

WETLANDS ON THE LANDSCAPE:

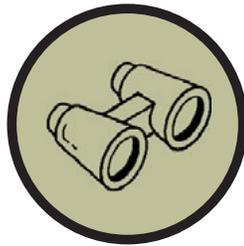
Wetland Values

Wetlands in the western boreal forest provide many ecosystem services, ranging from providing habitat for plant and animal species, to regulating surface and groundwater storage and flow, to serving as sites for recreation. A whole landscape approach to ecosystem-based management requires the recognition of the values and services provided by wetlands, even though they may not provide obvious and immediate economic benefits.

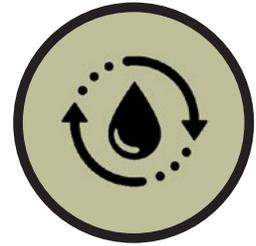
Ecosystem services provided by wetlands can be grouped into four categories:¹

Cultural Services

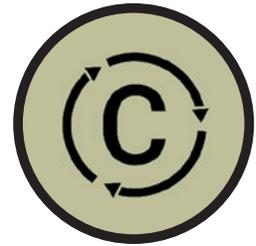
Non-material benefits that ecosystems provide to humans. These services encompass the intangible aspects of nature that enrich human lives, enhance well-being, and foster cultural identity and traditions.

**Regulating Services**

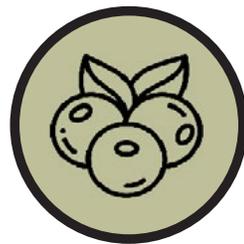
Ecological processes and functions that help maintain the balance and stability of ecosystems by regulating important environmental factors.



Wetland Ecosystem Services

**Provisioning Services**

Direct benefits that humans obtain from ecosystems in the form of goods and resources necessary for survival and well-being.

**Supporting Services**

Ecological processes and functions that are essential for the maintenance of ecosystems and the production of all other ecosystem services.

Table 1. Boreal wetland ecosystem services.¹⁰

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|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Regulating Services</p> | <ul style="list-style-type: none"> • Climate regulation • Water regulation • Water purification and treatment • Erosion protection | <ul style="list-style-type: none"> • Influencing rainfall, temperature, and greenhouse gas exchanges. • Maintaining evapotranspiration during dry periods.^{2,3} • Storing more carbon than forests (organic wetlands), but potentially emitting methane, especially if disturbed.^{4,5} • Regulating local and regional water flow by storing and moving surface and groundwater. • Storing and contributing water during droughts and floods.⁶ • Controlling erosion and mitigating runoff, especially in timber harvest areas.^{7,8,9} |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Provisioning Services</p> | <ul style="list-style-type: none"> • Fibre and fuel energy • Food • Fresh water • Medicines | <ul style="list-style-type: none"> • Supplying fresh water and replenishing groundwater sources for domestic and industrial use. • Providing wild game and food resources. • Providing fuel wood and commercial wood fiber. • Supporting fur-bearer resources for trappers. • Providing habitat for economically important pollinators and medicinal plants.¹ |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Cultural Services</p> | <ul style="list-style-type: none"> • Recreational and aesthetic • Spiritual and inspirational • Educational • Cultural | <ul style="list-style-type: none"> • Wetlands are important ecosystems for Indigenous Peoples, serving as reliable travel corridors, providing areas for hunting, and offering goods for food, shelter, and medicine. • Canadians from diverse backgrounds derive spiritual, inspirational, and recreational benefits from wetlands, including activities like canoeing, hunting, hiking, fishing, trapping, and birdwatching.¹ |



