

Prairie Restoration: An Interdisciplinary Approach

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Abstract

Invasions of nonnative species are a major problem for environments around the world, and interest in restoring the rare prairie ecosystem in Washington has been growing since the 1980s. The majority of the research in this field addresses the methods of restoration. To gain a better understanding of the process, I looked at how restoration of the native prairie remnant was being carried out at a national park in Washington and what major challenges were associated with it. I found through working with park staff and conducting interviews that, although there were significant challenges posed by eliminating nonnative species and preparing the land for seeding native plants, the major barrier to the restoration in this case was the public opposition to the project. In part, the former park superintendent had handled the conflict poorly, but I also discovered that much controversy surrounded this restoration project, especially for the public, regarding four main issues of debate: controlling the nonnative European rabbit, applying herbicides, whether the prairie should be restored at all, and what point it should be restored to. My findings point to the need for greater research regarding the social side of the issue, as it can present a significant obstacle to restoration's success.

Introduction

Restoration is an attempt to return the health of ecosystems, which is crucial for the well being of humans and the availability of natural resources to use. Invasive species are a major threat to ecosystems worldwide, as they are one of the key causes of biodiversity loss and over a trillion dollars in annual damage. Efforts to restore the historic prairies of Washington, which are rapidly disappearing and of which only a small fraction is left, have been growing since the 1980s. I was interested in finding out the

obstacles to restoration. My initial research question was: how was restoration of the native prairie remnant being carried out at a national park in Washington, and what major challenges were associated with it? As I worked on different parts of the restoration process, I expected to encounter problems such as difficulties in eliminating invasive species and preparing the land for native plants. However, as I soon discovered a whole other side to the issue and shifted the focus of my research, I began interviewing people of different backgrounds and levels of involvement with the park. I will first provide a history of the degradation of prairies and discuss the prior research in this field and then describe the ways in which I examined the barriers to restoration and what turned out to be the greatest challenge.

Background of Prairie Restoration

For thousands of years, the landscape on San Juan Island has been impacted by human activities. After the glaciers shaped the land and then retreated, Native Americans regularly burned the grassland, which improved cultivation of the native edible plant camas by removing competitors and improving productivity (Deur 1999). Burned land also advanced the Native Americans' hunting of game on the island (Schmidt 1998; Sinclair, Alverson, Dunn, Dunwiddie, and Gray 2006).

When European settlers arrived, the Native Americans stopped using fire, and much of the grassland was converted to cropland and pasture for livestock grazing (Schmidt 1998, 7). In other areas, the absence of fire allowed trees and shrubs to invade the prairie (Hamman, Dunwiddie, Nuckols, and McKinley 2011, 317). The new practices consequently introduced many nonnative species, both intentionally to improve grazing and horticulture and unintentionally through seeds carried over on other products brought

by the settlers (Lambert 2006, 7). These activities also made the native grasses more vulnerable to invasion by exotic species, and constant fire suppression allowed trees to advance onto the prairies (Sinclair et al. 2006; Polster, Sol, and Myers 2006; Lambert 2006). Thus, only a small fraction of prairies remain in the Pacific Northwest, and many of those that exist are severely fragmented and overrun by nonnative species (Lambert 2006; Sinclair et al. 2006).

During the mid-1880's, European rabbits (*Oryctolagus cuniculus*) were introduced by settlers and hunted for food until the formation of the national park in 1966 (Agee 1984, 27). This nonnative animal significantly altered the land, as its burrowing and eating disrupted natural processes of fire and nutrients and enabled exotic plants to become established in the soil newly bared from the rabbits' grazing (Rolph and Agee 1993, 40).

