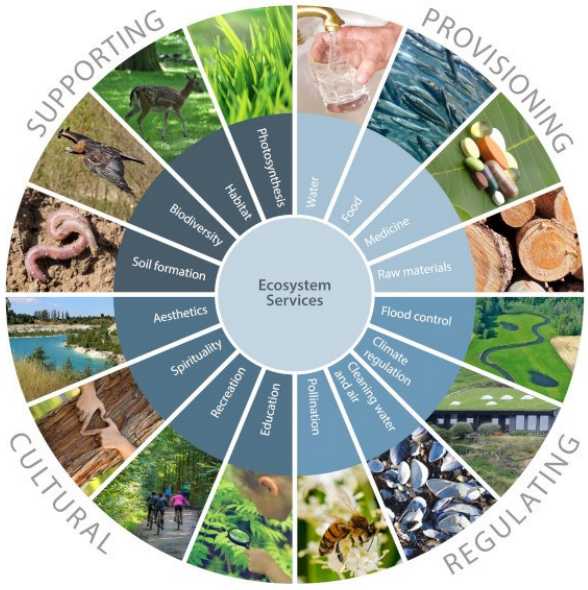
Ecosystem Services Work Group

2024 Legislative Progress Report



Prepared by
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December 31, 2024

WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

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Executive Summary

Ecosystem services refers to the range of direct and indirect benefits that natural systems provide to humans. These benefits include clean water, air purification, pollination, carbon sequestration, flood regulation, recreation, tourism, aesthetic value, cultural heritage, soil formation, nutrient cycling, and habitat provisioning. The economic value of these ecosystem services can be quantified and monetized through the sale of ecosystem service credits, which can be bought and sold in specialized ecosystem services markets.

The Washington State Department of Natural Resources (DNR) has been instructed through a legislative proviso (ESSB 5187 Chapter 475, Laws of 2023) to conduct an ecosystem services inventory and develop an ecosystem services asset plan. DNR has contracted with Greene Economics to create this asset plan and inventory on DNR-managed lands.

Greene Economics has initiated a review of the existing and emerging markets for ecosystem services. This review will explore potential avenues to monetize ecosystem services on DNR-managed lands.

Greene Economics' initial analysis has identified several ecosystem service markets as prospects for DNR. These markets include voluntary carbon, blue carbon, and biodiversity and habitat. Other potential ecosystem services markets include water quantity, avoided wildfire emissions, and regulatory carbon.

While Greene Economics continues to research and compile their findings, several reoccurring barriers to entering potential ecosystem services markets have emerged that need to be addressed. To participate in many of these markets, DNR must have explicit legislative authority to sell carbon credits and other ecosystem services. Until DNR has the legislative authority to enter into ecosystem services markets, DNR can only enter these markets indirectly through leasing to a third party. The third party would manage the ecosystem service projects under contract, which could result in a loss of value to DNR. Value can be added if DNR can sell ecosystem service credits directly. An additional barrier is the lease term limit that restricts DNR to a 99-year lease. The regulatory carbon market requires a 100+ year commitment, and biodiversity markets can require an even longer lease term. The ability to enter longer-term arrangements would make DNR more competitive in the ecosystem services market landscape.

DNR also lacks technical expertise and staff resources to manage these different ecosystem services opportunities. If DNR wishes to pursue a specific ecosystem service market, such as carbon, the agency will need to dedicate, train, and hire specialized staff knowledgeable in these markets.

Many ecosystem services projects require upfront funding to initiate the process, which is often many years before a project produces a credit. To be successful, DNR will need to adequately staff and fund any project and anticipate that it may take some time and patience before a project sees success.

While there are many steps that still need to occur before DNR can enter these markets, some of which DNR is already taking, ecosystem service markets can be both profitable and beneficial to the environment, making them worthwhile for the agency to explore.

