



MARINE RESERVES UPDATES



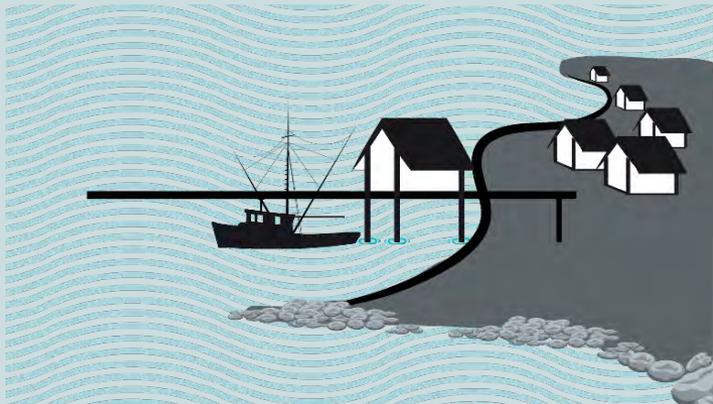


(20 minutes)

OregonMarineReserves.com



(5 minutes)

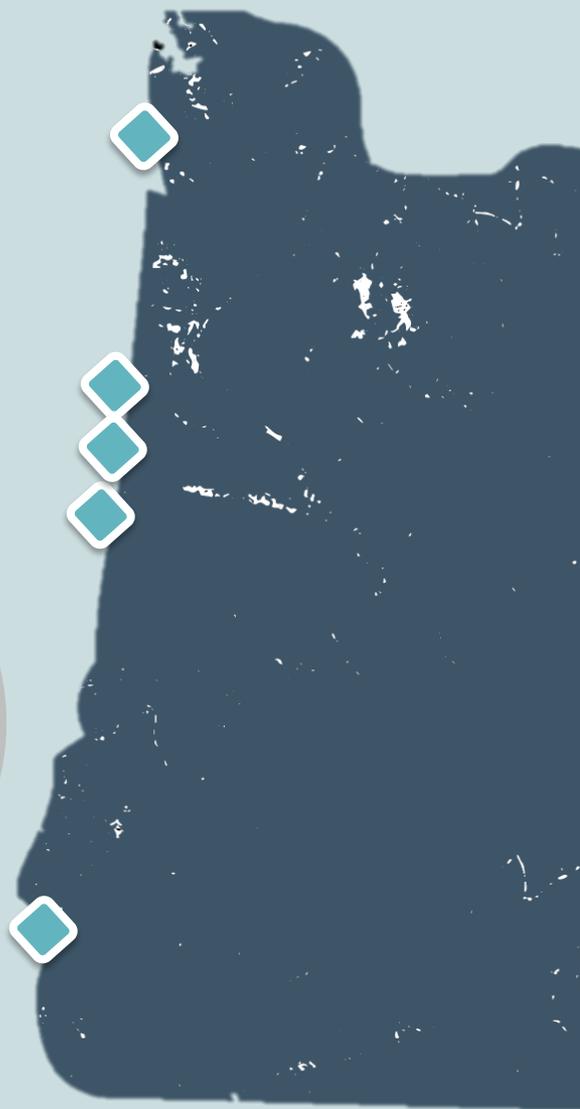


(25 minutes)

Dr. Elizabeth Marino
Assistant Professor of Anthropology, OSU Cascades

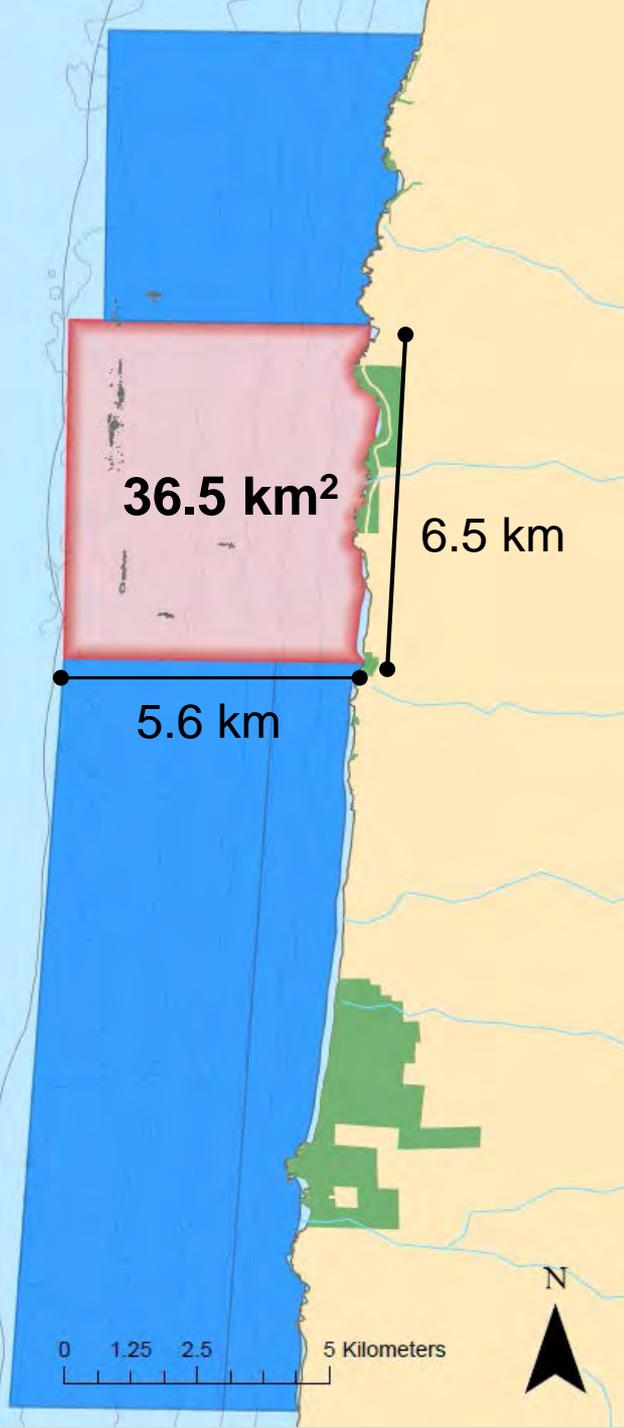
Understanding Social Change and
Uncertainty in Fishing Communities

EACH SITE IS UNIQUE

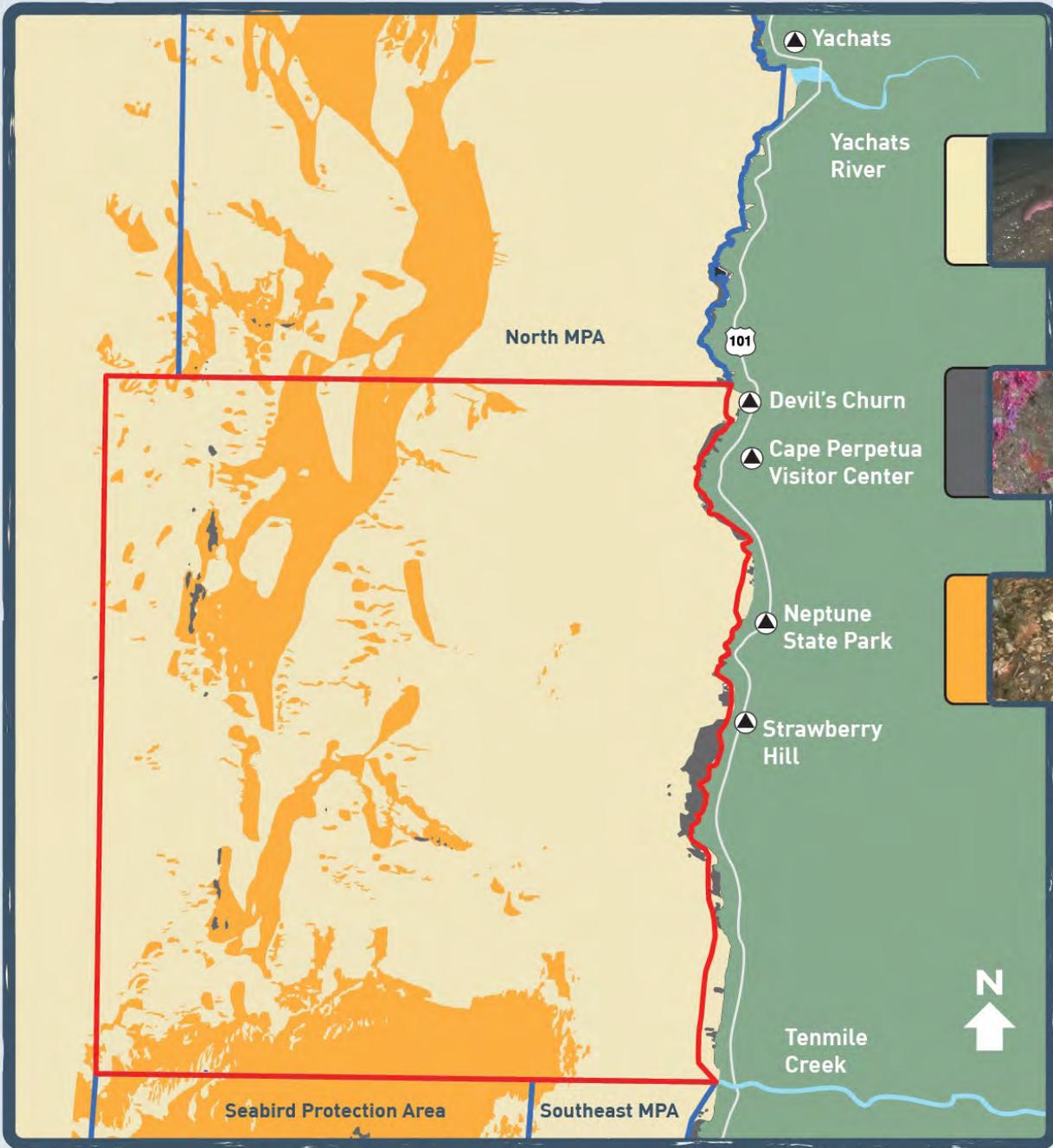




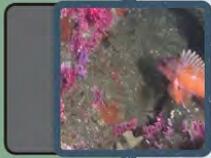
DESIGN AND PLACEMENT MATTERS



- Size and depths
- Habitats and connectivity
- Adult home ranges
- Ocean uses
- Fishing pressure
- Demographics



SAND



ROCK

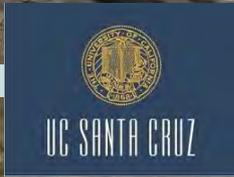


GRAVEL

— Marine Reserve
 — Marine Protected Area (MPA)



Biological Hotspot

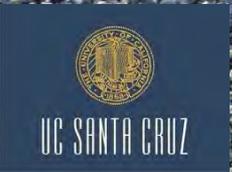
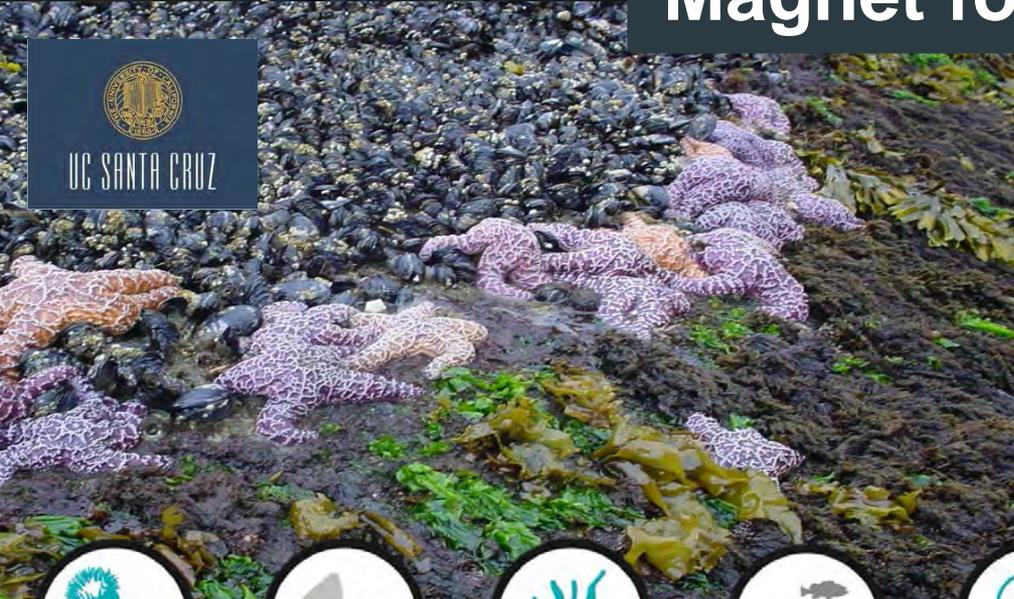




