Climate solutions for the fisheries sector

What can policymakers do? (Pingree and Reid 2020)

- Support "Coastal Blue Carbon" initiatives, which use coastal ecosystems and plants to capture and store CO2 more efficiently than forests.
- Establish the Maine Seafood Business Council, which will inform business on adaptation and mitigation practices they can adopt, while also cutting costs.
- Fund research focused on the effects of climate change on fisheries.
- Fund research on coastal energy projects.
- Support resiliency measures for coastal communities.

What can the fisheries sector do? (Pingree and Reid 2020)

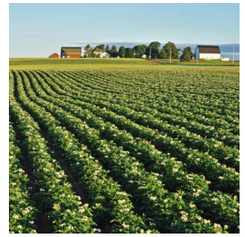
- Adopt adaptive management strategies to respond to changing ocean conditions (e.g. change target species).
- Diversify their catch and promote less-consumed species to reduce stress on marine ecosystems.

What can individuals do?

- Buy in-season, local seafood and seafood products that are lower on the food chain, which are less carbon intensive (Carlson and González 2009).
- Vote for officials who support clean energy, adaptation measures for coastal communities, and conservation of natural resources.
- Support coastal land trusts.

How will Maine's farms be affected?

Currently Maine's primary crops are well-suited to a short growing season. The agricultural sector supports over 24,000 jobs, which are threatened by climate change (Abello and Beal 2020).



Maine is projected to have a warmer and wetter climate, which will have several consequences for the farming sector:

1. Unseasonal winter warmth threatens some fruit tree crops, including apples and peaches (budding may occur before the last frost; Pingree and Reid 2020). Some crops (e.g. strawberries) may benefit from a longer growing season (F. Stevenson 2020).
2. Maine's most valuable crop is the potato; yields may be reduced 25-35% due to a warmer climate (Jacobsen et al. 2009).
3. All farmers will be threatened by more intense precipitation events, new pests, and disruptions to pollinators (Sabina 2017).

Farmers have already made changes in their practices to adapt to climate change. They will need to continue to adapt, shifting crops and technologies as the growing season lengthens (Fernandez et al. 2020).

*A low carbon diet means eating foods that are lower on the food chain i.e. less meat and dairy and more plants (Carlson and González 2009). When you do eat meat, opt for less carbon-intensive choices like chicken instead of red meat or scallops instead of tuna (ibid). Choosing locally-produced food cuts down on transportation and processing GHG emissions. Thinking about which option is best for the planet can be overwhelming, so take small steps to reduce how much meat and dairy you consume instead of trying to be "perfect."

Thanks to those who graciously offered their time to be interviewed for this project: Nat Bell, Hugh Cowperthwaite, Ken Laustsen and Ford Stevenson. Thanks, too, to those who contributed their expertise in making this project possible: Theresa Kerchner, Jane Matrisciano, and Cassaundra Rose. Finally, I'd like to acknowledge KLT's generous donors for the funding to make this internship even possible .

Climate solutions for the agricultural sector

What can policymakers do? (Abello and Beal 2020)

- Support access to sustainable food systems for all Mainers.
- Fund programs that support climate change adaptation measures for farmers.
- Create and strengthen incentives for landowners to adopt carbon sequestration practices and to commit to farmland conservation.
- Strengthen agricultural climate change R&D programs.

What can farmers do? (Abello and Beal 2020)

- Use carbon sequestration techniques: low-till methods, fall and winter cover cropping, crop rotation, and the use of compost or manure.
- Use anaerobic digestors to process animal manure and food waste.
- Consider livestock breeds and crops that are better adapted to higher temperature.

What can individuals do?

- Support local food systems
- Vote
- Talk about climate change to friends and family.
- Support farmland conservation.
- Eat a more carbon friendly diet* (Carlson and González 2009)

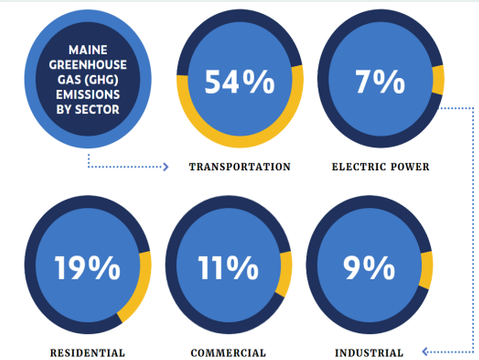
Acronyms used in this pamphlet:

GHG: Greenhouse gases. These gases, like carbon dioxide (CO_2) and methane, are produced by natural and human activity and they warm the planet, leading to climate change.

R&D: Research and Development

IPCC: International Panel on Climate Change

Climate Change Impacts on Maine's Forestry, Fishing, and Farming Economies



Evan Kuehnert
Kennebec Land Trust
2020 Summer Intern
McGill University, Class of 2022

KENNEBEC LAND TRUST
PO Box 261 • 331 Main Street
Winthrop, Maine 04364
207-377-2848 • www.tklt.org

Climate Change in Maine

Climate change impacts, including warming oceans, shorter winters, and an increase in invasive species, threaten Maine's natural resource based economies.

Three of Maine's primary natural resource based sectors— farming fisheries and forestry—contribute to and will be affected by climate change, but each also has the potential to advance climate solutions.

