

WESTON SOLUTIONS, INC.

CONSTRUCTED WETLANDS FOR MITIGATION AND WASTE TREATMENT

Treatment
Mitigation
Design, Build, & O&M



an employee-owned company

> FACING THE ISSUES



WESTON's diverse staff optimizes your resources.

Wetlands are valuable natural resources that provide many important ecological functions. As our understanding of the value and function of these systems has grown, the regulatory requirements for many activities in wetland areas have become more stringent. Mitigation is often a regulatory requirement for unavoidable wetland impacts. Understanding the regulatory requirements for wetland permitting (delineation, assessment, permitting, mitigation planning, design implementation, and monitoring) can be a critical factor in determining the success or failure of a project.

Government is committed to improving and maintaining the quality of our Nation's waters. As a result, both government and industry are faced with more stringent criteria for treating wastewater. As we have learned more about how wetlands function, the value of these systems to improve the water quality has become recognized. Wetlands have been demonstrated to provide effective treatment and removal of a variety of wastewater contaminants, including solids, nutrients, metals, organic compounds, biochemical oxygen demand (BOD), explosives, petroleum residuals, and infectious microorganisms. Constructed wetlands have been demonstrated to be a cost-effective alternative for treating a variety of wastewater streams, including municipal and industrial (e.g., landfill leachate, mine drainage, petrochemical, pulp and paper, and textile), agricultural, stormwater, contaminated groundwater, and residual metals. In addition, these wetlands often provide the added benefit of increased wildlife habitat and good public relations with the surrounding community. The use of wetlands alone or in combination with traditional wastewater treatment systems is today accepted by government and industry as a viable wastewater management alternative.

> Solving Your Toughest Challenges

WESTON understands the challenge of designing and permitting constructed wetlands for both mitigation and waste treatment. The WESTON Team has superior skills in all phases of assessment, design, construction, and management of these systems, including:

- Site Evaluation (Assessment, Delineation, Characterization)
- Waste Characterization
- Treatment Feasibility Studies
- Bench-Scale and Pilot-Verification Tests
- Field Demonstration Projects
- Permitting
- Planning, Design, Construction, and Operation

The WESTON Team provides our clients unparalleled access to a tremendous array of resources, including specialists in each engineering and ecological discipline, as well as offices located throughout the United States, including Alaska and Hawaii.

> Proven Project Management

WESTON has been providing quality environmental services to clients for over 45 years. We are an industry leader in developing design/build services for all water, wastewater and wetland mitigation needs. Constructed wetlands are a natural outgrowth of these capabilities, demonstrating the evolution of the industry toward lasting and sustainable operations.

WESTON has been successful in designing and constructing wetlands to satisfy wetland mitigation and wastewater treatment requirements. Specific wetland challenges, highlighted in the following project descriptions, include the design and construction of wetlands for mitigation of lost habitat, as well as treatment of otherwise difficult wastes.



Bench-scale studies are an essential component of the wetland design.

► *Bringing Benefit*

The WESTON Team's constructed wetland systems provide the following benefits for treating difficult waste streams:

- **Reduced operating costs** because wastes can be managed with minimal design and operating expense.
- **Enhanced public relations** as a result of improved ecosystems.
- **Greater savings and environmental compatibility** through the use of local soils and indigenous plant species.
- **Lasting and sustainable solutions** for a fraction of the annual maintenance costs required by traditional treatment systems.

The WESTON Team's expertise provides the following benefits for wetland mitigation projects:

- **Knowledge of wetland assessment and delineation methodologies** including Wetland Evaluation Technique (WET), Hollands-Magee Method, New England Wetland Assessment Methods, and Habitat Evaluation Procedure (HEP).
- **Knowledge of federal and state wetland programs and regulations** allows for the preparation of permits to streamline the regulatory process.
- **Scientists, engineers and construction managers with wetland mitigation expertise** allow WESTON to assemble the best team to support a client's needs.
- **Lasting and sustainable solutions** demonstrate WESTON's ability to solve a client's wetland permitting and mitigation needs in a timely and cost-efficient manner.



Although designed as a treatment process, wetlands can provide other beneficial uses.

Constructed wetlands provide an efficient alternative for treatment of metals in industrial wastewater. Constructed wetlands were used to treat approximately 1 million gallons per day of pretreated wastewater and stormwater runoff at the Savannah River Site, Aiken, SC, for the Department of Energy (DOE). The project involved a 21-million gallon retention basin and eight, 1-acre wetland cells. Wastewater targets included copper, lead, mercury, total, and chronic toxicity. The project consisted of a pilot testing program, engineering design, construction observation, startup services, and ongoing treatment assessment. To date, the treatment system has exceeded all goals for waste removal with discharge levels well below permit limits.

