisheries. We include boundary coordinates, maps, and a summary of the rules for each marine reserve site.

IN THE OREGON SPORT FISHING REGULATIONS GUIDE: Guide printed annually for Oregon recreational fisheries. We include maps and a summary of the rules for each marine reserve site in the Marine Zone section under Management Designations for Marine Areas. The guide is also available [electronically](#).

G.2 DOWNLOADABLE COORDINATES FOR DIGITAL DEVICES

We have site boundary coordinates available for download for some of the most common digital devices used by recreational and commercial fishers. The following are available from the state’s Oregon Marine Reserves website or by contacting the ODFW Newport office.

FOR GPS UNITS:

- **GPX FILE:** Used by most Garmin products.
- **PRINT FILE:** A printable pdf file with all coordinates for each site. Can be used to hand enter coordinates into your GPS unit.

FOR VESSEL NAVIGATION SYSTEMS: ODFW worked with the Oregon Fishermen’s Cable Committee (OFCC) to develop files, containing marine reserve site boundaries and rule summaries, that can be downloaded onto the most



06.05.19

Eyes in the Sky: Aerial Enforcement of Marine Reserves

A small, white, single engine plane bumped down the runway, gaining speed as it became airborne. It soared high above the coast as an Oregon State Police Trooper peered through binoculars at the ocean’s surface 2000 feet below. Learn more about aerial patrols of Oregon’s marine reserves [Read More](#)

common vessel navigation systems used by Oregon’s commercial fishing fleet. Files have been developed for the following navigation systems: Maptech Offshore Navigator, Rose Point Coastal Explorer, Nobeltec Visual Navigation suite/Odyssey Time Zero, OLEX, and P-Sea WindPlot II.

ODFW and OSP distributed preloaded electronic thumbdrives with these files to vessel captains during mandatory crab hold inspections at the start of the 2013-14, 2014-15, 2015-16 , and 2016-17 commercial crab seasons. You can learn more about this project [here](#).

FOR MAPPING PROGRAMS:

- KMZ FILE FOR GOOGLE EARTH: The file can be imported into Google Earth “My Places.”
- LAYER PACKAGE FOR ESRI ARCGIS: The layer package includes shapefiles of the site boundaries.

G.3 REGULATIONS SIGNS

Two types of regulations signs have been developed and are posted at strategic locations near boat ramps and beach access points for each marine reserve site. Locations for the signs were decided in consultation between ODFW, OSP and OPRD along with input from local community members.

HARVEST RESTRICTIONS SIGNS

Intended for fishers who may be fishing offshore from a boat. The signs provide a map of the site overlaid onto a nautical chart, the site boundary coordinates, and a summary of the prohibitions and allowances in the marine reserve and any associated MPAs. These signs have been placed at ports and boat ramps known to be used by fishers that have had a history of fishing in the area of the marine reserve site. Some ports, such as Newport and Depoe Bay, have more than one marine reserve site harvest restriction sign posted due to their ties to multiple marine reserve sites.

SHORESIDE REGULATIONS SIGNS

Aimed at folks who may be accessing the marine reserve site via the shore. These signs are placed at common beach access points adjacent to each marine reserve sites. The signs provide a generalized summary of what activities are prohibited from the shore at that specific location. Locations for signs were determined working with OPRD local beach rangers and park staff, as well with local community members.

G.4 WORKSHOPS AND MEETINGS

Workshops and meetings with the commercial fishing fleet, sport fishermen, or local community members have also been conducted when determined to be appropriate or requested as a means of disseminating regulatory information



WHAT ARE THE PENALTIES FOR VIOLATIONS?

Penalties for violations pertaining to fish, invertebrates, or wildlife within reserves are dictated by the wildlife code (Chapter 496) and commercial fishing code (Chapter 506) within Oregon Revised Statutes.



or discussing and gaining feedback on specific compliance or enforcement issues. These have included:

- **COMPLIANCE WORKSHOPS AND MEETINGS:** Conducted by OSP in Port Orford, Yachats, Lincoln City, Manzanita, and Falcon Cove at the request of local community members.
- **FISHING INDUSTRY MEETINGS:** ODFW marine reserves and fisheries management staff have presented marine reserves regulatory information at Oregon Dungeness Crab Commission meetings and at meetings with the Oregon commercial squid fishery.
- **SPORT FISHING CONFERENCES AND TRADESHOWS:** ODFW marine reserves and fisheries management staff have provided regulatory information at sport fishing conferences and saltwater tradeshow held in Oregon.

H. COMPLIANCE AND ENFORCEMENT BY THE NUMBERS

Here we report on enforcement effort, number of violations, and compliance rates. In the appendices you'll find more detailed data regarding violations and compliance rates ([Appendix A](#) and [B](#)) as well as enforcement summaries provided by OSP Troopers from marine reserve patrols and contacts ([Appendix C](#)), to provide additional context to the compliance and enforcement numbers presented here.

