THE MANAGEMENT FRAMEWORK IN PRACTICE – HOW SOCIAL BARRIERS CONTRIBUTE TO NOVEL ECOSYSTEM MAINTENANCE: MANAGING REINDEER POPULATIONS ON ST GEORGE ISLAND, Pribilof Islands, Alaska

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21.1 BACKGROUND

St George Island is the second largest island in the Pribilof archipelago, with a total land area of 27 square miles. The island has mixed ownership, with some areas federally owned as a part of the Alaska Maritime National Wildlife Refuge (AMNWR) and others owned by the Tanaq Native Corporation, a Native Village Corporation. The island has a history of introduced reindeer grazing, dating to a US government introduction in 1911 (Scheffer 1951). The purpose of the introduction was as a backup food source for the local Aleut population; the herd was little utilized by the locals however, who focused rather
on fish and seal. As a result the herd grew to around 222 animals before being locally extirpated in 1950 (Scheffer 1951). A second introduction in 1980, this time by the St George residents, resulted in a larger herd that grew to 100 animals by 1991 (Swanson and Barker 1992), c. 430 by 2002 (Sonnen 2004) and around 450–550 animals by 2004 (Hulvey 2004).

The island has little history of reindeer fencing, and the introduced reindeer have been free to move across lands spanning different owners. Five reindeer utilization surveys conducted between 1991 and 2005 show rapid ongoing tundra degradation corresponding to fluctuating herd size. While Swanson and Barker (1992) noted that the lichen ranges (many species) were in excellent condition in 1991, the Natural Resources Conservation Service (NRCS; see Box 21.1) determined in 2002 that the lichen range conditions had deteriorated over part of the island. A graduate student at University of California, Santa Cruz showed that these conditions had degraded further by 2004 (Hulvey 2004).

Continued degradation could have a number of negative ecological and social impacts on the Island. Reindeer may impact nesting habitat and nesting success of the endemic Pribilof Rock Sandpiper (*Calidris ptilocnemis ptilocnemis*), listed as high priority species in Alaska’s Comprehensive Wildlife Conservation Plan (Alaska Department of Fish and Game 2006). Continued reductions in the abundance and extent of lichen communities could also be encouraging the spread of nitrogen-fixing lupine that has the potential to alter soil properties. Studies of reindeer-altered lichen communities on St Matthew, another Bering Sea island, indicate that lichens may not recover, even after reindeer are removed for long periods of time (>50 years) (Klein 1987). Finally, members of the St George community including Elders and the Traditional Council have expressed concerns about the negative impacts of the reindeer on the landscape, as well as the possibility that a large herd might face starvation if not properly managed.

### 21.2 WHAT ARE THE ECOLOGICAL AND SOCIAL BARRIERS INFLUENCING MANAGEMENT?

The creation of a reindeer management plan has been complicated by a number of factors, including a lack of information about the reindeer impact on island ecology and St George’s remote location, which makes management logistics and collaborations more difficult. Additionally, the existence of numerous stakeholder groups has contributed to difficulties in coordinating management actions. These stakeholders differ in their ultimate vision of reindeer management because of differing organizational/community/business goals (Box 21.1).

### 21.3 WHAT MANAGEMENT APPROACH WAS USED?

Currently reindeer management aims to prevent further damage to the St George ecosystem, while allowing the most severely damaged areas to recover. This strategy blends community and other stakeholder interests in conserving the island ecosystem with the community’s need to secure income and employment.

Reindeer and ecosystem management evolved as an understanding of reindeer impacts on the island ecosystem increased with focused studies by NRCS and graduate students. Outreach work organized and coordinated by a graduate student, USFWS and NRCS scientists and a local non-profit group resulted in a community-based workshop that included a focus group to discuss reindeer management. Follow-up work included conducting extensive range surveys in collaboration with the Traditional Council’s Eco Office, working group discussions including scientists at local universities and ongoing informal networking among all stakeholders.

Using data from surveys, the NRCS determined in 2007 that the tundra could sustainably support c. 100 adult animals without further deterioration. Around the same time, the Tanaq Native Corporation and the Traditional Council entered an agreement to co-manage the herd, thus allowing the Council to have a larger hand in management decisions. The Council sought partnerships to develop a management plan and weighed management options offered by various stakeholders including eliminating all reindeer, increasing the population size or managing the population at a level deemed to be ‘sustainable’ on the tundra. The group considered the historical ecosystem conditions (i.e. no reindeer) as a reference but also took into consideration the needs of the community, which included the ability of the community to persist on the island when there were minimal economic
opportunities for community members. This made elimination of the reindeer very unfavorable. It also made increasing the herd size to increase income from big game hunting an option; there was a limit to the economic benefit of this operation to the community however, since it was run almost entirely by people not belonging to the community.

