ADDRESSING MISCONCEPTIONS IN NEWS ARTICLES COVERING THE REMOVAL OF BARRED OWLS IN NORTHERN SPOTTED OWL HABITAT

by

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In this thesis I analyze news article coverage of barred owl removal in northern spotted habitat. News coverage of the management reveals numerous misconceptions about ecological and management-based principles of barred owl removal. I identified and addressed the following three misconceptions in new articles: the failure to recognize the impact of barred owls on species other than the northern spotted owl, the assertion that barred owl removal is exorbitantly expensive and infeasible, and the expression that there is no hope for the recovery of the northern spotted owl. These misconceptions demonstrate that there is a large gap between the available information in government documents and scientific journal articles that is essential to forming a basic understanding of the issue, and the information described in news coverage. It is critical that the US Fish and Wildlife Service establish a more effective mode of communication with the media and public spheres in order to spread accurate information and gain positive views of environmental management.

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I. Preface

For the four years that I have lived in Oregon, the natural beauty of the state has continually lured me outdoors. From spending leisure time by the Willamette River many days a week and going for hikes along the coast or in the Willamette National Forest when I get the opportunity, I have become more attentive to my surroundings and developed an eye for spotting wildlife. Through a combination of experiential learning and courses I have taken in Environmental Studies, I am continually learning to identify more of the species of plants and animals that inhabit western Oregon. An event that greatly enhanced my interest in viewing wildlife, however, was receiving a pair of binoculars for my 20th birthday. With a magnified view, I was able to recognize the intricate patterns and slight transitions in colors of plumage in birds such as green herons and red-tailed hawks. I soon began to view many species of birds as living pieces of art.

The inspiration for this thesis emerged from a short backpacking trip in the Willamette National Forest last summer. Starting from the McKenzie River Ranger Station, a friend and I hiked eight miles along the McKenzie River Trail, passing through patches of old-growth Douglas-fir forests, before hiking up an abandoned forest road leading to Frissell Creek. I had backpacked here a couple of times before, because—with no car—I could escape the city and access the refuge of Frissell Creek after a bus ride and a day's hike. Although my friend and I were eager to reach the solitude of our camping spot at the convergence of three small mountain streams, we did not expect the rare encounter we would soon experience.

After reaching our destination and setting up camp, we started to cook our spaghetti dinner. Ten minutes into the preparation of our meal, a small owl swooped through the area and landed fifteen feet away from us on an alder branch ten feet off the ground. My friend slowly reached for her camera, so as not to scare the bird—little did we know that the owl was probably used to human encounters. During the half hour or so that the owl accompanied us during our dinner, my friend took a dozen or so photographs. I regretted leaving my *Birds of Oregon* identification book at home—a choice I have long deliberated before each backpacking outing since the book is not particularly light. My friend and I reviewed the photographs after the owl finally flew off and joked about how the owl looked like it was getting sleepy throughout the series of photographs. It, however, was likely just waking up.

At the end of our backpacking trip, we consulted the field biologist at the McKenzie River Ranger Station to identify the species of owl. After comparing the photographs to the field biologist's *Sibley Manual of North American Birds*, we were thrilled to learn that we had seen a northern spotted owl. She asked us to fill out a wildlife observation form including our names, and the date, time, and location of the sighting. The field biologist downloaded the pictures from my friend's camera and asked us about the owl's behavior. When my friend and I told her that the owl was perched on a low branch quite close to us and was not startled when we moved around or got closer, she informed us that some northern spotted owls will sometimes seek out people because they have become accustomed to being fed by biologists who study the owls at the nearby H.J. Andrews Experimental Forest. The thrill of seeing the famed owl that I had heard discussed in college courses and in casual conversation, and

learning about the connection between the owl's behavior and the scientists who study the species, encouraged me to dig deeper into the relationship formed between people and the northern spotted owl.

II. Introduction

The application of the Endangered Species Act to the northern spotted owl initiated a tremendous movement to protect the greater ecology of and ecosystem services associated with federal forests in the Pacific Northwest. Through the mid- to late 1980s, environmental groups petitioned and later sued the US Forest Service and US Fish and Wildlife Service to get the northern spotted owl listed under the Endangered Species Act. After many years of deliberation, the species was finally listed as threatened in 1989, triggering the creation of the Interagency Scientific Committee to address the conservation of the northern spotted owl. This committee called for the formation of habitat conservation areas that would provide areas of habitat large enough to support populations of northern spotted owls; these areas were generally composed of old-growth forest that spotted owls depend on and that were of high economic value to the timber industry.[1] This form of management caused an incredible amount of controversy because it greatly reduced logging on federal lands. Proponents of the timber industry viewed the habitat conservation areas as huge detriments to local economies, while environmentalists argued that the habitat conservation areas were not large enough and called for greater habitat protection.

[1] Jack Ward Thomas, Jerry F. Franklin, John Gordon, and K. Norman Johnson, "The Northwest Forest Plan: Origins, Components, Implementation Experience, and Suggestions for Change," *Conservation Biology* 20.2 (2006): 277-279; Jack W. Thomas, Eric D. Forsman, Joseph B. Lint, E. C. Meslow, Barry B. Noon, and Jared Verner, "A Conservation Strategy for the Northern Spotted Owl," *Interagency Scientific Committee To Address the Conservation of the Northern Spotted Owl*, May, 1990: 53-57.

The controversy produced numerous lawsuits that resulted in a moratorium on logging of federally owned old-growth forests in the Pacific Northwest during the early 1990s. In 1993, President Clinton convened the Forest Summit in Portland to address gridlock of federal forests in the region due to opposing views of land use. At the end of the Forest Summit, President Clinton created the Forest Ecosystem Management Assessment Team (FEMAT), composed of scientists and federal land managers, to create a management plan that addressed ecological and economic needs of Northwest forests.[2] In 1994, after a year of scientific analyses and involvement of various stakeholders, FEMAT produced the Northwest Forest Plan, a document guiding the continual management of forests throughout Pacific Northwest.

Although the Northwest Forest Plan emerged out of the listing of the northern spotted owl as a threatened species under the Endangered Species Act, it evolved into a much more integrated form of management. The central goals of the FEMAT in creating management objectives for Pacific Northwest forests were: to incorporate the socio-economic dimensions of forest use while preserving the long-term health of the forests, wildlife and waterways; to base management on "scientifically sound, ecologically credible, and legally responsible" knowledge; to establish sustainable levels of timber harvests; and to design unified management among many governmental agencies.[3] Although the Northwest Forest Plan had a large set of interconnected goals,

[2] Thomas et al., "The Northwest Forest Plan," 280.

[3] The plan took into account over a thousand species of plants and animals, with special emphases on northern spotted owl, marbled murrelet, and salmon. Thomas et al., "The Northwest Forest Plan," 279-280; Valerie Rapp, "Northwest Forest Plan, the first 10 years (1994-2003) first-decade results of the Northwest Forest Plan" (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 2008): 2-6; "Excerpts from Forest Ecosytem Management: An Ecological, Economic and Social Assessment; Report of the Forest Ecosystem Management Assessment Team," The Forest Ecosystem Management Team, July 1993: 3-4, http://www.blm.gov/or/plans/nwfpnepa/FEMAT-1993/1993_%20FEMAT-ExecSum.pdf

the northern spotted owl continued to symbolize the plan, representing progressive environmentalism to some and a loss of jobs and livelihoods to others.

Despite placing logging restrictions on more than ten million acres of public land under the Northwest Forest Plan, populations of northern spotted owl continued to decline dramatically. More than a decade after the implementation of the plan, wildlife researchers identified the invasion of the non-native barred owl as one of the leading causes of the continued decline of northern spotted owl populations. Barred owls compete with the northern spotted owls for food and nesting habitat, and they engage in physical aggression with northern spotted owls to maintain territories. As more studies revealed the huge population of barred owls in the Northwest and their negative effect on northern spotted owl, the US Fish and Wildlife Service began exploring the possibility of relocating and/or lethally removing barred owls from northern spotted owl habitat.

The proposal for killing barred owls to save northern spotted owls unleashed considerable debate and media coverage. The animal advocacy organization Friends of Animals filed a lawsuit to block the killing of barred owls, and many people in the public sphere considered the idea of "killing one owl to save another" (as commonly addressed in the news) as an inappropriate and absurd use of taxpayer money. After the release of the updated Northern Spotted Owl Recovery Plan in 2008, in which many suggested recovery action alternatives included barred owl removal, the US Fish and Wildlife Service received numerous negative comments from the public concerning the killing of barred owls. These public comments prompted the Fish and Wildlife Service to create a Barred Owl Stakeholder Group composed of "representatives of broad-

interest environmental groups, bird conservation groups, animal welfare groups, the timber industry, tribes, and federal, state, and local governmental agencies." In addition, the Fish and Wildlife Service hired an ethicist experienced in the development of ethical animal and environmental public policy, to facilitate Barred Owl Stakeholder Group discussions.[4] After several years of drafting an environmental impact statement, the US Fish and Wildlife Service announced that it would begin the experimental removal of barred owls in four study areas in California, Oregon, and Washington starting in 2014.[5]

After researching the issue of barred owl management in northern spotted owl territory, I discovered that the coverage of barred owl management in newspapers in Oregon and across the country revealed many misconceptions about environmental management. The portrayal of barred owl management in the news articles is important because the protection of northern spotted owls has been a fiercely debated area of public policy, and public views of environmental issues can be influential in policy-making. I argue that news articles covering barred owl removal have presented many misconceptions. Many news articles acknowledge the greater adaptability of barred owls, but fail to recognize their potential impact on species other than northern spotted owls, erroneously assert that the removal of barred owls will be inordinately expensive and infeasible, and mistakenly declare efforts to save the northern spotted owl as futile efforts. A closer examination reveals that removing barred owls will have a positive effect on many species in addition to the northern spotted owl, that barred owl removal

[4] "Timeline: Evolution of the Barred Owl Threat to Northern Spotted Owl," U.S. Fish and Wildlife Service, last modified April 19, 2012, http://www.fws.gov/oregonfwo/species/data/northernspottedowl/Documents/NSORecoveryFactSheetBarredOwl.4.19.12.pdf

[5] Robyn Thorson, "Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls; Record of Decision for Final Environmental Impact Statement" (Portland: US Fish and Wildlife Service, 2013) https://www.federalregister.gov/articles/2013/09/17/2013-22556/experimental-removal-of-barred-owls-to-benefit-threatened-northern-spotted-owls-record-of-decision

is feasible and similar in cost to comparable conservation activities, and that there are many reasons to be optimistic that the northern spotted owl will recover.

