



Coasts and Climate Change PowerPoint Presentation Guide

In this document you will find a screenshot of each slide in the PowerPoint, followed by two sections (where appropriate):

- Example language – outlines the concepts you want to communicate to your audience.
- Presenter notes – helps provide a deeper look at the content.

Not all of this information may be needed in your presentation, however it will help guide the discussion for each slide and serve as a resource for you to further elaborate on a concept or cite sources.

Please make the presentation your own—feel confident to add your own style and give the presentation your own flare—and share with us whatever content you find most effective.



1. Welcome

Give your name and briefly describe Great Old Broads.

Thank your audience for joining you in this conversation about coasts, climate change, and public lands in the Northwest. Share a bit about yourself, especially in the form of an interesting story about your connection/passion for public lands and coasts—but be sure to keep your intro brief.



2. Great Old Broads: Who We Are

We are one of the few public land conservation organizations led by women. We are national, but we emphasize local grassroots action. We value and promote women's leadership and experience. We care deeply about our public lands and all that they have to offer our communities.



3. Great Old Broads' Mission

Founded in 1989 by a few feisty women hikers who were also activists, our founders saw an important voice was missing from the conservation movement—the older woman—impassioned, experienced, and not afraid to speak out in defense of Mother Earth. Today we have members of all ages and genders—and 40 chapters across the US.

We take a three-pronged approach to what we do:

- Education...on threats to public lands and solutions to protect them including climate change on public lands, and how public land development increases greenhouse gas emissions (that's why we're here today).



- Stewardship...From ecological restoration to trail clearance, tree planting to removing obsolete fencing, wilderness solitude monitoring to documenting illegal off highway vehicle impacts, we do it all. (We'll talk more about that later).
- Advocacy...such as public testimony and comments on public land proposals, speaking out against activities that harm public lands and waters; and support for wilderness bills.

Presenter Note: You may substitute examples above for specific activities conducted by your Broadband.



4. Today We'll Learn About:

- Public lands and climate change.
- Impacts of climate change on oceans and coastal ecosystems.
- Ways to build climate resilience in our oceans and coastlines.



5. What are Public Lands?

Broadly speaking, they are lands designated by the US Government that belong to the public. Because the lands are held in trust for the public, these lands are to be managed for the long-term health of the land and the American people. Every American has a say in how these lands are managed.

Public lands have complex, often violent histories... (Use land acknowledgement statement.)

Presenter Note: Refer to the land acknowledgement planning guide to prepare a statement that is appropriate to your audience and location.



6. Federal, State, and Local Public Lands

Public lands are managed by federal, state, county, and municipal governments.

From the smallest local city park all the way to the largest national parks and forests, each government entity manages the lands differently.



7. Federal Public Lands in the Northwest

Here in the Northwest, several different agencies manage federal public lands for uses including everything from recreation to clear-cut logging.

Four agencies: *(offer local examples)*

- Bureau of Land Management
- US Forest Service
- Fish and Wildlife Service
- National Park Service

Some lands have special designations that protect them for their cultural significance, wildlife, or the intrinsic value of the ecosystem. Other public lands are used for more intensive commercial uses such as mining, logging, grazing, and energy development.

As you can see, the Bureau of Land Management (which is part of the Department of Interior) and the US Forest Service (part of the Department of Agriculture) manage the most federal lands in the region.

Tribes also play a critical role in public lands management. As sovereign nations, tribes hold a unique government-to-government role in public lands management decisions. Consultation and coordination is required if a proposed project affects tribal lands, resources or areas of significance.

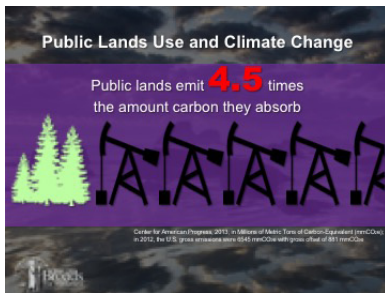


Through treaties with the federal government, many tribes reserved their rights to harvest fish and access other traditional resources in exchange for their land. For example, some treaty tribes are entitled to 50 percent of the harvestable salmon that return to Washington waters.



8. How Do Public Lands Relate to Climate Change?

So how, exactly, do our public lands relate to climate change?



9. Public Lands Use and Climate Change

Forests, marshes, wetlands, and grasslands all absorb carbon dioxide from the atmosphere, serving as a carbon sink—symbolized here by the trees.