This national park is dedicated to continuing the restoration of its historic grassland. About 600 acres of the park consists of open prairie (Lambert 2006, 21). When the National Park Service acquired the land in 1966, the park mainly focused on cultural and historical management, allowing the deserted croplands to become grasslands overrun by rabbits, until the 1980s, when it began to concentrate on management of natural resources as well (Agee 1984, 27). The current goal of the Park Service, and one of the actions decided upon in its recent Final General Management Plan and Environmental Impact Statement, is “to manage the natural resources so as to enhance the historic scene... As it pertains to vegetation, the historic scene would be a landscape similar in composition, structure, and function to that seen during the historic period (1853-1871)” (Rolph and Agee 1993, 1). This includes suppressing nonnative species,

preventing invasion of woody plants, and planting native species (National Park Service 2008, 60).

In addition to enhancing the historic appearance of the park, restoration would improve the health of the ecosystem by decreasing the danger of fires – because of the reduced fuel load – and reducing the intensity and cost of management as native species become well established and better able to reproduce and prevent further invasion of nonnative species and weeds (Rolph and Agee 1993, 49-51).

In order to fully restore and manage the prairie, the exotic rabbits must be restrained – something that no one has yet accomplished in the many regions of the world in which they have become established (Rolph and Agee 1993, 42). Additionally, many actions of the Native Americans that the Europeans ended used to encourage the growth of many native plants, such as harvesting, which can advance the spread and yield of plants; disrupting the soil as they gathered bulbs, which can encourage the growth of those below; and fire (Lambert 2006, 11). Fire benefits numerous native grasses, as it enhances their growth, and the flames kill many woody plants that take over the prairie (Schmidt 1998, 6). Monitoring grasslands after prescribed fires has shown that prairies appear to have adapted to and thrive with burning (Sinclair et al. 2006, 29). Fire can therefore enhance the restoration of this ecosystem, especially when used in conjunction with other treatments, which may prevent the fire from strengthening any nonnative species (Hamman et al. 2011, 325). However, simply burning the land as the Native Americans did is not enough due to the modern challenges of nonnative species, urban development, and different fuel levels (Hamman et al. 2011, 326). Other possible methods for controlling invasive species include tilling, harrowing, applying herbicides,

and solarization (catching heat under plastic to wipe out unwanted plants) (Sinclair et al. 2006, 48). Practices for establishing native plants include hand seeding, seed drilling, and hydroseeding (Sinclair et al. 2006, 51).

The restoration process faces substantial challenges. Nonnative species contend with those that are native for limited resources. Because of the current fragmented state of the remaining prairies in the Pacific Northwest, many important processes are gone, and there is a shortage of existing examples of this ecosystem from which to gather evidence about the composition, abundance, and distribution of vegetation in prairies (Sinclair et al. 2006, 40, 54-55). Additionally, some methods of restoration are controversial, such as herbicides and fires, because of possible dangers to health and property (Hamman et al. 2011, 323).

Much research exists regarding different methods of restoration, which supports my findings regarding how restoration was being carried out. Many have conducted experiments to find the most effective way of eliminating and controlling invasive species and preparing land for seeding. However, although I did find reports of a similar restoration project and public response in Chicago (Gobster 2000; Siewers 1997), little attention has been paid to the issue of public involvement in this restoration process.

Methods

To answer my questions, I spent approximately 50 hours in the field at the park. I learned from and worked with park staff on several of the different processes involved in the park's restoration, including collecting and sorting seeds of native plants from the prairie, seeding plugs in the nursery, planting the plugs out in the prairie, and attending a public meeting on the park's fire management. Through this hands-on experience, I

learned about the park's experimenting with different methods, mistakes made in the past, and future plans.

To research the social side of the issue, I spoke with 35 people during October and November 2011. Six of them were staff at the national park, three were professional restorationists, and 26 were members of the general public living on the island who use the national park. Two of those from the general public were members of an opposition organization, and one of them was a retired Park Service employee familiar with the staff at this park, although she never worked there. I did some of these interviews by meeting with the informant, although several were conducted over the phone due to long distances and time constraints. The conversations ranged from several minutes at a trailhead to more formal interviews about an hour long. Additionally, I observed park-visitor interactions in the visitor center and out on the trails in the park, and I conducted some archival research in the park's library, looking through newspaper clippings about the park dating from the 1980s to the present.

