# Forestry Roadmap to 2020
# Report to the Oregon Global Warming Commission

The following report, *Forestry Roadmap to 2020*, was developed by the Forestry Technical Committee of the Oregon Global Warming Commission (OGWC). Forestry Committee members are listed in Appendix B of this report.

## I. PURPOSE AND CONCLUSIONS

The purpose of the Committee was to develop and prioritize a set of strategies and actions for primarily increasing carbon storage in forest ecosystems and long-lived forest products to meet Oregon's 2020 greenhouse gas (GHG) goal. The recommendations will be considered by the Oregon Global Warming Commission for inclusion in the Interim Roadmap to 2020/Report to the new Governor and Legislature, to state agencies, and to Oregon's Congressional delegation. Recommendations may also guide private sector investments and university research agendas.

After several months of deliberations the Committee narrowed the Key Actions from a possible 31 to 4. Appendix A contains the consolidated Inventory of Actions developed by Forestry Technical Committee. The Committee's Key Actions are more fully described in Section III – Key Actions For 2020. In summary they are:

- Establish a Carbon Inventory for Oregon Forests
- Invest in Key Research to understand the impacts of climate change on carbon storage in forests
- Pursue Reforestation/Afforestation
- Advance Energy and Forest policies supporting biomass facilities

The Committee recognized that "Oregon's forests" and "Federal forests" are often used interchangeably; the error is understandable, since Oregon is substantially (61%) federally-owned1, mostly by the US Forest Service and the US Bureau of Land Management. But State and privately-owned forests are extensive, are generally more productive, often include critical ecosystems, and are frequently contiguous with or interspersed among the federal lands. Other, non-forested private lands are also placed such that what occurs on those lands affects the adjacent forest in significant ways (fire occurring in the urban/wild interface is one example; effects in watersheds critical to endangered species is another).

Thus carbon policy addressing and affecting forestlands, forest practices and forest products require particular attention to common strategies and collaborative practices. The recommendations in this section of the Oregon Roadmap to 2020 are meant to be read in that context. Policies on Federal, State and private lands do not need to be identical – in fact they must

[1]Oregon Forest Ownership: 61% Federal, 19% Industrial Private, 15% Non-industrial Private, 3% State, and 2% Tribal and other public lands

often be different but complementary. But each ownership type must inform and be informed by the others. Policies must be developed collaboratively, and executed across jurisdictional lines when ecosystems and carbon outcomes stretch across those lines.

## II. FUTURE STATEMENTS

The forest sector's contribution to achieving Oregon's greenhouse gas reductions goals will come primarily from increased carbon storage in forest ecosystems and long-lived forest products.

Despite predictive modeling and speculation, the effects of climate change on forest ecosystems are still uncertain and may, therefore, complicate future policy goals. For example, there is scientific consensus that the increase in average temperature predicted to occur will result in widespread changes in the geographic distribution of many tree species. How these changes occur across Oregon's ecoregions and then translate into the changes in the potential for carbon storage is highly uncertain. The probable increase in severe wildfires will add additional uncertainty to planning efforts and confound long-term projects to store more carbon in forest ecosystems. Expectations for carbon storage must reflect both geography and traditional benefits expected by various forest ownerships. The moist forest ecosystems west of the Cascade crest are more productive and have a greater opportunity for carbon storage than the drier eastside forestlands where the potential and occurrence of fires is much greater. These differences require different carbon strategies for different forest circumstances. Private and public forests have owners with different management objectives and expectations for economic returns that will likely result in different carbon strategies and outcomes.

Oregon's forest carbon management strategies are integrated into overall sustainable forestry objectives and practices that address fire regimes, insects, disease, drought, invasion by exotic species, and ecosystem function. Ecosystem dysfunctions resulting from misguided past practices – fire suppression, juniper range expansion – are addressed with policies that simultaneously target both increased carbon storage and resilient, productive forests. And since forest ecosystems cross the jurisdictional lines of forest management agencies common strategies and collaborative implementation must become standard practice.

With these primary qualifiers, the following describes one plausible pathway to Oregon's forest sector reducing Oregon's share of the atmospheric concentration of carbon dioxide in 2050 and beyond.

### Federal and State Land Use Policies

Land use policies between 2010 and 2050 have been successful in reversing the historical trend and preventing forest land from converting to other uses, resulting in no net loss of forest land[2], enabling a measurable gain in statewide carbon storage. Cooperative and effective implementation of land use policies combined with forest carbon offset markets or other programs that reward reforestation have resulted in a net increase in forest area. Significant investments have enhanced

[2] Intended to be consistent with current forest land composition and not a changed composition that includes less desired types, such as juniper woodlands.

the extent of services and benefits provided by Oregon's forests, including carbon sequestration and a long-lived product pool.

