Dear Members of the Maine Climate Council:

On behalf of the Natural and Working Lands (NWL) Work Group, we are very pleased to recommend the attached five overarching strategies and corresponding sub-strategies which, if implemented, would enable Maine's natural and working lands to offset the vast majority of Maine's greenhouse gas emissions and create far greater resilience within Maine's forestry, agriculture, and outdoor tourism sectors.

Over the past eight months, the members of the NWL Work Group met at least two dozen times, either in full group or in sub-group, to understand in detail the climate change-related threats to Maine's working forests, agricultural lands, and natural lands, and the potential these lands hold in offsetting Maine's greenhouse gas (GHG) emissions. We devoted individual meetings to each of these three major land types, learning from academic, departmental, nonprofit, and industry experts, with Work Group members reading extensive technical materials in advance of each meeting. Public attendance and participation was high at nearly all meetings, and the Work Group benefitted from these individuals' comments and suggested technical resources. A two-week public input period to react to draft strategies elicited 75 pages of comments from 91 individuals and organizations. This feedback significantly influenced the Work Group's final strategies.

We are pleased to report that this process resulted in the unanimous support by the entire Work Group (but for one sub-strategy in which one Work Group member's opposition is noted**) of all proposed strategies and sub-strategies submitted today.**

Maine's extensive natural and working lands play an absolutely essential role in capturing atmospheric carbon. Currently, Maine forestland sequesters the equivalent of 75% of Maine's GHG emissions. The State's natural and working lands hold a tremendous potential - with greater focus and investment - to sequester even more carbon and offset further emissions from all other sectors of Maine's economy.

The proposed strategies - taken as a whole - can deliver this potential. The majority of the sub-strategies are time-tested methods, proven to be highly effective. Every additional acre of natural and working land conserved and actively managed for climate outcomes will bring Maine closer to its goal of carbon neutrality, while every acre lost to development or not actively managed will make the State's goal less attainable.

Maine has a powerful story to tell. It is the most heavily forested state in the country (more than 89%). Our natural and working lands have always been among our greatest assets, serving as the foundation for our strong natural resource-based economy. For generations these lands have provided good paying jobs, food, wildlife habitat, and opportunities for recreation. With proper investment, we can add to that long list of positive attributes and declare Maine's natural and working lands a major driver in Maine achieving its goal of carbon neutrality by 2045.

Thank you for your consideration. We look forward to discussing these strategies on June 18th, and throughout the summer and fall as the Council evaluates these and other recommendations.

Sincerely,

Amanda Beal, Commissioner, Maine Department of Agriculture, Conservation & Forestry

Tom Abello, Senior Policy Advisor, Governor's Office

Maine Climate Council
Natural and Working Lands Work Group
Final Strategy Compilation
June 8, 2020

1. **Protect and conserve working and natural lands and waters through a dedicated, sustained funding source to support a robust forest products and agricultural economy, increase carbon storage opportunities, avoid future emissions, and enhance climate adaptation and resilience**

    a. Increase permanent protection of forest land and farmland (especially prime agricultural soils and soils of statewide significance) via conservation easements and fee acquisition

    b. Conserve areas of high biodiversity value and areas that support land and water connectivity and ecosystem health, as informed by Beginning with Habitat Focal Areas and other conservation planning tools from Maine's natural resource agencies

    c. Revise scoring criteria for state and federal land conservation funding sources (e.g. Maine Natural Resource Conservation Program, Land for Maine's Future Program, Forest Legacy Program, and Maine Outdoor Heritage Fund) to incorporate climate mitigation and resiliency goals into grant criteria and project selection

2. **Create new and update existing financial incentives and support for private land management and infrastructure that supports climate mitigation and adaptation**

    a. Establish a stakeholder process to develop a voluntary, incentive-based Maine forest carbon program (practice and/or inventory based) for woodland owners of 10 to 5,000 acres, and forest practitioners, to increase carbon storage and encourage forest management while maintaining current timber harvest levels (**See Question 6. Further details on Strategy 2a. Maine Forest Carbon Program Considerations**)

    b. Address land taxation policy through legislation introduced by the Governor to:
        i. Update the Open Space Current Use Taxation Program in a manner that incentivizes climate-friendly land management practices, makes it more attractive to woodland owners, and enables landowners to move between Tree Growth and Open Space as land management objectives change
        ii. Update Farmland Current Use Taxation Program in a manner that encourages broader use of the Program and incentivizes farmland management practices with climate mitigation and adaptation benefits
        iii. Operationalize and fund the currently eligible but unused "wildlife habitat" criterion of the Farm and Open Space Tax Law (36 M.R.S. §1101-1121) to provide landowner

financial incentives for conserving parcels with land and water resources of high biodiversity value, including species and habitats at risk of decline from climate change

iv. Maintain the Tree Growth Tax Law as an established program for landowners committed to active forest management

c. Provide funding to support the use of agricultural and forestry mitigation and adaptation practices; incentivize infrastructure and technology upgrades to support the adoption of those practices including on-farm renewable energy use and other strategies to reduce fossil-fuel usage

d. Reduce CO_2 emissions from fossil fuels used for building heat/power by encouraging the consideration of installation of efficient modern wood heat/power technology in homes, businesses, schools, hospitals and other institutions

e. Encourage high quality on-the-ground performance by loggers, and facilitate the use of low-impact timber harvesting equipment

f. Increase funding to improve aquatic connectivity at private and publicly owned barriers (including dams and road-crossing infrastructure), using Stream Smart practices for freshwater bridges and culverts, Coast Wise practices for tidal crossings, and a temporary steel bridge cost share program for forestry operations (administered by the Maine Forest Service), thereby reducing flooding damage, supporting habitat functionality, and responding to seal level rise

g. Provide financial support to strengthen Maine's food systems, so that more food can be produced and processed locally, distributed efficiently, and priced affordably

3. Provide technical assistance on natural climate solutions to landowners, land managers and agricultural producers

a. Forestry Assistance: Add significant field forester capacity to the DACF's Maine Forest Service to support landowner and land practitioner adoption of carbon-friendly and resilient forest management practices, through outreach, education, and technical assistance

b. Agricultural Assistance: Make natural climate solutions (such as soil health practices) a priority in federal and state agricultural programs, and increase technical service provider capacity to Soil & Water Conservation Districts, University of Maine Cooperative

Extension, NRCS, and non-governmental organizations to assist producers in using known and emerging agricultural practices with mitigation and adaptation benefits

c. Natural Land Assistance: Increase technical service provider capacity to DIFW's Beginning with Habitat Program and DACF's Maine Natural Areas Program to support towns, land trusts, land managers, and landowners in their efforts to conserve native species and land and water resources vulnerable to climate change and to address climate-related threats such as invasive species

4. Update and refocus state programs and policies to address climate mitigation and resilience

a. Continue and enhance climate-friendly public land management practices

   i. Update DACF's Bureau of Parks & Lands Integrated Resource Policy (IRP) to incorporate current climate science and management priorities for enhancing landscape and species resiliency and mitigating climate change

   ii. Maintain support for, and consider expansion of, the state's Ecological Reserve System (ERS), and update ERS legislation and mandates to reflect new science on climate change threats, mitigation opportunities, and landscape resiliency

   iii. Incorporate principles of climate science and landscape resiliency when evaluating and prioritizing future land acquisitions by DACF and DIFW

b. Update existing policy and staffing needs to support comprehensive, accurate, and timely environmental review of land and water resources and permitting of projects under environmental regulations, thereby ensuring smart development, shoreland protection, and appropriate renewable energy project siting

c. Assess and improve state, regional and local land use planning efforts, policies and regulations to promote climate mitigation, resilience, and adaptation, as well as carbon storage

   i. Enhance existing and develop new land use planning tools and policies that encourage greater state coordination to reconcile competing land uses and promote efficiency, particularly with regard to environmental review

   ii. Prioritize the retention of valuable working and natural lands, especially prime agricultural soils and forest land, in balance with renewable energy development

d. Increase climate education related to forestry, agriculture and natural lands, through public school curricula, consumer awareness, and landowner information

e. Develop and enhance marketing programs for Maine forest products, in coordination with programs such as ForMaine, focused on climate-friendly bio-based wood market innovation including Cross Laminated Timber (CLT), cellulosic insulation, pyrolysis oil, nanocellulosic materials, advanced biofuels, and bioplastics. Issue an Executive Order to seek opportunities in State construction projects to use Mass Timber (including CLT) building technologies, and to encourage related manufacturing facilities to locate in Maine

5. Strengthen research and development, and monitoring of climate mitigation and adaptation practices

a. Create a sustained source of funding for research on climate change and climate mitigation and adaptation strategies

   i. Conduct research in support of agriculture and forestry mitigation and adaptation practices

   ii. Promote research and monitoring to inform adaptive management practices designed to conserve climate-sensitive species and habitats

b. Establish the University of Maine as the coordinating hub for partnerships among academia, the private sector, and state government in Maine, for research on forestry, agriculture, and natural land-related climate concerns

c. Continue to invest in the University of Maine research facilities in their efforts to become a globally recognized hub for climate-friendly bio-based wood market innovation, including Cross Laminated Timber (CLT), cellulosic insulation, pyrolysis oil, nanocellulosic materials, advanced biofuels, and bioplastics

d. Promote research, development and planning efforts supporting the growth and stability of Maine food systems

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Natural & Working Lands Work Group
Recommended Climate Strategies, Actions and Measurable Outcomes

1. Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.

