

Nutrients

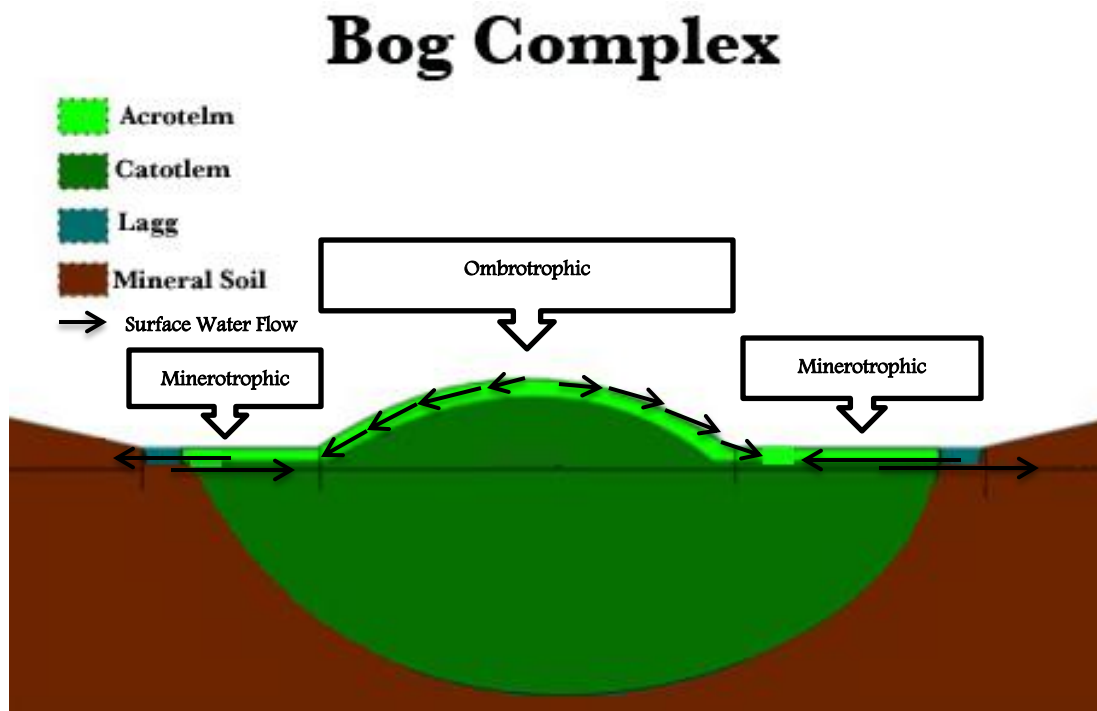
All plants need nutrients to survive and grow to their full and healthy potential. Non-mineral nutrients that plants require are hydrogen (H), carbon (C), and oxygen (O). Plants incorporate H, C and O through the process of photosynthesis. During photosynthesis plants take energy from sunlight and convert carbon dioxide (CO₂) and water (H₂O) from the air into starches and sugars as food energy (North Carolina Department of Agriculture, NA).

Plants also need mineral nutrients. Mineral nutrients are found in soil. The type and amounts of mineral nutrients in soil are a result of geologic and soil formation processes, which are influenced by rock types, and climatic conditions such as temperature and precipitation. In the soil, mineral nutrients dissolve in water and are then taken up by plant roots. These nutrients are broken down into two groups based on the amount of nutrients plants require. Macronutrients, “macro” means that large amounts are required by plants for growth, and micronutrients, “micro” means small amounts of these nutrients are needed for plant growth.

Macronutrients that plants need are further broken down into primary and secondary groups. Primary macronutrients are nitrogen (N), phosphorus (P) and potassium (K). Plants need the greatest amount of these nutrients for continued growth and survival. Secondary macronutrients are calcium (Ca), magnesium (Mg) and sulfur (S); plants require a lot of these nutrients but not as much as the primary macronutrients. Micronutrients that plants need include boron (B), chloride (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn) (North Carolina Department of Agriculture, NA).

In a raised part of a bog, essential nutrients are both limited and difficult to acquire. There are nutrients in peat, but they are largely tied-up. The reason nutrients are scarce in the raised portion of a bog is because the only source of water to the rooting zone is from the atmosphere. Because the area is raised, surface water from surrounding minerotrophic areas cannot flow up onto it (Figure 1).

Figure 1: Raised Bog Complex (Modified from Beebe, 2008).



In a raised bog environment, nitrogen is available in small but limited quantities. Nitrogen becomes available for plant use as plant and animal litter is broken down in the decomposition process or through precipitation (Johnson, 1985). Plants that live in this environment must adapt to live with nutrient shortages. Nevertheless, plant growth is very slow.