Meanwhile, there is also a great deal of industrial activity on public lands, such as coal, oil, and natural gas extraction.

Because of these activities, we are currently removing and burning far more carbon from the earth beneath these ecosystems than these same ecosystems can absorb. We are removing **4.5x** as much ancient carbon from the ground beneath our public lands as the ecosystems on all 640 million acres of public lands can absorb. Currently, extractive fossil fuel activities on public lands make up 25% of US emissions. These numbers continue to rise.



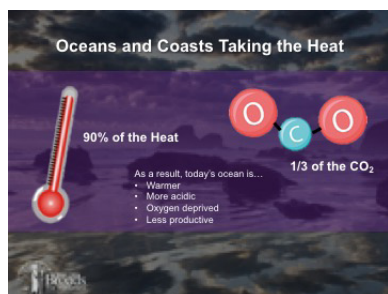
10. Greenhouse Effect

Greenhouse gases, including carbon dioxide and methane, naturally make up a small percentage of the gases in our atmosphere. These gases act like a blanket that surrounds the earth, keeping our planet at a reasonably comfortable, livable temperature while still allowing excess heat to escape into space.



But when we add more and more greenhouse gases to this “blanket” in the atmosphere, it’s like thickening the blanket. This thicker blanket traps more heat underneath it and allows far less to escape back into space, increasing the temperature and disrupting the climate worldwide.

98% of climate scientists agree that the human-caused emissions “thickening the blanket” are leading to a rapidly changing climate.



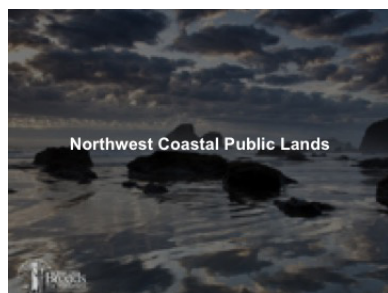
11. Oceans and Coasts Taking the Heat

These emissions contribute to a global problem that is closely tied to oceans and coasts. For decades, the world’s ocean has literally been “taking the heat” for climate change.

Oceans have absorbed over 90% of the heat from that thicker blanket, and nearly a third of the carbon dioxide from greenhouse gas emissions.

The result: an ocean that is warmer, more acidic, less productive, and increasingly starved of oxygen than before the impacts of climate change. We will dive into these impacts soon.

Source: <https://bit.ly/35iWgBz>



12. Northwest Coastal Public Lands

Today we are focusing on the intersection between public coastal ecosystems in the northwest and climate change—but where are these public lands? What do they look like? And who’s in charge?



13. Marine Protected Areas

When we think of public lands, many of us think of national parks or national forests. But how many of you have heard of a marine protected area?

Marine Protected Areas (MPAs) are above and below water that are set aside primarily for the conservation of habitat and species. They come in many shapes and sizes.

MPAs include **national marine sanctuaries, national parks, seashores** and **wildlife refuges**. Source: <https://oceanservice.noaa.gov/facts/mpaloc.html>

A **fully**-protected MPA restricts extractive or destructive activities and keeps negative impacts to a minimum. **This is comparable to wilderness areas on land.**

A **highly**-protected MPA allows only very light extractive activities, such as subsistence or very small amounts of recreational fishing.

Source: <https://bit.ly/35iWgBz>



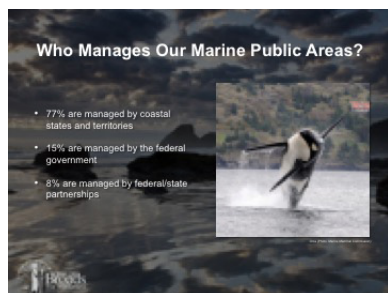
14. How Big are Marine Protected Areas?

There are over 1,700 MPAs in the US.

But only 3% of US oceans are fully protected and another 20% is highly protected—and nearly all of this area is located in two large protected areas in the remote Pacific Ocean.

The west coast (California, Oregon, and Washington) has the highest number of MPAs of any region.

Source: <https://oceanservice.noaa.gov/facts/mpaloc.html>



15. Who Manages Our Marine Protected Areas?

77% are managed by coastal states and territories, while 15% are under federal jurisdiction. The rest are managed by state/federal partnerships.

