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Abstract approved:

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This research explores the barriers that prevent stakeholders from changing their hobby behaviors to help prevent the spread of invasive species in Oregon. Invasive species are increasingly causing economic and ecosystem harm in Oregon. This is among the first studies done on the human dimensions of invasive species. Using the Theory of Planned Behavior as a framework, the attitudes, norms and perceived behavioral controls regarding preventative behaviors were elucidated during four focus groups (29 individuals) with individual groupings of gardeners, anglers, hunters and boaters. Findings indicate six belief barriers to changing hobby behaviors. These include 1) the attitude that preventative behaviors, such as using pesticides, may be worse for the environment than invasive species, 2)the attitude that the fight against invasive species is a losing battle, 3)the norm belief that institutions don't care enough to prioritize action on the issue of invasive species, 4) the norm belief that the general public both doesn't know and doesn't care about invasive species, 5) the behavioral control belief that one doesn't know enough about the preventative behaviors to be effective, and 6) the behavioral control belief that preventative behaviors are too difficult to perform. Understanding the beliefs that prevent changes in behavior will help inform the creation of effective statewide invasive species awareness and actions campaigns, such as that being led by the Oregon Invasive Species Council, as well as provide a foundation of research on which to build additional research. Findings suggest that an effective way to engage stakeholders

in being part of the solution to invasive species may include addressing social norms by targeting awareness messaging and engagement activities to hobby groups.

Keywords: invasive species, theory of planned behavior, attitude, beliefs, behavior change, focus groups, gardeners, boaters, anglers, hunters.

Exploring Stakeholders' Attitudes and Beliefs Regarding Behaviors that Prevent the Spread of Invasive Species: A Focus Group Study

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Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorized release of my thesis to any reader upon request.

Gwenn Kubeck, Author

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Exploring Stakeholders' Attitudes and Beliefs Regarding Behaviors that Prevent the Spread of Invasive Species: A Focus Group Study

INTRODUCTION

Invasive species are increasingly an economic and environmental detriment in Oregon. This study attempts to elucidate the attitudes and beliefs of key stakeholders, comprised of boaters, hunters, gardeners and recreational fishers, regarding behaviors that can help stop the introduction and spread of invasive species. These stakeholders participate in activities that potentially impact the spread of invasive species. The main question being researched is: **What are the barriers that prevent people from changing behaviors that would help stop the introduction and spread of invasive species?**

Overview of Invasive Species Pathways and Impacts

In 2006, the National Invasive Species Council published a white paper that defined invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (The National Invasive Species Council, 2006, pg.1). The National Invasive Species Council recognizes that there can be ambiguity in labeling an organism as 'invasive' since there are many non-native plants and animals that humans rely on for livelihood and lifestyle. There is also potential for disparity in defining invasive species because what is considered harmful to some may be considered beneficial by others. In this study, we have simplified the definition of invasive species to organisms that are not-native and cause harm, while recognizing the complexities inherent in this definition.

Invasive species can be introduced and spread through a myriad of pathways. Although natural pathways such as storm events may cause the introduction of a species outside its historic habitat range, it is commonly accepted that human pathways have dramatically accelerated the introduction and spread of invasive species (Rahel, 2007). This study

focuses on some of the human activities that result in the introduction and spread of terrestrial and aquatic invasive species.

Humans often introduce non-native species to new locations intentionally for a variety of livelihood and lifestyle reasons. For example, modern agriculture relies on the propagation of largely non-native organisms. However, in recent years, there has been a growing awareness that a small fraction of those organisms that are intentionally brought to new regions may be invasive and result in harm to local ecosystems and economies. Keller and Lodge (2007) cite commercial activities involving trade and transport of exotic pets, live food and/or bait, horticultural plants, and biological supplies as some key pathways for the intentional introduction of invasive aquatic organisms that cause significant harm in their new locations.

Humans have also unintentionally created pathways for the spread of non-native and sometimes invasive species. Historically, the spread of non-native species has been restricted by geographical barriers such as mountains ranges or oceans. But in today's age of globalization and commercial trade across vast distances, humans have increasingly created pathways for the unintentional spread of invasive species. Transportation systems such as roads, man-made canals and ships that traverse the oceans provide a multitude of pathways for the unintentional introduction and spread of invasive species (Rahel, 2007).

This study focuses on four popular recreational activities that potentially introduce and spread invasive species in Oregon through: gardening, fishing, hunting, and boating. Puth et al. (2005) identifies three stages of the invasion process for any invasive species. These include the initial dispersal, establishment of self-sustaining populations and the spread of the organism. The stakeholder groups targeted in this study impact both the initial dispersal, as well as the spread of invasive species.

Gardeners can be a vector for invasive species by purchasing invasive plants that then escape cultivation through the unintentional spread of berries, seeds or asexual rhizomes

(Colston, 2008). Johnson (2006) emphasizes the importance of gardeners being aware of which plants may be invasive in order to help protect endangered plants and maintain ecological diversity. Johnson et al. (2001) interviewed boaters and found that dispersal of invasive species, such as the zebra mussel, can occur through the accidental transport in water carried by boats in live wells, bilges, bait buckets and engines. Invasive aquatic plants can get tangled in boat trailers and anchors. These macrophytes may also be carrying additional invasive organisms in either adult or larval forms. Recreational fishers may influence the spread of invasive species by transporting organisms on boats and other equipment such as fishing rods, boots and waders (Raloff, 1999). In addition, recreational fishers can introduce invasive species by intentionally stocking fishing areas with preferred, non-native fish or using live bait (Schantz, 2005). Similarly, non-native game species can be released to bolster hunting opportunities, potentially leading to the introduction of a potentially invasive species (Mack et al., 2000). Like others whose hobby brings them in direct contact with nature, hunters can spread invasive species by transporting them unknowingly on clothing and equipment.