H.1 ENFORCEMENT EFFORT AND VIOLATIONS

Here we report on enforcement effort and violations from 2012, when harvest restrictions began at the first two pilot marine reserve sites, through 2020. In Table 1 we report the number of marine reserve enforcement hours logged by OSP and the number of contacts made by OSP. Contacts are people or vessels presumed to be engaged in a prohibited activity that were directly contacted by OSP. We also report on number of violations. Violations are warnings and citations that have been issued by OSP for prohibited commercial or recreational activities in a marine reserve site.

Table 1. Enforcement Effort and Violations (2012-2020)

Violations	Commercial	Recreational	Total	OSP Enforcement Hours and Contacts		No. of Violations			
				By Year	Hours	No. of Contacts	Commercial	Recreational	Total
Warnings	3	40	43						
Citations	16	16	32						
TOTAL	19	56	75						
				By Year	Hours	No. of Contacts			
				2012	232	91			0
				2013	219	47			0
				2014	822	91	4	1	5
				2015	361	157	2	1	3
				2016	419	302	2	2	4
				2017	459	149	3	11	14
				2018	363	59	4	8	12
				2019	683	49	1	17	18
				2020	387	132	3	16	19
				TOTAL	3943	1077	19	56	75
				By Site	Hours	No. of Contacts	Commercial	Recreational	Total
				Redfish Rocks	1084	153	1		1
				Otter Rock	294	137	1	7	8
				Cape Perpetua	952	459	8	5	13
				Cascade Head	378	101	6	33	39
				Cape Falcon	1235	227	3	8	11
				Unknown				3	3
				TOTAL	3943	1077	19	56	75

3943

ENFORCEMENT HOURS

BY OSP

1077

CONTACTS

PEOPLE OR VESSELS, PRESUMED TO BE ENGAGED IN A PROHIBITED ACTIVITY, CONTACTED BY OSP

75

VIOLATIONS

CITATIONS AND WARNINGS ISSUED BY OSP

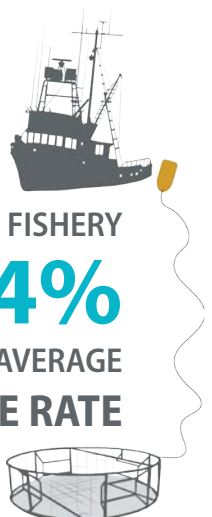
H.2 COMPLIANCE RATE: OCEAN COMMERCIAL CRAB FISHERY

Of the 19 commercial fishing violations in marine reserve sites from 2012-2020, 89% (17) occurred in the commercial crab fishery. Oregon's ocean commercial crab fishery is the most prominent commercial fishery that occurs in state waters and is considered the most valuable single species commercial fishery in Oregon, with a long-term average (25 years) of 16 million pounds landed each season. The crab season typically starts in December and ends on August 14. Since 1995, the fishery has operated under a limited entry permit system that limits the number of vessels participating in the fishery. The current number of permits in the fishery is 424. The number of active permits, where the permit holder makes at least one crab landing in Oregon, varies each season. For instance, between 2012 and 2020, the number of active permit holders each season has ranged between 305 and 322. Because we know the level of participation in the fishery each season, we can calculate a compliance rate.

We used the number of marine reserve commercial crab violations each season divided by the number of active permits each season to calculate a rate of compliance:

$$\text{Compliance Rate} = 1 - (\# \text{ commercial crab violations} / \# \text{ of active commercial crab permits})$$

Compliance of the commercial crab fishery to date has been high, with an average compliance rate of 99.4% (average noncompliance rate of 0.6%). The lowest compliance rate has been 98.7% (noncompliance rate of 1.3%), which



COMMERCIAL CRAB FISHERY
99.4%
AVERAGE COMPLIANCE RATE



occurred in two of the 10 crab seasons. The highest number of crab violations in any given season has been four. See [Appendix B](#) for more detailed data and graphs related to violations and compliance, by season and marine reserve site, for the commercial crab fishery.

H.3 EXAMPLES FROM THE FIELD

Here we highlight a few enforcement examples from the field to help illustrate the breadth and complexity of enforcement. See [Appendix C](#) for additional enforcement summaries from the field, provided by OSP Troopers, from January 2017 through May 2021.

April 2017: A Fish and Wildlife Sergeant was working the Cape Perpetua Marine Reserve and observed four subjects taking mussels in the Reserve near Cooks Chasm. Upon contact, it was determined two adults had shellfish licenses, but two juveniles did not. In all, the group had 294 mussels. The mussels were seized and released to ODFW for scientific purposes. One adult was cited for Taking Mussels in a Marine Reserve. The other adult and juveniles were warned for Taking Mussels in a Marine Reserve. The two juveniles were warned for No Shellfish License.

