

Effects of Ecological Restoration Decisions on Native Plant Horticulture

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INTRODUCTION

Applied Ecological Services, Inc. (AES) is a 40-year-old ecological consulting firm whose vision is one of bringing the science of ecology to all land use decisions. We bring to this mission a diverse consulting staff of ecologists, botanists, ornithologists, engineers, landscape architects, GIS specialists and other science specialists. Our experienced field contracting services personnel install and manage ecological restorations in a variety of ecosystems, adapting to challenges. In addition, since the firm's inception, success of these efforts has relied on the growth of our robust native plant nursery, Taylor Creek Restoration Nurseries (TCRN).

We learned, developed and refined our restoration process in Wisconsin and Illinois. And we are continually translating this experience to other locations. Although cultures vary, the ecological restoration and native plant horticulture principles we have developed can be applied throughout the world as demonstrated by work AES has done in such places as South America, Romania, Alaska, and China.

It is this synergy of consulting, contracting field services, and native plant nursery that has uniquely positioned AES to examine the ways ecological restoration decisions act as driving forces for innovations in native plant horticulture. In response to ecological challenges presented by our consultants and contractors, TCRN has continually solved the emerging challenges inherent in acquiring genetically appropriate propagule stock, producing and managing adequate volume native seeds and plants, matching species' traits to intended field uses, and storing and transporting viable products in a timely manner to far-flung project locations.

AES takes a long ecological view with all its ecological restorations. Our mission commits us to the use of wild genotypes (rather than cultivars) that can persist and adapt over time, knitting together intact, sustainable restored ecosystems. This commitment — not only to native species but also to regional genotypes — has allowed us to push

the envelope of native plant horticulture at all stages of production.

METHODS AND DISCUSSION

In this section we describe seminal ecological land use and restoration projects AES has conducted in diverse landscapes (e.g., agricultural, urban, natural areas, restored lands). Without the 40 years of widely varied AES projects and the demands each presented, the innovations and improvements in native plant horticulture experienced by Taylor Creek Restoration Nurseries would not have occurred. Truly, we have seen how “necessity is the mother of invention.”

We describe some of our “game-changing” projects that have translated to innovations in the techniques of both ecological restoration and native plant horticulture. We begin by summarizing challenges and then, in the context of the projects, describe innovations that produced successful project implementation.

Challenges of native plant horticulture derived from our experience in ecological restoration include:

- 1) Baseline assessments to accurately characterize restoration actions and goals and identify target species needed for successful restoration.
- 2) Creation of a restoration palette with sufficient species diversity to form viable, sustainable ecosystems.
- 3) Selection of plant species adapted to specific conditions (e.g., toxins and heavy metals, droughty soils, fire management, competition with invasive species).
- 4) Nursery propagation of rare species with unknown growth specifications.
- 5) Identification of geographic propagule sources for species that are genetically representative of target restoration location.

- 6) Identification of most appropriate propagules (e.g., seed, tuber, rhizome, plant plug) for successful installation and growth of each species.
- 7) Design of propagation schedules that complement projected planting schedules.
- 8) Need for remote nursery production for large-scale projects distant from Taylor Creek Restoration Nurseries.
- 9) Propagation, processing and handling of seeds and plants in sufficient volume in a timely fashion to meet scheduled demands.
- 10) Concerns about nursery production costs as well as client procurement costs.
- 11) Capacity for storage as needed to accommodate staggered production and scheduling and potential delays
- 12) Secure transport of propagules to restoration installation site and viable staging on site.

The following projects were instrumental in the creation and evolution of Taylor Creek Restoration Nurseries.

Flambeau Copper Mine Restoration (Wisconsin)

AES participated on a team that designed the backfill of an open pit copper mine in northwestern Wisconsin. The main ecological challenge was one of identifying plant species that could tolerate and grow on a substrate of ground-up rock that originated from the mine along with high concentrations of heavy metals. Droughty conditions and low nutrient concentrations due to limited organic soil were also prime limitations for species selection. Once suitable species were identified, seed sources were identified and propagules produced and installed to create a self-sustaining, soil-producing restored ecosystem.

Prairie Crossing Conservation Development (Grays Lake, Illinois)

Acclaimed in National Geographic, New York Times, Wall Street Journal, and honored with more than a dozen conservation awards over the past two decades, Prairie

Crossing is truly a national model of conservation development (Fig. 1). The project was designed with a vision of maintaining agrarian, ecological and historical connections to the landscape.



Figure 1. Prairie Crossing, Grayslake, Illinois with homes over wetlands.

One of the pioneering, and much-studied, strategies of the native landscape at Prairie Crossing is the treatment of stormwater runoff via the first major installation of the AES Stormwater Treatment Train™, a system composed of open swale stormwater conveyance, upland prairie biofiltration, wetlands and a man-made lake. Working in combination, these native landscapes and features are highly efficient at pollutant removal through biological and mechanical means while significantly reducing the volume and flow rate of stormwater runoff.

Project plant species were selected for considerations of aesthetics, biodiversity, ongoing maintenance costs, and resiliency for stormwater management. AES restored over 200 acres of prairie, wetland and

agricultural hedgerow communities. AES continues to maintain the health of ecological communities on an annual basis.

Rare Ecosystem Restoration on Albany, New York Landfill Site

AES worked collaboratively with government and community stakeholders on the design, permitting, construction and monitoring phases of a habitat restoration and wetland mitigation to restore globally imperiled pine bush community. Furthermore, the project was designed to help connect fragmented areas of the Albany Pine Bush Preserve, a significant natural area. The mitigation plan also included two stream relocations, creation of a biofilter wetland

complex and protection of a pine barrens vernal pond community.