The literature on the northern spotted owl is one of the most extensive collections of information on any species of bird in the world. There have been more than five hundred peer-reviewed articles published on the northern spotted owl, and because of the species' affect on land-use and the Northwest Forest Plan, there are also many long government-agency reports on the northern spotted owl and its habitat.[6] There are numerous articles that depict the economic, political, and legal dimensions of the issue and several books that characterize the species in relation to the modern environmental movement.[7] Although there is extensive literature on the northern spotted owl and related issues (some of which dates back to the early 1980s), the negative effects of barred owl on northern spotted owl is a more recent development. In the early 2000s biologists began documenting the range expansion (and population increase) of barred owls in the Pacific Northwest and their negative impact on northern spotted owls. In 2008 the US Fish and Wildlife Service responded to the amassed scientific evidence by declaring that the "barred owl poses a significant and complex threat to the spotted owl."[8] As a result of the scientific literature and governmental response, news organizations have covered the issue of barred owl's influence on northern spotted owl since the mid-2000s. This thesis addresses a niche in northern

[6] Rocky Gutiérrez, "Spotted Owl Research: A Quarter Century of Contributions to Education, Ornithology, Ecology, and Wildlife Management," *The Condor,* 110.4 (2008): 792-798.
[7] See for example, Douglas Bevington, *The Rebirth of Environmentalism: Grassroots Activism from the Spotted Owl to the Polar Bear* (Washington D.C.: Island Press, 2009); Steven Lewis Yaffey, *The Wisdom of the Spotted Owl: Policy Lessons for a New Century* (Washington D.C.: Island Press, 1994); Greg Easterbrook, *A Moment on Earth: The Coming Age of Environmental Optimism* (New York: Viking, 1995).
[8] "Recovery Plan for the Northern Spotted Owl," U.S. Fish and Wildlife Service, May 2008, http://www.fws.gov/ecos/ajax/docs/recovery_plan/NSO%20Final% 20Rec%20Plan%20051408_1.pdf

spotted owl and barred owl literature that has not yet been covered—analysis of news articles covering the environmental impact statements and related publications on the experimental removal of barred owls conducted by the US Fish and Wildlife Service.

III. Methods

I chose to analyze media representations of barred owl removal by analyzing news articles for many reasons. News articles are often long enough in length to provide significant detail, but are short enough that they must cover new and essential information rather than fill space with background information on issues. In addition, news articles are published more frequently than other forms of media (such as magazines, movies, and books) and thus can quickly respond to and cover emerging governmental actions and scientific studies. This is important because barred owl removal is a current issue for which important scientific studies have been released in the past half a year, and the implementation of experimental removal of barred owls by the USFWS has begun this year.

To search for news articles on barred owl removal, I used the databases Factiva, Infotrac News, Newspaper Source, LexisNexis Academic, and the Oregon Media Directory. I excluded articles with the following specifications from my analysis: articles that discussed northern spotted owl decline but not barred owl removal in particular, articles less than 250 words in length because they were not long enough to go into sufficient detail, and articles that were exact duplicates of governmental press releases or other news articles because they were not providing any (new) interpretation.

I engaged in content analysis to create an annotated bibliography, which I used to identify themes that appeared in multiple news articles. Analyzing common themes in the articles, I realized that there were numerous misconceptions in the reporting of barred owl management and its relationship with northern spotted owl recovery efforts. To prove that these portrayals of barred owl management were misconceptions, I compiled scientific and theoretical publications on barred owl ecology, invasive species removal, adaptive management, the Northwest Forest Plan, U.S. Fish and Wildlife Service publications, and journal and news coverage of preliminary barred owl removal projects. Using these sources, I refuted the misconceptions I identified in news coverage of barred owl removal. In my conclusion, I address the importance of accurate media coverage of barred owl management and offer suggestions for how the US Fish and Wildlife Service can better communicate with the media and relay accurate information.

IV. Background

Although the barred owl invasion is one of the fundamental causes of continued decline in populations of northern spotted owls, the root cause of decline is habitat destruction resulting from more than a century of logging in the Pacific Northwest. Conservative estimates place the loss of northern spotted owl habitat at 60 percent since the mid-1800s. Of the habitat that remains, much is of lower quality due to habitat fragmentation—the division of habitat into smaller, isolated parcels. Fragmented habitat is affected to a greater extent by edge effects like strong winds and increased temperatures, and may not be able to provide sufficient numbers of prey or other

characteristics essential to sustaining populations of northern spotted owl.[9] Habitat loss and degradation caused a significant decline in populations of northern spotted owls and led the US Fish and Wildlife Service to list the species as threatened under the Endangered Species Act in 1989.[10] The Northwest Forest Plan, implemented in 1994 under the Clinton administration, originated as a means to save the northern spotted owl under the Endangered Species Act. The plan was one of the first attempts at large-scale ecosystem management—a form of land-use aimed at conserving and maintaining an integrated system of ecological processes and species. For example, although old-growth forests are essential for northern spotted owls, the forests also aid in maintaining water quality and providing large woody debris to streams, which improves salmon spawning habitat. The plan coordinated the management of 24 million acres of forested land from northwestern California north through the northwestern half of Washington, 7.5 million acres of which were designated as late successional reserves.[11] The plan restricts timber harvest on these reserves (unless used as a form of management to enhance habitat quality like thinning of younger stands) in order to protect old-growth forests, their processes, and the species reliant on them. Many late successional reserves contain old-growth forest, a large portion of the forests designated as LSRs are mature

[9] Jack W. Thomas, Eric D. Forsman, Joseph B. Lint, E. C. Meslow, Barry B. Noon, and Jared Verner, "A Conservation Strategy for the Northern Spotted Owl," Interagency Scientific Committee To Address the Conservation of the Northern Spotted Owl, May, 1990: 2. http://www.fws.gov/wafwo/species/Fact%20 sheets/NSO%20Interagency%20Conservation%20Strategy.pdf

[10] "Northern spotted owl (*Strix occidentalis caurina*): Species fact sheet," U.S. Fish and Wildlife Service, last modified November 25, 2013, https://www.fws.gov/oregonfwo/species/ Data/NorthernSpottedOwl/; "Timeline: Evolution of the Barred Owl Threat to Northern Spotted Owl," U.S. Fish and Wildlife Service, last modified April 19, 2012, http://www.fws.gov/oregonfwo/species/data/northernspottedowl/ Documents/NSORecoveryFactSheetBarredOwl.4.19.12.pdf

[11] The range of the northern spotted owl extends into southwestern British Columbia, but the Northwest Forest Plan only addresses the management of lands within the United States. Nancy M. Diaz, "Proceedings: Views From the Ridge—Considerations for Planning at the Landscape Scale: Northwest Forest Plan," *Pacific Northwest Research Station, USDA Forest Service* (2004): 87-89, http://www.fs.fed.us/pnw/pubs/gtr596.pdf

or even young-aged stands that will be left to age so that there is old-growth forest habitat in the future.[12]

After the implementation of the Northwest Forest Plan, biologists projected that northern spotted owl populations would continue to decline for several years before the owls could respond to changes in land-use. Well over a decade later, however, owl populations have continued to decline by an average of 2.8 percent per year, with some study areas having rates of population decline as high as 7.1 percent per year since the implementation of the Northwest Forest Plan in 1994. As of 2008, populations of spotted owl in northern Oregon and Washington have been reduced to only 40 to 60 percent of their 1994 populations.[13] Two important factors involved in the continued decrease are destruction of habitat due to wildfires and competition from the barred owl.

In the early part of the 20th century, barred owls had a range that covered the majority of the eastern half of the United States, extending south into Texas and north through the southeastern portion of Canada.[14] Biologists started observing the barred owls spreading westward into British Columbia and south into Montana, Idaho, and Washington during the mid-1960s and early 1970s (see Figure 1).[15] The first sightings of the species in Oregon, documented by wildlife biologists Avery L. Taylor Jr. and Eric D. Forsman, occurred in 1974. At that time, Taylor and Forsman observed, "It seems doubtful that two species so similar in general food habits and habitat

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[12] Ibid.

[13] Raymond J. Davis, Katie M. Dugger, Shawne Mohoric, Louisa Evers, and William C. Aney, "The Northwest Forest Plan The First 15 Years (1994-2008): Status and Trends of Northern Spotted Owl Populations and Habitats," *USDA Forest Service* (2011): ii-iii, http://www.fs.fed.us/pnw/pubs/pnw_gtr850.pdf

[14] Charles B. Yackulic, Janice Reid, Raymond Davis, James D. Nichols, and Eric Forsman, "Neighborhood and Habitat Effects on Vital Rates: Expansion of the Barred Owl in the Oregon Coast Ranges," *Ecology* 93.8 (2012): 1954.

[15] Avery L. Taylor Jr., and Eric D. Forsman, "Recent Range Extensions of the Barred Owl in Western North America, including the First Records for Oregon," *The Condor* 78.4 (1976): 560.

requirements could coexist in the same areas for long, but this relationship remains to be investigated." Unfortunately for the northern spotted owls, few scientific studies explored the expansion and effect of barred owls for several decades.