## Federal Forest Lands

Federal Forest land managers have collaborated with State and private forestland counterparts to work for measureable contributions in reducing Oregon's share of global CO2 emissions. Policies have acknowledged the different goals for forests east (generally drier) and west (generally wetter) of the Cascades with an overall increase in forest carbon stores. East-side forests have been managed primarily for ecosystem restoration, safety, and climate adaptation with a minimum of incurred carbon debts (e.g., loss). West-side forests have been managed primarily to increase carbon storage to what is practically achievable in 40 years (and those policies are ongoing beyond 2050, although annual carbon gains will level off). Achievable carbon storage levels were arrived at by evaluating the costs and benefits of management for optimal carbon storage, then adjusting for the long term sustainability of other valued benefits and services expected from forest ecosystems that might be compromised in a one-dimensional focus on higher carbon densities[3].

## State-Owned Forest Lands

State-owned forest lands have been managed for multiple purposes including the long-term storage of carbon, with an overall goal of increasing carbon capture through management practices, afforestation and reforestation. Major forest policy and management decisions are informed by a clear accounting of the consequent change in carbon storage that will occur. There has been a net increase in the amount of forest land owned and managed by the State. Much of the additional forest land has a carbon storage obligation within the terms of the property transfer. Oregon's state-owned forest lands show a measurable contribution to reducing atmospheric $CO_2$.

## Privately-Owned forests

The net area of private forestlands in Oregon has remained constant since 2010, and the lands have been managed primarily for production of timber and wood products. Carbon storage levels have remained constant across all such lands, and in some cases have increased due to voluntary owner actions, frequently in collaboration with ecosystem services market mechanisms.

Atmospheric GHG reduction benefits have been optimized on private lands based on life-cycle analysis primarily through the following:

- The GHG reduction benefits of wood-based building materials over higher energy alternatives have been calculated to general government and stakeholder satisfaction, and are reflected in mitigation policies.

- GHG reduction benefits have been realized from a fully developed bioenergy infrastructure for the sustainable use of forest biomass residue and the anthropic waste stream.

[3] For example, the policy tradeoffs would have to be seriously evaluated if research were to consistently show that the forest sector could reach higher overall carbon storage densities, while protecting ecosystem function and species biodiversity, by allowing some conversion from the live tree pool to the products pool on federal forest lands to raise sequestration levels on non-federal forests.

- Additional GHG reduction benefits have been enabled through public and private sector investments using generally accepted certification standards and guidelines to promote carbon densification on privately owned forest lands.

## Ecosystem Services Markets

Carbon prices and markets have fully emerged and are available to landowners of all sizes. This has created the appropriate incentives for forest conservation, improved forest management, and the use of bioenergy and wood substitutes. Measurable indices have been devised for forest systems investments (e.g. carbon, fiber, air, energy, hydrology, wildlife, information, space). These are updated on a regular basis, garnering widespread interest and motivating investment. Market decisions and investor confidence are integrally linked with the forest monitoring and carbon accounting systems described above.

- Activity in the marketplace is at a level such that investment returns to forest owners are equal to or exceed their inventory, accounting and other transaction costs.

- Market investments and forest carbon accounting data are validated and shared globally.

- Markets depend upon solid oversight from national and international governing bodies.

Market in verifiable ecosystem services have emerged, resulting in a sustainable supply of services including but not limited to carbon storage that continue to motivate and maintain long-term investment. Market structures permit participation by both large and small forestland owners. State governments cooperate with implementing and administering national and international policy agreements and standards for market participation and verification.

## Forest Inventory and Carbon Accounting

A practical and statistical level of sufficiency in a standardized system of forest monitoring and carbon accounting of the role of Oregon's forests, on a lifecycle basis, in storing and contributing to the reduction in GHG levels has been established. This standardized carbon accounting system for the forest sector is sufficient for the full emergence of a solid ecosystem services marketplace. The system comprises a robust set of integrated state-of-the-art technologies encompassing biomass and carbon inventories, analysis and modeling, and reporting. Inventories continue to be a combination of field-based data collection systems and analyses of space and air-based remote sensing imagery. These technologies have become affordable and more integrated as technologies advance and emerge in image sensors, computational software and hardware, and atmospheric gas exchange. Significant improvements have been made to estimating carbon quantities in the components and transactions comprising forest ecosystems. Routine advancements in technology in each of these areas are being integrated to where they are mutually reinforcing and interdependent. A workforce capable of implementing these new accounting technologies has been trained.