The entire restored site includes 55 acres of hardwood forest converted to high quality oak savanna and enhancement of 35 acres of forested wetland. The project also involved sand placement and planting on closed portions of the landfill leading to final landfill closure.

Particularly noteworthy was the construction a 5-acre test plot on a closed portion of the landfill to test adaptability of selected plant species for closure conditions, and the creation of a 3-acre native plant nursery used to supply plant products for the project.

Parkland Development on Former Airbase (Northerly Island)

Applied Ecological Services was retained to assist the City of Chicago to design a beneficial re-use plan for the old Meigs Field Airport, on the coast of Lake Michigan in downtown Chicago. AES partnered with several other Chicago-area and regional firms for the planning, public process, technical design and engineering.

Shoreline stabilization of the lake fill zone combined with stormwater management via biofilters and dune restoration placed new demands on native plant production by TCRN. AES specifically focused on shoreline stabilization of the lake fill zone — recontouring needs for the lake fill to create native restored ecosystems that used to occupy parts of the historic island, which had

been expanded to create the airfield. For the new park, we designed the stormwater management system, conceptual grading plans, restoration plans, phasing plans, and prepared a regulatory environmental assessment and permit documents.

The AES team prepared technical strategies for stabilizing the island perimeter and lake fill. The decommissioning and removal of other costly airport infrastructure were also a significant challenge. Water quality regulatory challenges were addressed through ecological design and the use of stormwater biofilters which integrated nicely with the ultimate plans for wetland restoration, reducing the costly need to do additional excavation of sediments in existing biofilter areas.

A comprehensive park plan was designed – integrating passive recreation and access and active recreation with the conservation, ecosystem restoration and water quality design systems in the new park plans. The restoration was also focused on bringing back some of the rare coastal wetlands, dunal systems, and various types of migratory bird habitats that have otherwise been eliminated on the Chicago landscape.

All told, Taylor Creek Restoration Nurseries produced more than 350,000 native, local-ecotype plants for what has become one of the largest native plant restorations in Chicago history (Fig. 2).



Figure 2. Northerly Island image showing native, local-ecotype flowering plants.

Chicago's Jackson Park Ecosystem Restoration

Chicago's Jackson Park, designed by Frederick Law Olmsted as the centerpiece of the 1893 World's Columbian Exposition, is undergoing a holistic landscape renewal as

part of a five-year, multimillion-dollar restoration led and funded by the U.S. Army Corps of Engineers and the Chicago Park District in partnership with non-profit Chicago Project 120 (Fig. 3).



Figure 3. Chicago's Jackson Park restoration with native wildflowers and park bridge in the background.

AES was selected to lead the project as general contractor because of its extensive ecological landscape expertise. AES re-created and restored natural features (e.g., lagoons, trails, and a historic feature, the Wooded Island) to promote pedestrian circulation throughout the park, provide aesthetic features, and enhance natural habitat. Their restoration work commenced with brushing and herbicide treatments to remove invasive plants followed by replanting the park with more than 500,000 native herbaceous plants and 11,000 trees and shrubs. Eroded lagoon shorelines were rehabilitated with grading followed by planting with 90,000 carefully selected wetland plant species. Reconfigured

and refurbished dunes along Lakeshore Drive were subsequently planted with specialized Great Lakes dune vegetation. Maintenance—involving invasive plant control, mowing and burning—are ongoing.

Taylor Creek Nurseries staff worked hand-in-glove to meet U.S. Army Corps specifications for plant material. In recognition of AES plant propagation skills, USACE botanists purposefully expanded the restoration palette, including difficult native species and genotypes not typically propagated for restoration. The specific project palette, as well as production capacity, were major horticultural challenges.

SUMMARY

It is the very variety and complexity and diverse geographical locations of AES ecological land restoration projects that have driven the innovative growth in native plant horticulture that today characterizes Taylor Creek Restoration Nurseries.

In more than 30 years, Taylor Creek Restoration Nurseries has grown from a small operation growing a few thousand plants and with seed production beds started literally in the backyard to today's operation which handles more than 2 million plant plugs per year and manages approximately 250 acres of native seed production. But in addition to sheer increased capacity, TCRN has contributed significant innovations in native plant horticulture.

These include:

- 1) Protocols for successfully scheduling extensive, multi-year landscaping projects.
- 2) Techniques for creating remote nursery operations for large projects.
- 3) Adapting commercial shipping racks and containers to native propagules.
- 4) Development of creative partnerships both as clients and for production.

- 5) Experimental field trials of plantings to assess plant responses to new conditions such as extreme soil types, temperatures, pollutants, etc.
- 6) Strategies for propagating “difficult to grow” species (e.g., highly specialized requirements, low fecundity, low disease resistance) including tissue culture.
- 7) Intermixing of small and large projects in company work flow to maintain a steady client base in spite of unexpected delays and other challenges.
- 8) Techniques to cope with storage and long-term maintenance of product.
- 9) Balancing “ecologically ideal” species lists with “horticulturally possible” results.
- 10) Maintaining genetic diversity of product at all scales.
- 11) Tracking trends and responding to new markets such as garden centers and non-profits.

We anticipate additional innovative growth in native plant horticulture, continually driven by AES's equally innovative approaches to ecological restoration and land use.