Introduction

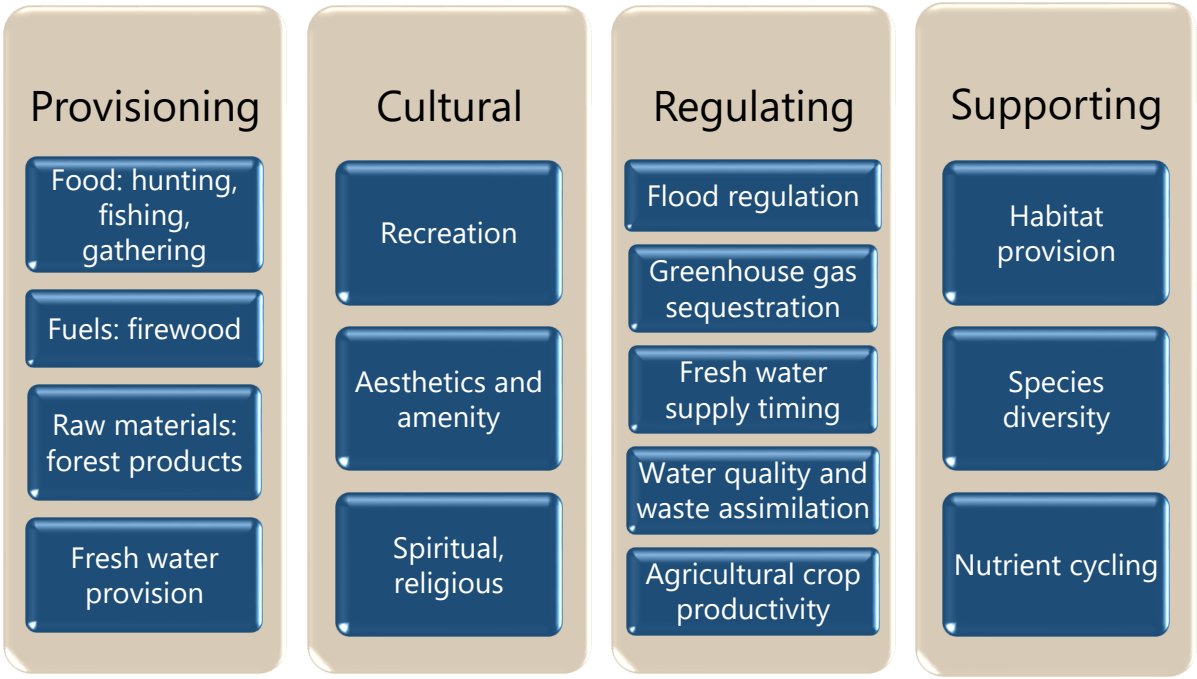
DNR was established by the Washington State legislature "to provide for more effective and efficient management of the forest and land resources in the state" (RCW 43.30.010). DNR manages seven specific trusts comprising 2.9 million acres of state-owned uplands to generate revenue and preserve forests, water, and habitat. DNR also manages 2.6 million acres of state-owned aquatic lands, and over 100,000 acres of state-owned, upland natural areas. Together, these lands provide a multitude of ecosystem services that include timber production, agriculture, carbon sequestration, wildlife habitat, clean air and water, recreation, and cultural uses.

Ecosystem services are the direct and indirect benefits that ecosystems provide humans. Many ecosystem services have traditionally been monetized and are now established as industries, while other markets for ecosystem services are emerging. This report is focusing on emerging ecosystem services markets. According to the USDA, ecosystem services can be broken down into provisioning, regulating, supporting, and cultural (refer to Figure 1):

- **Provisioning services** are any type of benefit to people that can be extracted from nature and include food, drinking water, timber, and natural gas, as well as many more.
- **Regulating services** are the benefits provided by ecosystem processes that moderate natural phenomena. Plants cleaning air and filtering water, or bees pollinating flowers are examples of regulating services.
- **Supporting services** are services that are necessary to produce all other ecosystem services. Photosynthesis, nutrient cycling, and oxygen production are all supporting services.
- **Cultural services** are non-material benefits that contribute to the developmental and cultural advancement of people, including how ecosystems play a role in local, national, and global cultures. These benefits include spirituality, recreation, and aesthetics.

