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From Planning to Implementation: Streamlining Compliance for U.S. Rodent Eradications

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ABSTRACT: Implementing rodent eradication projects on federally owned islands in the U.S. can take 10 or more years to plan and often accounts for more than 50% of total project expenses. Consequently, identifying ways to improve planning efficiency by streamlining the compliance process will allow land managers to restore more islands, thereby increasing ecosystem productivity and improving species resilience. The compliance process, defined here as fulfilling National Environmental Policy Act requirements and securing all necessary state and federal permits, creates a valuable and robust framework to examine goals, develop alternatives, assess anticipated impacts, establish partnerships, and engage the public. Additionally, it provides permitting agencies and the public an opportunity to participate in the planning process. One significant challenge to the planning process is that many variables that need to be accounted for early in the process are social, economic, or political in nature and are frequently overlooked, downplayed, or disregarded. We reviewed the planning documents for several rodent eradication projects and identified areas where the process could be streamlined, described lessons learned, and made recommendations for future projects. Streamlining can be achieved by identifying programmatic solutions, understanding social and political constraints, and developing a robust, transparent assessment of a range of alternatives.

KEY WORDS: compliance, environmental planning, invasive species, islands, National Environmental Policy Act (NEPA), rodent eradication, stakeholders

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INTRODUCTION

Invasive Species on Islands

The Earth has approximately 100,000 islands, many of which are important biodiversity hotspots made up of fragile ecosystems that are home to some of the most unique species in the world (CBD 2010). Island ecosystems are key areas for biodiversity conservation worldwide since they represent less than 5% of the planet's land mass, yet are home to 39% of critically endangered species (Diamond 1985, Diamond 1989, Olson 1989, Whittaker 1998). Island species are more susceptible to environmental stressors that cause extinctions as a result of their small population sizes and limited habitat availability. In addition, island species have adapted in isolated environments making them particularly vulnerable to impacts from invasive species (Diamond 1985, Diamond 1989, Olson 1989).

It is widely accepted that the natural world is facing a very high rate of species extinction (Raup 1988); that most recent extinctions can be directly attributed to human activity (Diamond 1989); and that for ethical, cultural, aesthetic, and economic reasons this current rate of extinction is cause for considerable concern (Ehrlich 1988, Ledec and Goodland 1988). One of the major worldwide causes of anthropogenic extinctions is the introduction of invasive species. Of the 245 recorded animal species extinctions since 1500, 75% were species endemic to islands (World Conservation Monitoring Centre 1992). Invasive species were at least partially responsible for a minimum of 54% of documented island extinctions, based on the 170 island species for which the cause of extinction is known (Ricketts et al. 2005).

Benefits of Eradicating Invasive Rodents

The effects of invasive species on islands accounts for 80% of all species extinctions recorded so far (Clavero and Garcia-Berthou 2005). Half of these recorded extinctions were caused by invasive alien vertebrates (IAV) such as rats, mice, pigs, goats, etc. Rodents (rats and mice), the most prolific of all invasive vertebrates, are estimated to have been introduced to more than 80% of the world's islands as the result of human activities (Atkinson 1985). Invasive species continue to invade new islands today with the ever-increasing movement of people and goods around the world. When introduced to islands, invasive species upset an island's natural equilibrium and severely impact native plants and animals that lack adaptations to protect themselves from the intruders. There is a relatively simple, efficient, and cost effective solution to this island-species extinction crisis: when invasive species are removed from islands, native plants, animals, and ecosystems recover with little or no additional intervention. Combined with effective biosecurity, the eradication of invasive species is one of the most effective ways to protect threatened island biodiversity.

