Michigan Council on Climate Solutions: Natural Working Lands and Forest Products Workgroup Recommendations

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Background

Michigan's natural working lands (NWL) and forests are a critical component of achieving the state's goal of net zero greenhouse gas emissions by midcentury. Wise management of working lands and forests can not only reduce emissions but remove carbon from the atmosphere. However, land use and land management decisions are complex, with the potential to incur trade-offs and create co-benefits.

To consider this complexity and develop recommendations, the Natural Working Lands and Forest Products Workgroup met eleven times for a duration of two hours at each meeting. The group followed a process with four phases:

1. In the first two meetings, the group set the stage by hearing from a series of experts on overall issues to be considered and developing a set of shared guiding principles to inform the process.
2. In meetings three through six, the group heard from topical experts and discussed specific barriers and opportunities for agriculture, forestry and mass timber, equity and environmental justice, and wetlands and waterways.
3. In meetings seven through nine, the workgroup split into three subgroups to develop draft recommendations within the categories of agriculture, forestry, and wetlands/waterways. Importantly, all subgroups were asked to maintain attention to the guiding principles, which include equity and environmental justice.
4. Finally, the workgroup reconvened for two meetings to review and discuss the full package of recommendations.

The workgroup co-chairs have sought to develop five overarching recommendations that capture the breadth of more targeted recommendations coming out of the subgroups.

GUIDING PRINCIPLES

The workgroup developed the following guiding principles to declare what they collectively aspired to and agreed to work on together in developing recommendations for the Michigan Council on Climate Solutions. These principles are intended to be taken as a package. They are numbered for reference purposes only; the numbers do not indicate a ranking or priority.

1. Focus on strategies and solutions that are necessary in the next 9 years to achieve significant greenhouse gas reductions (including CO2, methane and nitrous oxide) and carbon sequestration in natural working lands and forest products by 2050. Ensure that solutions…
    a. Are science-based, verifiable, and have solid research support behind them.
    b. Will maintain environmental integrity (from a carbon retention perspective) as the climate changes.
2. Build a shared understanding of insights from work both within and outside of Michigan, but tailor solutions to Michigan's unique characteristics and needs.
3. Consider cost and benefit trade-offs when developing and prioritizing solutions.

4. Ensure that solutions and strategies place a priority on effective and equitable community engagement, impacts and choices. This includes engaging tribal nations.
5. Prioritize strategies that have as many co-benefits as possible, including for the health and resiliency of Michigan's natural resources, ecosystems, people, and communities. We acknowledge that these are interdependent and mutually supporting.
6. Target strategies at all appropriate programs, organizations or levels of government, while considering feasibility of action. Leverage existing initiatives or partnerships wherever possible.
7. As we work together, embrace and embed in all of our ideas and actions the key values of equity, transparency, and integrity and clearly communicate these to stakeholders and the public.

Summarized Recommendations

Below, we have summarized the recommendations. The full recommendations, including additional details and a rationale for each, follow this list. The numbers for each recommendation are for reference purposes only and do not reflect a ranking or prioritization.

1. Maintain and develop healthy forests across public and private land.
2. Implement a Healthy Soils Act for Michigan in which the Legislature and Governor can set a floor for future funding and attract additional funding for soil, water, and habitat conservation by recognizing that protecting and enhancing the state's soils have a direct impact for climate solutions.
3. Protect existing wetlands and waterways, create new and restore wetlands where appropriate, and increase carbon storage in waterway green infrastructure in increase both mitigation and adaptation benefits.
4. Enhance and develop a transformative bioeconomy that 1) implements and promotes natural, sustainable, and low-emission materials production and use, 2) reduces emissions across all NWL commodities (agricultural and forest products), 3) reduces waste and increases efficiency, and 4) promotes sustainable land use planning.
5. Promote climate initiatives and ensure multi-level action for mitigation and adaption across natural and working lands by acting in a leadership capacity, fostering enabling conditions, promoting knowledge transfer, and increasing access to needed data and information.

Detailed Recommendations

I. Healthy Forests

1) Overview of recommendation.

Rationale: As of 2014, Michigan had 20.3 million acres of forestland. The acreage of Michigan forests are projected to decline from 20.3 million acres to a range of 19.2 to 18.7 million acres by 2060 due to anticipated population growth (in part from climate refugees), climate change, and invasive species.[1] Maintaining and developing healthy forests is critical to mitigating and adapting to the effects of climate change. Michigan's forests currently store approximately 537 million tons of live tree carbon and 2,045 million tons of total forest ecosystem carbon and continue to annually sequester additional carbon from the atmosphere.[2] Moreover, reforestation of land that was historically forested (excluding current productive ag lands), restocking currently under-stocked forest stands, and building out urban/suburban tree canopies in Michigan has the potential to sequester an average annual rate of 7 million metric tons of carbon dioxide equivalent (tCO2e) per year.[3]

Further, forest products and bioenergy are being forwarded as a central component of a climate solution and the state should prepare now to increase emphasis on all bio-based sources and materials to undertake a net-zero economic transition by 2030.

