

UPLIFTING AND REVITALIZING ECOSYSTEMS





ASSISTING ECOSYSTEM RECOVERY WITH A RESULTS-ORIENTED APPROACH

Understanding the local environment and having the right multi-discipline team to address the needs of each individual site, is critical to establishing healthy, resilient ecosystem restoration. At Stantec, we have a team of passionate biologists, ecologists, engineers, hydrologists, geomorphologists, and specialists in a variety of plant and wildlife species that focus on ecosystem restoration across North America.

Our engineers and scientists are recognized ecosystem restoration experts and understand that this field is constantly evolving. Using our experience and technical knowledge, Stantec has developed tools and methods to help advance the field of ecosystem protection, restoration, management, and monitoring. We bring our depth of knowledge to the entire ecosystem restoration process—from assessment and planning to design, construction, monitoring and adaptive management.

THE STANTEC ADVANTAGE



OUR COMMITMENT TO SAFETY

Stantec is committed to providing and maintaining an incident-free, healthy and safe workplace. At Stantec, we believe in doing what is right which includes sending our people home injury-free every day. Through our Health, Safety, Security, and Environment Program, Stantec employees are committed to:

- Complying with client health and safety requirements at all times when working on project sites.
- Identifying, assessing, and managing the environmental aspects and impacts associated with the services and products we provide.
- Identifying and managing the health, safety, security, and environmental risks and hazards to which our employees are exposed.
- Assisting our employees to develop an awareness and understanding of the health, safety, security, and environmental issues relevant to their work.
- Complying with legislation, regulations, and appropriate industry standards.
- Monitoring and enhancing the program through inspections, audits, reviews, investigations, corrective actions, and other processes.
- Facilitating communication regarding health, safety, security, and environmental issues.

Our Health, Safety, Security, and Environment Program applies to anyone employed by Stantec including employees, consultants, contractors, subcontractors, and suppliers working within Stantec workplaces.

At Stantec, we make safety a pillar in our company culture and incorporate it into all aspects of our business. Our team continually strives to improve the safe and efficient manner in which we execute our work. Stantec's commitment to health and safety is integrated into all aspects of our business.

LIFECYCLE SERVICES FOR ECOSYSTEM RESTORATION

Restoration activities vary greatly depending on the type of ecosystem, local conditions, and the needs of native plants and wildlife. But more importantly, the restoration solution needs to be customized to fit your unique project. We work collaboratively to understanding the drivers and develop achievable and functional objectives, regardless of project type or size. The services we can provide during a general lifecycle of a restoration project are outlined below.

✓ PLANNING

- Agency coordination
- Conceptual design
- Feasibility studies
- Alternatives analysis
- Project management
- Community outreach and public education
- Grant writing assistance
- Master planning

✓ EXISTING CONDITIONS ASSESSMENT

- Geomorphic assessments
- Hydraulic/hydrological modeling
- Natural resource inventories
- Wetland delineations
- Jurisdictional waters delineations
- Invasive species assessments
- Habitat analysis
- Biodiversity studies
- Sediment transport sampling/analysis
- Limiting factors analysis

✓ DESIGN

- Environmental permitting
- Vegetation design
- Forest management planning
- Natural channel design
- Streambank stabilization
- Habitat restoration
- Soil bioengineering
- Restoration and mitigation design
- Invasive species management planning
- Adaptive management planning and consultation
- Wetland enhancement and mitigation design
- Best management practices

✓ IMPLEMENTATION & MONITORING

- Construction monitoring/observation
- As-built surveys
- Wetland and vegetation monitoring
- Revegetation assessments
- Invasive species removal
- Site maintenance and erosion control
- Native species planting and re-seeding
- Forest management
- Prescribed burns
- Aquatic habitat enhancement
- Fluvial geomorphic monitoring
- Adaptive management
- Private procurement and municipal bidding assistance

2700+

environmental professionals
working out of 150+ offices
throughout North America



MOVING PROJECTS FORWARD WITH SUSTAINABLE ECOSYSTEMS

WETLANDS

Wetlands play a key role in providing floodwater protection, water quality improvement, and wildlife habitat. In addition to completing wetland delineations and assessments, we provide restoration activities when these important natural resources are damaged or impaired by natural or human activities. We partner with our clients to create a balanced approach so the project meets hydrologic, vegetative, and soils success criteria.