As a consequence of pioneering rodent eradication efforts in New Zealand during the 1970s, eradication projects have successfully removed rodent from 571 islands in more than 50 countries around the world (Howald et al. 2007, Keitt et al. 2011). Moreover, there have been 19 successful rodent eradications in the United States (Keitt et al. 2011). These successes have invariably resulted in species and ecosystem recovery and almost certainly saved some species from extinction

(Bellingham et al. 2010). For example, the successful eradication of black rats (*Rattus rattus*) from Anacapa Island (Channel Islands, California) more than 10 years ago resulted in an increased abundance of the Scripps murrelet (*Synthliboramphus scrippsi*) and the reemergence of the rare ashy storm-petrel (*Oceanodroma homochroa*) (NPS 2014). In the last 20 years, eradication of rodents from islands has become one of the most effective and powerful tools to prevent extinctions and restore ecosystems (Carrion et al. 2011). Since eradication projects are logistically complex, expensive, and controversial, they require a solid foundation of operational, legal, administrative, and communications support to ensure the successful removal of the target population (Morrison et al. 2011).

The Need to Streamline

The successful eradication of black rats from Anacapa in 2002 was the first-ever invasive rodent eradication from an entire island where an endemic rodent was present and the first aerial application of a rodenticide in North America for eradication purposes (Howald et al. 2009). This conservation success sparked a wave of rodent eradication efforts on federally-owned islands in the U.S. The science illustrating the need for rodent eradications and the benefits of rodent removal to island ecosystems has been well documented. Furthermore, several eradication tools have been used successfully on hundreds of projects around the world with minimal long-term negative consequences. However, since Anacapa Island was the site of the first rodent eradication in the U.S. to aerially broadcast rodenticide bait for eradication purposes, a National Environmental Policy Act (NEPA) analysis was required. An Environmental Impact Statement (EIS) was prepared along with numerous state and federal permits. The compliance process was relatively rigorous and took more than a year-and-a-half to complete, paving the way for subsequent projects using similar techniques in the U.S.

Since the successful removal of rats from Anacapa Island, federal land managers have worked with eradication experts to plan and implement more than 10 additional island rodent eradication projects (Keitt et al. 2011). A majority of these projects successfully eradicated the target species with little to no long-term negative side effects to island ecosystems including Palmyra Atoll, Mokapu Island, Egmont Cay, Mokolii Island, and Alau Island. Rats were successfully removed from Rat Island; however, experts did not anticipate the mortality of over 300 glaucous-winged gulls (*Larus glaucescens*) and over 40 bald eagles (*Haliaeetus leucocephalus*) from the implementation of the project (Ornithological Council 2010). Recently, Desecheo Island and Wake Atoll projects were implemented according to plan; however, on Desecheo Island the eradication team failed to fully eradicate the target species, while on Wake Atoll the team successfully eradicated Asian rats (*R. tanazumi*) but not Polynesian rats (*R. exulans*) (Griffiths 2014).

The recent mistakes in the U.S., coupled with a growing concern over the use of rodenticides on the mainland and their negative impacts to wildlife, children, and pets (Daniels 2013), has complicated the compliance

process for projects that are currently in the planning stages, and as a result these projects are being held to a higher standard requiring more rigorous analyses, additional public scrutiny, and supplemental compliance processes. For example, the proposed mouse eradication on the South Farallon Islands has been in the planning stages for over 10 years. The additional years of planning are the result of emerging information about the effects of rodenticide residues after eradication projects, greater evidence of non-target species take during eradication projects, and an increased concern over the potential for a project to fail. In addition, there has been a surge in stakeholder engagement, agency concern over impacts to resources, as well as concerns over losing the use of rodenticides for invasive rodent management in general. For these reasons, a systematic, transparent problem-oriented approach should be used to identify social and political constraints, identify areas for programmatic planning solutions, and provide opportunities for stakeholder engagement in an effort to more efficiently complete the planning process for conservation purposes. Therefore, the goal of a streamlining process should be to increase capacity to better anticipate risks and mitigate potential impacts; create opportunities to gain understanding of the project benefits and risks; provide an accurate and complete analysis of the costs and benefits of a proposed project; and enable stakeholders to make informed decisions on how and whether a project should proceed, as well as outline a clearly defined permitting process.

