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Human Dimensions of Invasive Vertebrate Species Management

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ABSTRACT Invasive vertebrate species can cause substantial damage to natural resources, property, crops, livestock, and pose a disease hazard to humans, native wildlife and domestic animals. Numerous island species have become extinct or are threatened with extinction from invasive species. The high rate of invasive species introductions continues because of the large volumes of world trade and international travel. Humans are often responsible for introductions, but are also the key to their prevention, management, and eradication. However, many of the values and perceptions of invasive species vary among humans. Hence, the prevention and control of invasive vertebrates often requires adjusting human behaviors, values, and beliefs, along with changing the way decisions are made. Most people have little idea of which species are invasive, what their impacts are, and what control methods might be appropriate for their management. A wide variety of education, outreach, and training programs are needed to help motivate people to take action and raise awareness of the causes of establishment, consequences of invasive species, and the need for prevention, control, and eradication programs. Key messages should target diverse audiences through appropriate media outlets and methods. Surveys to better understand how different stakeholder groups view invasive species, the threats they pose, and the potential methods of control are also needed. We review several programs in place to help achieve the critical need for an informed and active public with regard to invasive vertebrate species. The programs help create an informed public, generate public and financial support for invasive species management, train the public to recognize and report sightings of invasives, and encourage sustainable ecosystems.

KEY WORDS human dimensions, invasive species, public awareness, vertebrate species, wildlife damage

Invasive or non-native mammals, birds, reptiles and amphibians can cause substantial damage to natural resources, property, crops, livestock, and pose a disease hazard to humans, native wildlife and domestic animals (NISC 2008). The species include a wide variety of species such as Norway rats (*Rattus norvegicus*), feral pigs (*Sus scrofa*), monk parakeets (*Myiopsitta monachus*), and brown tree snakes (*Boiga irregularis*). Numerous native island species have become extinct or are threatened with extinction from invasive species. It has been estimated that more than 400 vertebrate species have been intentionally, unintentionally, or inadvertently introduced to the United States and its territories (Witmer et al. 2007). More than 50,000 species total have been introduced into the U.S. (Pimentel et al. 2005). Invasive plant and animal species cause more than $120 billion in damages each year (Pimentel et al. 2005). There are many reasons why invasive species introductions continue to happen in the US.:

- Increases in world trade and human travel
- Intentional introductions for economic reasons
- Lack of understanding or knowledge of state and federal laws regarding invasive species

- Increases in exotic pet ownership
- Lack of adequate and secure places to keep pets and livestock
- Abandonment of unwanted pets
- Lack of strict and specific regulations for the pet industry
- Limited import regulations and inspections on live animals

A key objective for obtaining human dimensions information is to integrate appropriate and objective data into all stages of the process of developing policies and practices for wild animal management (Fraser 2001, Garcia-Llorente et al. 2008, NISC 2008, Treves et al. 2006). Miller (2009) recently reviewed the history and application of human dimensions research with regard to wildlife population management. He noted the need to fully incorporate human dimensions studies into education and training programs in wildlife management. Carpenter et al. (2000) refined the concept of "wildlife acceptance capacity" with a more complex view of tolerance, recognizing that people perceive both positive and negative impacts associated with human-wildlife interaction, and that different stakeholders weigh the positives and negative differently. Numerous human factors influence invasive vertebrate species management, both in positive and negative ways (Poorter 2001, Wittenberg and Cock 2001). Positive factors include:

- An informed public can be a powerful and essential tool in the fight against invasive species
- The public can generate political pressure and funding
- Public actions can greatly reduce the likelihood of new introductions
- Public "eyes" can help with the early detection of invasive species
- Volunteers and communities can help control the spread of invasive species through local efforts

However, on the negative side, we face many challenges:

- People often cannot distinguish between native and invasive species
- People are unaware of how their quality of life, economy, biodiversity, and conservation can be significantly affected by invasive vertebrate species
- Many people believe in the sanctity of all life whether invasive or not and do not want invasives removed
- Many people have an inherent dislike or distrust of the use of chemicals and toxicants even though they may be necessary tools for invasive species management

Managers have often been frustrated with the inability to respond quickly to an invasive species introduction because of concerns and opposition by the public (Brenner and Park 2007). For example, when the American gray squirrel (*Sciurus carolinensis)* was introduced to Europe, agency personnel and others wanted to act quickly to prevent their spread and to pursue eradication, but the public prevented action until it was too late to achieve containment and possible eradication (Bertolino and Genovesi 2003). Even plans to eradicate introduced rats from islands in the U.S. have met with public opposition (Howald et al. 2005). These situations indicate the important role that awareness and education have in terms of increasing public support for invasive species management projects (Bremmer and Park 2007, Ellis and Elphick 2007).

Attitudes about invasive animals are influenced by demographic, social, and cultural factors. Fitzgerald et al. (2007)

surveyed the attitudes of Australian residents and found a number of significant factors:

- Gender: males are more concerned about invasive species
- Age: older people are more concerned about invasive species
- Residence: rural persons are more concerned about invasive species
- Species: large animals or companion animals are more accepted as invasive species
- Seriousness: if perceived as a pressing national or local problem, people are more concerned about invasive species
- Interest groups: stakeholders vary in attitudes depending on their group's interests and concerns
- Culture: whether the animal is considered a companion, a pest, or a food item in that culture

Fraser (2001) found similar results in his survey of residents of New Zealand, but noted their relative lack of knowledge of invasive species. Overall, his survey found that residents had more of a utilitarian rather than a protectionist attitude towards introduced wildlife. Past surveys of U.S. residents towards wildlife and its management indicated the role that an urban versus rural lifestyle plays in attitudes with the former having more protectionist attitudes and the latter more utilitarian attitudes (Kellert 1980). Fraser (2001) did not find urban versus rural lifestyle to be as strong a determinate of attitudes of New Zealand residents as did Kellert (1980). Garcia-Llorente et al. (2008) found that 5 stakeholder groups in Spain differed in their degree of knowledge, perception, attitudes, and willingness to pay for eradication. Driscoll (1995) came up with a "species ratings" after noting that people's attitudes towards animals depends in large part on just which animals are being addressed. For example, in Australia, the management of feral horses is a contentious issue because of their pluralistic status as an introduced pest species, but also a national icon (Nimmo and Miller 2007).