I had mainly thought to learn how exactly the park carries out restoration and expected to find that it was a relatively simple, straightforward process generally accepted as beneficial by most of the public.

Results

To my surprise, I found that there was considerable debate over many issues in restoration, including disagreement over the best techniques and many other aspects that complicated the process. There was also doubt over whether ecosystems in general, and prairies in particular, should even be restored at all, both among this particular group of people, as well as within the larger conservation community. Compounding the

uncertainty in this particular park was the fact that the Park Service had had a significantly negative relationship with the local community in a number of ways, and, despite its recent trend of being more responsive to and inclusive of the public, there was still substantial mistrust and discontent in the relationship between the two sides. This public opposition was the biggest obstacle to the entire process.

Natural Science

Through working with the park staff on the restoration project, I learned a great deal about the methods and hands-on process of prairie restoration. One major issue that routinely came up was the fact that the park had mostly only been experimenting with different techniques, determining which were most effective. The combination of prescribed fire plus herbicide application, which was found to be most successful in a series of experiments performed by University of Washington graduate student Amy Lambert, had been put on hold due to significant public opposition to both practices. Other methods that had been tried, such as solarization – smothering plants with sheets of plastic – had not been as effective and were not practical on the large scale that was needed on the prairie.

Additionally, different aspects complicated the process, especially due to the fact that it was a national park. The rare Island Marble butterfly, which had been considered extinct for almost 100 years before being rediscovered in the park's prairie in 1998, had become dependent on a nonnative species of mustard, rather than the native species, so the park needed to attempt to wean it off the nonnative before eliminating that plant from the prairie. Another challenge was the presence of many historical artifacts underground.

The park was not able to dig without an archaeologist present to ensure the protection of these cultural resources, which hindered the ability to plant larger species.

Social Science

The main obstacle to the project at this particular park was the intense opposition of some members of the public. My interviews revealed several reasons for this opposition, including the fact that a former superintendent had handled the conflict poorly.

One informant explained much of the story behind the controversy; this person, a retired islander who used to work for the Park Service at other national parks, had volunteered at this park since moving to the island over 15 years ago and was familiar with the staff. Her story was reinforced and supported by others whom I interviewed.

In the early 2000s, a new superintendent arrived at the park. Recognizing the significance of the prairie remnant, he placed more of an emphasis on restoring it. However, he made mistakes early on that alienated the public and turned them against him. Several members of the public with whom I spoke greatly criticized his refusing to become involved in the community, which they said was crucial for the success of a small park like this.

For example, several people mentioned that when he decided to begin controlling the invasive European rabbit – which was introduced to the island in the 1880s and, having no natural predators, had damaged the grassland – he attempted to avoid completing an Environmental Assessment for the project, which would require substantial public outreach and involvement. When some members of the public became concerned about the decline in the rabbit population and asked the Park Service about it

at a public meeting, the superintendent replied that they had not killed any. Angry islanders formed an opposition group, and one of the leaders filed for information through the Freedom of Information Act, which revealed that the park had ordered canisters of sodium nitrate, which would turn into carbon monoxide and kill the rabbits when released in their warrens. When asked to present the canisters, the superintendent then admitted to gassing some of the warrens. The public was furious, and some wrote letters to top officials. In my research in the park's library, I came across numerous letters to the editor in the local newspaper responding to the issue, many of which were greatly critical of the park (National Park Service Scrapbook Four). According to one member of the public whom I interviewed, the superintendent caused discontent among his own staff as well, and there was a high turnover rate.

An additional cause of conflict was the park's desire to use herbicides to get rid of invasive species on the prairie. Of the 26 members of the public I interviewed, 20 were strongly against using herbicides in the national park, one was against them but acknowledged that they may be necessary in small amounts, one was indifferent, and four said that they would not mind herbicides as long as they were used carefully and in small amounts.