Recommendation: Maintain and develop healthy forests across public and private land. See question 11 for specific measures that should be included.

2) In what timeframe is this recommendation achievable?

Many of the recommended policies (listed in question 11) should be implemented as soon as possible in order to yield the desired GHG emissions benefits by 2050. Some actions have interim goals that can be met by 2030.

3) What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?

Estimated avoided conversion and loss of 110.8 to 161.1 million tons of total forest ecosystem carbon by 2060 (projection from the forest service).

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[1] Michigan Forests 2014, USDA Forest Service Resource Bulletin NRS-110, 2017

[2] Reported as 2,000 pounds per ton.

[3] U.S. Climate Alliance State Natural and Working Lands Initiative Michigan Opportunity Assessment, The Nature Conservancy and World Resources Institute, 2019

4) **Describe the potential impacts of this recommendation on environmental justice.**

This recommendation has the potential to improve income for low-income rural private land owners. It may disproportionately benefit those that already own land, further perpetuating unequal ownership patterns.

Tree planting in urban environments can add beauty to the urban landscape and increase home and property values, mitigate the effect of urban heat sinks driving down utility costs, improve air quality, improve cardiovascular and other health outcomes, provide larger green spaces and outdoor recreational opportunities, and increase the general well-being of urban residents.

5) **Describe the potential impacts of this recommendation on labor.**

A decrease in the 2014 level of 20.3 million acres of forestland would exert downward pressure upon the approximately 40,700 direct jobs supported by Michigan's $20 billion forest products industry. Alternatively, scaling up of afforestation and reforestation efforts would require increases in planting stocks, which would need to be sourced locally, which represents an opportunity for job creation and growth of the nursery industry.

6) **Describe the potential impacts of this recommendation on the environment.**

This recommendation provides opportunities to connect public land and wildlife habitat fragments. Existing Michigan forest resources provide many ecosystem services, including carbon sequestration and storage, provision of clean air and water, and provision of timber and wildlife habitat. This supports climate mitigation as well as adapting to future conditions.

7) **Describe the potential impacts of this recommendation on economic development.**

A decrease in the 2014 level of 20.3 million acres of forestland would exert downward pressure upon Michigan's $20 billion forest products industry. Limitations on urban growth and development options, including expansion of infrastructure, could lower property values in some areas (e.g., sprawl prone areas) while increasing value in others (e.g., infill development).

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

Cost of implementation varies by scope of actions taken.

9) **Who is empowered to implement this recommendation?**

- Local government
- State government – Executive: Michigan Department of Natural Resource, Michigan Department of Agriculture and Rural Development
- State government – Legislative
- Federal government – Executive: United States Department of Agriculture (USDA) Forest Service and Natural Resources Conservation Service; United States

Department of the Interior (USDI) National Park Service and Fish and Wildlife Service

- Federal government – Legislative
- Private sector: Non-governmental Organizations (Michigan Association of Conservation Districts, of The Nature Conservancy and land conservancies)

10) Are there differing perspectives? If so, what are they?

There was consensus on this recommendation.

11) What are the most important considerations for achievability and feasibility of this recommendation?

The following measure should be included:

1. Fully implement the Michigan Forest Action Plan, which leverages USDA grant programs.
2. Support existing and advance new land use policies that protect forested lands in rural and urban landscapes from conversion and parcelization, including the following:
    a. Leverage and expand existing programs to increase emphasis on climate benefits, including the following:
        i. Michigan Department of Natural Resources (DNR) Commercial Forest and Michigan Department of Agriculture and Rural Development (MDARD) Qualified Forest programs that provide tax incentives that encourage private landowners in forested areas to maintain and restore forested areas;
        ii. Appropriate restricted operational funding for Conservation Districts to increase U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) program contracts, such as the Environmental Quality Incentives Program (EQIP), to incentivize maintaining forestland (avoiding conversion to ag land) from increased food production pressures;
        iii. Expand existing state grants that have climate benefits, such as keeping forests as forests.
    b. Create and fund a “climate-smart communities” revolving loan program to provide money to local governments to invest in green infrastructure projects that maintain urban and per-urban forestland, increase climate resilience, and sequester carbon.
    c. Fund at least one Conservation District licensed forester per county.
3. Pursue 30 x 30 land protection targets in Michigan (e.g., protect 30% of land by 2030). As part of this, acquire and protect new land with a special focus on the following:

a. Prioritize acquisition of public land in accordance with the DNR managed public land strategy with focus on creating consolidation of ownership and decrease forest fragmentation.

b. Support designating new Wilderness Areas and work with federal partners to expand acres as part of the National Forest System, National Wildlife Refuge System, or National Park System.

c. Identify and acquire additional old growth forests in partnership with governmental and non-governmental organizations to avoid emissions and maintain sinks.

