



**NATURAL
RESOURCES**

HILARY S. FRANZ
COMMISSIONER OF PUBLIC LANDS

THE WASHINGTON DEPARTMENT OF NATURAL RESOURCES' CARBON PLAYBOOK

Opportunities to mitigate
climate change and advance
climate resilience.



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GLOSSARY

Additionality: Emission reductions or removals that are demonstrably additive to the reductions that would have taken place in the absence of a carbon project

Afforestation: Establishment of a forest, especially on land not previously forested

Avoided conversion: Actions taken to prevent the permanent loss of forest to a non-forest use by dedicating land to continuous forest cover and maintaining or increasing stocking levels

Biochar: Black carbon produced from biomass sources (i.e., wood chips, plant residues, manure or other agricultural waste products) for the purpose of transforming the biomass carbon into a more stable form

Bioenergy: Renewable energy derived from biological sources, to be used for heat, electricity, or vehicle fuel

Biomass: Plant-based material used as fuel to produce heat or electricity

Blue carbon: Carbon which is part of marine or coastal ecosystems

Carbon flux: The movement of carbon between land, oceans, atmosphere, and living things

Carbon sequestration: The process of capturing, transporting, and securing atmospheric carbon dioxide for long-term storage

Carbon sink: A natural or artificial reservoir that absorbs and stores more of the atmosphere's carbon than it releases

Carbon storage: The retention of carbon dioxide in trees, underground reservoirs, and other carbon sinks in order to prevent it from escaping into the earth's atmosphere

Improved forest management: Forest management activities which result in increased carbon stocks within forests and/or reduce greenhouse gas emissions from forestry activities when compared to business-as-usual forestry practices

Reforestation: establishment of forest on land that had recent tree cover, but may have been lost to wildfire, timber harvest, drought, infestation etc.



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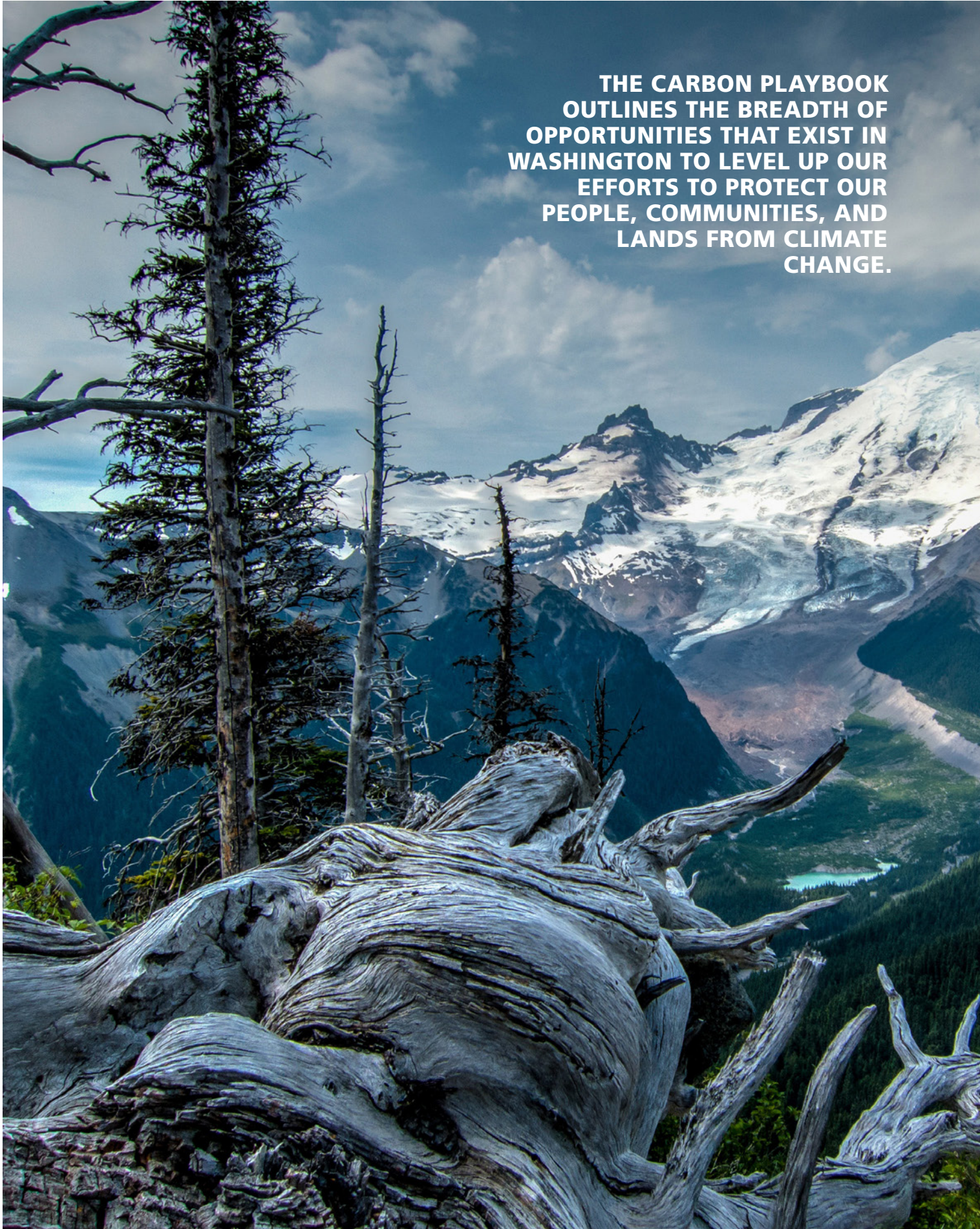
WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**

HILARY S. FRANZ
COMMISSIONER OF PUBLIC LANDS



**THE CARBON PLAYBOOK
OUTLINES THE BREADTH OF
OPPORTUNITIES THAT EXIST IN
WASHINGTON TO LEVEL UP OUR
EFFORTS TO PROTECT OUR
PEOPLE, COMMUNITIES, AND
LANDS FROM CLIMATE
CHANGE.**

CRAIG KERWIEN / UNSPLASH.COM



LETTER FROM THE COMMISSIONER OF PUBLIC LANDS



Hilary S. Franz, a statewide elected official, is Washington's fourteenth Commissioner of Public Lands since statehood in 1889.

Throughout our state, climate change is stressing landscapes, waterways, species, and communities. From our coasts to our inland shrub-steppe, we are seeing detrimental impacts such as ocean acidification, increasing wildland fires, drought, and rising temperatures. As your elected steward for public lands, I am committed to ensuring that the Department of Natural Resources (DNR) uses every tool at our disposal to avoid the worst impacts of climate change. And as a manager for almost 6 million acres of our state's precious lands and waters, DNR is uniquely positioned to be a leader in this burgeoning sector for natural climate solutions.

Carbon projects offer a path to be proactive in the face of a rapidly changing climate. The Washington Department of Natural Resources' Carbon Playbook lays out opportunities to implement or support carbon projects in our state that will provide real and verifiable climate benefits. These exciting opportunities hold the potential to provide environmental, economic, and social justice benefits for communities throughout our state. We understand that challenges and limitations exist for carbon projects and have listed them here. Our view is that these challenges represent opportunities to partner with our communities, the private sector, and others to create innovative solutions.

I encourage everyone to seize upon these opportunities and partner with the Department of Natural Resources to establish carbon projects that provide good stewardship, good governance, and good returns on investment. A partnership with us will not only reduce carbon in the atmosphere, but also at the same time stimulate new economic industries and fund critical social services. In working with DNR, together we can create a more sustainable environment, renewable economy and just society.