The attitude of a new ranger at the park exacerbated these issues. Many members of the public whom I interviewed complained of his threatening tactics, which intimidated the public and prevented them from feeling comfortable in and using the park as they used to. He made several arrests over a dog leash law and worked to dismantle forts made of driftwood on beaches at the park. During interviews, people referred to him as "abusive," a "control freak," and a "maniac."

In August 2011, that superintendent walked out on his job due – those interviewed speculated – to the enormous pressure from these combined issues. After his departure, the park started over in the planning process, attempting to involve the community much more and be more open to the public. In September 2011, a Prairie Symposium was held, at which professionals involved with nonprofit organizations, university professors, and even members of the group opposed to rabbit control spoke about different aspects of the restoration. Although many to whom I spoke described this as a good effort by the park, some had several criticisms, including the fact that it was held during the day on a weekday, when many people were at work, and that it was “heavily weighted on the science side.” The park had held several volunteer events as well, including seeding plugs and planting them in the prairie, although these were also said to not be publicized enough.

Although many members of all three informant groups were critical of the park’s public relations, several members of the public acknowledged and commended some of the park staff for their improved efforts, such as a booth at the summer Farmer’s Market, at which an employee gave out seeds of native plants for the community to plant on their own property. Additionally, as I planted seeds in the park’s nursery, which was next to the visitor center parking lot, numerous park visitors stopped by to inquire about what I was doing and many seemed genuinely interested in the project; I did not encounter any visibly negative attitudes toward the restoration as I worked there. Similarly, planting plugs out in the prairie, visitors in several of the cars that drove past smiled, waved, and gave a “thumbs-up.”

Issues in Restoration

The superintendent's poor management was not the whole explanation of the intense public opposition to the park's restoration project. Issues themselves can be controversial, so in order to gain a better understanding of several broader issues in restoration, I conducted additional interviews with three professionals experienced in that field. I discovered that there were four major topics that caused the conflict in this project: rabbit control, herbicide use, whether prairies should be restored, and to what point they should be restored.

The topic of whether rabbit control should be done in the national park was one of the questions that came up most often with the public. As described above, there was very vocal opposition to the park's actions. Several of those who were opposed held the view that rabbits could even be beneficial; sand dunes near the prairie provided habitat for some rare species of plants, and the maintenance of these dunes required disturbance, which could be supplied by the rabbits' burrowing. Much conflict also existed regarding the results of a study conducted by the Park Service. The NPS concluded that animals such as foxes and eagles do not rely on rabbits for food. However, several members of the public insisted that those results were biased because the study was done after the park had gassed rabbits, so those animals would naturally have changed their diet due to the absence of rabbits. Other members of the public, however, agreed with the park, arguing that eagles did indeed consume mainly fish and marine organisms as they had in the years before rabbits were introduced.

Of the 26 members of the public interviewed, about 46% were against killing rabbits, approximately 38% were in favor of killing rabbits, while the remainder were either indifferent or did not know. Thus, contrary to what might be expected based on the

amount of resistance encountered by the park, less than 50% of the public with whom I spoke objected to rabbit control.

Additionally, among the professionals and park staff whom I interviewed, this topic was not disputed at all – they were all in favor of rabbit control. As one professional restorationist put it, ‘people just think [the rabbits] are cute, but that doesn’t justify their being here,’¹ since they were an introduced species. One of the park employees reflected that the park had greatly underestimated the “emotional ties” people had with the rabbits; she mentioned that she used to hear people in the ferry line talking about watching the rabbits at the park, and several informants mentioned how, in years past, islanders would hunt the rabbits for food. In my archival research, I found a short newspaper article from 1988 announcing in a positive tone that the rabbit population appeared to be increasing after a decline, and saying: “...visitors can enjoy watching them around their underground warrens. Best spot for watching rabbits is American Camp” (*Springtide*, June 1988). Thus, it appeared that even the park used to encourage this endearment of the rabbits.

