RESTORING PRAIRIE AND FOREST ECOSYSTEMS: MAKING THE CASE FOR HUMAN INVOLVEMENT

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ABSTRACT

By examining forest and prairie ecosystems in the United States and Canada, where periodic human-caused fire disturbance was once an integral function of these ecosystems, this research will make the case for the reintroduction of human involvement through restoration projects and similar management of nature preserves and National Parks. Many scholars in Environmental Studies support the notion that humans are separate from the natural environment. The literature addresses the ecological damage done by humans and ultimately argues that the best course of action is to protect the remaining natural places and allow them to recover on their own. This sentiment ignores the innate connection between humans and the environment, in which both need the other to survive. Through the process of restoring ecosystems, the historical connection between humans and the environment can also be restored. My research illustrates how an interdisciplinary approach, drawing from the life sciences and the social sciences, is needed to produce effective human involvement in ecosystem management and a respectful and functional relationship with ecosystems.

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I. INTRODUCTION 1

As ecological systems are continually degraded and destroyed by human action, and environmentally inclined literature and media become increasingly frantic about the world's disappearing ecosystems, it is difficult to find sources that are providing a plan of action to stem the tide. Many environmental scholars agree that for the future sustainability of the earth's resources and for a more equitable human relationship with natural systems, a lifestyle change is required for human civilization. Changes do not have to be immediate or drastic to be effective; they can be small but significant. Restoration of ecological systems is a movement of international proportions that can involve all people in all places in small but significant ways, and it does not have to have the same meaning to all individuals and in all places. Restoration should not have a broad definition that ignores subtle or vast differences between areas being restored.

This work is an attempt to draw from many literature sources what restoration is and what it has come to mean to the people involved, and how their relationship to nature has changed as a result. The importance of both locally driven restoration practices and large-scale projects will be highlighted in this research project. This work deals with the problem of the endangerment of tallgrass prairie as a result of agricultural and urban sprawl in Minnesota particularly, and the increase in people's involvement to restore it. Tallgrass prairie is significant because it is the most threatened among grasslands, with the least amount of viably large reserves left. The case study in this work of a savanna restoration in Minnesota highlights how the relationship between the two ecosystems of prairie and forest defines a large part of the state's ecological character.

This work also more broadly applies to prairie, savanna and forest restoration in other parts of North America, where a significant growth of the discipline has occurred within the last

thirty years. Restoration is practiced all over the world within the context of many ecosystems and in many nations, including Japan, South America and Europe, among others (Miyawaki 2004, Higgs 2003). The sharing of the experience of ecological restoration work by volunteers and experts in North America is becoming more common. Habitat restoration work and alternative landscaping is also increasing in urban areas, in some cases augmenting grassland preserves and restorations in rural areas. Professional restorationists are extremely important for the future development of restoration, but the involvement of the local community in restoration projects through volunteerism must not be underestimated or subverted by professionals. Restoration work by volunteers includes cutting brush, pulling nonnative and invasive species, and in the fall collecting seed from diverse, biologically strong areas to be distributed to less biologically diverse areas. Volunteers learn that restoration work can be hot, repetitive, difficult, and requires volumes of patience. They begin to appreciate the preserved ecosystems already intact, discovering that restoration is not an easy way out of the consequences of environmental degradation. It is however an activity with a lot of promising characteristics for transforming present environmental policy to reflect the changes necessary for an environmentally sustainable future.

Through this research I will attempt to bring forth working alternatives to the current trajectory of overuse and degradation of ecosystems by showing how people can become involved with ecosystems through restoration. There are many complicated elements in the argument for restoration, such as philosophical, economic and political barriers, and failed attempts at restoration because of a lack of clear, well thought-out goals for restoration (Ehrenfeld 2000). Ecological restoration has the potential to change the idea that nature is something "out there," disconnected from general human experience. This research will show the value of human involvement as a key factor in ecosystem recovery, and how it is necessary to

combine conservation and restoration, the importance of balancing human involvement and letting nature alone. Many of the processes of ecosystems are still unknown to ecologists, and restoration offers a way to make new discoveries and revise old theories in ecology and other life sciences.

The case study highlighted in this work provides an example to engage with the themes introduced above and discussed further below. It does not exemplify an ideal case, but it shows how the themes have been physically attempted in one area. The case study is of a savanna planted in an urban environment, which is not a common characteristic of most restoration case studies. The reason why tends to be that suburban and especially rural areas simply have more space to restore an ecosystem that will be able to support a viable population of animal, insect and plant species. The larger the restoration the more strength it has to support its species. However, not unlike the function of zoos, urban restorations like the savanna can raise awareness in a community about the plight of endangered ecosystems outside the city. And like community gardens, urban restorations are opportunities for people in a neighborhood to gather for a purpose that strengthens human relationships and improves the quality of life for both people and non-human species. The purpose of this project is to educate the reader about ecological restoration as it applies to tallgrass prairie, savanna and forest ecosystems in North America in terms of what it can bring to ethical, political, communal, economic, and scientific fields, with the case study as a backdrop to show the contribution restoration can provide to an urban area.

Two important terms, ecological restoration and restoration ecology, need to be defined clearly before exploring how they are put into action. As Eric Higgs (2003) points out, "there is every possibility that restoration will be construed in ways that defy the intentions of its proponents" (94). The prospect of ecological restoration could potentially be used by land developers as an excuse to expand their activities, stating in effect "if we destroy it, we can restore it again somewhere else" with their actions. This sort of misuse of ecological restoration prevents a true dialogue from forming between restorationists and conservationists because restoration in this case is defined as a tool of land developers. Therefore it is crucial that proponents of ecological restoration define it on their own terms to prevent confusion, or worse, calculated misuse.

The Society for Ecological Restoration (SER) defined restoration in 1996 as following:

> Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices (Higgs 2003)

Within the definition are two concepts that reveal themselves over and over in discussions about restoration: ecological integrity and historical context (Higgs 2003). Ecological integrity ensures that restorationists will restore based on the ecosystem's distinct needs rather than any one person's personal idea of what the landscape should look like. Historical context takes into account the past use of the restoration site pre- and post-European colonization, as it applies to restorations done in the U.S. and Canada. While the 1996 definition helped bring increased awareness of these two important terms, the definition was too long and required explanation. It was changed in 2002 to "Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed" (Higgs 2003), and included an accompanying text to provide more distinct details to those interested. Embedded in the

definition is the assumption of human involvement, with the important distinction of "assisted recovery" rather than "implemented recovery," drawing the distinction that the presence of human involvement is not the exclusive force behind the restoration, rather that the ecosystem is restoring itself with human aid.