We also offer this playbook as a model for other state agencies, local governments, and non-profits to follow as they consider the types of carbon offset projects that might most benefit their work and communities.

Now is the time to take bold action on behalf of our climate and aggressively limit the amount of carbon pollution in the atmosphere through a diverse array of natural climate solutions and carbon capture technologies. To keep the Evergreen State truly evergreen, we must address the root cause of climate change: carbon emissions. And we must invest in natural climate solutions. Our Carbon Playbook outlines the breadth of opportunities that exist in Washington to level up our efforts to protect our people, communities, lands and waters from climate change.

Sincerely,



HILARY S. FRANZ
COMMISSIONER OF PUBLIC LANDS



JUSTIN HAUG / WDFW

Washington State has experienced increasingly severe wildfires due to the effects of climate change.





**EACH YEAR
AND EACH SEASON,
WASHINGTON STATE
EXPERIENCES CLIMATE
IMPACTS INCLUDING
INCREASINGLY
CATASTROPHIC
WILDFIRES, SEVERE
FLOODING AND
LANDSLIDES,
EXTREME HEAT,
DROUGHT, SEA
LEVEL RISE, OCEAN
ACIDIFICATION,
AND MORE.**

INTRODUCTION

Climate change is an existential threat that is already affecting the lives of Washingtonians and beyond. Each year and each season, Washington State experiences climate impacts including increasingly catastrophic wildfires, severe flooding and landslides, extreme heat, drought, sea level rise, ocean acidification, and more. In addition to the effects of extreme weather and natural disasters, the natural environment is adapting to the changing climate: seed zones are starting to move further north or into higher elevations; some forested areas affected by wildfire are not regenerating; animal species are adapting by changing their habitat range or diverting from their natural rhythms. These are only some of the impacts being seen and felt throughout Washington. As a manager of nearly 6 million acres of terrestrial and aquatic lands, the Washington State Department of Natural Resources (DNR) sees these changes firsthand and has a unique ability to respond with actions to mitigate and adapt to climate change.

Natural climate solutions for carbon sequestration and storage have been identified as some of the most powerful tools to mitigate the worst impacts of climate change. Done well, efforts to increase carbon sequestration and storage in the natural environment can also help plant, animal, and human communities alike to become more resilient to the impacts of new climate patterns. Given the nearly 6 million acres of lands DNR manages, it is well positioned to use these lands to help sequester and store carbon to reduce the impacts of climate change. Additionally, DNR is focused on increasing climate resilience (the ability to prepare for, recover from, and adapt to the hazardous impacts of climate change) within all of DNR's work. Therefore, it is with these dual goals in mind—mitigating climate change and advancing climate resilience—that DNR seeks opportunities to conduct carbon projects on our managed lands and to support the implementation of projects on Tribal, private, or other lands across the state.

DNR recognizes that a full and diverse portfolio of climate action is necessary to achieve these goals, and carbon projects are only one path to do so. Beyond our work with carbon projects, the agency is advancing climate mitigation and resilience in a number of ways. DNR is actively expanding clean energy production by leasing lands for solar and wind energy, as well as pursuing other clean energy solutions like biomass and biofuel. DNR has also been focused on reducing the agency's own greenhouse gas emissions through advances in our fleet and facilities. Furthermore, the agency is seeking solutions at scale for some of the most challenging issues facing our natural resources, species, and communities. DNR has set, and is working towards, significant goals to restore over 1.2 million acres of forests, reduce catastrophic wildfires, slow and reverse the trend of permanent loss of forests, promote watershed resilience in support of salmon recovery, and enhance kelp and eelgrass health and conservation.

¹ <https://www.science.org/doi/full/10.1126/sciadv.aat1869>



On top of these actions, carbon projects offer a unique opportunity to help the agency and the state with its statutory carbon emissions reduction and removal goals and create new revenue streams for trust beneficiaries, including schools, local governments, and critical community services, as well as funding for aquatic ecosystem restoration and conservation.

By sharing the opportunities and challenges we have already identified, we hope to accelerate the pace and scale of this work through the development of collaborative partnerships and viable project opportunities. To date, DNR has focused mostly on opportunities on our forested state lands; however, there is a broad space in which DNR could play a part in greater carbon sequestration and storage. DNR looks forward to pursuing any relevant leads with curious and collaborative partners that will enable us to achieve our goals of climate mitigation and resilience.

BY SHARING THE OPPORTUNITIES AND CHALLENGES WE HAVE ALREADY IDENTIFIED, WE HOPE TO ACCELERATE THE PACE AND SCALE OF THIS WORK THROUGH THE DEVELOPMENT OF COLLABORATIVE PARTNERSHIPS AND VIABLE PROJECT OPPORTUNITIES.



WHAT IS A CARBON PROJECT?

Carbon projects prevent or remove carbon emissions that are verifiably additional to the emissions reductions that would have occurred under an established baseline. In other words, they are an action or a change in practices that prevents emissions or increases removals compared to what might have happened in a business-as-usual scenario. Forest carbon projects, for example, can involve preventing the permanent loss of forest areas with a demonstrable deforestation risk, or reforesting an area post-wildfire that would not have been planted or naturally regenerated without direct intervention and the revenue from a carbon project to offset planting costs.

Through carbon projects, verified third parties calculate the amount of carbon emissions reductions or removals achieved through the action or change of practice; that amount is then translated into a carbon credit. One carbon credit represents one ton of carbon emissions reduced or removed. These carbon credits are then sold to companies or other entities looking to offset, or make up for, carbon emissions resulting from their operations.



**DNR IS
COMMITTED TO
EVIDENCE-BASED
CARBON PROJECTS
THAT GENERATE
HIGH QUALITY
CREDITS THROUGH
THE ROBUST
CALCULATIONS OF
BASELINES AND
CONSERVATIVE
ESTIMATES OF
CARBON EMISSIONS
REDUCTIONS OR
REMOVALS.**

DNR'S CARBON PROJECT PRINCIPLES

As a state agency entrusted with the management of critical natural resource lands and natural areas for present and future generations, DNR takes its stewardship responsibilities seriously. In the context of carbon projects, that stewardship extends to ensuring that the actions we take result in long-term carbon storage, climate resilience, and greater environmental and social benefit. DNR is committed to evidence-based carbon projects that generate high quality credits through the robust calculations of baselines and conservative estimates of carbon emissions reductions or removals.

DNR commits to implementing or supporting the development of carbon projects in which the greenhouse gas reductions or removals are:

Additional: Emission reductions or removals are demonstrably additional to the reductions that would have taken place in the absence of the carbon project.

Durable: Emissions reductions or removals should reduce the risk of reversal, and/or be backed by robust replacement mechanisms if they are re-emitted to the atmosphere.

Enforceable: Emissions reductions or removals should be supported by legal instruments that define their creation, provide for transparency, and ensure exclusive ownership.

Quantifiable: Emissions reductions should be measurable and trackable units calculated by accepted methodologies.

Real: Actual emissions reductions must have occurred, are not based on inaccurate or incomplete accounting, and include accounting for unintended consequences.

Verifiable: Emissions reductions or removals should result from projects that can be accurately monitored and verified.

Furthermore, in recognition of and respect for Tribal sovereignty, DNR will engage in government-to-government consultation with impacted or interested Tribes in the state on the development and implementation of carbon projects.