Table 1 continued. Boreal wetland ecosystem services.¹⁰

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| Supporting Services | | <p>Biodiversity:</p> <ul style="list-style-type: none"> • Providing habitat for numerous plant and animal species. • Indirectly influencing ecosystem function and resilience.¹¹ • Supporting breeding waterfowl, with approximately 26 million waterfowl utilizing North America's boreal wetlands annually.^{1,12} • Providing habitat for unique (e.g., the bog pitcher plant is wetland specialist) and at risk (e.g., boreal woodland caribou rely significantly on wetland habitat) species.¹³ <p>Water Quality:</p> <ul style="list-style-type: none"> • Help maintain water quality through filtration and nutrient cycling. • Pollutants, sediment, or nutrients can compromise wetland water quality and impact species composition. • Organic wetland water quality influences surrounding areas, with alterations potentially affecting pH levels and nutrient distribution.^{14,15,16,17} <p>Soil Integrity:</p> <ul style="list-style-type: none"> • Wetland soils, especially saturated and organic soils, are sensitive to disturbances and play a crucial role in chemical transformations and storage for wetland plants.¹⁸ • Activities in wetlands can affect soil properties such as bulk density, porosity, hydraulic conductivity, and nutrient availability.¹⁸ <p>Carbon:</p> <ul style="list-style-type: none"> • Wetlands are key players in the global carbon cycle due to the large amounts of organic carbon they store in vegetation and soils. • Wetland soil carbon stocks are influenced by hydrology, which affects carbon sequestration and release.¹⁹ • Alterations to wetland hydrology, such as flooding, can significantly impact methane (CH₄) emissions due to changes in anaerobic (wet) processes.¹⁹ |
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Few provisioning services have a measurable market value that is tracked, making it challenging to assign a dollar value to these services. Nonetheless, the estimated monetary value of ecosystem services provided by wetlands globally is approximately \$47.4 trillion annually.²⁰ However, this figure only includes the economic benefits that can be quantified, possibly neglecting benefits that are harder to quantify such as cultural heritage and water security. Monetary valuation approaches represent just one aspect of measuring the overall benefits that wetlands provide.

Indigenous Wetland Values

Identifying and defining wetland values has historically focused on western knowledge systems, often with an emphasis on economic value. A whole landscape approach needs to bring together western and Indigenous wetland values. “Muskeg”, a common term for wetlands in the western boreal forest, is derived from Cree and Ojibway languages. Wetlands hold profound cultural significance for Indigenous Peoples, reflecting a deep interconnection between land, language, and traditional knowledge. Indigenous cultures across North America encode their understanding of ecosystems and habitats within their languages, revealing nuanced ecological insights that often differ from Western scientific perspectives.²¹

In Indigenous worldviews, land is not merely defined by an ecologically distinct space or static representation on a map, but rather as a place inseparable from the people.^{21,22} These places maintain a habitat for living and fostering complex social and spiritual relationships.²¹ Essentially, they are described as vibrant societies or a network of interconnected relationships.



Wetlands are rich in biodiversity, ranging from sedges and mosses to shrubs and berries.²³ The intricate relationship between wetlands and Indigenous terms for “wet places” corresponds to ecological vegetation types.²¹

Wetlands provide essential medicinal plants, plant foods, and animal resources crucial for Indigenous livelihoods.²³ Shrubby swamps, for instance, may be associated to specific seasonal hunting grounds, such as fall and winter moose habitats, while small lakes and ponds supports summer moose habitat.^{21,23,24}

Vegetation, geographic features, and seasons influences travel routes for accessing potential resources. Viewing these connections between plants and landscape from an ethnoecological perspective grants insight into the fundamental relationships of Indigenous peoples to their homelands.²³

Recognizing the insights derived from Indigenous knowledge of wetlands not only enhances the cultural relationship with the land but also contributes to sustainable land management practices, thereby fostering long-term sustainability and resilience.²³ Moreover, preserving linguistic diversity and cultural heritage enriches understanding of historical and contemporary relationships with the land.²¹ Valuing Indigenous knowledge allows for a deeper appreciation of the interconnectedness of the landscape and promotes holistic approaches to wetland stewardship and management.^{21,23}



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