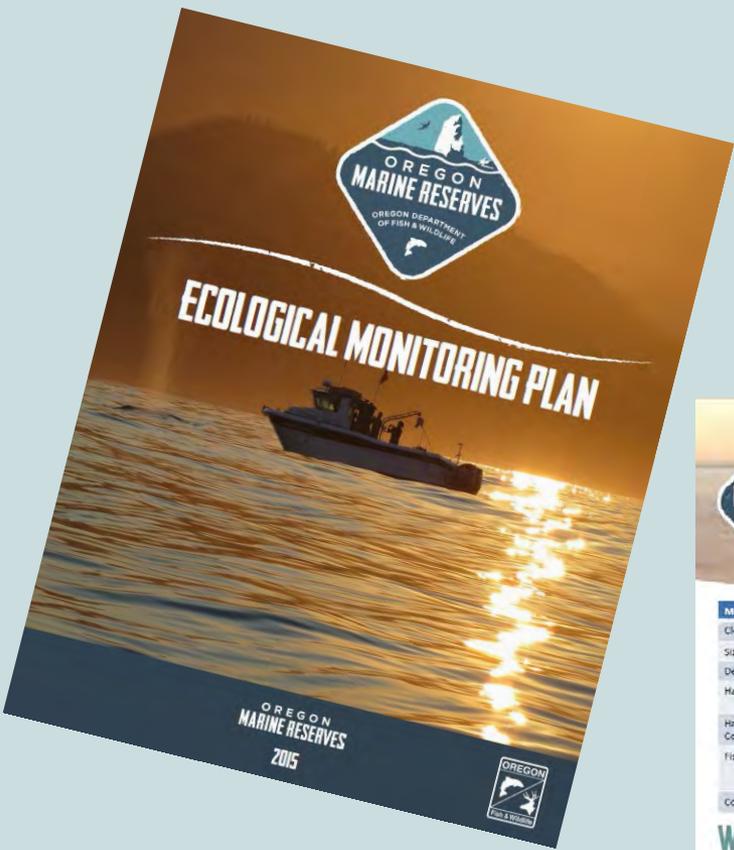
Hypoxia and Ocean Acidification



Magnet for Research



Understanding changes over time





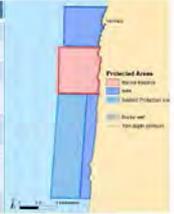


Monitoring Began	2012
Closure Date	January 1, 2014
Size	36.5km ² (14.1mi ²); MPAs 49.7km ² (19.2mi ²)
Depth Range	0-95m
Habitats Present	Mostly soft sediments with a small, low-relief rocky reef in deeper water
Habitat Connectivity	Isolated rocky reef entirely contained within reserve
Fishing Pressure	Low fishing pressure on reef due to distance from port and limited habitat; popular crabbing grounds on soft sediments
Comparison Areas	Seal Rock and Tokatee

WHAT MAKES CAPE PERPETUA UNIQUE?

Long-term Research Hotspot
Compared to other areas along the Oregon coast, the rocky intertidal habitats in Cape Perpetua Marine Reserve are a hotpot of biodiversity. Researchers have been monitoring the dynamics and species of this intertidal habitat for decades. The waters around Cape Perpetua experience episodic hypoxia (low oxygen) and acidification (low pH) associated with strong summer upwelling activity. These oceanographic events are considered indicators of climate change and make this an extremely unique research site to investigate how changes in seawater chemistry can impact marine life.

Design and Placement Matter
Cape Perpetua Marine Reserve contains a deep, isolated rocky reef unique to the area. Since there is no nearby rocky reef habitat that is at a similar depth with comparable oceanographic conditions and fishing pressure, we will explore how this isolated community changes through time in a before-after comparison. Additionally, we will determine how these trajectories of change compare to other, albeit shallower, rocky habitats in the surrounding area.



COLLABORATIVE MONITORING EFFORTS

Monitoring Method	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hook-and-Line	█	█	█	█	█	█	█	█	█	█	█
ROV			█	█	█	█	█	█	█	█	█
SCUBA			ROCKY REEF IS TOO DEEP FOR SCUBA								
Video Lander	█	█	█	█	█	█	█	█	█	█	█

Program Evolution ★

Hypoxia-Ecology Study
Since 2002, ODFW scientists using their ROV and oceanographers from Oregon State University (OSU) have been investigating the impacts of hypoxia on the rocky reef communities in this area.

Oceanographic Surveys
Oceanographic surveys have been conducted at Cape Perpetua since early 2000s and will continue to be conducted based on funding.

Intertidal Surveys
Since the early 1990's PISCO researchers from Bruce Menge's laboratory at OSU have conducted intertidal surveys in this area at sites like Strawberry Hill and Bob Creek. These ongoing surveys provide long-term datasets that inform our monitoring of the rocky intertidal.

LEARNING & ADAPTING

Pilot Study: Is Cape Perpetua a *de facto* reserve, with larger fish than the other reserves?

Hypothesis: Fish are larger compared to the other reserves due to Cape Perpetua serving as an isolated (i.e. rocky reef infrequently fished) *de facto* reserve.

Approach: Compare species-specific fish size in Cape Perpetua Marine Reserve to each of the other reserves.



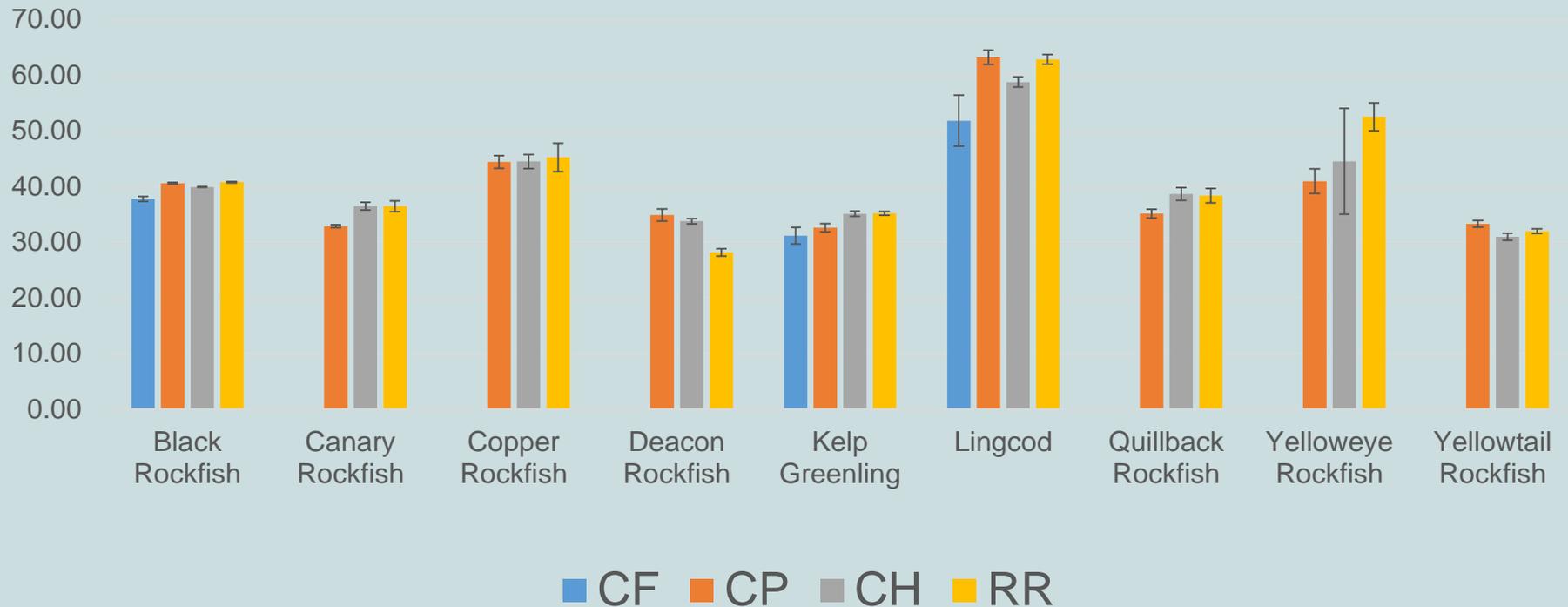
2013-14 Data

Cape Falcon, Cascade Head, Cape Perpetua,
Redfish Rocks



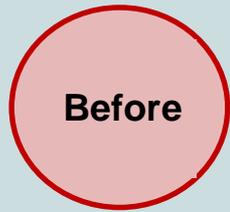
De facto Reserve? No

Mean Fish Lengths Across Reserves

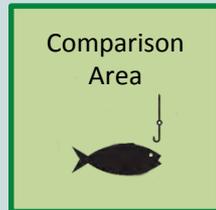


No single species was significantly larger in Cape Perpetua than in all of the other reserves.

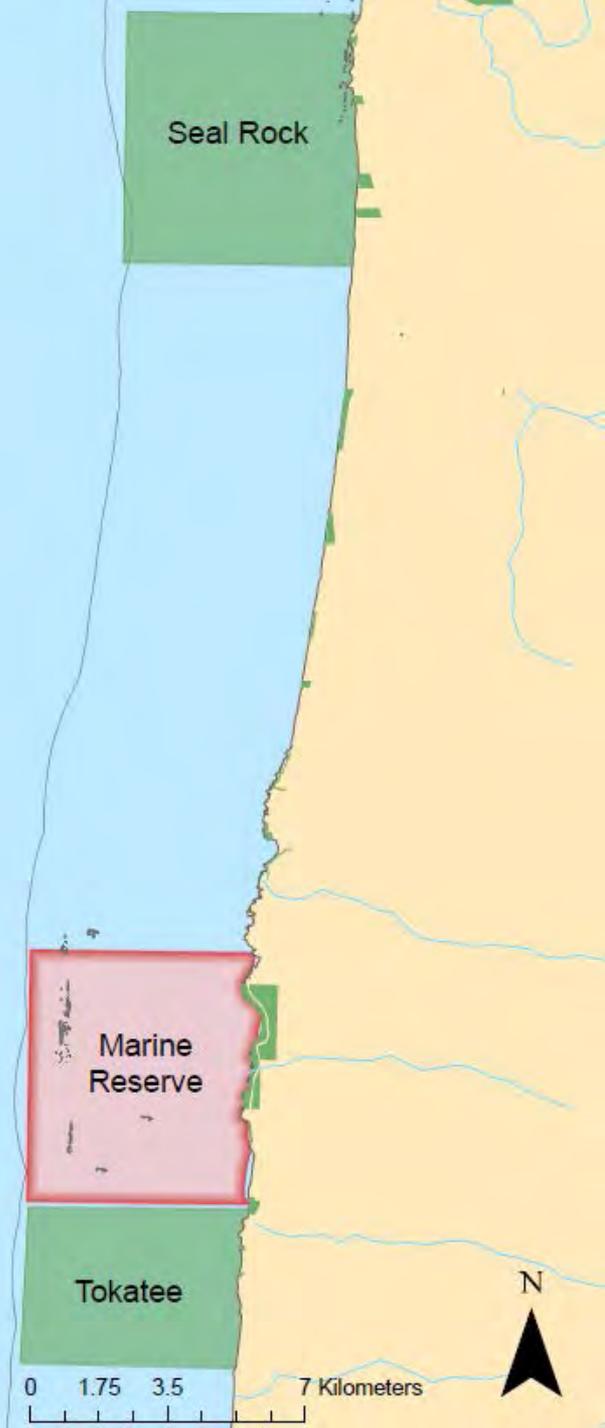
We Sample:



How does the rocky reef community change through time?

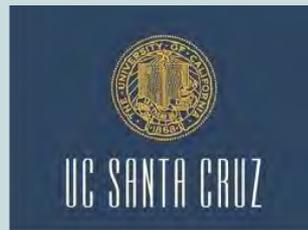


How do these trajectories of change compare to shallow reefs?