FROM PLANNING TO IMPLEMENTATION The Role of Environmental Compliance in Project Implementation

An assessment of environmental impacts under NEPA is required for all activities that have the potential to cause “significant harm to the human environment” (42 USC 4321-4347). Environmental Impact Assessment (EIA) is a formal analysis used to forecast the environmental consequences of any project implemented on federal land, as well as projects that involve federal funds or personnel. The purpose of developing a robust EIA is to ensure that any potential problems are identified and addressed early in the planning and design of a project. In addition, EIAs enable decision-makers to weigh the environmental costs and benefits of a project at an early stage (Ingole 2007). NEPA requires federal agencies to consider environmental issues prior to making any major decisions on projects that have federal involvement (e.g., funding or permitting). To determine a project’s potential benefit or harm to the environment, NEPA requires an assessment of environmental impacts and an evaluation of alternatives through the development of an Environmental Assessment (EA) or EIS (42 USC 4321-4347). In addition, EIAs provide the background and evidentiary support needed for other permits that are typically required for large projects.

The compliance process can take anywhere from 2 to 10 years or more to complete for rodent eradication projects in the U.S. Navigating the compliance process can be quite cumbersome and complicated, since the level of detail required is typically dictated by the perceived

risks rather than the actual biological, social, or economic risks. Stakeholders can play a powerful role in the outcome of the planning process, as NEPA is a procedural law that only outlines the steps necessary to complete the process, while the courts interpret the policy and determine the scope of work. Active stakeholders that are not properly engaged in the planning process can create unanticipated regulatory requirements, resulting in projects that are often behind schedule and over budget. For these reasons, agency consultation and stakeholder engagement should be incorporated into the early phases of planning and continued throughout the compliance process. Furthermore, stakeholders that are engaged in the planning process are less likely to seek injunctions, require additional analyses, or disseminate misinformation (Clark 2002).

NEPA Analysis

The National Environmental Policy Act of 1970 was the first law written to establish a broad national framework for environmental protecting. The basic premise of NEPA is to ensure that the federal government properly considers the environment prior to initiating any major federal action that has the potential to significantly affect the environment (42 U.S.C. § 4321 et seq.). NEPA analysis includes the completion of either an EA or an EIS, depending on the predicted affects to the environment, the economy, and cultural and historic resources.

An EA as described in Section 1508.9 of CEQ's NEPA Regulations is a concise public document that has 3 defined functions: providing sufficient evidence and analysis to determine if an EIS is necessary, acting as the agency's compliance analysis if an EIS is unnecessary, and facilitating the preparation of an EIS (EPA 2014). Since the EA is a concise document, it should not contain long descriptions or detailed data that the agency may have gathered. Rather, it should contain a brief discussion of the need for the proposal, alternatives to the proposal, the environmental impacts of the proposed action and alternatives, and a list of agencies and individuals consulted Section 1508.9(b). Agencies should make the Finding of No Significant Impact (FONSI) and the EA available for 30 days of public comment and review before taking action Section 1501.4(e)(2) (CEQ 1981).

An EIS, on the other hand, is a detailed environmental analysis that serves to assure the public and permitting agencies that the policies and goals defined in NEPA are incorporated by federal agencies into planning decisions. EISs are generally prepared for projects that are likely to have significant environmental impacts. The EIS should provide a discussion of potential environmental impacts and a reasonable range of alternatives (including a No Action alternative) designed to meet the goals and objectives of the project, as well as avoid or minimize adverse impacts and enhance the quality of the human environment. Agencies should allow at least a 45-day comment period for Draft EISs and a 30-day review period for Final EISs (EPA 2014). The EIS process is the more streamlined approach for rodent eradication since the majority of recent projects have come under heavy public scrutiny over the use of rodenticides, the ability to

successfully eradicate the target species, and the perceived risks to non-target species and the marine environment.

