Chapter 2. Background Assessment and Planning

Wetland restoration efforts will be more successful if time is spent to understand your goals and site early in the planning process. Creating a restoration plan that responds to what you learn will help ensure that you have the proper materials, personnel, machinery, and permits to maximize the quality and scope of your work within the limited budget and timeframe of your project. Additionally, in most cases, a restoration plan is required to be submitted to and approved by the Vermont Wetlands Program before work can begin. This chapter walks through the key steps involved in deciding on a project purpose, choosing a project location, assessing a site, and developing a restoration plan. A Site Assessment Worksheet is included to structure and guide the selection and assessment of your project site.

Site Selection

Project Purpose

The first step in creating a restoration plan is deciding on the main purpose of your project. If you already have a project site, having a clearly articulated purpose will help you decide which areas to treat and how to treat them. If you have not chosen a site yet, your project purpose can help you narrow down a long list of possibilities into a shortlist of sites with high impact.

The unifying goal of wetland restoration projects promoted in this guide is to restore degraded wetlands into self-sustaining natural systems, preferably as closely as possible to their pre-disturbance condition. When choosing sites and creating a plan, it is helpful to be specific in what you want to accomplish. Try choosing one or two primary goals for your project purpose, understanding that there may also be many secondary goals. It is also helpful to specify the geographic extent of possible project locations (such as within property, town, or watershed boundaries), as well as the general strategy for achieving your primary goals.

Primary and Secondary Goal Examples

- Improve water quality.
- Reduce erosion.
- Slow down and infiltrate stormwater.
- Increase groundwater recharge.
- Reduce downstream flood severity.
- Restore a diversity of wetland plant species.
- Expand wildlife habitat for wetland dependent species.
- Enhance fisheries.
- Reconnect floodplains.
- Restore habitat connectivity for wetland dependent animal species (e.g. amphibians, turtles, etc.).
- Restore habitat connectivity for a broad range of species (e.g. large terrestrial species).

Project Purpose Example

Reduce downstream flood severity and improve habitat connectivity for a broad range of species within town boundaries by reconnecting floodplains and revegetating wetlands and riparian buffers.

Site Selection Examples

The Lake Champlain Basin Wetland Restoration Plan identified improving water quality through nonpoint source phosphorous removal as its main purpose. This clear goal allowed planners to identify 200 top priority sites within the 2.9 million acres of Vermont's Lake Champlain basin.

Site selection can also be important at a much smaller scale. For example, a project team could search for sites within a farm boundary that contain actively eroding soils to reduce downstream erosion and improve water quality.

Desktop Review

Once you understand your project purpose you can move on to a desktop review. This is the stage where you take your project purpose and search for and review candidate project locations. The ANR Natural Resources Atlas online mapping tool is a great place to begin and may be able to provide much of the information you need for a thorough desktop review. In other cases, the data layers available won't be complete or up to date in your project area. Do your best and take note of what you need to assess or confirm in the field.

ANR Atlas Helpful Layers

DEFINITION

Reference Site: A nearby undisturbed natural area that has similar environmental conditions (soils, hydrology, landscape position) to a degraded site. A reference site can provide target microtopography, hydrology, vegetation, and natural communities for a restoration project.

Resources: The book Wetland, Woodland, Wildland is a helpful resource for determining wetland community types in Vermont. The Vermont Fish & Wildlife Department also provides free online natural community fact sheets for each of Vermont's wetland community types.

Key site questions to answer are:

Wetland Presence	Do any data layers identify potential wetlands or flooding?
	Are any hydric soils mapped?
	Are there visual indicators in the aerial imagery of saturated soils or standing water?
	Are there any topographic indicators of saturated soil or standing water?
Characteristics	What are the current wetland types?
	Where are their approximate boundaries?
Alterations	How have the natural ecological processes been altered? Examples include ditching, impoundment, tile draining, fill, vegetation removal, grading, fragmentation, etc.
Context	What are the upstream and downstream land uses and ecosystem types?
	What are the nearby important habitat features?
	Where are the available water sources (e.g., groundwater, streams, etc.)?
	Are there any nearby intact wetlands that could serve as a reference site?