Strategy # 1: Protect and conserve working and natural lands and waters through a dedicated, sustained funding source to support a robust forest products and agricultural economy, increase carbon storage opportunities, avoid future emissions, and enhance climate adaptation and resilience

a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**

This strategy addresses both mitigation and adaptation objectives.

In 2019, the Maine Land Conservation Task Force produced a set of recommendations designed to guide the next generation of land conservation in Maine. Of the Task Force's six recommendations, one was to "**Target land conservation efforts to effectively protect critical natural resources and help Maine combat and adapt to a changing climate."** This Natural and Working Lands Work Group recommendation aligns fully with the Task Force's recommendation.

Natural areas like forests, farms, and wetlands provide essential ecosystem services including storing vast amounts of carbon, and providing natural protection of vital community resources including clean drinking water. Continued conservation of these lands is critical to ensuring that carbon sequestration capacity grows, and that these community resources are protected. In addition to helping to stabilize global warming, these lands support Maine's vital forestry and agricultural economies. Together, Maine's forestry and agriculture sectors account for over $12 billion in annual sales, and make up over 7% of Maine's workforce. These substantial economic contributions obviously depend on forests and farmland remaining available and affordable.

In addition, biodiversity focal areas of statewide significance host species and habitats most vulnerable to climate change and places most likely to serve as refugia for biodiversity in a changing climate. These designated hotspots comprise a relatively small area of the Maine landscape, but can have an outsized role in improving the adaptive capacity of Maine's biological diversity.

This strategy can be accomplished by creating a sustained funding source for permanent protection of forest land, farm land, and areas of exceptional biodiversity value via conservation easements and fee acquisition. This new, sustained funding source would most logically flow to Maine's primary existing land conservation funding program, the Land for Maine's Future (LMF) program. LMF's scoring criteria would be revised to incorporate climate mitigation and resiliency goals into its project selection criteria.

While exact numbers are difficult to obtain, well over 2 million acres of land has been conserved in Maine over the past three decades through federal, state, municipal and private efforts and funding mechanisms. To support maintenance of current levels of carbon capture, and accelerate land conservation efforts to guard against permanent land conversion and increase carbon capture, conservation of lands through the Land for Maine's Future Program for these essential purposes should exceed historical rates of land conservation under this Program.

Established by Maine voters in 1987, the Land for Maine's Future Program has conserved more than 600,000 acres of forests, recreational lands, working farms and waterfronts, and important wildlife habitat. On six occasions, Maine people have given the LMF program resounding support at the ballot box - passing six bond measures between 1987 and 2012. These investments have strengthened Maine's most natural resource industries including forestry, agriculture and outdoor recreational tourism, while making Maine a more desirable place to live and raise a family. It is well past time to create a sustained funding source for this highly successful program.

Additionally, Maine's other land conservation funding programs' grant and project selection criteria would be revised to incorporate climate mitigation and resiliency goals. The programs include, for example, the Maine Natural Resource Conservation Program, the Forest Legacy Program (these are federal monies, but the state can influence where they are spent), and the Maine Outdoor Heritage Fund.

Given the advanced average age of Maine's farmers, and ongoing development pressure on farmland, roughly 400,000 acres of farmland is expected to be in transition in the state over the next 10-20 years. This will require a much greater level of investment to prevent farmland conversion than Maine has historically dedicated to this purpose. Maine lags far behind other New England states in its financial investment for farmland protection, allocating $12.5 million through LMF since the Program's inception, as compared, for instance, to MA, VT, RI and NH which have invested $233M, $81M, $36M, and $19M respectively. Conserving all types of farmland is important, but given that prime agricultural soils and soils of statewide significance are limited resources in Maine, providing for their conservation is especially important for the agricultural sector.

Areas of exceptional biodiversity value would be informed by Beginning with Habitat Focal Areas and other conservation planning tools from the Maine Department of Agriculture, Conservation & Forestry (DACF) Maine Natural Areas Program, and the Maine Department of Inland Fisheries & Wildlife (DIFW).

Conserving working forestland addresses the need to increase carbon sequestration. It provides greater stability within the forestry sector and gives landowners and land practitioners the confidence to invest in carbon-friendly land management practices.

Strategic land conservation addresses the need to build community resiliency and protect drinking water supplies in the face of flood hazards and sea level rise.

Conservation of resilient landscapes will reduce the vulnerability of Maine wildlife and natural resources to climate change, in turn reducing the vulnerability of Maine's people and economy that rely on those resources for their livelihood.

Conserving farmland is critical for ensuring there is the land base to support the agricultural sector, thereby helping to ensure the resiliency of this important element of Maine's economy and its ability to provide food security to communities across the state.

b. **List any site-specific geographies where the strategy would be applied.**

This strategy would be applied appropriately across Maine's natural and working lands.

2. What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?

There is a need for agricultural and forest land acreage loss through permanent conversion to be more closely tracked and quantified. Specific measurable outcomes would include: slowing this rate of loss and exceeding historical rates of land protection that have been achieved through multiple land protection programs, including the Land for Maine's Future Program. Future agricultural land conservation efforts should not be tied to historical rates of protection given that insufficient resources have historically been allocated to this land category.

a. For mitigation strategies:

i. What is the estimated CO_2e savings (metric tons) by 2025, 2030, 2050?

Currently, Maine's forest lands are estimated to capture ~13 million metric tons of CO_2e per year. This effectively equates to ~75**%** of Maine's current GHG emissions.

Research is underway through a New England educational and nonprofit partnership to produce a customized estimate of carbon benefits from avoided forest conversion, that includes estimates of forest carbon sequestration. Also, a UMaine study (the Natural Climate Solutions Initiative) currently underway will be assessing the climate mitigation and adaptation benefits associated with farmland and forestland conservation in Maine. Results are expected in June.

ii. What is the cost effectiveness of those reductions (cost per ton of CO_2e reduced) and the total cost?

This strategy is intended to prevent loss of current carbon capture and increase carbon sequestration capacity. ERG is assessing potential carbon storage losses if there is a decline in forest and agricultural lands across the State.

b. Are outcomes measurable with current monitoring systems?

Yes. Maine's GIS databases and easement registries currently record both conserved lands held in fee and under easement. The Maine Forest Service is capable of measuring forest land acreage

loss. The University of Maine has remote sensing capability to assess forest land conversation as well. The Ag. Census produced by USDA every 5 years provides data on farmland acreage. Emerging technology utilizing remote sensing has the capability to inventory biodiverse lands.

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

a. Increase permanent protection of forest land and farmland (especially prime agricultural soils and soils of statewide significance) via conservation easements and fee acquisition

b. Conserve areas of high biodiversity value and areas that support land and water connectivity and ecosystem health, as informed by Beginning with Habitat Focal Areas and other conservation planning tools from Maine's natural resource agencies

c. Revise scoring criteria for state and federal land conservation funding sources (e.g. Maine Natural Resource Conservation Program, Land for Maine's Future Program, Forest Legacy Program, and Maine Outdoor Heritage Fund) to incorporate climate mitigation and resiliency goals into grant criteria and project selection

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	**X**	**X**	**X**	**X**
To realize outcomes		**X**	**X**	**X**

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?
Forest industry. The Maine forest products industry has a total estimated 2016 statewide economic impact contribution, including multiplier effect, of $8.5 billion in sales output, over 33,500 full- or part-time positions, and $1.8 billion in labor income. This is 4.13 percent of the employment in Maine. The conservation of working forestland helps to safeguard these jobs.