4. Establish a Michigan Billion Trees initiative, envisioned as a public/private partnership to plant one billion trees across the Great Lakes State by the year 2050. This goal equates to 36 million trees per year planted across public and private land in urban, peri-urban, and rural landscapes. An interim goal would involve planting 50 million trees by the year 2030. Planting efforts should focus on the following areas (not in order of priority and some categories not mutually exclusive):

    a. Poor quality marginal current and former agricultural lands (as being piloted by MDARD in the successful 2021 Regional Conservation Partnership Program (RCPP) project);

    b. Under-stocked rural forest lands and urban landscapes, areas impacted by invasive species or disease (e.g. emerald ash borer, beech bark disease) or have climate ‘losers’;

    c. Under-served urban communities with street tree cover deficit;

    d. Urban and rural brownfields;

    e. Riparian and floodplain areas;

    f. Areas where connectivity and habitat are enhanced (essential for climate resilience).

5. Incorporate carbon management considerations in all land use planning, recognizing carbon sequestration and storage as crucial, including through the following measures:

    a. Support proactive forest management where appropriate to maximize carbon sequestration and storage.

    b. Prioritize climate-beneficial uses of wood (e.g., long-term carbon storage and substituting for more emissions-intensive materials).

    c. Using available data, identify carbon pools for targeting long-term, secure landscape carbon storage (e.g., low risk for disturbance, high soil carbon)

II. Healthy Soils

1) Overview of recommendation.

Rationale: Globally, soils store two to three times more carbon dioxide than the atmosphere and two to five times more carbon than is stored in vegetation. How we manage this carbon pool can have significant impacts on climate change. With 11.8 million acres of agricultural land in Michigan[4], there is an enormous opportunity to rebuild soil health by increasing organic carbon, sequestering atmospheric carbon, and reducing methane and nitrous oxide emissions. By increasing soil health, improved water infiltration also results in less runoff and more drought resilience. Some estimates suggest that if the U.S. were able to adequately address economic, social, and technical barriers to implementing soil management best practices, U.S. croplands have the potential to sequester 1.5–5.0 billion metric tons of carbon dioxide equivalent per year for 20 years. The same agronomic practices that increase carbon sequestration also can help mitigate flood events, protect water quality, recharge groundwater, and increase resilience to drought. Recognizing the societal importance of food production, land managers and policymakers must strive to balance the protection of ecosystems for climate mitigation and other environmental co-benefits with the need to optimize agricultural management to feed a growing world population.[5]

Recommendation: Implement a Healthy Soils Act for Michigan in which the Legislature and Governor can set a floor for future funding and attract additional funding for soil, water, and habitat conservation by recognizing that protecting and enhancing the state's soils have a direct impact for climate solutions.[6] See question 11 for the actions to be included.

2) In what timeframe is this recommendation achievable?

Action on implementing the existing farm bill is ongoing and changes to existing programs could see positive gains by 2030.

3) What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?

Potential total carbon sequestration for Michigan using regenerative agricultural practices such as no till, cover crops, and crop rotation ranges from 1.8 million to 6.5 Mg C/ha/year

4) Describe the potential impacts of this recommendation on environmental justice.

Reducing water quality concerns, which often have a particular impact in urban areas

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[4] https://farmlandinfo.org/statistics/michigan-statistics/

[5] Add citation here – from Wisconsin's recommendation

[6] Michigan is one of the few states that have not enacted a Healthy Soils Act. In addition, in each state the USDA Natural Resources Conservation Service (NRCS) has developed a strategy for healthy soils NRCS State Soil Health Strategies.

5) **Describe the potential impacts of this recommendation on labor.**

Unknown.

6) **Describe the potential impacts of this recommendation on the environment.**

Avoided conversion of AG land to urbanization avoids further GHG emissions and protects water quality and biodiversity. In addition, adding managed pasturing to Conservation Reserve Program (CRP) land increases carbon sequestration, biodiversity and reduces current impair of water quality. Finally, incentives and subsidies to move away from monoculture cash crops with a high carbon footprint will also increase biodiversity and water quality.

7) **Describe the potential impacts of this recommendation on economic development.**

Degraded soils reduce productivity, thus improving overall soil health is a strategy for long-term economic growth and stability.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

Cost of implementation varies by scope of actions taken.

9) **Who is empowered to implement this recommendation?**

State legislature.

10) **Are there differing perspectives? If so, what are they?**

This recommendation had broad support from the group.

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

The following actions should be included:

1. Promote agricultural conservation best management practices (e.g., no-till, cover crops, extended crop rotations, etc.) to promote soil health, increase carbon storage, and reduce emissions.
2. Allocate state funding in the order of $25 million annually to leverage federal Farm Bill dollars and assist farmers and producers in implementing the array of conservation practices.
3. Foster permanent grasslands and forestry by recommending that our federal senators and representatives make a case to significantly increase the rental rates for marginal lands that meet the Environmental Benefits Index (EBI) requirements.[7] The major benefit of land enrolled in long-term permanent cover is

[7] Currently in Michigan approximately 120,000 acres are enrolled in either a 10 or 15 year contract through the USDA Conservation Reserve Program. There is an opportunity for additional acres of marginal land, that meet the

reduction of soil erosion and runoff, enhanced air quality, and carbon sequestration.