Ecological restoration practices most likely had no distinct beginning, but the most commonly accepted foundation was Aldo Leopold's planting of his arboretum and prairie. Leopold advocated and funded a small restoration of prairie and woodland meant to represent the native vegetation of Wisconsin and stand as a representation of Wisconsin's presettlement landscape. Ecological restoration is not limited to restoring an ecologically degraded site. Restoration also includes the reintroduction of practices such as burning prairie and forests periodically, which is what the Native Americans practiced until Europeans took the land and began suppressing fire. The Native Americans burned prairies and forests to renew the ecosystem and encourage the appearance of bison and the growth of important understory plants, respectively, though much of what is known about their relationship to the land is speculative. Their actions fall into the same category as ecological restoration practices, but the Native Americans who used prairie and forest ecosystems were doing so as part of their livelihood. Now ecological restoration is done more for ecosystems rather than to reintroduce an economic relationship between people and ecosystems, other than improve the general quality of the surrounding environment. In its most typical usage the term restoration refers to current attempts to regenerate landscapes to a state of ecological health determined by factors such as species diversity and soil or water quality. This general definition should not be assumed too readily, because the definition should be flexible and be able to evolve with the changing attitudes of restorationists (Higgs 2003).

Alternatively, others have defined ecological restoration as a growing discipline, setting a

starting date at thirty years ago (Sarr et al 2004). Early restoration projects tended to involve the reclamation of land damaged by heavy mining. Activities included revegetation and general restabilization of some ecosystem functions, mainly to prevent erosion. The goals of these reclamation projects were site-specific, meaning that the site's relationship to the surrounding landscape was not taken into account, and these projects did not attempt full restoration of ecosystem function. Mostly the goal these projects was simply revegetation of the surface. Many land reclamation projects were analogous to sweeping dust under a rug: the surface looks clean but underneath it is a mess.

Since mining reclamation, ecological restoration has not only been furthered scientifically, it has also shown potential for strengthening communities by improving democratic and equitable relationships between people. On the local level, volunteers from the same community have gathered and worked together to restore an ecosystem in their area. Ecological restoration projects have the potential for a democratic decision making process by the group of volunteers working on restoring it, or the projects can become professionalized, in which the restorers are hired by corporations to put up a front of environmental concern. If the latter happens there is the risk of the restoration project's goal becoming focused on creating a restoration product rather than restorationists staying continuously involved through generations in a restoration process (Higgs and Light 1996). However, there is an opportunity to use the power and influence of corporations in a positive way for restoration, for example the Fermilab corporation's funding of a 1000-acre prairie restoration on their property, planted and tended by Robert Betz, one of restoration's forerunners. The Fermilab prairie is one possible model for future collaborations between corporations and restorationists (Stevens 1995).

Restoration ecology, on the other hand, is a subordinate discipline of ecological restoration that uses ecological restoration practices as a model to develop and test ecological

theories. Separating ecological restoration and restoration ecology is a convention that Higgs and Light (1996) adopt, and since it is a reasonable and effective convention it is also supported here. The science of restoration ecology provides a base for creating initial goals, and acts as a guide for a myriad of decisions needed to be made over the years of continued stewardship of a restored site. For tallgrass prairie, the science of restoration ecology can determine when to do a prescribed burn, identify exotic species to be removed, decide which native grasses and forbs need to be planted initially, and monitor the competition and succession relationships between the chosen planted species (Wilson and Partel 2003, Choi 2003). Restoration ecology determines small but important details such as the difference between a C4 grass, a prairie grass that will make a four carbon compound, versus a C3 grass that will make a three carbon compound (Samson and Knopf, eds. 1996). A C4 grass is a warm season grass and typically becomes very tall, and a C3 grass is a cool season grass that is shorter. Each of them fills the gap of time that the other leaves behind. Without restoration ecology, restorationists would not have this important scientific information to draw from while restoring a site.

Sarr et al (2004) state that restoration ecology is a slowly growing field compared to ecological restoration. Restoration ecology intersects with every other life science since restoration needs to take into account all facets of the ecosystem being restored. It is a science still in its first stages of life but with implications of drawing from all sciences. Sarr et al (2004) illustrate the intersection of restoration ecology and other disciplines. They describe restoration ecology as interdisciplinary, with social science, wildlife ecology, entomology, geomorphology, aquatic ecology, soil science and theoretical ecology all contributing to it. Their description shows the necessity for restoration ecologists to critically analyze all factors involved in the ecosystem being restored (i.e. community relationships, weather, soil) to create a successful restoration. Now that the two terms are sufficiently separated, ecological restoration

shall be the primary focus (though restoration ecology is subsumed in ecological restoration) and sometimes referred to as solely “restoration.”

Some important ethical and philosophical points must be addressed to establish an effective reasoning for restoration and also provide a driving force behind restoration practices. There are two ethical views of restoration that are currently trying to assert themselves. On one side there are Eric Katz and Robert Elliot, both of whom publish works that back the idea of a nature/culture dichotomy and argue against restoration practices because the human imprint, as it is intrinsically unnatural, should not venture into wild places. Steven Vogel, Andrew Light and Eric Higgs all publish works that represent the new ethical development in restoration that places humans within wild places to be involved in but not above ecosystem processes. Stephen Vogel provides a succinct response to both Katz and Elliot and therefore his perspective is discussed more than Light and Higgs, as they have not written direct responses to Katz and Elliot.

Steven Vogel (2003)'s article "The Nature of Artifacts" is a response to Katz and Elliot, philosophers who argued with conviction that restoration cannot be natural because human intention is driving the restoring. Their argument represents a prominent opinion in many environmental fields: human action must remain separate from nature in order to preserve the wildness of ecological systems. The ethic behind conservation tends to originate from the desire of environmentalists to keep human civilization's historically damaging practices away from the idea of a pristine or an untouched wilderness. "[I]f by a natural area we mean one where humans have never interfered, then there is hardly any nature left: what we call natural usually turns out to be human" (Vogel 161). For example, a healthy prairie without exception relies on periodic disturbances such as fire and grazing, and half of that reliance is on human agency. In Katz and Elliot's argument, nature becomes something "out there," as in outside civilization, and thus the disconnection between humans and the environment is reinforced. Vogel (2003) considers carefully the notion of humans as separate from natural processes, and structures his argument

around the concept that humans evolved from nature and cannot be placed above or separated from it. Since humans evolved out of the same natural processes as other plants and animals, sharing the same characteristics of the wild, it is arguably damaging to the human psyche not only to perceive themselves as divided from nature but also to see nature as subordinate to human desire.