Agriculture industry. Farming and its related industries are a key component of Maine's economy, contributing almost $3.8 billion in statewide total sales and supporting over 24,000 jobs statewide.[1] Maintaining jobs in the agriculture sector includes agriculture-support industries such as feed stores/companies, veterinarians, farm equipment providers, and others.

Outdoor recreation tourism and economy. Retaining healthy fish and wildlife populations and well managed natural and working lands contributes to Maine's outdoor recreation economy, which generates $8.2 billion in spending and supports 76,000 jobs. A study in 2013 determined that hunting and fishing alone contributed over $650 million to Maine's economy while supporting nearly 7,000 jobs. The economics of wildlife viewing are not yet quantified in Maine, but at least 47 million bird watchers spent $7 billion nationwide during 2016.

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[1] Farm Credit East, "Northeast Economic Engine: Agriculture, Forest Products and Commercial Fishing," (2015), 8-9, available at: https://www.farmcrediteast.com/knowledge-exchange/Reports/northeast-economic-engine-agriculture-forest-products-and-commercial-fishing; Rigoberto A. Lopez, et al., "*Economic Impacts of Agriculture in Eight Northeastern States: A Report for Farm Credit East,"* University of Connecticut, *(2014), 23.* Available at: http://zwickcenter.uconn.edu/documents/ResearchReportno2.pdf.

Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduced natural hazard risk, increased recreation, avoided damage)?

Carbon sequestration. Permanent protection of working and natural lands will help maintain existing significant carbon stores, while also enabling increased carbon sequestration.

Sustainable timber supply. Forestland protection, accomplished primarily through working forest easements, ensures a permanent supply of timber to support Maine's forest products industry.

Secure Food Supply. Conserving farmland permanently ensures an agricultural land base to support a local food economy, thereby increasing long-term food security in Maine.

Economic contributions. Working lands protected by conservation easement continue to support the local tax base, and provide additional economic benefits by avoiding the costs of public services associated with development.

Outdoor recreation tourism and economy. Conserved lands support Maine's wild character and uniqueness of place, provide substantial public access benefits to Maine residents, and form the basis of the State's outdoor recreation economy.

Habitat connectivity. Conserving priority lands will address wildlife habitat fragmentation, providing habitat connectivity for species at greatest risk from climate change.

Drinking water protection. Conserving high priority forest land is the most efficient and economical way to protect water quality, thereby permanently ensuring safe drinking water supplies to Maine communities.

Flood hazard and erosion control protection. Conservation land provides essential protection against extreme weather events, safeguarding communities and protecting essential infrastructure.

Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?

Maintaining Maine's historical rate of successes in land conservation through the Land for Maine's Future Program alone would require $5 million in annual funding (from 1998 to 2010, LMF helped to annually conserve an average of 42,300 acres using an average of $4.85 million).

These figures, however, understate by orders of magnitude the level of funding that has been brought to bear for land conservation in Maine over the past three decades, via federal, private, and other state and municipal funding sources. **To achieve the potential that natural and working lands possess in mitigating climate change, a substantial investment in land conservation is required.**

The Trust for Public Land has been engaged by the Natural and Working Lands Work Group to perform a feasibility study to identify possible permanent funding sources for natural climate solutions, of which land conservation is a major part.

Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?

This strategy is expected to disproportionately benefit rural residents and communities. Maine's forestry and agricultural sectors, the primary beneficiaries of land conservation, are predominantly located in rural areas.

Providing a consistent source of funding for farmland protection would provide funding to farmers, many of whom qualify as low-income, to protect their land, allowing them to use the funds they receive to reinvest in the farm, pay off debt, or extract some equity before passing the farm on to the next generation. Farmland conservation also supports farmland access by allowing the land to be sold at its "farm use value," making the farmland more affordable for a subsequent farmer, which is especially important for new and beginning farmers, as well as

New American farmers. Farmland protection is also an important component of strengthening the local food system by ensuring there is the land base to support the agricultural sector and that low-income, rural, and vulnerable residents have access to food in unstable times. The cost burden will be dependent on the funding source(s). There is precedent in other states in developing funding sources that have a strong nexus to the areas that the funding would benefit or areas that conflict with natural climate solutions/land conservation, such as a sporting goods sales tax dedication or a real estate transfer tax. Such a nexus is generally perceived as being equitable.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?
Programs to implement this strategy are already in place, and have been extremely successful when funded. Current limits on funding for land conservation are barriers to further implementation. All programs' scoring and project selection criteria would need to be revised to incorporate climate mitigation and resiliency goals. Other New England states (MA and VT) have highly successful land conservation programs supported by permanently authorized funding. These and others can serve as models for establishing a sustained source of funding for land conservation in Maine. The feasibility study being undertaken by Trust for Public Land will assist in identifying viable funding options for Maine.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?
Statutory authority exists for land conservation programs. As noted above, the Trust for Public Land will perform a feasibility study to identify possible permanent funding sources. There is a strong likelihood that a consistent, sufficient, dedicated funding stream would require legislation. Some revisions may be needed to direct programs toward climate mitigation and adaptation as priority considerations.

6. Rationale/Background Information

Significant public comment was received advocating for setting a specific acreage or funding goal to ensure strong progress is made on this strategy.

****Please footnote substantive disagreements among the Working Group members**

Natural & Working Lands Work Group
Recommended Climate Strategies, Actions and Measurable Outcomes

1. Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.

Strategy # 2: Create new and update existing financial incentives and support for private land management and infrastructure that supports climate mitigation and adaptation (see specific sub-strategies in question 3)

a. For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?

This strategy addresses both mitigation and adaptation objectives. It addresses the need for Maine's commercial forests, natural lands and agricultural lands to capture and store as much carbon as possible to make a significant contribution to realizing the Governor's GHG reduction goals. Maine's forests are already sequestering **75%** of Maine's GHG emissions, and concrete measures are required to ensure this level of sequestration does not decline. Beyond this, specific sub-strategies incentivize private and industrial landowners to implement sustainable forest management practices to increase carbon storage as well as increasing resilience in response to climate change. Incentivizing climate-friendly land management practices will also result in greater adaptation and resiliency for forest and farm landowners and land managers in the face of climate change.

In addition, while the forestry and agriculture sectors sequester significant carbon, incentives are needed to reduce fossil-fuel usage and minimize soil disturbance that results in carbon loss. Upgrading road crossing infrastructure addresses areas most vulnerable to flooding as a result of increased extreme weather events while also creating effective wildlife corridors necessary for adaptation. Strengthening the local food system addresses climate impacts from emissions associated with long-distance transport of food to reach Maine consumers.

b. List any site-specific geographies where the strategy would be applied.

This strategy would be applied appropriately across Maine's natural and working lands.

2. What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?

Specific measurable outcomes include: increase in enrollment in Open Space and Farmland Current Use Tax programs; increase in carbon sequestration from improved forest management and agricultural practices; farm resilience to impacts from climate change; # of new wood heat

technology units; reduced size and impact of flooding events on transportation infrastructure; increase in sales of local farm products.

a. **For mitigation strategies:**
   i. What is the estimated CO_2e savings (metric tons) by 2025, 2030, 2050?

Currently, Maine's are estimated to capture ~13 million metric tons of CO_2e per year. This effectively equates to ~75**%** of Maine's current GHG emissions. The incentives are intended to retain this level of carbon capture, while also increasing carbon sequestration capacity. A UMaine study is currently underway to identify the most impactful forest and farm-based climate mitigation practices and quantify their climate benefits and potential costs. Results are expected in June. Installation of modern wood heat/power technology would reduce CO_2 emissions, with impact dependent on scale.

ii. What is the cost effectiveness of those reductions (cost per ton of CO_2e reduced) and the total cost?

This strategy is intended to incentivize carbon-friendly private land management and infrastructure, resulting in increased climate mitigation and adaptation. The UMaine study referenced above will provide analysis of cost effectiveness for forest and farm natural climate solutions practices. Total cost and cost effectiveness of other financial incentives remains to be analyzed.

b. **Are outcomes measurable with current monitoring systems?**

Yes (attribution of results will be difficult, as multiple strategies will have complementary and overlapping influences on climate outcomes).