4. Sustain full funding for conservation districts to enhance implementation of climate-beneficial conservation programs (starting in FY22 Michigan appropriated operational funds for the 75 conservation districts for the first time since 2009).
5. Establishing a State of Michigan cost-share program for conservation practices.
6. Advance and fund soil amendment initiatives (e.g., biochar) and composting

III. Healthy Freshwater Systems

1) Overview of recommendation.

Rationale: Prioritizing Michigan's wetlands and waterways is critical to economic growth, ecological functions, and healthy, resilient communities. Development pressure, rising temperatures, frequent intense storms, and pollution significantly deteriorates wetlands and waterways and the important ecosystem services they provide. One ecosystem service is the storage of carbon, particularly of wetlands. These lands are important stores of carbon thus, disrupting these lands releases stores of GHGs and restoring them can create a powerful carbon sink.

Recommendation: Protect existing wetlands and waterways, create new and restore wetlands where appropriate, and increase carbon storage in waterway green infrastructure to increase both mitigation and adaptation benefits.

2) In what timeframe is this recommendation achievable?

There is a longer timeframe for restoring landscapes, but protecting remaining wetlands will have an immediate avoidance of emissions. Timelines vary by actions taken.

3) What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?

In one estimate, increasing riparian buffers in MI can results in 472,843 tCO_2-e/yr or at least 11.8 million metric tCO_2-e by 2050 (TNC Opportunity Assessment for Michigan,2019). Recent estimates of annual wetland loss in Michigan were just over 1000 acres per year.[8]

Michigan hosts some of the most carbon rich wetlands in the US (averaging 1331.9 tC per acre in the upper midwest)[9] and disturbing wetlands releases long-stored carbon both immediately and continually until a new equilibrium is reached. Estimating a 25%

Environmental Benefits Index (EBI) rating, for enrollment in CRP. For example, the current national ceiling for CRP is27 million acres and only 22.9 million acres are currently enrolled. The primary reason that landowners are hesitant to enroll land is the low rental payment (current average is approximately $85/acre/year).

[8] EGLE Assessment

[9] Nahlik and Fennessy, 2016. Carbon storage in US wetlands. Nature Communications. https://www.nature.com/articles/ncomms13835

loss of carbon when destroyed, protecting wetlands could result in avoiding 331,975 tC per year, equivalent to 332,975 metric tons of CO2-e with a potential total impact of over 8.3 MMT of CO2-e in 25 years.

4) **Describe the potential impacts of this recommendation on environmental justice.**

Polluted water and degraded lands have a disproportionate impact on poor and marginal communities. Wetlands provide numerous ecosystem services to communities, including protecting water quality, preventing erosion, providing flooding storage and conveyance, and creating access to natural resources. Actions to protect existing wetlands would ensure that current spaces continue to exist and grow to provide ecosystem services for all.

Socio-economical vulnerable populations, communities of color and Indigenous people are most at risk of catastrophic flooding related to dam failure and less likely to recover quickly. Removing outdated, unused dams will reduce GHG emissions, including methane gas and increase resiliency for communities and Tribal Nations. Acknowledging the water and cultural rights of Tribal Nations need to be equitably considered into meeting emission reductions from dam removals/monitoring. In 2020, dam failures in Michigan forced hundreds of families to evacuate, caused millions of dollars of property damage.

5) **Describe the potential impacts of this recommendation on labor.**

This recommendation will create new job opportunities in green and blue economies throughout the state, support outdoor tourism, valuable industries and sustainable agricultural production. The National Oceanic and Atmospheric Administration (NOAA) identified restorative activities from 125 projects supported more than 2,200 jobs in construction, engineering, scientist, management, skilled labor and technicians, legal, communications and environmental consultants[10]. Investments in comprehensive training can improve transferability to new employment sectors and foster equal opportunities for a prepared workforce. Restoring wetlands and waterways improve hydrology to support community-based sustainable agricultural practices and fisheries. Important watershed restoration activities are identified activities in H.R. 2358 21st Century Civilian Conservation Corps Act, which would establish a Civilian Conservation Corps to "employ unemployed or underemployed, in the construction, maintenance, and carrying on of works of a public nature, including reforestation, soil erosion and climate adaptation infrastructure."[11]

6) **Describe the potential impacts of this recommendation on the environment.**

According to EGLE's most recent wetland inventory (2000-2005), Michigan has approximately 6,465,109 million acres remaining from the original 10.7 million acres that

[10] https://www.fisheries.noaa.gov/feature-story/habitat-restoration-supports-jobs-stewardship

[11] https://www.filesforprogress.org/memos/blue-jobs.pdf

existed before European settlement[12] The extent and magnitude of climate change effects on coastal wetlands will result in significant economic and environmental losses without adequate adaptation and mitigation measures. To support maintenance of current levels of carbon stored in wetlands and accelerate land conservation efforts to guard against permanent land conversion and increase carbon capture, wetlands conservation and restoration should exceed current measures of wetland conservation to reach net increases of identified wetland areas.