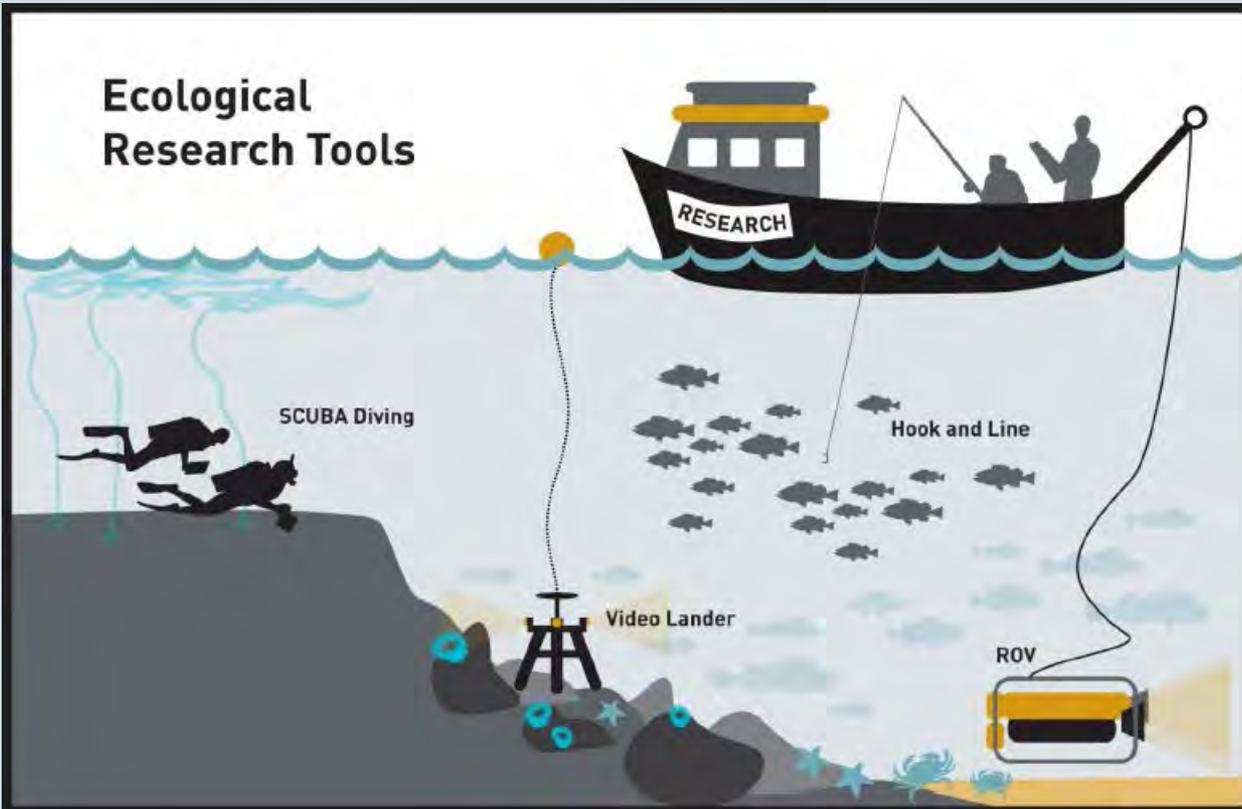




Ecological Monitoring



Ecological Research Tools



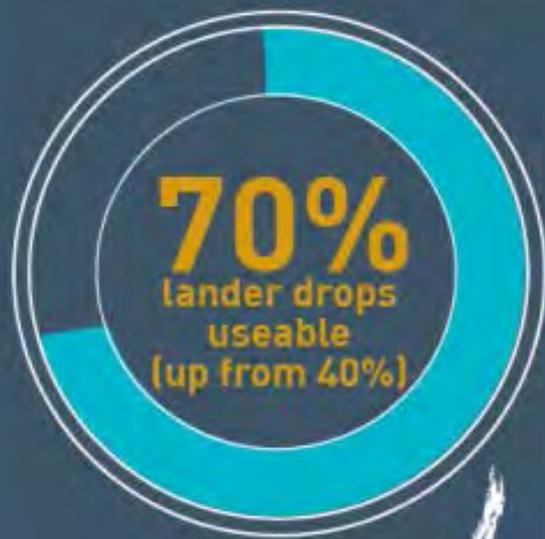
Monitoring Ecosystems











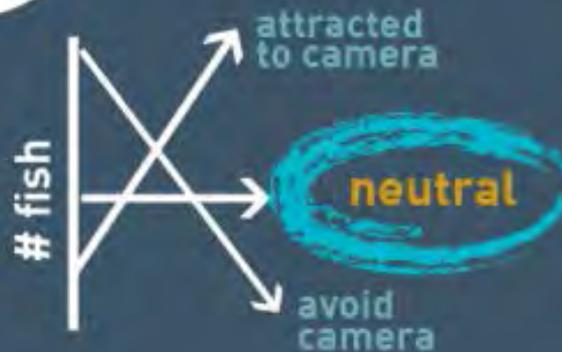
Conclusions from pilot study

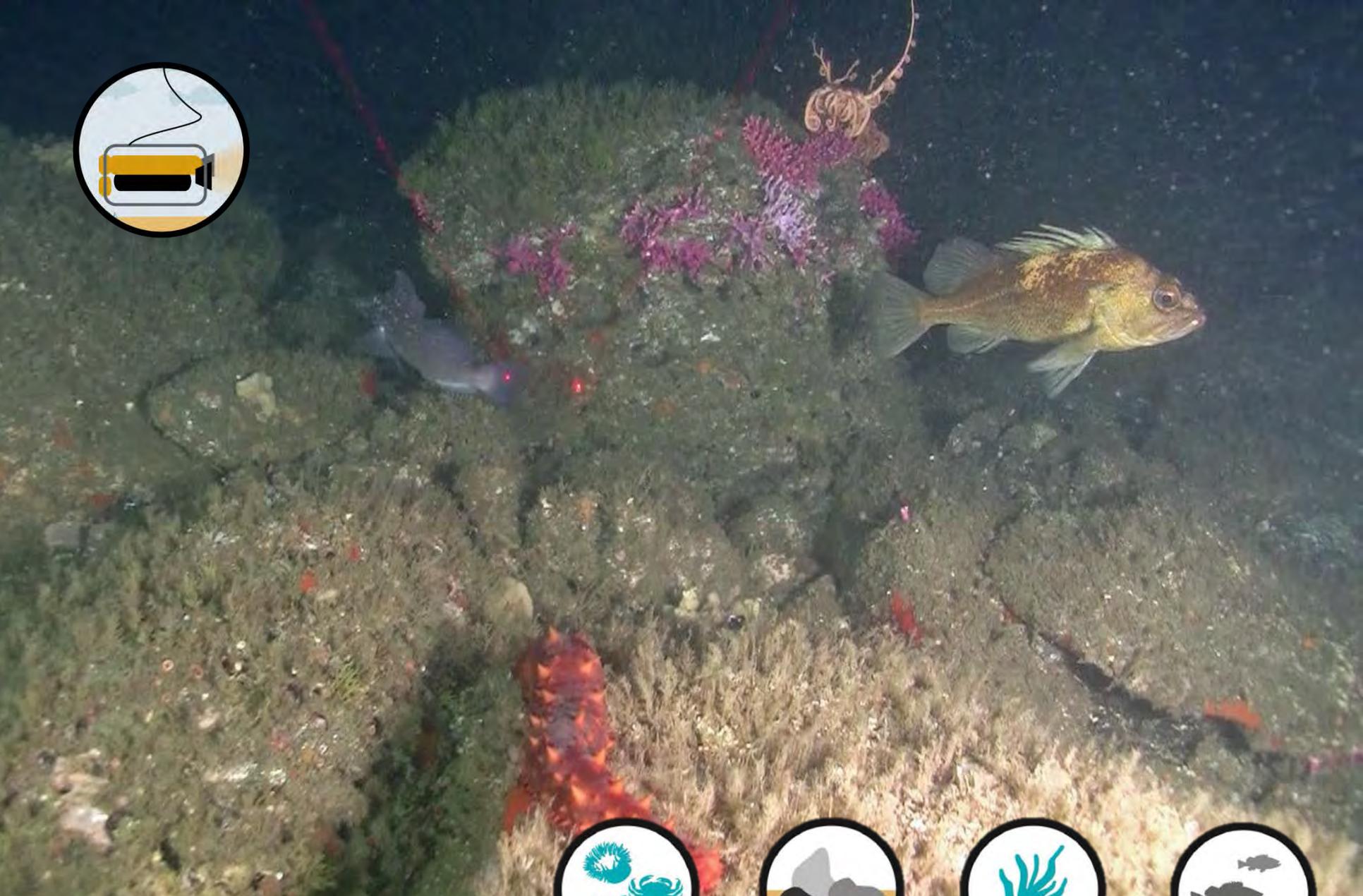


No
benefits
with
Bait



Are fish
camera
shy?

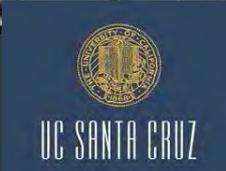




OCEANOGRAPHIC MONITORING



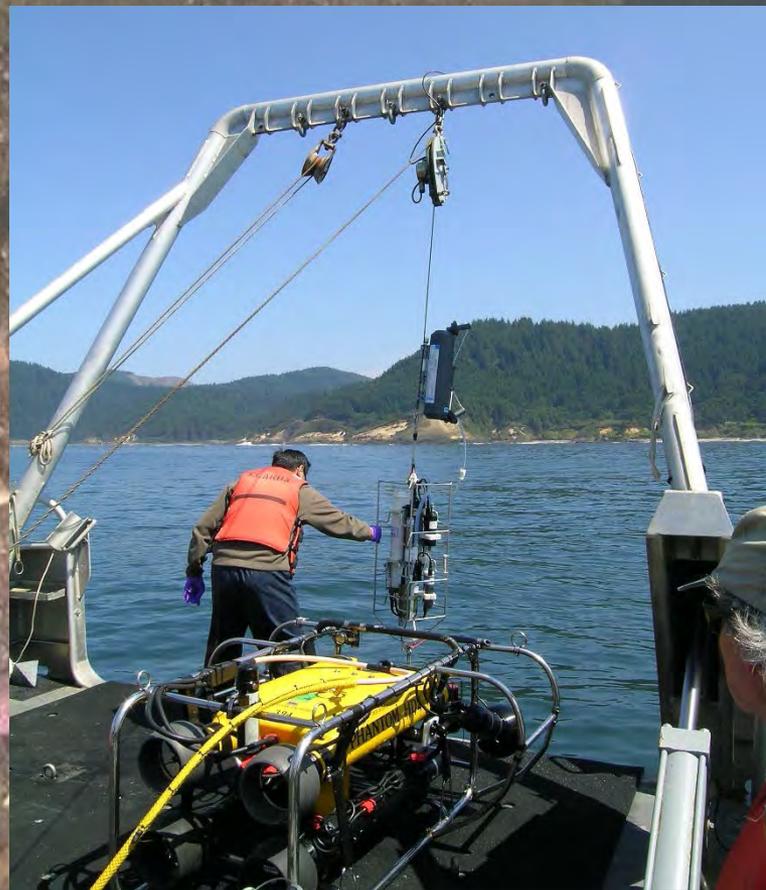
ROCKY INTERTIDAL MONITORING



Sampling Sites

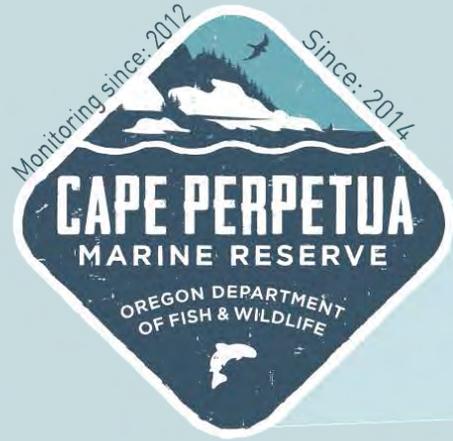


HYPOXIA-ECOLOGY RESEARCH



What's unique about this reserve?

RESEARCH magnet



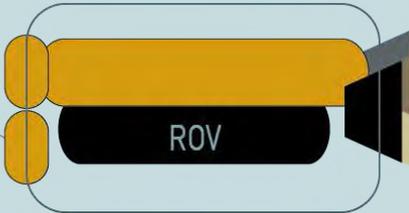
most
visited
reserve



Intertidal
Research
Hotspot

20+
years
monitoring

16 VIDEO
years
annual survey research



**Isolated
ROCKY REEF**

3
Violations
since 2014



OregonMarineReserves.com



 RULES, MAPS & COORDINATES

[The Reserves](#) [About the Science](#) [Photos & Videos](#) [Resource Library](#)

A DEEPER UNDERSTANDING

THERE'S MORE BENEATH THE SURFACE



Oregon's marine reserves are areas in our coastal waters dedicated to conservation and scientific research. **5 Sites:** The **Cape Falcon**, **Cascade Head**, **Otter Rock**, **Cape Perpetua**, and **Redfish Rocks** marine reserves are each named for local natural landmarks. Within the marine reserves all removal of marine life is prohibited, as is ocean development.

The **Oregon Department of Fish & Wildlife** oversees the management and scientific



Elizabeth Marino, PhD

Current Positions at OSU

Assistant Professor of Anthropology and Sustainability
Program Lead, Social Science Program, OSU—Cascades

Research Interests

Individual and community-scaled resilience and the production of vulnerability to disasters
Migration and social change linked to environmental shift
Risk communication and the moral framing of risk
Environmental and disaster management

Marine Reserves – Cape Falcon Marine Reserves: A Pilot Study of Impacts, Outcomes, and Effort Shift of Commercial and Charter Fishers

Project Description: A preliminary project identifying effort shift among fishers near the Cape Falcon Marine Reserve.

Background

The marine reserve at Cape Falcon went into effect in January 2016. The community team at Cape Falcon voted to implement the reserve in a contentious vote of 9-7, with all of the dissenting votes coming from the fishing community. Because of the particularly divisive nature of the decision at Cape Falcon, this project had, as its initial challenge, bringing up a highly controversial subject among the fishers. Initial field work for the project occurred in June 2015.

Marine Reserves – Cape Falcon Marine Reserves: A Pilot Study of Impacts, Outcomes, and Effort Shift of Commercial and Charter Fishers

I interviewed a total of 9 fishers and/or people highly involved in the fishing community. Three of the nine participated in the Community Team Meetings, held by OPAC and ODFW and voted “no” to marine reserve implementation.

Findings were consistent across interviews

Vetting findings are in process – the vetting process does not change findings, but is an iterative process that is meant to give greater resolution to ethnographic data.

Marine Reserves – Cape Falcon Marine Reserves: A Pilot Study of Impacts, Outcomes, and Effort Shift of Commercial and Charter Fishers

Main findings were:

- Effort shift will be minimal because, prior to marine reserve implementation, there was an insignificant amount of commercial fishing happening in the marine reserve area.
- Economic impact will be greatest on charter fishing boats, and, cyclically, for crabbers.
- There are socio-cultural impacts related to a few families' long-term informal territorial rights to the area as a place to “overnight”.

Marine Reserves – Cape Falcon Marine Reserves: A Pilot Study of Impacts, Outcomes, and Effort Shift of Commercial and Charter Fishers

Secondary Findings

- The lack of commercial fishing in the marine reserve site stirred the belief that the science behind marine reserves was flawed.
- The idea of marine reserves being held in common was a challenge to fishers who felt they had stronger claim to the near shore linked to personal life histories and, in some cases, family histories. This is likely linked to larger socio-cultural and political economic trends happening on the coast and ideological differences regarding the ocean as “the commons.”
- Fishers [and pro-reserve conservationists I interviewed in addition to the fishers] all talk about the initial marine reserve implementation as a step towards wider ocean protection policies. This creates uncertainty among fishers.