DNR also recognizes that the impacts of carbon projects can go beyond emissions reductions or removals. Projects may have important co-benefits on the one hand, such as protection of wildlife habitat or increased watershed resilience, as well as indirect consequences on the other. Indirect consequences can include on-going localized pollution by entities purchasing offset credits in lieu of directly reducing emissions or impacts to jobs and community livelihoods due to changes in natural resource management. DNR will prioritize projects that prevent or reduce environmental harms to overburdened and highly impacted communities, and will work to ensure that key environmental justice criteria are being considered and met in project development, including:



Co-benefits and ecosystem integrity: Projects should maximize environmental and community co-benefits, and preserve or enhance ecosystem integrity in their implementation through science- and evidence-based procedures to determine the compatibility of proposed actions with key ecosystem features and functions.

Minimization of unintended consequences: Projects should consider the full range of potential unintended consequences, including point source emissions from purchasers of credits, and take steps to minimize their likelihood or otherwise mitigate the impacts.

Transparency and engagement: Projects should be announced in the planning stages, to allow time for consultation with impacted communities with rights, title, or treaties and engage interested parties. This engagement will help to ensure that the projects meet a broad range of criteria for success, while minimizing potential detrimental impacts to local communities or ecosystems.

Additionally, DNR's activities on state trust lands are guided by the agency's responsibility to trust beneficiaries, which include schools, counties, and junior taxing districts. In addition to complying with general laws throughout the development of carbon projects, DNR, as a trust land manager will follow the common law duties of a trustee. DNR's trust lands generate revenue for K-12 school construction and critical community services; therefore, it is of utmost importance to ensure that the agency's carbon projects are of high quality and are highly valued to continue to fund these services. In turn, purchasers of these carbon credits will receive an additional return on investment knowing that the projects not only support emissions reductions goals, but also community well-being.

Finally, project opportunities that fit into existing agency priorities, plans, or goals have a higher chance of success. Examples of these priorities, plans, and goals include:

The 20-Year Forest Health Strategic Plan: set a goal to restore 1.25 million acres of forest to a wildfire resilient state;

The Evergreen Communities Act: helps communities develop urban forestry plans aligning with other high-priority goals, such as salmon and orca recovery, environmental health disparities, human health, and local air and water quality improvements, and includes a focus on environmental justice, ensuring that at least 50 percent of all program activities benefit highly impacted communities;

The Forest Action Plan: a comprehensive review of forests across all lands — public, private, rural, and urban — that offers proactive solutions to conserve, protect, and enhance the trees and forests that people and wildlife depend on;

Keep Washington Evergreen: set three complementary goals to protect Washington's forests; restore one million acres of forests to resilient conditions, conserve one million acres of forest, and reforest one million acres by 2040 (see sidebar on page 12);

The Kelp Forest and Eelgrass Meadows Health and Conservation Act: sets the goal to restore and conserve at least 10,000 acres of kelp forest and eelgrass meadow habitats by 2040;

The Plan for Climate Resilience: an agency-wide plan that highlights actions the agency can take to ensure it is prepared for, and adapting to, climate-related changes;

The Watershed Resilience Action Plan: a trees to seas plan for landscape scale restoration and salmon recovery in the Snohomish Watershed.

DNR is confident that by following these principles and working collaboratively with partners, we will be able to take significant action to reduce carbon emissions and increase carbon sequestration, while creating supporting our environment, our economy and our communities.



WASHINGTON'S GREENHOUSE GAS LIMITS

In 2020, the Washington Legislature set greenhouse gas emission limits in order to combat climate change. Under the law, the state is required to reduce emissions levels:

2020 – reduce to 1990 levels.

2030 – 45% below 1990 levels.

2040 – 70% below 1990 levels.

2050 – 95% below 1990 levels and achieve net zero emissions.

RCW 70A.45 highlights the opportunities in Washington state to reach these goals, and specifically promotes the removal of excess carbon from the atmosphere through natural and working lands, among other pathways. DNR is one of many state agencies directed to seek all practical opportunities to maximize carbon sequestration in our agency operations. This playbook sets us on a path to do just that.



DNR PLAYS A BROAD RANGE OF IMPORTANT ROLES, FROM PROTECTING FORESTS, TO MANAGING AQUATIC LANDS, TO MAPPING AND MONITORING GEOLOGIC RESOURCES AND HAZARDS.

DNR'S ROLES AND RESPONSIBILITIES

As the Washington State Department of Natural Resources (DNR) manages 5.6 million acres of forest, range, agricultural, aquatic, and commercial lands.

The majority of DNR forested trust lands are managed for long-term timber production, while roughly 840,000 acres are managed for conservation. These forests also provide specific fish and wildlife habitat objectives, protection of clean, abundant water, and public outdoor access and recreation opportunities. Through our Natural Areas and Natural Heritage Programs, we restore and conserve special areas and ecosystems that represent excellent, and often threatened, examples of native ecosystems, as well as habitat for endangered, threatened and sensitive plants and animals, and scenic landscapes.

CATEGORY OF STATE LAND	LAND TYPE	ACRES
State Trust Lands	Forest	2 million
	Agriculture and Grazing	1.1 million
	Commercial Real Estate, Renewable Energies, Mining, and Other	530,000
	Natural Areas	164,000
	Community Forests	52,000
State-Owned Aquatic Lands		2.6 million

* Some of the listed acres are counted more than once due to overlapping uses between asset classes. Numbers are rounded.

The agency also protects about 13 million private and non-federal public forested acres from wildland fires, and administers the state Forest Practices Rules, providing forest protection and regulation on more than 12 million acres of non-federal, public, and private lands. DNR offers various types of support to small forestland owners in the state, including technical assistance and cost-share programs. Additionally, through the Good Neighbor Authority and Shared Stewardship Agreements we have with the United States Forest Service, we are having significant impact on federal forest lands, from forest restoration and prescribed burns, to culvert replacement and restoring fish and wildlife habitat.

The DNR also leases various types of land for activities such as agricultural production, renewable energies, or commercial and residential properties. Our trust lands offer the largest wheat production in the state, as well as other high value crops like orchards and viticulture. The agency has a goal to lease DNR-managed land for 500 megawatts of solar energy development by 2025, which translates to roughly 5,000 acres of development. Our commercial leases are comprised of a variety of properties, including Costco, Bartells, Safeway, Business Parks, and the Edgewater Hotel in downtown Seattle.



DNR is responsible for managing and stewarding the state's navigable lakes, rivers, streams, and marine waters, such as Puget Sound. For these aquatic lands, DNR plays a role in encouraging responsible public access and use, ensuring environmental protection, and promoting water-dependent commercial uses, when consistent with the previous goals. DNR has aquatic leases throughout the state with ports, marinas, shellfish growers, and others. Revenue from these leases goes directly to funding aquatic habitat restoration and clean up and providing public access to our waterways. DNR manages aquatic reserves, including the state's first Kelp and Eelgrass Protection Zone, which conserves 2,300 acres of valuable habitat near the mouth of the Snohomish River. The agency's research and monitoring of ocean acidification and nearshore habitat also provides critical insight into the effects of climate change on aquatic species and ecosystems.

The agency supports tree canopy in urban areas through our Urban and Community Forestry Program. For most of its history, this program has operated solely with federal funding, providing grants and technical assistance to Washington cities and towns seeking to increase or retain their tree canopy cover. In 2021, the legislature passed a bill updating the Evergreen Communities Act, which for the first time provided state funding to expand the program's capacity. Furthermore, the act added environmental justice principles to DNR's work to support to municipalities seeking to increase or protect their urban forests and tree canopy cover.