Everyone can and should take simple actions in their lives to help solve climate change. For example, voting, talking about climate change, and eating a low carbon diet are simple ways to affect change.*

Sources

Abello, Tom and Beal, Amanda (2020)."Maine Climate Council Natural and Working Lands Work Group Final Strategy Compilation. Retrieved from: https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/NaturalWorkingLandsWG_FinalStrategyRecommendations_June2020.pdf

Carlsson-Kanyama A, González AD. Potential contributions of food consumption patterns to climate change. *Am J Clin Nutr*. 2009;89 (5):1704S-1709S. doi:10.3945/ajcn.2009.26736AA

Climate Change in Maine. (2020). Retrieved August 07, 2020, from https://climatecouncil.maine.gov/maines-climate

Fernandez, Ivan & Birkel, Sean & Simonson, Julia & Lyon, Bradford & Pershing, Andrew & Stancioff, Esperanza & Jacobson, George & Dr, Mayewski,. (2020). Maine's Climate Future: 2020 Update.

Fernandez, Ivan. (2015). Maine's Climate Future: 2015 Update. 10.13140/2.1.3356.4961.

F. Stevenson. Personal Communication. July 14, 2020.

H. Cowperthwaite. Personal Communication. July 13, 2020.

L. Jacobson, George & Fernandez, Ivan & Andrew Mayewski, Paul & V. Schmitt, Catherine. 2009. Maine's climate future: an initial assessment.

N. Bell. Personal Communication. July 23, 2020.

Pingree, Hannah and Reid, Jerry (2020). "A Report from the Coastal and Marine Working Group of the Maine Climate Council." Retrieved from: https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/CoastalMarineWG_FinalStrategyRecommendations_ June2020.pdf

Sabina, E. (2017, August 10). A Changing Climate and Maine's Farms: A real threat, matched by real promise. Retrieved August 04, 2020, from https://www.mainefarmlandtrust.org/a-changing-climate-and-maines-farms-a-real-threat-matched-by-real-promise/ (MFT)

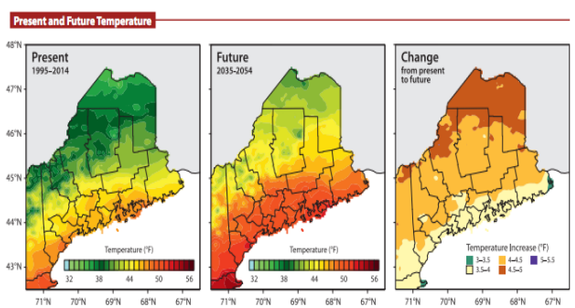
Wilkerson, E., Galbraith, H., Whitman, A., & Balch, S. (2011). Allen-Whitney Memorial Forest: Climate Change Adaptation Plan. *Manomet Center for Conservation Sciences, Brunswick, ME.*

How will climate change affect Maine's forest-products businesses?

The impacts of climate change on forests could also affect the many jobs tied to Maine's forest-products businesses.

Maine is projected to become warmer and wetter, with several consequences for its forests.

1. The soil will be frozen for a shorter period of time, reducing the time during which timber can be harvested (N. Bell 2020).
2. White pine needle disease is projected to spread more in wetter weather (Fernandez 2015).
3. Habitat for species including sugar maple, red maple, black cherry, balsam fir, red spruce, and yellow and paper birch is expected to decline (Wilkenson et al 2011). Beech, which is less commercially valuable, is expected to be more widespread (Fernandez et al. 2020).
4. Drought is often the greatest source of stress on forests (Fernandez et al 2020); it increases the likelihood of fires and can make diseases more prevalent.



"Maps showing mean annual temperature for 1995-2014 (left), 2035 –2054 (center), and the predicted change or difference between the two time periods (right).

The predicted rise in temperature by 2050 ranges 3.0-5.0°F from the coast inland to the Canadian border. Maps derived from an ensemble simulation of the IPCC A2 emissions scenario" (Fernandez 2015).

Climate solutions for forest-products businesses

What can policymakers do? (Abello and Beal 2020)

- Promote voluntary, incentivized forest management programs focused on carbon storage and sequestration.
- Encourage efficient wood-powered heating.
- Incentivize the purchase of local wood products.
- Fund infrastructure and technological innovation and assistance to make the forestry sector less carbon intensive.

What can forested landowners and the forestry sector do?

- Keep forests as forests so that GHG emissions from land conversion are avoided and forests continue to take CO_2 from the atmosphere.
- Use best practices to minimize GHG emissions.

What can individuals do?

- Use local wood products as a substitute for more carbon intensive building materials like concrete or steel.
- Vote for local, state, and national government officials who support sustainable forest management.
- Support Maine's Local Wood WORKS initiative.

Local Wood WORKS

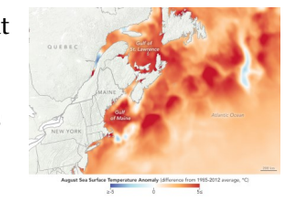
localwoodworks.org

How will climate change affect Maine's fisheries?

The Gulf of Maine is warming faster than 99% of the world's oceans (Fernandez et al. 2020). Warmer water has a number of negative effects:

1. Less vertical mixing of ocean water means fewer nutrients reach the surface, with negative impacts on ecosystem health (Fernandez et al 2020).

2. Warmer temperatures cause an increase in toxic algal blooms, which can make shellfish toxic to humans and lead to large scale fish kills ("Climate Change in Maine" 2020).



3. Ocean heatwaves that disrupt patterns of fish and seafood migration, are harmful to fisheries (e.g. the marine heatwave in 2012 negatively affected the lobster sector) (Fernandez 2015).

Another effect of climate change is ocean acidification, which occurs when CO_2 accumulates in the ocean. As a result of this process, there are fewer calcium carbonate ions, which shellfish use to form their shells, available in the water. Ocean acidification presents a significant challenge to the shellfish sector (H. Cowperthwaite 2020).

Climate change can introduce new invasive species and exacerbate the effects of existing ones, like the green crab. These species compete with native species and threaten Maine's fisheries sector by disrupting marine ecosystems (Pingree and Reid 2020).