Marine Reserves – Cape Falcon Marine Reserves: A Pilot Study of Impacts, Outcomes, and Effort Shift of Commercial and Charter Fishers

Next steps

-Having the fisher perspective seems critical to assessing outcomes of marine reserves.

-Maintaining relationships is critical and should be done strategically and not piecemeal with fishers.

-This was essentially rapid-ethnographic assessment, and could be done at relatively minimal expense across marine reserve sites.

-Doing ethnographic assessment might give managers and legislatures more tools for decreasing contentiousness and friction among diverse communities on the coast – particularly during a time of rapid social and demographic shift – surrounding issues of how to manage and protect resources.

Marine Debris Workgroup Update



Workgroup Primary Progress

- Identified NOAA MD Action Planning as Priority
- Created a Planning Committee to support process and stakeholder outreach
- Organized a Statewide Action Planning Workshop (4/13-14/2016)

Planning for the Plan

- **Action Plan Workshop Planning Committee**
 - Identified Key Stakeholders and Invite List
 - Designed action plan outreach materials
 - Designed/Implemented Pre-workshop Stakeholder Survey
 - Designed Workshop Process, Facilitation, Agenda and Pre-workshop Webinar

Action Planning Workshop

April 13-14, 2016 - Newport, OR

Federal

NOAA
USCG
US ACE R10
EPA
South Slough

Tribes

Confederated Tribes of Lower Umpqua, Coos,
Coquille and Siuslaw
Confederated Tribes of Grand Ronde

NGOs

Sea Grant
SOLVE
Surfrider Foundation
Washed Ashore
CoastWatch
Oregon Coast Aquarium
COASST

OSU
PSMFC

State/Local

OPRD
DEQ
Newport
ODFW
OSMB
DLCD
DSL
County
Governor's Office
Port of Toledo
Port of
City of Newport
Curry County
Coos County
Lincoln

Industry

Oregon Dungeness Crab Commission

Workshop Attendance/Surveys

-40 RSVPs
-40 Surveyed
60+ Priorities

Oregon Marine Debris Action Planning Overview

- April Workshop: Generate content from stakeholders
- Spring-Fall: Draft action plan and review process
- Winter workshop: Review plan, stakeholders commit to actions
- Post-second workshop: Review and finalize written Action Plan

Roles for OPAC in Action plan?

- Rubber Stamp – State Endorsed Plan
- Public Outreach Body
- Policy Review / Recommendations
- No Role



Territorial Sea Plan Part Three: Rocky Shores Management Strategy

Territorial Sea Plan Part III

“To protect the ecological values and coastal biodiversity within and among Oregon’s rocky shores while allowing appropriate use”

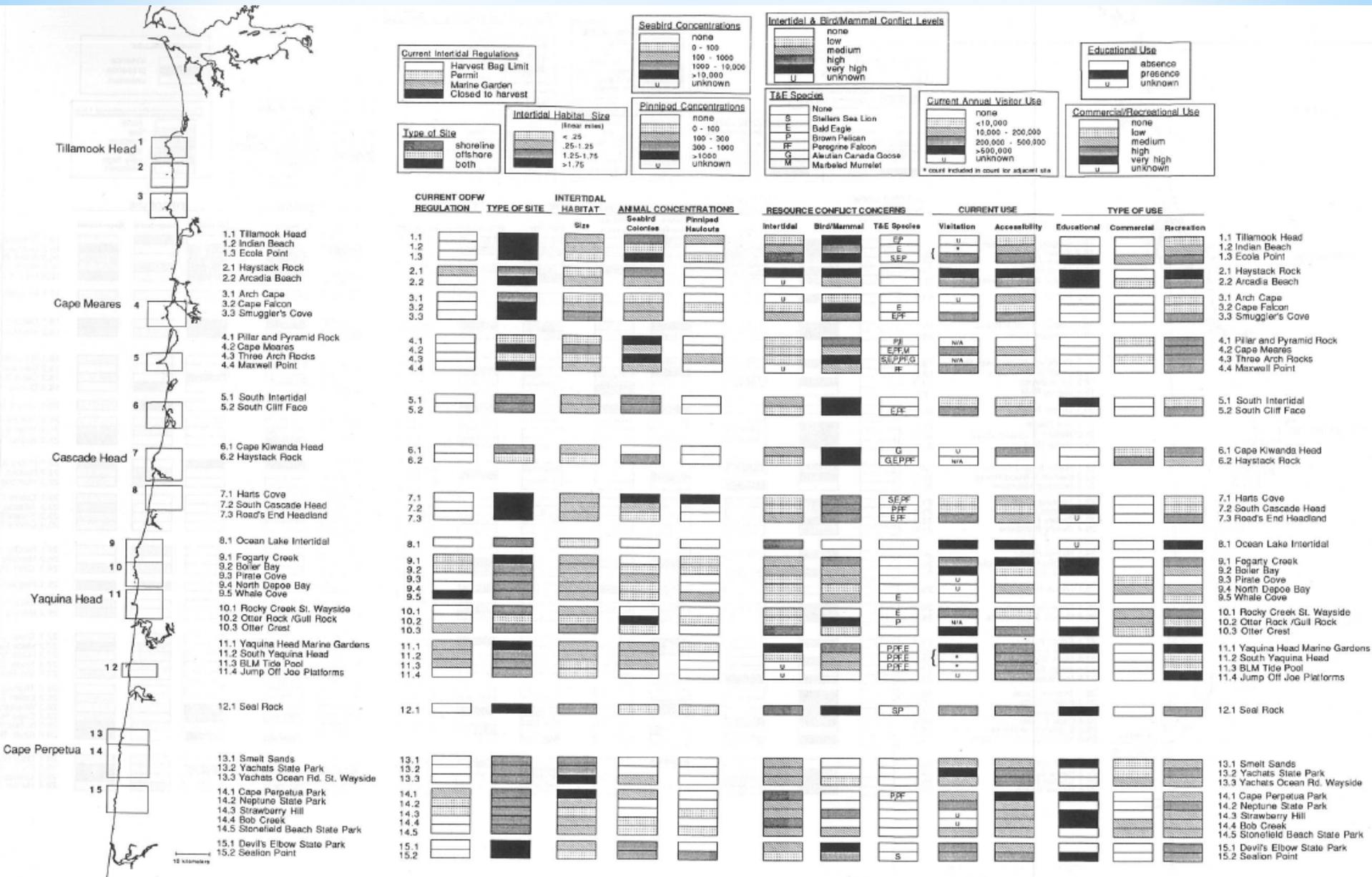
The Rocky Shore Management Strategy

- ❑ Policies and objectives +**
 - ❑ Scientific data on resources and uses,**
 - ❑ Applied to specific sites and situations,**
 - ❑ Relying on state and federal authorities & programs**
- * OPAC does not implement the strategy.**



Part III Section F Site Analysis & Categories

Evaluate, list and map sites based on type, habitat and use.



Part III Section (G)

□ **Designates 39 sites (parts) as either:**

- **Marine Garden (8)**
- **Habitat Refuge (10)**
- **Research Reserve (7)**

Or identified as;

- **Not Yet Designated (9)**
- **Priority Offshore Rocks/Reefs (7)**
- **Marine Shores – listed but not shown on maps (28)**

Map 1
 #1 Tillamook Head
 #2 Ecola State Park

G. Site Designations

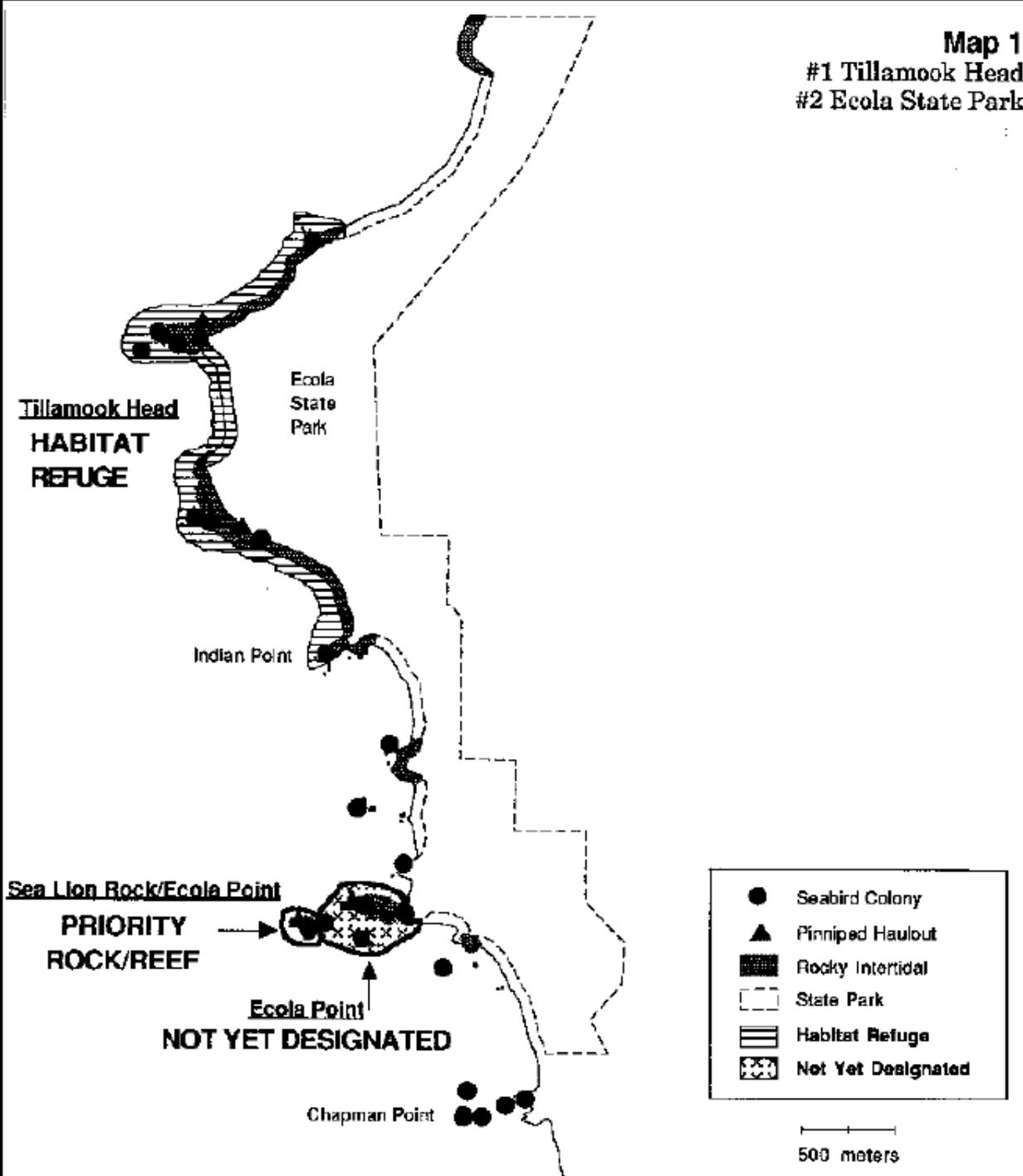
Designation
 Area Included

Description:

- Access
- Ownership
- Key Resources

Use and Management

- Current Use
- Current Management
- Impact Concerns
- Mgt. Objectives
- Mgt. Prescriptions



TSP Part Three: OPAC Amendment Criteria

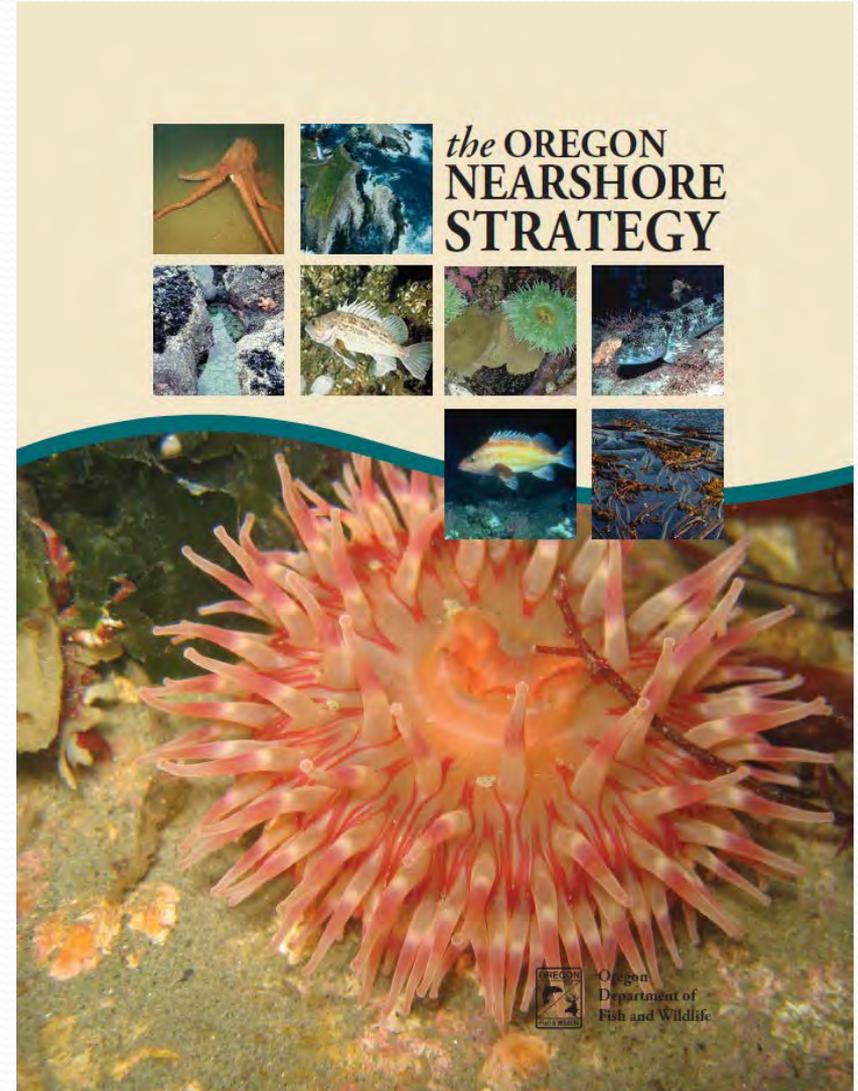
- **In Response to more detailed site study and analysis**
- **Change in circumstances affecting management**
- **When sites are proposed for designation**