DNR additionally houses the Washington Geological Survey (WGS), whose mission is to collect, develop, use, distribute, and preserve geologic information to promote the safety, health, and welfare of Washingtonians, protect the environment, and support its economy. The WGS work ranges from comprehensive mapping of geologic, industrial, and critical resources; monitoring and planning for geologic hazards such as earthquakes, tsunamis, volcanic events, and landslides; to administering regulations around surface mining and reclamation, and geothermal resources.



KEEP WASHINGTON EVERGREEN

In 2021, Commissioner Franz launched an initiative to "Keep Washington Evergreen," which set the goals to restore one million acres of forest, conserve one million acres of forest, and reforest one million acres by 2040. This triad of goals directly address the major threats to our forests. Washington State is increasingly experiencing severe wildfires that impact hundreds of thousands of acres a forest a year. Additionally, the state's population is growing, which leads to housing and other development in previously forested areas. As a result, for the first time in history, Washington is no longer 50% forested.

Achieving these goals to restore, conserve, and reforest the state's forests, will not only prevent significant carbon emissions, but can also actually increase Washington's overall forest cover, and therefore remove additional carbon from the atmosphere. DNR is eager to explore opportunities with innovative partners willing to take a jurisdictional approach to carbon credits, by tracking regional or statewide progress against these goals, and calculating and purchasing credits for the overall carbon benefit.

This groundbreaking approach could address concerns related to leakage, because rather than focusing on individual forest carbon projects that may trigger changes in harvesting or supply elsewhere, a statewide increase of forested acres could ensure that reductions in harvest in one area, would be offset by new, additional working forests in another area.



DNR RECOGNIZES THAT TRIBES BRING INVALUABLE LEADERSHIP, EXPERTISE, SCIENCE, AND LOCAL AND INDIGENOUS KNOWLEDGE THAT CAN BETTER INFORM DNR'S EFFORTS TO MITIGATE CLIMATE CHANGE AND ADVANCE CLIMATE RESILIENCE.

DNR'S RELATIONSHIP WITH TRIBAL NATIONS

Tribal Nations have been stewards of this land since time immemorial. There are 31 federally recognized Tribes with usual and accustomed territory in Washington State, and each one has a unique history and connection to the natural landscape that surrounds all of us. Tribal Nations are critical to the on-going stewardship and management of our shared public lands, waters, and resources.

DNR programs such as forest practices regulation, state lands leasing and forest management, and state aquatic land leasing and management provide a platform for partnership and collaboration with Tribes as we all steward interconnected lands and waters. DNR recognizes that Tribes bring invaluable leadership, expertise, science, and local and Indigenous knowledge that can better inform DNR's efforts to mitigate climate change and advance climate resilience.

DNR recognizes the sovereignty of Tribal Nations, and in respect of their rights, titles, and treaties, consistently engages in government-to-government relationships to ensure access, protection of cultural resources, and sustainable use of our shared natural resources. The Commissioner of Public Lands recognizes the department's relationship with Washington's sovereign Tribes with an official Commissioner's Order on Tribal Relations, and the agency's Tribal Consultation Policy. The agency actively seeks partnerships with Tribes to conserve, restore, and protect the health and integrity of Washington's lands, waters, and species.

DNR looks forward to identifying opportunities to partner with Tribal Nations in support of carbon projects that accomplish these goals and in ways that further Tribal objectives for their lands and waters.



Opportunities for Carbon Projects

**POTENTIAL
LIMITATIONS
SHOULD BE SEEN AS
OPPORTUNITIES TO
FURTHER SCIENTIFIC
UNDERSTANDING,
STRENGTHEN
THE CREDIBILITY
OF POTENTIAL
PROJECTS, AND
INCREASE
COLLABORATION
WITH PARTNERS.**

Within the agency's varied roles, DNR's influence ranges from direct management, to providing support or technical assistance to landowners or local governments, to consultation with Tribal Nations on their reserved rights and usual and accustomed territory, and beyond. This section captures the various roles DNR plays in land management and the relevant carbon project opportunities that align with each.

DNR also has certain constraints due to constitutional mandate, statutory authority and legislative direction, established agency priorities, and duty to represent and respond to varied stakeholder concerns related to natural resource management. These and other potential limitations are described below as relevant to each opportunity, and will need to be taken into consideration as the agency explores this work with partners. None of them should be interpreted as outright barriers to implementation, but rather as opportunities to further scientific understanding, strengthen the credibility of potential projects, and increase collaboration with partners.



DEREK CHURCHILL

1. STATE FORESTED LANDS

- Acquisition for avoided conversion
- Improved forest management on State Uplands
- Reforestation
- Biochar

2. STATE AQUATIC LANDS

- Conservation and restoration of submerged vegetation
- Conservation and restoration of wetlands

3. LEASED AGRICULTURE LANDS

- Improved soil management with lessees
- Reforestation (riparian restoration)
- Biochar

4. PARTNERSHIPS WITH TRIBAL NATIONS

- Forest carbon projects with Tribal Nations
- Blue carbon projects with Tribal Nations

5. PRIVATE FORESTED LANDS

- Improved forest management for Small Forest Landowners
- Avoided Conversion
- Reforestation

6. URBAN AREAS

- Tree planting
- Tree preservation/ Urban forest management
- Stored carbon in built environment

7. GEOLOGIC CARBON STORAGE

- Geologic carbon sequestration in basalt
- Geologic carbon sequestration in sandstone
- Bioenergy with Carbon Capture and Sequestration (BECCS)
- Direct Air Capture (DAC) of carbon and sequestration



1 STATE FORESTED LANDS

There are three broad categories of DNR managed (terrestrial) state lands: Natural Areas, Community Forest Trust lands, and State Trust Lands.

Natural Areas: There are two types of natural areas that DNR manages to conserve and restore special ecological communities and ecosystems. Natural Area Preserves (NAPs) protect the best remaining examples of many ecological communities, including rare plant and animal habitat. The NAP system includes more than 40,816 acres in 57 sites throughout the state. Meanwhile, Natural Resources Conservation Areas (NRCAs) protect outstanding examples of native ecosystems, habitat for endangered, threatened and sensitive plants and animals, and scenic landscapes or geologic, cultural, historical, and archeological sites. Environmental education and low-impact public use are appropriate on conservation areas where they do not impair the protected features. More than 125,577 acres are conserved in 39 Washington State NRCAs.

Community Forest Trust lands: Community Forest Trust lands are working forests that have significant environmental, economic and social value to local communities but are at high-risk of being converted to other, non-forest uses. These lands are selected based on nominations by communities and purchased from willing sellers of private forestland or from other state land trusts. The goals of the Community Forest Trust program include protecting working forest lands and maintaining them in working forest status, providing for ongoing and sustainable recreational access, local timber jobs, clean air and water, carbon storage, fish and wildlife habitat, as well as providing open space and education opportunities for local communities. DNR currently manages 52,000 acres in two Community Forest Trusts: the Teanaway Community Forest in Kittitas County and the Klickitat Canyon Community Forest in Klickitat County.

