Chapter 1. Introduction

Goals of this Manual

This manual was written to provide a structure for understanding how to design and implement a successful voluntary wetland restoration project in Vermont. Following the recommendations found in this manual will also facilitate approval of restoration plans by the Vermont Department of Environmental Conservation Wetlands Program, as well as compliance with federal, state, and local regulations.

The manual covers everything from site selection and assessment to developing a plan and evaluating success. Enough information is provided in each section to convey the scope and purpose of the work involved, while also keeping the manual streamlined. This means that practitioners may need to look to other resources to supplement what is written here.

Wetland Restoration as an Allowed Use

The Vermont Wetland Rules serve to identify and protect significant wetlands, as well as their values and functions. These rules prohibit activity in many wetlands and their buffers unless the activity is an allowed use or authorized by a permit. Wetland restoration projects are considered an allowed use if they are enacted in accordance with a plan approved by the Vermont Wetlands Program.

What are Wetlands, and Why Restore Them?

DEFINITION Wetlands are places that are flooded or saturated with water for enough time during the growing season to support plants that are adapted to saturated soils. Some places, such as cattail marshes or alder swamps, are easily recognizable as wetlands. Others, like wet meadows or small woodlands seeps, may be less obvious, but no less important.

Wetland ecologists in Vermont follow the Army Corps of Engineers Wetland Delineation Manual for mapping the boundary of a wetland, which generally requires that the following three criteria are met to confirm historic and ongoing wetland conditions:

1. Hydrophytic vegetation (plants adapted to saturated soils) is prevalent.
2. Hydric soils (soils developed in saturated conditions) are present.
3. Wetland hydrology thresholds are met. This means that the area is either flooded or saturated for at least 5% of the growing season in most years, which is about 14 days. Wetland hydrology is usually inferred from indicators rather than directly monitored.

During the growing season, microorganisms in the soil use oxygen to access the energy they need to live. When soils are saturated oxygen is less accessible, and so the microbes use up most of what is available. Only certain plants can tolerate and thrive in these anoxic conditions, which is why the presence of hydrophytic vegetation is a key component to identifying a wetland. The anoxic conditions also lead to distinct microbial processes and chemical reactions in the soil, which produce the characteristics of hydric soils. Examples of hydric soil characteristics include the presence of peat or muck (which form because microbes degrade dead plant material more slowly in anoxic conditions), or the presence of rusty mottling (a.k.a. redoximorphic features) in the soil (which forms from dissolved iron reacting to repeated wetting and drying).

10 V.S.A. § 902 (5) states that wetlands are "those areas of the State that are inundated by surface or groundwater with a frequency sufficient to support significant vegetation or aquatic life that depend on saturated or seasonally saturated soil conditions for growth and reproduction. Such areas include marshes, swamps, sloughs, potholes, fens, river and lake overflows, mud flats, bogs, and ponds, but excluding such areas as grow food or crops in connection with farming activities."

Wetland Types

Hydrology, nutrient availability, soil formation, water and ice movement, and climate all work together to shape unique wetland communities. In Vermont, the book Wetland, Woodland, Wildland identifies over 40 wetland natural community types, which are organized into two broad categories.

Forested Wetlands

Forested wetlands contain trees with at least 25% canopy cover and are the most abundant type of wetland in Vermont. Forested wetlands are broken into four groups, each of which contain multiple natural communities:

- Floodplain Forests
- Hardwood Swamps
- Softwood Swamps
- Seeps
- Vernal Pools

Open and Shrub Wetlands

In these wetlands, trees are sparse, with less than 25% canopy cover. Open and shrub wetlands are broken into four groups, each of which contain multiple natural communities:

- Open Peatlands
- Marshes
- Sedge Meadows
- Wet Shores
- Shrub Swamps

Functions and Values

The English language contains many metaphors that reference wetlands, and most seem to convey a sense of frustration or worthlessness. A person feeling overwhelmed might say they're swamped, bogged down, or mired in some problem. And who wants to be a stick in the mud? The impediments wetlands present to cultivation and development explain these phrases, and also explain why more than 35% of the original wetlands in Vermont have been drained and lost.

But these sloughs, backwaters, swamps, and generally soggy places provide immensely important functions and values, all of which flow downstream. Wetlands are places that hold onto water and slow its travel. This reduces erosion, removes pollutants like phosphorous and nitrogen, minimizes flood damage, and recharges groundwater. Forested wetlands produce cool water, which is critical for many species of fish. Wetlands also provide a stage for water-requiring plants and animals to live out their lives, which increases biodiversity and the health of natural places. In addition, because saturated soils can become depleted of oxygen, the microbial decomposition of organic material (the carbon-rich remains of plants and animals) in wetlands is often slowed, which stores carbon in the soil instead of releasing it into the atmosphere.

Carbon Storage: Wetlands hold 20-30% of the Earth's soil carbon while only occupying 5-8% of its land surface (Nahlik & Fennessy, 2016).

Other Functions and Values of Wetlands:

- Education and research in natural sciences
- Recreational value and economic benefit
- Open space and aesthetics

Restoring Natural Ecological Processes

Restoration projects will vary widely in their goals, practices, and level of effort. However, all projects should generally strive to restore self-sustaining natural systems requiring minimal ongoing management. Along with other practices, this should be accomplished by recreating historic topography and hydrology, which sets the course for appropriate natural community reestablishment over time. When sites cannot be restored to their historic state, practitioners should create the best restoration possible within the limits of their situation.

This guide describes restoring degraded or former wetlands. We do not address or promote wetland creation, which involves converting a place that was never wetland to wetland.