Katz takes the distinction further by claiming that all human-made creations, including restoration, are artificial because they are driven by a distinctly human intention. A car would not be natural, for instance, because it is created by humans for human purposes, and is subject to act in the way humans programmed it. Vogel counters with the example of a baby; also a human creation, but acts in unpredictable ways not able to be controlled by the humans who created it. Similarly, though a car is more artificial than something like a tree as it is made using materials that are not produced without human assistance, it is still subject to natural processes like weather and time. Katz's argument that humans are "intervening" into natural processes by restoring natural areas is contradicted by Vogel:

> It is not correct to say that we 'intervene' in any of them; nor do we even act to modify them; we set (some) of them in motion and then find ourselves absolutely at their mercy. In doing so, we find ourselves in the presence of the wild. In restoration, I am arguing, the wild--and the natural--are always there (163).

Elliot, also arguing from a similar standpoint as Katz, claims that restoration projects are a forgery of nature that cannot function as well as the original. In his claim he assumes that restorationists are attempting to control the ecosystem they are restoring, when in fact they only have the power to set ecological processes (i.e. by burning, planting native plants, and pulling invasive plants) in motion and let nature do the rest. Vogel's response makes it clear that restorationists do not claim to have the ability to re-create the same ecosystems we have lost or damaged: "environments are in any case always changing, and have no clear 'origin'[. . .]A

restored prairie in the twenty-first century, [. . .] is obviously not the same as an eighteenth-century prairie described by early European settlers" (161). Restorationists can bring back most ecosystem functions for the use of native species, but the renewed landscape would not be the same as an ecosystem never degraded or destroyed.

Vogel ends his response to Katz's and Elliot's works by moving on to his own ethical views about restoring the environment. He brings up the ethical development of restorationists and restoration volunteers, caused by participating in restoration activities, that is an important component of elevating the status of restoration. Reaching the understanding that every restorative action people take part in causes all kinds of unpredictable results, and by realizing that we are unable to fully control the outcome of the restoration, we can develop "the virtue of humility" (Vogel 2003). We become humbled to see the consequences human civilization has wrought on the landscape, and to see that it is a difficult and complicated road back to ecosystem recovery. The virtue of humility is an important realization, but it should also be combined with "self-knowledge," which comes from learning our history of environmental degradation but also understanding that that history is not the only option for the future.

Humans have had both a history of environmental degradation and neglect, and a history of environmental cooperation and respect. Knowing that there is a choice of whether to continue on a large scale the former or the latter is an act of self-knowledge. Vogel explains the way to combine the virtues of self- knowledge and humility: "teaching us the responsibility for the world we inhabit on the one hand but also reminding us not to over-estimate our ability to remake it in any way we want on the other" (168). Self-knowledge teaches us responsibility and humility teaches us to work together with natural processes, not above them. These two virtues are tied to the need for having a strong environmental ethic to guide our involvement in nature.

Having an environmental ethic involves deciding to agree on a set of principles that can be

used to determine the outcome of an environmental issue. There are several different kinds of environmental ethics, each based on what a person values. In a human-centered ethic, humans are valued over nature, and the environment is protected based on how it benefits human society. In an animal-centered ethic, the value is extended to animals but not other non-human living things. Finally, in a holistic ethic, all living and nonliving parts of the biosphere are valued equally. (Elliot 1995). When convincing others to support restoration, initially it helps to appeal to them with human-centered ethics, in other words to show them the benefit for humans to restore an ecosystem. Eventually as they become more aware of their connection to the earth through restoration, a more holistic ethic can be developed. Agreeing on an environmental ethic that is holistic is an ideal development for restoration to be successful, because consideration of all parts of the ecosystem is required. A holistic ethic enforces humility in restorationists that will ensure an openness and fluidity when unexpected consequences occur in restoration, as they inevitably do.

Historical accuracy is a contested aspect of ecological restoration. Some argue that the only true restorations are the ones that take into account what ecosystem was present prior to damage or destruction (Kettle et al. 2000). Others contest that because some ecosystems are more threatened than others, such as the tallgrass prairie ecosystem, they should be given prior consideration, but some reference to historical conditions is also important (Higgs 2003). The former is preferable, because historical fidelity (Higgs 2003) is important for restoration, and in certain cases, the land-use history of a site is unavailable. Lack of data about the kind of ecosystem present prior to disturbance should not prevent ecological restoration from being undertaken. Data of specific historical conditions can in many cases be substituted with reference conditions--the practice of using a more intact ecosystem as a reference for the one about to be restored. In cases where there is a lack of known historical conditions, restoration activities can be the catalyst for discovering what they were, by making mistakes and in effect creating a "bad" restoration, because experimenting and finding out what does not work on a site can lead to discovering what does work on a site (Jordan 2003).

Kettle et al. argue convincingly that land-use history is of the highest concern when figuring out the best ecological system to choose for a restoration. "Research focused on restoration or preservation of ecosystems in the prairie-forest ecotone must consider the historical context under which communities developed and the subsequent changes brought about by European settlement" (307-8). Both the way the land was used by the European settlers and the way Native American people used it before them are crucial factors to be considered when doing a large- and small-scale restoration. An idea of how the European settlers used the land is important for predicting what kinds of introduced plant species could be a problem for restorationists, a key factor in deciding what land management practices would be most effective

for combating the European species.

In many cases for the tallgrass prairie, some native plants still grow on the site and can return if intensive use of the land is stopped, especially if the use is or was grazing and not tilling. Kettle et al. argue that ecosystems leave an imprint of their existence even on the most disturbed land. "Initial conditions of the plant community are known to have persistent effects that may be observable in the character of the plant community at any given time in the future" (314). Study of the remnant of initial conditions involves extensive scientific knowledge of complex interactions in ecological systems. In the case of deforested areas, trees are known to re-grow quickly, but without the reintroduction of human involvement they do not recover their original biodiversity. For forest in some cases and for tallgrass prairie especially, the main factor inhibiting a return to initial conditions (pre-European colonization), is fire suppression. When fires are reintroduced in both these ecosystems, native plants are favored over exotics, and in the case of forest, forest floor debris and overcrowded areas are cleared out to make room for a diversity of understory herbaceous plants (Anderson and Barbour 2003, Fule et al. 2004).

Kettle et al. (2000) conclude by recommending the practice of researching the history of a specific site in all possible cases. "Ideally, site history should be incorporated into the experimental design of new restoration sites so that subsequent research will be more definitive and broadly applicable" (Kettle et al. 316). Authors here are referring to the practice of using initial conditions and post-disturbance conditions to help compare restoration sites to each other, but Ehrenfeld (2000) warns against letting this practice become too widespread. She argues "there is no one paradigm for setting restoration goals," so applying data results too broadly to other restoration projects, restorationists risk making avoidable mistakes. Ehrenfeld (2000) warns restoration ecologists against attempting to develop general laws like other sciences do, because ecology is much more unpredictable than other sciences. She suggests instead the use of

"probabilistic laws," which help determine in what cases there is a need for developing general goals. In most cases goals for a restoration should be developed individually, based on the conditions present in each site (Eherenfeld 2000).