Another significant issue in restoration was the use of herbicides. This practice was widely accepted in the conservation community, according to the professionals I interviewed; most of them asserted that the possible risks outweigh the substantial benefits. As one professional working for the county Land Bank explained, herbicides are ‘not unusual in ecological restoration; it’s more unusual for herbicides to not be used.’ Another professional asserted that ‘if we decide that all herbicides are bad, restoring native prairies will be difficult or even impossible – we’ll be left with a highly degraded

¹ I did not record any of my interviews, so single quotation marks are used because the quotes may not be the exact wording.

mix of natives [plants] and nonnatives, and some natives will go extinct' and dismissed common concerns about herbicides contaminating water supplies as invalid.

However, several professionals and park staff voiced concern about herbicides as well. One park employee said that he “hates” herbicides, though he considered them a “necessary evil” if the goal was to restore the prairie to what it was; the Land Bank employee was “concerned” about the unknown long-term impacts on the ecosystem; and a professional restorationist, as well as a Park Service botanist working for another park, said that people’s hesitation and concerns regarding herbicides were valid and should be researched, but that said that they were necessary to control the invasive plant species. Of the members of the public interviewed, nearly 81% were against using herbicides in the national park, while one respondent was indifferent. The remaining four people who said they would not mind herbicides in the park emphasized that the use must be very careful, limited, and well researched.

Several members of the public mentioned that they would not mind prescribed burns on the prairie, but the professionals explained that, because the landscape was so degraded by the invasive species, simply burning was not enough – fire would actually benefit some nonnative species. Burns could indeed maintain the structure of the grassland ecosystem and aid in preparing the ground for seeding native plants, but herbicides were necessary as well to prevent the nonnatives from returning, according to these professionals.

One question that had never occurred to me before beginning this research was why the prairie should even be restored at all. This issue first came up for me in talking with a park employee while working on the restoration, and it appeared to be a topic of

confusion among some of the members of the public with whom I spoke. Several park employees emphasized that ecosystems are dynamic and continually changing; they are only static when kept that way by humans. Prairies, in particular, are only sustained by human interference. If left to themselves, trees and shrubs would encroach on the land and take over; this was beginning to happen in some areas of the park in which there had not been prescribed burns in a long time. Some wondered why humans should resist this change and natural progression.

According to the park staff, one of the original reasons for the restoration was to enhance the historical landscape. Because this was a historical park, created to commemorate events in American history, the primary focus was not on the natural resources. However, one restorationist reflected that the park was “gradually recognizing that maintenance of the cultural landscape requires maintenance of the ecological landscape.” A 1988 Park Service publication, *Management Policies*, stated: “Trees, other plants, and landscapes in a cultural zone generally will be managed to reflect the historic designed landscape or the scene that prevailed during the historic period...” (4:8). The Park Service was therefore required, when able, to restore the prairie. However, the three professionals with whom I spoke explained that they supported restoring prairies to save this diverse, increasingly rare ecosystem, and all of the organisms it supported, from extinction. One professional described that, because prairies were formed by glaciers and had been sustained by humans since then, the native species had become adapted to the human interference, such as prescribed burns, so without them, the ecosystem would disappear. She stated one perspective that ‘humans have a responsibility to maintain that species diversity and habitat – we created it, and if we don’t maintain it, it will be lost

forever,’ as well the view that ‘prairies provide a unique change from the forested landscape,’ and we should protect them in ‘appreciation for the diversity of ecosystems.’ However, there were also concerns about changing the landscape back to its historic composition so quickly, such as the uncertainty over whether organisms would be able to adapt to fire or different plant species. For example, as mentioned earlier, the rare Island Marble butterfly had become dependent on a species of nonnative mustard. The park was therefore working to wean the butterfly off of this nonnative species and onto the native species before attempting to eradicate the nonnative.

Finally, if one concluded that prairies should be restored and maintained, there was the question of what point to restore it to. As discussed above, one of the original reasons for the project was to restore the historic landscape, since this was a national historical park. However, in most of my interviews with park staff and professionals, the main reason given was to restore the environment to a healthy, balanced ecosystem, and many informants mentioned that they struggle greatly with determining this. Because of the lack of an exact point as a goal, some in the public criticized the restoration; three of the 26 members of the public with whom I spoke brought this issue up without my asking them. One member of the group opposed to rabbit control stated that she did not ‘think they should be resisting change and killing lots of organisms to bring it [the prairie] back to an arbitrary point in time; the prairie is beautiful, but nature doesn’t stay the same.’