3. **What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?**

a. Establish a stakeholder process to develop a voluntary, incentive-based Maine forest carbon program (practice and/or inventory based) for woodland owners of 10 to 5,000 acres, and forest practitioners, to increase carbon storage and encourage forest management while maintaining current timber harvest levels (**See Question 6. Further details on Strategy 2a. Maine Forest Carbon Program Considerations**)

b. Address land taxation policy through legislation introduced by the Governor to:

   i. Update the Open Space Current Use Taxation Program in a manner that incentivizes climate-friendly land management practices, makes it more attractive to woodland owners, and enables landowners to move between Tree Growth and Open Space as land management objectives change

ii. Update Farmland Current Use Taxation Program in a manner that encourages broader use of the Program and incentivizes farmland management practices with climate mitigation and adaptation benefits

iii. Operationalize and fund the currently eligible but unused "wildlife habitat" criterion of the Farm and Open Space Tax Law (36 M.R.S. §1101-1121) to provide landowner financial incentives for conserving parcels with land and water resources of high biodiversity value, including species and habitats at risk of decline from climate change

iv. Maintain the Tree Growth Tax Law as an established program for landowners committed to active forest management

c. Provide funding to support the use of agricultural and forestry mitigation and adaptation practices; incentivize infrastructure and technology upgrades to support the adoption of those practices including on-farm renewable energy use and other strategies to reduce fossil-fuel usage

d. Reduce CO_2 emissions from fossil fuels used for building heat/power by encouraging the consideration of installation of efficient modern wood heat/power technology in homes, businesses, schools, hospitals and other institutions

e. Encourage high quality on-the-ground performance by loggers, and facilitate the use of low-impact timber harvesting equipment

f. Increase funding to improve aquatic connectivity at private and publicly owned barriers (including dams and road-crossing infrastructure), using Stream Smart practices for freshwater bridges and culverts, Coast Wise practices for tidal crossings, and a temporary steel bridge cost share program for forestry operations (administered by the Maine Forest Service), thereby reducing flooding damage, supporting habitat functionality, and responding to seal level rise

g. Provide financial support to strengthen Maine's food systems, so that more food can be produced and processed locally, distributed efficiently, and priced affordably

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	**X**	**X**	**X**	**X**
To realize outcomes		**X**	**X**	**X**

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?
Financial incentives will improve economic viability for woodland owners and farmers and sustain the forest products, agriculture, and outdoor recreation economies. These industries and the lands that support them are essential to Maine's economy and the quality of life that attracts and retains Maine residents and businesses. An incentive-based voluntary forest carbon program will create jobs for private consulting foresters to develop forest management plans that maximize carbon storage. There will also be an increased need for technical assistance providers to assist landowners in the adoption and implementation of land management practices that support adaptation and mitigation. Enrollment in current use taxation programs will provide some tax relief for landowners, helping farmers in particular to stay in business. Likewise, the adoption of climate-friendly agricultural practices produces greater yields and lower production costs, resulting in greater farm resiliency and financial viability, ultimately helping farmers to stay in business. These results will have a multiplier effect. For instance, farmers maintain the need for jobs in related industries such as feed stores/companies, veterinarians, farm equipment providers, etc. Job opportunities associated with wood heat/power technology will be created. The expanded use of climate-friendly timber harvesting practices, as envisioned, will require certified logging companies and third party certifiers to verify timber harvesting practices. Improvement of road crossing infrastructure requires significant use of Maine engineers and contractors.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduced natural hazard risk, increased recreation, avoided damage)?
Incentives to practice informed forest stewardship and maintain older forest or increase stand stocking will help maintain significant existing forest carbon stores, while also enabling increased carbon sequestration. Incentives will build resilience of forest lands, resulting in increased productivity, improved watershed function, protection of outdoor recreational resources, improved wildlife habitat, and protection from pests and pathogens.

Providing financial incentives to forestland owners and agricultural producers will support greater usage of land management practices that have climate mitigation and adaptation benefits by overcoming the costs associated with switching to new management systems or practices, as well as using any related new equipment or infrastructure to implement those systems and practices.

Financial incentives will allow for increased use of agricultural practices that build the health of the soil. Soil health is fundamental to sustainable food systems, and to mitigating and adapting to climate change. Incentivizing climate-friendly management practices on Maine farms will help farm businesses become more resilient, improve farm viability, and ensure that the state retains the necessary farmland base to strengthen the local and regional food system and food economy.

Incentivizing land to be kept as farmland and forestland will avoid the future emissions that would be associated with its residential or commercial development, preserving the land's mitigation potential.

With energy usage being one of the greatest sources of emissions for the forest harvesting and agricultural sectors, incentivizing landowners and operators to invest in energy infrastructure and equipment upgrades will reduce the use of fossil fuels and association carbon emissions.

Installation of modern wood appliance for heat/power generation will a) substantially reduce CO_2 emissions created by fossil fuels for building heat in Maine; b) nurture a homegrown energy economy; c) create a market for sawmill residuals, slash, precommercial thinning, and poor quality trees; and d) encourage increased certification of Maine's forests and logging practices, supporting a renewable source of energy.

Upgrading road crossing bridge and culvert infrastructure, specifically through the use of Stream Smart practices, improves fish and wildlife habitat, protects roads and public safety, and reduces ongoing maintenance costs.

Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?

Providing financial incentives to help landowners adopt climate smart land management practices will require funding on the part of state and federal governments. However, some established state funding programs through DACF could be reorganized to provide this financial support in the near-term, with the goal of establishing a more focused source of funding in the future. Funding can also be sought from existing NRCS programs.

DEP currently provides competitive grants for Stream Smart projects to match local funding. This funding would need to increase for broader implementation and impact.

Encouraging greater and more targeted use of Current Use Taxation Programs could result in reduced property tax revenue for municipalities, but municipalities have utilized the Programs

out of recognition that other benefits provided by forests and farms in their communities greatly outweigh the loss of property tax revenue.

The Trust for Public Land has been engaged by the Natural and Working Lands Work Group to perform a feasibility study to identify possible permanent funding sources for natural climate solutions.

Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?

This strategy will strongly benefit the most rural parts of the state. Rural communities are highly dependent on financially viable forestry and farming operations. These operations are the economic backbone of many rural communities, and residents rely on them for the rural jobs that they provide.

Strengthening the local food system will ensure that low-income, rural, and vulnerable residents will have access to food in increasingly unstable conditions caused by climate change.

Maine has a growing number of farms operated by New Americans who will also benefit from these incentives. Property tax reductions associated with Current Use Taxation Programs would also allow for greater farmland access for new and socially disadvantaged (Farm Bill term) farmers.

Equitable benefit distribution will depend on effective outreach to underserved or remote populations and locations.

Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?

In general, yes, this is a proven strategy that is feasible to implement, with aspects that are already taking place in Maine or in other jurisdictions.

Specific components of the strategy vary in their ease of implementation.

2.a. proposes development of a new program that will require substantial effort in appropriate design, but which can be informed by existing forest carbon offset and incentive programs and current Maine-based research (see further details in Question 6)

2.b. proposes enhancement of Maine's existing current use tax programs – this is a proven and widely accepted strategy.

2.c. is already successfully taking place in Maine through DACF and NRCS grants and cost-share programs to fund soil conservation and forest management. The biggest barrier is educating farmers and forest landowners about the fact that these opportunities exist and helping them enroll.

2.d. reestablishes and expands a former successful Maine program

2.e. builds on an existing successful program in Maine 2.f. builds on successful Maine programs 2.g. builds on current ACF and DECD programs (Eat Maine, etc)
Legal authority - Does the strategy require new statutory (legal/legislative) authority?
Yes. Legislation would be required to amend the Open Space and Farmland Current Use Taxation Law, establish and/or fund state cost-sharing programs for soil and forest health, and establish and fund a Maine forest carbon program
The Trust for Public Land feasibility study being undertaken to identify possible permanent funding sources for natural climate solutions (see Costs section above) should explore whether Renewable Energy Credits could be used as a funding source for forest carbon program enrollees, shifting funding away from the General Fund and to the Renewable Portfolio Standard.

6. Rationale/Background Information

Further details on Strategy 2a. Maine Forest Carbon Program Considerations -

Purpose: Increase carbon storage on Maine forestland and reduce atmospheric greenhouse gas concentrations over time through a voluntary program that would keep forests as forests and help maintain current statewide harvest levels. Seek to develop two options:

- incentives for voluntary commitments of landowners to maintain increased carbon stocking, and
- incentives for implementation of practices known to contribute to increased carbon stocking.

Guiding Principles:

- Do no harm to the forestry community: landowners, loggers, foresters, industry. Recognize potential to grow the industry – both new and current products.
- Recognize a continued supply of wood products is integral to Maine's economy.
- Do no harm to existing programs that work well (e.g. Tree Growth Tax Law).
- Program should be simple, easy to participate, easy to administer, and accountable for the use of funds.
- A timeframe for stocking commitments of 20-30 years should be selected to be workable for family woodland owners and relevant to mid-century atmospheric greenhouse gas reduction goals.