When a project has unavoidable impacts to a wetland, Stantec can also provide compensatory wetland mitigation services. Working with our clients and regulatory agencies, we help identify suitable mitigation sites and design solution that meets required performance standards.

Following project implementation, our team monitors wetland performance to determine if the site is following the designed trajectory and to evaluate its progress with respect to performance criteria. We perform invasive species control and restoration activities including herbicide application, mowing/cutting, native seeding, and prescribed burning to help create high quality wetlands that are floristically diverse and able to support native plants and wildlife.

COASTAL ENVIRONMENTS

Working in coastal environments requires a unique understanding of marine habitats and underlying biological, physical, and chemical processes. Each restoration design needs to be assessed for vulnerability, adaptability, and resiliency in an increasingly dynamic marine environment influenced by climate change. Our team has decades of experience restoring a variety of coastal habitats ranging from saltmarshes, mangroves, coastal fringes, and dunes. We have extensive experience with seagrass restoration and have pioneered the use of several seagrass restoration/analysis techniques, including the "Modified Shovel Method" which increases the efficiency of harvesting and transplanting plugs.

FOREST, PRAIRIES, AND GRASSLANDS

Forests, prairies, and grasslands provide diverse habitats for a multitude of species. These areas are increasingly lost to human development, making those that remain especially valuable to ecosystem stability. If a forest, prairie, or grassland is degraded and overrun with invasive species, it is not able to provide adequate habitat to native species. Native plants and animals are being forced to other regions, and in some cases, becoming threatened or endangered due to lack of suitable habitat. Understanding of a broad range of ecological conditions, including native species, impact of invasive species, topographical considerations, and changes in the surrounding watershed, is necessary to effectively restore these environments. Our forestry, grassland, and prairie experts are well versed in the biological and ecological aspects of this terrestrial habitat and can provide you with the best strategy to achieve your restoration goals.



RIVER AND STREAMS

When restoring streams and rivers, we don't simply design a solution for an isolated issue. We examine the entire watershed to understand the overall causes of ecosystem disturbances. We combine our expertise in engineering, geomorphology, biology, and hydrology to identify and apply appropriate restoration techniques to create resilient, functioning streams and rivers that are characterized by natural processes. This approach creates a sound ecological environment that is ideally self-sustaining and requires little-to-no maintenance. We take time to understand the complexity of riverine ecosystems and have dedicated team of stream restoration professionals with years of experience developing the skills to address long term challenges.

Depending on observed field conditions, our evaluation may include complex analyses, such as sediment transport modeling to design channel geometry appropriate for the physical and environmental setting. Stantec is adept with an array of channel design techniques, soil

bioengineering methods, and in-stream grade control and habitat enhancement structures, which we have successfully used on many projects.

Stantec is a pioneer in the development of restoration tools. Stantec has designed and developed RIVERMorph®, an innovative stream restoration software which integrates virtually every design function needed for a Natural Channel Design project into a single program, thus allowing users to navigate with ease and precision. The only software of its kind, RIVERMorph® has set the standard for accurate and efficient stream assessments and Natural Channel Design. Tools provided within RIVERMorph® allow the user to quickly analyze geomorphic data, develop dimensionless ratios from cross sections, profiles, and platform dimensions, process stream gage data, and develop and extract data from regional curves. Stantec continues to improve and enhance RIVERMorph® by including tools and analytical features needed by the profession.

DAM REMOVAL

Dams have been powerful forces in our economy for hundreds of years. As numerous dams across North America are reaching the end of their service life and are no longer needed due to technological advances, communities are seeking to remove them and restore their waterways.

Stantec brings a powerful blend of technical knowledge and regulatory experience to dam removal projects. These projects often include a multi-disciplinary team, including engineers, regulatory permitting specialists, community development designers, landscape architects and stream restoration experts. Our team can quickly determine the benefits and feasibility of dam removal or modification ranging from large earthen or concrete structures to smaller low-head structures.

