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Attitudes Towards Trophic Rewilding of Wild Boar in Scotland

Aaron Sieve

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Outline

- Importance of Rewilding
  - Definition
  - Mechanism
  - Limitations
- Study Proposal
  - Importance
  - Methods

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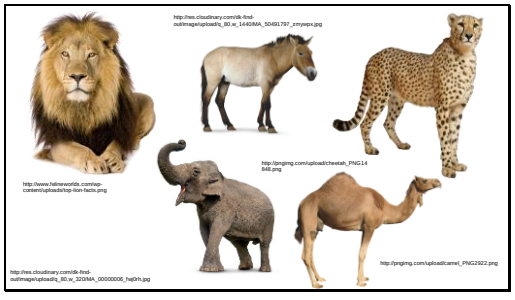

How would you feel if a conservationist proposed the introduction of these species to the Great Plains of North America? You would probably have a lot of concerns…

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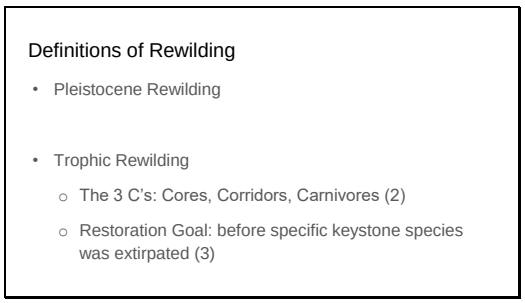

But in fact, Pleistocene Rewilding is the method that I had just talked about. This subcategory of rewilding is largely hypothetical at this point and is extremely controversial so I will not focus on it.

A broad definition of Rewilding is the conservation method where keystone species are reintroduced to a degraded habitat to maintain trophic cascades and restore ecosystem function.

Trophic Rewilding is the specific rewilding method that I will focus on. This method can be reduced into the three Cs: Cores, Corridors and Carnivores. Where keystone species, often carnivores, are released into core wilderness areas that are connected through corridors. The restoration goal is to return ecosystems back to a level of functioning before certain keystone species were extirpated. There have been many successful Trophic Rewilding projects such as the reintroduction of wolves to Yellowstone.

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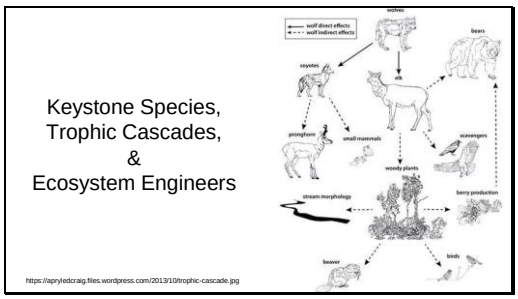

But how do reintroductions of these species actually help the ecosystem?

The species being reintroduced in rewilding projects are keystone species, which are organisms that impact their ecosystem more than would be expected through their interactions with other species in the area (Soulé and Noss 1998). It is proposed that this unequal effect on other species is possible through top-down regulation, also known as a trophic cascade (Svenning et al. 2015). Trophic cascades occur when an apex consumer's direct impact on another species is spread through the food web, thus shaping the ecosystem (Svenning et al. 2015).

Ecosystem engineers are another type of keystone species that are used in trophic rewilding projects to restore functioning ecological processes to an area (Sandom et al. 2013). An ecosystem engineer is any organism that indirectly affects other organisms by "creating, modifying, maintaining, or destroying" their environment (Byers et al. 2006).

It is often the case that when reintroductions begin with non-regulating native species, they are not able to survive because they cannot overcome the changes to the abiotic environment that occurred due to the removal of such controls (Byers et al 2016).

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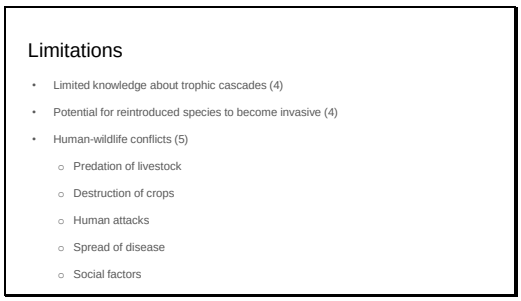

When looking at any conservation method it is important to look at potential limitations.