Incentives for Practitioners:

- Consider development of financial incentives for practitioners including foresters and loggers to provide services that advance program goals.

Eligibility Requirements for Landowner Incentives:

- Program incentives will be targeted to owners of 10 - 5,000 acres. This acreage range is consistent with the Forest Stewardship/WoodsWise Program (WW) now administered by MFS.
- Entire wooded portion of parcel must be enrolled.
- Landowner must have a forest management plan, with a timber cruise, written to WW standards.
- Landowner determines silvicultural practices to implement. Harvest plan support would be made available (WW standards).

Landowner Agreements and Accountability:

- Participating landowner would enter into a written, 20-30 year agreement with the MFS.
- The agreement will "run with the land" and be filed at the Registry of Deeds as an enforceable deed restriction.
- Agreements would be renewable; landowner must notify before expiration of agreement if they wish to remain in the program for another term or to opt out at end of contract.

- If landowner violates the terms of the agreement, or chooses to participate in voluntary or compliance carbon markets during the term of the agreement, landowner must return any payments to program with interest at prevailing rate.
- Provisions would be included to limit landowner liability for natural disasters, disease outbreaks, or other events beyond the landowner's control.

Needs:

- Additional MFS staff.
- Training in program administration for private sector consulting foresters and loggers.
- Explore investing in LIDAR and making it available for inventory determination, management, and verification.

Other points:

- A stakeholder process that would develop a voluntary incentive-based forest carbon program was originally conceived with a focus on smaller private landowners, many of whom do not actively manage their forests or use professional foresters. Landowners with larger acreages generally can participate in existing voluntary or regulatory carbon markets, as they typically

can afford the associated transaction and verification costs. However, the State should also explore opportunities to encourage high potential carbon sequestration on larger private ownerships.

Further details on Strategy 2.b. - The Natural and Working Lands Work Group acknowledges the public concern that current use taxation programs affect all landowners in the towns in which specific land tax reductions occur, causing other landowners to assume an additional tax burden. To be most effective, current use taxation programs must address this funding challenge.

Further details on Strategy 2.b.i. - Open Space Current Use Taxation Program - While the Tree Growth Tax Law (TGTL) program has been frequently scrutinized, the Open Space (OS) program has seen little change or assessment since it was first established. It is the logical alternative for woodland owners unwilling to commit to the TGTL program, which requires the land be managed primarily for tree growth and commercial harvest. However, in its current form, the OS program is underutilized. Modifications should be made to the program to make it more attractive to woodland owners, to result in forest land remaining intact and undeveloped. The time is ripe for a legislative task force to review and modify this program, to result in greater enrollment, and increased carbon sequestration on enrolled lands. Improvements could include enabling landowners to move between TGTL and OS as land management objectives change, providing reimbursement to municipalities to enhance program viability, and ensuring consistency in program implementation by municipalities.

Further details on Strategy 2.b.ii. - The Farmland current Use Taxation Program should be updated to both determine how there could be greater enrollment and determine how the Program could be restructured to incentivize climate smart agricultural and land management practices.

Further details on Strategy 2.b.iv. - Maine is the most forested state in the nation. The Tree Growth Tax Law Program has proven highly successful at keeping woodland in an undeveloped state and storing carbon, as well as producing other public benefits such as wildlife habitat, clean water, outdoor recreation opportunities, and wood for the forest products industry. Any effort that undermines this program deters woodland owner participation and puts these public values at risk.

Further details on Strategy 2.c. - DACF grant programs include: Agricultural Development Grants, Specialty Crop Block Grants, Dairy Improvement Fund, Farms For The Future Program, Woods Wise Incentives Program, Project Canopy, and others. Some of these grant programs could be revised to include carbon sequestration and climate resiliency as factors in setting priorities and scoring criteria for funding. USDA-NRCS is currently the primary funding source to landowners for agricultural and forestry conservation practices; additional state-level cost-sharing could supplement carbon management practices on farm and forest lands. Such cost-sharing would require a funding source and close coordination with NRCS, possibly through the

USDA Regional Conservation Partnership Program (RCPP). A few Soil & Water Conservation Districts have offered loan or rental programs for specialized soil health tools (such as no-till drills, cover crop seeders, etc.), but the efficacy and funding for such efforts needs review.

Further details on Strategy 2.d. - The Natural and Working Lands Work Group notes that this sub-strategy generated a significant amount of public comment, the vast majority of which expressed strong opposition. Comments focused primarily on the concern that burning wood generates carbon dioxide emissions, and that a program would not necessarily be able to control the sources of the wood burned.

Further details on Strategy 2.e. - Expand the Maine Clean Water Revolving Loan Fund/Direct Link Loan (DLL)Program, administered by MFS in partnership with Maine DEP and Maine Municipal Bond Bank. The DLL Program provides reduced interest loans to logging companies for the purchase of equipment that helps protect water quality. As a result of rising equipment costs and demand for this technology, the DLL program has more demand than supply of funding. Also, the Northeast Master Logger (NML) program, which is third party certification of logging company practices, administered by the Trust to Conserve Northeast Forestlands, requires that participants implement techniques that protect soil resources and use techniques that provide minimal impact to residual stands. The NML program provides verification that high standards are being met at the point of harvest, by utilizing independent licensed foresters as auditors. A barrier for logging companies to participate in NML is the upfront cost of certification. Funds to help offset the cost of certification and auditing of the NML and other land and logger certification programs will help ensure logging performance is at a high level.

Further details on Strategy 2.f. - Stream Smart culverts maintain fish and wildlife habitat while protecting roads and public safety. In Maine, brook trout, Atlantic salmon, and other aquatic organisms get “stuck” at decaying, undersized stream culverts. Surveys show that up to 90% of Maine culvert crossings make movement up and down streams difficult or impossible for fish and wildlife at least part of the year, and often force semi-aquatic species like mink, raccoons, and river otter to move up and over the road, where they are subject to collisions with vehicles. When fish and wildlife habitat is fragmented like this, it can result in population declines and the loss of species. In addition to their fish and wildlife benefits, Stream Smart crossings last longer than traditional culverts and reduce maintenance costs, because the crossings can typically withstand flooding and can better weather increasingly intense storms without damaging the road, saving money over the long term.

Natural & Working Lands Work Group
Recommended Climate Strategies, Actions and Measurable Outcomes

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**

Strategy # 3: Provide technical assistance on natural climate solutions to landowners, land managers, and agricultural producers (see specific sub-strategies in question 3)

a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**

This strategy addresses both mitigation and adaptation objectives. In order to address the pressing need to sequester as much carbon as possible through natural and working lands, and also to build resilience within the farming, forestry, and outdoor recreation sectors in the face of climate change, a significant increase in technical support for landowners, land managers and municipalities is required.

Currently, Maine's forests are estimated to capture ~13 million metric tons of CO_2e per year. This effectively equates to ~75**%** of Maine's current GHG emissions. Concrete measures (such as financial incentives - see Strategy #2) are needed to ensure this level of sequestration does not decline. However, there is also potential to capture an even greater amount of carbon through active and effective natural and working land management approaches. Technical assistance is intended to accomplish this.

Technical service providers transfer the knowledge necessary for effective implementation of mitigation and adaptation practices. They provide the advance warning of emerging land management threats, such as pests, diseases and invasive species. They help tailor climate-friendly land management practices to the unique conditions of a specific property. They help farmers, woodland owners, and forest land managers modify their practices to prepare effectively for more frequent and extreme weather events, and also adapt to growing season changes brought on by climate change.

b. **List any site-specific geographies where the strategy would be applied.**

This strategy can be implemented quickly with additional staffing, and would be applied appropriately across Maine's working and natural lands.

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**

The number of landowners and land managers receiving technical support, and the acreage thereby affected, can be readily tracked. Measurable outcomes would vary depending on the mitigation or adaptation approach being implemented on the land.

a. **For mitigation strategies:**
   i. **What is the estimated CO_2e savings (metric tons) by 2025, 2030, 2050?**

A UMaine study is currently underway to identify the most impactful forest and farm-based climate mitigation practices and quantify their climate benefits and potential costs. Results are expected in June 2020.

ii. What is the cost effectiveness of those reductions (cost per ton of CO_2e reduced) and the total cost?

The UMaine study referenced above will provide analysis of cost effectiveness for forest and farm natural climate solutions practices. Total cost and cost effectiveness of technical assistance remains to be analyzed.

b. Are outcomes measurable with current monitoring systems?