Identify Site Selection Challenges

Before moving ahead with a selected site, it is important to understand the challenges that may influence, or even prohibit, your restoration plans. Challenges to consider include:

- ☐ Buildings, dams, or other structures
- ☐ Utilities, Right-of-ways, easements, or other property issues
- ☐ Landowner willingness
- ☐ Incompatible adjacent land uses (either uses that could affect your project area or proposed project activities like restoring hydrology that could affect neighboring properties)
- ☐ Community use and expectations
- ☐ Presence of non-native invasive species (NNIS)
- ☐ Additional permitting requirements (see Chapter 4)
- ☐ Funding requirements (if outside funding is used)

Professional wetland delineation will likely be needed if your work triggers State or federal permitting (see Chapter 4).

How might the identified challenges affect the quality or scope of your restoration work? Does your selected site still seem like a good candidate for restoration, or should you search for another location?

Site Assessment

Now it is time to assess your site in greater detail to confirm or correct your restoration expectations, and to fill in knowledge gaps. Start with a general understanding of the site, and then narrow into the details as your plan develops. Depending on your project, you may need to move back and forth between desktop assessment, field assessment, and planning.

Supplemental assessment: If you are interested in producing a repeatable and quantifiable metric of wetland quality, the Vermont Rapid Assessment Method for Wetlands (VRAM, see Chapter 5) could be a worthwhile addition to your initial site assessment.

Overview

General Conditions and Project Scope

- What are the current conditions of the site? Is it in agriculture?
- What factors led to the degradation or loss of the wetland?
- Where are the boundaries of the wetland on site?
- What was the likely extent of the wetland before disturbance?
- Identify preliminary boundaries of the restoration project. You may modify these as you learn more.

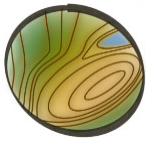
Landowner Knowledge

If you are not the landowner, it can be helpful to reach out and ask for their knowledge about the project area. Landowners likely know more about the project site than you can gather on your own. Keep them in mind as you continue your site assessment.

- What's the land use history of the site?
- How do they use or manage the area now, and what are their plans for the future?

Detailed Assessment

Topography



At a landscape scale, topography affects large drainage patterns, ambient temperature, and a site's exposure to sun and wind. On a smaller scale, microtopography affects how water moves across the surface of the ground, and the specific conditions that a plant germinates and grows in. Try using the ANR Atlas LiDAR Hillshade basemap and the contour layers (topographic lines).

- Where are there ridges, slopes, benches, basins, or flats?
- How would you expect water to flow through the landscape, and where would you expect it to accumulate under natural conditions?
- Where are there stream channels and ditches?
- What does the microtopography look like? Are there rough areas that have pit and mound formations? Are there areas that have been smoothed or leveled?
- How does microtopography differ from expected natural conditions or a reference site?

Landscape Position

The position a wetland occupies on the landscape impacts its functions and will influence your restoration goals and practices.

- What is the landscape position of the wetland? Is it the headwaters of a stream, a floodplain, a depression, or a seep? Something else?

Soils

Soils hold clues about the history and natural processes of a site, even when summer weather appears to dry up some wetlands. Dig a few shallow holes (10-20 inches) with a hand auger or shovel in wetland areas, upland areas, and their interface. Identify:

- Soil texture (mucky, loamy, sandy; optional: color)
- Redoximorphic features (rusty mottling)
- Saturation
- Water table depth
- Sediment deposition
- Compaction or other disturbance
- Location and boundaries of hydric soils

Field Equipment List

- Hand Auger
- Shovel
- Tape Measure
- Camera
- GPS
- Data Forms
- Base Maps

Hydrology

Hydrology refers to the location, duration, and movement of water, both in saturated soils and visible surface water. Assess your site's hydrology to:

- Identify existing water sources (e.g. streams, ditches, lakes or rivers, groundwater discharge, springs, seeps), as well as how water moves out of the wetland.
- Identify the existing hydrologic regime (seasonal or semi-permanent saturation, flooding, etc.)
- Locate features that disrupt natural hydrology (e.g. ditches, tile drains, berms, fill).
- Understand how current hydrology differs from expected natural conditions or a reference site.