April 2019: Astoria Fish and Wildlife Troopers, and a USCG boarding officer contacted a vessel with four anglers on board angling for halibut within the Cape Falcon Marine Reserve. The subjects had the marine reserve on their plotter, but claimed that they thought they were outside of it. Further investigation also revealed that one of the subjects had been buying Oregon resident angling licenses, but was a Washington resident. Four citations were issued for Angling Within a Marine Reserve, and one citation was issued for Unlawful Possession of a Falsely Applied for Licenses.

March 2020: Members of the Marine Fisheries Team conducted a multiday ocean patrol from Newport to the California border. The focus was on marine reserves, commercial Dungeness crab and recreational and commercial groundfish. Multiple sport anglers were contacted as well as several commercial nearshore and



09.28.16

Enforcement: Here's What's Working...

Marine reserves depend on enforcement and compliance, otherwise they are simply "paper parks" with lines on a map. The compliance rates have been relatively high among Oregon's reserve sites due to a combination of factors including fishermen's willingness to comply with the rules, and education and outreach efforts by Oregon State Police, ODFW, and State Parks. [Read More](#)

open access groundfish fisherman. Patrols in the Cape Perpetua marine reserve, with air support from USCG helicopter crew, located and retrieved three derelict pots inside of the closure. Patrols in Redfish Rocks Marine Reserve found no violations. The team patrolled near the Oregon/California border and found no violations. The team also checked a multitude of commercial crab strings to ensure gear was marked appropriately with pot tags.

I. CHALLENGES, LESSONS LEARNED, AND CONSIDERATIONS FOR THE FUTURE

Here we reflect on some key challenges, lessons learned, and compliance and enforcement considerations for the future.

MARINE RESERVE ACCESSIBILITY AND OSP CAPACITY: The fairly remote location of most of the marine reserve sites, away from ports, creates enforcement challenges. Aircraft operated by OSP and USCG are used to help monitor vessel activities and fishing gear within marine reserve sites. At the height of the commercial crab season weather is often inconducive for PV Guardian patrols, making the use of aircraft critical for timely monitoring. Even when fishing gear is spotted in a marine reserve site, OSP may still have to wait for a weather window for the PV Guardian to be deployed to go locate and pull the gear.

Ability to make observations from land are impacted by weather and time of day. The Cape Falcon site poses some additional challenges compared to the other sites in that none of the site is readily visible from the highway. OSP staff must drive into the Falcon Cove neighborhood or hike out to one of the headlands or down to Short Sand beach to see the site.

Another challenge is the number of OSP Troopers available for the various enforcement priorities OSP is tasked with covering on the coast (see [map](#) of OSP Fish and Wildlife Division staff allocation for the 2021-23 biennium). Meeting the needs for the different fisheries can be difficult given OSP capacity. The PV Guardian currently does not have a dedicated boat crew that could deploy at moment's notice when conditions allow, and Troopers not assigned to the Marine Fisheries Team are often used to help with patrols.

RECREATIONAL FISHERY COMPLIANCE RATE: There have been 56 recreational violations in marine reserve sites from 2012-2020. We currently do not have a good way of calculating the compliance rate for the recreational fishery. The state does not have a ready way of differentiating saltwater and freshwater anglers from the total number of recreational fishing license holders. Additional complications arise when determining if or how daily or multi-day licenses should be used in the calculations. Considerations for the future include possible exploration of how marine reserve visitor counts from human dimensions research surveys, or fishing effort data from ODFW's Ocean Recreational Boat Survey (ORBS), might be used to calculate compliance rates.

SURVEILLANCE CAMERA PILOT PROJECT: OSP piloted surveillance cameras at two of the marine reserve sites to test their efficacy in monitoring of marine reserve sites. The cameras were placed at permanent locations on land overlooking the reserve sites and had internet access. They could be viewed in real time from OSP computers and video was also stored on a state-owned server. The cameras also had the ability to pan and zoom.

Administrative and logistical hurdles delayed the pilot project by more than one year. The pilot project revealed several deficiencies and limitations in the use of the cameras to support enforcement: 1) Weather, such as fog and rain, often impacted visibility. 2) The camera was not able to see all areas of the shoreline in the reserve site. 3) The zoom function was not of sufficient magnitude to read vessel numbers on boats inside the reserve site, although other discerning boat features such as type of boat and colors could often be made out. Upon review of the pilot test, it was determined that the cameras were of limited use and would not be implemented at other sites.