Although the specific cause of the range expansion of barred owl is debated, it is generally thought that changes in human created suitable habitat, or corridors for the owls to access suitable habitat. Specific theories include the idea that the planting of trees in riparian areas by farmers in the Great Plains created corridors for the barred owl to travel westward, or that altered fire practices and/or logging created new forms of habitat which the barred owl could utilize.[16] The barred owl continued to expand its range and was found in California in 1981.[17]

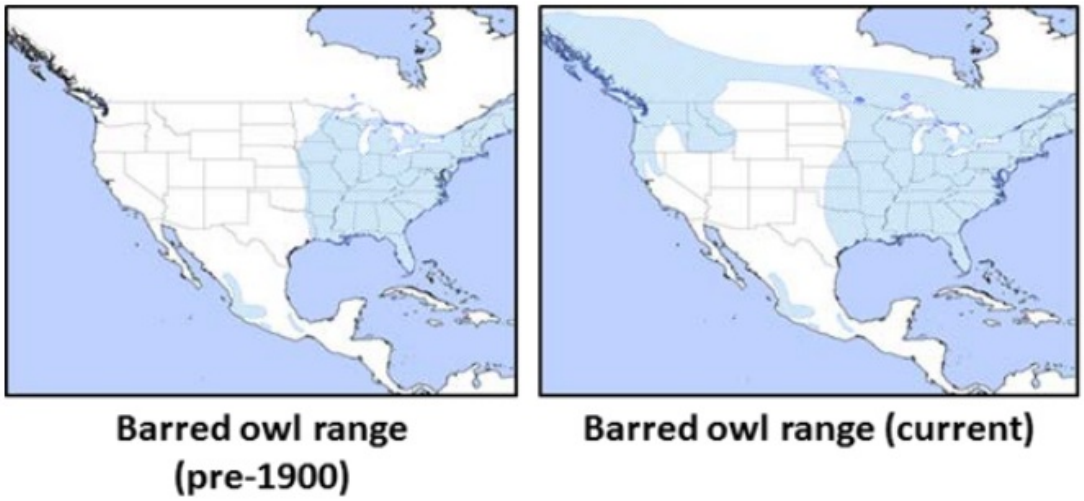

Figure 1: Barred Owl Range Expansion[18]

[16] Shawna J. Dark, R. J. Gutierrez, and Gordon I. Gould, Jr., "The Barred Owl (Strix Varia) Invasion in California," *The Auk* 115.1 (1998): 54.
[17] Dark et al., "The Barred Owl (Strix Varia)," 50.
[18] "Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Final Environmental Impact Statement," U.S. Fish and Wildlife Service, July 2013: 313, http://www.fws.gov/oregonfwo/species/data/northernspottedowl/BarredOwl/Documents/ExecSummaryFinalEIS.pdf

In addition to continuing to expand their range, barred owl populations have continued to increase in density throughout the Pacific Northwest, often displacing northern spotted owls. In a study by Dugger and her colleagues that tested the occupancy dynamics of the two species of owls, the researchers found that the presence of barred owls in northern spotted owl territory increased dramatically from the late 1990s into the 2000s: in 1999 barred owls were found in less than 5 percent of spotted owl territories in the Southern Cascade Study Area of southern Oregon, but were present in 30 percent of spotted owl territories in the study area by 2006. In addition, when barred owls were found in the study area, the extinction rates of pairs of spotted owls tripled, and the colonization rates of spotted owls decreased dramatically.[19] Barred owls are now more prevalent than northern spotted owls in British Columbia, Washington, and Oregon.[20]

The barred owl has many advantageous traits that have led it to becoming the dominant species of owl throughout the range of the northern spotted owl. Barred owls are generalists, whereas northern spotted owls are specialists, meaning that barred owls can tolerate a wider spectrum of environmental conditions than northern spotted owl. Barred owls exploit a wider variety of prey, can live in a much greater array of habitat types, and are able to live in higher densities than northern spotted owls.[21]

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[19] Katie M. Dugger, Robert G. Anthony, and Lawrence S. Andrews, "Transient Dynamics of Invasive Competition: Barred Owls, Spotted Owls, Habitat, and the Demons of Competition Present," *Ecological Applications* 21 (2011), DOI:http://dx.doi.org/10.1890/10-2142.1

[20] David J. Wiens, Robert G. Anthony, and Eric D. Forsman, "Competitive interactions and resource partitioning between northern spotted owls and barred owls in western Oregon," *Wildlife Monographs*, 185.1 (2014): 6, DOI: 10.1002/wmon.1009.

[21] Thomas E. Hamer, Eric D. Forsman, and Elizabeth M. Glenn, "Home Range Attributes and Habitat Selection of Barred Owls and Spotted Owls in an Area of Sympatry," *The Condor* 109.4 (2007): 750,760-765.

Although barred owls have a broader and more evenly distributed diet than northern spotted owls, in some portions of the northern spotted owl's range, the diets of the two species overlap considerably, indicating competition for food. A study conducted by Hamer and his colleagues demonstrated that about three-fourths of the diets of the two species overlap in western Washington. The study also found that the diet of northern spotted owls consists almost entirely of three species of nocturnal mammals—snowshoe hare, bushy-tailed woodrats, and flying squirrels (the latter two of which are arboreal and semi-arboreal species). About three-fourths of the barred owl diet consists of the same species of mammals, but the other fourth consists of a range of birds, amphibians, snails, and insects. While both species of owls are considered nocturnal, barred owls occasionally hunt during the day.[22] The hunting of barred owls during the day is important because it demonstrates that they have the potential to affect species of prey that are diurnal, whereas northern spotted owls would not have any direct affect on diurnal species. Furthermore, barred owls are opportunistic hunters and their choice of prey varies across seasons—amphibians, reptiles, and invertebrates make up a large proportion of their summer diet.[23] In the Final Environmental Impact Statement for the experimental removal of barred owls, the US Fish and Wildlife Service states: "Given the information on food habits, we conclude that any forest species under 35 ounces, or any aquatic forest species that either uses shallows at some

[22] Hamer, T. E., D. L. Hays, C. M. Senger, and E. D. Forsman, "Diets of Northern Barred Owls and Northern Spotted Owls in an Area of Sympatry," *Raptor Research*. 35 (2001): 221-227; "Experimental Removal of Barred Owl to Benefit Threatened Northern Spotted Owls: Draft Environmental Impact Statement," U.S. Fish and Wildlife Service, (2012): 157-162, 225, https://www.fws.gov/oregonfwo/species/Data/NorthernSpottedOwl/BarredOwl/Documents/DraftEIS.ExpRemoval2.20.12.pdf

[23] "Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Final Environmental Impact Statement," 169-170.

point in its life cycle or comes to the surface, are potential prey for barred owls."[24] Although there has not been enough research on barred owl diets to conclude that extent to which barred owls are affecting other forest species, the findings so far demonstrate that the opportunistic tendencies of barred owl predation could have large ecosystem effects in Pacific Northwest forests.

In addition to more specific diets, spotted owls also have more specific habitat requirements, as they largely depend on areas of old-growth forest. Although northern spotted owls are able to occupy areas that have a matrix of various aged stands, the larger the percentage of young trees in an area, the larger the territory the spotted owl requires. By contrast, barred owls can live in a wide array of forest types and even excel in suburban environments.[25] Furthermore, northern spotted owls have larger home ranges—two to five barred owl territories can fit within one spotted owl territory—presumably because the narrower diet of northern spotted owls forces them to hunt across larger areas.[26]

The primary reason for barred owl taking over northern spotted owl habitat is perhaps its more aggressive nature. Barred owl is the bigger of the two species and aggressively defends its territory by swooping on and chasing northern spotted owls away. In surveys of barred owls and northern spotted owls, biologists play recorded northern spotted owl calls, and if a spotted owl or barred owl is nearby, they will typically respond to the call. Often barred owls will respond to these recordings by

[24] "Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Final Environmental Impact Statement," 171.
[25] Cheryl R. Dykstra, Melinda M. Simon, F. Bernard Daniel, and Jeffrey L. Hays. "Habitats of Suburban Barred Owls (*Strix varia*) and Red-Shouldered Hawks (*Buteo lineatus*) in Southwestern Ohio 1". *Journal of Raptor Research.* 46.2 (2012): 190.
[26] Hamer et al., "Home Range Attributes and Habitat Selection," 756-765.

crashing on nearby branches in an attempt to scare off spotted owls. In several instances, barred owls have attacked surveyors who have played spotted owl recordings.[27] While conducting barred owl and western screech-owl surveys in British Columbia, ornithologist Kyle Elliott was attacked 11 times by barred owls.[28] Biologists have observed a couple instances of barred owls killing northern spotted owls in acts of aggression, or predation.[29] In response to territorial aggression from barred owls, northern spotted owls will stop making vocalizations in order to avoid attacks; this behavior reduces the northern spotted owls' reproductive success because they need to communicate in order to attract mates.[30]

V. News Misconceptions and Scientific Knowledge

When the US Fish and Wildlife Service has released documents about barred owl removal, newspapers have been quick to respond (see Appendix 1). However, the news coverage of these materials has been overly simplistic, and many of the articles conveyed misconceptions about barred owl removal. A majority of the articles I investigated focused on the ethical dilemma of "killing one species of owl to save another." With one or two exceptions, these articles did not note that the US Fish and Wildlife Service hired an ethicist to lead a Barred Owl Stakeholder group that covered troubling ethical questions involving the culling of barred owl.[31] The formation of the

[27] Diller, "To Shoot or Not to Shoot"; "Experimental Removal of Barred Owl for the Benefit of Northern Spotted Owl: Final Environmental Impact Statement," 337-338.
[28] Elliott, Kyle. "Declining Numbers of Western Screech-Owl in the Lower Mainland of British Columbia." *British Columbia Birds* 14 (2006): 9.
[29] "Experimental Removal of Barred Owl to Benefit Northern Spotted Owl: Draft Environmental Impact Statement," 310-12.
[30] Lowell V. Diller "To Shoot or Not to Shoot: The Ethical Dilemma of Killing One Raptor to Save Another." *The Wildlife Society News.* 17 January 2014. http://news.wildlife.org/featured/to-shoot-or-not-to-shoot/
[31] "Public Comments Received on the Draft Environmental Impact Statement on the Experimental Removal of Barred Owls to Benefit Northern Spotted Owls," U.S. Fish and Wildlife Service, June 2012,

Barred Owl Stakeholder group demonstrates that the US Fish and Wildlife Service is aware of the ethical issues involved in barred owl management. These questions are extremely difficult to answer and have a heavy emphasis on personal opinion. For this reason, I have chosen to focus my analysis on misconceptions of barred removal involving ecological and management-based principles. I identified and analyzed three common simplifications or misconceptions covered in news articles: a failure to recognize the impact of barred owl on other species, a depiction of barred owl management as exorbitantly expensive and infeasible, and descriptions of northern spotted owl recovery efforts as futile.