Presenter Note: Use this tool to find examples of local MPAs. Are they locally, regionally, or federally managed? Find Marine Protected Areas with this mapping tool: <https://bit.ly/3kfOpuu>

Washington State public lands inventory: <https://bit.ly/34el2ll>

Curious about what aquatic areas are public? This brochure dives into the nitty-gritty: https://www.dnr.wa.gov/Publications/aqr_aquatic_land_boundaries.pdf

Further Background info on MPA's info: <https://bit.ly/3o9tLyA>

But who exactly is in charge of coastal public lands?

The Environmental Protection Agency, National Oceanographic and Atmospheric Administration, US Army Corps of Engineers, US Fish and Wildlife Service, Federal Highway Administration, Natural Resources Conservation Service, United States Geological Survey, and the US Department of Agriculture are all participants in the Interagency Coastal Wetlands Workgroup.

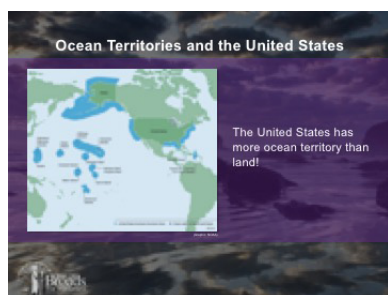
Because coastal public lands are managed at a federal, state, or local level, their management requires a great deal of collaboration across governing bodies.

Each state manages coastal ecosystems differently. Oregon is a shining example of strong public access to coastal ecosystems...like beaches!



Presenter Note: Of all the US coastal states, the states of Oregon and Hawaii stand out for their public beach access protections. Oregon is one of the best for legal protection of the public's use of and access to its coastal land. Thanks to Oregon's landmark Beach Bill, passed in 1967, and a 1969 Oregon Supreme Court decision, the public's right to access to all of the state's beaches is guaranteed. The Beach Bill recognized a state easement on all beaches between the low water mark and the vegetation line, and in 1969 the state Supreme Court invoked the doctrine of custom in declaring that the public has a right to recreate and enjoy the state's dry sand beaches

Map of public shoreline access in Washington: <https://bit.ly/3dKDNBI>



16. Ocean Territories and the United States

The United States has one of the largest ocean territories in the world, greater than the area of our land.

And our ocean includes tropical coral reefs, lush kelp forests, deep ocean canyons, Arctic sea ice, and so many more habitats. These places are home to an incredible diverse ecosystem—including whales, endangered sea turtles, migratory seabirds, fish, and other

ocean wildlife.



17. Coastal Ecosystems

What comes to mind when you think of coastal ecosystems? Of course, these places are where the land meets the sea. Perhaps you're thinking of a beach or scenic bluff?

Coastal ecosystems are incredibly diverse along the northwest coast. Tidal marshes, seagrass beds, tidal forests, and oyster beds are all relatively small ecosystems by area, but they have

some incredible functions.

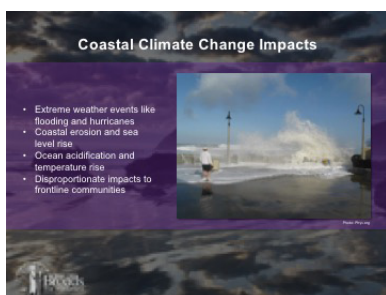
Presenter Note: More about Washington coastal ecosystems: <https://bit.ly/2H9nD98>



18. Coastal Climate Change Impacts

Northwest coastlines are experiencing substantial climate impacts, affecting both ecosystems and communities living along the coast.

(Ask participants to type a coastal climate impact that they are aware of into the chat box. Give everyone a few minutes to type theirs and read others' responses.)



19. Coastal Climate Change Impacts

In this presentation we will focus on the biggest climate impacts that are happening now and projected to worsen in the Northwest:

- Extreme weather events, including unprecedented flooding.
- Coastal erosion and sea level rise.
- Ocean acidification and temperature rise.
- Disproportionate impacts to frontline communities.

Frontline communities in the Northwest include:

- Tribes and Indigenous peoples.
- Those most dependent on natural resources for their livelihoods.
- The economically disadvantaged, among others, who are not in a position to easily relocate or navigate these impacts.



20. Coasts and Climate Change Impacts

What does all this mean here in the Pacific Northwest? Let's start by taking a closer look at the harm that climate change is causing to coastal ecosystems and communities.



