WET AREAS MAPPING AT EMEND
KEY FINDINGS AND NEW APPLICATIONS

Foresters have long used information about wet areas on the landscape to make decisions that reduce their operational risks. We took the same tool managers use—wet area maps produced using LiDAR—and asked whether it could also be used to manage forests sustainably when it comes to biodiversity, ecosystem function and forest productivity.

Wet Areas Mapping (WAM) revealed relationships between site wetness, biodiversity, ecosystem processes, and harvesting.

These relationships are a powerful tool that will allow managers to prioritize retention to achieve specific management goals.

Mosses and liverworts were most abundant and species-rich in wetter sites in conifer and mixed stands. Several species were sensitive to any level of harvest.

Ground beetles (carabids) were more diverse and had more specialist species in wetter sites, except for higher diversity on drier conifer sites.

Vascular plants were most sensitive to harvesting in wetter conifer stands, and in drier deciduous stands because of increased competition.

Forest floor carbon stocks were most sensitive to harvest at wetter conifer sites, while harvesting from wetter deciduous sites may promote increased forest floor carbon stocks.

Forest productivity and regeneration were higher on drier sites in all forest cover types.

Coniferous

Wetter
- Mosses & liverworts
- Vascular plants
- Ground beetle specialists
- Soil carbon and nitrogen

Drier
- Forest regeneration
- Ground beetle diversity

Mixedwood

Wetter
- Mosses & liverworts
- Vascular plant diversity
- Ground beetles

Drier
- Forest regeneration
- Vascular plant cover

Deciduous

Wetter
- Vascular plant diversity
- Ground beetles
- Mineral soil carbon and nitrogen

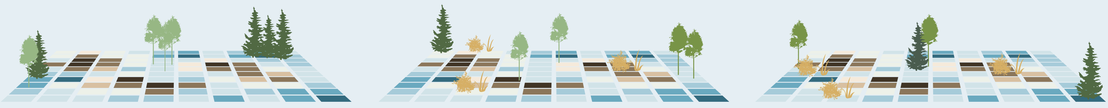
Drier
- Forest regeneration
- Mosses & liverworts
- Vascular plant cover

How can we use this information to optimize forestry practices?

We harnessed the power of WAM and a biodiversity optimization tool, Zonation, to plan retention patches in northwestern Alberta. We defined scenarios that prioritized both biodiversity and other objectives: cost; aggregation; and dry, mesic or wet areas.

Our model outputs had smaller, more numerous retention patches occupying drier sites than the operational reference. These results suggest that this approach could be used to plan retention to meet multiple objectives (e.g., cost, habitat patch size, and biodiversity).

Outputs of the Zonation scenarios compared with the operational reference



Wetter ⟵ Drier

Operational reference
- Fewer, larger patches
- Aspen and spruce evenly represented
- Mainly on wet and mesic sites

Wetter ⟵ Drier

No cost constraint
- Many very small patches
- Aspen and grass/shrubs evenly represented
- Mainly on mesic sites and some dry

Wetter ⟵ Drier

With cost constraint
- Slightly larger and fewer patches
- Spruce, grass/shrubs, and some aspen
- Mainly on mesic sites and some dry/wet

This scenario modelling demonstrates the power of a tool that will allow managers to "move the sliders" on different productivity, biodiversity, carbon and economic objectives—and tailor these scenarios and models to local conditions and needs.

Our recommendations for forest managers

In coniferous or mixedwood stands...

Retaining trees on wetter sites will largely conserve biodiversity and prevent losses of carbon stocks, especially if trees are retained in patches.

In deciduous stands...

Retaining trees on drier sites will help to conserve unique dry-adapted species, while high retention on wetter sites may help conserve beetle diversity. Harvesting at wetter sites may, in this case, increase forest floor carbon stores.

Some species are highly sensitive to harvest

Harvest patterns that mimic natural disturbance can be used to maintain forest structure and conditions that are essential to maintain sensitive species like liverworts on the landscape.

Wet Areas Mapping is a powerful tool for forest management.

The research conducted at EMEND using Wet Areas Mapping shows us that ecosystem values (like biodiversity) and processes (like carbon cycling and regeneration) change along a gradient of site wetness. By assessing how these values and processes change after harvesting, we can recommend retention patterns that will best achieve different objectives. These relationships can even be entered into prioritization software, allowing managers to tailor retention strategies to specific objectives in balance with operational and economic constraints.

Research at EMEND is made possible by our many partners and funders:

UNIVERSITY OF ALBERTA DEPARTMENT OF RENEWABLE RESOURCES

Alberta Agriculture and Forestry

NSERC CRSNG

Natural Resources Canada

MERCER peace river

CANFOR

Wet Areas Mapping is a collaborative project:

UNIVERSITY OF ALBERTA DEPARTMENT OF RENEWABLE RESOURCES

Alberta Agriculture and Forestry

UNB UNIVERSITY OF NEW BRUNSWICK

Visit www.alberta.ca to learn more and request data.