## Bioenergy and biofuels

After evaluation and verification of net carbon benefit, advances in technologies for bioenergy systems have allowed for biomass energy in the forest management sector. Fuels management, recovery and conversion technologies, and the scheduling and sequencing of forest biomass removal have been optimized to minimize short-term carbon debt. Demand for low-carbon energy production from forests has led to the integration of biofuel production from forest biomass with the timber harvest and transport systems. That biomass-sourced energy powers the removal and transportation of excess forest fuels out of Oregon's forests while also providing a supply of materials to the product carbon storage pool to benefit humanity, consistent with other values including adequate preservation of genetic material, hydrologic function, O2 production, and forest productivity (CO2 conversion).

The need to minimize the cost of management and transport of forest material has led to efficiencies in the removal, processing and transportation of the lower size range of forest material to maximize volume per unit haul distance. Technological breakthroughs in advanced materials engineering enable more energy and carbon efficient on-site processing operations.

## Education and Public Perception

The general public has an understanding for the role that forests and forest products play in carbon management.

There is widespread understanding and acceptance that forest ecosystems are a principle component in, and valued as, a set of life supporting systems on the planet. This perception is brought about through advanced scientific understanding of the Earth's interacting biophysical systems and wide distribution of this knowledge through advances in free, widespread and highly effective social education systems. Advanced systems in technology for monitoring and measuring (remote sensing, field-based) forest functions -- from atmospheric gas exchange to continuous detection and counting of individual organisms -- has reduced uncertainty in resource composition, abundance, and flux. This advanced understanding of human interdependence with other biological systems has nurtured investments in the long-term sustainability, and management of multiple benefits supplied by forest ecosystems.

Investments have been made in the development of new technology and the transfer of that technological knowledge to landowners of all types. The lessons learned are propagated broadly to the public, and in more targeted ways (e.g., best practices; technology transfers) to forest landowners, forest workers and regulators.

## III. KEY ACTIONS FOR 2020

The following Key Actions were developed in part by reviewing various local and regional Global Warming plans and developing enhanced recommendations where possible. The remaining actions are included in Appendix A.

- Establish a Carbon Inventory for Oregon Forests
- Pursue Reforestation/Afforestation
- Invest in Key Research Actions - impacts of climate change, adaptation tools, and benefits of durable products
- Advance Energy and Forest policies supporting biomass facilities

**Overall goal: Between 2010 and 2150[4], no net loss of Oregon forested lands and a net gain in carbon storage in an amount to be determined.**

Oregon's forests are a carbon sink, capturing more carbon than they release. As such, Oregon's forests and its forest sector have and will continue to contribute to the goal of achieving reductions in greenhouse gas emissions by remaining a robust sector in Oregon.

### 1. Carbon Inventory

1.1. Establish a carbon inventory for all Oregon forests. This will require a collaborative effort to define and develop an agreed upon approach for developing and maintaining a carbon inventory system. Based on these data, establish baselines and both long-term and intermediate goals for carbon storage, for different forests types and ownerships, including overall storage gains in public forests.

### 2. Reforestation/Afforestation/Acquisition

2.1. The Federal government, the State and Oregon communities should seek reforestation opportunities on lands previously forested, irrespective of ownership.

2.2. The Federal government should assure sufficient resources for reforestation on Federal forestlands.

2.3. The State and Oregon communities should seek to acquire forestlands that can be conserved, restored and managed.

2.4. Afforestation opportunities should also be sought and welcomed, but should be carefully evaluated for unintended consequences to ecosystem values before proceeding (e.g. "planting of non-native trees rather than natives").

### 3. Research

3.1. Oregon Climate Change Research Institute and the Oregon University System should collaborate with the Federal and State Government and private land owners to project and

[4] The effects of actions in the forestry sector are realized over many decades. We recommend 2150 as the end-date for the Commission's Forestry vision rather than 2050 to communicate the time-scale differences between this sector and the others that make up Oregon's carbon reduction management strategies.

map actual changes in Oregon forest productivity, ecosystem function and species biodiversity and distribution, anticipated from climate change.

3.2. A significant effort within the broader scientific community should be given to identifying a comprehensive set of features, across sectors, predicted to be affected by changes in climate and their impact on carbon storage. These features, or indicators should become the focus of status and trend monitoring to inform adaptation planning at local and regional levels.

3.3. Oregon Department of Forestry, Department of Environmental Quality, and stakeholders, in collaboration with the Oregon University System and identified experts, should develop a strategy for use and reuse of durable forest products, along with carbon sequestration/gain values that may accrue.