21. Climate-driven Sea Level Rise

First we will touch on sea level rise because it is one of the most **likely** and **disruptive** consequences of climate change.

Sea level rise is caused by the melting of glacial ice on land that runs into the ocean. Sea level rise is also caused by warming ocean temperatures, which cause water molecules to spread apart.

Unfortunately, melting of Arctic glaciers is similar a runaway train. This is because glacial melting causes **feedback loops** that scientists now understand are speeding up this cycle. We can slow the process by limiting future warming, but some future sea level rise is inevitable.

Source: <https://bit.ly/3m4wwQ4>



22. Impacts of Sea Level Rise on People

Sea level rise is going to have a major impact on the millions of people who live on or near the coast. By 2100, sea-level rise of 3 feet could place 4.2 million people at risk of inundation, while 6 feet of sea level rise could affect 13.1 million people.

As you can imagine, both people and ecosystems will have to be able to migrate to higher elevations to weather these impacts.

Washington state is poised to bear a very high financial burden because it has thousands of miles of tidal shoreline and a very large number of small communities and settlements in these tidal areas. The state was ranked seventh among states in the US for highest anticipated costs from sea level rise caused by climate change.

Source: <https://bit.ly/2FJGw1F>

Presenter Note: 2100 can feel far away for many of us! To bring this into tangible reality for your audience, consider an example they can relate to. For instance, if you have a grandchild born in 2017, 2100 will be their 83rd birthday. Young people living today will have to deal with these enormous climate impacts.



23. Frontline Communities

The impact of sea level rise on coastal Indigenous communities across the region is especially severe. The 660-person Quinault Nation village of Taholah in Washington is currently being relocated by Tribal leadership above projected sea level rise and flooding zones.

According to the Washington State Department of Ecology, there are several other Native American communities on the Olympic Peninsula that are vulnerable not only to sea level rise, but also flooding and earthquake-triggered tsunamis.

In addition to direct threats to coastal communities, sea level rise along the Olympic Coastal Strip, a wilderness area in Olympic National Park, is threatening sensitive cultural sites, including shell middens that are important to tribes for their traditional values and cultural materials that they contain.

Indigenous groups are currently working with the National Park Service to protect exposed materials from poaching and inappropriate treatment by visitors, but erosion prevention is infeasible in most cases.

Presenter Note: This website offers visual comparison of best- and worst-case sea level rise scenarios: <https://bit.ly/3dIXQsf>



24. Sea Level Rise Impacts to Ecosystems

Sea level rise will also disrupt the fresh/salt water balance in estuaries as salt water moves into areas that were previously dominated by fresh water.

As an example, in Skagit Delta marshes (WA), with 18 inches of sea level rise, could harm juvenile Chinook salmon killing an estimated 211,000 fish.

Source: <https://bit.ly/2FMZeWa>



Why such a large impact? Salmon transition from fresh to salt water during their life-cycle and have a vital transitional period when fresh water juveniles transition into ocean-dwelling adults. This time spent in coastal estuaries strongly influences their later survival. The loss of coastal ecosystems caused by climate change directly threatens the survival of salmon and resident orca populations that are foundational to our region's identity

Meanwhile, many sea and shorebirds—such as the Aleutian tern, Kittlitz's murrelet, beach-nesting Black oystercatchers, and the Cassin's auklet—are highly vulnerable to climate impacts. For coastal birds, loss of habitat and food sources are the largest climate change-related concerns. Population recovery is less likely if climate change results in catastrophic events that are more frequent, more intense, or of longer duration.

Source: <https://bit.ly/2FMZeWa>



25. Climate Impacts: Storm Surges

Research shows that a seemingly low increase in sea level will have significant impacts when storm surges occur.

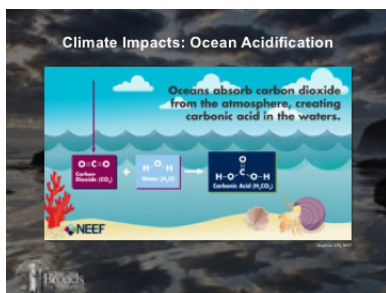
This is because storm surges magnify sea level rise **five times** and increase the frequency of historic flood events exponentially.