DNR has special obligations and responsibilities to Tribes because the lands that DNR manages are the ancestral homelands and territories of native people. DNR has deep respect for and gratitude towards these original and active stewards of the region. In respect of the sovereignty of Tribal Nations and their rights, titles, and treaties, DNR will engage in government-to-government relationships as appropriate or requested in the assessment of future ecosystem services opportunities.

Figure 1. Typical breakdown of ecosystem services and examples of each type of service.



Emerging environmental markets, such as Washington State's carbon offset program, provide new opportunities for the state to monetize some of these ecosystem services, while simultaneously reducing or removing greenhouse gas emissions and enhancing other ecosystem services. For example, the recently enacted Climate Commitment Act (CCA) established a comprehensive, market-based program to reduce carbon pollution and achieve greenhouse gas limits, positioning Washington State to become carbon neutral by 2050. Further research into these ecosystem services markets could identify opportunities for DNR to generate funds for its trust beneficiaries while also improving and uplifting different aspects of the ecosystem.

2023 Legislative Proviso

In 2023, ESSB 5187 Chapter 475, Laws of 2023 was passed for the fiscal biennium of 2023 to 2025. This legislative proviso established that DNR is to "convene a group composed of a balanced representation of experts and stakeholders to conduct a state ecosystem services inventory and develop a state lands ecosystem services asset plan. The plan must outline how state lands under the department's jurisdiction can be monetized, including ecosystem services credits, and utilized to reduce the overall greenhouse emissions, or increase greenhouse gas sequestration and storage, in the state, including both public and private emissions."

The proviso specifically requires the following:

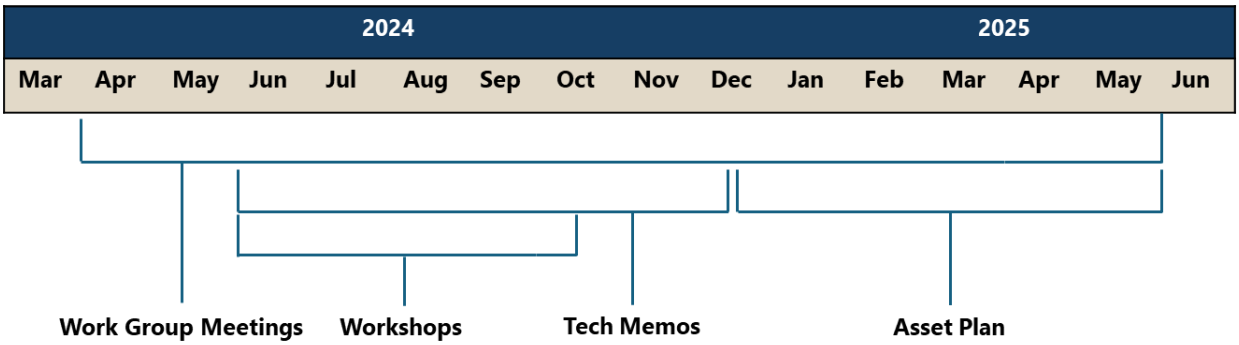
- Conduct a resource and asset inventory;
- Explore opportunities for ecosystem services credits;
- Develop a marginal cost abatement model;
- Conduct a needs assessment in relation to marketing, including a proposed implementation plan and recommendations for execution;
- Identify regulatory limitations;
- Create an implementation plan for a virtual dashboard; and
- Make recommendations for the creation of an ecosystem services equity and innovation account.

For a more detailed description of these requirements, refer to the proviso in the appendix.

Timeline

This project is over halfway through (Figure 2), and Greene Economics has written several technical memorandums, led several workshops for DNR staff, led work group meetings for external stakeholders, and begun to develop the first draft of the asset plan and inventory. The project completion date is June 30, 2025. A final legislative report detailing the findings and asset plan and inventory will be submitted in June 2025.

Figure 2. High-level project timeline. Final outcomes of the technical memorandums and the asset plan will be included in the final legislative report.