7) **Describe the potential impacts of this recommendation on economic development.**

Polluted water and waterways require costly interventions in both built and rural environments. Potential job creation in site remediation. Restrictions on development could limit returns for some landowners.

Wetlands protected by conservation easement support the local tax base, and provide additional economic benefits by avoiding the costs of public services associated with development, and the risks incurred by landowners with infrastructure vulnerable to changes in water levels. Clustering development activity, incorporating nature into setback requirements and coordinated site plan reviews will further extend protection for existing wetlands and waterways.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

Wetlands are costly to create, rehabilitate and restore. In comparison, protecting and enhancing of existing wetlands is a better economic return on investment, despite potential opportunity costs (referring to potential other valuable uses for that land).

9) **Who is empowered to implement this recommendation?**

- State legislature, quality of life agencies, municipal planners and policymakers.
- Tribal nations should be able to petition for dam removals impairing tribal lands.
- Rural actors including farmers in crop production and animal husbandry.

10) **Are there differing perspectives? If so, what are they?**

This recommendation was widely accepted by the group.

11) **What are the most important considerations for achievability and feasibility of this recommendation?**

In support of this recommendation, implement the following measures:

1. Establish a statewide moratorium on the destruction of wetlands.
2. In all development and infrastructure projects:

[12] https://www.michigan.gov/egle/0,9429,7-135-3313_3687-10332--,00.html

a. Identify and prioritize wetland protection, restoration, and creation;

b. Promote use of green infrastructure in built environments and prioritize climate benefits over cost in ranking top options -- use this approach specifically to address inequitable climate impacts in vulnerable communities;

c. Ensure equity is upheld in alignment with this working group's guiding principles.

3. Develop and update statewide climate change mitigation and adaptation guidelines to prioritize protecting, restoring, and conserving vital freshwater systems through inclusive, equitable planning.
4. Increase implementation of conservation practices to reduce runoff (e.g., buffers, responsible fertilizer use, limiting concentrated animal feeding operations) while increasing carbon storage (e.g., carbon sequestration in trees).
5. Remove outdated 'hard' infrastructure (e.g., unused dams and retainment walls) and replace with green infrastructure to increase carbon sequestration, improve water quality, restore native aquatic life, increase resiliency, and reduce risk of failing infrastructure

IV. Climate-Beneficial Bioeconomy

1) Overview of recommendation.

Rationale: Reaching climate targets will require dramatic action from all sectors of the economy over a period of several decades. While energy and transportation are the largest sources of U.S. emissions, the future climate also depends in great measure on the biological carbon cycle. Carbon dioxide is absorbed from the atmosphere by photosynthesis and stored for months, decades, or even millennia in plants, trees and soils, and later returned to the atmosphere when the plants die and break down and carbon stored in soils is oxidized. This cycle keeps carbon out of the atmosphere. Bio-based materials are an important part of natural and working lands climate solutions because they are less emissions-intensive substitutes for materials like steel, concrete and plastics; in some cases, bio-based products store carbon throughout their lives. Natural and working lands produce these materials that can be used in the built environment and for energy.

Promoting a bioeconomy will encompass land use decision-making and promotion of climate beneficial bio-based products and materials. Bioenergy and other bio-based products sit at the intersection of energy and transportation fuel emissions and the biological carbon cycle, so we must consider both to understand their role in a world free of carbon pollution.

Recommendation: Enhance and develop a transformative climate beneficial bioeconomy that 1) implements and promotes natural, sustainable, and low-emission materials

production and use, 2) reduces emissions across all NWL commodities (agricultural and forest products), 3) reduces waste and increases efficiency, and 4) promotes sustainable land use planning.

2) In what timeframe is this recommendation achievable?

Actions starting now with strong near-term benefits but with accumulating changes and effects over time, changing market indicators and shaping future decision-making.

3) What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?

900 metric tons of CO2 equivalent per year; **8,100** metric tons of CO2 equivalent **by 2030.**

900 metric tons of CO2 equivalent per year; **17,100** metric tons of CO2 equivalent **by 2040.**

900 metric tons of CO2 equivalent per year; **26,100** metric tons of CO2 equivalent **by 2050.**

*Based on 5 mass timber buildings being constructed per decade that use about 4,000 m^3 of glulam and CLT combined, black spruce lumber or the equivalent.

4) Describe the potential impacts of this recommendation on environmental justice.