Source: <https://bit.ly/3kdHltb>

We are already experiencing heavy storms occurring with greater frequency and intensity. Off the Oregon and Washington coasts, extreme storm waves are now eight feet higher since the mid-1980s and deliver 65% more force when they come ashore. These destructive weather events not only increase coastal erosion and loss of coastal habitat, but are also proving incredibly expensive when coastal communities are impacted.

Preparing for these climate impacts could cost Seattle \$716.3 million according to a study released by the Center for Climate Integrity.

Source: <https://bit.ly/3m2pwmD>

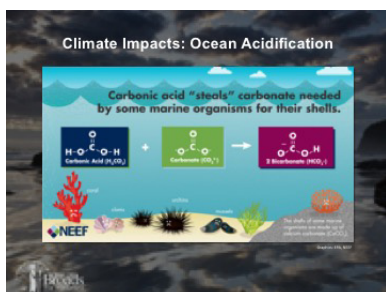


26. Ocean Acidification Breakdown

A hidden impact of climate change that many people do not fully understand is ocean acidification. We don't have to be chemists or climate scientists to understand the basics of what is happening in our oceans.

As we burn fossil fuels, we are adding an extra blanket to the atmosphere, causing the planet to warm. But not all of these gases remain in the atmosphere—much of this excess CO₂ is absorbed by the ocean.

When ocean water absorbs carbon dioxide from the atmosphere, it reacts with water to create carbonic acid.



27. Ocean Acidification Breakdown

All this carbonic acid in the water captures carbonate (green box). Carbonate is an important ingredient in our oceans needed to form shells. Less carbonate in seawater is very important because a great many marine organisms use carbonate, combined with calcium, to form their exoskeletons, shells, or other structures. So not only are oceans more acidic, but also a very important molecule that marine life depends on.

So how bad is ocean acidification right now?

On average, surface layers of the ocean have become **26% more acidic** since pre-industrial times, and **acidity is expected to increase by 100% or more by 2100** if global carbon emissions continue unchanged.



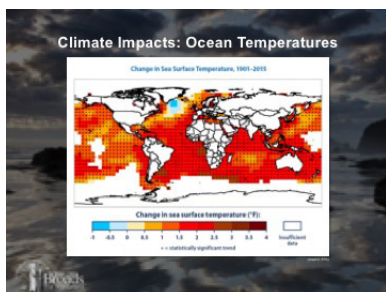
28. Climate Impacts of Ocean Acidification

This will have a major negative impact on aquatic species, to say nothing of the cost to economies and communities.

Many frontline and Indigenous groups rely on shellfish for both food and cultural reasons. The decline of shellfish species has a disproportionate impact on indigenous health in the region.

With rising acidity, shellfish farmers are finding it harder and harder to grow young shellfish and keep their businesses running.

It's not just humans that like to eat animals with calcium carbonate shells. Many ocean and coastal animals are at risk if this valuable food source decreases. Ocean acidification could have catastrophic impacts to entire food webs and Northwest regional economies if these trends are allowed to continue.



29. Climate Impacts: Ocean Temperatures

As anyone knows who's gone for a hike on a very hot day with a cool bottle of water in the side pocket of their backpack, liquids eventually reach temperature equilibrium with the surrounding environment. As much as we would like our water to stay icy cold all day, it eventually warms from the heat of the air and the sun's warming rays. This same process is taking place at a massive scale as our oceans equalize with the warming atmosphere.

When we look beneath the surface, warming waters cause a variety of harmful impacts that occur throughout ocean ecosystems.



30. Ocean Temperatures & Wildlife

Ocean temperatures influence everything from marine animals' metabolic rates, to plants' ability to perform photosynthesis, to shifting sensitive predator-prey interactions. Without the help of science, many of us couldn't imagine how sensitive the oceans are to temperature change.

Seasonal upwelling: Warmer waters can also cause a mismatch of seasonal events due to stagnant, stratified layers in the ocean.

In 2005, when the Northwest upwelling season occurred three months later than usual, it caused a lack of plankton production until August (rather than April-May). The delay worked its way up the food chain and harmed plankton-reliant rockfish species, caused low survival of Coho and Chinook salmon, complete nesting failure by Cassin's Auklet, and widespread deaths of other seabirds.

Source: <https://bit.ly/3mCSCtj>

Source: <https://bit.ly/2FMZeWa>



31. Natural Climate Defense

There is no doubt that coastal climate impacts will have dramatic, harmful impacts on coastal communities and ecosystems that could fundamentally alter Northwest coastal communities and landscapes. However, these ocean and coastal ecosystems have an important—and positive—role to play in a changing climate.