Restored wetlands save utility company cost of building a cooling tower. A utility client determined that the restoration of a tidal wetland system to restore lost habitat in a major river estuary to avoid construction of a cooling tower at a nearby nuclear generating station was a viable alternative. WESTON worked with the client to assess alternatives for restoring tidal flow to a 4,000-acre diked salt hay farm. WESTON conducted comprehensive site assessments, completed the permit documents, prepared designs, and oversaw construction for the restoration of the salt hay farm to functional salt marsh. Considerations included identifying target species of interest, reestablishing tidal flow, and optimizing the use of natural drainageways to minimize restoration cost.

Constructed wetlands provide polishing of effluent from small wastewater treatment plant. Keowee Key Utility Systems serves 2,200 people at the headwaters of the Savannah River in northeastern South Carolina. Operators of the 0.2 MGD treatment plant were looking for a cost-effective technology to polish the effluent and ensure compliance with phosphorus and nitrogen limits in the summer and permit irrigation reuse on community landscaping and an adjacent golf course. An abandoned polishing pond was modified to serve as the constructed wetland. By subcontracting the earthwork, purchasing the minimal piping, valves and equipment required, and self performing the piping and equipment installation and landscaping, the project was completed for \$50,000. Clemson University donated the wetland species and the labor for initial wetland planting.

Composting facility runoffs remediated using constructed wetland system. A solid waste authority contracted WESTON to design a wetlands system to treat runoff from a yard waste composting facility. The design used subsurface constructed wetland cells contained in a greenhouse-type environment to provide treatment during even the coldest winter months.

Wetlands impacted by construction are restored, averting costly fines and administrative proceedings. At gas pipeline compressor stations statewide, wetlands investigations were conducted to assess the impact of recent and historical construction activities. Tasks included delineating and assessing wetlands, designing wetland mitigation and monitoring plans, permitting, overseeing construction, and monitoring restored



A geo-synthetic clay liner eliminated long-term groundwater monitoring requirements.

wetlands. State regulators accepted all activities, averting extensive fines and lengthy administrative proceedings. All impacted wetlands were successfully restored within 2 years.

Wetlands used for stormwater treatment and mitigation, avoiding costly treatment alternatives. Closure of a landfill was expected to result in permanent impacts to site wetlands prompting EPA to require mitigation for these impacts. A wetland mitigation plan was developed to include stormwater detention systems that would also function as wetlands. Both the delineation and mitigation plans were approved by EPA and the state, and landfill closure was completed successfully with the construction of a wetland mitigation site.

Wetlands applied to treat chlorinated solvents in groundwater. Groundwater contaminated with chlorinated volatile organic compounds, including TCE, DCE, and vinyl chloride, was discharging into wetlands and subsequently into a creek.



Following cleanup, pools, riffles, and meanders are created as part of the restoration design.

Treatment wetlands constructed to intercept the shallow contaminated groundwater discharge have reduced groundwater contamination below permit discharge requirements.

Contaminated sediments were removed and ecosystem restored. A creek/floodplain restoration plan was required for the removal of 145,000 cubic yards of PCB contaminated sediment from the creek and associated floodplain and wetland habitat. The approved and implemented restoration included returning the river to its original configuration utilizing on-site materials such as tree trunks and boulders, restoring the floodplain and wetland areas to original elevations, and utilizing local native wetland species and seed mixes to obtain rapid revegetation and minimize the presence of invasive plant species. The plan was successfully implemented and the



Constructed wetlands treat petroleum residuals in refinery waste, meeting strict permit discharge limits

floodplain and river were stabilized after one growing season.

Environmental assessment and restoration design for a contaminated river. Environmental assessments and the preparation of wetland and river restoration plans were performed for the cleanup of a contaminated 5.5-mile section of river. The restoration plan included the construction of a new river channel. Activities have included delineation of wetlands using remote sensing; assessment of aquatic, wetland, and terrestrial habitats; and development of habitat restoration plans.

Mitigation wetland permitting, design and construction. A commercial power company is building a cogeneration power plant on land containing wetlands and other waters. WESTON was contracted to perform the assessment, delineation, permitting and mitigation for wetland and stream impacts. An individual permit was received from both the U.S. Army Corps of Engineers and South Carolina Department of Health and Environmental Control. Mitigation included minimizing and avoiding wetlands on the project site and restoring impacted (drained) wetlands adjacent to the project site.

Wetland consulting for a sanitary landfill expansion. A landfill expansion included impacts to wetlands that required federal and state permits. WESTON performed the assessment, delineation, permitting and mitigation for wetland and stream impacts. The wetland was designed to meet both regulatory mitigation requirements and to provide final treatment of runoff from the active landfill.



Industry and nature can co-exist adjacent to each other.

► For More Information, Contact:

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