A. Failure to Recognize Impact of Barred Owl on Other Species

Many newspapers covered the issue of barred owl management as a simple story of one species of owl versus another. Although the reason for barred owl management is to benefit the northern spotted owl, barred owls could have widespread negative effects on wildlife communities in Pacific Northwest forests. The effects that barred owl have on other species (through predation and aggression) is a serious concern because barred owl populations have continued to grow rapidly and, as US Fish and Wildlife Service states, "eat almost any species they encounter."[32] However, a simplification of the species' effect in the Pacific Northwest, as covered in news articles, devalues the broader significance of removing barred owls.

Even though the US Fish and Wildlife Service released information detailing observed and potential future effects of barred owls on other species in the draft

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http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/BarredOwl/Documents/DEIS%20Comments.pdf

[32] "Experimental Removal of Barred Owl to Benefit Northern Spotted Owl: Draft Environmental Impact Statement," 157.

environmental impact statement for barred owl removal, none of the articles I reviewed even acknowledged that barred owls could have a negative impact on species other than northern spotted owl.[33] In my news analysis, fifteen of the thirty-four news articles clearly acknowledged that barred owls had a broader diet and are more aggressive, but failed to recognize that this broader diet and aggressiveness have a negative impact on other species. Demonstrating that the barred owls negatively affect many species could increase the support for their removal and relieve some of the political burden that northern spotted owl conservation carries.

News articles did not acknowledge the effect of barred owls on other species before or after the draft and final environmental impact statements were released. For example, *The Democrat-herald* article "Report: Barred owls ousting spotted owls in the Northwest" describes the barred owl only in its relation to northern spotted owl: "the larger barred owl is considered to be a more aggressive competitor, with higher reproductive capacity as well as a more diverse diet and use of habitat. In the face of increasing barred owl populations and declining habitat, the medium size Northern spotted owl, which lives in old-growth forests of northern California and the Pacific Northwest of the United States, is declining."[34] Although this description is accurate, it describes the ecological role of barred owl in a way that indicates that its presence has an effect only on the northern spotted owl. Allowing the barred owl to replace the spotted owl, however, has influences throughout the ecosystem.

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[33] "Update on Experimental Removal of Barred Owls in Support of Northern Spotted Owl Recovery," *U.S. Fish and Wildlife Service*, August 2011: 5, http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/AugustNewsletter.pdf

[34] "Report: Barred owls ousting spotted owls in the Northwest." *The Democrat-herald.* 24 February 2014. http://democratherald.com/news/local/report-barred-owls-ousting-spotted-owls-in-the-northwest/article_0fe3c98a-9d7c-11e3-b7e5-001a4bcf887a.html

Several news articles place the two species of owls side-by-side as if it were a boxing match, distancing the two owls' relationship from any other species. For example, the article "Feds advance plan to kill 3,603 barred owls in the Pacific Northwest" describes the management of the barred owl invasion as: "Federal wildlife officials have moved one step closer to their plan to play referee in a habitat supremacy contest that has pitted two species of owl against one another . . . the barred owls are bigger and more aggressive than the northern spotted variety."[35] This type of characterization distances the reader from any ideas of ecology, and the need for managing invasive species.

Even articles that do describe the situation from more of an ecological standpoint still compare the two species without any reference to their greater role or impact within environment. An *Associated Press* article describes the two species in the following manner: the barred owl is "a larger more aggressive type of owl" that "expanded rapidly because they adapt well to mixed habitat and eat a variety of prey . . . Spotted owls on the other hand, prefer old-growth to nest and mostly eat flying squirrels."[36] These articles are characteristic of the extent to which news articles depict the behavior of barred owls, and their ecological impact. The stories do not go into any depth in describing the diet of barred owls or depict the species' aggressive behavior. Furthermore, the articles that describe barred owls as having a more diverse diet do not question how an owl with a broader diet that lives in greater densities could diminish

[35] Glionna, John M. "Feds advance plan to kill 3,603 barred owls in the Pacific Northwest." The LA Times. 23 July 2013. http://articles.latimes.com/2013/jul/23/nation/la-na-nn-feds-seek-to-kill-barred-owls-20130723

[36] Jeff Barnard, "Owl vs. Owl: Feds begin killing barred owls in experiment to help spotted owls," *The Associated Press*, 21 December 2013, http://www.peninsuladailynews.com/article/20131221/NEWS/131229996/owl-vs-owl-feds-begin-killing-barred-owls-in-experiment-to-help

populations of its prey. The articles also do not acknowledge how the barred owls' extreme aggression and territoriality could affect other species of birds, especially other species of owls.

In many ways, it is logical that the media would focus on barred owl's effect on northern spotted owl because it is the reason for the barred owl removal and the most pressing issue at hand. However, the effect of barred owl on many other species makes the case for barred owl removal much stronger. Removing the barred owl would not simply save one owl by killing another; it would benefit many species. These articles were published after the release of the environmental impact statement so information on the barred owls' affect on other species was available at the time.

Contrary to the representation depicted in the news, barred owls have impacts on many species of wildlife. Barred owls are known to prey on birds in significant numbers; they consume ducks, hawks, grouse, woodpeckers, songbirds, and other owls.[37] Birds comprise 19.4 percent of biomass in barred owl diets in western Washington.[38] Barred owls aggressively defend their territories from other species of owls. Several studies have depicted barred owls' negative affect on other species of owls, such as the western screech-owl. A study conducted by Jamie Acker on Bainbridge Island, Washington, surveyed barred owls and western screech-owls from 1995-2010. The surveys showed a sharp increase in the barred owl population and a corresponding decrease in the western screech-owl population on the island. Acker observed western screech-owls at eleven locations on the island at the beginning of his study. The owls were extirpated from the island by 2010, while the population of barred

[37] "Experimental Removal of Barred Owl: Draft EIS," 169. https://www.fws.gov/oregonfwo/species/Data/NorthernSpottedOwl/BarredOwl/Documents/DraftEIS.ExpRemoval2.20.12.pdf
[38] Hamer et al., "Diets of Northern Barred Owls and Northern Spotted Owls," 224.

increased from a few individuals to more than twenty-five pairs.[39] Elliott depicted similar trends of barred owls' effect on western screech-owls on Vancouver Island, British Columbia. In this study area, western screech-owls had been one of the most common species of birds. As on Bainbridge Island, when the population of barred owls increased, the western screech-owls disappeared. Elliott found that the western screech-owls persisted longest in areas that were not yet colonized by barred owls and in forest fragments that were on the smaller side of barred owl habitat size requirements. Both studies referenced data from Christmas Bird Counts that showed similar trends between barred owl range expansions and population increases, and western screech-owl declines and disappearances.[40]

Analyses of barred owls pellets show that they prey on western screech-owls and other types of owls such as northern saw-whet owls, although in small numbers.[41] Barred owls also may have been a contributing factor in the recent decline of northern pygmy owls on Vancouver Island.[42] Whether it is through predation, food competition, or territorial aggression, barred owls have negative affects on many species of small owls. These previous studies on western screech-owls demonstrate that barred owls can dramatically affect other species within small timeframes.

Although a large portion of the diets of barred owls and northern spotted owls overlap, the barred owl diets are much more diverse. Barred owls prey on significantly

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[39] Jamie Acker, "Recent Trends in Western Screech-Owl and Barred Owl Abundances on Bainbridge Island, Washington," *Northwestern Naturalist,* 93, no. 2 (2012): 133-137.
[40] Elliott, "Declining Numbers of Western Screech-Owl," 2-11; Acker, "Recent Trends in Western Screech-Owl and Barred Owl," 133-137.
[41] Wiens et al., "Competitive interactions and resource partitioning," 48-49; Hamer et al., "Diets of Northern Barred Owls," 224; "Experimental Removal of Barred Owl," 158, https://www.fws.gov/oregonfwo/species/Data/NorthernSpottedOwl/BarredOwl/Documents/DraftEIS.ExpRemoval2.20.12.pdf
[42] L. M. Darling, "Status of the Vancouver Island Northern Pygmy-Owl," *The Wildlife Bulletin,* (2003): 9, http://www.env.gov.bc.ca/wld/documents/statusrpts/b113.pdf

more diurnal species than northern spotted owls do, and they prey on terrestrial and aquatic species in much greater numbers than do spotted owls. The diets of barred owls vary significantly across seasons: during the summer barred owls predate amphibians, reptiles, and crayfish.[43] David Wiens and his colleagues found that salamanders and frogs made up 8.0 percent of prey numbers in barred owl diets versus 0.1 percent of prey numbers in northern spotted owl diets in the Oregon Coast Range, and Hamer and his colleagues found that amphibians made up 5.7 percent of the prey numbers in barred owl diets and none of the northern spotted owl diets in western Washington.[44] In addition, barred owls prey much more on insects, crayfish, reptiles, fish, and snails than do northern spotted owls. Analyses of pellets have also shown that barred owls prey on two species of concern in Oregon: the red tree vole and the band-tailed pigeon. Additionally, in analyses of pellet samples, biologists are not always able to identify the animal down to the species level. Many samples collected from Olympic National Park contain small salamanders and small shrews that could be Van dyke's salamander and Trowbridge's shrew, both of which are species of concern. Among U.S. Fish and Wildlife Service biologists there is also worry that barred owls prey upon Shasta crayfish (another species of concern) and have the potential to deplete populations of the crayfish in a short period of time (in other parts of the barred owl's range it preys on crayfish in high numbers). The Draft Environmental Impact Statement for experimental barred owl removal also states that removal could benefit "4 to 12 state or federally-

[43] Wiens et al., "Competitive interactions and resource partitioning," 25.
[44] Wiens et al., "Competitive interactions and resource partitioning," 25; Hamer et al., "Diets of Northern Barred Owls and Northern Spotted Owls," 224.

listed species" and benefit other unlisted species of wildlife through reduced predation and competition.[45]

As seen in the news coverage of many issues, the news of barred owl removal is a tremendous simplification of the issue. Barred owl removal should be viewed in a light similar to the preservation of old-growth forest under the initiation of the Northwest Forest Plan. Although the northern spotted owl was the species that attracted attention to save old-growth forests, many other species benefited. Likewise, the northern spotted owl was the species that initiated barred owl removal, but many other species within the northern spotted owl's range will benefit. It is important for news organizations to understand and articulate that if a generalist species like the barred owl replaces a specialist species such as the northern spotted owl, there will be effects on many other species within the ecosystem. Furthermore, these effects are not limited to direct effects from predation and territorial aggression, because even small changes in the relative abundances of species within a community can have large cascading effects throughout an ecosystem. It is important that news portrayals of barred owl management highlight that they have the potential to affect forests in the Northwest in many ways; their effects are not limited to continued decline of northern spotted owl.