32. Coastal Ecosystems & “Blue” Carbon Sinks

Coastal ecosystems offer a variety of invaluable climate defense tools that may surprise you! Wetlands, seagrass beds, oyster reefs, and other coastal ecosystems can help mitigate climate impacts on coastal communities while capturing carbon.

A carbon sink is an ecosystem that captures carbon from the atmosphere via photosynthesis and holds it—first in living plants and, as those plants die and decay, carbon is stored in soils.

When we think of carbon sinks, we typically think of forests...but what about coastal ecosystems? Tidal marshes, seagrass beds, and tidal forests are exceptionally efficient at absorbing and storing carbon. We call the carbon stored by coastal ecosystems “blue carbon.”

Researchers found that the average carbon stored in a coastal ecosystem in the PNW is higher than in other ecosystems of the US and other parts of the world. Marsh carbon stocks are twice the global average compared to other ecosystems. These coastal soils store 10x the carbon compared to forests per acre.

This information is very new to the scientific community. Why didn’t we know this sooner? We overlooked soils. Because we didn’t see towers of carbon stored in living trees, we assumed carbon wasn’t being stored in the soil.

Coastal wetlands store organic carbon in deep layers of soil for millennia. They account for almost 50% of carbon storage in ocean sediments despite occupying only 0.2% of ocean area!

Blue carbon is threatened by changes brought on by climate change. Long-term sea-level rise will likely decrease ecosystem carbon stocks. This is a concern if wetlands can’t successfully migrate with rising sea levels due to being bound by terrain and human development.

This problem brings up the huge importance of ecosystem connectivity: these coastal ecosystems can only adapt to climate change and continue to sequester carbon if they have room to adapt.

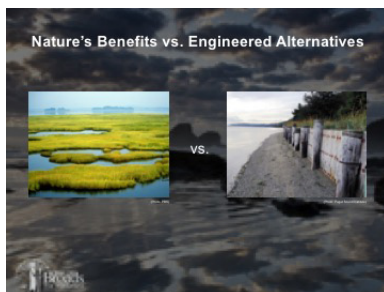


33. Coastal Ecosystems: Benefits Beyond Carbon

Coastal ecosystems provide a variety of other benefits beyond carbon storage that can help to lessen the impacts of climate change. They have been proven to protect coastal communities, homes and businesses, from storm surges and flooding.

For instance, a large wetland habitats with dense and productive vegetation significantly cut down wave energy. Healthy, connected ecosystems are stronger climate buffers than degraded or fragmented wetlands that protect coastal communities.

Presenter Note: Detailed description of benefits from different green infrastructure:
<https://bit.ly/3jdboVO>

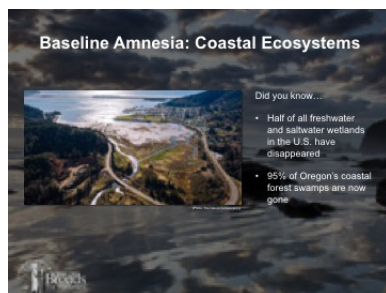


34. Nature's Benefits vs. Engineered Alternatives

If we compare hard structures like bulkheads and sea walls to living shorelines provide multiple, how do they stack up? They provide multiple benefits like improved water quality, aquatic habitat, and carbon sequestration.

They also do not require the expensive construction or maintenance costs of human-made infrastructure.

All the while, these ecosystems provide economic benefits such as habitat for commercially-valuable fish species, tourism value, and cultural value for coastal communities who recreate and cherish these natural landscapes. Not to mention, human health and well-being tends to be higher in proximity to healthy natural ecosystems like those found in fully and highly-protected Marine Protected Areas.

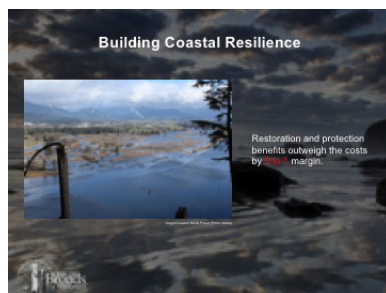


35. Baseline Amnesia: Coastal Ecosystems

Clearly, coastal ecosystems have a lot to offer. Unfortunately, we have lost a great deal. Half of all freshwater and saltwater wetlands in the contiguous 48 states have disappeared to development, including settlements, roads, agriculture, and draining and diking.