Contractor Selection

Greene Economics and their subcontractors (SIG, Pax Environmental, and Montrose Environmental) were selected in March 2024 through the state's competitive bidding process. Greene Economics was hired to research and develop an ecosystem services

asset plan for all DNR-managed lands. To accomplish this, Greene Economics has completed four out of six required technical memorandums, conducted four workshops for DNR staff, and engaged in four of seven meetings with external work group members.

Establishment of the Work Group

DNR has convened an external work group composed of a balanced representation of experts and stakeholders (Table 1). DNR reached out to many organizations to solicit applications for the work group. The following groups are represented: trust beneficiaries, Tribes, conservation organizations, timber industry representatives, ecosystem services experts, environmental justice representatives, and staff from the Washington State Department of Ecology (Ecology).

Greene Economics has presented their research methods, approach, and initial findings to the work group members to solicit their feedback and input.

Table 1. Ecosystem Services Work Group Members

Name	Organization	Representation
Mark Burrows	Stevens County	Beneficiary
Brenda Campbell	Snoqualmie Tribe	Tribal Representative
Matt Comisky	American Forest Resource Council	Stakeholder
Stephen Donofrio	Climate Markets Expert	Expert
Kathleen Farley Wolf	DNRP King County	Expert
Kim Bray	Hoh Indian Tribe	Tribal Representative
Rebecca Niggemann	Washington State Department of Fish and Wildlife	Stakeholder
David Onstad	Kitsap Environmental Coalition	Stakeholder
Mark Ozias	Clallam County	Beneficiary
Kasia Patora	Department of Ecology	Partner Agency
Russ Pfeiffer-Hoyt	School Board of Directors, Chair and WWSDA Trust Lands Advisory Committee, Chair	Beneficiary
Mary Jean Ryan	Center for Responsible Forestry	Stakeholder
Gareth Waugh	Port Blakely	Stakeholder
Jordan Wildish	Department of Ecology	Partner Agency
Rene Zamora Cristales	University of Oregon	Expert

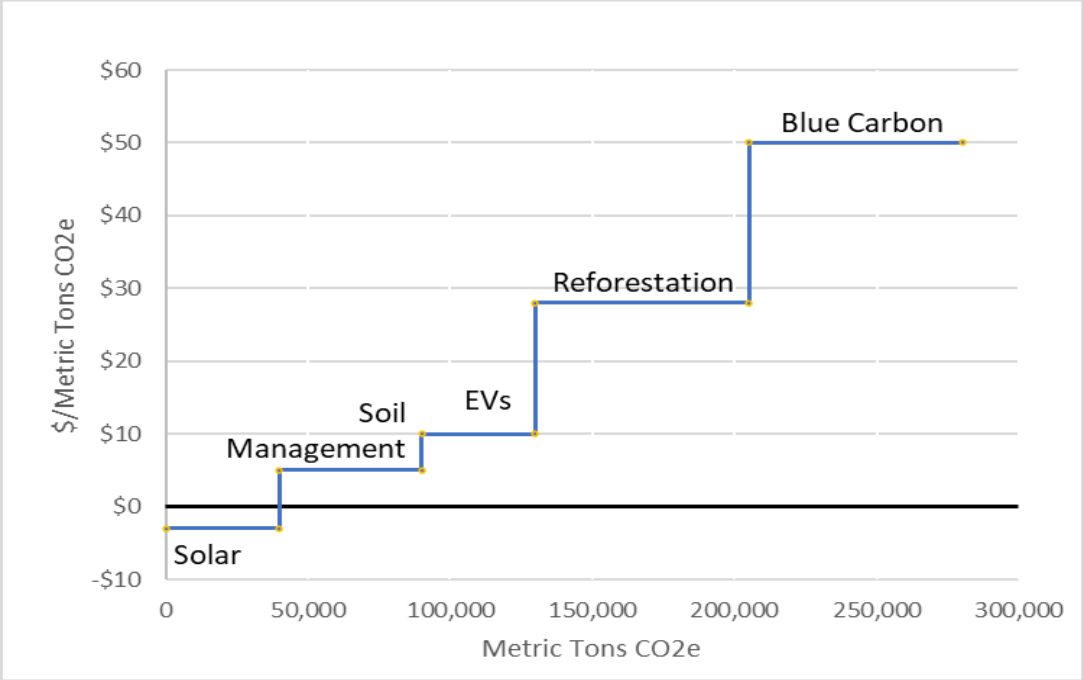
Ecosystem Services Approach and Preliminary Findings