Morrison (2002) gives a guide to the technical side of restoration, but uses too few examples of specific plants and animals and instead uses general language that seems to cover all types of wildlife. His book works as a resource for restoration techniques, but the restorationist must find the data for their specific site on their own. Like Kettle et al.(2000), Morrison (2002) organizes the general methods for historical assessment and explains how to use them. Collecting data of the historical conditions of a restoration site is one of the fundamental ways to create goals for the restoration project. Conducting the research of initial conditions can be costly, time-consuming and can lead to a dead end of not enough information available, but having data on the historical context is a way to ensure the restoration will not be a failure. Historical data is very important to have in the early stages of restoration to minimize setbacks caused by poor planning, as well as knowledge of the surrounding landscape to assess possible edge effects (Morrison 2002).

A better definition for understanding historical context in restoration is the notion of historical fidelity. Historical fidelity still requires restorationists to consider the historical background of a landscape, but to keep in mind that natural processes are not static, they are constantly changing. It is impossible for any ecosystem to return to its original state. Restoration is the ongoing process of freeing ecosystems, not a method of forcing them to return to a determined point in history. "Freeing ecosystems" more accurately describes the role of a restorationist, whose task is to adhere to the needs of the ecosystem rather than follow a personal desire. Historical fidelity is a way to be "faithful" to what an ecosystem used to be, while also allowing the ecosystem being restored to regrow itself into its own state based on the

current environmental conditions affecting it. In most cases a restoration site is bordered by other human constructions such as farms and residential areas, which will affect ecosystems in new, unpredictable ways.

As an example of the debate over choosing the right ecosystem to fit historical conditions, Higgs (2003), when discussing whether a specific project was a restoration or not (it used to be forest and was being restored to tallgrass prairie), put forth two interesting opinions from his colleagues. One was "a reasonable decision could be made on the basis of enhancing biodiversity; tallgrass prairies are threatened ecosystems and must be given every opportunity to flourish." (104). Another opinion was to create a compromise: "turn it into a savannah—choose an intermediate [alternative]—one that represents what the boundaries look like in that area" (104). In many situations it is more realistic to go by a compromise, or to restore what seems to fit in an area based on scientific criteria other than historic criteria. It is tempting to restore an area that was once forest to prairie, since prairie is much more endangered. However, subtle differences in climate and humidity can make that effort a futile attempt and a poor representation of restoration as a whole.

V. METHODS FOR INTEGRATING SCIENCE AND PRACTICE 17

How is the science and practice of restoration integrated? Can either one really work without the other? The two complement each other; the field work of restoration is considered the lab work used to prove or disprove the theories in restoration ecology. The practice has other components that are important for its success, such as community building among practitioners, and fostering an understanding and respect for native species and ecosystem processes. These components are not always present in all restoration projects, especially in large scale projects in which the restorationists are hired and the restoration work is done by professionals and not practiced on a local level. However, in most cases it is the professionals that have nuanced scientific knowledge of ecology and other life sciences necessary for restoration mentioned earlier, and are best suited to lead restoration projects. Neither the science nor the practice should be too emphasized in any project. In any given restoration project there should be community support and volunteer labor, in addition to experienced professional restorationists to guide the volunteers and make sure ecological integrity and historical fidelity are being followed.

Throughout his book Miracle Under the Oaks, William K. Stevens (1995) addresses the conflict between restoration science and restoration practice. The books centers around the true story of a group of dedicated individuals who began restoring an oak savanna, prairie, and woodland in Illinois, starting in the 1970s and still continues to do so today. The leader of the group, Steve Packard (now an influential thinker on the restoration of oak savannas), found the site and did much of the scientific research involved in restoring the site, especially the savanna. When his research on savannas was published, it garnered harsh criticism from scientists in the field of ecology who claimed his work was not scientific enough. Particularly they criticized Packard's argument that oak savanna is not only (as it is typically defined) a prairie with trees, but its own unique ecosystem with specific kinds of plants that dominate it. Packard's work

was largely based on his successful experience restoring an oak savanna and prairie; in other words, direct field experience was the weight behind his argument rather than research gathered from academic sources. In this example, if Packard had followed the commonly accepted understanding of oak savannas, his restoration would never have become successful. Because he experimented with what he planted, he was able to discover what plant species would grow on his specific site.

Stevens's (1995) discussion of the relationship between the science and practice of restoration leads to a conclusion that urges more dialogue between the two disciplines. Restoration ecology and ecological restoration can mutually benefit each other, but they can also draw from other disciplines such as forestry, geomorphology and even agriculture. Restoration ecology provides initial goals for restoration projects, strengthening them from the outset and providing support when there are setbacks. Restoration ecology also provides a critical monitoring system that prevents any area of the project from being neglected and to ensure that the goals are being fulfilled. Information also flows the other way, with ecological restorationists making new discoveries in the field of complex ecosystems and passing them along to the science to make changes that result in better decisions.

VI. CASE STUDY: OAK SAVANNA

A significant portion of my internship on habitat restoration and native landscaping was spent tending, studying and cataloguing the oak savanna and prairie plants on the land belonging to the Sisters of St. Joseph of Carondelet, adjacent to the College of St. Catherine. Called a "habitat restoration," the oak savanna and prairie is too small (2 acres) to be considered a full ecosystem restoration. The oak savanna and prairie transition into each other smoothly, from partial shade to full sun. Oak savanna is considered by most ecologists to be an ecotone, meaning it is a transition zone between woodland and prairie that contains prairie species (in this case, mostly tallgrass prairie species) and oak trees. It is also considered the rarest of ecosystems, without a quality remnant recorded.

Behind the original idea to plant the savanna in 2000 was a water leakage problem in the sisters' retirement home. After it rained, water would seep through the sod of Kentucky Blue Grass and into the basement of the home. Prairie plants, especially the grasses, have long root systems that keep water from flowing very quickly through the soil. Grasses native to Minnesota have root systems up to ten times longer than the typical introduced grass, particularly longer than Kentucky Blue Grass. In fact, in a healthy prairie typically only ten percent of the rain water that falls reaches the soil, because the thick cover of vegetation absorbs most of it. This characteristic enables the prairie grasses and forbs to survive dryer conditions than forest or woodland ecosystems. In their beginning stages of growth, prairie plants put most of their energy into their roots. Eventually the native vegetation cover stopped the water from leaking into the retirement home.

Towards the end of my work on the sisters' savanna, my internship supervisor and I compiled a (changing) list of all plant life contained in the savanna. Our results showed a high level of diversity for such a small area: six species of prairie grasses plus forty-six species of

forbs or herbaceous plants. Unfortunately, we also catalogued twenty-one species of exotics and thirteen species of woodland plants that do not belong in a savanna ecosystem. My supervisor and I postulated that the small size of the savanna and the dominance of the forbs over grasses contributed to a high level of invasion from exotics. A healthy tallgrass prairie is dominated by grasses which have the longest root systems and therefore out-compete the shorter roots of exotics (often consisting of a single taproot) for water and soil nutrients.