Discussion

My research results regarding carrying out the restoration process, including the challenges of getting rid of invasive species and seeding and encouraging the growth of native plants, were in agreement with the previous research conducted in this field.

However, other than two reports I read of a similar project, it appeared that little attention had been paid to the social side of ecological restoration, such as my finding: that public opposition was the major barrier to restoration in this case.

The park's actions – controlling the introduced rabbits and using herbicides on the invasive plant species – were common, accepted practices in ecosystem restoration. But many people in the public, as well as several among professionals and park staff, were uneasy about their application. The controversy appeared to have been exacerbated in this case because the park staff – especially the former superintendent – handled the issue poorly, alienating the public through a number of their actions and mistakes. Park staff who had been involved in restoration at other national parks observed that it was more controversial at this park because of the rabbit control issue. One employee from another park who had been involved in this restoration mentioned that people tended to be supportive of things like restoring native plants, but opposed killing rabbits.

Many with whom I spoke from all three informant groups emphasized that the park was walking a delicate balance between being responsive to the community and being responsible in protecting the natural and cultural resources. It was the park's duty, as a federal public service agency, to involve and cater to the public, but the Park Service also had to protect “unimpaired the natural and cultural resources and values of the national park system for... this and future generations” (National Park Service). The retired Park Service employee compared it to the example of when Yellowstone National Park removed its bleachers for visitors to watch bears rummage through trash; the Park Service must ‘ensure protection of the resources despite public outcry.’ For some issues,

it would have been irresponsible to put it to the public vote, as not all were sufficiently informed to make a decision.

Some members of the public gave suggestions in our interviews for improving the park's relationship with the community. Nearly all of them, as well as some of the professionals and park staff, mentioned the need for much more outreach: volunteer events and public meetings should have been much more publicized; the park should have been involved in the community more, such as at the year-round Farmers Market and county fair; and people of all ages should have received more education about what they could do to help the process, both at the park and on their own property. Involving schoolchildren was seen as a good way to obtain help with and increase education about the restoration. Community ownership over the project was cited multiple times by members of the public as a key factor for success; islanders felt intimidated, threatened, and belittled by the park's actions and attitude. Based on my interviews, as well as my observations of a public meeting the park held regarding prescribed burns, there was significant confusion about the reasons for and methods of the restoration. To much of the general public, the prairie appeared beautiful and healthy; many did not understand the need for restoration, as they grew up on the island never knowing the grassland any other way. They thus resented officials who informed them that the landscape that they loved was degraded and needed to be filled with chemicals and poisonous gas to kill the plants and animals. Education about what exactly the park was doing and why seemed therefore crucial.

As mentioned by many professionals and park staff, further research is needed to determine long-term impacts of herbicides on the landscape and how those impacts may

be limited and mitigated. Despite the fact that this is an accepted practice by restorationists, I agree with many in the public that the fact that the long-term effects are uncertain is concerning, and I question whether they should be used before more is known. Additionally, research regarding possible impacts of climate change on the prairie and how to adjust the ecosystem management to accommodate those changes is necessary.

Conclusion

Interest in prairie restoration has been growing in Washington, as this is an increasingly rare ecosystem that will disappear if left alone, and invasive species cause substantial damage which is expensive for humans, harms native species, and decreases biodiversity. Through working at the national park and a series of interviews and conversations with three groups of people, I found that the park service's prairie restoration project faced a number of obstacles, some of which were expected, such as determining treatments to foster growth of native plants. However, despite the huge problem presented by invasions of nonnative species, to my surprise, the social side of the issue was a greater challenge in this case study than the issues associated with actually carrying out the restoration, and several issues regarding restoration were debated among the members of all three groups: the public, park employees, and professional restorationists.

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