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While the term "restoration" is widely used in the United States and Europe, many projects and activities falling under this rubric might more appropriately be labeled "renaturing." *Restoration* often aims to recreate presettlement conditions (in the United States) or some other chosen point in the past. We are not alone in questioning this focus; many of the authors in this volume challenge and evaluate the use of a single historical point to frame restoration activities. We find that "restoration" is especially problematic in urban situations, where the settlement activity impacts soils and nutrients, fragments land cover, alters hydrology, and can change human values for the land and thereby seriously restrict hopes of returning a site to historic conditions with any degree of authenticity. For example, a prairie restoration at the scale of a nature garden or even one 50 acres (20 hectares) in extent will never be home to a bison, the prairie's keystone species. Instead, most projects focus on recovering or reintroducing the key flora of a target community and hope to attract smaller fauna such as butterflies and reptiles. A dune restoration cannot be given the freedom to shift across a park road or into a neighbor's backyard. Instead, plant communities in the urban world are necessarily fixed in space and any movement of elements in the community must take place within site boundaries. And while prescribed burning may be used to manage the understory of an open oak woodland or savannah restoration, setting back succession with a stand-consuming crown fire is not in the urban restorationist's playbook. While the historical context can provide ideas of what plants to use or stream shapes to reconfigure, we also need creative, contemporary strategies to deal with the new realities of climate, species arrivals (be they invasives or endangered species finding new habitat), fragmentation, changes in human population and settlement patterns, industrial legacies, altered hydrology, and other unknowns involved in bringing back ecological structure and function.

In coming to grips with such realities, a number of emerging models have been posed as alternatives to traditional restoration concepts and are premised on what functions best in a landscape for different objectives, such as the provision of habitat, recreation, or ecosystem services. These renaturing models include "reconciliation ecology," "ecological rehabilitation," "designer ecosystems," "new wilderness," and "invented nature."[1] Common to each of these renaturing models is the acknowledgment that the issues are more complex than returning a landscape back to a single desired ecological reference point. Renaturing activities in Europe and increasingly in the United States often must grapple with accommodating the multiple layers of history present at a site, histories that are difficult to separate into discrete categories of "natural" and "cultural."

In this chapter we examine how urban renaturing activities in the United States and Europe are attempting to incorporate the natural and historical legacies of sites into plans for current use. Two research settings are highlighted, both focused on renaturing in an industrial setting: the Calumet Initiative, a project to revitalize the rustbelt landscape of the southeast side of Chicago and northwest Indiana, USA; and the renaturing of open cast mining operations around Leipzig, Germany. These two projects make it clear that we value in some way what was lost and/or what might be gained by increasing the number or viability of the plant and animal communities and the biogeophysical processes upon which they depend. This is fundamental: restoration and renaturing are inherently human activities based on individual and group attitudes, beliefs, and values.

RESEARCH SETTINGS

The Calumet Initiative

The Calumet region is extensive, covering 160 square miles (414 square kilometers) of northeast Illinois and northwest Indiana in the United States. It includes 10 percent of the city of Chicago, many of its southern suburbs, Indiana communities including Gary and Hammond, and the Indiana Dunes National Lakeshore. The Calumet Initiative is a partnership of government, non-profit groups, business, and local residents aimed at revitalizing the local economy and environment. The Calumet region was the largest area of heavy industry in the world after World War II. It is still an industrial region, but one with many brownfields and contaminated sites. It is also home to many wetlands, prairie, dune and swale, savannah, and woodland patches. These range in size from the very small to the 15,000 acres (6070 hectares) of the Indiana Dunes National Lakeshore. They also range in health from severely degraded to robust natural systems.

At the urging of local residents, funding was provided to study the Calumet region for inclusion in the U.S. National Park system. The study indicated that much of the region fit the criteria for a national heritage area, having sufficient cultural and natural assets to warrant protection. Some of the cultural resources include the former company towns of Pullman in Chicago and Marktown in East Chicago, Indiana. These were built at

the turn of the last century and are still distinct communities today. The Underground Railroad is believed to have had safe houses in the region, and efforts are underway to identify their locations and preserve the sites. While there was significant support for designating sections of the Calumet region a Heritage Area, there was also opposition. Today, the debate continues on this and other projects and developments.