State Trust Lands: As part of the creation of Washington State, the US Congress passed the Enabling Act of 1889 and granted Washington over 3 million acres of land to generate revenue for public institutions. These lands are called federally granted lands. Additional lands were acquired by the state from the counties in the 1920s and 1930s, with others purchased or acquired as a gift. These lands are called State Forest Lands. The federally granted lands and State Forest Lands are collectively referred to as state trust lands, which are held in trust and managed by DNR to generate revenue for trust beneficiaries (this requirement is known as the "trust mandate"). The Washington State Supreme Court affirmed in 2022 that these lands are held in trust, while also acknowledging DNR's discretion to manage state trust lands to provide broad environmental, social, and economic good for Washington's communities. In total, DNR manages over 3.1 million acres of trust lands to provide revenue through activities such as harvesting timber, biomass byproducts, and other forest products (2.4 million acres); leasing lands for agricultural purposes, such as orchards and vineyards, irrigated agriculture, dryland crops, and grazing (590,000 acres); and leasing communications sites, mining and mineral leases, wind farms and energy production, commercial properties, and rights of way (110,000 acres). These lands are also managed to protect habitat for native plant and animal species, sequester carbon, and offer diverse public recreation opportunities, and provide clean and abundant water, among other ecosystem services.



Morning Star Natural Resources Conservation Area (NRCA).

DNR'S CARBON PROJECT

In April 2022, DNR announced that it was launching an innovative carbon project to protect some of our most ecologically and culturally valuable forests, while generating millions of dollars in revenue for the schools, colleges, and critical local services that state trust lands support.

DNR is launching a carbon project on 10,000 acres of Western Washington's most ecologically and culturally valuable forests to store carbon and generate revenue for state trust land beneficiaries through the sale of carbon credits. The carbon project will help to diversify revenue streams, providing annual payments to beneficiaries, while allowing the trees to continue to grow on the landscape. DNR is working to ensure that the carbon project meets the highest standards of additionality and durability.

This initiative represents the first-in-the-nation use of carbon markets by a state agency to protect critical forest areas by immediately removing stands from the planned harvest schedule, many of which were slated for imminent harvest.

More than an estimated 900,000 carbon offsets credits will be generated from the project in just the first 10 years, which is equivalent to preventing more than 2 billion miles driven by gas-powered cars, according to the EPA's Greenhouse Gas Equivalencies.

For more information go to our website at: <https://www.dnr.wa.gov/CarbonProject>.



Opportunities

Within these different state lands designations, DNR has identified potential opportunities for carbon projects.

Post-fire replanting: Millions of acres across Washington State have been devastated by wildfires in the last several years. It is the agency's preference to replant trees following stand-replacing fires, but this is not always possible. The silviculture program can only afford to provide seedlings and contract workers when there is revenue from a salvage timber harvest to pay for them. Under some circumstances, a salvage harvest may be ecologically appropriate, viable at the location, and profitable enough to cover these costs. More commonly, the low commercial value of the burned timber, or barriers to accessing the burned area, results in thousands of acres across the state not being replanted. Carbon projects could help to finance these reforestation efforts across the state. **Potential project type: Reforestation.**

Lengthening rotations: Many factors contribute to determining the age at which a stand of trees will be harvested. Typically, a stand reaches its commercial potential before it reaches its carbon sequestration potential. Based on data from previous years of harvests (2016-2021) about 16% or roughly 17,000 acres out of approximately 106,000 were harvested between 40 and 49 years, and 23% or about 24,000 acres were harvested between 50 and 59 years. Harvest on stands of these ages could be deferred to allow them to sequester additional carbon. Revenue from the sale of carbon credits could help to mitigate short-term revenue loss, while still allowing for future harvests and maintaining or potentially increasing timber volume over the medium and long term. **Potential project type: Improved forest management.**

Working forestland acquisition: DNR could acquire tracts that are in danger of future conversion to non-forest land-use (i.e., forestlands adjacent to or near growing urban areas). DNR could manage the newly acquired landscape according to the laws, strategic plans, and policies that guide the rest of its timber business such as the Policy for Sustainable Forests, the Habitat Conservation Plan, and the relevant sustainable harvest calculation. They could also become Community Forests or a new land designation, that would ensure the long-term protection of these lands as forests. **Potential project types: Avoided conversion, improved forest management.**

Natural Area expansion and restoration:

DNR could acquire and protect areas adjacent to existing forestland natural area boundaries. This could incorporate reforestation or afforestation and restoration work, including in riparian areas, if the areas had previously been deforested, degraded, or converted out of their natural state. **Potential project types: Avoided conversion, reforestation.**

Biochar: Biochar is a stable form of carbon made by pyrolysis² of biomass, including forest residuals. When timber is harvested, there can be significant woody debris that remains, and is often accumulated into slash piles that are burned at the harvest site. These residuals can instead be used as a feedstock for the creation of biochar, which can then be used as a soil amendment which then increases soil carbon and contributes to other positive outcomes such as increased soil retention of nutrients and reductions of runoff. DNR could partner with biochar production facilities to provide forest residuals from harvest as supply for the facilities, thus avoiding emissions caused by burning slash piles, and increasing carbon capture in agricultural soils in which the biochar is used.

CASE STUDY

COLLINS-MODOC REFORESTATION PROJECT IN CALIFORNIA

Over two million trees planted on roughly 10,000 acres of the Modoc Plateau in northern California, which was damaged by the 2012 Barry Point Fire.

- **Reforests an area that failed to recover, and the company did not have the capital to reforest**
- **Incorporates consideration of future timber harvests**
- **Project protects watersheds for state water supply and reduces erosion**

² Pyrolysis is heating in the absence of oxygen to drive off volatiles and break down materials without releasing carbon.



Limitations

Although there are opportunities for carbon projects on state lands, there are also several constraints that pose challenges to taking full advantage of each of them.

Potential leakage: DNR is committed to establishing carbon projects that result in real and additional carbon capture and storage. Some stakeholders have raised questions about the impacts of potential management decisions on atmospheric carbon and carbon fluxes, particularly if practices are changed at relatively large scales. Further information may be helpful to better understand the potential for decreased timber harvest volume in Washington to lead to increased harvesting in other states or regions with fewer environmental protections. Carbon protocols have methods to mitigate this risk, but some stakeholders question their effectiveness. Additional research or staff capacity may be necessary to address these questions and build confidence in a potential projects' additionality.

Dollar value per credit: The majority of DNR's managed lands come with a responsibility to generate revenue for their designated beneficiaries and to act in the best interests of the trusts, while considering the benefits and impacts for all the people of Washington. DNR is hoping to set a new standard for the per-ton price of carbon in which credits are valued more closely to timber prices, and will need to work with carbon project developers, potential credit purchasers, agency stakeholders, and beneficiaries, to help ensure that high quality carbon projects are developed and executed in the best interests of the trusts and Washington's communities.

Supply constraints: State lands provide a steady source of timber to local mills, which contributes to the vitality of rural economies. Reduction of volume from timber harvests, even if temporary, due to the establishment of carbon projects could create uncertainty around the supply to local mills and impact communities where the mills operate. Engagement with mills and industry associations will be key to mitigate impact and prepare contingencies, as necessary.

Mill infrastructure: Many mills throughout Washington have infrastructure to process logs that are 23 inches in diameter or less; some mills are able to process logs up to 36 inches in diameter. Extending rotations would increase the size of logs that are harvested, potentially to the extent that in some cases local mills may no longer be able to process them. Specialty mills that can accommodate larger logs are geographically dispersed, and therefore may lead to additional challenges with transportation of logs, increased emissions from transportation, and associated costs.