At Orono Bog Boardwalk the differences in the amounts of available nutrients are easily recognizable from luxuriant growth in minerotrophic areas (photo 1) to inhibited growth in ombrotrophic areas (photo 2). Minerotrophic areas also have greater plant species diversity. In minerotrophic areas, trees grow fast, are tall and have wide trunks. In the ombrotrophic area, trees grow very slowly, are short with spindly trunks. For example, black spruce (*Picea mariana*) trees are commonly found in both areas, but in the minerotrophic area black spruce trees that are 80 years old may be 50 feet tall and a foot in diameter, while in the raised part of the bog, black spruces of the same age may be only 8 feet tall and two inches in diameter. Sampled tree rings show us that the smaller trees in the bog may be as much as two times older than the much larger trees in the fen.

The effects of the lack of nutrients on plant growth can be a difficult concept to understand, but imagine what would happen if you were to eat only one cup of sugar a day a year? How healthy would you be? If you are still a growing child would your physical and mental development be affected?

Photo 1: Orono Bog Boardwalk around station 2 in the nutrient rich Fen (Priest, 2011).

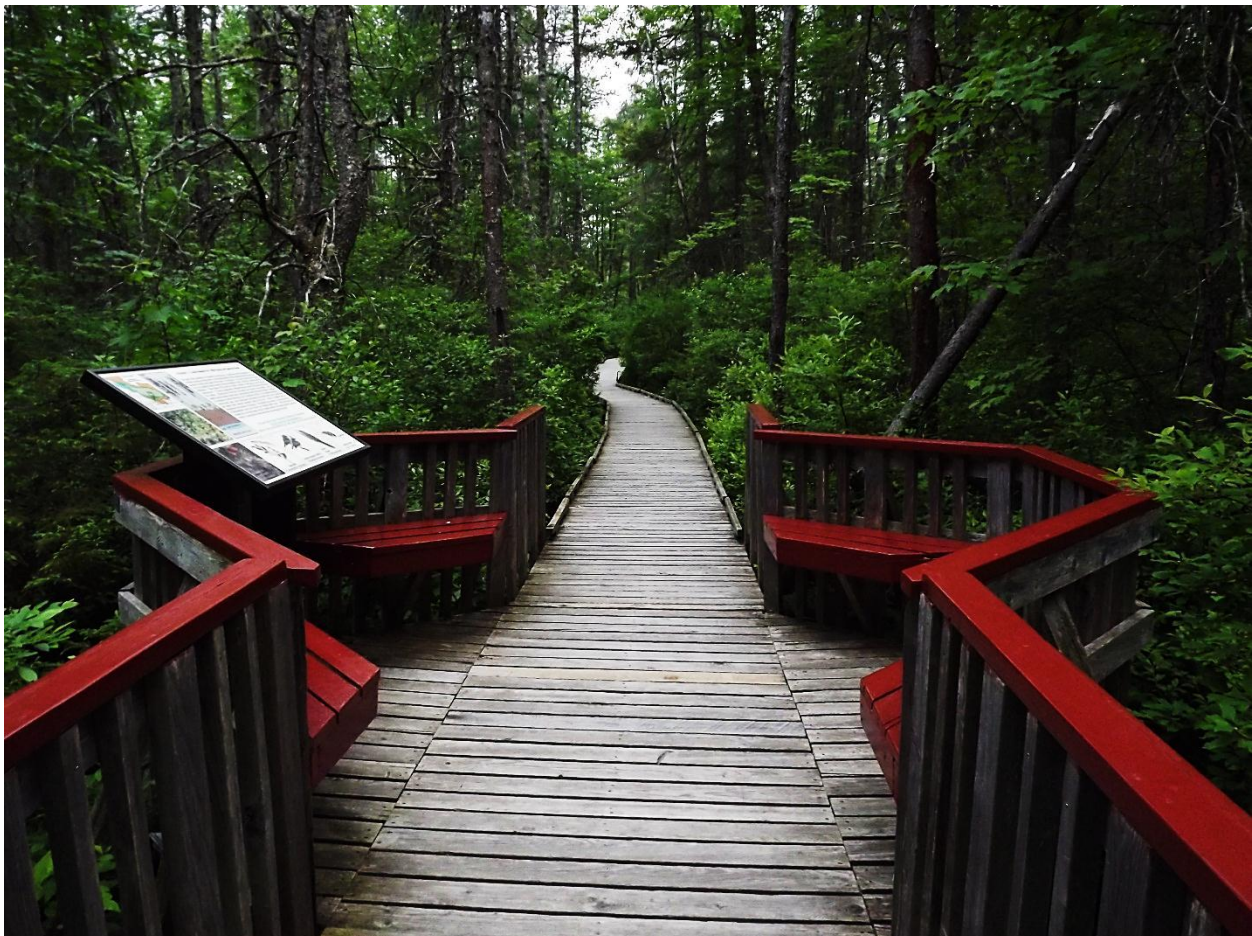


Photo 2: Orono Bog Boardwalk between stations 5 and 6 in the raised bog where there is very few nutrients available for plant growth (Priest, 2010).



References:

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