Stantec's dam removal and river restoration services are part of our larger corporate commitment to sustainable solutions. Over the years, we have leveraged our relationships and successfully teamed with numerous federal and state agencies, private land owners, electric utilities, commercial developers, architects, local conservation groups, and municipalities to identify funding for these projects. We also excel at what tends to be the most difficult aspect of dam removals – sediment management, focusing on both sediment quality, including contamination, and quantity. Our engineers and geomorphologists use the latest sediment transport models to reduce the potential for downstream sedimentation and ecological risk. We also focus on the human element—providing safe waterways and improving the recreation potential of rivers and streams. Our landscape architects and land planners design user-friendly features along the restored river corridor that foster a sense of place—walking trails, gardens, shelters, educational signage—to connect communities to the water that surround them.

ECOSYSTEM RESTORATION IMPLEMENTATION

Providing restoration design is just the beginning. Having in-house, experienced team of ecosystem restoration professionals that can implement your design can make the difference in successful long-term restoration. Restoration implementation is much more than following the plan set and installing new plants. It requires an understanding of each native environment and the knowledge to adjust the plan when a space may not be responding according to the original design.

At Stantec, we have experienced ecologists, engineers, biologists, and forestry experts that understand the changing needs of these sensitive environments and can work with our design team when a plan needs to be adapted to better suit the needs of each space. Our team has also been brought into projects to repair previously unsuccessful restoration activities. The ability to implement a restoration design provides our clients with a unique offering: complete lifecycle of ecosystem restoration services from assessment to implementation and long-term monitoring.

ECOLOGICAL RESTORATION PROJECT EXPERIENCE





DEER GROVE FOREST PRESERVE MITIGATION PLANNING AND IMPLEMENTATION

Cook County, Illinois

Stantec is conducting ecological restoration and maintenance to carry out two Management and Monitoring Plans – a 185-acre portion of Deer Grove East and 240-acre portion of Deer Grove West. These habitat enhancement projects are sponsored by Openlands (a conservation group in the greater Chicago region) to mitigate off-site impacts to wetlands associated with the O'Hare International Airport expansion. The preserve, located in the northwest suburbs of Chicago, Illinois, is surrounded by a heavily urbanized area which presents unique challenges to the projects.

Stantec has been providing services at Deer Grove East since 2009, and services at Deer Grove West began in 2015. Both projects are expected to continue through 2021. We have provided a variety of services including: hydrology assessments, restoration oversight, and monitoring; water quality improvements; erosion control and soil stabilization; stream stabilization; woodland management; seed bed preparation; native plantings; invasive species control; prescribed burning; ecological stewardship; vegetation surveys; and avian monitoring.

Stantec completed selective tree and brush removals on over 150 acres of remnant oak woodland and provided contract oversight for clearing on another 190 acres between the two sites. We also procured and installed over 75,000 plugs and seeded 270 native species at Deer Grove East, and achieved performance standards just three years after planting. This rewarding project continues to provide ongoing stewardship of prairie, oak woodlands, oak savanna, and wetlands.

Passionate about the resource, we also coordinate stewardship responsibilities with a local volunteer group, that resulted in the development of a weed scout program, expansion of restoration activities, enhanced local seed collection efforts, and increased public awareness of ecological restoration. Deer Grove West is a dedicated State of Illinois Nature Preserve and Deer Grove East was recently dedicated as a State of Illinois Land and Water Reserve.



HATCHERY CREEK STREAM RESTORATION

Russell County, Kentucky

Hatchery Creek is the outlet for the Wolf Creek Trout Hatchery located immediately downstream of the Wolf Creek dam, which forms Lake Cumberland. Water level fluctuations below the dam impaired trout spawning. Using in-lieu fee funding, the Kentucky Department of Fish and Wildlife Resources hired the Stantec team to design and build a one-mile extension downstream to create Kentucky's first self-sustaining trout stream capable of supporting spawning.