The list is probably not complete, because it takes many years for some prairie seeds to germinate and grow. Some plants can become established right away, whereas others require more specific conditions to be in place before they are able to grow. Conditions such as soil quality and the type of surrounding plants, when right, can satisfy some plants' limiting needs. This relationship is called "facilitation," where "early pioneer species modify the environment favorably to successive groups of species" (Choi 76). The sisters' savanna has only been growing for four years, so many seeds already in the ground may show up in later years. Our list is thorough, but not complete. Like many restoration projects, it may never be "complete."

The process of planting and then maintaining the sisters' savanna highlights the convergence of restoration ecology and ecological restoration on a small scale. Andy Sudbrock did the original planning of the savanna and woodland, with the help of the sisters. It was continued by Thomas Ibsen (my supervisor) and I during the cataloguing and assessment of the site four years after the first planting. Initially, the sisters' land was covered in the typical dense sod of most lawns, with one special characteristic: the old bur oaks growing out of it, trees that fit perfectly with tallgrass prairie to make a savanna. Sudbrock determined that the site was a prime spot for oak savanna and went about collecting the native flora that would be appropriate. In order to ensure that the seeding of the tallgrass species worked, Sudbrock used an herbicide on

the bluegrass to kill it, making way for the native seeds to germinate.

The savanna represents a mixture of scientific implications and community potential. Sudbrock experimented with different methods of burning the savanna, because of the savanna's close proximity to the sisters' retirement home and its general location within an urban environment and near a college campus. The savanna was burned every year for the first three years, which is not typically done so often on larger prairies in the country. Typically burning is done every three to five years to let the prairie grasses build up fuel for the fire. Even so, the height of some of the grasses in the savanna is a testament to the positive results. However, after the accumulation of more fuel, a stronger (and also more risky) fire would be much more effective at controlling the tree saplings and exotic species and would favor the native grasses and forbs. The relative ineffectiveness of the weak fires proves scientifically that stronger, less frequent fires would yield a better response from the savanna, though the urban constraints prevent the riskier fires.

The savanna has some characteristics not typical of a native bur oak savanna. Along with the bur oaks, there is a norway maple, a silver maple, an elm, and a black walnut growing there. All four contribute to the growth of saplings that compete with the prairie plants for water and sunlight. The norway maple alone has shaded out all native species in a four foot ring under its branches. All four trees would have been killed by a strong enough prairie fire, but so far only weak fires have been burned for reasons stated above. The fact that the norway maple (a nonnative species to Minnesota) shaded out native species proves in a physical way the scientific theory that norway maples do not belong in an oak savanna, and that they in fact harm it.

The low percentage of native grasses is another problem we faced, one that requires more patience. Using extra grass seed from a nearby native plant garden and grass seed from the

savanna itself, we carefully distributed it to some of the more problematic areas and bare spots. Some places had native forbs but they were too homogenous and allowed non native plant species to establish themselves underneath. Some places had been nearly completely shaded out by the fast-growing shrub Elderberry, one of the woody plants we removed. These were the places we added the grass seed. Basic knowledge of restoration ecology techniques was employed to plant the savanna and to do the maintenance required for its awkward stages.

The oak savanna has come to mean much more to the community than just preventing leaks and providing a physical domain to test ecological theories. Historically there is evidence that the Twin Cities area once supported deciduous forest, oak savanna and tallgrass prairie, one transitioning to the next in a constantly fluctuating line, occasionally incorporating lakes, rivers and wetland. The Sisters' savanna is a micro-representation in memory of those old relationships, and serves as an educational tool for urban dwellers. The savanna has become a communal space to enjoy for the retired sisters, and in the case of the sisters who are unable to leave the retirement home, a beautiful canvas that they can see through their window and changes colors throughout the season.

Our final assessment showed that even though the savanna had many invasive species, we were able to make more progress clearing them out than originally thought. The savanna is about 80 percent clear of invasive plants and woody plants, but our progress could be quickly reversed if the savanna is neglected again. Whether or not this happens is dependent upon if the savanna continues to be meaningful to the Sisters of St. Joseph and those in the community who know what it is and why it is there. The savanna has from time to time been used recreationally by a family to have picnics and take pictures, and by the sisters themselves, but the savanna is too small for any widespread use by the community. This is the reason the savanna has not been advertised in the wider community, but if it was done in the right way people could appreciate

the savanna, learn about native plants, and perhaps be influenced to plant native species in their yard. They may learn that native species do not require nearly as much tending as the typical lawn, since natives have evolved taking care of themselves. Some people may also decide to become involved in taking care of the savanna or another nearby restoration project.

Conservation is a much older discipline, with a lot more academic exploration and scientific research than restoration. Restoration methods have been used in conjunction with conservation efforts (they are most often not referred to as restoration but as "land management" practices), but restoration remains a subordinate discipline of conservation biology. The purpose of this next section is to explore conservation as a scientific discipline and ethic, compare it to its offshoot, restoration ecology, and then show how the two seemingly different disciplines can be combined for a common goal.

Restoration ecology has often been considered a subordinate discipline from environmental conservation, but the two actually differ strongly in their conceptual makeup. Urbanska (2000) offers a method of separating the two, by asking two fundamental questions: when are the two disciplines enacted, and what kind of landscape does each apply to? Urbanska offers key words for each discipline that shed light on their foundations. "Conservation keywords: decline, structure reinforcing, process improvement" (21) refers to an environmental condition of an area that still has some or most of its ecosystem functions, and is in danger of losing all of them. Restoration ecology, on the other hand, has keywords such as: "destruction, structure rebuilding, process initiation" (21) which suggests an area whose ecosystem functions are destroyed almost completely or are already gone.

Another distinction between the two disciplines is the focus on either species populations or whole community interactions. Conservation focuses on single populations of species, especially keystone species, and monitors the health of an ecosystem through the tunnel vision of one endangered species. Restoration ecology takes a step back to encompass all aspects of ecosystem function, including biotic and abiotic parts. The shape of the land, the amount of shade or sunlight, and natural barriers such as rivers or mountains are considered in addition to threatened and non-threatened organisms. In restoration ecology, "the first step towards

sustainability of a restored area is the restoration of ecosystem function" (Urbanska 21). Conservationists also look at these factors, but it is through the lens of how they affect the key species being monitored.

Opportunities for the two disciplines to work together is to use concepts that were developed out of their respective centers of study. For conservation, advanced population analysis such as the population viability analysis (PVA), out of which minimum viable population (MVP) comes from. MVP is a useful tool to determine the lowest population necessary to sustain the species as a whole under the conditions of environmental stochasticity and genetic drift. Restoration ecologists can use this useful tool when monitoring the success of their restoration projects. Urbanska (2000) calls it an "interface" when the two disciplines are able to work together: "Another interface between conservation and restoration may be recognized when single species-oriented studies are carried out to verify usefulness of particular species as restoration material" (24). Not only are restorationists able to use this concept during the restoration process, they are also able to use it in their plans before the restoration begins.