Yes, depending on the level of detail for various land types. Maine Forest Service has extensive data on forest management practices. The USDA Census of Agriculture provides data every 5 years on agricultural land use trends. USDA-NRCS tracks conservation practices, but privacy requirements can limit access to data for individual landowners; some USDA data can be aggregated at the county level. More intensive tracking of land uses and management practices will be needed to monitor progress on this strategy.

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

a. Forestry Assistance: Add significant field forester capacity to the DACF's Maine Forest Service to support landowner and land practitioner adoption of carbon-friendly and resilient forest management practices, through outreach, education, and technical assistance

b. Agricultural Assistance: Make natural climate solutions (such as soil health practices) a priority in federal and state agricultural programs, and increase technical service provider capacity to Soil & Water Conservation Districts, University of Maine Cooperative Extension, NRCS, and non-governmental organizations to assist producers in using known and emerging agricultural practices with mitigation and adaptation benefits

c. Natural Land Assistance: Increase technical service provider capacity to DIFW's Beginning with Habitat Program and DACF's Maine Natural Areas Program to support

towns, land trusts, land managers, and landowners in their efforts to conserve native species and land and water resources vulnerable to climate change and to address climate-related threats such as invasive species

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	**X**	**X**	**X**	**X**
To realize outcomes	**(2023-24)**	**X**	**X**	**X**

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?

This strategy will maintain and add jobs for private and state foresters, agricultural technical service providers, and land use planners and consultants.

This strategy calls for significantly increasing the field forester capacity within the Maine Forest Service (MFS) to ensure that carbon-friendly forest management practices are understood and implemented broadly on private woodlands. This will strengthen the already existing private/public partnership between private foresters, loggers, and state foresters. This strategy builds on that positive relationship.

The resulting enhanced forest management on private forest lands will contribute to the growth of Maine's forest industry and the jobs the industry supports. The Maine forest products industry has a total estimated 2016 statewide economic impact contribution, including multiplier effect, of $8.5 billion in sales output, over 33,500 full- or part-time positions, and $1.8 billion in labor income. This is 4.13 percent of the employment in Maine.

The strategy also calls for a realignment of federal and state technical assistance programs and services to support climate mitigation and adaptation objectives. Farming and its related industries are a key component of Maine's economy, contributing almost $3.8 billion in statewide total sales and supporting over 24,000 jobs statewide.[1] Maintaining jobs in the agriculture sector includes agriculture-support industries such as feed stores/companies, veterinarians, farm equipment providers, and others.

Finally, the strategy calls for increasing staff capacity within two well-established state programs: DIFW's Beginning with Habitat Program, and DACF's Maine Natural Areas Program to support the implementation of adaptive measures to conserve species and habitat particularly

vulnerable to climate change. Maine's outdoor recreation economy, which depends on abundant native species and habitats, generates $8.2 billion in spending and supports 76,000 jobs.

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[1] Farm Credit East, "Northeast Economic Engine: Agriculture, Forest Products and Commercial Fishing," (2015), 8-9, available at: https://www.farmcrediteast.com/knowledge-exchange/Reports/northeast-economic-engine-agriculture-forest-products-and-commercial-fishing; Rigoberto A. Lopez, et al., "*Economic Impacts of Agriculture in Eight Northeastern States: A Report for Farm Credit East,"* University of Connecticut, *(2014), 23.* Available at: http://zwickcenter.uconn.edu/documents/ResearchReportno2.pdf.

Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?

Keeping forests as forests. Technical assistance engages woodland owners in active forest management, which has been shown to be a major predictor of a landowner's willingness and commitment to retain their land ownership. The strong correlation between active land management and land retention points to technical assistance being a critical function for retaining the capacity of Maine's forested acreage to sequester the maximum amount of carbon possible.

Increased land productivity. Farmers, woodland owners and forest land managers will benefit from increased productivity as a result of site-appropriate technical assistance that target soil health and forest stand health, resulting in increased food and fiber to supply local markets, and the increased financial returns that come from greater production.

Enhanced wildlife habitat and connectivity. Technical assistance can yield rapid improvements to wildlife habitat and increase habitat connectivity, enabling wildlife to better adapt to climate change. Collaboration between state foresters and wildlife biologists is well established, and need only be expanded. Enhancing wildlife habitat is among the top land management interests of woodland owners.

Drinking water protection. Implementing adaptive land management practices has tangible water quality protection benefits, safeguarding drinking water supplies for Maine communities.

Resilience against new threats. Technical assistance can be targeted to support planning, weather forecasting and advisories, and implementation of practices that protect against new pests, diseases and invasive species, as well as flooding and erosion resulting from extreme weather events. The benefits are better safeguards for communities and increased protection of essential infrastructure.

Adaptability. Technical assistance to individual landowners is predicated on the need to remain adaptive as new knowledge about natural climate solutions is gained. This flexible approach also

provides the basic infrastructure needed for the implementation of additional future climate efforts, such as for a voluntary carbon management program for woodland owners.
Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?
Increased technical assistance capacity will require annual State investment in field foresters, soil conservationists, and other resource specialists. Structural elements to enable this work are already effectively in place through state natural resource agencies, enabling rapid implementation. By building on a successful existing model, this strategy allows climate related educational efforts to be easily integrated into existing and enhanced outreach efforts.
Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?
Increased technical assistance for working lands will primarily benefit rural areas of the state where the majority of farming and forest management occurs. However, there is significant additional capacity for smaller woodlands and farms to sequester carbon, hence the application of this strategy statewide. Maine's agricultural sector benefits from significant work from seasonal migrant workers, some of whom have transitioned to permanent residency in Maine. Increased farm stability resulting from the implementation of adaptive farm practices should benefit these farm workers. New Americans establishing farm operations in Maine will also benefit from this technical assistance.
Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?
Voluntary, locally-focused technical assistance to private working and natural land owners has been a cornerstone of national and state conservation programs for over 75 years. The increasing use of technology (remote sensing, GPS applications, portable computing devices) can improve land management data and analysis on a real-time basis. The primary barrier to implementation is currently insufficient funding to support the necessary increases in staffing and technology.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?
This strategy would utilize existing statutory authority. It may require updating regulations and organizational structures to prioritize climate issues.

Rationale/Background Information

Further details on Strategy 3b. Agricultural soils have the capacity to sequester significant amounts of carbon through increases in organic matter. Traditional soil conservation practices have focused on physical erosion of soil and nutrient inputs to increase soil productivity. Soil health practices add to these benefits by strengthening biotic communities in soil. Many of these practices have multiple benefits and are supported by the USDA Natural Resources Conservation Service (NRCS). Common practices include:

a. Expanded use of fall and winter cover crops
b. Diversified crop rotations
c. Reduced or no-till tillage

d. Use of compost, manure, biochar, or other soil amendments

Animal waste management systems have been identified as a source of methane (a potent greenhouse gas). Anaerobic digesters can be used to process animal manure and food waste to reduce GHG and provide electric power. Energy use can be a significant farm expense, and energy conservation practices can increase farm profitability and resilience.

****Please footnote substantive disagreements among the Working Group members**

Natural & Working Lands Work Group
Recommended Climate Strategies, Actions and Measurable Outcomes

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**

Strategy # 4: Update and refocus state programs and policies to address climate mitigation and resilience (see specific sub-strategies in question 3)

   a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**

This strategy addresses both mitigation and adaptation objectives. It addresses the need for state policies and programs that pertain to agriculture, forestry, and natural lands to become more explicitly aligned with the Governor's GHG reduction goals and commitment to transitioning to a lower carbon economy. While Maine's forests are already sequestering **75%** of Maine's GHG emissions, and also providing other vital ecosystem services, updating and refocusing state forest, agriculture and natural land management programs and policies will increase mitigation potential and improve resilience of public lands, while also supporting better planning on private lands. In addition, State efforts facilitating reduced reliance on fossil fuels will address the negative impacts that result from carbon emissions, while climate education addresses the need for an engaged citizenry and a next generation that can become the skilled workforce for this issue.

   b. **List any site-specific geographies where the strategy would be applied.**

This strategy would be applied appropriately across Maine's natural and working lands.