Approach

Marginal Abatement Cost Curve Model

Greene Economics is developing a marginal abatement cost curve (MACC) model to inform DNR's feasibility assessment of participating in carbon markets. A MACC involves sorting through all strategies that generate a natural resource credit, usually a carbon reduction, and aligning them in a graph. The vertical axis represents the costs of reducing emissions and the horizontal axis shows how much emissions can be reduced. As one moves to the right, emissions are reduced more, but each additional unit of reduction becomes more expensive. This model helps determine the most cost-effective ways to reduce emissions. Figure 3 illustrates a hypothetical cost abatement curve.

Figure 3. An example of a Marginal Abatement Cost Curve with the marginal cost on the vertical axis and carbon reduction or sequestered on the horizontal axis



A similar concept can be used to analyze the cost, and opportunity costs, of foregoing the sale of timber to sequester more carbon and potentially sell credits in a carbon market. This analysis involves estimating the potential revenue from harvesting the

timber, subtracting any costs to harvest the timber, and comparing this net revenue with the potential sale of sequestered carbon. Any costs to enter and participate in the new carbon market would be subtracted from that potential ecosystem service market value.

Data Gathering

To construct a series of MACC models for carbon and other ecosystem services, the contractors have been compiling relevant information pertaining to costs and prices in these markets. They began by understanding DNR's forest estate model, which is used to calculate the decadal sustainable harvest level. The sustainable harvest level is the timber volume scheduled for harvest from state trust lands during a planning decade and was most recently completed for western Washington. Using the forest estate model outputs is one way to compare the revenue DNR is expecting to generate from timber harvest to revenue that could be generated in an emerging ecosystem service market.

A literature review is also underway to understand ecosystem service markets that exist in Washington State, including current prices for ecosystem services and associated credits, costs for generating credits, and the potential location of these ecosystem services on DNR-managed lands. The ecosystem services external work group has provided additional insights into how markets operate in the state.

Additional data has been gathered from publicly available and internal sources to accurately reflect DNR's current asset inventory for ecosystem services, including DNR's annual report, state land leasing data, aquatic leasing data, fire risk maps, the California Air Resources Board Forest Protocol[1], and Priority Habitats and Species[2] data from Washington State Department of Fish and Wildlife (DFW). These data are currently being incorporated into an assessment of each potential ecosystem service market, which will be the basis for the final inventory and asset plan. The final report will provide additional detail on how the data is used to create the asset plan.

[1] The California Air Resources Board (CARB) is a state agency that protects public health from air pollution and addresses climate change in California. They set air quality standards similar to how Ecology does in Washington State. The CARB Forest Protocol is a set of requirements and methods for quantifying the climate benefits of carbon sequestration on forestland and has been adopted by Ecology in Washington.
[2] The Priority Habitats and Species Program is WDFW's primary means of transferring fish and wildlife information from our resource experts to local governments, landowners, and others who use it to protect habitat.

Modeling Results

Greene Economics is still working on the MACC models and the final results will be included in the final legislative report.

Other Ecosystem Services Modeling

Using a similar approach to evaluate DNR's other ecosystem service assets and the costs of participating in other ecosystem service markets may suggest additional environmental benefits and revenue opportunities. Models to achieve this and to model carbon in eastern Washington are still in development by Greene Economics.

Existing Markets

Greene Economics is comparing new market opportunities to the revenue that DNR is generating from markets in which it is already participating. The markets that DNR already utilizes are timber, grazing and agriculture, mineral extraction, and revenue from aquatics. Greene Economics is not conducting research into expanding into these markets, unless they are directly related to the markets discussed in the next section.