Substituting mass timber for steel and/or concrete components in the built environment can address greenhouse gas emissions by a) eliminating the substantial emissions associated with mining and manufacturing steel and concrete and transporting these materials to building sites; and b) storing carbon sequestered by trees in the mass timber products themselves, and c) better energy efficiency resulting in further tenant savings than similar construction. These benefits contribute overall to climate solutions that are not specific to environmental justice communities, but accrue to all populations. In terms of benefits specific to under-served or disadvantaged communities, mass timber offers the following opportunities:

a. Affordable Housing: Well-planned and implemented mass timber projects can speed up the building process significantly, which can translate into both overall cost savings and quicker availability of affordable units to Michiganders who need them. This can include both infill development in urban and suburban areas and workforce housing in rural areas.
b. Energy Savings: The inherent R-value of wood and tight manufacturing tolerances achieved with cross laminated timber buildings result in buildings that have lower air leakage and better energy performance in appropriate designs.

c. Rural Economic Development: Harvest and manufacture activities to produce Michigan-sourced-and-made mass timber can provide new and expanded job and economic opportunities in under-served rural areas of the state.

5) Describe the potential impacts of this recommendation on labor.

Centrally contributing to a broader understanding of a green job economy – thousands of new jobs in materials processing, reclaiming materials, and increased scope and application of products (e.g., biofuels and mass timber).

Some of the construction cost savings associated with mass timber construction result from ability to use smaller construction crews and lighter equipment than for concrete and steel buildings. That said, attracting a mass timber manufacturer to Michigan could result in the addition of 50 to 100+ direct jobs, and support other indirect and induced employment. It's not clear what the net impact would be yet. It is likely that mass timber could eventually capture 5 to 10% of the multi-story building market in Michigan, so the impact on other construction jobs is likely to be modest.

6) Describe the potential impacts of this recommendation on the environment.

Direct and indirect emissions reductions as well as carbon storage in wood products. Life cycle analyses (LCAs) will be necessary to calculate CO2-e of sector and commodity specific improvements from all major greenhouse gases (e.g., carbon dioxide, methane, and nitrous oxide).

Construction accounts for 40% of global greenhouse gas emissions, and 30% of global energy consumption. Mass timber products have been demonstrated to require less energy for production than concrete and steel. Also, mass timber building projects have been shown to store considerable quantities of CO2, about 750 kg/m^3 in some studies. In life cycle analyses, mass timber buildings performed better than similar concrete and steel designs in most environmental measures. Raw materials used to manufacture mass timber products are sourced from sustainable managed forests, generally under one or more certification systems.

7) Describe the potential impacts of this recommendation on economic development.

Many other sectors will contribute (e.g., building and construction) and will benefit from increased efficiency. Direct linkages between demand and supply between rural production and consumption in terms of energy, commodities, waste materials will increase value of NWL materials and boost rural economies while making efficient materials available in the built environment, lowering overall costs.

Mass timber construction offers several economic development benefits. Mass timber structures are often lighter in weight than comparable concrete and steel designs, allowing use of poorer quality soils in some cases. Mass timber projects be faster and cheaper to erect, resulting in overall cost savings of up to 30% compared to concrete and steel. In some areas, particularly in states that already have a mass timber product manufacturer, the wood components can be sourced from local forests and

sawmills, keeping the construction investment circulating in local economies. Stimulating market demand for local wood products helps provide outlets for products from forest management and retention of forests as working lands, as an alternative to subdivision and development.

Mass timber construction projects use large quantities of products that could be manufactured in Michigan as well as large quantities of products that are currently manufactured here such as oriented strand board, dimensional lumber for light frame wall infill, and gypsum board. In the future, mass timber products using hardwood species which are prevalent in Michigan could be approved for use in construction, resulting in an additional market outlet for locally grown forest products.

The forest products industry in Michigan currently supports 91,000 jobs and is an important regional employer, providing 30% of manufacturing jobs in the Upper Peninsula. Attracting a mass timber product manufacturer to the northern 2/3 of the state could directly provide 50 to 100 jobs, and support another 80 to 130 jobs through indirect and induced economic activity.

8) What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:

Potential costs by 2030 could total $22 million. The cost for the first two of the strategies would be minimal (requiring state funded building projects to consider a mass timber design, and early adoption of the mass timber portions of the 2021 International Building Code). Incentives for attracting a mass timber manufacturer would be on the order of a similar sized forest products manufacturer, potentially between $1 million and $5 million in economic development funds (one-time expense). Support for training, outreach and education on mass timber project design and construction could cost about $700,000 per year. Meaningful support for research on mass timber manufacturing and end-of-life uses for mass timber could cost up to $500,000 per year.

9) Who is empowered to implement this recommendation?

All of the entities below are empowered to implement parts of this recommendation, however executive order and/or legislation may be required to implement a requirement to consider mass timber designs for capital outlay fund applications, and to require LARA to pursue early adoption of the mass timber portions of the 2021 International Building Code. State government – executive branch and legislature are empowered to authorize new funds to support outreach and education to constructors, architects and engineers on mass timber construction, and to support research.