Detailed Site Study and Analysis

Ocean Shore Management Plan



Oregon Parks and Recreation Department
January 2005



OREGON
Department of
Fish and Wildlife



Arizona Beach

Sisters Rock

Oregon's Marine Reserves

Cape Perpetua



Cascade Head



Cape Falcon



Redfish Rocks



Otter Rock



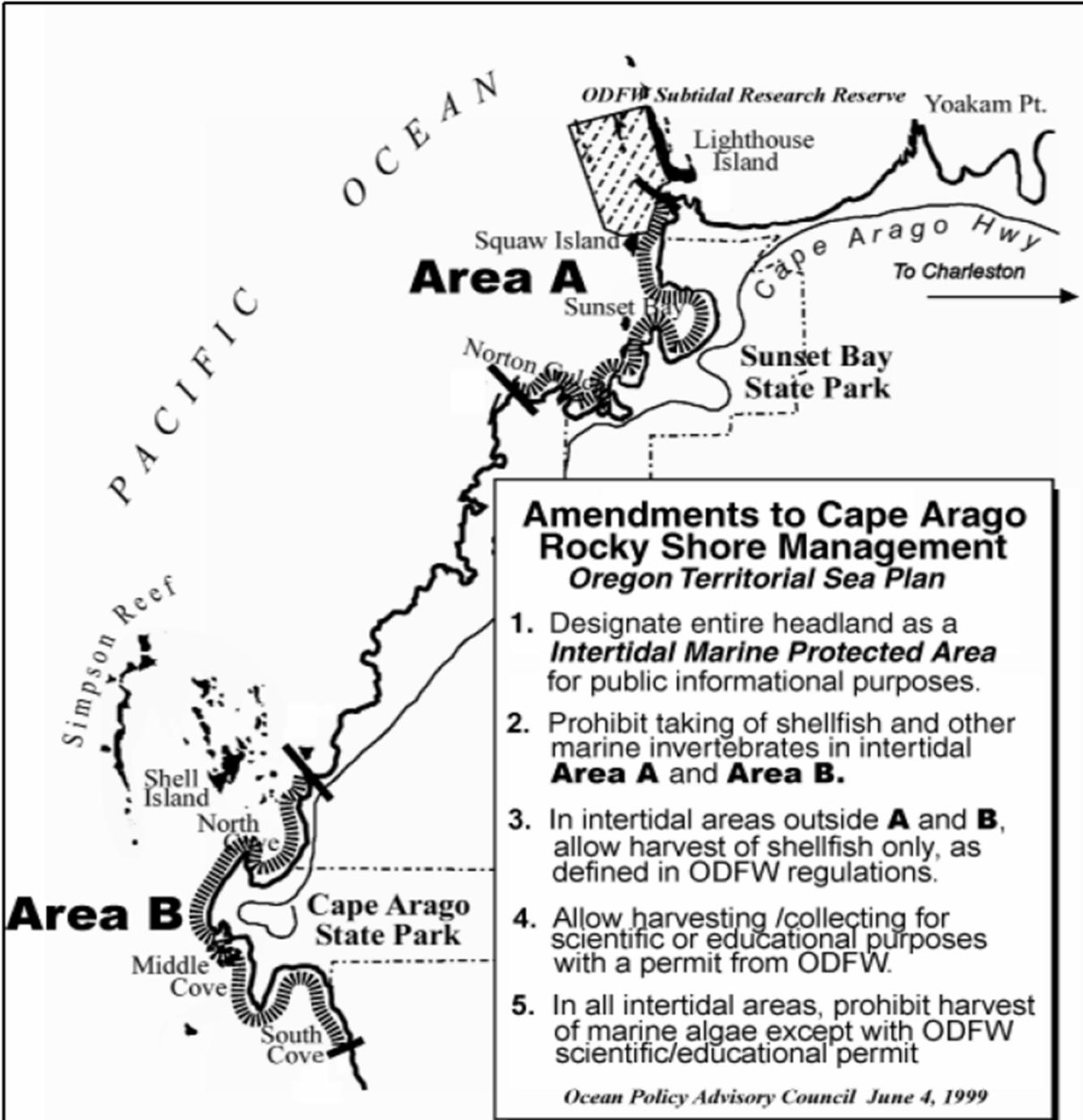
Cape Arago

2001 Amendment:
OPAC recommended
Part Three be
reorganized and
re-formatted into

Rocky Shore Cells

Multiple Sites

Model method

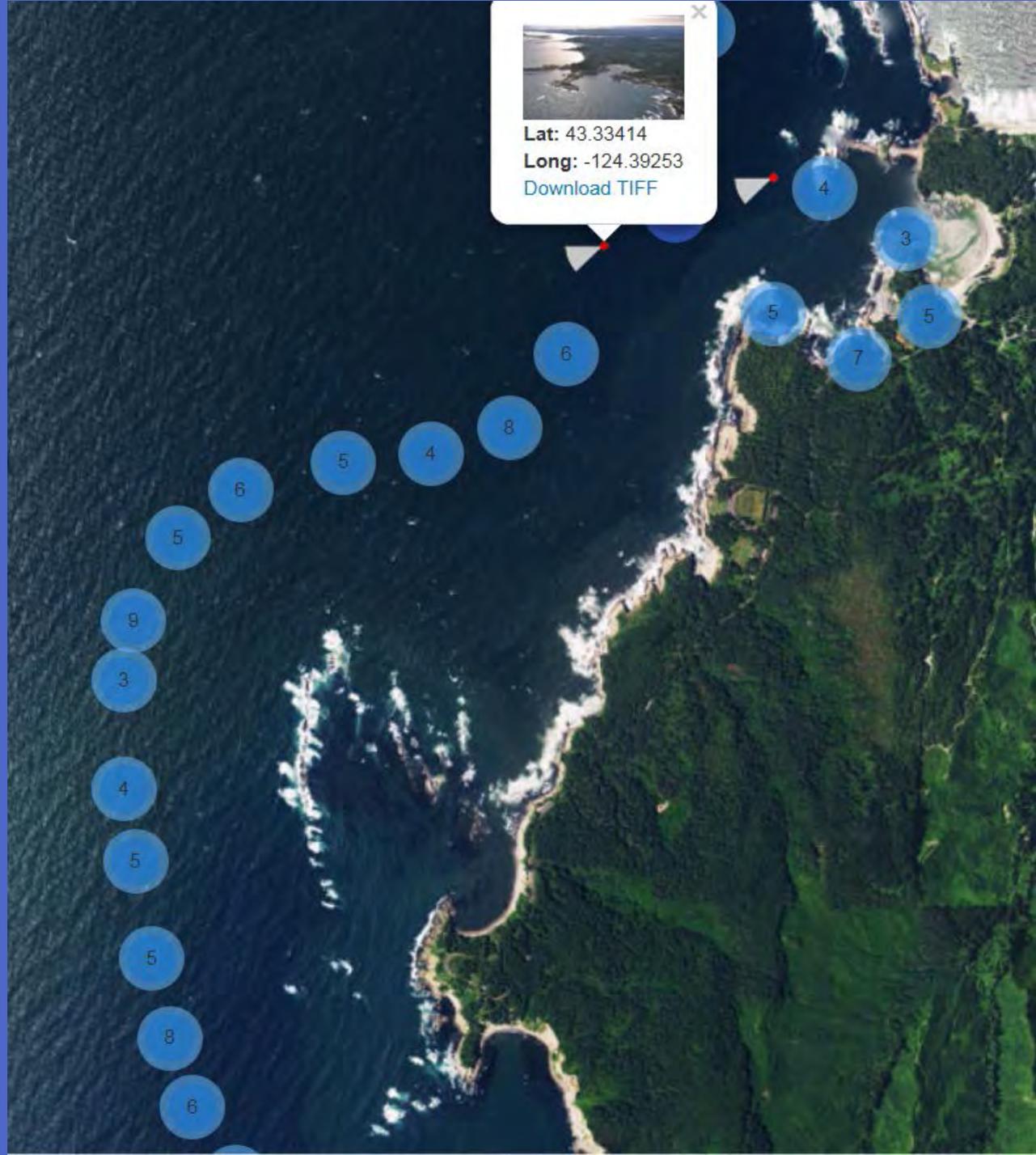


ShoreZone

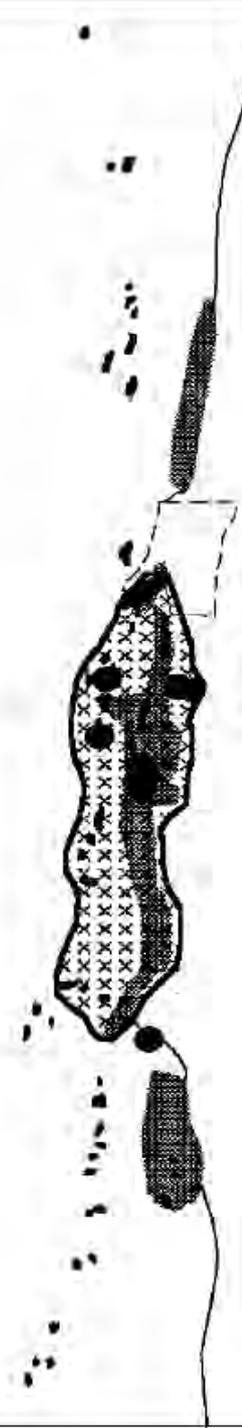
Georeferenced
Video &
Aerial Photos

Interpretive
Analysis

- ❖ Geological
- ❖ Biological



Map 12
#14 Seal Rock

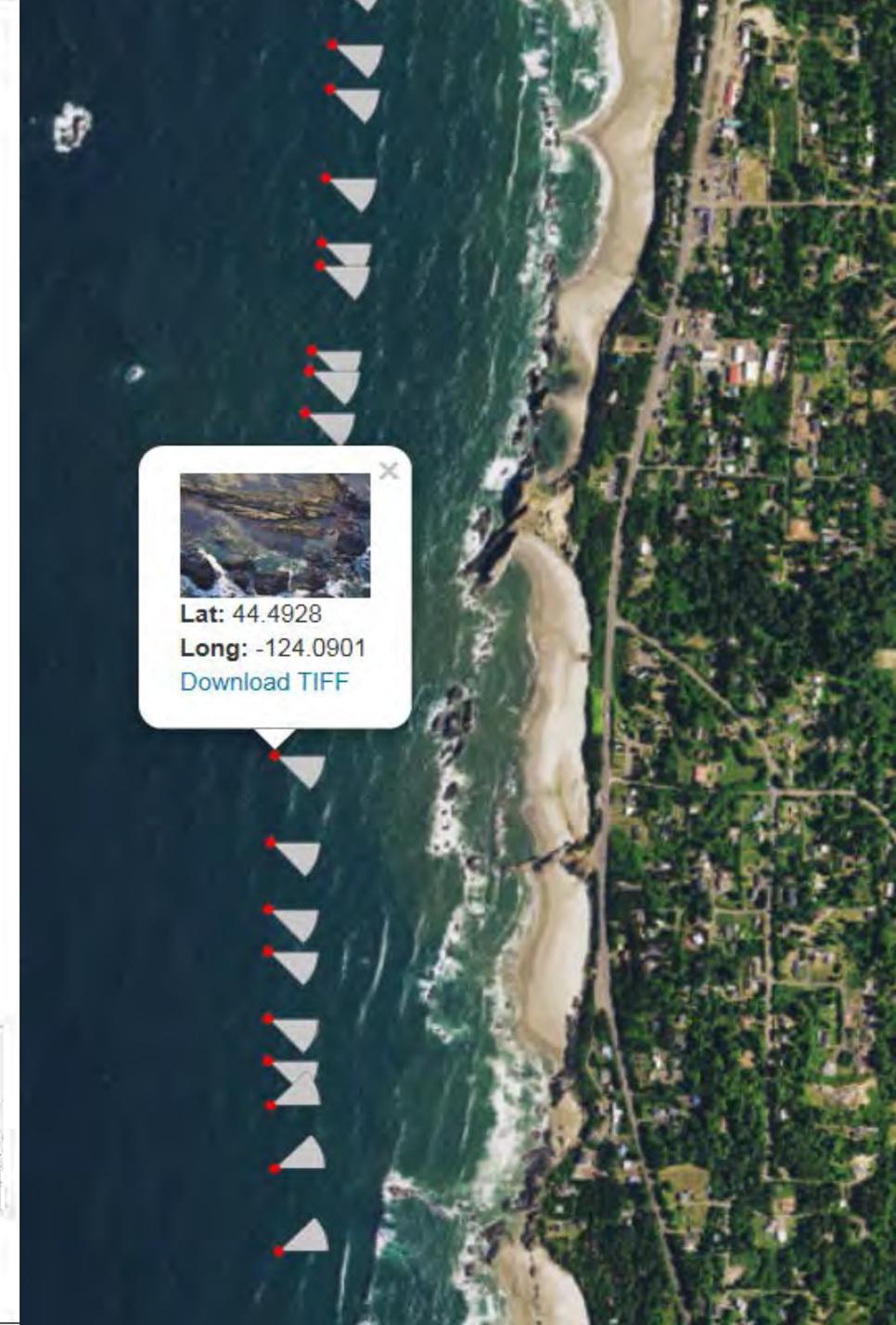


Seal Rock State Wayside

Seal Rock
NOT YET DESIGNATED

-  Pinniped Haulout
-  Seabird Colony
-  Rocky Intertidal
-  State Park
-  Not yet designated