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**

Individual sub-strategies require different metrics to assess impacts. Measurable outcomes could include: the effective date of updated policies or specific tangible changes to land management policies, reduced time required for rigorous environmental review of renewable energy projects, and # of positions added to natural resource agencies.

   a. **For mitigation strategies:**

      i. **What is the estimated CO_2e savings (metric tons) by 2025, 2030, 2050?**

Currently, Maine's forests are estimated to capture ~13 million metric tons of CO_2e per year. This effectively equates to ~75**%** of Maine's current GHG emissions. A UMaine study is currently underway to identify the most impactful forest-based climate mitigation practices and

quantify their climate benefits and potential costs. Results are expected in June, and will inform public land management decisions.

ii. What is the cost effectiveness of those reductions (cost per ton of CO_2e reduced) and the total cost?

The UMaine study referenced above will provide analysis of cost effectiveness for forest and farm natural climate solutions practices, which will inform the focus of state programs and policies to best address climate mitigation and adaptation on natural and working lands.

b. Are outcomes measurable with current monitoring systems?

Yes (attribution of results will be difficult, as multiple strategies will have complementary and overlapping influences on climate outcomes).

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

a. Continue and enhance climate-friendly public land management practices

   i. Update DACF's Bureau of Parks & Lands Integrated Resource Policy (IRP) to incorporate current climate science and management priorities for enhancing landscape and species resiliency and mitigating climate change

   ii. Maintain support for, and consider expansion of, the state's Ecological Reserve System (ERS), and update ERS legislation and mandates to reflect new science on climate change threats, mitigation opportunities, and landscape resiliency

   iii. Incorporate principles of climate science and landscape resiliency when evaluating and prioritizing future land acquisitions by DACF and DIFW

b. Update existing policy and staffing needs to support comprehensive, accurate, and timely environmental review of land and water resources and permitting of projects under environmental regulations, thereby ensuring smart development, shoreland protection, and appropriate renewable energy project siting

c. Assess and improve state, regional and local land use planning efforts, policies and regulations to promote climate mitigation, resilience, and adaptation, as well as carbon storage

i. Enhance existing and develop new land use planning tools and policies that encourage greater state coordination to reconcile competing land uses and promote efficiency, particularly with regard to environmental review

ii. Prioritize the retention of valuable working and natural lands, especially prime agricultural soils and forest land, in balance with renewable energy development

d. Increase climate education related to forestry, agriculture and natural lands, through public school curricula, consumer awareness, and landowner information

e. Develop and enhance marketing programs for Maine forest products, in coordination with programs such as ForMaine, focused on climate-friendly bio-based wood market innovation including Cross Laminated Timber (CLT), cellulosic insulation, pyrolysis oil, nanocellulosic materials, advanced biofuels, and bioplastics. Issue an Executive Order to seek opportunities in State construction projects to use Mass Timber (including CLT) building technologies, and to encourage related manufacturing facilities to locate in Maine

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	**X**	**X**	**X**	**X**
To realize outcomes		**X**	**X**	**X**

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?
Multiple sub-strategies will require additional agency staffing for effective land and resource management and planning, environmental review and permitting, and renewable energy program management. Ensuring that farms are supported through relevant planning processes and tools will ensure the continuation of jobs within the agricultural sector, both on-farm and in agriculture support industries.

Climate and natural resource-related education will cultivate the next generation of foresters, farmers, and natural resource managers.

Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?

***Positive Economic Impact*:** Retaining healthy fish and wildlife populations and well managed natural and working lands contributes to Maine's outdoor recreation economy, which generates $8.2 billion in spending and supports 76,000 jobs. A study in 2013 determined that hunting and fishing alone contributed over $650 million to Maine's economy while supporting nearly 7,000 jobs. The economics of wildlife viewing are not yet quantified in Maine, but at least 47 million bird watchers spent $7 billion nationwide during 2016.

Retained farms resulting from effective application of relevant planning processes and tools support a vital agricultural economy that contributes nearly $3.8 billion in statewide annual sales.

Natural Heritage & Ecosystem Services Benefits: Maine is unique among eastern U.S. states in that it retains much of its natural and working landscape, which in turn supports an abundant and diverse flora and fauna. This diversity contributes to Maine's wild character, uniqueness of place, and quality of life. Privately owned farm and forest land contribute significantly to this natural heritage.

A. Public Lands:

1. Maine's Public Lands are positioned to serve a unique role in helping the state mitigate and adapt to the effects of climate change because of their mandate to manage for a wide range of public trust values, including wildlife, recreation, water quality, and others.
2. Ecological Reserves include many of Maine's best examples of alpine meadows, lakes and streams, old growth forests, and other natural communities. Enhancing the Reserve network's capacity to protect these ecosystems will help improve resiliency for climate vulnerable species and habitats.

B. Environmental Review & Land-use Planning:

1. Biologists agree that reducing impacts from current environmental stressors within our control (e.g., habitat loss and fragmentation, pollution) will increase the adaptive capacity of species and habitats vulnerable to climate change.

2. Increased staff capacity will permit state agencies to better serve the public with timely and accurate environmental review products. The current volume of reviews leads to delays and uncertainty for developers and inadequate protections for sensitive resources.

3. Assessing and improving state/regional/local land use planning tools/policies/regulations to promote climate mitigation and resilience will ensure that working lands and natural resources are protected and supported in balance with other competing land uses.

4. Environmental review agencies charged to meet state mandates for minimizing development impacts to protected natural resources are understaffed and overwhelmed, making it difficult to permit best development practices in an accurate and timely manner. This issue is exacerbated by the high volume of newly proposed solar and wind energy projects

Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?

Additional investment in State employees will be necessary; reprioritization of current staff workload may be possible. Investment in technology and inter-agency planning can streamline workloads.

Additional State and municipal investment will be required to improve technical planning and review capacity.

Current low fossil fuel prices may dictate a need for financial incentives to convert to modern wood energy technology.

Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?

The well-managed use of working lands and the establishment of a modern wood appliance program will expand economic opportunities in rural areas.

Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?

Yes. Maine has a highly functional public land system and land use planning models exist and work well.

State environmental review processes are well-developed but have been hampered by limited resources when workloads have expanded. Other states may provide examples of successful consolidated site review processes. A modern wood appliance program can build off a similar program that previously existed within DACF.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?
While many planning functions described in this strategy are the responsibility of DACF and DIFW, certain planning activities would benefit from the reestablishment of a State Planning Office. Strategy 4.b.may require legislation to better define environmental permitting for renewable energy projects.

Rationale/Background Information

****Please footnote substantive disagreements among the Working Group members**

Natural and Working Lands Work Group member Patrick Strauch of the Maine Forest Products Council did not support the language in Strategy 4.a.ii. regarding consideration of the expansion of the state's Ecological Reserve System, based on a concern over maintaining sufficient wood availability to support Maine's forest economy.

Natural & Working Lands Work Group
Recommended Climate Strategies, Actions and Measurable Outcomes

1. **Describe the Recommended Strategy and how it addresses Maine's climate resiliency and mitigation goals.**

Strategy # 5: Strengthen research and development, and monitoring of climate mitigation and adaptation practices (see specific sub-strategies in question 3)

   a. **For adaptation strategies, what climate impacts does it address? How will this strategy reduce the vulnerability of Mainers to the impacts of climate change?**

This strategy addresses both mitigation and adaptation objectives.

It would be difficult to identify a more pressing issue demanding research than climate change. Much remains poorly understood regarding how to maximize the capacity of trees, forest soils, and agricultural soils to sequester carbon. Just as many questions exist about the most effective adaptive management strategies for the forestry, agricultural, and outdoor recreation sectors, and for species and habitats, in the face of climate change. Research is sorely needed. Maine is well-positioned to undertake long term research projects associated with forestry, agriculture and natural lands, both as a leader and as part of a national and international network of ongoing research efforts. There are also significant research needs associated with the development of new wood-based products and in establishing viable markets for these products. The opportunities to share new information and benefit from the knowledge developed by others is vast.

This strategy will assist the forestry, agricultural and outdoor recreation sectors in evaluating and adopting practices to help them mitigate and adapt to climate change. It will also address the need for land managers to adopt management practices that conserve climate-sensitive species and habitats.

   b. **List any site-specific geographies where the strategy would be applied.**

While specific research locations currently exist throughout the state (see Proven Strategy section), applied research activities also occur on-farm and in woodlots across Maine.

2. **What is your measurable outcome for this strategy, assuming all recommended actions to implement the strategy are achieved?**

Direct outcomes of basic and applied research can sometimes be difficult to measure beyond technical publications. However, quantification of the adoption of new practices across the climate mitigation and adaptation spectrum, and measurements of their benefits, can and should be achieved. Specific areas of high priority research, like quantifying dynamic carbon processes

now, and in plausible alternative futures, can be accomplished and is a high priority area of research. Other measurable outcomes include number of farms and forestland owners adopting adaptive strategies as a result of applied research.

a. For mitigation strategies:

i. What is the estimated CO_2e savings (metric tons) by 2025, 2030, 2050?