Potential limitations with implementing a rewilding model are that many times not enough is known about trophic cascades to be effective at creating a rewilding model and the potential for reintroduced species to become invasive because either they are a replacement for an extinct species or they had been absent from the habitat for a long time (Svenning et al. 2015). Rather than showcasing real limitations on the model itself, these concerns highlight the need for more comprehensive experiments and research to be done on trophic cascades in certain habitats.

The most frequently stated and largest limitation of rewilding is negative human-wildlife conflicts (Svenning et al. 2015). Such concerns include the fear of depredation of livestock, destruction of crops and stored food, attacks on humans, and the spread of disease to humans or livestock (Dickman 2010). However, the causes of conflict can be much more complex than just direct harm because people's perception human-animal conflict may be more influenced by social factors such as culture, expectations, and beliefs (Dickman 2010).

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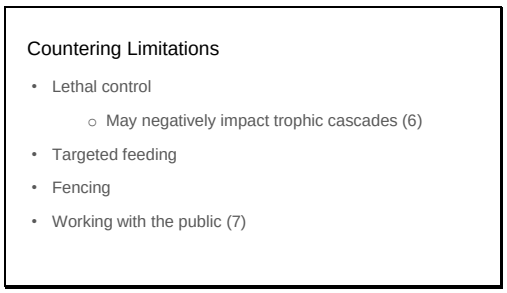

It is essential that these limitations be countered for rewilding projects to be successful.

One method for doing this is lethal control. Hunting can be effective in decreasing the amount of human-animal conflict by reducing the amount of animals that can cause the conflict. However, a smaller population of predators could limit their ability to reduce densities of their prey (Ordiz et al. 2013).

Targeted feeding and/or fencing may be used to keep wild animals away from human civilization but may not work for all species, or habitats because they may be too small or strong or because fences can cause habitat fragmentation.

Another proposed method that aims to increase the tolerance of stakeholders to wildlife interaction would be working with the public from the start of the proposed reintroduction to understand what they feel would be an appropriate way to manage the animals (Kansky et al. 2016). This may be critical in reducing conflict that is made through indirect social causes rather than the direct damage from the animal. There is little research done in this area of conservation but it important because humans cannot be ignored when thinking about conservation programs and its goals.

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Study Proposal

- Proposed reintroduction of Wild Boar to Scotland (7)
- Potential Human-wildlife conflict
  - Crop destruction(8)
  - Spread disease(9)
- Need for a survey of stakeholder attitudes
  - Reading and Kellert (1991)

http://northernwoodlands.org/articles/article/got-fern-controlling-native-invasive-plants

This last way to prevent human-animal conflict is what I will be focusing on my proposed study because I will be looking at stakeholder's attitudes towards a proposed reintroduction of boar in Scotland.

Full reintroduction or seasonal release of wild boar, an ecosystem engineer, into the Scottish Highlands may be a beneficial restoration technique for removal of bracken fern, an invasive native species (Sandom et al. 2013). However, if wild boars are released into the Alladale Wilderness Reserve, there is a potential for human-wildlife conflict because they may root in nearby agricultural fields (Geisser and Reyer 2004) or transmit diseases to livestock (Meng et al. 2009). It is important for managers in this situation to determine potential reactions to rewilding because this can determine the support that the project will receive later on and also help to anticipate any conflict that may be seen in the future. In order to effectively do this, it is important for all stakeholders to be involved (Kansky et al. 2016).

Although boar have been proposed to be reintroduced for quite some time, no study has been done to assess whether the public would view it favorably. Therefore, it is essential that perceptions be assessed so potential strategies to increase support can be implemented, if necessary.

The following study design is adapted from research by Reading and Kellert (1991) that examined the knowledge, attitudes, and opinions of ranchers towards a proposed reintroduction site of black-footed ferrets and prairie dogs in Montana.