Calumet also has a rich natural history. In the late 1800s and early 1900s, University of Chicago botanist Henry Cowles conducted his investigations of Calumet's dunes and bogs, leading to his contributions to early ecological theory in plant community succession. In the early 1900s, another researcher from University of Chicago, Norma Pfeiffer, found *thismia americana* in Calumet, the only known location of this plant in North America. The plant was last seen in 1916. For several years in the mid 1990s, annual *thismia americana* hunts were conducted. Volunteers came from miles around in hopes of rediscovering this tiny plant. Their efforts did not yield the *thismia*, but other plant species were identified and added to Calumet's list. In 2002, the Calumet Bioblitz amplified this species hunt, and in a 24-hour collection period, over 130 scientists and scores of local volunteers scoured two Calumet sites for as many species as possible. The results: Over 2200 species of plants and animals were identified, some newly recorded for the region. Together, this pastiche of industry, nature, and the history of both, is Calumet.[2]

Renaturing of Open Cast Mining Operations Around Leipzig, Germany

Around Leipzig, open cast mining of coal has utterly transformed the landscape within the span of a few decades drastically disturbing centuries-long cultural patterns of farms and woodlands. Now eastern Germany's economic shifts and a shrinking population have opened the way for the renaturing of mining sites, creating the *Bergbaufolgelandschaft*, or post-mining landscape of lakes, woodlands, and other "natural" places for the area's 150,000 residents and anticipated visitors and tourists.

The approach to creating mines in the former German Democratic Republic was to destroy villages to expand the mines, often relocating an entire village's population within a single apartment block. Altogether 25,000 people were resettled between the 1950s and the late 1980s, and seventy villages and small towns were wholly or partially destroyed.[3]

The end of mining was welcomed by many. As one resident stated in an interview: "In 1990 it did not matter what was suggested as an alternative for mining, as long as the mining, the pollution, and the destruction of the land was stopped."[4] Not everyone felt this way, especially some of the former mining employees who lost their jobs, but the closing of the mines created a new beginning in the hearts and minds of Leipziger residents.

Beginning in the early 1990s, many of the open cast pits were flooded, some by naturally rising water tables, others filled with industrial waters from neighboring active mining pits, and still others filled with water diverted from adjacent rivers. These changes have been taking place rapidly, with seven lakes to be created by 2012 in the immediate vicinity of Leipzig, and more throughout the Freestate of Saxony. Several lakes have been completed already, including Lake Cospuden, offering boating, swimming, hiking, and other recreational activities. The lakes range from 69 to 2258 acres (28 to 914 ha). Along with the increased surface water, woodlands are also expected to increase. In 1996 only 17 percent of the mining-counties' landscapes were woodland, but by 2050 it is expected that some 40 percent of these landscapes will be covered with woodland and new forests. By contrast, in 1996, 31 percent of the landscape was farmland, but by 2050 it is expected that only 20 percent will be farmed. These changes also reflect the expected patterns of human land use in the future.

Certainly this renatured landscape is substantially different from that which existed before mining. The new nature replacing the closed mines is created by using pre-mining landscapes as a guide, and emulating lakes formed through natural processes. While this large-scale effort is not restoration in the sense of returning an area to some earlier condition, the past can nonetheless guide current projects, as by suggesting plant species (including rare and native species) and approaches to managing wildlife as it returns. This approach is taken in some areas of the former mining landscape south of Leipzig, where natural lakes of the region are used as a design template for the now-flooded pits in an attempt to fit them into the landscape as if they had existed in the nineteenth century, that is, as if nature, itself, had built the lakes.

The end of mining has opened space for hopes and dreams for the future, something that was missing during the mining era. And the ways in which these aspirations are expressed indicate the strong connection between the land and the expression and creation of culture. One example is found around the new Lake Störmthal. This lake will be fully flooded by 2012, but eight annual Störmthaler Seefests, or lake festivals, have been held already, celebrating a yet-to-exist lake. Other indications of the new possibilities created by the new lakes are residents opening wind surfing shops and other businesses counting on the recreational and tourist business opportunities created by the new lake district.