BOTTOM CONTACT GEAR ENFORCEMENT ISSUES: In the last few years, OSP has seen an increase in commercial crab gear being set on the boundary edge at some of the marine reserve sites. This has resulted in larger amounts of gear

getting blown into the reserve, which has also resulted in greater amounts of “derelict” gear inside the reserve when that gear gets blown into waters too shallow and close to shore to be pulled and removed. In addition, gear set on the boundary edge frequently results in surface buoys drifting into the marine reserve. As a result, there has been an increase in time spent by OSP fielding calls from constituents reporting surface buoys in marine reserves. The surface buoys of crab and other bottom contact gear make it difficult for OSP to determine if the gear is inside the reserve. Surface buoys are not directly above the gear, due to the scope of the line, so their position does not necessarily correspond to the exact location of the gear. This requires OSP to spend time pulling the gear, getting the enforcement vessel directly above the pot, to try and determine the exact location.

OSP and ODFW determined that the best way to address these issues and support OSP’s enforcement of the marine reserve sites was to make a clarification in the marine reserve administrative rules (OAR 635-12). In [October 2021](#) (Exhibit C), the Oregon Fish and Wildlife Commission adopted a modification to the definition of “fishing gear” in the marine reserve OARs to include surface buoys of bottom contact gear, thereby prohibiting surface fishing gear in the reserves and conceivably deterring crabbers from setting gear at the boundary edge.

OSP will continue to monitor these issues during the upcoming 2021-22 crab season and assess whether there has been a shift in fisher behavior and/or reduction in amount of crab gear blown into the reserves.

LOCAL COMMUNITY MEMBERS AND FISHERS PLAY IMPORTANT ROLE IN ENFORCEMENT: With finite capacity of the state and federal agencies to monitor and patrol the marine reserve sites, local community members and fishers have played a critical role in marine reserves enforcement by reporting possible violations to OSP and ODFW. The state agencies will continue to build relationships and strategies with local fishers and community members to promote compliance and foster informed reporting of violations to OSP.





CHAPTER 6. CONTRIBUTIONS, LESSONS LEARNED, & CONSIDERATIONS FOR MOVING FORWARD

- A. INTRODUCTION
- B. PROGRAM CONTRIBUTIONS
- C. LESSONS LEARNED
- D. CONSIDERATIONS FOR A SUSTAINABLE PROGRAM THAT CONTINUES TO SUPPORT OREGON'S MARINE RESERVES
- E. IN CONCLUSION

A. INTRODUCTION

Development of this Synthesis Report has given our team the opportunity to reflect on the development and execution of this relatively new conservation and monitoring program. In this chapter we reflect on the contributions and lessons learned since the program's inception. We also consider efficiencies that might be addressed in the future, to ensure a sustainable program that continues to support Oregon's marine reserve contributions to conservation, management, research, and Oregon's coastal communities and ocean users. These reflections are intended to help inform adaptive management of the program and can be used by other MPA or long-term monitoring programs to learn from.

B. PROGRAM CONTRIBUTIONS

B.1 NEVER BEFORE IN OREGON

Implementation of Oregon's marine reserve system is the first long-term nearshore ocean conservation and monitoring program executed by the state. The five marine reserve sites and nine research comparison areas serve as important sentinel nearshore monitoring sites. This is the only ecosystem-focused, fisheries-independent monitoring program designed to track and understand ocean changes occurring in Oregon's state waters.

This is also the first comprehensive human dimensions research program focused on examining the economic, social, and cultural dynamics of the Oregon coast and coastal communities as they relate to state marine resource policy. Beyond Oregon, we have established one of the most comprehensive human dimensions research programs ever focused on Marine Protected Areas (MPAs).

B.2 A CASE STUDY OF A SPECIFIC MARINE NATURAL RESOURCE POLICY

One could consider the human dimensions and ecological research our program has conducted as a decade long exercise in marine conservation policy analysis; a broad based study of the impact of a specific marine resource man-

agement policy (i.e marine reserve implementation) over time. With the singular emphasis on the marine reserves in our research, we have created a unique opportunity uncommon in most research contexts. Our research has created a decadal body of work that is both ecological and socioeconomic. Our program is relatively unique in having employed a comprehensive range of tools of interdisciplinary research for ten years. These parallel interdisciplinary and inter-temporal data are an exceedingly rare outcome in any applied or academic research program. The resulting opportunity is essentially a case study of how we might work toward integrating ecological and socioeconomic research in nearshore conservation and management.

B.3 MARINE RESERVES CREATED AN OPPORTUNITY TO COLLABORATE WITH THE FISHING INDUSTRY

Oregon’s marine reserves have provided an opportunity for ODFW and the fishing industry to collaborate in the research and management of marine natural resources. Multiple aspects of the program fostered dialogue with the fishing occupational community including the planning and siting process, [vessel contracts for research](#), and engagement in research and monitoring design and activities. The commercial fishing industry has [funded some complementary](#) research in the marine reserve sites and has worked to [support enforcement](#). The marine reserves provided a constructive opportunity for both parties to enhance communication, address emerging topics and provide a forum for dialogue about marine resource issues. The ODFW Marine Reserves Program values the expert knowledge of the fishing industry that has helped improve our research and implementation of the program. While there has typically been greater engagement between the fishing industry and scientists on the central coast of Oregon, our program has provided new and more frequent opportunities for engagement on the north and south coasts. Our reflections about this opportunity are not one-sided; recent research (Marino 2020) corroborates that the fishing occupational community perceives the marine reserves as a constructive opportunity to further collaborate with ODFW, contributing their knowledge and expertise to research, and a dialogue between interests.