200 meters



Lat: 44.4928

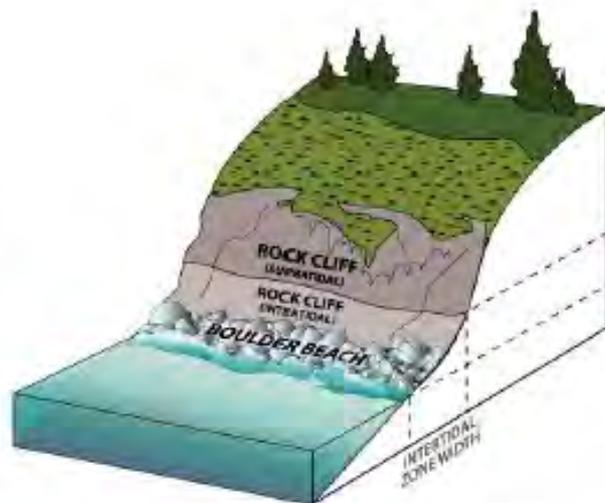
Long: -124.0901

[Download TIFF](#)

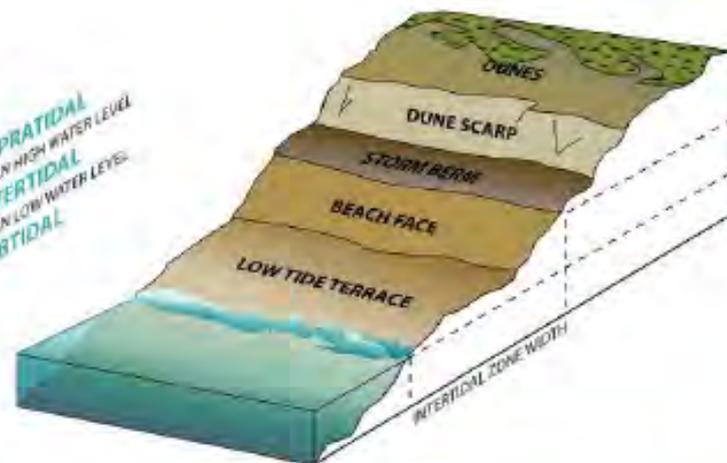


B-7. Wide platform with sand beach; *Shore Type 17*;
Otter Rock (Unit 50/01/2064/0)

COMPONENTS



SUPRATIDAL
MEAN HIGH WATER LEVEL
INTERTIDAL
MEAN LOW WATER LEVEL
SUBTIDAL



SUPRATIDAL
MEAN HIGH WATER LEVEL
INTERTIDAL
MEAN LOW WATER LEVEL
SUBTIDAL

BIOBANDS

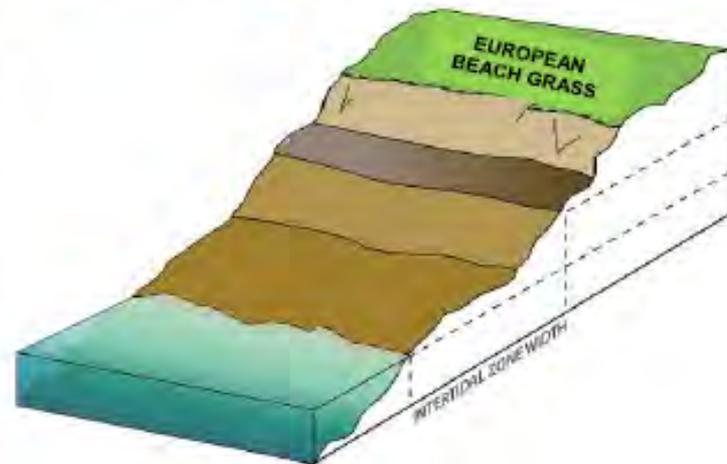
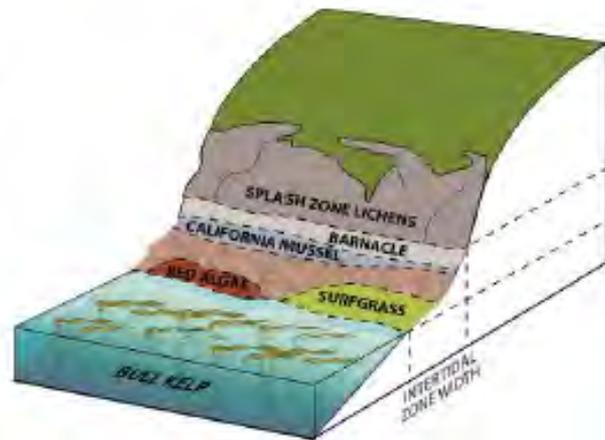


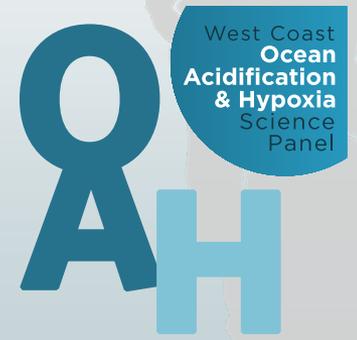
Figure 7. Schematic representation of across-shore *Components* and *Biobands* for two common shore types of the Oregon coast. *Components* are carefully referenced to the three tidal zones and *Biobands* are nested within *Components*. The stable substrate of the rock cliffs support a number of different biobands whereas the dynamic nature of the sand beaches are stable only in the vegetated dunes where the *European Beach Grass Bioband* is noted. The supratidal zone lies between the MHWL and the storm log line.

OPAC Part III Amendment Process

Part I Section F.2

- ❖ **Work Program: agency staff, work schedule, target date, TSP work group and STAC.**
- ❖ **Public Participation: public workshops**
- ❖ **Submittal to LCDC**

The West Coast Ocean Acidification and Hypoxia Science Panel



Briefing to OPAC April 5th 2016



The West Coast Ocean Acidification & Hypoxia Science Panel



- 20 scientists from CA, OR, WA, BC
- Charge of Panel:
 - Advance understanding of OAH
 - Develop options for decision-makers
- Convened in 2013 by the Ocean Science Trust at the request of the California Ocean Protection Council, in partnership with the Oregon Governor's Office

Institute of Ocean Sciences,
British Columbia

University of Victoria,
British Columbia

University of Washington,
NOAA PMEL

Oregon State University,
NOAA Fisheries

UC Davis,
Bodega Marine Lab

Ocean Science Trust

Stanford University

Herring Marine Station

UC Santa Barbara

Southern California Coastal
Water Research Project

UC San Diego,
Scripps Institution of
Oceanography



The West Coast Ocean Acidification & Hypoxia Science Panel



Ali Boehm (Chair)
Stanford University



Jack Barth
Oregon State University



Francis Chan
Oregon State University



Elizabeth Chornesky
Consultant



Andrew Dickson
Scripps Institution of Oceanography



Richard Feely
NOAA PMEL



Burke Hales
Oregon State University



Tessa Hill
UC Davis



Gretchen Hofmann
UC Santa Barbara



Terrie Klinger
University of Washington



Debby Ianson
Institute of Ocean Sciences, BC



John Largier
UC Davis



Jan Newton
University of Washington



Thomas Pedersen
Pac. Inst. for Climate Solutions, BC



George Somero
Stanford University



Martha Sutula
So. CA Coastal Water Research Project



Waldo Wakefield
NOAA Oregon State University



George Waldbusser
Oregon State University



Steve Weisberg
So. CA Coastal Water Research Project



Liz Whiteman
California Ocean Science Trust

Panel Products Overview



Some subtext...

- 1. We need to proceed with sound science**
- 2. Certain actions will bring disproportionate results**
- 3. Regional document but one size doesn't fit all**
- 4. There's tremendous value in regional cooperation but Oregon has an outsized leadership role in science, actions and policy**



If we were to cut through the fog...