Conservation likewise has begun to use restoration concepts in order to help save rare species. Creating a preserve for a rare species is not always enough to save it, so "habitat/ecosystem restoration has been given much attention when recovery plans for threatened species were made" (Urbanska 24). To illustrate her point, Urbanska uses an example of a recovery plan for Pitcher's thistle. The following quote shows the collaboration between conservation and restoration practices: "Depending on particular situation, recovery goals included not only habitat identification and protection [conservation strategies], but also restoration of natural shoreline dynamics or dune systems, and also visitor use control" (24). In many cases, especially with fragmented ecosystems, restoration practices and conservation practices need to work together to fulfill their mutual goals.

Ecological restoration derived management practices have been increasing in wildlife refuges, national parks and preserves over the past few years, as restoration is seen more and more as a necessary component to the health of protected ecosystems. Institutionalization of restoration is becoming more common, and more people are considering themselves restorationists professionally (Light and Higgs 1996). Many in the restoration field see this as a positive movement, hoping that restoration will receive the same funding and government support as conservation efforts. Even more promising is the possibility of undertaking large-scale restoration projects, like the 24,000 acre prairie restoration recently begun near Crookston, Minnesota, a feat not easily accomplished by volunteer efforts alone. Professionalization of restoration could expand its reach and speed up the effort in unprecedented ways, but would that be the best path for restoration to take? Would professionalization fulfill the promise and potential of restoration? (Higgs 2003)

Both Higgs (2003) and Jordan (2003) carefully address the issue of a professionalized field of ecological restoration. They both see it as a natural progression for a growing discipline in an industrialized world; industrialization in many ways depends on continuous technological improvements in order to speed up production, increase quality and lower cost of production. Ecosystems, and by extension humans, could only be better served if we were able to lower costs, increase and hasten production of restoration. Thus restoration performed solely by experts and that uses a more sophisticated level of technology than the physical labor of volunteers could produce quality ecosystems, but at the same time the restoration might be viewed as a "product." This "product" Higgs (2003) also refers to as a "device," conveying the consumptive quality of the restoration. A "device," as Higgs (2003) defines it, provides no special meaning or attachment for the person using it, and therefore it becomes an object to be

used and discarded by humans without concern for the ecosystem itself. This is only meant as an argument against ecological restoration becoming exclusively professional, while in the process excluding volunteers. Professionalization has many benefits (some of which are highlighted above), but we must be cautious of its effect on restoration.

Jordan (2003) uses a more spiritual argument against the exclusive professionalization of restoration. He uses the complex spiritual idea of shame, which is in essence a human-felt existential feeling of inadequacy resulting from, in this case, our need to kill in order to live. Shame is the feeling from which ritual originates, because ritual allows us to deal with shame in a constructive way. Jordan (2003) argues that restoration could become a cornucopia of ritual with its deeply embedded function of giving back to nature after we have taken so much. Restoration causes us to enter into a relationship with nature through the ancient practice of gift exchange: what we give to the ecosystem in restoring it we expect back in the form of nature's bounty. Jordan (2003) argues that a solely professional and scientific approach to restoration would rob it of spiritual meaning that is very much the core of human experience. The promise and potential of restoration can only be fulfilled if restorationists take into account the relationship of gift exchange between humans and ecosystems; if restoration is viewed as a process and not a product (Jordan 2003).

As long as restoration is viewed as a process and not a product, there is plenty of room for professional restorationists; indeed advanced training of restoration practices should be encouraged. Especially if the trained professionals collaborate with restoration volunteers and share their knowledge so as to enable the local community to be autonomous in their stewardship of a restoration site, can serve a function similar to how a priest or other religious leader guides their followers. Both the priest and the followers become engaged in conducting religious rites; both are involved in the religious experience. If ecological restoration were to continue to develop

ritually for people, the restoration professional could fulfill the role of ritual guide. In other ways the restoration professional serves as educator, leader and advisor for restoration volunteers and others new to restoration practices. In the restoration movement there should be guides like restoration professionals, but they should not be the only part of the movement.

What is lost for restoration if it is practiced exclusively by select groups of experts? Restoration could certainly become widespread more quickly, and the ecosystems restored would not necessarily be lacking in biological diversity and ecological health. But how would the value of restoration reach the general public, if they were not able to participate without certification? How would people begin to develop a connection between themselves and the landscape around them? Right now, because institutionalization has not set in, most restoration projects depend on volunteer efforts to survive. Steve Packard's Somme Prairie Grove in Illinois would not have been able to continue to today without a volunteer effort (Stevens 1995). In Japan, some forest restorationists have cleverly created "planting festivals" to involve a large number of people at once over the course of a few days (Miyawaki 2004). Again, these restorations continue to be successful because of the collaboration between restoration professionals and volunteers. In the future restoration projects will still need the labor of volunteers but their role in the decision-making process is threatened by too much emphasis on professional restorationists.

One of the most important components of community renewal through restoration is the involvement of Native Americans, either to help teach restoration methods or to learn them themselves in cases where their relationship to the land has been severed. European Americans have had a longer collective history of viewing themselves as separate from nature, and need new ways to connect themselves. This can be done with the help of traditional Native American practices, along with a healthy measure of creativity and invention. There are still spiritual structures and cultural practices left intact among some tribes, but that knowledge is disappearing

and must be incorporated into the scientific and spiritual aspects of restoration for the benefit of all.

To provide an example, in British Colombia, First Nation people never signed a treaty with settlers and so, with legal support, their permission and involvement is required in the use of land. First Nation children can then be educated about the historical and spiritual relationship their people have had with the land (de Carlo 2004). Their case should be emulated, while keeping in mind the uniqueness of each case, not only in the United States and other parts of Canada, but also every other part of the world with a similar history. Indigenous people all over the world have wisdom about the land that is starting to be recognized in academic circles (Jordan 2003), and that wisdom can guide restoration in both land management practices and the spiritual values of restorationists.

Anderson and Barbour (2003) both argue for bringing in indigenous harvesting and disturbance practices in national parks where the land has been historically influenced by these practices. From their research they created a conceptual model for these specific areas called Simulated Indigenous Management Model (SIMM). The importance of indigenous management and its effect on biological diversity is described by Anderson and Barbour (2003) through the ecological theory called the "intermediate disturbance hypothesis" (From Huston 1979).