Seedling supply and workforce constraints: The Webster Nursery, the state's sole public nursery, run by DNR, has been at or beyond capacity for several years. Demand for seedlings is only increasing, with wildlands fires growing in size and severity, and other nurseries in the state and region shutting down. Increased capacity to collect seeds and produce seedlings at Webster Nursery—through an upgraded seed plant, and additional greenhouses and growpads—will be necessary to meet reforestation goals. Workforce constraints, including recruiting, training, and retaining qualified staff for the nursery, will also have to be addressed concurrently with expansion of the nursery.

Cost/benefit ratio of collecting and transporting biomass for biochar production: It can be costly to transport biomass to production facilities for biochar or other uses, and without a high price for the ultimate product, it may not be economically viable. Financial returns from biochar may not be sufficient to effectively incentivize collection of biomass from forest areas.

Use and acceptance of biochar: Many farmers do not understand the benefits of biochar. More work needs to be done in the research and promotion of biochar so that an offtake market can develop for this product.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.



2

STATE AQUATIC LANDS

DNR is a steward of more than 2.6 million acres of state-owned aquatic lands, with responsibility to protect habitat and foster public access and water-dependent activities for future generations. Aquatic lands include navigable lakes, rivers, and streams, and the beds of marine bodies of water, such as Puget Sound. DNR is directed by statute to manage state-owned aquatic lands through the following goals:

- Encourage direct public use and access;
- Foster water-dependent uses;
- Ensure environmental protection;
- Create opportunities for utilization of renewable resources; and,
- Generate income from use of aquatic lands, when consistent with the previous goals.

DNR generates revenue by selling the rights to harvest renewable resources like wild geoducks and other shellfish and from leasing and licensing state-owned aquatic lands. That revenue is reinvested to manage and restore Washington's aquatic ecosystems, remove derelict maritime equipment, protect their health and productivity, and fund local projects that ensure the public can enjoy the state's aquatic lands. Notably, DNR is not held by a fiduciary responsibility to generate revenue on aquatic lands, and therefore has flexibility in decision-making regarding management of these 2.6 million acres.

The Aquatic Assessment and Monitoring Team (AAMT) also conducts research and monitoring around the effects of climate change, such as ocean acidification. AAMT has developed an Acidification Nearshore Monitoring Network (ANeMoNe) to investigate ocean acidification issues in the shallow marine areas where most human activity occurs. Some of this research and data may contribute to prioritization of areas or restoration activities that could be accelerated through carbon projects.

**ON OUR AQUATIC
LANDS, DNR PROTECTS
HABITAT AND FOSTERS
PUBLIC ACCESS AND
WATER-DEPENDENT
ACTIVITIES FOR FUTURE
GENERATIONS.**





Opportunities

Conservation and/or restoration of submerged vegetation: Submerged aquatic forests can capture up to 20 times more carbon than terrestrial forests, and represent significant opportunities for carbon sequestration projects. As with terrestrial forests, conservation areas that protect habitat from anthropogenic disturbance can promote natural carbon sequestration through submerged vegetation growth and sediment storage. Commissioner Franz set a goal for DNR to restore and conserve at least 10,000 acres of kelp forest and eelgrass meadow habitat by 2040. DNR's scientific research and monitoring of kelp forests, eelgrass beds, and other marine habitats which has helped establish where such conservation could contribute the most to habitat protection and carbon sequestration. In March of 2022, DNR established its first Kelp and Eelgrass Protection Zone near Everett, Washington, which has laid the foundation for kelp and eelgrass conservation and recovery strategies and contributed to 2,300 acres towards meeting the goal. Thus far, the agency has not committed to any blue carbon projects, however, DNR hopes to develop a blue carbon offset project in the coming years. DNR's monitoring work and research is contributing to the scientific body of knowledge about their potential to sequester and store carbon, as well as stressors that impact their survival, and chances for restoration. There is an opportunity to establish carbon projects that may generate revenue while working to conserve these important ecosystems. **Potential project types: Conservation and restoration of submerged aquatic vegetation like kelp and eelgrass.**

Conservation and/or restoration of wetlands: Wetlands and estuaries, including tidal forests, play an important role in the global carbon cycle as a blue carbon sink. Storing as much of 30% of global carbon, these environments represent an opportunity for significant carbon sequestration. Within Washington State, restoration and conservation of wetlands, tidal forests, and estuarine habitats provides secondary benefits of promoting climate resilience by mitigating effects of floods and sea level rise, improving habitat for salmon and other species of concern, and cleaning waters through natural filtration. DNR has an opportunity to support ongoing conservation and restoration of wetlands and estuarine habitats and scope potential conservation and restoration projects for the future. Innovative solutions for reducing wetland loss, such as floating wetlands, as well as projects to anticipate future change due to sea level rise could couple carbon sequestration with broader climate resilience and habitat restoration. **Potential project types: Conservation and restoration of wetlands.**

Limitations

Proof of concept: To date, there are fewer examples of blue carbon projects compared to terrestrial carbon projects, and research into the sequestration, storage, and loss of carbon from blue carbon systems is ongoing. Accordingly, there are significant unknowns in terms of what it might take to successfully implement a blue carbon project in Washington. Additional staff capacity and expertise may be required to apply this knowledge to explore and develop blue carbon opportunities.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.



Wetlands and estuaries, including tidal forests, play an important role in the global carbon cycle as a blue carbon sink.

3

LEASED AGRICULTURAL LANDS

**AGRICULTURAL
LANDS REPRESENT
SIGNIFICANT
OPPORTUNITIES FOR
INCREASED CARBON
STORAGE**

DNR leases 1 million acres of state trust lands for agriculture and grazing. The agency works with lessees to assure that the lands are productive and sustainably managed while public resources such as water, fish, and wildlife are protected.

Agricultural lands represent significant opportunities for increased carbon storage through the adoption of best management practices such as decreased soil disturbance, crop rotation or cover cropping, or applying compost, biochar or crop residues to fields. Managed livestock grazing can also improve soil carbon retention. These practices often come with co-benefits, including increased water storage and recharge of run-off, improved soil health and crop productivity, increased climate resilience, and reduction of fertilizer and water use. DNR is interested in exploring these opportunities with our lessees and supporting their adoption where feasible.

DNR works with lessees to assure that the lands are productive and sustainably managed while public resources such as water, fish, and wildlife are protected.



OPPORTUNITIES FOR CARBON PROJECTS
LEASED AGRICULTURAL LANDS



Opportunities

Improved agricultural practices with lessees:

DNR can work with lessees of agricultural lands to improve practices for positive outcomes for the lessees, public and public resources. There is an opportunity for DNR to partner or develop more specific contracts with lessees to apply biochar or otherwise improve agricultural practices such that there is increased soil carbon sequestration as a result. **Potential project types: Soil enrichment, nitrogen management.**

Incentives for riparian buffer zones: Extending riparian buffer zones on agricultural lands can provide important benefits for watershed health and species' habitats, but can also constrain the available space for cropland. Carbon projects may offer an opportunity to incentivize planting extended riparian buffer areas because the revenue from the sale of carbon credits could help to mitigate potential financial losses of reducing the crop area. **Potential project types: Afforestation.**

Limitations

Dollar value per credit: As with the forested trust lands described above, DNR's leased agricultural lands come with a responsibility to generate revenue for their designated beneficiaries and act in the best interest of the trusts, while considering the benefits and impacts for all the people of Washington. Activities that improve carbon sequestration or storage may in the short term come at the expense of revenue generated for the beneficiaries if the value of carbon is not sufficient to offset the costs associated with changing practices. Conversely, these practices may also result in increases in yield over the longer-term. DNR will seek to develop high quality projects that are valued highly on the market in order to mitigate potential risks while increasing potential benefits.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.