Vegetation

The plants on any given site are influenced by topography, soil conditions, water regime, seed sources, and disturbance events. They in turn influence the rest of the food web. Assess vegetation in the wetland restoration and adjoining upland areas. Note:

- Strata present (tree, shrub, herbaceous)
- Native plant species
- Natural communities
- Non-native invasive species
- Native plant species and natural communities in reference site

Wildlife

Wildlife may be difficult to observe directly, but often tracks and signs abound. Note:

- Expected wildlife for a historic or reference site
- Tracks, signs, and wildlife observations
- Wildlife habitat features (woody debris, snags, brush, mast trees, vernal pools, pollinator plants, riparian forest, open water, etc.)
- Wildlife habitat features lacking

Feasibility Assessment

Use the information you have gathered to draft a concept restoration plan and make a feasibility assessment. Here are some questions to help guide you.

- Is wetland restoration needed for this site?
- What are the major challenges and project constraints?
- Which aspects of the site (topography, microtopography, soils, hydrology, vegetation, wildlife) need restoration?

Describe the target conditions and the practices needed to get there (see Chapter 3).

- What are the minimum actions required to restore an acceptable amount of wetland function? Make these the primary focus of your project.
- What additional permitting requirements are likely to affect your project (see Chapter 4)?
- Is the project possible or practical? Does it need to be redefined?

If your project is complex, resource intensive, or if you have questions, this is a good moment to contact your Vermont Wetlands Program District Wetland Ecologist. Send them a concept plan (see Submitting a Restoration Plan below) and give them an opportunity to flag considerations or concerns before you move forward with the full plan.

Site Assessment Worksheet

SITE SELECTION	**Project Purpose**	Primary Goals *(choose one or two)*	
		Secondary Goals *(choose a few)*	
		Geographic Extent	
		General Strategy	
		Project Purpose *(primary goals and how you will achieve them)*	
	Desktop Review	Are there, or were there ever, wetlands here? What evidence suggests this?	
		What are the current wetland types, and where are their approximate boundaries?	
		How have the natural ecological processes been altered?	
		What is the surrounding landscape context?	
	Identify Challenges	Challenges *(structures, utilities, adjacent land uses, NNIS)*	
		How might the identified challenges affect the quality or scope of your work?	
		Does your selected site still seem like a good candidate for restoration, or should you search for another location?	
	Site Selection Notes		

Site Assessment Worksheet *(cont.)*

SITE ASSESSMENT

General Conditions	Current conditions	
	What factors led to the degradation or loss of the wetland?	
	What was the likely extent of wetland before disturbance? *(Sketch or map below)*	
	What are the preliminary boundaries of the restoration project? *(Sketch or map below)*	
Landowner Knowledge	Are there, or were there ever, wetlands here? What evidence suggests this?	
	What is the land use history of the site?	
	How do they use or manage the area now, and what are their plans for the future?	
Site Overview Sketch		

Site Assessment Worksheet *(cont.)*

SITE ASSESSMENT	**Topography & Landscape Position**	Identify and describe the major topographic features expected to impact the restoration project	
		What is the slope of the site? *(flat, moderate, steep)*	
		Identify and describe areas of intact and modified microtopography	
		How does microtopography differ from expected natural conditions or a reference site? *(e.g. cultivated, compacted, graded)*	
		Landscape position of the wetland? *(headwaters, floodplain, depression, seep etc.)*	
	Soils	Describe soil texture in wetland, transition zone, and upland. *(sand, loam, clay, muck, peat, etc.)*	
		Are there redoximorphic features present? Note the depth from the surface and % of soil	
		Other relevant soil characteristics	
	Hydrology	Existing water sources	
		Existing hydrologic regime *(seasonal or semi-permanent saturation, flooding, etc.)*	
		Features that disrupt natural hydrology *(e.g. ditches, tile drains, berms, fill)*	
		Expected hydrology under normal condition	
	Vegetation	Strata present *(tree, shrub, herbaceous)*	
		Native plant species and relative abundance	
		Natural communities	
		Non-native invasive species *(NNIS)*	
		Native plant species and natural communities in reference site	