B.4 CONTRIBUTIONS TO NEARSHORE MANAGEMENT, UNDERSTANDING OF EMERGING OCEAN ISSUES, AND SCIENTIFIC METHODS

Our program has contributed data and information from marine reserves monitoring and research that has been used in nearshore ocean management, policy decisions, and understanding of emerging ocean issues here in Oregon and beyond. Our contributions have supported:

- Nearshore groundfish stock assessments
- IUCN Red Listing of the Sunflower Sea Star
- Tracking of Ocean Acidification and Hypoxia (OAH)
- Development of a spatial economic fisheries model for Oregon
- Scientific methods advancements

Here we provide a brief overview of these contributions:



NEARSHORE GROUND FISH STOCK ASSESSMENTS

Our fishery-independent monitoring efforts are generating useful data to aid in nearshore groundfish stock assessments. The data from our ROV, hook-and-line and juvenile fish surveys have been used in the nearshore groundfish stock assessment process of the Pacific Fishery Management Council (PFMC) for Cabezon (2019), Blue/Deacon Rockfish (2017), and Kelp Greenling (2015). Ecological monitoring data from the marine reserves were also included as part of a PFMC Science and Statistical Committee methodology review for Oregon’s ROV data (2020) to evaluate its use and value in future stock assessments.

IUCN RED LISTING OF THE SUNFLOWER SEA STAR

Oregon Marine Reserves data from SCUBA, ROV and Sea Urchin surveys contributed to the listing of the Sunflower Sea Star, *Pycnopodia helianthoides*, as critically endangered on the [IUCN Red List of Threatened and Endangered Species](#). This became an emerging marine ecosystem issue after sea star wasting disease hit

the Oregon coast in 2014, and other West Coast wide locations in 2013. Our monitoring documented severe declines in this subtidal sea star species, with no observations recorded in marine reserves after 2016.

OCEAN ACIDIFICATION AND HYPOXIA (OAH)

Ocean Acidification and Hypoxia (OAH) are [newly prioritized resource management issues](#) for the State of Oregon with the passage of the 2017 Oregon Senate Bill 1039. Oregon was one of the first places in the world to observe the direct impacts of ocean acidification when oyster hatchery production collapsed in 2007. Hypoxia events continue to intensify along the coast, and Oregon's iconic fisheries and the coastal communities that depend on them are at risk. The Oregon Marine Reserve Program began soon after the direct impacts of OAH were detected in Oregon, thus providing valuable documentation to understand future impacts on marine natural resources. Our ecological monitoring has now generated biological time series of fish, invertebrate and benthic habitat communities at 14 locations throughout Oregon's nearshore. This rich dataset is available to combine with increasing spatial coverage of ocean conditions in Oregon's nearshore to better understand the impacts to nearshore ecological communities from this emerging threat.

SPATIAL ECONOMIC FISHERIES MODEL

The fisheries spatial economic model (TRG 2021b) is designed to provide spatial attribution of the regional economic impact of the most important nearshore fisheries along the entire Oregon nearshore in the state territorial seas. The basis for that attribution is the integration of commercially and recreationally important nearshore species- habitat relationships with both benthic mapping and related fisheries data. This allows the model to assess the economic impact of nearshore commercial and recreational marine fishing at any level of spatial resolution in any part of the Territorial Sea. Our primary purpose for the model was to assess the economic importance of the marine reserve areas, which comprise about 3% of the Territorial Sea. It is also relevant to any spatial consideration across the other 97% of the nearshore. This is a model that can be used to assess the related economic implications of any nearshore spatial planning or management decision anywhere in the state territorial seas.

SCIENTIFIC RESEARCH METHODS/METHODOLOGY ADVANCEMENTS

HUMAN DIMENSIONS RESEARCH: Working with faculty from OSU Cascades, our Human Dimensions Research program funded a research project to explore coastal residents' spatial preferences related to the marine reserves. With this study, we concurrently investigated several new research methods, including the development of scales of individual and community resilience, to improve assessment of these constructs (Lindberg and Swearingen 2020), and scales to assess evaluative subjective well-being (SWB) across multiple dimensions (Lindberg et al. 2019b).

This study also included SWB vignettes to derive subjects' policy preferences (spatial preference for marine reserve protections) in a manner similar to choice experiments (CE) (Lindberg et al. 2019b; Lindberg and Williams 2019), allowing an assessment of the relative utility of the more novel SWB approach. The similarity of the results using SWB vignettes and CE methods lends credence to the value of SWB as a measure of total utility, theoretically including non-market ecosystem services (Lindberg et al. 2019b).