RENATURING MODELS

These settings and the projects taking place across the Calumet and Leipzig landscapes vary considerably, underscoring the fact that not all restoration or renaturing projects are the same. The presence of native and exotic species and the type and extent of human presence in the landscape differ

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considerably even within these two settings. Gobster articulated several types of renaturing projects he found in the urban parks he has studied.[5] These include (1) the "classical" model, (2) the sensitive species model, and (3) the habitat model. Westphal and Gross find examples of these three in the industrial legacy sites they work in, but add two additional models, (4) the cultural landscape restoration model, and (5) the rehabilitation model. These models are discussed here, and while they are not meant to be an exhaustive list, they illustrate the different types of approaches, questions, values, and needs being addressed by renaturing work worldwide. Each model is described, followed by an example from Leipzig or Calumet.

1. "Classical" model: This type of renaturing builds on significant remnant indigenous flora that are left because the land has been protected from development for a variety of reasons (e.g., steep hillsides, wetlands). Renaturing of these urban sites conforms most closely to a "classical" model of ecological restoration, where native plant diversity is maintained and enhanced through invasive species control and replanting, though these activities are sometimes accomplished in uncommon ways to deal with structural and social constraints.

Example: Powderhorn Lake, Marsh, and Prairie is a 175 acre (~71 ha) protected Illinois Natural Area with intact oak savannah and dune and swale structure. The site provides habitat for threatened plants and animals, while also providing fishing and other recreational activities. It is one of the rare places where one can stand on native soils in the industrialized region of Chicago's Calumet. Restoration on the site has focused on preserving the rare ecosystem, and has been done through many volunteer hours of brush cutting, prescribed burns, and other "boutique" methods for removing invasive plant species. For several years, volunteer restoration activities were halted due to controversy over the use of pesticides.[6] The restoration moratorium has been lifted, and restoration work is again underway. Powderhorn was one of the sites for the Calumet Bioblitz mentioned earlier.

2. Sensitive species model: Some urban sites harbor plant or animal species that have been identified as rare, threatened, or present some other reason of conservation interest to the region. In contrast to the plant community focus of the classical model, restoration of these sites focuses in significant part on protecting and enhancing the populations of these sensitive individual species. The weight these species are given in site management invokes a kind of "ecological primacy" that makes the existence of incompatible exotics and access by incompatible uses much less negotiable. This primacy is sometimes controversial when sensitive species are re-introduced into a restoration area where they have been extirpated, and may be seen by some critics as a move by restorationists to close off public park space to a special interest.

Example: Calumet's Indian Ridge Marsh and the wetlands immediately around it are managed for the state endangered Black-crowned night heron.

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The marsh hosts one of Illinois' most important rookeries for the herons, where the birds use the structure provided by phragmities (an invasive with both native and exotic varieties) for their nests. The need for a viable rookery takes precedent over other considerations, including other potential uses for the site, such as recreational trails. And because the herons use the phragmities, typical restoration techniques like the removal of invasive species are also precluded, at least until the site has alternative nesting structure for the rookery.

3. Habitat model: More broadly conceived than the sensitive species model, the habitat model of restoration aims at providing the appropriate set of conditions for a range of species of interest such as neotropical song birds or wetland dependent birds. Non-native species that provide food and cover are often tolerated or even added in habitat projects, though there is increasing concern in avoiding plants that may produce invasive monocultures.