Site Assessment Worksheet *(cont.)*

SITE ASSESSMENT	Wildlife	Expected wildlife for a historic or reference site	
		Tracks, signs, and wildlife observations	
		Wildlife habitat features *(woody debris, snags, brush, mast trees, vernal pools, pollinator plants, riparian forest, open water, etc.)*	
		Wildlife habitat features lacking	

FEASIBILITY ASSESSMENT	Is restoration needed for this site?	
	What are the major challenges and project constraints?	
	Which aspects of the site need restoration? *(topography, microtopography, soils, hydrology, vegetation, habitat)*	
	Describe the target conditions and the practices needed to get there *(see Chapter 3)*	
	What are the minimum actions required to restore an acceptable amount of wetland function?	
	What additional permitting requirements are likely to affect your project? *(see Chapter 4)*	
Wildlife	Is the project possible or practical? Does it need to be redefined?	

COMMENTS

Developing a Restoration Plan

Once you have confirmed that the project is practical and worthwhile, it is time to put together a restoration plan. Once complete, this plan needs to be submitted to your Vermont Wetlands Program District Wetland Ecologist, and their approval is required before work can begin.

Choosing the Right Amount of Complexity

Wetland restoration projects vary widely in their level of planning and difficulty. Some projects will only require passive treatment or a little replanting. Others may involve professional assistance (private wetland consultants or environmental engineers), multiple restoration practices, and heavy machinery. Here are a few guidelines to help identify the appropriate scope of work for your site.

Guardrails:

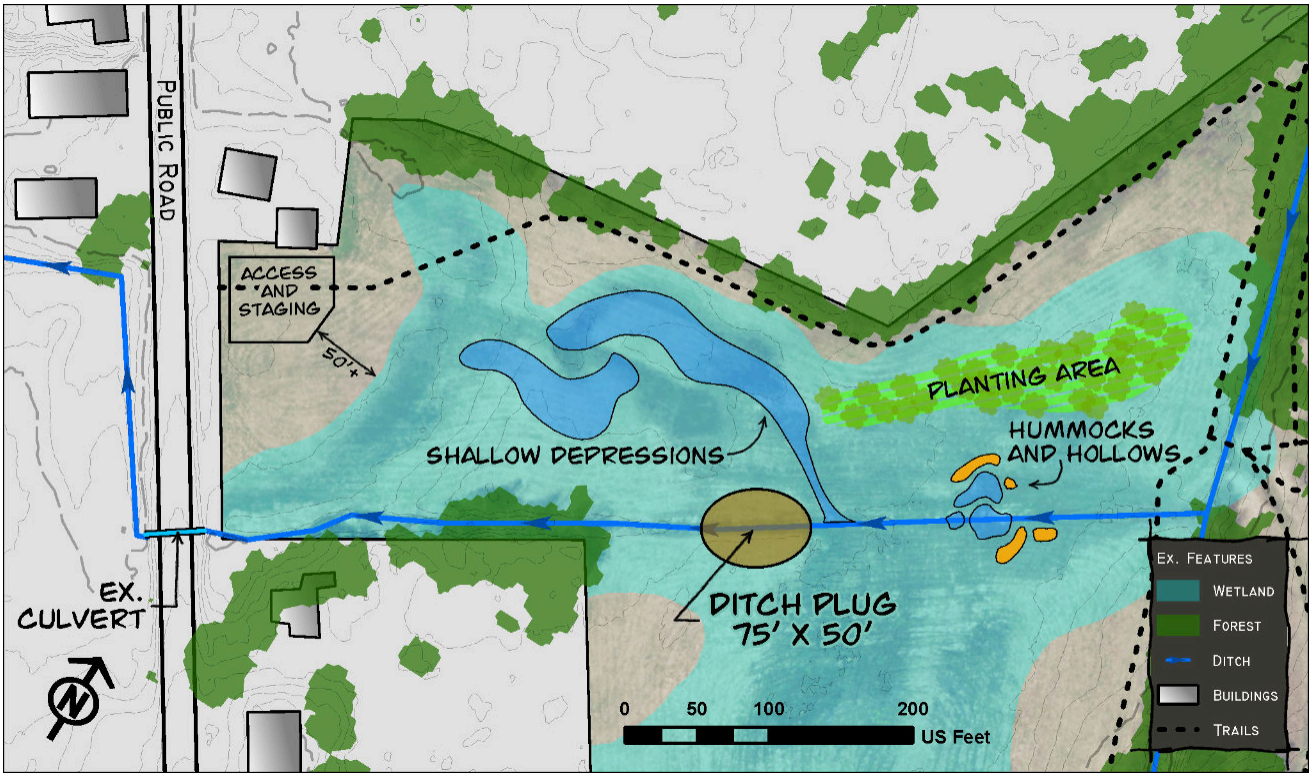
Keep your plans simple enough as to not require hydraulic analysis, but refrain from altering the hydrology of surrounding properties.