Rodent eradication projects are often perceived to have significant impacts to biological, social, or economic resources regardless of the actual long term risks from the operation. For this reason, it is recommended to proceed with a Draft EIS and subsequently to convert the document to a Finding of No Significant Impact (FONSI) if impacts are determined not to be significant with appropriate mitigation. The clear advantage to this method is that a lot of time, money, and other resources can be saved by avoiding a 2-step EA-EIS process, if an EIS is determined to be required. Similarly, if the EIS analysis illustrates that there are no potential significant affects, a FONSI can be used as the final decision document. Moreover, starting with an EA and then determining that there are likely to be significant issues that require the preparation of an EIS, would entail starting from the beginning of the EIS process with public scoping. This can add anywhere from 1 to 5 additional years of planning to the process (Eccleston 2008). As an example, the proposed mouse eradication on the Farallon Islands began as an EA; however, after several years and multiple public meetings, it was determined that an EIS would need to be prepared requiring FWS to begin with public scoping and adding at least 3 additional years to the planning process.

Agency and Stakeholder Engagement

Environmental problems, like introduced rodents on islands, and subsequent eradications are often complex, multi-scale issues that affect a large array of stakeholder and agencies. Additionally, most projects have a great deal of uncertainty associated with the outcome of the operation, since it is difficult to accurately predict conservation benefits from large-scale ecosystem-wide projects. As a result, projects of this capacity require transparent decision-making, early and ongoing outreach with relevant stakeholders, and the ability to be flexible to changing circumstances (Reed 2008). Furthermore, Reed (2008) recommends that "participation should be considered as early as possible and throughout the process, representing relevant stakeholders systematically" to avoid unanticipated outcomes.

Stakeholder engagement includes outreach and communication with permitting agencies, interested parties, and relevant interest groups. Early engagement with permitting agencies provides an opportunity to determine the information, data, and field trials needed to issue a permit, as well as create an inclusive atmosphere that promotes collaboration and support for the project. Early engagement with interest groups will help identify the public's perceived risks of the project, as they are usually different than the actual biological, economic, or social risks of the operation. By engaging with stakeholders early in the process, it is possible to address the public's specific concerns, allow them to feel directly involved in the process, gain the public's trust, potentially avert the spread of misinformation, and clarify technical aspects of a project that are difficult to understand. In general, the more engaged agencies and the public are in the planning

process, the more likely that controversial issues can be resolved without the threat of unanticipated outcomes like additional field trials, more in depth impacts analysis, injunctions, or denial of a permit.

The Need to Streamline Compliance

“Streamlining” is defined by Merriam-Webster’s online dictionary (www.Merriam-Webster.com) as being stripped of nonessentials, effectively integrated, and brought up to date. Streamlining compliance for rodent eradications is intended to make the process more efficient and effective by decreasing constraints; however, it is not a method to bypass the process. In fact, the importance of strict adherence to compliance and regulatory process cannot be understated (Morrison et al. 2011). Thinking about rodent eradications globally and identifying programmatic solutions allows decision-makers to tease out areas that can be streamlined in a manner that accelerates the process for specific projects.

This review covers 6 approaches to streamline compliance for rodent eradications that together will result in fewer roadblocks to conservation. Some of the approaches are intended to be preventative measures that can help decrease the likelihood of a long drawn out court battle, while others are approaches are intended to simplify the process. An integrated approach to streamlining will ultimately lead to a more holistic planning process for rodent eradication projects in the U.S., while enabling individual projects to get through the compliance phase and into the operational phase in a more timely and efficient manner. The following is a summary of the 6 recommended approaches to streamlining with a description of the benefits of employing each approach:

- 1) Identify programmatic planning and permitting opportunities that will increase efficiency by:
 - a. Reducing redundancy,
 - b. Decreasing the planning timeline and budget, and
 - c. Increasing continuity between projects.
- 2) Identify and understand social and political constraints that can be incorporated into the planning process to:
 - a. Minimize the risk of controversial law suits or injunctions,
 - b. Identify concepts that require clarification to gain support for the project,
 - c. Provide stakeholders with an opportunity to contribute to the planning and decision making of a project, and
 - d. Ensure that social and political constraints are included and evaluated in the planning process.
- 3) Develop a rigorous NEPA document that incorporates all of the social, environmental, and economic impacts while providing plenty of opportunities for public involvement by:
 - a. Producing a document that can stand up to public and political scrutiny,
 - b. Using NEPA as a method to minimize the risk of injunction, negative public and agency comments that can require additional document drafts, analyses, or field trials, and
 - c. Applying the Precautionary Principle by planning for a worst case scenario.