The information highlighted above is covered in the draft and final environmental impact statements, which includes information on the vast majority of the available research on barred owl in forests of the Pacific Northwest. The environmental impact statements, however, are more than four-hundred-page-long documents. Although journalists should be held accountable for covering issues in an

[45] "Experimental Removal of Barred Owl," 157-59, 383-396, https://www.fws.gov/oregonfwo/species/Data/NorthernSpottedOwl/BarredOwl/Documents/DraftEIS.ExpRemoval2.20.12.pdf

informed manner, it is unrealistic to think that they will read governmental documents of this length. The US Fish and Wildlife Service did release a newsletter during the drafting of the Environmental Impact Statement that highlighted topics to be covered in the report (including the effect barred owls have on other species), but it was released almost a year before the draft Environmental Impact Statement was released.[46] Therefore, the US Fish and Wildlife Service must be more effective in relaying information from governmental reports to the media in a concise form.

B. Management of Invasive Barred Owl is Expensive and Infeasible

Another trend prevalent in newspaper coverage of barred owl removal is that barred owl removal is extremely costly and would be difficult to implement. News articles highlight that these two species cover an incredible amount of forest, and barred owl removal would have to be conducted for the long-term because the species is expanding its range and would continue to re-colonize northern spotted owl habitat. Although these are legitimate issues, management of invasive species is often costly, and the management of barred owls is not more costly than for other species. And even though removal of many invasive species requires long-term management and will not necessarily result in the species being eradicated, people do not give up on efforts to control them. So why should the idea of long-term management deter the implementation of barred owl removal? Five out of the thirty-four articles I investigated voiced that barred owl management was too expensive and infeasible. Many articles that characterized barred owl removal as infeasible were published before the release of

[46] "Update on Experimental Removal of Barred Owls in Support of Northern Spotted Owl Recovery."

a cost and feasibility study involving a pilot removal of barred owls that had positive results; this shows that the news articles jumped to hasty conclusions.[47]

Many newspapers covering the issue point to the technical difficulties of removing barred owls and the corresponding high cost. An article in *The Chronicle* (of Centralia, Washington) describes the issue of the accessing of barred owl sites: "Shooting the barred owl is not common sense. It isn't going to work. Much of the spotted and barred owl habitat is in unreachable terrain–with no road access–deep in areas such as the Gifford Pinchot National Forest or the Olympic National Forest, and at high elevations."[48] Although there may be some barred owl territories that are difficult to get to, people in the Northwest have been able to access nearly all the forested terrain for logging and find ways to transport heavy logs out of remote areas to distant markets. It may be more expensive to access certain remote areas due to longer travel times for biologists, but it would certainly be feasible. In another example, the editorial "Barred Owls Beware!" featured in *The Register-Guard* articulates concerns about long-term management particularly well by saying that barred owl removal is "an expensive and labor-intensive strategy. To keep even one of the targeted study areas free of owls for a decade, hunters would have to kill dozens of barred owls every year, and perhaps more. And once an area is cleared, what's to keep new barred owls, which have spread

[47] Lowell V. Diller, John P. Dumbacher, Raymond P. Bosch, Robin R. Bown, and R. J. Gutiérrez. "Removing barred owls from local areas: Techniques and Feasibility." *The Wildlife Society Bulletin* 38 (2013): 211-216. http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/BarredOwl/Documents/Diller.et%20al.2013BOremoval.pdf; Jeff Barnard, "Removing barred owls cheaper than thought," *The Associated Press*, 21 January 2014, http://www.washingtontimes.com/news/2014/jan/21/removing-barred-owls-easier-than-thought/?page=all

[48] "Shooting Barred Owls Doesn't Make Sense" [Editorial], *The Chronicle*, 15 June 2011, http://go.galegroup.com/ps/retrieve.do?sgHitCountType=None&sort=DA-SORT&inPS=true&prodId=STND&userGroupName=s8492775&tabID=T004&searchId=R3&resultListType=RESULT_LIST&contentSegment=&searchType=AdvancedSearchForm&currentPosition=1&contentSet=GALE%7CA258949353&&docId=GALE|A258949353&docType=GALE&role=

westward across the United States and Canada in recent decades and are now found throughout the spotted owls' range, from reclaiming [their] forest turf?"[49] These two articles express legitimate issues, but the removal of many if not most invasive species is a difficult process.

When barred owl management is placed within the framework of invasive species management in general, it seems much more realistic. Thus, although the views presented in these articles are not necessarily wrong, they do not show an informed view of invasive species management. To address the *Register-Guard* statement, the removal of invasive species in general is an expensive and labor-intensive activity, yet it is still conducted by numerous federal and state governmental agencies. The government funds invasive species removal for economic reasons such as reducing competition in agriculture and maintaining the functioning of hydropower facilities, and for ecological reasons such as maintaining biodiversity, high quality habitat, and water quality. Management of invasive species is common even at the household level in managing invasive weeds in yards for aesthetic values. The total cost of managing invasive species in the U.S. is estimated at $143 billion a year.[50]

In the Everglades, the US Fish and Wildlife Service has spent $720,000 annually since 2005 to control invasive constrictor snakes such as the Burmese python. Several endangered species have been found in the stomachs of Burmese pythons, such as wood storks and Key Largo woodrats. The US Fish and Wildlife Service has spent well over

[49] "Barred Owls, Beware!" [Editorial], *The Register-Guard*, 24 July 2013, http://www.thefreelibrary.com/Barred+owls,+beware!-a0338133926

[50] Chris Cusack, Michael Harte, and Samuel Chan, "The Economics of Invasive Species," Oregon Sea Grant, Oregon State University, 2009, http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g09001.pdf

$100 million on recovery programs for these two species.[51] Nutria are another invasive species that cause extensive damage to wetland ecosystems in many states in the U.S., including Oregon and Washington. The cost is high: Louisiana paid almost $2 million to private trappers in one season, and between 1999 and 2008 Louisiana and Maryland together spent $14.2 million for nutria removal efforts.[52] As these examples illustrate, the management of invasive species can be expensive, but is necessary to protect ecological function. The cost of experimental removal of barred owl is strikingly similar to the amount of money spent annually on constrictor snake removal in the Everglades; experimental barred owl removal will cost an estimated $2.91 million over four years, or $727,500 per year.[53]

News coverage of barred owl removal is often critical of the necessity for long-term management, but as in the cases of constrictor snake and nutria removal, long-term management is necessary in many cases of invasive species (these management programs have been going on for eight years or longer and may go on for many more). Although these two programs hope to eradicate nutria and constrictor snakes, the reality is that eradication is extremely difficult when species are no longer or not conventionally thought of as prized hunting species. The necessity of long-term management of invasive species of plants such as Himalayan blackberry is widely accepted. Even though the aggressive Himalayan blackberries can produce up to 13,000 seeds per square meter that remain viable for several years, the management of the

[51] "The Economic Cost of Large Constrictor Snakes," U.S. Fish and Wildlife Service, January 2012, http://www.fws.gov/home/feature/2012/pdfs/EconImpact.pdf
[52] Trevor Sheffels, and Mark Sytsma, "Report on Nutria Management and Research in the Pacific Northwest," Portland State University, December 2007, http://www.clr.pdx.edu/docs/CLR_nutria_report.pdf
[53] "Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Final Environmental Impact Statement," U.S. Fish and Wildlife Service, July 2013, http://www.fws.gov/oregonfwo/species/data/northernspottedowl/BarredOwl/Documents/ExecSummaryFinalEIS.pdf

species is common throughout the Pacific Northwest and its management along stream banks is deemed essential for promoting "desired riparian function."[54]

Although there have not been many instances where raptors have been removed to benefit populations of native birds, there have been examples of removing species of birds to benefit other endangered species of birds.[55] The Michigan Department of Natural Resources has been removing brown-headed cowbirds from the habitat of the Kirtland's warbler for more than four decades. As with the northern spotted owl, the Kirtland's warbler population plummeted due to habitat loss and the negative affects of another bird species, the brown-headed cowbird. Kirtland's warblers have specific habitat requirements (like the northern spotted owl) for nesting; they require stands of jack pine between the ages of six and twenty-two years old. Brown-headed cowbirds are considered parasites because they remove eggs from warbler nests and replace them with their own eggs to be raised by the warblers. The U.S. Fish and Wildlife Service, with help from several other agencies, began cowbird removal in 1972, and they have continued the management practice since then. In addition, the U.S. Fish and Wildlife Service clear-cuts thousands of acres of jack pine every year and replants them with two-year-old trees so that there will continuously be young stands of jack pine which the Kirtland's warbler depends on. These management practices have been successful; the species reached population low of 167 individuals in 1987 but has increased in number to 1,828 individuals in 2011.[56] This example is also important because it was a

[54] Bennett, Max, "Managing Himalyan blackberry in western Oregon riparian areas," Oregon State University 2006, http://pnw-ipc.org/docs/ManagingHimalayanBlackberry.pdf
[55] Kent B. Livezey, "Killing Barred Owls to Help Spotted Owls I: A Global Perspective," *Northwestern Naturalist*, 91 (2): 107-133. 2010.
[56] "Endangered Species: Kirtland's warbler Fact Sheet," U.S. Fish and Wildlife Service, 1 April 2014, http://www.fws.gov/midwest/endangered/birds/Kirtland/kiwafctsht.html

large management program: between 1975 and 1981 alone, more than 24,000 cowbirds were removed, and since 1972 a total of more than 100,000 cowbirds have been removed.[57] The removal of brown-headed cowbirds is further relevant because, like barred owls, they are generalists and affect many species. In addition to Kirtland's warbler, brown-headed cowbirds have been managed to benefit the least Bell's vireo, southwestern willow flycatcher, and black-capped vireo.[58] This massive long-term management of brown-headed cowbirds has been successful; wildlife managers have reached their goal of maintaining a population of Kirtland's warblers with at least 1,000 individuals. It is also worth noting that the conservation of the Kirtland's warbler was not initially successful. The U.S. Fish and Wildlife Service and Michigan Department of Conservation began efforts to save the Kirtland's warbler by only managing cowbirds without recognizing the habitat requirements of the Kirtland's warbler. It was not until the agency practiced *both* cowbird and habitat management that the population of Kirtland's warbler began its strong recovery.