- Local government
- State government – Executive
- State government – Legislative
- Federal government – Executive
- Federal government – Legislative
- Private sector

10) Are there differing perspectives? If so, what are they?

There were strong and divergent opinions about the role of plant-rich diets in this recommendation.

11) What are the most important considerations for achievability and feasibility of this recommendation?

The following measures should be implemented in support of this recommendation:

1. Support and promote natural, sustainable, and low-emission materials production and use.
    a. Use sustainably grown wood and reclaimed wood products that store carbon, reduce emissions, or serve as climate-beneficial-or-neutral substitutes for emissions-intensive materials (e.g., plastics, metals, concrete) derived from fossil fuels or that have high fossil fuel emissions.
        i. Examples of such products include biochar, sustainable biofuels, renewable natural gas, bioenergy, nano-technology and chemical products, and mass timber.
        ii. Promote mass timber in building construction as a climate-beneficial substitute for more emission-intensive materials as recommended by the Council on Climate Solutions Buildings and Housing Workgroup. Promote in-state manufacture of Mass Timber from Michigan-sourced timber and reclaimed wood.
    b. Promote expansion and consumption of lowest-emission agricultural commodities (e.g., locally grown and/or plant crops) through platforms like the Michigan Department of Agriculture Marketing Development Programs.
2. Reduce emissions across all NWL commodities (agricultural and forest products)
    a. Using commodity-specific data, identify best practices for low emission production and encourage practice adoption by all producers, aiming for continual improvement
3. Reduce waste and increase efficiency of NWL products and materials
    a. Focus on achieving efficiencies and waste reductions throughout the food system, including at different levels of production.
    b. Support efforts to aggregate forest and agricultural feedstocks to reduce waste and increase efficiency of use, including, but not limited to, promoting mixed-product manufacturing campuses.
    c. Support development of new products and expansion of markets for existing products that can be made from urban wood and wood manufacturing residues, as a market-driven mechanism for diverting

wood materials from landfills and avoiding methane emissions. Examples include:

i. Encouraging utilizing wood from urban spaces by creating small scale wood processing capabilities downstate.

ii. Providing state support for technology advancement to create innovative new materials and processing efficiencies.

V. Leadership, Education, and Advocacy

1) Overview of recommendation.

Rationale: Leveraging Natural and Working Lands is essential to achieve carbon neutrality targets. Near-term action is required by 2030 with continued and sustained improvements through 2050. Starting immediately, Michigan must take a lead role in fostering enabling conditions, promoting knowledge transfer, and increasing access to needed data information. This will require multi-level climate action from diverse stakeholders and active promotion and advocacy. In addition, the state's climate goals need to be considered across all land sector policies and programs and built into assessments, strategic planning, and decision-making processes.

Recommendation: Promote climate initiatives and ensure multi-level action for mitigation and adaptation across natural and working lands by acting in a leadership capacity, fostering enabling conditions, promoting knowledge transfer, and increasing access to needed data and information.

2) In what timeframe is this recommendation achievable?

Achievable by 2025 or sooner.

Michigan can benefit greatly from the example set by other regions where compliance markets and voluntary markets for offsets have been established. By learning from detailed case studies of other marketplaces, it would be possible to develop guiding principles from identified best practices, template out the necessary processes and design elements, and identify resources to refine Michigan's approach.

3) What is the relative magnitude of this recommendation, in terms of GHG emissions reductions?

The magnitude likely to be achieved is not immediately knowable. This will depend greatly on the level of landowner participation, which in turn will be driven by the presence (or absence) of emissions mandates and other climate policy and their stringency, and the relative attractiveness of offsets available in the proposed Michigan market compared to alternatives. However, if we were to hypothesize steady development of Michigan's opportunities such that 50% of DNR state forest and wildlife areas (1.3 million acres) and non-industrial private family forestland ownerships (4.56 million acres) are developed, these forest carbon projects could potentially generate between 5,000,000 and 15,000,000 metric tons CO2e per year if fully developed.

4) **Describe the potential impacts of this recommendation on environmental justice.**

Enabling nature-based solutions would not have direct environmental justice impacts. Overreliance on offsets to meet decarbonization objectives could lead to conflict with environmental justice priorities, as offsets do not address the impact major emissions sources have on the localities where they exist. For this reason, in the case that a state or multi-state emissions reduction mandate is considered in the future, a cap on the use of offset credits should be part of the mandate. Offsets should complement, but not replace, efforts to directly address emissions at their source.

5) **Describe the potential impacts of this recommendation on labor.**

This proposal will have a negligible impact upon labor.

6) **Describe the potential impacts of this recommendation on the environment.**

About 9.13 million acres of forest in Michigan are held in private family and individual ownership. All of this land is vulnerable to development. With the anticipated influx of climate refugees to the Great Lakes region,Michigan will experience increased development pressure.