> According to this hypothesis, the maximum number of species present in a community or ecosystem occurs at some intermediate frequency or intensity of disturbance. Periodic disturbances often maintain a community type that would disappear without the disturbance. [. . .] Native Americans in different tribes often set fires to keep areas in earlier successional states because these states produced greater plant diversity and great landscape heterogeneity--important considerations in widening the array of useful species to maintain indigenous subsistence economies (271).

This theory proves the necessity of a give-and-take relationship between humans and nature, and Anderson and Barbour's (2003) model for national parks, based on this theory, provides a method for ensuring biodiversity in ecosystems that need disturbance for ecological health. They

recommend the integration of their model (SIMM) with ethnoecological assessments such as documenting native vegetation and determining its use in Native American cultural products. This process of studying the historical relationship between humans and nature opens up many opportunities for a further understanding of the past and how to best combine it with present methods for the future.

Restoration provides a forum for studying ecology and exploring the relationship between humans and the land in a way that is different from conservation. Restoration brings people into an active role within ecosystems. Conservation can help prevent ecosystems from becoming degraded, but people remain separate from them in the process. If people do not work with the land in some way, for their livelihood or in their spare time, whether it be gardening, agriculture or restoration, they develop no attachment to the land, and therefore care little when the land is plowed or built upon. The land has not become sacred to them through the act of developing a relationship to the land. They can make no connection between the land around them and the resources that sustain them. As people living in a world where civilization has reached almost every corner, we have forgotten our connection to the earth even while we remain inextricably bound to it. We see the products of the land in the form of food, clothing and modern commodities, but the act of bringing these products into our lives with our own hands is fast becoming a rare experience. Restoration has the potential to be the catalyst to bring the knowledge and wisdom of the land into our lives, and become truly native to our soil.

IX. POLITICS OF RESTORATION

Ecological restoration is deeply political. It begins with the arguments of Eric Katz and Robert Elliot, whose core argument against restoration is that the act perpetuates the idea of human sovereignty over nature. Since humans rule nature, we can decide how we want to use it, whether to degrade and destroy it or to restore it. Katz and Elliot are against viewing humans as controllers of nature and argue for us to take the sole path of preservation, to protect nature so that it can repair itself. I have been arguing more for a stewardship model, that we as humans have the potential to be caretakers of ecosystems rather than their dominators or destroyers. William Jordan, in previous works before The Sunflower Forest, has argued that restoration is inherently democratic, and that a restoration that does not involve the element of public participation is not a restoration. Andrew Light and Eric Higgs (1996), and a follow up from Light (2000), all adjust Jordan's distinction by arguing that restoration has democratic potential but it is not inherently democratic. A democratic work ethic should be striven for in restoration, but its absence does not take away the restoration label.

A recurring illustration Light and Higgs (1996) and Light (2000) use is that of a restoration produced by slave labor. They argue that the resulting restored ecosystem could be exemplary in terms of biodiversity and ecological health if produced by slave labor, and in this respect could still be defined as a good restoration in the strictest scientific terms. In ethical terms, however, it would not be a good restoration, but still a restoration. There must be a better argument for why equal public participation makes an ethically good restoration and why a lack of democratic participation does not.

The new argument for the value of public participation in restoration begins with a comparison between the value created by nature preservation and nature restoration (Light and Higgs 1996). In the act of preservation, a legal protection is created around the land being

preserved, but there is no human involvement physically with the land. A restorationist becomes connected with the land by working to understand how it should function and using that knowledge to decide what to do to bring the ecosystem back to life. A restorationist in a sense becomes part of the ecosystem, taking on the role of the butterfly or hummingbird and hand pollenating flowers that need it, or serving in the role of a Native American and burning the prairie (Jordan 2003). The essence of ecological restoration is public participation within it, because a restoration cannot happen without human intervention, and it is a failure of a restoration to not fulfill its democratic potential.

An example of a restoration failing its democratic potential is revealed in the very undemocratic example of commodification (Light and Higgs 1996). Commodification is the act of treating the restoration of an ecosystem like a commodity instead of a living, changing collection of species. Commodified use of restoration is done particularly by corporations in America, and it involves putting up a front of ecological integrity as a company by funding a restoration but not putting in the effort required. The restorations are done by workers and trained restorationists employed by the company, without involvement of the surrounding community. Light and Higgs (1996) use the concept of hegemony to illustrate the effect of a corporate restoration over the general public:

> Corporations, whether they intend to or not, have appropriated the language of good restorations by successfully labeling their products as such. Absent some stipulation in the definition of restoration that requires a democratic character to the act, nothing prevents this association in the minds of most people. Here we see the power of hegemony to form consent--in this case consent about what counts as a good restoration (241).

Without this consent from the public, companies that fund these restorations would have a harder time with their ecologically-friendly smokescreen. If there was a consensus in a community to define a restoration on their own terms, then that community would have a resource of political activism they could use to prevent corporations from using restoration so.

The act of setting a price for restoring land and therefore turning it into a commodity is seen as a problem by some environmentalists, who tend to argue that nature is priceless. Jordan (2003) counters with the idea that economics and ecology are inseparable, and when environmentalists insist on nature's pricelessness it is "dangerously close to giving it no value at all" (Jordan 132). Putting a price on restoring land is necessary in a capitalist market system, but at the same time it is notoriously difficult to find a set cost because of a variety of factors: different kinds of ecosystems with unique needs, the unpredictability of weather conditions, and a myriad of other factors that are easily overlooked when placing a value on something as complex as an ecosystem. Sustainable use of land, in which the user takes less from the land to enable it to renew itself continuously, is arguably the most economic use of land. For example, in silviculture and in sustainable farming, making use of the land without depleting it has worked better over longer periods of time primarily because the land is allowed to renew itself.

In a capitalist market system, making profits has become the most important consideration. This attitude has caused businesses to choose the option with the highest profit in the short run, which is inevitably the option with the least amount of ecological integrity. For example, a business taking part in clear cutting a forest rakes in a much larger profit on lumber than a business practicing silviculture in their first harvest. The first business must move onto another forest for their next harvest, because they have depleted their resource. The silviculture business, on the other hand, can continue harvesting from the same area without running out of lumber, because they only take what the forest can give, allowing it to renew itself over and over again. Restoration requires the same kind of harmony with the ecosystem being restored. By knowing how much we can take without putting stress on the ecosystem, we can reinvent a different kind of economic relationship with ecosystems, one that relies on a respect and

understanding of them rather than taking from them.

Sustainable use is not widely employed in North America, so there are compromises to be made and techniques to try to work within the system already in place. Quantifying ecosystems services and assessing damage to ecosystems is a new and growing method being used to help calculate how much it costs to restore an ecosystem and who should pay for it. Ecological as well as economic considerations should be balanced when restoring an area. The important services to animal habitat and to human society should be returned to the ecosystem, but the cost of restoration should not exceed the benefits of the restored ecosystem (Holl and Howorth 2000). The benefits of an ecosystem are measured by both their "direct-use value" and their "existence value." The direct-use value includes services such as pest control, soil fertility, and water quality. The existence value for humans cannot be quantified as easily, because they "involve aesthetics, community pride, and a sense of stewardship" (Holl and Howorth 2000).