Did you know that we have lost 95% of coastal forest swamps in Oregon alone. On the west coast, about 85% of tidal wetlands have been lost. *Source:* <https://bit.ly/3m4qoap>

This is a major loss of all of the benefits that we just described—including carbon storage, climate change defense, and diverse wildlife habitats.



36. Building Coastal Resilience

So, despite these losses, what can we do to make our coastal lands and communities more resilient to climate change? There still remains a huge potential for restoration, including many new opportunities for efficient carbon sequestration.

Habitat restoration and enhanced protection of intact ecosystems are essential to current and future climate resilience of coastal landscapes.

The economic benefits of protected coastal ecosystems have been shown to outweigh the costs by at least five to one!

Presenter Note: Background info on living shorelines: <https://bit.ly/37raeDV>



37. Abundance of Coastal Restoration Projects

There are countless projects taking place across the west coast that are not only restoring the health of these shorelines, but also enhancing these landscapes' climate resilience:

- Forest marsh replanting projects.
- Eelgrass bed restoration.
- Oyster reef restoration.
- Dike removal and wetland connectivity enhancements.



38. Creating New Marine Protected Areas

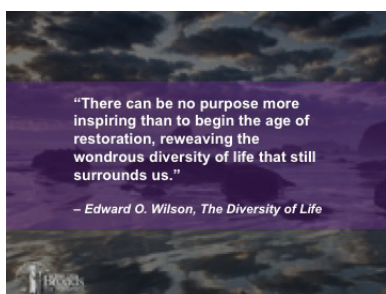
Creating new and enhanced Marine Protected Areas would go a long way towards the goals of carbon sequestration, coastline ecosystem protection, and increasing climate change resiliency.

Recent research suggests that the target established by the Convention on Biological Diversity and Sustainable Development should be raised from 10% ocean protection to at least 30% to

safeguard marine ecosystems in the long term.

Preserving a greater number of coastal ecosystems will play a vital role in climate change mitigation and adaptation.

Source: <https://www.pnas.org/content/114/24/6167>



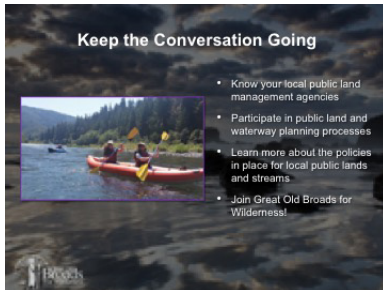
39. E.O. Wilson Quote

Extend an invitation to participate. Anyone can participate in public lands stewardship in ways big or small that benefit all of us. Ask your audience to consider the challenges facing the coastal ecosystems and communities near them. What challenges spark their curiosity? What opportunities might there be to strengthen these landscapes?



40. Public Lands Stewardship

There's no panacea—but all restoration projects, large and small, add up to significant changes and a more resilient coastal ecosystem. Join us!



41. Keep the Conversation Going

There are plenty of other valuable ways to get involved:

Become more educated about the public lands in your area and the forces that are impacting them. There are many ways to spread this knowledge with others. Stay informed, and keep the dialogue going.

Get to know the local, state, and federal agencies that manage the public lands in the area. Stay in contact with your elected officials at all levels of government and make sure they're aware of the issues facing your coastal areas. Getting involved in these conversations can help lead to the decisions that aid coastal ecosystem recovery.

Participate in the public lands planning process. Attend and take an active part in meetings, and volunteer to serve on advisory boards and committees. Be heard!

Get to know and understand the policies already in place for local public lands. Ask if these policies go far enough to protect coastal and ocean ecosystems.

Join your local Broadband!



42. Upcoming Broads Events

If you're interested and want to learn more, we have some great upcoming events in this area you might be interested in... (Discuss upcoming events)



43. Comprehensive Campaign

A grant helped us start this program and develop the curriculum to educate communities in the Pacific Northwest about public lands and climate change. While that grant got us started, for the program to continue and expand to other parts of the country, we need your help.

If you enjoyed, and learned from today's presentation, please consider making a tax-deductible donation to Great Old Broads for Wilderness, which is a 501(c)3 organization.

You can give us a check today (point out who in the room will take checks) or donate online at greatoldbroads.org.

Questions?