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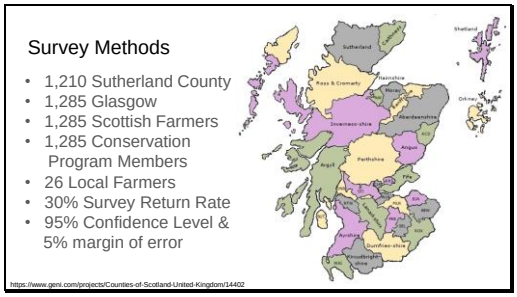

The proposed study features a survey that investigates the participant's attitudes and perceptions about wild boar. Those sent the survey will include about 1,210 residents of Sutherland County (which contains the proposed reintroduction site), 1,285 residents of Glasgow (the largest city in Scotland), 1,285 farmers throughout Scotland, 1,285 members of Scottish-based conservation organizations, and all 26 owners of agricultural lands located around Alladale Wilderness Reserve.

The sample sizes were calculated anticipating a 30% survey return rate at a 95% confidence level and a 5% margin of error (Kaplowitz et al. 2004). To calculate this, the populations were taken from census data.

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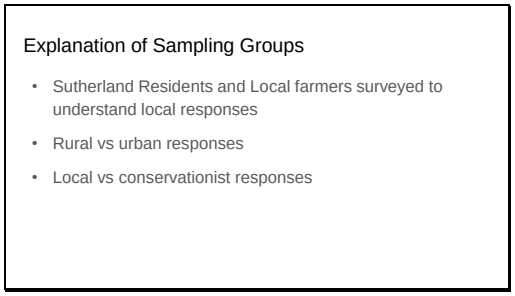

These sampling groups were selected in order to gain further insight into local responses because they are more likely to affect the program, this is why both local farmers and Sutherland county residents were surveyed.

The attitudes of local farmers and Sutherland residents will be compared to those of farmers not specifically impacted by the reintroduction and people in the more urban environment of Glasgow to understand how location and way of life may impact responses.

Finally, it is critical to understand how local views may differ from conservationists, who may be more likely to understand the importance of rewilding wild boars as a means for reducing an invasive species.

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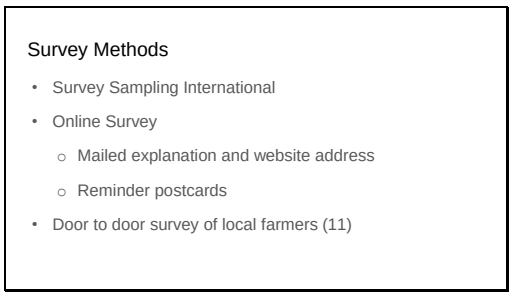

The participants from Glasgow and Sutherland County will be selected through the use of the survey company Survey Sampling International (https://www.surveysampling.com). Farmers will be randomly chosen from a list provided by the National Farmer's Union Scotland. Members of conservation groups will be chosen at random from membership lists provided by several Scottish-based conservation programs.

Though the survey itself will be online, a letter will be sent to the randomly selected individuals that will explain the purpose of the study and provide the website address of the survey. A reminder postcard will be mailed to those who did not partake in the survey after two-weeks and again after one month in order to encourage participation. Meanwhile, the survey of farmers surrounding the Alladale Wilderness Reserve will be handed out door to door to encourage a higher participation rate (Holbrook et al. 2003).

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Survey and Analysis

- Six sections of questions
  - 5-9 questions each
  - 5 point Likert Scale
- Cronbach's Coefficient Alpha
- Pearson chi-squared
- Multiple & stepwise Regression
- Tukey test to analyze variance

Table 1. Black-footed ferret/prairie dog attitude scale definitions.