Once the value of renewing a degraded ecosystem is established and the cost is determined, the question of who will pay for it becomes an issue. The first option is to require the group who caused the degradation or destruction to be the one to pay for the restoration. If that information is known then they can be made to pay for it. However, in many cases damage comes from non-point sources such as a neighborhood of people whose lawn fertilizer and animal waste can runoff into a nearby stream. In this case the option would be to tax the population to pay for the damage. In other cases a tax can be applied to materials that are used to cause damage to the environment in order to pay for the eventual damage they may cause. "For example, excise taxes from the sale of fishing equipment and motorboat and small engine fuels are being used for acquisition and restoration of coastal marshes" (Holl and Howorth 2000).

A third way restoration efforts are funded is voluntary donations of time and money. Many nonprofit environmental groups are funded in this way, and most restoration projects are

are tended using the labor of volunteers. The Sisters of St. Joseph's woodland, oak savanna and prairie was funded by the sisters initially, was planted by a paid native plant landscaper, and was tended later by a volunteer National Park ranger and a native landscaping intern. To reiterate the value of community involvement: "The importance of community involvement in restoration cannot be underestimated in terms of education and developing a sense of stewardship" (Holl and Howorth 2000). The rapid increase in volunteer involvement in restoration shows that many people do value ecosystems more than their economic worth, and their help makes it easier to pay for damage done to the environment.

Wilcove and Lee (2003) discuss the importance of privately owned land as an obstacle to overcome when trying to restore lands for endangered species. Landowners tend to be wary of regulatory consequences of having endangered species habitat on their land and many times they are unhelpful to environmental agencies who they perceive as trying to seize control of their land. There are three new programs designed to work with landowners by giving them financial incentives to protect habitat: safe harbor, Environmental Defense's Landowner Conservation Assistance Program, and conservation banking. All three have strengths and weaknesses, but given the variety of situations that exist for landowners and for endangered species, each program fits where the other two may not be as appropriate.

Safe harbor is a program in which the landowner conserves native habitat so that in the future they have the right to undo the protection. The landowner does not make money from this program but it protects them from losing money from regulatory consequences. So far no landowner has exercised their right to undo the habitat protection. Environmental Defense's Landowner Conservation Assistance Program shares the cost and technical assistance needed for restoring the land. This program provides assistance where safe harbor does not. Conservation banking is a program for developers which requires them to use conservation banking credits they

can accrue by paying for the restoration of land in another area when they want to develop a piece of land. This program has garnered a lot of criticism from environmentalists because many times the ecosystem services restored are not as effective as the services of the new site to be developed on (Wilcove and Lee 2003). The short amount of time allotted for restoration of ecosystem services (5 years) is not enough to bring the site into a state of recovery to match the quality of a never developed ecosystem.

The major findings of the research done on these three programs was: "Technical guidance appears to be more important than either regulatory relief or financial assistance in securing the cooperation of some landowners" (Wilcove and Lee 2003). In other words, when trying to convince landowners to become involved in these programs, the ability to relate to the landowners the right information about how they can coexist with endangered species on their land was more important to some than financial considerations or a lack of a penalty. Many landowners were eager to work with these programs once assumptions about what they wanted were eliminated and a true dialogue was initiated.

XI. CONCLUSION

Ecological Restoration is often defined as actively assisting an ecosystem on its way to full recovery. The key word in the definition is "assist," because a good restoration is one that puts the ecosystem's needs first but that also allows people to be active participants in its recovery. The main fear of restoration's opponents is that restoration will become a method for humans to reshape our environment in any way we desire, instead of restoring ecosystems in a way that works for them and us. Ecosystems also need to be part of a larger connected biosphere in order to fulfill their true potential. By using the historical conditions of an area in combination with ecological integrity, ecological restoration can be explored with a certain amount of creativity as well. Restoration can teach people new ways to be connected with the earth as its stewards rather than its enemies. Humans have been shaping the environment for as long as we have been on the earth, and our actions are of the highest importance to the fate of natural systems. We have made so many changes to our surrounding environment that without our involvement ecosystems will not recover.

I approached my research with the goal of finding out the promise and potential of ecological restoration as a force for not only renewing our damaged ecosystems, but also creating ecosystems where there had not been one for many years. I did not anticipate the multitude of implications of restoration I would encounter, in both social and scientific realms. I discovered that, as much as restoration is about restoring ecosystems, it is just as much about restoring human culture's value of nature. While concluding my own research, I thought I would offer up the divergent recommendations of the two authors who I have come to view as the most influential thinkers in ecological restoration: Eric Higgs and William Jordan III.

Higgs (2003) is tentative about the future of restoration. He sees the restoration current flowing towards commodification and professionalization, and with it the risk of restoration

becoming a device that supports further degradation of the land. He recommends that we view restoration as a conversation between people and nature, where both sides participate rather than one ruling over the other. He insists that we can only gain from increased participation from people with native landscapes. Rather than people running amok with their inclusion in the decision making process for wild places, Higgs is optimistic about people, that when given trust and the opportunity, they will take their responsibility very seriously and use it to deepen their relationship with ecosystems.

Jordan (2003) sees increased participation in ecological restoration as inevitable; there is evidence enough that the current of restoration is flowing in the right direction: to involve more people and to create unprecedented value for the rediscovery of humanity's rightful place in ecosystems. He believes restoration is the transition zone between our present culture of increasing environmental degradation to an ecologically sustainable future. For him, ecological restoration is a constructive activity that gives us the opportunity to redefine our relationship with the landscape economically, spiritually and socially. He specifically highlights the capacity of restoration for creating rituals to celebrate restoration that further enhance people's relationship to the land and strengthen their communities.

I can see both of their visions as possibilities for our future. I believe that their contributions to restoration touch on all essential aspects of human life as well as give people incentive to become involved in restoration. Concern for environmental issues has become more widespread and bipartisan, but there is still a lot of work to be done. The remaining questions of who will pay for restoration, how will its costs be decided, and how restoration will manifest itself scientifically, politically, socially and ethically will be determined by each area of the world restoration takes place. With more examination of the contribution of restoration to society as well as ecological systems, ecological restoration can be strengthened as a discipline, thereby

allowing the information to trickle down to the popular consciousness and the necessary cultural shift may become possible. For now I recommend community restorations, especially ones in urban areas like the Sisters of St. Joseph's savanna project, to make people's concern for the environment more personal and participatory. All humans remain inextricably connected to the land and its resources physically, but restoration holds the possibility of reconnecting people to the land mentally and spiritually as well.

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