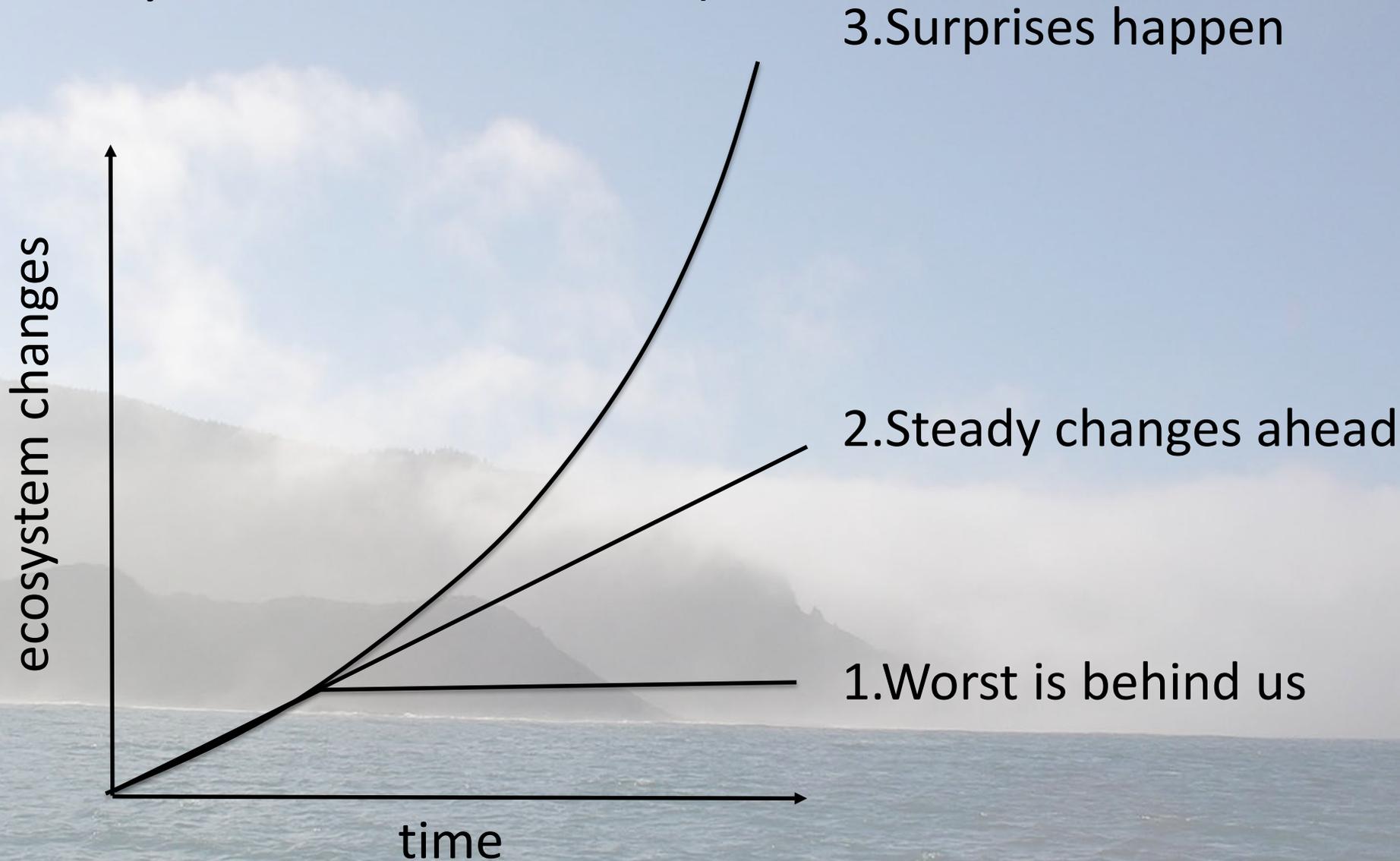


6 Major Findings

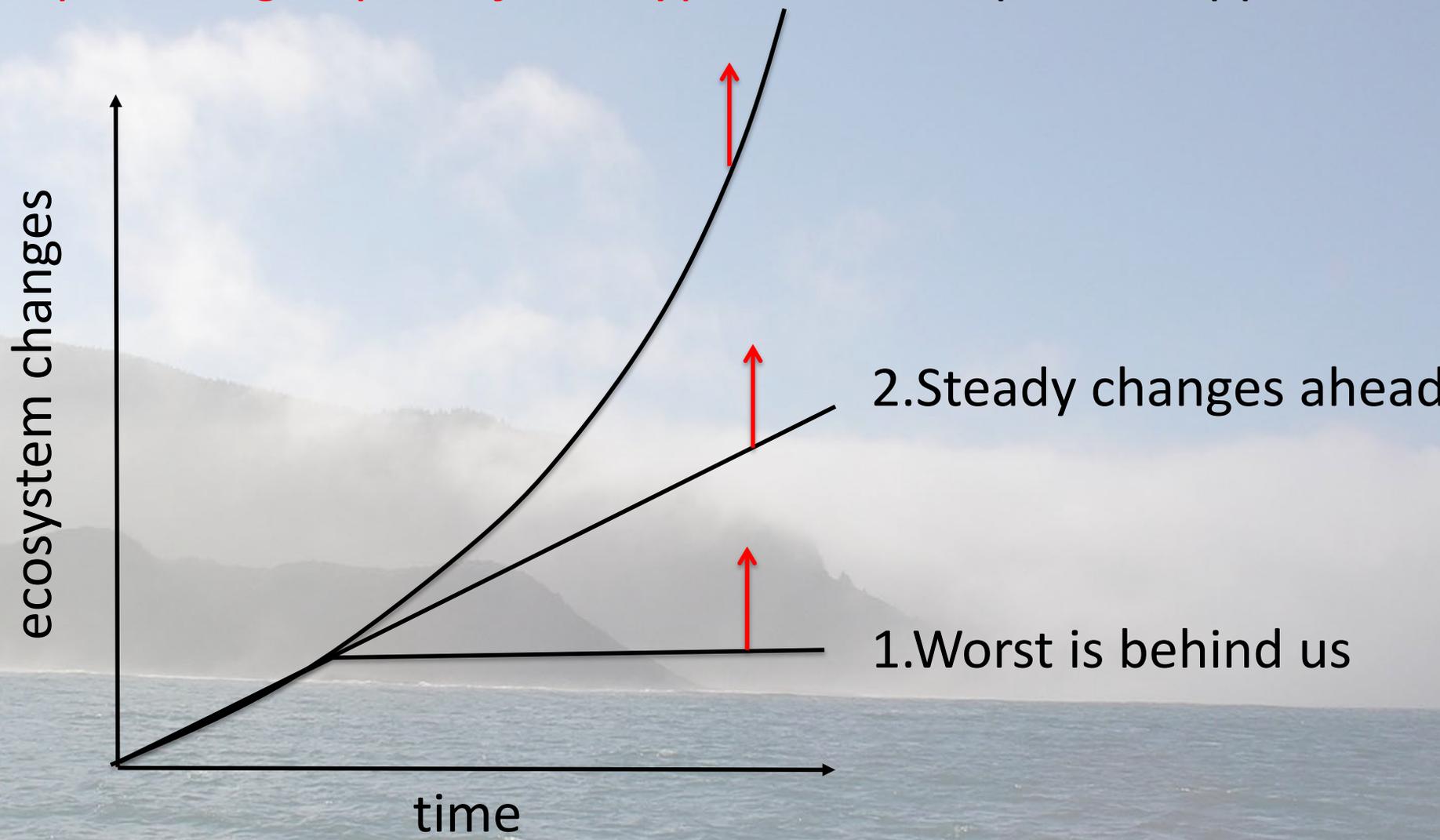
1. Consequences: OAH will have severe environmental, ecological and economic consequences for the West Coast, and requires a concerted regional focus
2. Global carbon emissions are the dominant cause of OAH
3. There are actions we can take to lessen exposure to OA
4. Strengthen: We can enhance the ability of ecosystems and organisms to cope with OA
5. Science: Accelerating OA science will expand the number of management options available
6. Act now: Inaction now will reduce options and impose higher costs later



What will the future hold (does OAH warrant high priority for decision makers)?

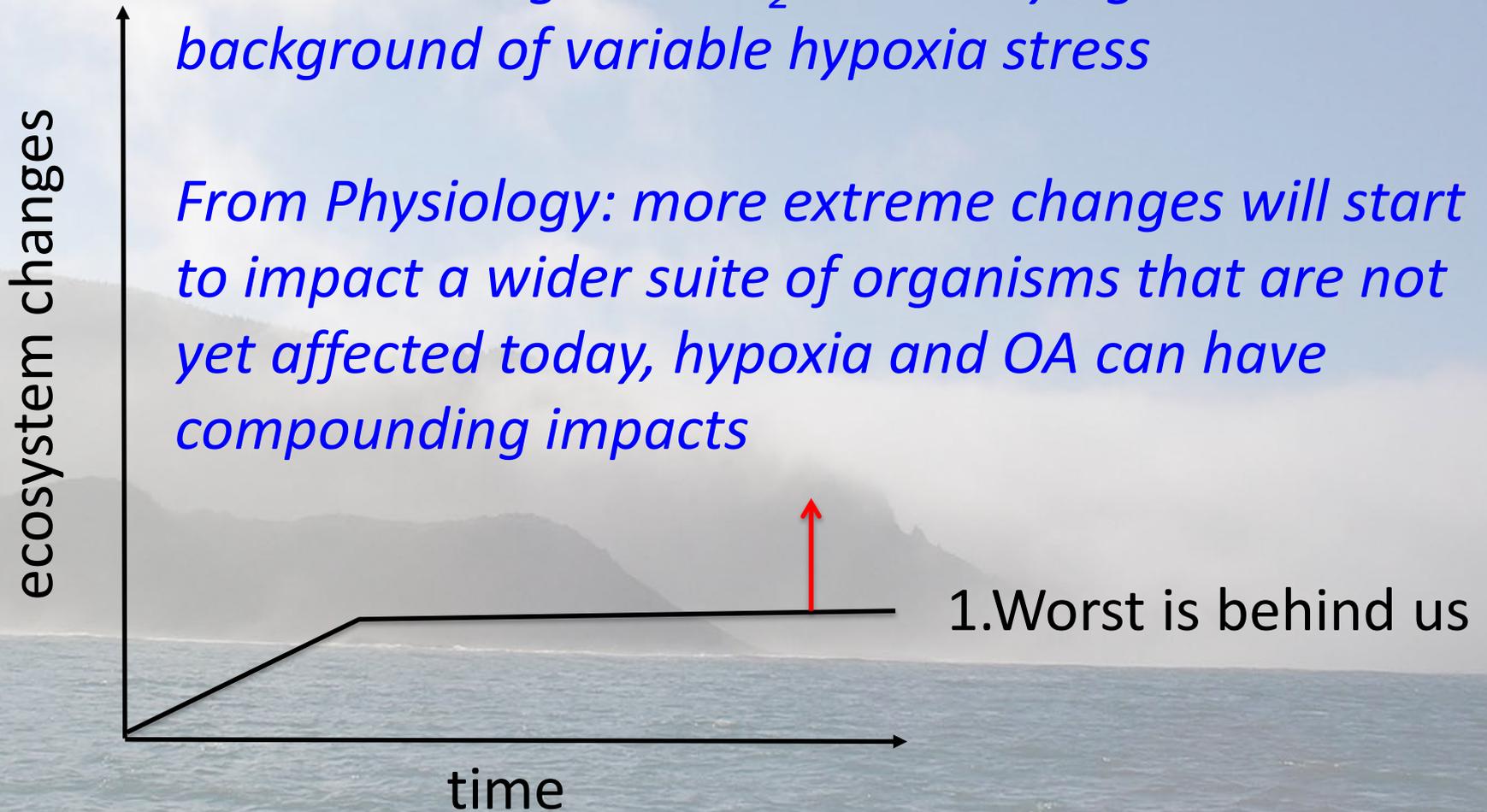


Compounding impacts from hypoxia? 3. Surprises happen



From Oceanography: We have committed to more extreme changes in CO₂ chemistry against a background of variable hypoxia stress

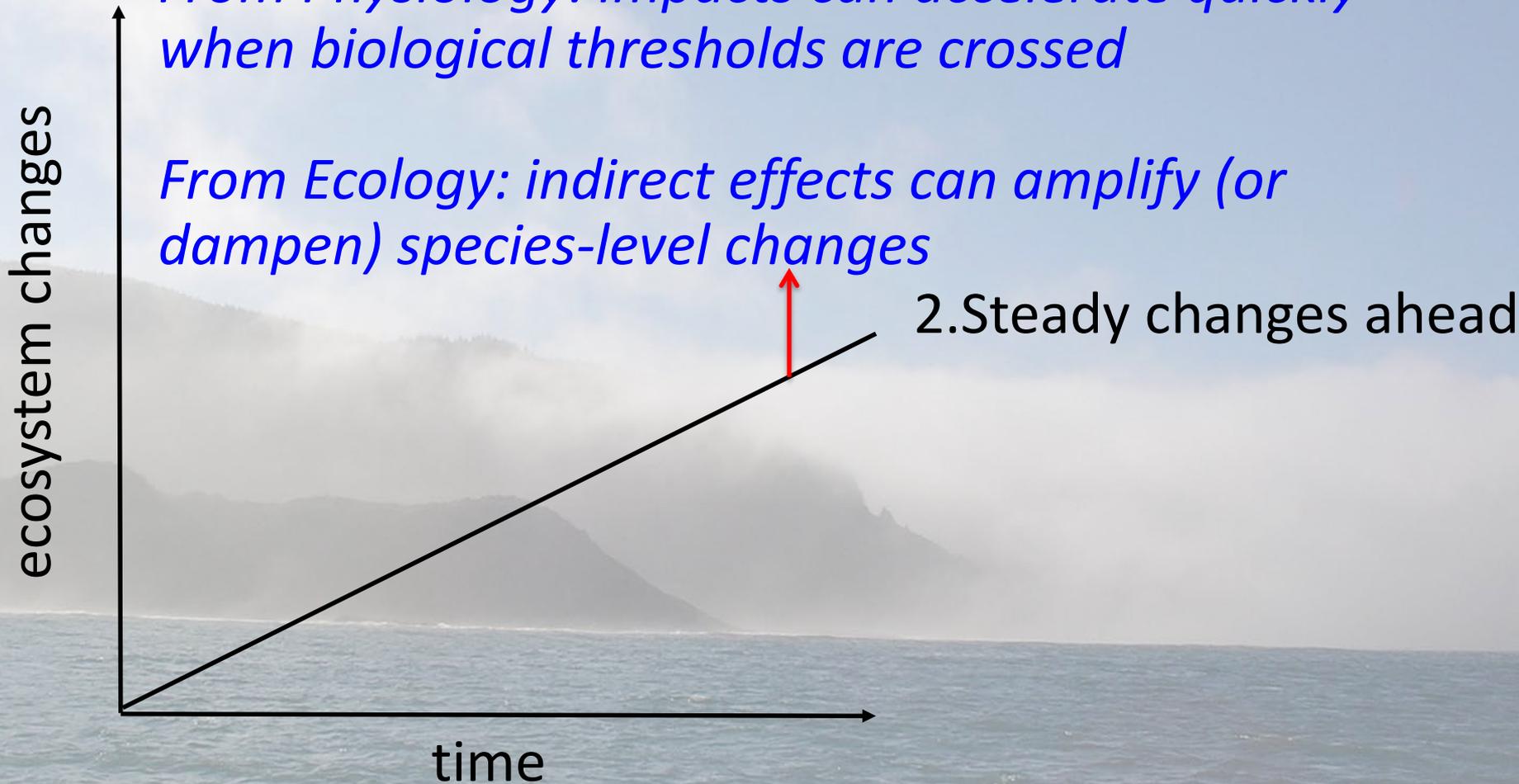
From Physiology: more extreme changes will start to impact a wider suite of organisms that are not yet affected today, hypoxia and OA can have compounding impacts



From Oceanography: chemical changes are not linear, we will start to cross thresholds in chemistry

From Physiology: impacts can accelerate quickly when biological thresholds are crossed

From Ecology: indirect effects can amplify (or dampen) species-level changes



6 Major Findings

1. Consequences: OAH will have severe environmental, ecological and economic consequences for the West Coast, and requires a concerted regional focus
2. Global carbon emissions are the dominant cause of OAH
3. There are actions we can take to lessen exposure to OA
4. Strengthen: We can enhance the ability of ecosystems and organisms to cope with OA
5. Science: Accelerating OA science will expand the number of management options available
6. Act now: Inaction now will reduce options and impose higher costs later



**OAH is something that we wait to
happen to us**

vs.

**something that we can and should get
out in front of?**

Roadmap of Local Management Options to Address OAH



REDUCE EXPOSURE



ENHANCE ABILITY OF BIOTA TO COPE

Reduce nutrient and carbon inputs



Advance carbon removal strategies



Reduce other stressors



Promote adaptive capacity



Recommendation 1

Theme: Address local factors that can reduce OAH exposure



Reduce local pollutant inputs that exacerbate OAH (*where they matter*)

Actions:

- Generate an inventory of areas where local pollutant inputs are likely to exacerbate OA
- Develop robust predictive models of OAH
- Develop an incentive-based strategy for reducing pollutant inputs



Photo: Elaine Thompson

Seattle
(650,000)



Port Orford
(1,100)



Los Angeles
(18,500,000)



Recommendation 2

Theme: Address local factors that can reduce OAH exposure



Advance approaches that remove CO₂ from seawater

Actions:

- Use demonstration projects to evaluate which locations are optimal for implementing CO₂ removal strategies
- Generate an inventory of locations where conservation or restoration of aquatic vegetation habitats can be successfully applied to mitigate OA.
- Consider CO₂ removal during habitat restoration planning process.