ECOLOGICAL MONITORING: Our program explored, adapted, and refined a large suite of monitoring tools that ultimately resulted in the four core monitoring tools in use today. This process contributed to documenting methodological developments of research tools for use in Oregon's nearshore waters. Oregon's state waters are a cold, high energy environment with frequent poor underwater visibility conditions. Our program explored a variety of sampling methods previously used in waters farther offshore in Oregon or by other monitoring programs



in neighboring West Coast states that more regularly experience calmer sea conditions and better underwater visibility. We learned that not all tools were suitable for monitoring Oregon’s nearshore rocky reefs, and we adapted our monitoring accordingly. We modified methods to account for challenging sea states, underwater visibility, and safety. We re-engineered large underwater video equipment to be readily deployable from a small boat (Watson and Huntington 2016), explored the use of stereo video capabilities (Knight et al. 2018), and investigated how to gather data on invertebrates and biogenic habitat with video tools (Lawrence et al. 2016). We incorporated local fisher knowledge to improve our hook-and-line sampling design and data collection protocols, and added a supplemental longline survey at Redfish Rocks. Several of our efforts to develop monitoring tools resulted in publications allowing us to share our methods development with others, helping advance nearshore and protected area research in Oregon and beyond.

B.5 GENERATION AND SHARING OF NEW KNOWLEDGE

Our program has contributed new knowledge about Oregon’s nearshore marine resources in three key ways:

- Increasing our understanding of nearshore nearshore species, communities, and habitats
- Gaining new insight in understanding public attitudes and knowledge related to the ocean
- Developing peer review publications to share the new knowledge

SPECIES, COMMUNITIES AND HABITATS

The research from marine reserves ecological monitoring has provided valuable new information about the species, communities, and habitats in Oregon’s nearshore. Oregon Marine Reserve monitoring data generated new knowledge and biological data for 24 different Nearshore Strategy Species (see Chapter 5.2 [Table 2](#)) We’ve learned that not all sea star species responded the same to sea star wasting disease, and that response varied intertidally, subtidally, and geographically. Our ecological monitoring at 14 sites along the Oregon coast suggests that the nearshore rocky reef community response to multiple ecosystem stressors in Oregon has been varied. This is a notable difference from recent research identifying a phase shift in northern California from species-rich macroalgal-dominated kelp forests to species-poor sea urchin barrens in response to



multiple ecosystem stressors (Rogers-Bennett and Catton 2019). Long-term monitoring at multiple sites will continue to provide new knowledge about spatial heterogeneity and broad patterns in the disturbance and resiliency of Oregon’s dynamic nearshore marine communities to multiple stressors.

PUBLIC ATTITUDES AND KNOWLEDGE RELATED TO THE OCEAN

To inform nearshore management and provide insight into coastal visitors’ level of knowledge related to marine resources, the Human Dimensions Project conducted a coastwide survey of ocean knowledge, awareness, and concerns among Oregon coastal visitors (Epperly et al. 2017). We wanted to know more about visitors’ perceptions of ecological threats to the ocean and how well informed our coastal visitors may be. The respondents had very modest levels of factual knowledge about the ocean. As one would expect, respondents who visited the Oregon coast more frequently or lived on the Oregon coast were more knowledgeable about ocean issues. In addition, respondents who felt they knew more about ocean issues and felt that the ocean was more threatened were also more knowledgeable about ocean issues.

PUBLICATIONS

The Human Dimensions and Ecological Monitoring programs have published 19 peer-reviewed journal publications and five ODFW informational reports. These publications have shared valuable knowledge generated by the program with larger scientific and academic audiences, demonstrating that the knowledge generated from our program has value beyond Oregon, and contributes more broadly to the advancement of marine reserve and marine natural resource management.

C. LESSONS LEARNED

C.1 DEVELOPING A SUSTAINABLE LONG-TERM MONITORING PROGRAM REQUIRES LEARNING AND ADAPTING

Sustainable long-term monitoring programs take time to develop, and Oregon’s Marine Reserves Program has been no different, with many lessons learned along the way. During the first five to seven years of implementation, we were heavily dependent on expert advice from Oregon and other U.S. west coast scientists and Oregon fishers to help us develop, evaluate, and fine tune our monitoring tools and approaches. We built and worked to maintain partnerships; we sought courtesy faculty appointments in academia to encourage applied academic research; we found creative solutions when faced with administrative challenges and contracting. We developed analytical infrastructure supporting advancements in data management, analysis and reporting; we sought community input and wrote management plans. With each task our program has learned and adapted to advance the efficiency of our program; however this Synthesis Report is the first opportunity to comprehensively review the program overall. Now that the synthesis is complete, the program can reflect and adapt accordingly to ensure Oregon’s Marine Reserve Program is sustainable for the long-term.