Example: One of the prominent features of the landscape south of Leipzig is a large hill, called Trages heap. This hill does not date from the glacial age, but was made from the overburden removed from the local coal mines. It was planted with trees and now is heavily vegetated. A viewing tower was built on top and hiking is permitted on some trails and the one road. The trees are now mature enough for timber harvest. Once-familiar species of plants and
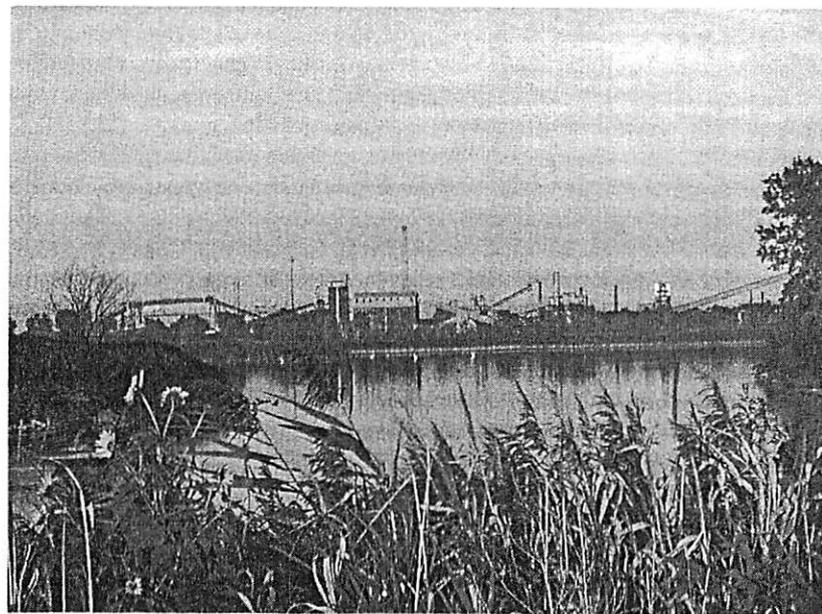
Figure 19.1 The Calumet Region is a pastiche of industry, nature, and the history of both. (Photograph by Lynne M. Westphal)

animals (including deer, hare, and boar) have re-colonized the hill, increasing the local biodiversity. The tree planting renatured the overburden pile creating habitat, as well as economic and recreation opportunities.

4. Cultural Landscape Restoration model: In this type, the role of humans in shaping the landscape is more widespread than recognized in other renaturing models. The Cultural Landscape Restoration model recognizes the importance of human endeavors in a region, the values people have for the land and their history as reflected on the land, as well as for the plant and animal assemblages that make use of the land. The European Landscape Convention from 2000 defines landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."[7] This definition is valuable since it not only addresses the negative impacts of people on the "natural" landscape, but also the potential benefits, the values attached to nature, and the ways people contribute to the distinctiveness of the landscape. In Chapter 17 in this volume, Tomblin discusses cultural restoration, and the use of American Indian restoration activities as an act of resistance against threats to a culture or subculture. This can also be the case in the Cultural Landscape Restoration model, when organizing around natural areas is also an expression of identity and/or used as a tool in negotiating with external entities.

Example: Leipzig's new lake district is creating new cultures as well as new landscapes. The lake festivals and restaurants located along lakes that don't yet exist indicate the power that even potential positive change in the landscape—the creation of new natures—can have for people, particularly when local cultures have been stressed and dramatically changed by powers outside their control. The creation of new cultures, however, does not wipe the old cultures from the landscape. An Association of Lost Villages has formed, holding village reunions and safeguarding artifacts from lost villages. In one case, residents saved the town's church bell. When the lake is completed, they plan to build a replica of the church steeple on an island where the church stood, and reinstall the bell in the steeple. Tours of completed lakes include what had existed before: "here was the school, here was the church." This landscape carries with it the old and the new, allowing for new futures and new cultures while also carrying memories of the past.

