Ecosystem Services Provided By Wetlands

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What are Ecosystem Services?

Ecosystem services are the benefits nature provides to households, communities, and economies for little or no cost.[1]

Here we focus on three key ecosystem services that wetlands provide: Flood control and water filtration, biodiversity support, and cultural ecosystem services.

What Defines a Wetland?

Wetlands are [usually] low lying areas of rich soil that are saturated with water.[1] They are found around the globe and are often classified by type:

1. Salty Coastal Flats
2. Bogs and Ferns
3. Swamps
4. Marshes

Wetland classification depends on geographical location, soil, and native species.[1]

Often misunderstood due to lack of education, wetlands have an undeserved bad reputation and are frequently destroyed for human convenience.[2]

Wetlands In Alberta

Wetlands make up around 20% of our province and can be found in every region.[3] The disappearance of wetlands by human means has prompted the Alberta government to implement a wetland policy to minimize the further loss and degradation of wetlands.

Alberta Wetlands are classified into 5 categories:[2,3]

Peatlands:

1. Bogs: Strongly acidic and low in nutrients
2. Fens: Ground water, often basic, high in flora
3. Swamps: Flood cycles and nutrient rich

Non-peatlands:

4. Shallow open water ponds: Standing water
5. Marshes: Nutrient standing water

Figure 1: Weaselhead Wetland, Alberta[4]

-Water Services-

Flood Control

The ability of wetlands to hold and slowly release water makes them an important resource in flood mitigation. Alberta has lost approximately 379,000,000 m^3 of water storage capability due to wetland loss from development.[5]

Wetlands cannot prevent flooding, however, they can reduce the intensity of a flood event. The impacts of wetland loss on flooding is shown in Figure 2. The wetlands are capable of retaining water and reducing how much water enters adjacent river or streams. Water is slowly released from the wetland, reducing the intensity of flooding and impacts of humans .

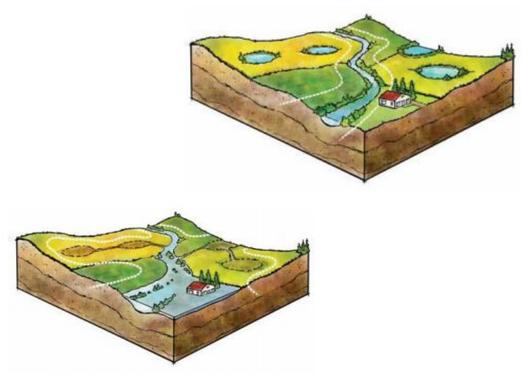


Figure 2: Flooding impacts on loss of wetlands[5]

Natural or constructed wetlands are cost effective flood mitigation tools. Wetlands can reduce the need for other flood mitigation measures that can be much more expensive and sometimes invasive such as levees or dry dams.

Water filtration

Wetlands are capable of efficiently filtering pollutants such as excess nitrogen from surface water. Pollutants such as sediment, excess nutrients and potentially toxic compounds from runoff are trapped in wetlands.

In urban areas pollutants include sediment, hydrocarbons from vehicles, road salts and possibly heavy metals. Nitrogen and phosphorus can accumulate through the use of fertilizers, especially in agricultural areas. Wetlands act as a buffer between contaminated runoff and ground water or surface water, protecting these fresh water sources.

There are two main vehicles for removal of nitrogen through wetlands: (1) storage and usage of nitrogen by aquatic plants in the wetland and (2) denitrification by microorganisms in the wetland remove nitrates.[6] The ability of wetlands to remove nitrogen from fresh water occurs year round and prevents algal bloom in adjacent water bodies. This continuous filtering ability means that wetlands are effective tools in reducing excess nitrogen[7]

-Biodiversity Support-

Wetlands are vital in their support and maintenance of biodiversity. Their primary support equals that of coral reefs and tropical rainforests. Wetland biodiversity includes many species of fish, mammals, birds, insects, amphibians, reptiles, and plants. According to the North American Environmental Protection Agency (EPA), wetlands are crucial in the maintenance of about 1/3 of the endangered plant and animal species in North America (about half of which utilize a wetland at some point in their life).[1]

Wetland biodiversity also provides a source of food for humans. Common wetland crops include:[2]