Emerging Ecosystem Service Market Analysis

After several discussions with DNR staff and the work group members as well as internal research, Greene Economics has chosen to analyze the following markets: carbon (voluntary and regulatory), habitat and biodiversity (voluntary and regulatory), blue carbon, water quality, water quantity, and avoided wildfire emissions.

These markets were analyzed through a literature and regulatory review. Market aspects analyzed included revenue potential, environmental benefit, maturity of market, ease of entry, labor lift, timing of maturity, data availability, co-benefit potential, and political risk.

The following is a brief description of each ecosystem service market, which will be further detailed in the final report.

Regulatory carbon markets

The carbon regulatory market is well established, albeit new to Washington with the introduction of the CCA. A carbon credit market is a specialized marketplace in which carbon allowances and credits can be bought and sold as part of cap-and trade programs. Entities can receive offset credits by funding projects that reduce, remove, or

avoid greenhouse gas emissions. In general, there are four conditions that an offset credit project needs to meet:

a. They must be additional; a project is considered additional if it results in lower carbon emission compared to what is currently being emitted without the project in place.
b. Double counting is not allowed; credits cannot be counted for multiple projects or in both the regulatory and voluntary market.
c. The offset must be permanent; Washington uses 100 years as a project-length minimum.
d. Verification and audits throughout the project lifespan are necessary, though they may vary in frequency.

Voluntary carbon markets

Voluntary carbon markets are markets in which individuals, businesses, governments, or other entities can buy and sell carbon offset credits to mitigate emissions. Unlike regulatory markets, these markets are decentralized and incentive based. A notable difference between the markets is the governing entity. Credits and projects are not regulated by the state. There is opportunity for minimum project lengths shorter than 100 years which allows for more flexibility.

Blue carbon markets

Blue Carbon refers to the carbon stored in coastal and marine ecosystems, such as mangrove forests, seagrass beds, and salt marshes. These ecosystems capture carbon from the atmosphere and store it in marine vegetation. Blue carbon habitats can store carbon at higher rates and for longer periods than terrestrial ecosystems. The blue carbon market is still developing; however, it has potential to be a good option for DNR because blue carbon projects not only sequester carbon but also provide numerous other ecological benefits, such as habitat restoration.

Habitat and biodiversity markets

A habitat and biodiversity market is an ecosystem market that facilitates the protection, restoration, or enhancement of natural habitats and biodiversity. It does this by translating conservation efforts into measurable credits that represent environmental outcomes, such as restored habitat, preserved wildlife corridors, or increased species diversity. Habitat and biodiversity markets, like carbon, exist both as regulatory and voluntary markets. For regulatory markets, the U.S. uses both mitigation and conservation banks as credit providers for mitigation offsets. Mitigation banks primarily

aim to offset damage to wetlands and aquatic habitats and focus on activities like restoring, creating, or enhancing aquatic resources to improve environmental conditions. Conservation banks prioritize the preservation of habitat for endangered or threatened species. This market is well established with many projects active in Washington, including with the Washington State Department of Transportation.

Like the voluntary carbon market, the voluntary habitat and biodiversity market is incentive based. Generally, biocredits are proposed as a net-positive contribution to biodiversity conservation or restoration. The market is relatively new, with a variety of ways to measure a credit.

Water quality markets

A water quality market aims to improve water quality by allowing entities, such as farmers, landowners, or organizations, to buy and sell credits representing reductions in water pollution. Water quality markets enable trading of water quality credits, allowing regulated entities to offset pollution by investing in projects that improve water quality in other locations. Water quality markets are mature and widely active elsewhere in the U.S., but new to Washington. Ecology governs this market in Washington through National Pollutant Discharge Elimination System (NPDES) permits. The water quality market research is still underway but may have potential.

Water quantity markets

A water quantity market is designed to manage and allocate water resources by allowing the trading of water rights and water use credits. These markets incentivize large-scale water users (for example, farmers, industries, or municipalities) to consume water more efficiently, conserve water, and improve water retention. All water in Washington is the property of the public and cannot be owned directly, but the right to use a specific volume of water for a designated purpose is granted by Ecology to private users. The water rights market is well developed, with water leasing occurring throughout Washington. There are three types of water quantity credits: flood reduction, water conservation, and water efficiency. DNR currently manages over 3,000 individual water rights, with the potential for more.

