

Wetland Design Process

by
Thomas R. Biebighauser

Overview

The following outlines the recommended steps for designing a wetland project on private or public land, in cooperation with the landowner or agency representative. Following this process will ensure that each wetland is successfully designed to meet specific objectives and long-term ecological goals.

Identifying Potential Wetland Sites

During the design visit, the following areas are typically evaluated for wetland restoration or construction:

- Fields and old fields with deep or shallow ditches
- Areas containing buried drainage structures (rock, wood, clay, or plastic)
- Modified springs and small streams
- Irrigation ditches bordered by sedges, bulrushes, or cattails
- Vehicle ruts or areas where equipment has become stuck
- Cattle tracks or muddy depressions where water collects
- Constructed ponds that no longer hold water
- Flat land near wells or bright green zones visible on aerial photos
- Land adjacent to existing wetlands or ponds
- Shallow basins supporting sedges, bulrushes, or cattails
- Old fields dominated by reed canary grass or phragmites
- Historic wetland footprints visible on older aerial imagery but not on recent photos

Preparing for the Design Visit

Before the design day, please invite key individuals such as the landowner, adjacent landowners, agency representatives, and potential funders. Schedule the meeting date, time, and location well in advance.

Group Size and Duration:

- Designing a wetland less than one acre in size typically requires about four hours.
- Larger or more complex wetlands may take several days to design.
- To maintain productivity, limit the group to no more than eight participants.

Equipment Provided by Tom Biebighauser

- Plastic ribbon (four colors) and wire flags (two colors)
- Laser level with long-range capability, tripod, and survey rod with reverse scale
- Soil augers (4 ft and 10 ft), tile probes (4 ft and 10 ft)
- Tape measures (100 ft and 300 ft)
- Range finder and smartphone with Garmin GPS (Fields Area Measure App)

What the Landowner or Agency Should Prepare

1. Obtain detailed property boundary maps and know their exact locations.
2. Gather historic aerial photos (1930s to present).
3. Identify regulated ditches or dams managed by drainage, diking, or irrigation districts.
4. Locate leased agricultural or range areas.
5. Identify buried utilities (gas, electric, fiber optic, water, sewer).
6. Mark road easements and utility rights-of-way.
7. Determine the presence of clay tile drains or plastic drainpipes.

On-Site Design Process

8. Establish Objectives: Discuss the landowner's goals for the project. Objectives will guide every design decision.
9. Visualize Wetland Types: Review photos of wetland types or visit nearby examples to identify preferred appearances and functions.
10. Field Assessment: Walk the property together, examining proposed and potential wetland sites. Avoid existing wetlands to streamline permitting.
11. Marking and Testing: Mark wetland perimeters using colored ribbon or flags. Verify elevation changes with a laser level (≤ 35 cm, not exceeding 1 meter). Dig test holes (≥ 1.2 meters deep) to identify soil texture, groundwater, and rock layers. Record coordinates and perimeters with GPS. Complete the Wetland Design Form and take site photos.

Understanding Site Constraints

Topography and Cost:

- Flatter ground (0.1–2% slope) allows for larger, lower-cost wetlands.
- Steeper slopes (>4%) limit size and raise costs.
- Avoid designing wetlands on slopes >6%.
- Always measure slope with a laser level, not by sight.

Deep Test Holes: Excavator or backhoe test holes provide crucial data on soil layering, groundwater elevation, and buried structures. This ensures accurate construction cost estimates and proper design methods.

Construction Cost Factors

Cost Category	Slope (%)	Soil Texture	Groundwater	Ditch/Stream	Drainage Structures
Low	0.1–2.0	Clay	At surface	None	None
Moderate	2.1–4.0	Silt	Within 1 m of surface	Intermittent	Clay, wood, or rock
High	>4.0	Gravel	None	Perennial	Plastic & clay

Design Considerations

- Leave space for gentle uphill slopes; a pre-construction 6% grade may become 30% afterward.
- Avoid vertical slopes or retaining walls near wetlands.
- Do not build dams, berms, dikes, or levees—they restrict wildlife movement and require costly maintenance.
- Plan ahead for spoil placement; soil removed from construction typically requires an area equal in size to the wetland.
- Confirm permit requirements and secure funding before construction.

Construction Phase

Expect the landowner to experience some anxiety before and during construction—this is normal. Clear communication and on-site supervision help build confidence.

Tom recommends being on-site 100% of the time during excavation and shaping. His presence ensures correct wetland depth, slope, and function.

Post-Design Reporting

Following the site visit, Tom Biebighauser prepares a detailed Wetland Design Report, typically completed within two weeks. This report includes project objectives, design drawings, specifications, contracting guidelines, budget estimates, and recommendations. These reports are often used to secure permits and funding for wetland construction.

Final Thoughts

Landowners who build wetlands often say, “It’s the best thing I’ve ever done.” By following this process, you’ll be well on your way to restoring functional, beautiful wetlands that support wildlife and improve the environment.

Thomas R. Biebighauser
Wildlife Biologist & Wetland Ecologist
Wetland Restoration and Training LLC
3415 Sugar Loaf Mountain Road
Morehead, KY 40351 USA

Cell: (606) 356-4569

Website: www.wetlandrestorationandtraining.com