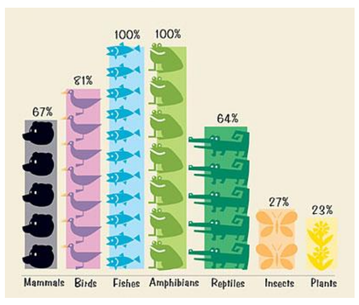
1. Cranberries
2. Blueberries
3. Wild rice

Figure 3: Cranberry Wetland Crop[9]

Many wetland plants also have medicinal properties.[1]

Within Alberta, it is estimated that more than 400 species of plants live in wetland habitats. Over 550 species of animals are considered typical wildlife within the province, and many of them will use, if not depend on, wetlands.[3] One such group are the amphibians which are wetland-dependent and are particularly sensitive to changes in water quality. This makes amphibians ideal indicators of wetland ecosystem health.

Common levels of dependence among wetland species:



Common species include:

- Beavers
- Muskrat(→)
- Canadian Toad
- Red-Winged Blackbird
- Canada Goose
- Boreal Chorus Frog(→)
- Great blue heron
- Blue-Winged Teal
- Wood Frog
- Tiger Salamander(→)
- Yellow Rail
- Long-Toed Salamander

Although restoration projects are on the rise, the complexity of Wetland biodiversity is difficult to reproduce after damage has been done.[10]

-Cultural Services-

There are many resources that wetlands provide for people, directly and indirectly, that are often taken for granted. This has been attributed to a lack of understanding of the 'free services' provided by wetlands.[11]

Human Well-being

In recent years there has been an increasing recognition of the reciprocal relationship that exists between people's well-being and the quality of their surroundings. Ecosystem services provided by wetlands and the ways in which they can affect human well-being can be illustrated as follows:[11]

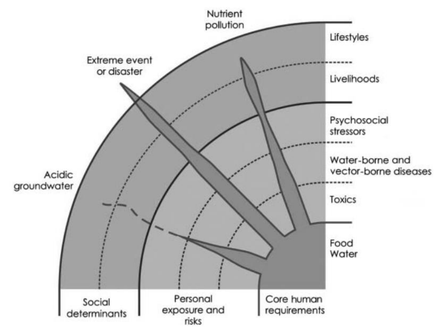


Figure 4: Influences of wetlands on human health. Three examples of cross-cutting are shown, and the extent of the influence is represented by the widths of the "stream."[11]

Economic Values

Quantifying the free services provided by wetlands places the estimated global economic value at $3.4 billion (US).[12] Figure 5 illustrates the total estimated economic values by continent and type of wetland, and also the estimated economic value of each service provided by wetlands:[12]

Total Economic Value of Global Wetlands by Continent and Wetland Type (thousands of US$ per year, 2000)

	Mangrove	Unvegetated. Sediment	Salt/Brackish Marsh	Freshwater Marsh	Freshwater Woodland	TOTAL
N America	30,014	550,980	29,810	1,728	64,315	676,846
Latin America	8,445	104,782	3,129	531	6,125	123,012
Europe	0	268,333	12,051	253	19,503	300,141
Asia	27,519	1,617,518	23,806	29	149,597	1,818,534
Africa	84,994	159,118	2,466	334	9,775	256,687
Australasia	34,696	147,779	2,120	960	83,907	269,462
TOTAL	185,667	2,848,575	73,382	3,836	333,223	3,444,682

Medium Wetland Economic Values by Wetland Function

Wetland Function	Median Wetland Economic Value (US$ per hectare per year, 2000)
Flood Control	464
Recreational Fishing	374
Amenity/Recreation	492
Water Filtering	288
Biodiversity	214
Habitat Nursery	201
Recreational Hunting	123
Water Supply	45
Materials	45
Fuel wood	14

Figure 5: The total estimated economic values by continent and type of wetland. As well as the estimated economic value of each service provided.[12]

Socio-Cultural Values

Wetlands have historical and spiritual values for many local communities.[12] Calgary is located in traditional Blackfoot territory. Therefore, there are many symbolic associations between the Blackfoot people and the services provided by wetlands. For example, the significant spiritual association of water places a high value on water regulation services. Furthermore, the continuation of hunting and gathering traditional foods, like berries and deer, places value on provisioning services and sustainability of wetland biodiversity for First Nation communities.[13]

Figure 5: Common Wetland[8]

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