- 4) Strive for expert consensus within and among the eradication and planning community by:
 - a. Engaging experts in the early stages of planning to build consensus for the preferred eradication tools, non-target mitigation strategies, and to identify additional permits that may be needed,
 - b. Developing consensus will build confidence in the proposed operation with stakeholders, and
 - c. Adding continuity between projects by acknowledging the lessons learned from each additional project.
- 5) Be transparent during planning, outreach, and document developing to:
 - a. Decrease the appearance of impropriety,
 - b. Accurately portray the expected impacts from the alternatives,
 - c. Provide as much detail as possible without restricting the ability to adaptively manage the operation,
 - d. Provide an opportunity to gain buy-in and trust from stakeholders, and
 - e. Reduce the chance of injunction or law suit.
- 6) Engage all stakeholder by:
 - a. Identifying all relevant stakeholders,
 - b. Ensuring that the neglected perspective is included in planning,
 - c. Engaging stakeholders early and often during the planning process, and
 - d. Decreasing the risk of appearing biased or pre-decisional.

How Can We Streamline?

The underlying premise behind all rodent eradications is to remove 100% of the target species, while having a minimal effect on other non-target resources. The methods used to eradicate rodents, while they can be controversial in nature, have proven to effectively eradicate the target species with minimal non-target impacts (Howald et al. 2007). Additionally, while the island resources vary from project to project, the nature of the concerns over the implementation of the operation and the required permits are fairly standard. For these reasons, finding programmatic solutions that can be applied broadly are ideal for these types of projects, particularly in light of the fact that the same federal permitting agencies are involved in all U.S.-based projects.

As an example, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires that all pesticides obtain a label that specifies the exact uses of the product, as well as environmental and human health protection considerations. Once a “parent label” has been registered with the EPA under FIFRA Section 3, any project that complies with the restrictions listed on the label can obtain and use the product without any additional permitting under FIFRA. If a project-specific label is needed for a particular project, a registered “supplemental label” can be obtained.

Less effort is required to obtain a supplemental label, as opposed to a parent label, for a project using a product that has been registered under FIFRA, because all of the scientific evidence needed to regulate the product has already been submitted and reviewed by EPA; therefore,

practitioners only need to justify the unique aspects of a project to obtain the supplemental label. The Palmyra Atoll rat eradication would have surely failed had the project team not obtained a supplemental label allowing the team to increase the application rate in order to account for nonlethal primary consumption by crabs. In addition, without consulting with other eradication and island experts early in the process, it would have been much more difficult to obtain consensus for the operational plan to eradicate rats from Palmyra Atoll, which was essential for EPA to issue the supplemental label.

Another programmatic solution that has already been developed is a Special Purpose Permit under the Migratory Bird Treaty Act (MBTA), which allows for the take of MBTA-listed species if the purpose of the operations is intended to result in species conservation. Prior to 2009, the U.S. Fish and Wildlife Service (FWS) did not issue any incidental take permits for listed species. However, after the take of listed birds from the Rat Island eradication in 2008 (Ornithological Council 2010), the FWS began issuing take permits for eradication projects, since the goal of these projects was to benefit listed species in the long term (Kurth 2010).