3.4. Oregon University System, in collaboration with other relevant research entities, will support the research and design of information and tools necessary to support the carbon inventory system outlined in Section 1.1.

## 4. Biomass

4.1. State of Oregon energy and forest policies should encourage private landowners to develop forest and range biomass production capabilities supporting biomass energy facilities where this can be done consistent with or enhancing ecosystem values.

# APPENDIX A
## Technical Committee Recommended Actions

| | ACTIONS/RECOMMENDATIONS | DESCRIPTION | | | METRIC | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| | | Lead Gov, Agency, Private, etc.? | Type of Action (use word) Incentive, Tax/Fee, Regulation; Standard, Information, Technical Research, etc. | Timing of Impact (Short = 1-5 yrs) Medium = 5-10 yrs. Long = > 10 yrs | GHG Savings? (Y/N, Quantity) | Fossil Fuel Savings? (Y/N, Quantity) | Cost (Savings)? | C/E (High, Medium, Low) | Co-benefits? Risks/Tradeoffs? Unintended Consequences? Politics? Adaptation Value? (use concise narrative) |
| **CARBON INVENTORY** | | | | | | | | | |
| 1 | Establish a carbon inventory for all Oregon forests. This will require a collaborative effort to define and develop an agreed upon approach for developing and maintaining a carbon inventory system. Based on these data, establish baselines and both long-term and intermediate goals for carbon storage, for different forests types and ownerships, including overall storage gains in public forests. | ODOF | Technical Research | Short to long term | | | | | |
| **PUBLIC FORESTS** | | | | | | | | | |
| 2 | Use the Oregon carbon inventory, defined in 1.1 above, to establish a baseline and a carbon storage | ODOF | Standard | Long | | | | | |

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| | goal for public lands. | | | | | | | | |
| 3 | All timber management planning and public forest transactions (e.g., timber sales, offset sales) should include net impact on Oregon's carbon account. | ODOF | Standard<br>Information<br>Technical | Short to long term | | | | | |
| | ***Federal Forestlands Management (West/moist)*** | | | | | | | | |
| 4 | Federal Westside (moist) forests should be managed for carbon storage gains consistent with public benefits and other ecosystem values. Priority strategies should include strategic management supporting that carbon storage outcome, including longer rotations, minimum disturbance to soils and forest floor, sustained growth potential and preservation. | USFS<br>BLM | Regulation<br>Standard<br>Information<br>Technical<br>Research | Short to Long term | | | | | |
| | ***Federal Forestlands Management (East/dry)*** | | | | | | | | |

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| 5 | Federal Eastside (dry) forests should be managed for stability of long-term carbon storage and minimum carbon debt (loss) consistent with other ecosystem values. Priority strategies should include thinning and other fuel load reductions, restoration of historic fire cycles, and restoration and protection of forest ecosystem function. | USFS<br>BLM | Regulation<br>Standard<br>Information<br>Technical<br>Research | Short to Long term | | | | | |
| 6 | Consistent with the minimum carbon debt objective in 2.4.1, fuel load reduction strategies should establish (1) durable products and (2) fuel supply for biomass conversion, as priority uses of removed materials. To support private capital investment in biomass-to-energy facilities, firm ten to twenty year fuel supply contracts should be made available. | USFS<br>BLM<br>ODOF | Regulation<br>Standard<br>Technical | Short to long term | | | | | |
| | ***Existing State Forestlands Management*** | | | | | | | | |
| 7 | Oregon State forestlands should be managed to increase carbon stores over time, consistent with | ODOF | Standard | Short to long term | | | | | |

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| | ecosystem values and yield of durable forest product. | | | | | | | | |
| 8 | The Oregon Department of Forestry should explore opportunities to act on behalf of private small woodlot owners in offering aggregated private and public forest carbon offsets to the ecosystem services market. | ODOF | Technical<br>Funding | Short to long term | | | | | |
| **PRIVATE FORESTLANDS MANAGEMENT** | | | | | | | | | |
| 9 | Private forestlands in Oregon should be managed for yield of durable product consistent with ecosystem values and no net loss of forested acreage at current overall carbon storage levels. | Private<br>ODOF | Incentive<br>Standard<br>Technical<br>Research<br>Funding | Short to long term | | | | | |
| 10 | Voluntary, state, regional and/or federal regulatory markets should develop incentives that are | Private | Incentive | Short to | | | | | |