Avoided wildfire emissions

Avoided wildfire emissions refers to the reduction or prevention of carbon emissions that would have resulted if a wildland fire had occurred. Wildfire carbon emissions can be reduced through proactive forest management, such as controlled burns, fuel reduction, and forest thinning. This is a nascent market that links fuel treatments to reduce wildfire emissions with greenhouse gas emission-reduction credits. This market

is still in development but could help with DNR's commitments to improving forest health, thereby reducing the risk of wildfire.

Greene Economics' initial market review, subject to change with additional analysis, found voluntary carbon markets to be one of the more favorable opportunities for DNR to pursue but more research is necessary. For DNR to enter some ecosystem services markets, legislative amendments must be passed that explicitly define ecosystem service credits, including carbon credits, as a valuable material that can be sold. The cap and trade program and other emerging market opportunities are options for DNR to enter that could generate revenue streams while positively benefitting the environment. Further analysis of these markets will be conducted by Greene Economics and reported in the final legislative report.

Marketing and Implementation Plan

Greene Economics is researching and developing a needs assessment and a roadmap for entering carbon markets, which will be included in the final legislative report. The needs assessment will identify the specific requirements, gaps, and conditions necessary to enter each ecosystem service market, such as assessing what funding resources, staff knowledge, and capabilities are already in place at DNR versus what is needed. While the needs assessment will outline what is needed to get started, the roadmap will outline a step-by-step plan to enter the different carbon markets. It will include key stages, timelines for completing tasks, detailed steps needed to complete the verification and audit process, and identification of potential risks and mitigation strategies along the way.

Ecosystem Services Work Group Meetings

To date, Greene Economics has conducted four of seven required work group meetings.

1) The first work group meeting introduced the work group to ecosystem services and the basics of DNR and its trust obligations.
2) The second work group meeting covered the overall, planned approach for the project, a review of an initial inventory of land categories, an overview of the preliminary market landscape, and preliminary policy and regulatory limitations.
3) The third work group meeting covered the MACC and challenges.
4) The fourth work group meeting was a deeper dive into market opportunities and challenges detailed in the "Emerging Ecosystem Services Market" section of this report.

In all work group meetings, Greene Economics has shared their preliminary findings and gathered feedback and input from the work group members. The work group's input and questions have guided Greene Economics in their selection of markets to explore and has provided Greene with more recent accounts about current carbon projects as near as King County and as far as New Zealand. The work group's input on the draft asset plan will be their most important contribution to this project. Three more work group meetings are scheduled to occur by the end of the project.

Next Steps

The next step is for Green Economics to create the ecosystem services asset plan and inventory that will identify, assess, and catalog the natural resources and ecological benefits managed by DNR. This plan involves mapping out and detailing the ecological assets (for example, forests, wetlands, grasslands, marine habitat) that DNR manages and quantifying the potential ecosystem services they offer. This plan will help DNR understand the value of these assets, set priorities, and identify opportunities for participation in ecosystem service markets.

Greene Economics is also identifying elements that can go into an online dashboard for ecosystem services. Elements of the dashboard could include features such as key metrics for each ecosystem service, data visualization, an interactive map, user-friendly filters and dropdown menus, interactive features (such as clickable elements, hover-over details), user engagement tools (such as reports and feedback mechanisms), and performance indicators (for example, benchmarking and targets versus actuals). Development of the dashboard is not part of this contract or funded in this proviso.

Greene Economics continues to develop the needs assessment and roadmap for entering ecosystem service markets. To this end, they will conduct three more work group meetings and present three more technical memorandums for DNR feedback. Additional input will be provided to the project through two drafts before the final asset plan and inventory are completed.