5. Rehabilitation model: In this model, the landscape has been so degraded that restorationists are working almost from scratch to reestablish natural systems and assemblages. Brownfields in the form of mining areas, gas stations, air strips, and landfills have all been reclaimed with native vegetation, (re)introduced streams and lakes, and other "natural" features. Sites in this category often have contamination that must be addressed. Planting and renaturing can help, as in the case of phytoremediation and tree planting to address mine tailings. In other cases, renaturing might need to be restricted so as not to introduce contaminants into the food chain.
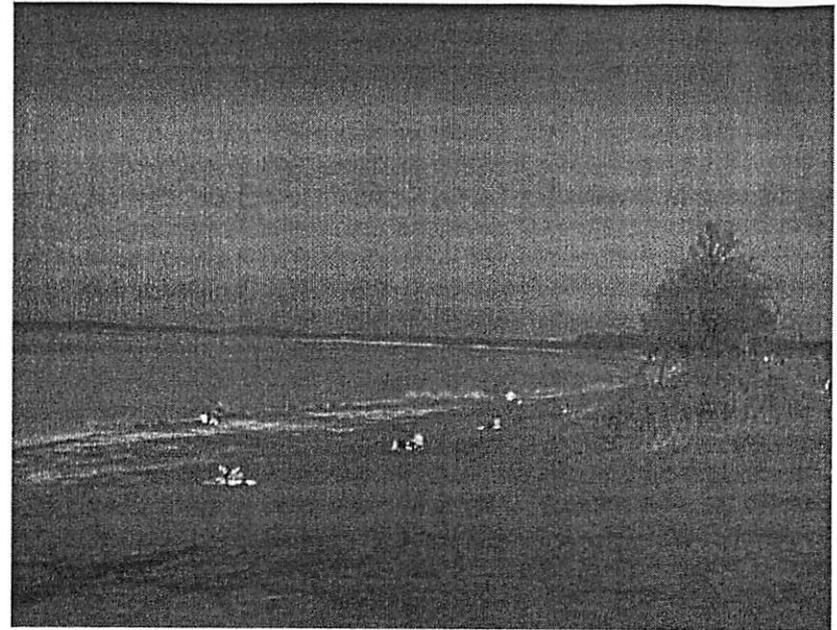
Figure 19.2   This is a Leipzig restoration site, Germany: *Cultural Landscape Model.* (Photograph by Matthias Gross)

Example: Calumet's Indian Creek did not exist as a creek or stream before European arrival. It was formed when the existing wetlands were filled over the decades with slag and cinder from local industry, leaving a ditch that was optimistically named Indian Creek. There is some historical evidence that it was maintained as a channel through the wetland by the indigenous Americans, the Potawatomi, but it was never a creek. At the beginning of the Calumet Initiative, Indian Creek was an aquatic dead zone. Research determined how to improve the aquatic habitat by making it more stream-like. This meant changing its shape to increase flow speed so that calcite that leached from the slag would flush from the stream bed, and adding pools and riffles to provide resting and feeding places for fish. This transformation has taken place on a part of Indian Creek, with some promising early results.

CONCLUSIONS

These models suggest the variation that is possible among restoration and renaturing projects, especially those done in urban, industrial legacy areas.

These five models by no means describe the wide range of renaturing projects. But these models do make clear that humans undertake restoration and renaturing projects because they meet human needs and values. Even those who focus on restoration and renaturing for the sake of non-human nature do so because there is something about non-human nature they value. The examples, provided with the different models, illustrate some of the underlying values that motivate the restoration and renaturing projects. One value that can vary across these models is the acceptability of evidence of human beings. This is generally less acceptable in the classical model, but is potentially acceptable in the sensitive species model, and is a fundamental element in the cultural landscape restoration model. Another range of values is the primacy of a single species or the primacy of a community or assemblage. The sensitive species model focuses on a given species, while the habitat model reflects values of a broader nature. The Indian Creek example from Calumet is indicative of a value set that accepts limitations and does not seek an "ideal" landscape, while the creation of a new lake district around Leipzig integrates past landscapes and local culture with new possibilities.

These models, and their underlying human values, matter for restoration projects. The aims of a project and the clarity of its goals—as shown by identifying the model a project best fits—can help in the decision process for a site. Are all non-indigenous invasives to be removed? Yes, in the classical model; not necessarily, in the sensitive species or rehabilitation models. Restoration and renaturing activities can be contentious, both within a project and between project proponents and others.[8] Understanding the different models can make it easier to see the root of a conflict, and therefore to create more lasting resolutions. Listen closely and you may hear one person speaking on behalf of idealized past landscapes—the classical restoration model—while another espouses the rich cultural legacy present in the landscape, or the cultural landscape restoration model. Whichever the case, restoration and renaturing are done because people value the outcome, and because people are intrinsically connected to the land.

NOTES

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Pletsch, eds., *Beyond Preservation: Restoring and Inventing Landscapes* (Minneapolis: University of Minnesota Press, 1994).

2. For more about Calumet go to http://www.nrs.fs.fed.us/4902/focus/calumet/; http://www.fieldmuseum.org/bioblitz/; http://www.fieldmuseum.org/calumet.

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8. Gobster and Hull, *Restoring Nature.*

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