Existing Michigan forest resources provide many ecosystem services, including carbon sequestration and storage, provision of clean air and water, flood mitigation, groundwater recharge, and provision of timber and wildlife habitat. Greater enrollment of Michigan forestland in carbon off-set programs would provide incentive to keep forestland as forestland and retain these environmental benefits.

7) **Describe the potential impacts of this recommendation on economic development.**

Enables landowners to diversify revenue sources and reduce risk from forestland ownership.

8) **What are the relative costs of this recommendation? Unknown, or different timeframe – explain why:**

The cost for establishing such a marketplace would require further analysis to estimate.

9) **Who is empowered to implement this recommendation?**

- State government – Executive: Michigan Department of Natural Resources, Michigan Department of Agriculture and Rural Development; Michigan Department of Environment Great Lakes and Energy.
- Federal government – Executive: USDA Natural Resources Conservation Service and Farm Service Agency
- Private sector/NGO: The Nature Conservancy; Michigan Association of Conservation Districts

10) Are there differing perspectives? If so, what are they?

There was consensus that Michigan needs to be a leader in climate policy, advocacy and action. While the group generally supports limiting and eventually eliminating fossil fuel production on natural and working lands, there was a at least one strong and divergent opinion from state government about reducing fossil fuel production on state lands.,

11) What are the most important considerations for achievability and feasibility of this recommendation?

The following measures should be implemented in support of this recommendation:

1. Promote sustainable land use planning
    a. Identify, adopt, and promote policies that limit sprawl, installation of infrastructure (e.g., roads, sewer, and power) in remaining natural areas. On the contrary, actively promote infill development of existing urban areas.
    b. In relation to increasing renewable energy demands on rural lands, site solar in priority areas such as marginal ag land, urban brownfields, landfills, on structures, and in dual-use opportunities (e.g., solar on farms and electric farm equipment), creating pollinator habitats, and soil remediation.
    c. Avoid land use or management conversions to uses that are less beneficial to climate.
        i. As examples: maintain agricultural land and any move should be towards improved practices or return to forest where appropriate. Keep working forests healthy and productive and any move should be towards higher carbon storage. Protect special forests (e.g., old growth, key habitat).
2. Build climate impacts into decision-making
    a. For state government decision-making, require climate considerations (e.g., GHG emissions), with best available data, to all land sector policies and programs, built into assessments, strategic planning, and decision-making processes.
        i. As part of this, provide guidance for state agencies to estimate the GHG emissions consequences of each decision.

    b. Advocating for climate-smart regional and local land management policy.
    c. Relationship building with key partners at local, state (cross agency), and federal levels to engage on climate topics.

3. Demonstrate support of nature-based carbon offset projects in MI by:
    a. Forming a government-NGO partnership to promote carbon projects on private forest land.
    b. Functioning as an information hub for nature-based carbon projects.
    c. Developing guidance on tracking carbon reductions from in-state and out of state offset buyers, and how to tie these reductions to Michigan's carbon neutrality targets.
4. Limit and eventually eliminate fossil fuel production on NWLs by creating legislation that commits state agencies and the energy producers to an EDAP: Energy Descent Action Plan. In other words, a divestment from fossil extraction at a sensible rate over a reasonable time.
    a. Support allowing some limited funds generated by the Michigan Natural Resources Trust Fund to be used for the reclamation and rehabilitation of sites on public land negatively affected by gas and oil production.

5. Foster enabling conditions
    a. Include climate priorities across all planning and land use decision-making, budget prioritization, grants, etc.
    b. Prioritize nature-based climate solutions in development activity through the implementation of urban green and blue infrastructure and encourage large-scale adoption of climate-resilient strategies through inclusive incentives-based programs.
6. Promote knowledge transfer.
    a. Lead innovative and influential citizen education and engagement campaigns to increase carbon storage on the landscape (e.g., urban and ag landscapes, improved forest management), chose bio-based materials and fuels, and avoid land use change
7. Review the K-12 academic science standards to include one or more standards regarding the ability of natural land and waterways to sequester or release carbon.
8. Educate on climate-smart lifestyles choices connected to NWL

    a. Educate to the health and climate benefits of a local and/or plant rich diet
    b. Selecting wood products when possible
    c. Reducing food waste

9. Increase access to needed data information
    a. Invest in continued research and data collecting as well as platforms to share that information (e.g., web-based interactive geographic information system (GIS) planning and monitoring database and mapping tool) that assesses potential and co-benefits of greenhouse gas storage and sinks, identifies strategies on both public and private parcels throughout the state, and is used to guide funding from NWL initiatives.
        i. Develop a web-based GIS-based conservation as well as a source of information for initiatives not funded by NWL.
10. Public GHG inventory data, including those from natural and working lands
    a. The state must lead an initiative specific to inventorying to identify how pools and fluxes will be accounted for from the NWLs, with particular attention to avoid double counting (e.g., determining a strategy to deduct carbon credits being used to offset emissions for other actors)