C.2 STATE FUNDING AND STAFF ARE NECESSARY FOR ATTRACTING ADDITIONAL RESOURCES

Without core state funding and staff, we lose the ability to attract partners and additional grant funds. Continuity of state funds and staff, sufficient to carry out the basic marine reserve management and monitoring functions, are the minimum necessary for attracting additional resources. This level of state support demonstrates a commitment by the state, allows us to provide seed money to partners for projects which they can then leverage, and allows us to provide sufficient match for grants sought by ODFW or our partners. We have found that in most instances granters are not interested or willing to fund staff or long-term monitoring activities. Therefore, state resources are extremely important to cover these core functions. Grants allow our program and our partners to pilot new tools, methods, or studies, and may fund shorter-term research investigations, graduate student assistance on projects, or post-graduate fellowships. A demonstration of sufficient commitment by the state has also, in many instances, been necessary to help our collaborative partners successfully secure grants.

Our partners have contributed critical additional expertise, personnel, funding, volunteers, and equipment to support marine reserves implementation. Oregon’s current five marine reserve sites and our program are very reliant on this additional funding and capacity.

C.3 OUR PROGRAM HAS THE ABILITY TO ADAPT AND PILOT NEW APPROACHES QUICKLY

A centralized management structure in combination with a modest number of sites to implement allows our program to be nimble, and adapt or pilot new approaches quickly. Our access to a strong network of marine scientists and natural resource focused human dimensions researchers in Oregon and along the U.S. west coast further enhances this ability.

C.4 CHALLENGES WHEN IMPLEMENTING APPLIED RESEARCH AND MANAGEMENT

Implementing applied research and management is challenged by the trade-offs in applying best practice in science and management within staff capacity and funding constraints, the complexities of the ecosystems and social systems we are studying, and the accountability to constituents. Below we share some of the challenges we have experienced during the implementation of this applied research and management program.

APPLIED RESEARCH AND RECOMMENDED STUDY DESIGNS

There is a disconnect between the published recommendations for study designs to properly assess marine reserve performance (i.e. Before After Control Impact-BACI or Before After Control Impact Paired Series-BACIPS) and real-world difficulties in achieving these recommendations (Claudet and Guidetti 2010, Huntington et al. 2010). Typically the BACI concept assumes the impact is acute. That is not the case in Oregon, since differences between control and impact sites in temperate marine reserves may take between 10-15 years, and potentially up to 40 years, to accrue for some marine species (Kaplan et al. 2019, Nichols et al. 2019, Starr et al. 2015). The most challenging aspect with the BACI approach in Oregon was selecting appropriate comparison areas because of the unique features of several reserves. The Cape Perpetua Marine Reserve experiences unique oceanographic features on its patchy isolated deep reef; Otter Rock Marine Reserve is small and shallow, while Cape Falcon's isolated shallow reef had historically low fishing pressure. These characteristics challenged our ability to find appropriate comparison areas and forced us to [move beyond a typical BACI approach](#) when interpreting marine reserve performance.

WORKING WITH ACADEMIC RESEARCHERS IS FUNDAMENTAL BUT COMES WITH CHALLENGES TO APPLIED RESEARCH AND MANAGEMENT

The additional capacity, funding, and expertise contributed by partners is essential to the success of marine reserves implementation. While the ODFW Marine Reserves Program is obligated to implement the marine reserve sites and mandates, our partners often have additional obligations, mandates, and incentives beyond the marine reserves. For example, academic partners may be incentivized to focus on novel research methods, providing research experiences for students, or publishing their findings in a peer reviewed journal. Such academic pursuits may not always be pertinent or timely in an applied research and management program. We have found that building collaborative partnerships and projects requires time, frequent interactions, and consistency in personnel to build relationships and projects that meet the needs of both our program and our partners. Only then do these partnerships meaningfully contribute to an applied research and management program administered by the state for all Oregonians. We have also found that clearly defining roles and responsibilities, and initial establishment of firm goals for data management and deadlines for deliverables or final reports provides a strong foundation for the success of our collaborations.

In this context, the majority of our socioeconomic studies involved external partners with associated contract management responsibilities. These responsibilities can require a considerable commitment of time. In addition, designing studies that meet the applied agency information needs, while also retaining sufficient academic content for professional publications, can be a difficult task. Without the latter, faculty cannot allocate time and resources to support our projects. Identifying a mutually beneficial study design is a real challenge. However, one of the benefits of working with our academic human dimensions partners has been that such studies most commonly occur within a discrete time frame and must generate routine project reports. These circumstances mean that as a project is initiated, creatively working with our partners allows us to design studies that provide students with support and data to pursue graduate degrees. Many of our projects thus have been well suited for working with masters' students, in particular.