EXAMPLES OF PUBLIC AWARENESS CAMPAIGNS

Garcia-Llorente et al. (2008) noted that most stakeholder groups and decision makers have a limited knowledge of the invasive species problem, and therefore, education and public awareness campaigns are essential to the development and implementation of invasive species programs. If educational and informative programs are to be effective, they should be designed to target specific stakeholder groups. The programs should include elements of stakeholder interests, personal socio-demographic characteristics, environmental behavior, and personal experience. Addressing invasive species issues across adjoining borders or between trade-partner countries makes the need to engage affected stakeholders through positive interactions even more acute (Stokes et al. 2006).

Stop Rats

Alaska has initiated a major campaign to keep invasive rodents out of the state and off its islands (Fritts 2007). Campaign actions include:

- Statewide invasive rodent management plan with widespread stakeholder input
- Manual for communities and stakeholders on rat control for Alaska waterfront facilities
- Rapid response program for rat spills from shipwrecks (Ebbert et al. 2007)
- Public education materials (posters, t-shirts, cups, magnets) to increase

awareness of the need to protect seabirds from invasive rodents

Silent Invasion

In 1996, the Coordinating Group on Alien Pest Species conducted a statewide survey to increase public awareness of the threat from invasive brown tree snakes to the state of Hawaii. The subsequent "Silent Invasion" campaign started in 1997 (Martin 2007) and included the following actions:

- Baseline survey on public perceptions and knowledge of issue
- "Shock footage" television commercials and television specials
- Toll-free "Pest Hotline"
- Radio jingle
- Web site and MySpace pages for young adults

Don't Give Snakes a Break

Since 1992, the Commonwealth of the Northern Mariana Islands has worked to increase public awareness of the threat posed by brown tree snakes (Hawley 2007). In 2002, the islands began a 10-month campaign encouraging the use of a pest hotline to report snake sightings. The average public response time to snake sightings dropped from 126 hours to less than 2 hours after the campaign. Campaign actions included:

- Baseline and a subsequent re-evaluation surveys regarding public perceptions and knowledge of issue
- Toll-free "Pest Hotline"
- Radio jingle
- Billboards and other signage around island
- Outreach to school children
- Official "Don't Give Snakes a Break" trucks

Habitattitude™

The Habitattitude campaign began in 2005 to prevent the introduction of unwanted pets into natural systems (Reaser and Meyers 2007). The program is organized by the Pet Industry Joint Advisory Council with assistance from several federal agencies. Campaign components include educating consumers to make wise pet choices, providing resources to enable high standards of animal care and maintenance, and encouraging pet owners to choose among several alternatives to the release of any unwanted pets. Campaign actions include:

- Web site
- Pet store signage, door decals, care sheets, fish bags, and pet starter kits
- Best practices manuals for pet store employees
- Factsheets, coloring books, and other booklets
- Booths at pet industry trade shows, pet shows, and association meetings
- Articles in industry magazines

ENGAGING THE PUBLIC

While human values, behaviors and activities are often the main cause behind species invasions, they are also at the heart of the solution (Poorter 2001). Public interest, participation and support of invasive vertebrate species prevention and management can be increased by (from McNeely 2005):

- Being proactive. The community and interested parties should be brought into projects and planning early on
- Surveying public perceptions towards invasive species
- Delivering clear and consistent messages to diverse audiences through a variety of media outlets
- Helping the public identify and embrace values that are environmentally sound and relate to their sense of community
- Developing and implementing public education, outreach, and training programs to increase public

knowledge and involvement in invasive species issues

- Developing conservation practices and ethics that emphasize the importance of native ecosystems
- Basing approaches on participatory methods, co-management responsibilities, consensus-building, and feedback mechanisms that have the objectives of protecting the environment and safeguarding human health and safety
- Identifying measures that work within existing value systems (such as economic incentives)
- Ensuring the costs of controlling invasive species is paid by those benefiting from, or responsible for, introductions
- Linking concerns about invasive species to the drive for global development that motivates most people and governments
- Including human dimension aspects in agreements and guidelines
- Using risk assessment procedures for species introductions that take into account future changes in usage and demonstrate that negative impacts will be limited

RESEARCH NEEDS

There has been relatively little research into the human aspects of invasive species research and some researchers have called for more peer-reviewed research (Fitzgerald et al. 2007, McNeely 2005). McNeely (2005) presented some potential research priorities for human dimensions and invasive species:

- Identify conflicting interests regarding the benefits and risks of introductions
- Identify underlying causes for human choices in relation to introductions and invasive species
- Ascertain what is known scientifically about the ubiquitous human affinity for other species
- Evaluate potentially useful indigenous species rather than non-indigenous ones
- Elucidate the interactions between the media, the public, scientists, and conservationists
- Identify the views of indigenous peoples and other special interest groups about introductions and invasive species
- Further model the projected outcomes if we are unable to slow or stop the spread of invasive species

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