ETHANSTUCKEY

DNR HAS THE ABILITY TO WORK WITH LESSEES OF AGRICULTURAL LANDS TO IMPROVE PRACTICES FOR POSITIVE OUTCOMES FOR THE PUBLIC AND PUBLIC RESOURCES.



4

PARTNERSHIPS WITH TRIBAL NATIONS

THERE ARE 31 FEDERALLY RECOGNIZED TRIBES WITH USUAL AND ACCUSTOMED TERRITORY IN WASHINGTON STATE, AND EACH ONE HAS A UNIQUE HISTORY AND CONNECTION TO THE NATURAL LANDSCAPE THAT SURROUNDS ALL OF US.

DNR partners with Tribal Nations as we seek to achieve mutually shared natural resource management goals.

The agency respects Tribal treaty and reserved rights, works to preserve and promote access and use of their usual and accustomed territory, and partners with Tribes in protection of critical cultural resources. DNR welcomes opportunities to support Tribal Nations in their climate mitigation and stewardship goals through carbon projects, where relevant and desired.



CASE STUDY

IMPROVED FOREST MANAGEMENT IN WASHINGTON

The Confederated Tribes of the Colville Reservation extended rotations on almost half a million acres of forest in the Colville Reservation in Washington State.

- 100-120 year rotation length
- More than doubles carbon storage compared to 40-year rotation
- Balance of native species planted
- Over 14 million credits generated

OPPORTUNITIES FOR CARBON PROJECTS PARTNERSHIPS WITH TRIBAL NATIONS



Opportunities

Forest carbon opportunities with Tribal Nations: DNR may be able to support carbon projects led by or in collaboration with Tribal Nations, including but not limited to, through contracts to provide seedlings for reforestation efforts, co-management opportunities, restoration projects, or jointly identifying areas of DNR managed land with important cultural or traditional values to alter management practices to be compatible with those values and increase carbon storage. Recognizing that some Tribal Nations have relatively small land bases, DNR could also serve a similar aggregation role as described below for small private landowners. **Potential project types: Improved forest management, avoided conversion, reforestation.**

Restoration of riparian areas: Restoration of riparian areas can support salmon habitat and recovery, among other important benefits for a variety of riparian plant and animal species. DNR may be able to support carbon projects led by or in collaboration with Tribal Nations that replant or restore riparian areas that increase carbon sequestration and storage and enhance riparian ecosystems. **Potential project types: Reforestation, improved forest management.**

Blue carbon opportunities with Tribal Nations: Some Tribal Nations have wetlands or marine ecosystems within their rights, title, or treaty land. Furthermore, submerged vegetation such as kelp and eelgrass has special cultural significance for some Tribes. DNR may be able to support carbon projects led by or in collaboration with Tribal Nations that protect these important cultural resources while mitigating climate change and restoring ecosystem health. **Potential project types: Conservation and restoration of submerged aquatic vegetation, conservation and restoration of wetlands.**

Limitations

Staff capacity and knowledge: Currently, DNR does not have the necessary staff capacity and expertise to function as a carbon project aggregator. Funding and external support in the shorter-term would be required to get projects off the ground before DNR would be capable of managing the project aggregation internally.

Tribal capacity and funding: Many Tribal Nations have limited capacity to take on additional work. It can take significant time and resources to establish carbon projects, even with aggregation as a possibility. Funding to support capacity building may be necessary for Tribal Nations to successfully enter this space.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.



5

PRIVATE LANDOWNERS

As the administrator for the state's Forest Practices rules, DNR provides financial and technical assistance and support to small forest landowners to better enable them to comply with regulations and manage their land according to their individual objectives. Such objectives include enhanced fish and wildlife habitat, fuel reduction, increased recreation opportunities, improved forest health, revenue production, or protecting ecosystem services such as carbon sequestration.

The Climate Commitment Act calls for DNR to contract with an eligible entity to establish a small forest landowner carbon work group, in order to identify barriers and potential solutions for small forest landowner participation in carbon markets. DNR received funding for this work in July 2022 and expects an outcome of this group to be additional ideas or recommendations for roles that DNR could play to reduce barriers to, or incentivize, private landowners' participation in carbon markets.

Partnerships with small forest landowners: A logical extension of DNR's technical assistance and support role may be to act as a facilitator or clearinghouse for carbon projects with small forest landowners throughout the state. DNR could take on the role as a project aggregator, or support the process of establishing a baseline, developing a management strategy for forest landowners to agree to, and verifying the project through its term. These projects could improve carbon sequestration and storage throughout private non-industrial forestlands, support working forest conservation through avoided conversion projects, incentivize riparian restoration or habitat enhancement, or facilitate reforestation post-wildfire, particularly for landowners who may lack the financial capital to replant without the revenue from a harvest. **Potential project types: Improved forest management, avoided conversion, reforestation.**

Limitations

Staff capacity and knowledge: Currently, DNR does not have the necessary staff capacity and expertise to function as a carbon project aggregator. Funding and external support in the shorter-term would be required to get projects off the ground before DNR would be capable of managing the project aggregation internally.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.





6

URBAN FORESTS

The Washington State Urban and Community Forestry Program within DNR's Forest Resilience division works to educate residents and decision-makers about the economic, environmental, psychological, and aesthetic benefits of trees. The program additionally provides technical, educational and financial assistance to Washington's cities and towns, counties, Tribal governments, non-profit organizations, and educational institutions in planting and sustaining healthy trees and vegetation. Its mission is to support cities, towns, and counties to increase investments in the preservation, planting, and management of forests and trees for public benefit and quality of life.

Urban forests have not typically been the focus of carbon projects, however, there are existing standards for tree planting and forest preservation within urban areas (defined as in or around cities and towns) that DNR could incorporate into its Urban and Community Forestry Program.





Opportunities

Inequity in urban tree canopy cover: There is an opportunity to address the historic and systemic inequity in urban tree canopy cover through tree planting carbon projects. Through our Urban and Community Forestry program, DNR could partner with local governments and community organizations to facilitate carbon projects that had a direct impact on improving the health and resilience of highly impacted communities. **Potential project types: Tree planting.**

Avoided conversion in and around cities and towns: Forests in quickly urbanizing areas are some of the highest risk for conversion to development. In many cases, these are areas that are considered “urban” and therefore can be protected from conversion through urban forest preservation protocols. Working in partnership with local government and community organizations to prevent the permanent loss of these forests would fit in well with the agency’s “Keep Washington Evergreen” initiative to conserve one million acres of forest by 2040. Other projects could focus on maintaining existing tree canopy cover in urban areas. **Potential project types: Tree preservation, urban forest management, reforestation.**

Stored carbon in the built environment: Wood is widely regarded as one of the most sustainable building materials due to its low carbon intensity. When substituting wood for high carbon intensity building materials like concrete or steel, there can be significant emissions reductions. Maintaining or increasing demand for wood products can also help to ensure the economic viability of working forests, thereby helping to ensure that they remain as forests. Innovations such as environmental product declarations that shed light on the carbon footprint of different types of materials can help to encourage the use of wood, but there are many other opportunities to incentivize increased substitution. **Potential project type: Environmental product declaration.**

Limitations

Program scope: Although the Urban and Community Forestry Program recently was revamped and funded through the Evergreen Communities Act, there was no explicit focus on carbon in how the program would be developed out. Recruiting staff with expertise in urban carbon opportunities and implementing a carbon program was not part of the initial intent of the legislative update but may be necessary to develop robust opportunities.