The argument that controlling barred owl populations will be infeasible has a couple of holes in it. People have a long history of being extremely efficient at causing species to go extinct, despite large population sizes and species ranges. The passenger pigeon, flocks of which were so large and dense that they darkened the skies (some flocks were composed of billions of birds), went from being one of the most abundant birds in the 1840s to becoming extinct in 1914. The flocking behavior of the species

[57] Sean T. Kelly, and Michael E. DeCapita, "Cowbird Control and Its Effect on Kirtland's Warbler Reproductive Success," *The Wilson Bulletin,* 94.3 (1982): 363-365.; Solomon, B. D., "Impending Recovery of Kirtland's Warbler: Case Study in the Effectiveness of the Endangered Species Act," *Environmental Management,* 22.1 (1998): 9-18.
[58] Rebecca Siegle and Darrell Ahlers, "Brown-headed Cowbird Management Techniques Manual," U.S. Department of Interior, Bureau of Reclamation, 2004, http://www.usbr.gov/pmts/fish/Reports/Siegle_Cowbirdmanual.pdf

made it possible to kill or capture large numbers of the birds at a time.[59] If people are able to make species of birds go extinct so quickly, why would it not be feasible to control a population of invasive barred owls that is tiny in comparison to the historic passenger pigeon populations? Like the passenger pigeon, the barred owl has behaviors that make it easy to attract and remove. During a pilot study for removing barred owls, Diller and others found that barred owls consistently flew to a remote call device playing northern spotted owl calls. Diller is quoted in one news article, declaring, "Barred owls' aggression is their Achilles heel . . . When they hear another owl calling–barred or spotted–they fly to confront the intruder. Less wary than usual, they are easy targets."[60] Ironically, the barred owl's strong aggression, which has helped it displace northern spotted owl, also facilitates the ease of its removal.

Although the cost of experimental barred owl removal is comparable to the management of other invasive species, it is true that the experimental effort is only taking place in a small portion of the range of northern spotted owl (it is limited to four northern spotted owl study areas: one in Washington, two in Oregon, and one in California).[61] Should the experimental removal of barred owl prove effective in benefitting the northern spotted owl, it does not mean that barred owl will have to be managed across the entire range of northern spotted owl. For example, barred owl removal could continue to be performed in the areas of highest quality habitat for northern spotted owl or primarily in the eleven northern spotted owl study areas.

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[59]"Migratory Bird Program: A Guide to the Laws and Treaties of the United States for Protecting Migratory Birds," U.S. Fish and Wildlife Service, 11 April 2011, http://www.fws.gov/migratorybirds/regulationspolicies/treatlaw.html

[60]Mortensen, "Make this call in the wild," http://www.oregonlive.com/environment/index.ssf/ 2011/02/make_this_call_in_the_wild_sho.html

[61] Thorson, "Experimental Removal of Barred Owls," https://www.federalregister.gov/articles/2013/09/17/2013-22556/experimental-removal-of-barred-owls-to-benefit-threatened-northern-spotted-owls-record-of-decision

Ecological management is flexible. As Lowell Diller, the biologist who conducted pilot removal of barred owls, says, "You don't have to kill them all . . . A measured reduction in their numbers—10 to 20 percent—might be enough."[62] In areas where accessibility is the most difficult, and thus the mostly costly (as mentioned in the article featured in *The Chronicle*), biologists may simply choose to not manage barred owls (which are scattered throughout the range of northern spotted owl). The northern spotted owl study areas designated by the Northwest Forest Plan all have road access because biologists regularly conduct research in the areas.

In the preliminary trial of barred owl removal conducted in northern California, researchers found that it was more feasible and cost-effective than previously anticipated. It took an average of two hours to remove a barred owl, and the cost was estimated between $100 and $150 per bird. The authors determined it was technically feasible: they never had a misidentification (e.g., killed a northern spotted owl by accident) and were highly successful in killing barred owls with one shot. The authors observed that it is especially efficient to conduct barred owl removal in locations where previous demographic studies of northern spotted owl and/or barred owl have been conducted because historical nesting locations are known. The study also found that continued management (removing barred owls that had re-colonized sites) was cheaper than the initial removals.[63] This piece of information is important, since barred owl removal would need to be a long-term form of management. The cost of removal may

[62] Mortensen, "Make this call in the wild," http://www.oregonlive.com/environment/index.ssf/ 2011/02/ make_this_call_in_the_wild_sho.html

[63] Diller, Lowell V., John P. Dumbacher, Raymond P. Bosch, Robin R. Bown, and R. J. Gutiérrez. "Removing barred owls from local areas: Techniques and Feasibility," *The Wildlife Society Bulletin*, 38 (2013): 211-216, http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/BarredOwl/ Documents/Diller.et%20al.2013BOremoval.pdf

decrease over time. This study shows that removal of barred owl is efficient compared to other types of invasive species removal because barred owl's territorial aggression makes it easy to attract individuals. During the course of the study, the researchers made a couple of technical adjustments (such as adding a laser sight and a flashlight to their guns) that improved efficiency of removal. Furthermore, the Northwest Forest Plan calls for continued scientific studies of northern spotted owl. This allows for the ability to conduct barred owl removal in unison with demographic studies, further reducing overall costs and advancing scientific knowledge of barred owls and northern spotted owls. The experimental removal studies require the processing of the dead barred owls, which may reveal more evidence of the benefits of barred owl removal for other species.

C. Efforts to Save the Northern Spotted Owl Are Failures, No Hope for Recovery

Another misconception that appeared in news articles is that the Northwest Forest Plan and related efforts to save the northern spotted owls are failures. If one were to believe news articles, there is no hope for recovery of the northern spotted owl, and barred owl management will not work. In some ways, this notion is understandable. Northern spotted owl populations continue to decline dramatically: the species' annual population decline averaged 2.8 percent across its range, and was as high as 7.1 percent in Washington.[64] The species is state-listed as endangered in Washington and threatened in Oregon and California. And despite the government placing many millions of acres of habitat under protection from logging for two decades, northern spotted owl populations have not responded positively. However, these negative views

[64] Davis et al., "The Northwest Forest Plan The First 15 Years," ii, 14, http://www.fs.fed.us/pnw/pubs/pnw_gtr850.pdf

of northern spotted owl recovery efforts ignore the fact that the Northwest Forest Plan is designed as a flexible 100-year project.[65] We are only in the initial stages of a plan that has a time frame that people have difficulty comprehending. Furthermore, in Oregon and California, the populations are still listed as "threatened"—meaning that there are enough individuals in the population to have a relatively good chance of recovery, should the threats be reduced.

Of the news articles I reviewed, six considered the efforts to save northern spotted owl as failures. According to these accounts, barred owl management is a hopeless, last-ditch effort for saving northern spotted owls. The following two quotes are exemplary of the six articles that depicted spotted owl efforts as failures. An article from *Targeted News Source* reported, "Twenty years after the Northern Spotted Owl was added to the Endangered Species Act (ESA) list, and years of failed management under the Northwest Forest Plan, these forests and the benefits they provide are in jeopardy."[66] And an editorial from the *Corvallis Gazette-Times* depicted barred owl removal as "a tinge of desperation . . . to give the northern spotted owl one more shot at survival? That doesn't sound like an effective strategy to give the spotted owl a leg up in its competition with the barred owl. But, frankly, it doesn't seem that anything has worked for the spotted owl. And, maybe, nothing will. Maybe it's time to recognize that humans sometimes are powerless to intervene in the workings of

[65] Rapp, "Northwest Forest Plan, the first 10 years," 2, http://www.fs.fed.us/pnw/publications/pnw_gtr720/pnw_gtr720a.pdf

[66] "Spotted Owl Proposal Doubles Down on Policies that Harm Forest Health, Rural Economies and Ignores Barred Owl Impact," *Targeted News Service*, 17 July 2012, http://go.galegroup.com/ps/i.do?id=GALE%7CA293377526&v=2.1&u=s8492775&it=r&p=STND&sw=w&asid=32a66334f03df98da1f6504048bab0d0

nature."[67] These articles, like many others covering barred owl management, are pessimistic, deeming past efforts to save the northern spotted owl as failures and new efforts at barred owl management as unlikely to help. Although it is understandable that some people are frustrated with the continued decline of northern spotted owl, it is still too early to declare spotted owl recovery efforts failures.

There are many reasons to believe that northern spotted owl populations will recover. To analyze the success of the Northwest Forest Plan, it is important to place it into a proper timeframe. We are in just the initial stages of the plan, and although it has restricted logging on millions of acres of federal land, this does not necessarily mean there is currently a large amount of habitat available for northern spotted owl. Of the late successional reserves that are protected under the Northwest Forest Plan, most of them are young or mature Douglas-fir forests, meaning that they are not yet old-growth.[68] These forests have been set aside so that in the future (whether that is 50, 100, or 150 years from now) there will be old-growth forests that will provide more habitat for the species that rely on them. This demonstrates that the Northwest Forest Plan cannot be considered a failure in its attempts so far to save the northern spotted owl—it is simply a work in progress. Barred owl management is necessary so that the northern spotted owl can survive to make use of future increases in habitat.