Recommendation 3

Theme: Address local factors that can reduce OAH exposure



Revise water quality criteria (we lack a useable benchmark that tells us if we are doing well or poorly)

Actions:

- Agree on parameters that will be part of OAH criteria

“Existing water-quality criteria, which were created four decades ago, are not scientifically appropriate for assessing OA condition.

Even when existing water-quality criteria for seawater pH are met, a wide range of severe biological impacts are routinely observed.”

– The West Coast OAH Panel:

Major Findings, Recommendations, and Actions

Recommendation 3

Revise water quality criteria

Need to quickly move pH monitoring beyond academic research...

WENDY SCHMIDT
OCEAN HEALTH XPRIZE®

\$2 million global competition

Challenge: Develop pH sensor

- Affordable
- Management-relevant
- Accurate



XPRIZE Winners, Sunburst Sensors

Photo Credit: XPRIZE

**OSU's MSI is the recipient of \$250,000 from Schmidt Foundation to train next generation of OA monitoring practitioners*

Recommendation 4

Theme: Systematically integrate OAH into the management of marine ecosystems and biological resources



Reduce co-occurring stressors on ecosystems

Actions:

- Integrate OAH effects into the management of ocean and coastal ecosystems and biological resources.

Recommendation 5

Theme: Systematically integrate OAH into the management of marine ecosystems and biological resources



Advance the adaptive capacity of marine species and ecosystems

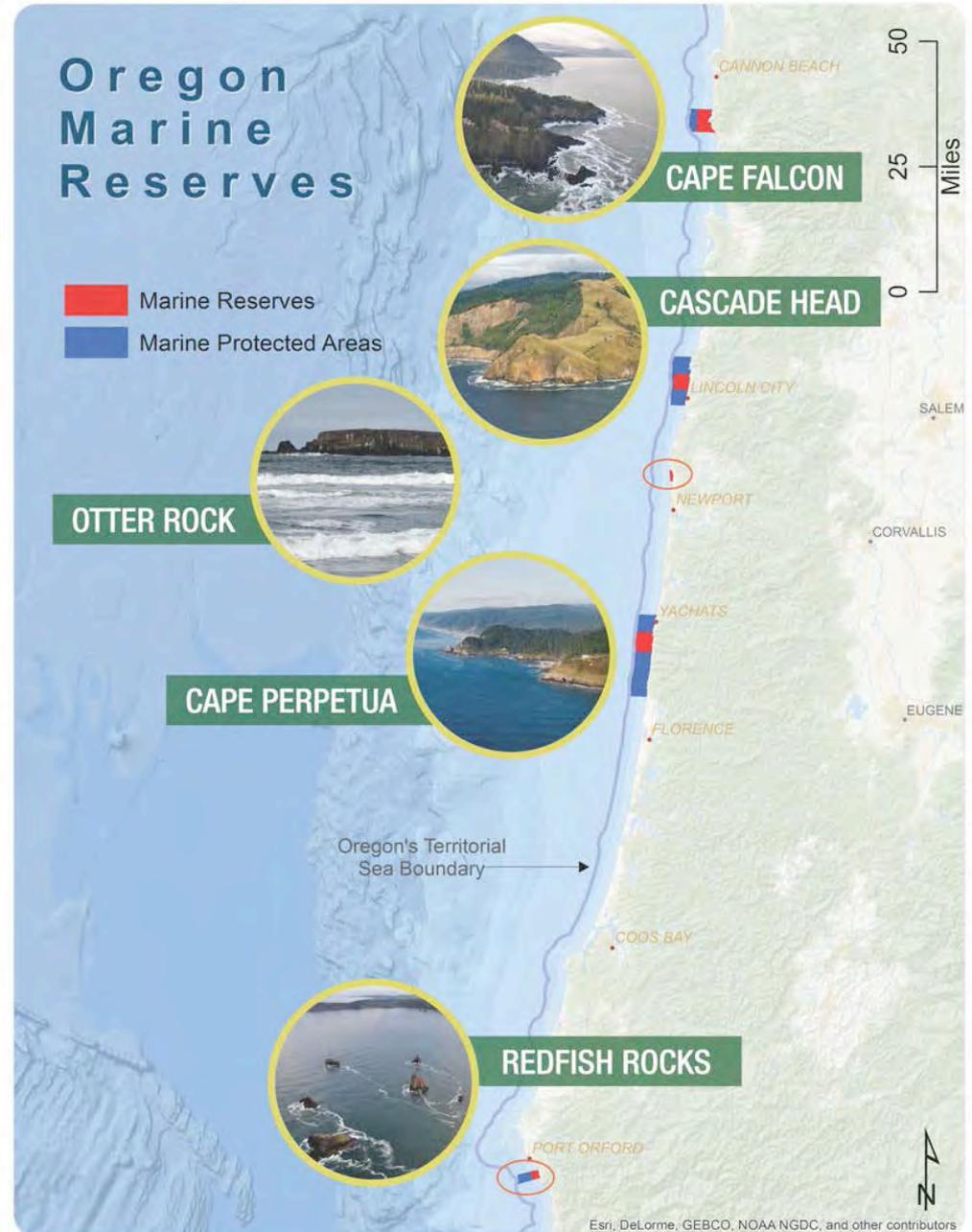
Actions:

- Inventory the co-location of protected areas vulnerable to OAH.
- Evaluate the benefits and risks to active enhancement of adaptive capacity

Triple duty for marine reserves?

Reservoir of genetic diversity

Natural listening posts for OAH



Recommendation 6

Theme: Expand knowledge about OAH



Establish a coordinated research strategy

Actions:

- Create agreement among the multiple organizations that fund OAH research to establish joint research priorities.

Recommendation 7

Theme: Expand knowledge about OAH



Build out a West Coast monitoring program that meets management needs

Actions:

- Define gaps between monitoring efforts and management needs.
- Enhance comparability and access of OAH data.

Recommendation 8

Theme: Expand knowledge about OAH

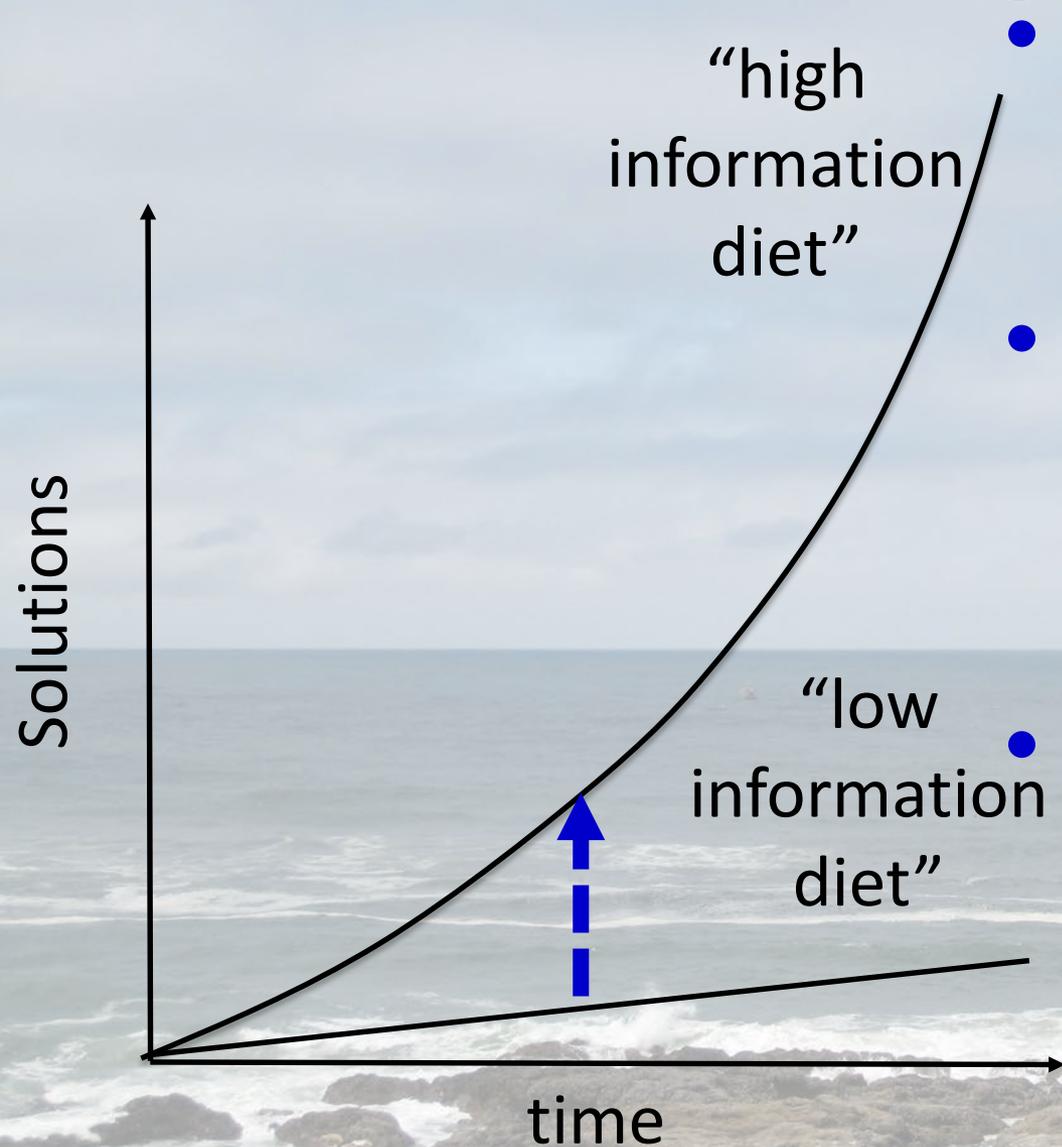


Expand scientific engagement to meet evolving management needs

Actions:

- Create a science task force

How can we change course today?



- **Prioritize and innovate relevant research**
- **Smart monitoring to know where we are heading**
- **Science – decision maker partnership to translate new knowledge into actual solutions**

How can we change course today?

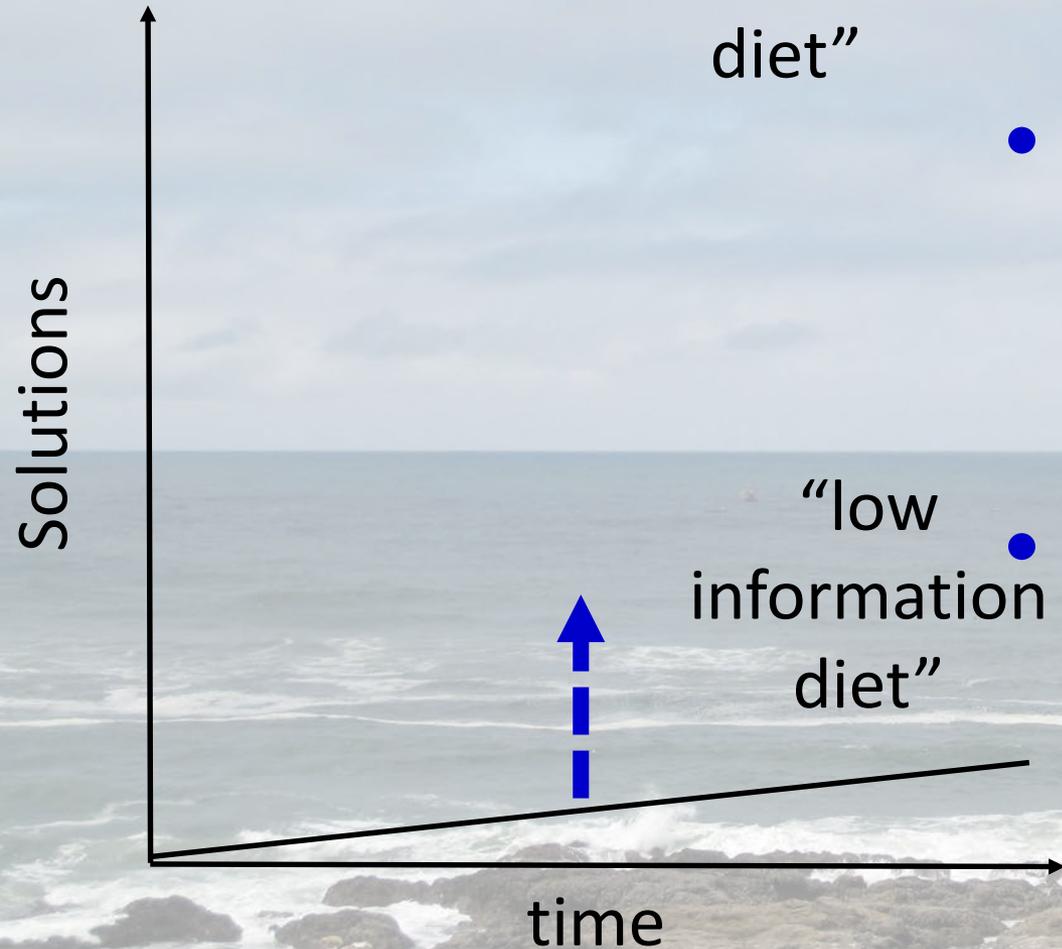
“high
information
diet”

- **Prioritize and innovate relevant research**

- **Smart monitoring to know where we are heading**

“low
information
diet”

- **Science – decision maker partnership to translate new knowledge into actual solutions**



What's happening, what's next?

- Enhanced engagement with federal agencies (commitment to West Coast partnership, Panel actions...)
- Regional pivot from OAH-blind to OAH-informed policies
- Opportunities in Oregon to build from knowledge+partnerships, MSI, and legislative actions (e.g. shellfish initiative, ship time...etc.)