In addition to programmatic solutions, compliance processes can be implemented more efficiently by developing robust NEPA analyses that clearly state the purpose and need for the project, evaluate a reasonable range of alternatives, fully assess potential impacts and mitigation activities, and actively engage the public and experts throughout the process. The Anacapa Island rat eradication was the first aerial rodent eradication in the U.S. For this reason, the National Park Service (NPS) developed an EIS and conducted several field trials and risk assessments to identify the potential risk to the islands resources and develop an operational protocol to eliminate 100% of the rats on the island. Despite all of the compliance effort and public involvement, the NPS was sued by an interest group seeking an injunction to halt the project. Since the EIS was well developed, fulfilled the procedural obligations of NEPA, and was supported by eradication experts, the NPS was able to win the court case and implement the project on schedule due to the rigor in the compliance process (Howald et al. 2005). Another notable example stems from the pig eradication conducted on Santa Cruz Island, CA in 2005, where 5 legal challenges were brought to the courts with allegations that the EIS inadequately evaluated the risk to the islands species. The project team had developed a robust NEPA analysis that was supported by a team of experts and was able to withstand all 5 legal challenges without the need for any additional analysis (Morrison et al. 2011).

Along with developing a robust NEPA analysis, it is essential to include an assessment of the social and political environment to better understand the social conditions in the region, and the underlying political concerns, as well as identify the perceived risks of the problem. Environmental problems, including invasive species management, are complex and dynamic issues requiring flexible, transparent decision-making that accounts for the diversity of values in the region, and

identifies any gaps in knowledge of the different stakeholders (Reed 2008). Failure to assess stakeholder concerns could result in public relations issues, additional analyses, lawsuit, or injunction. For example, planning for the proposed mouse eradication on the Farallon Islands was initiated prior to the implementation of the Rat Island, Palmyra Atoll, and Desecheo Island rat eradications when there was far less public scrutiny over the implementation of rodent eradications. However, the Rat Island rat eradication resulted in the unanticipated mortality of over 300 glaucous-winged gulls and over 40 bald eagles, the Palmyra Atoll rat eradication resulted in unexpected mortality of a small number of mullets in the shallow lagoon, and the Desecheo Island rat eradication failed to successfully remove all individuals from the island. Subsequently, after these projects were completed, the public and permitting agencies began to look more closely at how rodent eradications were being implemented in the U.S., as well as the potential impacts to non-target species from the operation. The original EA that was developed for the proposed mouse eradication on the Farallon Islands was deemed to be inappropriate, and as a result an EIS was developed along with several additional modeling efforts, field trials, and alternatives analyses that were needed to complete the compliance process.

CONCLUSION

Natural resource professionals manage large, complex problems that are extremely dynamic, include both scientific and non-scientific issues, and are often limited by the risks perceived by interested stakeholders. Problems related to invasive species management demand responses that are not conventional, yet are highly effective at eradicating the target species. The unconventional nature of eradication operations, coupled with the social and political constraints associated with managing invasive species, make planning and implementing eradications extremely difficult. In many cases, it is difficult to analyze and solve the problem due to the complex, competing interests of a diverse group of stakeholders (Clark 2002). Moreover, the overarching regulatory environment exacerbates the conflict by requiring stakeholder engagement and regulatory oversight from permitting agencies. For these reasons, the compliance process for rodent eradications is intended to provide the framework to assess alternatives, identify potential impacts, and actively engage with stakeholders.

After reviewing the planning documents for several of the most recent rodent eradication projects planned in the U.S., we identified areas where the process could be streamlined. Streamlining is a process that can be achieved by identifying programmatic solutions, understanding social and political constraints, and developing a robust, transparent assessment of a range of alternatives. The importance of the compliance process cannot be overstated. Streamlining environmental compliance for rodent eradications can help practitioners complete their compliance obligation in a timelier manner while maintaining environmental safeguards. Although each island is unique, many of the required regulatory hurdles including NEPA, Endangered Species Act, Clean Water

Act, Coastal Zone Management Act, FIFRA, and the MBTA are relevant to all U.S.-based rodent eradications. Identifying areas to streamline within the required regulatory framework will make planning more efficient, more cost effective, and less burdensome. Looking for programmatic solutions; actively engaging with stakeholders and permitting agencies; developing robust, transparent NEPA documents; and incorporating social and political constraints into the decision making process can help promote stakeholder engagement, increase buy-in from the public and experts, and provide more opportunities to remove invasive rodents from islands and help prevent extinctions. The key is to think globally but act locally.

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