Reasons to Stop or Get Help:

- If a project is likely to affect other properties.
- If your plan includes hydrologic manipulations such as ditch plugs, tile drain removal, or surface water rerouting.
- If a site contains a lot of non-native invasive species. Avoid the worst of these sites.
- If a site contains sloped wetlands.
- If a plan requires permitting, such as when: constructing new access roads or trails, stockpiling soil in a wetland buffer, adding rock fill, creating a new discharge area, or installing beaver dam analogs and post-assisted log structures (see Chapter 4).

Keep it Simple, Don't Over-Engineer

It is better to do a simple job well than risk implementing a complex job poorly, especially if you are new to wetland restoration.



Example Restoration Plan-existing conditions and proposed practices

Plan Components

Outline Project Area

Identify wetland areas to be restored or impacted by restoration work. Identify nearby sensitive land uses, give them at least a 25-foot buffer, and ensure the project area doesn't encroach. If your restoration practices trigger additional permitting (see Chapter 3 and Chapter 4) you will likely need to hire a qualified professional to perform wetland delineations.

Map and Plan Restoration Practices

Identify which restoration practices you will be implementing (see Chapter 3), and where each practice will take place. Plan your materials, personnel, and equipment needs for each location.

Identify Work Zones Around the Restoration Area

Identify where equipment and material will be stored around the restoration area, as well as site access. Work zones within a wetland buffer will likely require permitting.

Outline Permitting Requirements

Chapter 4 provides an overview of potential permitting requirements. We've also flagged likely requirements associated with each restoration practice in Chapter 3. Using your site assessment, planned restoration practices, and identified work zones, outline your anticipated permitting requirements.

Project Schedule

Working backwards from hard deadlines, plan when each stage of the restoration project will take place. Take care to create a sensible order of operations such as planting after heavy machinery work and hydraulic manipulations are complete. Make sure to reserve plants, materials, and machinery well in advance.

Monitoring and Evaluating Success

Include a list of measurable objectives in your restoration plan that meet your project purpose (see Chapter 5). The metrics you monitor will depend on your goals, the restoration practices you implement, and any reporting requirements you may have. Example metrics include NNIS monitoring, the Vermont Rapid Assessment Method, vegetation monitoring, plant survivability, etc. When possible, give each metric a timeline. Make assessments before restoration practices take place to establish a baseline, then follow up afterwards according to your timelines. Comparing metrics before and after will allow you to evaluate the success of your treatments.

Adaptive Management

Most restoration projects will require more than a single intervention (see Chapter 5). Make sure to plan for this adaptive management in your budget and timelines.

Submitting A Restoration Plan

Once your restoration plan is complete, visit the Vermont Department of Environmental Conservation website and navigate to the Wetlands Inquiry Portal. This portal will allow you to submit a request for project review and provide you with your District Wetland Ecologist's email. After submitting the form, you should email your wetland restoration plan directly to your District Wetland Ecologist. For more complicated projects, especially those involving permitting, expect a 3-6 month review period. Once your plan is approved and you have obtained any required permits you can begin restoration activities.

1. Request Project Review (*wetland inquiry portal*)
2. Email Plan to District Wetland Ecologist
3. Plan Review (*may take up to 6 months*)
4. Plan Approval
5. Permitting, if required
6. Implement Plan