Specific CO_2e savings will vary according to the specific management practice researched and implemented.

ii. What is the cost effectiveness of those reductions (cost per ton of CO_2e reduced) and the total cost?

The cost effectiveness of this strategy is tied to the specific management practice researched and adopted.

b. Are outcomes measurable with current monitoring systems?

Specific outcome measurements would be developed as part of any research project.

3. What specific actions would be required to implement the strategy, including but not limited to legislation or regulation. Examples include: establish a program or a fund, conduct additional research, provide education or training, coordinate with other parties/agencies/states, etc. Considering the recommended actions listed, who, if they can be named, are the specific actors needed for implementation?

a. Create a sustained source of funding for research on climate change and climate mitigation and adaptation strategies

   i. Conduct research in support of agriculture and forestry mitigation and adaptation practices

   ii. Promote research and monitoring to inform adaptive management practices designed to conserve climate-sensitive species and habitats

b. Establish the University of Maine as the coordinating hub for partnerships among academia, the private sector, and state government in Maine, for research on forestry, agriculture, and natural land-related climate concerns

c. Continue to invest in the University of Maine research facilities in their efforts to become a globally recognized hub for climate-friendly bio-based wood market innovation, including Cross Laminated Timber (CLT), cellulosic insulation, pyrolysis oil, nanocellulosic materials, advanced biofuels, and bioplastics

d. Promote research, development and planning efforts supporting the growth and stability of Maine food systems

4. What is the timeframe for this strategy?

	Short-term (2022)	Mid-term (2030)	Long-term (2050)	2070 -2100
To implement	**X**	**X**	**X**	**X**
To realize outcomes		**X**	**X**	**X**

5. Please analyze the Recommended Strategy against the following criteria. (Each Working Group can add its own sector-specific criteria as appropriate.)

Workforce - Will the strategy create new jobs, prevent job loss, or cost the state jobs?
Investment in research will maintain and expand scientific and technical jobs, including graduate students. Technological innovations in the forestry and agriculture sectors are likely to support the retention and expansion of markets for Maine products. Indirect workforce benefits will result from improved resilience of the forestry and agriculture sectors.
Benefits (non-workforce) - What are the expected co-benefits of this strategy (e.g., improved health, increased economic activity, wildlife habitat connectivity, reduce natural hazard risk, increased recreation, avoided damage)?
Applied research will benefit private landowners, land managers, and workers, and improve the economic viability and environmental resilience of working lands. **Economic Security**. Maine's forest industry is a major player in the state's economy. In 2016, the economic impact of the forest products industry was estimated at $8.5 billion, equal to $1 out of every $20 of the state GDP. The industry accounts for nearly 30% of Maine's export value and sustains more than 33,500 jobs, or 1 out of every 24 jobs in Maine.[Maine Forest Products Council Maine's Forest Economy (2016) 32.] Farming and its related industries are likewise a key component of Maine's economy, contributing almost $3.8 billion in statewide total sales and supporting over 24,000 jobs statewide.[Farm Credit East, "Northeast Economic Engine: Agriculture, Forest Products and Commercial Fishing," (2015), 8-9; Rigoberto A. Lopez, et al., "Economic Impacts of Agriculture in Eight Northeastern States: A Report for Farm Credit East," University of Connecticut, (2014), 23.] Maintaining jobs in the agriculture sector also includes agriculture-support industries such as feed stores/companies, veterinarians, farm equipment providers, and others. Healthy fish and wildlife populations contribute to Maine's outdoor recreation economy, which generates $8.2 billion in spending and supports 76,000 jobs. A study in 2013 determined that hunting and fishing alone contributed over $650 million to Maine's economy while supporting nearly 7,000 jobs.

Co-benefits. Many of the practices that farmers and forest managers might implement to increase carbon sequestration will also have co-benefits, including but not limited to:

- lowering the cost of inputs;
- improving soil fertility;
- increasing the resilience of forests and farmland to flooding, drought, and other erratic weather patterns associated with climate change;
- increasing farm profitability/viability through increases in yields/profits per acre; and
- creating new markets for Maine-produced products.

Adaptive Management. Enhanced capacity for monitoring key biodiversity indicators will help inform state policy and management initiatives that can facilitate improved adaptation of climate-sensitive species and habitats.

Costs – What are the estimated fiscal costs and other costs to carry out this program. To the state? To municipalities? What resources do you anticipate needing to inform Mainers about the strategy and the opportunity/costs of the strategy? Where would financing likely come from?

Establishing a sustainable source of funding for long-term research and development would require an ongoing General Fund appropriation. Research to support a core set of measurements at multiple sites could cost $1 million per year or more. However, research in support of a deeper understanding of the interplay of natural and working lands, climate impacts, and carbon sequestration is not necessarily dependent on a site-specific research model. In either case, costs would be specific to the particular research design. There would be no cost to municipalities. The dissemination of research findings could be absorbed within existing programs already devoted to such functions.

The Maine Economic Improvement Fund (MEIF) is one source of State funding. MEIF advances research and economic development for the benefit of all Maine people. In FY 2016, the state's $17.35 million investment was leveraged at a rate of 3:1 by UMaine system campuses for an additional $50.3 million in federal and private-sector grants and contracts and helped Maine's public universities secure new patents, work on development projects with large and small businesses and startups and provide R&D support to over 500 companies and individuals.

The Long Term Ecological Research Program supported by the National Science Foundation provides an example of the cost of long-term research at a national scale. In 2018, the NSF paid $29.46 million to maintain 28 long-term research studies, or about $1 million per site. The National Streamflow Information Network, while not a pure research effort, provides another example. In 2017, this program costs $188 million (federal and state funds) to support the

collection and/or delivery of streamflow and water-level information for over 8,500 sites and water-level information alone for over 1,700 additional sites, or about $18,000 per site.

The Bear Brook Watershed Study provides a local example. Research began there in the mid-1980s as part of the national research agenda to determine the effects of acid deposition on surface waters and their related watersheds. Since then, the research program has grown to encompass an array of scientific objectives that include climate change and carbon sequestration, among other issues. It has demonstrated the effectiveness of state and federal policies aimed at reducing nitrogen and sulfur emissions. The program costs approximately $100,000 per year for base funding; researchers obtain additional funding from multiple sources to conduct specific research. This project leveraged MEIF funds through the University for roughly 12:1 in federal funds during the 2000s.

Sources:

https://psmag.com/environment/who-is-going-to-fund-long-term-ecological-research

https://pubs.usgs.gov/fs/2018/3081/fs20183081.pdf

https://umaine.edu/bbwm/

https://umaine.edu/meif/

Equity - Is this strategy expected to benefit or burden low-income, rural, and vulnerable residents and/or communities? What outreach has been/will be undertaken to understand the impact of the strategy on front-line communities?

By focusing on the forestry and agricultural sectors, research supports the resilience of rural communities. It may create new opportunities for rural businesses, developing a skilled workforce in these communities prepared for future challenges.

Proven strategy & feasibility – Has this strategy been implemented successfully elsewhere? Is it feasible with today's technology? What barriers to implementation exist (e.g., financial, structural, workforce capacity, public/market acceptability)?

Long term ecological research has proven its worth in understanding the impacts both of land management practices and climate change, as evidenced in several publications. Examples in Maine include but are not limited to the Aroostook Farm in Presque Isle, Highmoor Farm in Monmouth, Blueberry Hill Farm in Jonesboro, J. F. Witter Teaching and Research Center in Old Town, the Lyle E. Littlefield Ornamentals Trial Garden and the Roger Clapp Greenhouses in Orono, and the Dwight B. Demeritt Forest in Old Town and Orono. Others include the Weymouth Point Study Area, the Howland Research Forest, and the Penobscot and Massabesic Experimental Forests. Several research projects are undertaken with an established network of stakeholders, including farmers, woodland owners, forestry and agricultural sector businesses, and nonprofits.

Barriers to implementation are largely financial, as long-term research requires a sustained commitment that extends far beyond term limits and election cycles.
Legal authority - Does the strategy require new statutory (legal/legislative) authority?
A long-term research program could be incorporated into existing statutory authorities where they exist, but funding would require ongoing biennial appropriations by the Legislature.

6. Rationale/Background Information

****Please footnote substantive disagreements among the Working Group members**