A solution involving NRCS’s cost-share Environmental Quality Incentives Program (EQIP) provided a workable option. This program combined the commu-

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**Box 21.1 Stakeholders involved in reindeer management decisions**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Connection to reindeer</th>
<th>Initial management goals</th>
</tr>
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<tbody>
<tr>
<td><strong>Tanaq Native Corporation:</strong> Native Corporation that holds the assets of the local Aleut via The Native Claims Settlement Act.</td>
<td>Own the land on the island and most of the island’s assets including the reindeer.</td>
<td>Interested in the profits the herd might provide, but also interested in working with other Native groups to protect the island’s ecology.</td>
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<tr>
<td><strong>Kayumixtax Traditional Council:</strong> Native group that promotes a healthy and financially stable local community.</td>
<td>Invest time, labor and money in island stewardship, including reindeer management.</td>
<td>Interested in ensuring the reindeer do not degrade St George’s ecosystem. Interested in securing community profits from the reindeer.</td>
</tr>
<tr>
<td><strong>Alaska Maritime National Wildlife Refuge (AMNWR):</strong> A government agency that is a branch of the US Fish &amp; Wildlife Service. Portions of St George are part of, and therefore managed by, the AMNWR.</td>
<td>Provide some funding, labor and support for reindeer management. Have agreed to authorize the EQIP fence to cross the Refuge lands as long as reindeer numbers are maintained at those agreed upon in the EQIP contract.</td>
<td>Interested in preserving unique island ecology in its natural diversity including bird life, lichens and native plants. View growing reindeer population as a threat to island ecology due to trampling and overgrazing.</td>
</tr>
<tr>
<td><strong>Natural Resources Conservation Service (NRCS):</strong> Government agency whose programs aim to help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat and reduce damage caused by floods and other natural disasters.</td>
<td>Has provided information to AMNWR, Tanaq and the Traditional Council on range conditions via multiple range surveys over the past decade. Has also offered information about how to manage the reindeer population in order to reduce harm to the tundra.</td>
<td>Goal is to provide stakeholders with accurate and relevant information about lichen condition and reindeer population management so that they can make informed decisions about impacts of reindeer on island ecosystems and develop the best reindeer management plan possible.</td>
</tr>
<tr>
<td><strong>Private hunting company:</strong> Non-local big game hunter company.</td>
<td>Group has provided hired labor for reindeer culls.</td>
<td>Interested in earning money from hunting and therefore in maintaining a larger herd size than NRCS or AMNWR in order to ensure the herd produces the maximum number of trophy animals per year.</td>
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</tbody>
</table>
How social barriers contribute to novel ecosystem maintenance

21.4.3 Are ecosystem changes reversible via management?

Perhaps but existing social barriers make management to a historical baseline unlikely. With complete elimination of the reindeer, it is possible that where lichen still dominates mats would increase in depth. It is also possible that some of the area that has crossed from a lichen-dominated ecotype to a vascular-plant-dominated ecotype might recover. Because reindeer prefer some species of lichens over others, the lasting effects of grazing on lichen composition and diversity are uncertain. Additionally, changing climate has been noted by multiple members of the community. A new study on the effects of climate change on lichen growth indicates that, even with reindeer management, the range may not recover to its past state (Klein and Shulski 2011). While it is uncertain how changing climate might alter ecosystem recovery with reindeer removal, restoring to a pre-reindeer state was not an option due to social dynamics including a complex array of stakeholders with different management goals and the economic needs of the local community. These factors suggest the system could be managed as a possible novel ecosystem (Figure 18.2).

21.4.4 What is the management goal (Figure 18.3)?

The current goal is to create and manage an ecosystem in a way that supports community livelihoods and considers historical ecological references. Management therefore seeks to strike a balance where no new degradation is caused by the reindeer, some highly damaged areas are allowed to recover and the community can make some income from reindeer management. To help achieve this balance, local managers collaborated with partners to determine target herd size and lichen range conditions. This included setting up a plan to monitor herd size and range conditions. Based on collected data, decisions will be made about whether and how to adjust herd population size and exclusion zone placement.

21.4.5 Is the cost/risk acceptable?

Yes, but this could change over time. The cost of management, particularly in such a remote area, is large.
this has been a factor that has hindered herd management in the past. Currently costs are covered through a variety of collaborations between the Traditional Council and various partners. For example, the herd size is maintained with help from AMNWR, fencing costs are covered by the NRCS cost-share program and range monitoring is conducted with the help of NRCS specialists. Additionally, some of the local community’s management costs (labor) are compensated by NRCS through the cost-share EQIP. This program also compensates for possible lost revenues that could be generated from other activities such as big game hunting, and makes sustainable herd management a plausible economic option for the community.

Risks include the possibility that current solutions may cause deterioration to formerly low-degraded areas because reindeer exclusion from highly degraded areas results in the herd moving into areas that have had less grazing in the past. Continued surveys will hopefully reveal if conditions decline in these areas, allowing managers to adjust management. Additionally, the current management scheme will only provide income for 3 years. The community might not be able to continue current management activities after this without additional funding. This could potentially lead to increases in herd size and degradation from associated rangeland utilization by the reindeer.

REFERENCES

Alaska Department of Fish and Game (2006) Our wealth maintained: A strategy for conserving Alaska’s diverse wildlife and fish resources. Alaska Department of Fish and Game, Juneau.