Seedling supply and workforce constraints: With the increased attention to inequity in urban tree canopy cover, there is growing demand for seedlings and trees appropriate for urban settings. Current nursery capacity across the state and in the region may be unable to meet this demand. Additionally, an increased workforce will be necessary to take on the tree planting and on-going maintenance.

On-going maintenance of urban forests: While there is frequently funding for tree planting initiatives, once planted the trees require care and maintenance, which means on-going financial investments. Ensuring the long-term health of urban forests and trees is critical to realizing the full carbon benefits of these initiatives. Additional, long-term funding requirements must be built into consideration of tree planting initiatives.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency’s budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.

THE UPDATED EVERGREEN COMMUNITIES ACT (SB 1216) SET IN STATUTE THAT AT LEAST 50% OF ACTIVITIES IN DNR’S URBAN FORESTRY PROGRAM BENEFIT VULNERABLE POPULATIONS AND ARE DELIVERED IN OR WITHIN ONE-QUARTER MILE OF HIGHLY IMPACTED COMMUNITIES.



7

GEOLOGIC CARBON STORAGE

The bedrock beneath all DNR managed lands includes pore spaces where groundwater and other fluids reside. The injection of compressed carbon dioxide into the pore spaces in bedrock at depth can lead to permanent sequestration of carbon. The rate of that sequestration is faster in basalt bedrock which is found in many parts of Washington. This geologic formation, alongside Washington's vast forest resources, means that there could be special opportunities to position biomass plants in proximity to areas where permanent sequestration of carbon emissions resulting from the fuel production or consumption may be possible.

THE VISION OF THE WASHINGTON GEOLOGICAL SURVEY IS TO FOSTER A SAFER, MORE PRODUCTIVE AND RESILIENT SOCIETY THAT INCORPORATES GEOLOGY INTO ITS REGULAR THOUGHT AND DECISION-MAKING PROCESSES.

Basalt columns form the straight sides of the butte landscape in eastern Washington.





Opportunities

Columbia Basin Basalt carbon storage: The Washington Geological Survey, in collaboration with other geologic research groups, has identified opportunities to permanently store carbon in basalt in the Columbia Basin. This area is a strong candidate for geologic carbon storage because of existing pipeline infrastructure to transport compressed carbon dioxide from sources of emissions and the thickness of the Columbia River Basalts are such that injection of carbon can proceed in a way to protect potable groundwater, eliminate leakage, and lead to permanent storage.

Potential project types: Basalt carbon capture and storage.

Sequestration in Western Washington sandstone:

Industry in the U.S. and abroad has been injecting CO₂ into sedimentary reservoirs for 50 years. This activity has a proven record at an industrial scale while basalt sequestration has been proven at the pilot test level of readiness in the U.S. Sandstones in western WA can trap large quantities of injected CO₂. Unlike basalt sequestration, this CO₂ will not mineralize into an inert solid. However, CO₂ injected into sandstone can safely remain trapped in the rock as a gas for millions of years similar to natural gas traps. **Potential project types: Sandstone carbon capture and storage.**

Bioenergy and Carbon Capture and Storage (BECCS):

Throughout Washington forest health treatments and silviculture are needed to improve the health of our forests, and in Eastern Washington, to reduce fuel load and thereby prevent future wildfires from reaching catastrophic levels. Currently, slash piles and forest thinning by private and public landowners are burned, releasing carbon into the atmosphere. There is potential to capitalize on this untapped market to supply biomass to a new bioenergy plant in the area, which could then be combined with geologic carbon storage to capture and store emissions from the bioenergy plant. **Potential project types: Bioenergy plus carbon capture and storage.**

Direct Air Capture (DAC): DAC is one of several avenues of removing carbon from the atmosphere. Once captured, that carbon can be compressed, transported, and sequestered, for example, at depth in geologic formations for permanent storage. Washington, and the DNR lands therein, provide a potential market for various forms of carbon capture and sequestration. Proximity to oceans, prolific forests, basalt and ultramafic mines, and expansive injection reservoirs in deep basalt are all options for optimizing the best combination of methods, e.g. DAC, enhanced mineralization, direct ocean capture, and Biomass Carbon Removal and Storage (BiCRS), for atmospheric carbon reduction and climate goal advancement. **Potential project types: Direct air capture and storage.**

Limitations

Proof of concept: Although there have been small pilots to test the potential for carbon storage in basalt, experimentation has not been completed at scale, and there are many remaining steps in potential project development before implementation will be feasible. Sandstone sequestration does not suffer from this limitation. Both basalt and sandstone sequestration exploration and permitting may take significant time and capital resources.

Wood supply: There must be sufficient wood supply on federal, state, Tribal and private lands to support investment in a greenfield BECCS, where the basalt storage opportunities are. Wood supplies in Western Washington could support sequestration in Western Washington sandstones.

Planning, development, and infrastructure:

Constructing a greenfield BECCS site will require significant investment in planning and design processes, development processes including siting and permitting, and building the infrastructure itself. These processes would require significant human and financial capital, and significant time to reach completion. Retrofitting existing facilities may circumvent these capital and time hurdles.

Funding: The development of any of these types of projects would require financial investments that are not currently accounted for in the agency's budgeting. Funding requests to the legislature, grants, public-private partnerships or other creative financing opportunities will need to be explored.



Conclusion

DNR is eager to explore all opportunities to increase carbon sequestration and storage on our managed lands, or in partnership with other land managers across the state. Given the climate crisis facing our communities, our state, and our world, it is incumbent on us as a state agency and steward of critical natural resources and natural areas to ensure that we are actively pursuing actions and initiatives to mitigate and adapt to climate change.

Within these many and varied opportunities and challenges, there are several common themes.

- DNR's varied roles as land manager, lessor, and technical and financial assistance provider should all be seen as opportunities to contribute to greater carbon sequestration and storage.
- Carbon projects on DNR trust lands or aquatic lands offer a unique dual benefit for credit purchasers by supporting emissions reductions goals and funding community services through our trust beneficiaries, including schools, local governments, and fire districts, or ecosystem restoration in the aquatics space.
- Every opportunity has challenges that must be addressed, whether it is proof of concept, potential mitigation of revenue loss, or simple logistics. None of these are insurmountable, and DNR looks forward to developing solutions with partners to overcome these challenges in ways that lead to more robust, transparent, and collaborative projects.
- It is paramount for the calculations of carbon emissions reductions or avoided emissions be robust, defensible, measurable, and significant, given the agency's deep commitment to climate change mitigation and resilience, and our accountability and transparency to the public we represent.
- Various stakeholder perspectives will need to be taken into account, including trust beneficiaries, environmental and conservation advocates, private landowners, industry associations, community organizations, scientists and subject matter experts, etc. Tribal Nations and those with rights, title, or treaties must be consulted during project development.

We will know we will have been successful in this work if we have increased the numbers of partners we are collaborating with to mitigate climate change through greater carbon sequestration and storage, established or facilitated the development of successful carbon projects, and measurably contributed to greenhouse gas emission reductions.

DNR is eager to explore these and other opportunities, and welcomes discussion, questions, or ideas sparked by the contents of this document. Together with partners, we can do our part to mitigate climate change and create a more resilient Washington.

DNR looks forward to developing solutions with partners to overcome challenges in ways that lead to more robust, transparent, and collaborative projects.



Mount Si, Natural Resources
Conservation Area



Contact

For more information about partnering with DNR to advance carbon sequestration and storage opportunities, please contact:

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**NATURAL
RESOURCES**

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