Attitude Scale	*Definition*	*Cronbach's α**
Negativistic	Strong dislike or indifference towards black-footed ferrets and prairie dogs and their conservation	0.878
Libertarian/ Dominionistic	Strong interest in individual rights and freedoms and in the mastery, control, and domination of wildlife	0.878
Utilitarian	Strong support for the direct utilization of wildlife and subordination of wildlife habitat for human use	0.887
Moralistic	Strong concern for the possible infliction of cruelty, harm, and exploitation of black-footed ferrets and prairie dogs	0.882
Humanistic	Strong emotional attachment to, and support for the existence value of, black-footed ferrets and prairie dogs	0.876
Naturalistic/ Ecologistic	Strong interest in direct outdoor recreational contact with black-footed ferrets and prairie dogs and in their ecological value	0.882

** Cronbach's α is a measure of the scale's internal consistency. Its interpretation is similar to that for a correlation coefficient ranging from 0 to 1.*

From table 1 of Reading and Kellert (1991).

The survey itself will consist of attitude and opinion questions that will be assessed on a five-point Likert scale (strongly disagree to strongly agree). Six attitude scales (negativistic, libertarian/dominionistic, utilitarian, moralistic, humanistic, and naturalistic/ecologistic) from Reading and Kellert (1991) will be assessed and the definition of each attitude scale is presented in Table 5. Five to nine questions pertaining to similar basic attitudes towards boars will be asked to assess each scale. The scale reliability for each scale will be tested using Cronbach's Coefficient Alpha. This will measure how closely related the set of questions are to one another within each scale.

Pearson chi-squared values will then be used to assess whether differences among the individual attitude questions are significant. The variation in specific group's perceptions of wild boar reintroduction will be assessed using multiple and step-wise regressions to understand potential relationships between values. Next, the variance between the groups and the Tukey test will be used to calculate and compare the means of paired scale scores.

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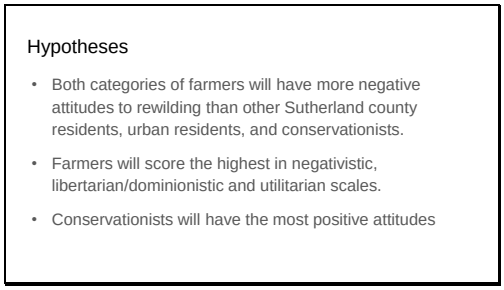

One hypothesis is that the data will show that a majority of both categories of farmers will have more negative responses to the reintroduction of wild boar than any other subcategory because they will fear potential damage to their fields or disease exposure to their livestock. Nilsen et al. (2007) studied rural and urban attitudes towards the reintroduction of wolves in Scotland and found that Scottish farmers had more negative responses than urban respondents, but 43% favored their reintroduction so there is a possibility that not all responses will be negative.

It is also expected that farmers will score highest in the negativistic, libertarian/dominionistic, and utilitarian attitude scales than the moralistic, humanistic, and naturalist/ecologistic attitude scales. This is hypothesized because farmers rely on their land and livestock for their livelihood, so they will be more likely to want to prevent boars from entering their property in any way possible.

And finally, members of conservation groups are expected to have the most positive attitude towards rewilding wild boar because they are more likely to understand the importance of invasive species management.

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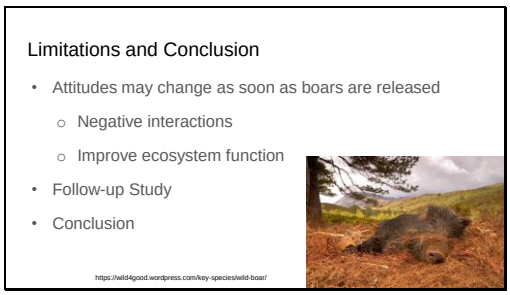

Although analysis of this survey may provide a good idea of the general attitudes towards wild boar reintroduction, these attitudes may change quickly once boars are actually released into the Alladale Wildlife Reserve. It is most likely that attitudes towards boars will become more negative the more people interact with them because as a study on the rewilding of wolves in Yellowstone shows, the more people encountered wolves, the more they had negative experiences with them, causing overall attitudes towards wolves to decline (Williams et al. 2002). It is possible though that if boars are only partially released during winter months, when they are less likely to impact crop yields, that locals will have fairly positive attitudes towards rewilding with boars. This positive response may be even more likely if boars are able to restore ecosystem function. It may be that no study would be able to accurately predict how public opinion will change on the advent of release, so continued surveying of the public opinion post-release will be necessary for conservationists to make fully-informed management decisions.