Stantec's responsibilities included completing a geomorphic assessment, preliminary and final design, permitting, hydraulic modeling, jurisdictional waters determinations, construction observation services, as-built survey, and post-construction monitoring. The project design focused on supporting all trout life stages and included a variety of stream types including A, C, and D channels. In the braided D-channel sections, a variety of wetlands and vernal pools were constructed to provide rearing

habitat. The lower portion included a step pool system designed to promote fish passage from the Cumberland River up into Hatchery Creek. A fish migration barrier on the upper portion of the project was also designed to separate areas with different fishing restrictions.

The design consisted of approximately 6,000 linear feet of channel with dozens of oxbow features, and numerous in-stream structures including toe wood, lunger structures, step pools, and a variety of riffles. Wood harvested from the site was used throughout to help create a natural looking stream system and provide habitat.



LOWER POWERS CREEK FLOOD RECOVERY CHANNEL WORKS

West Kelowna, British Columbia

Stantec was commissioned by the City of West Kelowna to support flood recovery efforts in response to high flow events of 2017 and 2018 in Lower Powers Creek. Stantec provided real-time emergency mitigation during the flood events and guided the City through the post-flood recovery process. The high flow event left areas of degradation in the upper channel reaches and large-scale deposition in the lower reaches.

The City required a channel recovery design that would restore conveyance to the creek and reduce future flooding. The design included bank stability features and required protective cover to be restored to utility lines that cross below the channel bed. Powers Creek is home to numerous aquatic species and as such, the design incorporated the restoration of habitat features for resident species, including Kokanee salmon.

Recovery plans were solidified based on inclusive consultation with regulators and Westbank First Nation. As a result, the City was successful in securing funding for naturalized channel recovery as an eligible enhancement through the province of British Columbia's Disaster Financial Assistance program.

Stantec provided contract administration and tendering services to the City, leading up to construction, and conducted construction oversight and environmental monitoring.



Before Dam Removal

IDLEWOOD CREEK DAM REMOVAL AND STREAM RESTORATION

Kitchener, Ontario, Canada

Healthy creeks with thriving aquatic ecosystems are an important of the City of Kitchener's vision for sustainable, vibrant communities. Removing barriers to fish passage and restoring streams to naturalized conditions are key components of this vision.

In 2018, The City of Kitchener used funds from its Stormwater Utility to revitalize Idlewood Creek by removing two small dams and an old farm crossing. All three barriers were preventing fish from accessing the upper reaches of Idlewood Creek from the Grand River.

Stantec's stream engineers and landscape architects worked closely with the City, local residents, and regulators to design three reaches of natural channel to replace the barriers. In removing these barriers, the design re-established fish passage from the Grand River to the upper reaches of Idlewood Creek. The design was not without its challenges; the Idlewood Creek valley in the project reach was steeper and narrower than usual for southern Ontario, and target fish species were small with limited jumping and swimming abilities. The Stantec team investigated shear stresses in stable

streams and used advanced two-dimensional modelling techniques to produce a resilient design providing fish passage and channel stability for low and high flow conditions. Stantec's landscape architects integrated the natural channel design into the infrastructure of the Walter Bean Trail, providing a way for the community to enjoy the restored natural habitat for generations to come. Stantec also managed the safe removal and disposal of contaminated soils in the construction footprint, and helped maintain a high degree of public engagement from the initial planning stage through to completion of construction.

Construction of the project was completed in the fall of 2018. The trail has opened, the channel corridor has naturalized, and fish from the Grand River have been enjoying their newfound habitat – spawning was observed above the restored reaches as soon as the spring of 2019. With the success of the project, the City has gained habitat banking credits that allow them to continue to take good care of their water resources, their communities, and their natural features.



UNAGRELLI PRESERVE HABITAT RESTORATION

Manatee County, Florida

Manatee County engaged Stantec ecologists to help establish project goals and strategies for enhancing an awkwardly shaped, overgrown 31.3-acre site into a passive, recreation area that would benefit the local community.

Stantec created a restoration plan that converted highly degraded uplands on the site to coastal hammock and removed spoil from wetland areas to improve hydrology. This plan included the placement of fill on an upland island and required a temporary wetland impact to mangrove habitat. Our plan will eventually remove the overgrown nuisance and undesirable plant species, enhance the mangrove swamp, and provide public access and educational opportunities.