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| | attractive to both investors and landowners (relative to other carbon reduction opportunities) for increasing carbon stores on private forestlands in ways that are additional, measurable and verifiable. Establish innovative incentive programs for private forests to promote carbon sequestration and/or offsets. | ODOF | Technical<br>Research<br>Funding | long term | | | | | |
| 11 | State of Oregon energy and forest policies should encourage private landowners to develop forest and range biomass production capabilities supporting biomass energy facilities where this can be done consistent with or enhancing ecosystem values. | ODOF<br>ODA<br>ODOE | Incentive<br>Technical<br>Research | Short to long term | | | | | |
| **URBAN FORESTS** | | | | | | | | | |
| 12 | Oregon urban areas should act to increase urban forest canopy cover, while selecting species and locating plantings to maximize opportunities for co- | ODOF<br>City | Incentive<br>Standard | Short to long term | | | | | |

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| | benefits (e.g., cooling/shading homes, businesses, streams and riparian areas). | | | | | | | | |
| **REFORESTATION/AFFORESTATION/ACQUISITION** | | | | | | | | | |
| 13 | The Federal government, the State and Oregon communities should seek reforestation opportunities on lands previously forested, irrespective of ownership. | USFS<br>BLM<br>ODOF<br>Private | Incentive<br>Standard<br>Technical | Short to Medium | | | | | |
| 14 | The Federal government should assure sufficient resources for reforestation on Federal forestlands. | USFS<br>BLM | Funding | Short to long term | | | | | |
| 15 | The State and Oregon communities should seek to acquire forestlands that can be conserved, restored and managed. | ODOF<br>County | Standard<br>Funding | Short to long term | | | | | |

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| 16 | Afforestation opportunities should also be sought and welcomed, but should be carefully evaluated for unintended consequences to ecosystem values before proceeding (e.g. "planting of non-native trees rather than natives"). | ODOF<br>ODA<br>ODFW<br>Private | Incentive<br>Funding | | | | | | |
| **RESEARCH** | | | | | | | | | |
| 17 | Oregon Climate Change Research Institute and the Oregon University System should collaborate with the Federal and State Government and private land owners to project and map actual changes in Oregon forest productivity, ecosystem function and species biodiversity and distribution, anticipated from climate change. | USFS<br>OCCRI<br>ODOF<br>ODFW | Research<br>Funding | Short to long term | | | | | |
| 18 | A significant effort within the broader scientific community should be given to identifying a comprehensive set of features, across sectors, | OUS<br>ODOF | Research<br>Funding | Short to long term | | | | | |

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| | predicted to be affected by changes in climate and their impact on carbon storage. These features, or indicators should become the focus of status and trend monitoring to inform adaptation planning at local and regional levels. | USFS<br>Private | | | | | | | |
| 19 | Oregon Department of Forestry, Department of Environmental Quality, and stakeholders, in collaboration with the Oregon University System and identified experts, should develop a strategy for use and reuse of durable forest products, along with carbon sequestration/gain values that may accrue. | ODOF<br>DEQ<br>OUS<br>Private | Incentive<br>Research<br>Funding | Short to long term | | | | | |
| 20 | Oregon University System, in collaboration with other relevant research entities, will support the research and design of information and tools necessary to support the carbon inventory system outlined in Section 1.1. | OUS<br>ODOF<br>USFS<br>BLM | Research | Short to long term | | | | | |

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| **OTHER** | | | | | | | | | |
| 21 | The Global Warming Commission should convene, in 2011, a work group that includes members of the Materials/Waste Management and Forestry Technical Subcommittees, together with other stakeholders as appropriate, to further explore the question of valuing carbon content in forest products that are used as construction materials or otherwise are included in durable goods with a measurable life span, including substitution effects and long-term persistence of durable products. The team will also consider whether recommendations for incentives or policies are appropriate. | | Information | | | | | | |
| 22 | The Global Warming Commission will also, in 2011, take up the question of substitution effects on net atmospheric carbon resulting from different biofuels strategies. | | Information | | | | | | |

# APPENDIX B

## Forestry Technical Committee Members

| Name | Organization |
|---|---|
| Angus Duncan | Global Warming Commission |
| Andrew Yost | Oregon Department of Forestry |
| Brian Kernohan | Forest Capital Partners |
| Linc Cannon | Oregon Forest Industries Council |
| Beverly Law | Oregon State University |
| Elaine O'Neill | CORRIM |
| Greg Miller | Weyerhaeuser |
| Mark Harmon | Oregon State University |
| Olga Krankina | Oregon State University |
| Rick Brown | Defenders of Wildlife |
| Steve Dettman | EcoTrust |
| Evan Smith | The Conservation Fund |
| Mike Cloughsey | Oregon Forest Resource Institute |
| Peter Weisberg | The Climate Trust |
| Jeannette Griese | Bureau of Land Management |