Rewilding can be an effective restoration mechanism in certain situations but its limitations, especially human-wildlife conflict, must be managed carefully to prevent failure. It is important to for the public to know what rewilding is and for conservationists to know what the public perceptions of such programs are, especially as the amount of these types of programs increase.

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Literature Cited

(1)Donlan J. Berger J, Bock C. 2005. Rewilding North America. Nature. [serial online]. [cited 2016 Dec 18]; 436(18): 913-4. Available from: Ebsco

(2)Soulé M, Noss R. 1998. Rewilding and Biodiversity: complementary goals for continental conservation. Wild Earth. [serial online]. [cited 2016 Dec 18]; 8:8-28. Available from: Ebsco.

(3)Jørgensen D. 2015. Rethinking Rewilding. Geoforum. [serial online]. [cited 2016 Dec 18]; 65:482-88. Available from: Science Direct.

(4)Svenning J, Pederson P, Donlan C, Ejrnaes R, Faurby S, Galetti M, Hansen D, Sandel B, Sandom C, Terbough J, Vera F. 2015. Science for a wilder Anthropocene: synthesis and future directions for trophic rewilding research. P Natl Acad Sci-Biol. [serial online]. [cited 2016 Dec 18]; 113(4):896-906. Available from: Ebsco.

(5)Dickman J. 2010. Complexities of conflict: the importance of considering social factors for effectively resolving human-wildlife conflict. Anim Conserv. [cited 2017 Jan 22]; 13:458-466. Available from: Ebsco.

(6)Ordiz A, Bischof R, Swenson JE. 2013. Saving large carnivores, but losing the apex predator? Biol Conserv. [serial online]. [cited 2016 Dec 18]; 168:128-133. Available from: Science Direct.

(7)Sandom CJ, Hughes J, Macdonald DW. 2013. Rewilding the Scottish Highlands: Do Wild Boar, Sus scrofa, Use a Suitable Foraging Strategy to be Effective Ecosystem Engineers? Restor Ecol. [serial online]. [cited 2016 Dec 18]; 21(3):336-343. Available from: Ebsco.

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Literature Cited

(8)Geisser H, Reyer H. 2004. Efficacy of Hunting, Feeding, and Fencing to Reduce Crop Damage by Wild Boars. J Wildl Manage. [serial online]. [cited 2017 Jan 22];68(4):939-949. Available from: JSTOR.

(9)Meng X, Lindsay D, Sriranganathan N. 2009. Wild Boars as Sources for Infectious diseases in livestock and humans. Phil Trans R Soc B. [serial online]. [cited 2017 Feb 3]; 364 (1530): 2697- 2707. Available from: JSTOR.

(10)Reading R, Kellert S. 1993. Attitudes Toward a Proposed Reintroduction of Black-Footed Ferrets (*Mustela nigripes*). Conserv Biol. [serial online]. [cited 2017 Jan 22]; 7(3):569-580. Available from: JSTOR.

(11)Holbrook A, Green M, Krosnick J, 2003. Telephone versus Face-to-Face Interviewing of National Probability Samples with Long Questionnaires: Comparisons of Respondent Satisficing and Social Desirability Response Bias. Pub Opin Q. [serial online]. [cited 2017 Feb 3]; 67(1): 79-125. Available from: JSTOR.

(12)Nilsen E, Milner-Gulland E, Schofield L, Mysterud A, Stenseth N, Coulson T. 2007. Wolf Reintroduction to Scotland: Public Attitudes and Consequences for Red Deer Management. Proc R Soc B. [serial online]. [cited 2017 Feb 3]; 27:995-1002. Available from: JSTOR.