Although the site presented poor soil conditions, low upland elevations, and temporary wetland impacts, our team was able to successfully navigate these challenges and present a comprehensive restoration plan to the County that will help conserve and protect valuable coastal habitats in Southwest Florida.

YORK RIVER MITIGATION BANK

King William County, Virginia

The York River Mitigation Bank in King William County covers 959 acres along three miles of the Pamunkey River, including 13 miles of stream mitigation and more than 230 acres of wetland mitigation. Since 1998, Stantec has served as the County's environmental consultant. During that time, we've completed resource surveys, Interagency Review Team coordination, and detailed stream and wetland mitigation assessment. Stantec has also provided design, construction plans, agency permitting, contractor coordination, and construction oversight as part of this contract.

Through several phases of development, planting, and monitoring, more than 163 acres of wetlands have been restored, created, or preserved as part of the York River Mitigation Bank. We focus on working with the existing topography and soils to identify opportunities where we can restore and create wetland features that fit naturally into the landscape. Likewise, we've restored many degraded stream channels and worked with the property owner to establish and maintain wider buffers on these streams to prevent future damage.



FIFTH AVENUE DAM EVALUATION AND REMOVAL

Columbus, Ohio

When the 5th Avenue Dam was built on the Olentangy River in 1935, it served a useful purpose – providing cooling water for a power plant on The Ohio State University campus. Decades later, with the power plant long gone, the dam was not necessary. Dams often impair the health of the rivers by disrupting natural flow patterns and creating lake-like conditions that trap pollutants, sediment and obstruct the migration of aquatic species. That's exactly what was happening behind this dam, so the City of Columbus retained Stantec to design its removal and restore 1.6 miles of the river to a more natural state.

During the feasibility study, we established that only the top two feet of the dam needed to be removed from the western half of the 470-foot long dam. Our natural channel design deepened the river, reestablished its natural

flow and form and created four fringe wetland complexes. More than 7,500 mussels of 13 distinct species were rescued and relocated to safer areas upstream and downstream of the restoration area. Seven new riffles now provide prime habitat.

Nearly all sediment that was trapped behind the dam was recycled to restore and expand the river's banks. The newly narrowed and vegetated banks offer a continually evolving green space that the university has already embraced as a center for research and recreation. Now canoers and kayakers can freely paddle through this newly restored stretch of the river, and fishermen are returning to the area as its biodiversity rebounds



BIG THOMPSON STREAM RESTORATION PROJECT

Loveland, Colorado

After experiencing devastating floods in northern Colorado in 2013, the Front Range watersheds were in desperate need of repair. To help restore the Big Thompson River and prepare for future flooding events, the Big Thompson Watershed Coalition hired Stantec to perform stream restoration design and implementation.

Stantec worked on the assessment and design documents to guide rehabilitation and resilience efforts for the Big Thompson River, its floodplain, and its riparian corridor including the Lower Canyon (Cedar Cove and Jasper Lake reaches) and West Loveland (Riverview to Morey). The goal was to promote long-term resiliency and create a design that incorporates stakeholder input while also developing a restoration plan that could be successfully implemented.

To meet this project's goals, Stantec's design reset the ecological trajectory of the river reaches based on historical context and contemporary boundary conditions and was designed to handle the hydrological demands of the future. The design process involved a diverse group of stakeholders, including private land owners that were concerned about their property's riverfront. The resulting design used the existing river's location, including its physical and biological characteristics to enhance riparian function and prepare this watershed for future flooding events.



COMED PRAIRIE PROGRAM IMPLEMENTATION AND MANAGEMENT

Northern Illinois

ComEd's Prairie Program, which began in 1994 to preserve and restore native prairie habitats within their electric transmission rights-of-way, covers its entire territory within northern Illinois, with many of the sites located in the Chicago region. Since 2009, Stantec has assisted ComEd with expanding the Prairie Program from about 100 acres of actively managed sites to over 300 acres through ongoing efforts to increase visibility of the program, partnerships, and effectiveness of on-the-ground restoration efforts.