Furthermore, the Northwest Forest Plan has been successful in its call for continued scientific research. For that matter, the plan can be viewed as a success for simply identifying barred owls as a primary threat to northern spotted owls and

[67] "Shooting barred owls; the best we can do? [Editorial]," *Corvallis Gazette-Times*, 1 August 2013, http://www.gazettetimes.com/news/opinion/editorial/editorial-shooting-barred-owls-the-best-we-can-do/article_c3edfd7a-fa83-11e2-9bae-0019bb2963f4.html
[68] Diaz, "Proceedings: Views From the Ridge," 88-89, http://www.fs.fed.us/pnw/pubs/gtr596.pdf

determining how the species affects the northern spotted owl. Research on the northern spotted owl has not only revealed how the species interacts in the Pacific Northwest, but has also provided insight into the habits of owls and even raptors in general. It has become the most studied species of raptor in the world and the most studied endangered species.[69] The removal of barred owls calls for accompanying scientific studies that not only measure northern spotted owls' recolonization success, but also process the barred owls for the potential impact of pesticides on the species.[70] Research on the habitat requirements for the northern spotted owl informs management plans to determine the minimum size of habitat reserves. Barred owl removal has the potential to be extremely informative for future avian recovery projects and has illuminated the behavior of the owls and raptors in general. As Rocky Gutiérrez, a prominent researcher of the northern spotted owl, states, "The strong applied nature and single-species focus of this research has the potential, I believe, to overshadow its general application to ornithology and ecology." Here Gutiérrez is describing that the impact of spotted owl research extends beyond the survival of northern spotted owl—it has significantly advanced the fields of wildlife sciences and environmental management. Northern spotted owl research has demanded the creation of novel data analysis metrics such as habitat fitness potential and techniques that increased the efficiency of analyzing huge quantities of population data, which can be used for studying other species.[71] In addition, conservation of the

[69] Rocky Gutiérrez, "Spotted Owl Research: A Quarter Century of Contributions to Education, Ornithology, Ecology, and Wildlife Management," *The Condor,* 110.4 (2008): 792-798.
[70] Jeff Barnard, "Owl vs. Owl: Feds begin killing barred owls in experiment to help spotted owls," *Associated Press,* 21 December 2013, http://www.peninsuladailynews.com/article/20131221/NEWS/131229996/owl-vs-owl-feds-begin-killing-barred-owls-in-experiment-to-help
[71] Habitat fitness potential—a standard of measurement that quantifies the relationship between demography and habitat selection, while taking into account survival and reproduction within specific habitat conditions.

northern spotted owl based on sound scientific findings has set a precedent for future conservation plans.[72]

The central role of science in the Northwest Forest Plan is exemplified in the plan's emphasis of adaptive management. The Northwest Forest Plan is one of the first attempts at large-scale adaptive management for forest ecosystems in the country. An adaptive approach addresses the fact that restoration projects often do not succeed as initially planned and require changes in order to meet their stated goals. The reasons for restoration projects not developing as planned are numerous: it is impossible to obtain complete knowledge of ecosystem functions and relationships, and unforeseen or stochastic events occur during the course of many projects. A definition that emphasizes adaptive management as a process is:

> "adaptive management treats actions and policies as experiments that yield learning. An adaptive approach mimics the scientific method: It specifies hypotheses, highlights uncertainties, structures actions to expose hypotheses to field tests, processes and evaluates results, and adjusts subsequent actions in light of those results. In an adaptive approach, actions and policies are undertaken based on the best available knowledge and they are implemented in such a way as to produce new understanding that can inform subsequent actions."[73]

Because adaptive management was clearly articulated in the drafts of the Northwest Forest Plan, barred owl management should not be viewed as a management activity separate from the Northwest Forest Plan, but as a part of the plan's adapted course of action over time. In fact, the overview report, *First-Decade Results of the Northwest Forest Plan*, states: "Adaptive management—learning while managing,

[72] Rocky Gutiérrez, "Spotted Owl Research: A Quarter Century of Contributions to Education, Ornithology, Ecology, and Wildlife Management," *The Condor*, 110.4 (2008): 792-798.
[73] George H. Stankey, Bernard T. Bormann, Clare Ryan, Bruce Schindler, Victoria Sturtevant, Roger N. Clark, and Charles Philpot, "Adaptive Management and the Northwest Forest Plan: Rhetoric and Reality," *Journal of Forestry* 101 (2003): 40-46.

through deliberate testing, monitoring, and change—is a vital part of the Plan's approach." Thus, barred owl removal should not be viewed as a costly addition to spotted owl recovery, but as an adjustment resulting from the accumulated knowledge of the increased presence of barred owls in Pacific Northwest forests (and from the negative impact on northern spotted owl) since the inception of the Northwest Forest Plan.

Forest Service managers will never be perfect in their efforts to manage these protected forests because of the complexity and dynamic nature of the matrix of forest stands. Some of the large-scale changes in these forests are part of their normal functioning, and some are related (directly or indirectly) to significant human alterations. Many dramatic changes in the ecosystem are bound to occur over the course of the 100 years of the plan due to climate change, insect infestations, fire outbreaks, and invasions of foreign species. As with the barred owl, it is important that these adverse circumstances are not viewed as failures of the plan to protect the old-growth ecosystem, but as successes for the plan to be able to identify problems through long-term monitoring studies and ensuing adaptations of management actions. It is important that the public be informed of environmental management. Government documents are incredibly lengthy and tedious to read, so the U.S. Fish and Wildlife Service and Forest Service need to take more active roles in communicating the ideas underlying management goals and objectives to other the government agencies, news media, and the general public.

There are many reasons that the adaptive approach to barred owl removal signifies hope for the survival of the northern spotted owl. The species is still listed as

threatened in Oregon and California, as opposed to its endangered status in Washington. The population of northern spotted owl throughout its range is at least several thousand individuals.[74] For comparison, the population of bald eagles in the contiguous United States dipped below 500 nesting pairs in 1963, which resulted in the species being listed as endangered. Since then, the species has recovered to a healthy population of almost 10,000 breeding pairs as of 2006.[75] Not only does this example put the population status and potential recovery of northern spotted owl in perspective, but it also demonstrates the lengthy time-span involved in the recovery of endangered species. The bald eagle was not removed from the endangered species list until 2007, forty years after it was listed under the Endangered Species Preservation Act (legislation prior to the Endangered Species Act). Although the decline of the bald eagle population can be attributed to problems (DDT and hunting) distinct from those that threaten the northern spotted owl, the example of the bald eagle illuminates a sense of time that should be applied to the recovery of northern spotted owl.[76]

News of preliminary barred owl removal studies show promising results for northern spotted owls. The Canadian government has recently begun efforts to remove barred owls from northern spotted owl habitat in British Columbia. Preliminary results have found that northern spotted owls returned to nine out of seventeen sites where barred owls were removed. At these sites thirteen spotted owls were found; eight adults

[74] Dugger et al., "The Northwest Forest Plan The First 15 Years," 11.
[75] "Bald Eagle: Fact Sheet Natural History, Ecology, and History of Recovery," U.S. Fish and Wildlife, last modified June 2007, http://www.fws.gov/midwest/eagle/recovery/ biologue.html; "Bald Eagle: Chart and Table of Bald Eagle Breeding Pairs in Lower 48 States," U.S. Fish and Wildlife, last modified March 18, 2013, http://www.fws.gov/midwest/eagle/population/ chtofprs.html
[76] "Bald Eagle: Fact Sheet Natural History, Ecology, and History of Recovery," U.S. Fish and Wildlife, last modified June 2007, http://www.fws.gov/midwest/eagle/recovery/ biologue.html

and five young.[77] Some northern spotted owls reoccupied nesting sites within one year.[78] This data is especially inspiring considering that some population estimates of northern spotted owls in British Columbia total ten individuals.[79] This may indicate that northern spotted owls can recover quickly following the removal of aggressive barred owls from highly valued nesting sites. Starting in 2006, wildlife biologist Lowell Diller conducted a pilot study in association with the California Academy of Sciences in northern California on private land. In the Green Diamond study area, there is an abundance of high quality habitat. Nonetheless, northern spotted owl populations started to decrease in the early 2000s, coinciding with increases in barred owl populations in the area. Diller presented his results halfway through the study at the Western Raptor Symposium in 2011: northern spotted owls continued to leave nesting sites in control areas (where barred owls were not removed), while the number of occupied northern spotted owl nesting sites increased "dramatically" in treatment areas (where barred owls were actively removed). He found that northern spotted owls reoccupied all of the nesting sites that barred owls were removed from, in a short time period ranging from a few weeks to one year.[80] These findings were reaffirmed at the conclusion of his study.

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[77] "Shooting of owls OK'd to protect endangered species," *The Canadian Press*, 27 Jan. 2013, http://www.cbc.ca/news/canada/british-columbia/shooting-of-owls-ok-d-to-protect-endangered-species-1.1308126; "Pondering the nature of politics," *Salmon Arm Observer*, 8 February 2013, http://go.galegroup.com/ps/i.do?id=GALE%7CA318081204&v=2.1&u=s8492775&it=r&p=STND&sw=w&asid=03a06a20c64442581b65008aa0f88a15; Dene Moore, "In B.C., to keep one owl alive, another species must die," *Globe & Mail*, 28 January 2013, http://go.galegroup.com/ps/retrieve.do?sgHitCountType=None&sort=DA-SORT&inPS=true&prodId=STND&userGroupName=s8492775&tabID=T004&searchId=R5&resultListType=RESULT_LIST&contentSegment=&searchType=BasicSearchForm&currentPosition=4&contentSet=GALE%7CA316574655&&docId=GALE|A316574655&docType=GALE&role=

[78] "Barred Owl: Frequently Asked Questions," U.S. Fish and Wildlife Service: Oregon Fish and Wildlife Office,10 September 2013, http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/BarredOwl/FAQ.asp#Status

[79] "Shooting of owls OK'd"; "Pondering the nature of politics"; Moore, "In B.C., to keep one owl alive, another species must die."