D. CONSIDERATIONS FOR A SUSTAINABLE PROGRAM THAT CONTINUES TO SUPPORT OREGON'S MARINE RESERVES

LEARNING AND ADAPTING

Learning and adapting have been an integral component of our program. Current staff capacity has limited the amount of time and frequency in which we focused on in-depth data analyses and reporting. This Synthesis Report has allotted our program, for the first time, the space and time necessary to conduct in-depth data analyses, data integration, and reporting, and to reflect across the program as a whole.

MOVING FORWARD

With this new information, as we now turn our focus back towards our continued long-term monitoring and management of the marine reserve sites, we can determine what adjustments and further efficiencies are needed to better the program. This includes ensuring our programmatic work is sustainable with the given staff and funding resources. For instance, we now have information to make informed decisions on how we can scale back on the frequency of some sampling that will both meet our research needs and our current staff capacity. We also have a better understanding of the time and staff capacity it takes to develop management plans, allowing us to adjust the frequency of reviews and updates.

WHAT ADDITIONAL CAPACITY CAN PROVIDE

This endeavor has also provided us the opportunity to consider how the program might be adapted in the future to provide for a more sustainable program, provide greater continuity, and better support implementation of this long-term conservation and monitoring program. Current staff capacity provides little time for staff to be able to focus on data analysis, report writing and publications, or provide pertinent data and information for use in other nearshore management decision-making. We also note that additional capacity could further the integration of ecological and socioeconomic studies and data, a unique opportunity in natural resource management.

Here we reflect on what additional capacity could bring:

- **A SECOND HUMAN DIMENSIONS RESEARCH POSITION WITH A FOCUS ON ECONOMICS:** There is a significant need both in our program and in the larger Marine Resources Program at ODFW for in-house marine resource and fisheries economics expertise. With our long-time marine fisheries economist research partner and contractor, Shannon Davis of The Research Group (TRG), retiring, there is a large gap to fill for marine reserves and for marine commercial and recreational fisheries economics reporting for the State of Oregon. Academic researchers are not readily available or incentivized to focus on this type of applied research or on updating the existing economic models built for Oregon's fisheries. Other consultants have lacked the on-the-ground knowledge of Oregon's shoreside fisheries infrastructure supporting the fishing industry to be effective. The result is an inability to routinely update existing models or produce thorough and accurate economics reports on Oregon's fishing industry. ODFW has two economics positions in Salem that serve the entire agency and are therefore unable to provide these necessary economics studies of marine fisheries. Our existing Human Dimensions Research position must stay focused on the overall coordination of this research program, managing our various research contracts, and fostering our existing and new collaborations with partners, as well as carrying out some in-house social science research projects and surveys. A position that is at least equivalent to the project leader (NRS3) level would be needed to carry out this important economics work to advance the efficacy of the Human Dimensions research agenda.
- **AN ADDITIONAL ECOLOGICAL MONITORING POSITION AT THE PROJECT LEADER (NRS3) LEVEL:** This additional capacity would provide the program with more time to focus on data analysis, producing scientific reports and publications, continue improvements to our data management, and enable us to make better use of the limited weather and ocean condition windows for conducting at-sea fieldwork. The position would allow greater focus on fostering existing collaborations with partners and in developing new collaborations. The increased capacity would also provide us with the time and attention necessary for working with fisheries stock assessors, marine resource managers, and decision-makers to increase our program's contributions of data and information for use in nearshore management decisions.
- **CONTINUATION OF A JOINT ODFW-MSI POSITION:** We worked with Oregon State University (OSU) to create a

joint post-graduate fellow position housed at OSU, first starting in 2014. Fellowships were for two years, dependent on funding. Fellows provided added analytical support to our program, as well as contributed to research design, fieldwork (including SCUBA diving), technical reports, peer reviewed publications, and outreach. This position has provided critical support in the development and execution of our ecological monitoring program. We are currently exploring what this position might look like in the future, including whether this should remain a two-year fellowship program or become a permanent position, providing more continuity for working with academic collaborators and building our student engagement opportunities. We are looking at ways to sustainably fund this position moving forward. We will need additional funds to continue this joint position.

E. IN CONCLUSION

This report has served as an important check-in on the development and execution of Oregon's marine reserve sites and the ODFW Marine Reserves Program. It has been a chance for our program to share, and all Oregonians to reflect on, the accomplishments, challenges, and lessons learned over the last 10 years. We conclude with an acknowledgement and recognition that the advancements of our program over the last decade are built on the many contributions of individuals, the fishing industry, communities, conservation and other organizations, and the support from the Oregon Legislature. Collectively we have developed Oregon's first nearshore ecosystem based monitoring program that will continue to inform Oregonians about nearshore marine natural resources and emerging nearshore management issues.





Marine Resources

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