Recommendations

Greene Economics' research to date on the ecosystem services market landscape has found several markets to be lucrative prospects for DNR to explore further: the voluntary carbon, blue carbon, and biodiversity and habitat (regulatory and voluntary) markets. Other ecosystem service markets analyzed also seem promising, including water quantity and quality, avoided wildfire emissions, and the regulatory carbon market. Further analysis of these markets will result in more detailed recommendations.

DNR will need to overcome certain barriers to participating in ecosystem services markets. For example, DNR will need legislative authority to enter some markets. Until then, DNR can only enter these markets indirectly through leasing agreements with third parties, which could limit the financial benefits to DNR. To be more competitive, DNR also must have the flexibility to extend its third-party lease terms past its current limit of 99 years, since many of these ecosystem services markets require substantially longer lease terms. Finally, staff and funding will be necessary for DNR to develop and implement any new ecosystem services projects, and it will take many years for these projects to materialize and generate revenue for trust beneficiaries.

Further recommendations will be presented in the final report, following additional research and the development of the asset plan and inventory.

Acknowledgments and Primary Contacts

DNR Steering Committee

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- Michael Kearney, Division Manager, Product Sales & Leasing Division
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- Gareth Waugh, Port Blakely
- David Onstad, Kitsap Environmental Coalition
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USDA Ecosystem Services https://www.climatehubs.usda.gov/ecosystem-services#:~:text=Ecosystem%20services%20are%20the%20direct,support%20and%20sustain%20human%20livelihoods.

DNR Appendix F The Forest Estate Model https://www.dnr.wa.gov/publications/amp_sepa_nonpro_shc_feis_app_f.pdf?uzo06i

DNR 2023 Annual Report https://issuu.com/wadnr/docs/em_annual_report_2023?ff&backgroundColorFullscreen=

The California Air Resources Board https://ww2.arb.ca.gov/about

CARB U.S. Forest Projects – June 25, 2015 https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/compliance-offset-protocols/us-forest-projects/2015

Appendix

Appendix A: 2023-25 Biennium Operating Budget Proviso, Ecosystem Services Inventory and Asset Plan

ESSB 5187 Chapter 475, Laws of 2023, Section 310 (12), pages 440-441

(12)

a) $1,500,000 of the natural climate solutions account—state appropriation is provided solely for the department, in close collaboration with the department of ecology, to convene a group composed of a balanced representation of experts and stakeholders to conduct a state ecosystem services inventory and develop a state lands ecosystem services asset plan. The plan must outline how state lands under the department's jurisdiction can be monetized, including ecosystem services credits, and utilized to reduce the overall greenhouse emissions, or increase greenhouse gas sequestration and storage, in the state, including both public and private emissions.

b) In developing the plan, the department must:
    i. Conduct a resource and asset inventory to identify all state-owned or controlled lands under its jurisdiction that could be eligible or utilized in ecosystem services credits, including carbon offset markets;
    ii. Explore opportunities for the department to utilize its inventoried proprietary assets in offering ecosystem services credits, including carbon offset credits, both under the regulatory offset department's programs, such as the one established under RCW 70A.65.170, and existing or future voluntary, private ecosystem service markets, including carbon offset programs;
    iii. Develop a marginal cost abatement model to inform highest and best use of state assets in ecosystem services markets, including carbon markets;
    iv. Conduct a needs assessment in relation to marketing state-owned carbon assets on state lands under the jurisdiction to third party developers, including a proposed implementation plan and recommendations for plan execution;

v. Identify any known or suspected policy or regulatory limitations to the formation and full execution of the ecosystem services inventory and asset plan identified above;

vi. Create an implementation plan for a virtual dashboard where public and private sector participants in regulatory or voluntary carbon markets can locate the inventory created under this subsection, understand the marginal cost abatement model, and locate any requests for proposals from state asset-involved carbon projects on lands under the department's jurisdiction; and

vii. Make recommendations for the creation of an ecosystems services equity and innovation account that includes:

A. New modes of ecosystem services; and

B. Identification of new or different beneficiaries of carbon investments that increase the participation of historically marginalized groups in ecosystem service opportunities.

c) The department must report its progress and findings under this subsection to the legislature no later than December 31, 2024.