[80] Lowell V. Diller, "Preliminary Results of Controlling the Barred Owl Threat after Two Decades of

In January of 2014, Diller described the results of his finished study in the *Wildlife Society News* in 2014: "After nearly five years of research . . . We found that virtually 100 percent of the sites freed from barred owls have been rapidly re-occupied—within the same breeding season—by spotted owls, and the number of occupied spotted owl sites has increased in the removal areas."[81]

Although the studies discussed are small, they indicate that northern spotted owls respond incredibly well to barred owl removal. These results coupled with findings that the cost of removing the barred owls was cheaper than thought and the method of removal was found to be fast and effective, give hope for the survival of the northern spotted owl. Although Diller found that spotted owl pairs were displaced by new barred owls at two nesting sits, this process took three to four years after the initial barred owl removal.[82] This barred owl recolonization confirms that barred owls will continue to move in and displace spotted owls, and will require consistent removal, but may only be required at infrequent intervals of time. Thus, there is a hopeful outlook for the survival of northern spotted owls, should barred owl management be implemented.

IX. Conclusion

Efforts to save the northern spotted owl are an essential part of the one of the largest ecosystem management efforts in our country's history. Few environmental management plans have been as controversial or had as many economic, cultural, and

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Research and Monitoring to Meet the Habitat Needs of Northern Spotted Owls" [Lecture], *Western Raptor Symposium: The Western Section of the Wildlife Society and Wildlife Research Institute,* 9 February 2011, Riverside California, http://www.wildlifeprofessional.org/western/raptor/TWS-WS_2011_Raptor_Symp_Feb09_0955_Diller-web.pdf

[81] Lowell V. Diller, "To Shoot or Not to Shoot: The Ethical Dilemma of Killing One Raptor to Save Another," *The Wildlife Society News,* January 17, 2014, http://news.wildlife.org/featured/to-shoot-or-not-to-shoot/

[82] Lowell V. Diller, "Preliminary Results of Controlling the Barred Owl," http://www.wildlife professional.org/western/raptor/TWS-WS_2011_Raptor_Symp_Feb09_0955_Diller-web.pdf

ecological impacts as the Northwest Forest Plan. At this point, the management of the invasive barred owl appears essential to the survival and potential recovery of the northern spotted owl.

News organizations, however, have covered the issue of removing barred to benefit northern spotted owls in largely a negative way that disseminates many misconceptions of the management. Contrary to portrayals in news articles, barred owl management is comparable in cost to other examples of invasive species removal. Furthermore, preliminary studies demonstrate that the physical act of barred owl removal is time-effective and the lethal removal techniques are swift. Although the primary benefit of removing barred owls is to aid the recovery of northern spotted owls, news articles do not even hint at the idea of barred owls having negative effects on any other species. Many articles have covered the issue by placing one owl vs. the other, ignoring the complexities of the issue that are essential to forming a basic understanding. Numerous articles have depicted barred owl removal as a last ditch effort to save the northern spotted. There is hope for the survival of northern spotted owl, as seen in the results from pilot removal studies. Barred owl removal is an adaptive management initiative that should be viewed as an action directed by the Northwest Forest Plan. The portrayal of barred owl removal in the news is important because a large portion of the American public obtains information on current events through news coverage. In addition, taxes fund barred owl removal, and it is therefore necessary that the public receive accurate information regarding the allocation of their tax dollars.

A quick Internet search of “barred owl removal” reveals that news coverage dominates the first few pages of results. Sixteen of the first forty results for a Google

search on “barred owl removal” are news articles, while only seven are governmental documents, agency web pages, or scientific articles. Of the first forty results, ten are from environmental organizations, which are likely to cover the issue to further their agenda. The first result of the search was the draft environmental impact statement for experimental removal of barred owls, but this document is longer than four hundred pages, and therefore unlikely to be read by the general public. The results from this brief search reiterate that news organizations play an important role in delivering information on barred owl removal to the general public, and therefore help shape the public’s understanding of the issue.

Although the Northwest Forest Plan is effective because it is a form of management based on the best science available, the publication of long documents that dryly describe that science is not an effective way of communicating information to the masses. The U.S. and Wildlife Service need to establish a better mode of communication with news organizations so that the public can receive informative, yet interesting articles. One piece that was duplicated repeatedly (or quoted often) in news articles was the article by biologist Lowell Diller, “To Shoot or Not to Shoot: The Ethical Dilemma of Killing One Raptor to Save Another.” This article reported the results of his pilot study in northern California, but was written in a story-like form. He included a description of the ethical dilemma he felt during his first barred owl removal. This combination of informative coverage of a subject coupled with the strong human component is what newspapers are looking to do themselves.

If the U.S. Fish and Wildlife Service could put out information in a fashion similar to Diller’s article—that combines ecology and narrative—the agency may

produce more favorable views of controversial subjects such as barred owl removal, or at the very least spread accurate information. In addition, it would be more effective for the agency to distribute information to the general public by interspersing science within a narrative, rather than relying on newspapers to do so. The ethical issues involved in barred owl removal necessitate better communication between the U.S. Fish and Wildlife Service and the media in order to disseminate more accurate portrayals of the management. The U.S. Fish and Wildlife Service will have to address many similar management issues regarding invasive species in the future as many species are expanding and contracting their ranges due to climate change and continued changes in land use.[83]

These environmental issues—climate change, changes in land-use, and impending extinction of species—are issues that will continue to prompt controversial forms of management (or prompt controversies from failing to manage these issues). Effective management will require continued involvement because the government owns substantial amounts of land and is a prominent force in environmental management. These issues are inherently complex and are brought to mass attention at the interface of the governmental, scientific, news, and public spheres. In future controversies, governmental agencies and the scientific community will need to find a better way of communicating scientific information in a form that is easy to read and that will reach the masses.

[83] Livezey, Kent B. "Killing Barred Owls to Help Spotted Owls II: Implications for Many Other Range-Expanding Species." *Northwestern Naturalist* 91.3 (2010): 251-270.

Appendix

Timeline of U.S. Fish and Wildlife Document Releases, News Articles, and Diller Preliminary Study Publications			
Title	**Date**	**Type of Publication**	**Misconception**
"Draft Revised Recovery Plan for the Northern Spotted Owl"	September 2010	USFWS draft Revised Recovery Plan	_____
"The hooobris of hooomans may be deadly to barred owls"	February 10, 2011	News Article	A
"Mercy Killing?: Plan would kill barred owls to save spotted owls"	June 13, 2011	News Article	B
"Shooting Barred Owls Doesn't Make Sense"	June 15, 2011	News Article	B
"Revised Recovery Plan for Northern Spotted Owl"	June 30, 2011	USFWS final Revised Recovery Plan	_____
"Environmentalist Wisdom: Shoot One Owl to Save The Other: The feds take battle between spotted owls and barred owls"	July 30, 2011	News Article	A
"Update on Experimental Removal of Barred Owls in Support of Northern Spotted Owl Recovery"	August 2011	USFWS News Release	_____
"Wildlife officials weigh an ethical dilemma: Killing barred owls to benefit spotted owls"	February 28, 2012	News Article	None
"Spotted owl recovery plan calls for killing barred owls and designating habitat, but allowing logging"	February 28, 2012	News Article	None
"Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Draft Environmental Impact Statement"	March 2012	USFWS Draft EIS	_____
"Owl vs. Owl"	March 3, 2012	News Article	None
"Targeting the Competition:	March 4, 2012	News Article	A & B

Salazar pulls trigger on plan to kill barred owls”			
“Whoo’s Dat?: Study Reveals that barred owl is a menace to northern spotted owl”	April 13, 2012	News Article	A & B
“Spotted Owl Proposal Doubles Down on Policies that Harm Forest Health, Rural Economies and Ignores Barred Owl Impact”	July 17, 2012	News Article	C
“Government to double habitat for spotted owl”	November 22, 2012	News Article	None
“Shooting of owls OK'd to protect endangered species”	January 27, 2013	News Article	None
“In B.C., to keep one owl alive, another species must die”	January 28, 2013	News Article	None
“Is owl cull the only answer?”	January 30, 2013	News Article	None
“Pondering the nature of politics”	February 8, 2013	News Article	A
“Scientists examine rat poison on pot farms as possible spotted owl threat”	May 28, 2013	News Article	None
“Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls: Final Environmental Impact Statement”	July 2013	USFWS Final EIS	_____
“U.S. Fish and Wildlife Service plans to start shooting barred owls”	July 23, 2013	News Article	A & C
“Feds advance plan to kill 3,603 barred owls in the Pacific Northwest”	July 23, 2014	News Article	A
“To save spotted owl, Fish and Wildlife targets barred owls in Douglas County”	July 24, 2013	News Article	A & C
“Barred Owls, Beware!”	July 24, 2013	News Article	B
“Agency may kill one type of owl to save another”	July 25, 2013	News Article	A
“Killing barred owls to save spotted owls? Wildlife managers should proceed with their test”	July 27, 2013	News Article	A

"U.S. owl hunt could save species from extinction"	July 29, 2013	News Article	A
"Shooting Barred Owls; the best we can do?"	August 1, 2013	News Article	C
"U.S. barred owls targeted as threat to other species"	August 13, 2013	News Article	A
"Animal rights group files lawsuit to stop barred owl shooting"	October 2, 2013	News Article	None
"Oregon Views: Suit against barred owl killing silly"	October 23, 2013	News Article	A & C
"Experimental Removal of Barred Owls to Benefit Northern Spotted Owls: Record of Decision"	September 2013	USFWS Record of Decision	_____
"Removing Barred Owls from Local Areas: Techniques and Feasibility"	December 13, 2013	Diller Scientific Feasibility Study	_____
"Feds begin killing barred owls to help spotted owl"	December 20, 2013	News Article	None
"To Save Threatened Owl, Another Species is Shot"	January 16, 2014	News Article	None
"To Shoot or Not to Shoot: The Ethical Dilemma of Killing One Raptor to Save Another"	January 17, 2014	Diller News Article	_____
"Removing barred owls easier than thought: Study finds it's also cheaper, could aid northern spotted owl"	January 28, 2014	News Article	A
"Report: Barred owls ousting spotted owls in the Northwest"	February 24, 2014	News Article	None
"Northern spotted owls are being ousted by barred owl invaders"	February 24, 2014	News Article	None
"Why are spotted owls more important than other owls—and people?"	May 7, 2014	News Article	C

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