Prairie sites are in various stages of development, from high quality remnants to recently seeded sites. To support on-the-ground restoration and stewardship, Stantec provides a full range of restoration services, including invasive species control, seedbed preparation, native seeding, mowing, shrub removal, and prescribed burning. Prescribed burning presents unique challenges on rights-of-way, and Stantec carefully plans these burns to protect utility infrastructure and the

public. In addition, we have assisted ComEd with developing and refining a prescribed burn approval process. Other parts of this program have included ecological assessments, development of restoration plans, pollinator initiatives and identification of new potential sites. Stantec has coordinated restoration work with adjacent landowners at numerous sites as part of larger landscape-scale restoration efforts, including dedicated state nature preserves and other protected natural areas.

This project has also served as the focus for presentations about this work at industry tradeshows and events and has also earned certifications and awards through various conservation organizations.



PERICO PRESERVE RESTORATION

Manatee County, Florida

Creating a wildlife habitat from a 175-acre parcel of abandoned farmland was no small task, but we helped Manatee County achieve that goal. Stantec's environmental team created upland, wetland, and inter-tidal wildlife habitats, while replacing exotic invasive plants with plants native to coastal south Tampa Bay.

Establishing project goals, determining and documenting pre-restoration conditions and future management methods, and conceptualizing a restoration project were the keys to success in the development and permitting of this large restoration plan. Encompassing habitats from coastal scrub to mangroves, the Perico Preserve Restoration consisted of both direct seeding to establish ground cover and planting of containerized trees and shrubs with more than 100 species of plants specified to return botanical diversity to this site.

Our ecologists implemented an overall restoration of the property while accommodating constantly changing uses including mitigation needs for off site projects, volunteer planting of wetland creation areas, identifying a potential seagrass mitigation site, and maintaining high construction and implementation standards for the designed habitats. The first phase of restoration included grading, seeding, and planting. The second phase consisted of more than 160,000 cubic yards of soil excavation for the creation of a future open water body, and the third phase created seagrass meadows and mangrove forests habitats. Perico Preserve is a unique site where fish and wildlife will thrive and residents of Manatee County will have an opportunity to experience rare habitats up close.



KATY PRAIRIE STREAM MITIGATION

Harris County, Texas

Stantec is working with Restoration Systems, the Katy Prairie Conservancy, and Warren Ranch to develop the largest stream mitigation bank in the world in Katy, Texas.

Phase 1 consisted of approximately three miles of channel. The design involved a Priority I restoration in a coastal plain environment and is largely focused on introducing wood and habitat into the system and restoring floodplain access to the stream. Phases 2-5 consist of approximately 15 miles of stream restoration totally approximately 80,000 linear feet of new channel along with dozens of oxbow features as well as hundreds of feet of wood toe. A set of design documents was created using our in-house 3D design package. The objectives were to develop stable streams to minimize erosion and sedimentation, improve water quality, and increase habitat. The streams were realigned to mimic what they looked like in the past.

The design had to be completed on a fast-track basis to secure permits in time for funding requirements. We completed the design of 80,000 feet of stream restoration within three months using multiple sets of teams working side-by-side. The magnitude of this project shows our tremendous capacity to complete large stream restoration projects quickly. We provided construction phase services for Phases 1-4. We are currently providing stream geomorphic monitoring for the phases that have been constructed. Monitoring consists of measuring stream cross sections and profiles, geomorphic features, and vegetation establishment. Information is compiled in annual monitoring reports.

After restoration, the stream was subject to a 500-year flood with minimal damage/erosion. The project is an example of how stream restoration can produce resilient ecosystems that prepare communities for future flood events.

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of place and of belonging. That's why at Stantec, we always design with community in mind.

We care about the communities we serve—because they're our communities too. This allows us to assess what's needed and connect our expertise, to appreciate nuances and envision what's never been considered, to bring together diverse perspectives so we can collaborate toward a shared success.

We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

Stantec trades on the TSX and the NYSE under the symbol STN. Visit us at [stantec.com](https://www.stantec.com) or find us on social media.