Invasions can result in heavy damages, both environmentally and economically. According to Coblentz (1990), exotic organisms have an enormous impact on biodiversity because their presence can lead to extinctions and environmental crises. Invasive organisms cause harm to native organisms through competition for resources, predation or by introducing disease. They can also reduce biodiversity by degrading habitat, increasing erosion or altering nutrient cycling (Coblentz, 1990). The famous biologist and environmentalist, E.O. Wilson, identified invasive species as one of the major threats to biodiversity by including it in his popular HIPPO acronym: Habitat destruction, Invasive species, Pollution, Population growth, and Overconsumption (Wilson, 2002).

In 2005, Pimentel reported that invasive species cost the United States almost $120 billion per year in economic damages and losses (Pimentel, 2005). Just four established invasive species in Oregon cost the state over $40 million each year in economic costs.

This figure doesn't include the costs to Oregon's ecosystems and represents only a small fraction of the expenditures Oregon uses to keep established invasive species under control (Nugent, 2005). As stated by a representative of the Oregon Invasive Species Council (2005), "early detection and rapid response are by far the most cost-effective way of dealing with undesirable invaders (pg. 7)". This highlights the importance of exploring the attitudes and beliefs of stakeholders whose hobby behaviors may be modified to *prevent* the introduction and spread of invasive species in Oregon.

Oregon Invasive Species Awareness and Action Campaign

The Oregon Invasive Species Council (OISC) is a council of representatives from various state agencies and other relevant groups who have a stake in the future of Oregon's natural resources. Standing members of the OISC include representatives from the Oregon Department of Fish and Wildlife, the Oregon Department of Agriculture, Portland State University, and the Oregon Sea Grant program at Oregon State University. The purpose of the OISC is to "conduct a coordinated and comprehensive effort to keep invasive species out of Oregon and to eliminate, reduce, or mitigate the impacts of invasive species already established in Oregon" (Oregon Invasive Species Council, 2008, pg.1).

An important component of the OISC mission includes educating the public about invasive species. In 2006, the Oregon Invasive Species Council (OISC) expressed interest in gaining background information in order to design a statewide education campaign that effectively educates Oregon citizens about invasive species. In 2007, the OISC joined with partners such as Oregon Public Broadcasting, the Nature Conservancy and SOLV to launch an awareness and action campaign to engage Oregon citizens in being part of the solution to the issue of invasive species. The impetus for this study arose from the need to better understand current attitudes and perspectives of key stakeholders whose activities can spread invasive species, in order to effectively target messages to change those behaviors.

Theoretical Framework for Exploring Barriers to Changing Behaviors

Extensive background research was conducted prior to beginning this study. Preliminary literature was done in the arena of communication theory as it relates to behavior change (Kubeck, 2007). After reviewing a large body of communication literature, the Theory of Planned Behavior was chosen as the appropriate model of behavior change to employ in this study. Because communication theory is based heavily in health research, additional searches were done using key words such as 'environmentally responsible behavior' to bridge the gap between health applications of behavior change and the focus of this study, invasive species. Research was also conducted in natural resource and recreation literature. Literature searches were also conducted to find examples of focus group studies that employ the Theories of Reasoned Action and Planned Behavior. Academic Search Premier and JSTOR databases were used to uncover any research on the human dimensions of invasive species relating to behavior change. All synonyms of invasive species were entered as key words, including non-native, noxious, exotic, etc. This revealed very little previous research on the human dimensions of invasive species and the attitudes, norms and control beliefs that influence behaviors that impact the spread of invasive species.

The Theory of Reasoned Action, and its' successor, the Theory of Planned Behavior, are well known and well cited in communication literature about behavior change. The Theory of Reasoned Action focuses on the variables of attitude, norms and intention to predict the likelihood of a behavior taking place. According to this theory, attitude (the positive or negative feeling associated with performing a behavior) and subjective norms (the perceived social pressure to perform a behavior) predict a person's intention to perform a behavior. Attitude is shaped by both behavioral beliefs (beliefs that performing a behavior will produce certain outcomes) as well as the evaluation of this outcome as favorable or not. Subjective norms are shaped by normative beliefs (beliefs about whether or not the behavior should be performed based on perceived peer group

opinions) and the motivation to comply with this normative belief. Explicit in this theory is the assumption that intention to perform a behavior is the best predictor of whether or not that behavior will be executed (Ajzen and Fishbein, 1980, Fishbein and Ajzen 1975). This theory refers only to behaviors that are not constrained by external factors and are within a person's full volitional control.

Because there are many activities and behaviors that are subject to constraints outside a person's sphere of control, Ajzen augmented the Theory of Reasoned Action in 1991 by including perceived behavioral control (a person's perception of his/her ability to perform a behavior) as an influence that shapes a person's intention to perform a behavior. The revised theory is called the Theory of Planned Behavior, which is unique in that it incorporates the rationale that personal and environmental barriers determine, in part, a person's ability to implement an intention to perform a behavior.

The Theory of Planned Behavior is meant to be applied to beliefs about a behavior, as opposed to beliefs about an issue. In this study, the desired behaviors include those that would minimize the spread of invasive species. For gardeners, this may mean not purchasing invasive plants and controlling those invasive species that are already established. For hunters, anglers and boaters, it may mean washing off hobby equipment before changing locations. For all groups, desired preventative behaviors could include educating others about invasive species. Due to the exploratory nature of this study, the desired preventative behaviors were not defined prior to the study.

This study simplifies the Theory of Planned Behavior to explore the barriers that may prevent important stakeholder groups from changing their behaviors to help stop the spread of invasive species (see Figure 1. for theoretical framework used in this study).

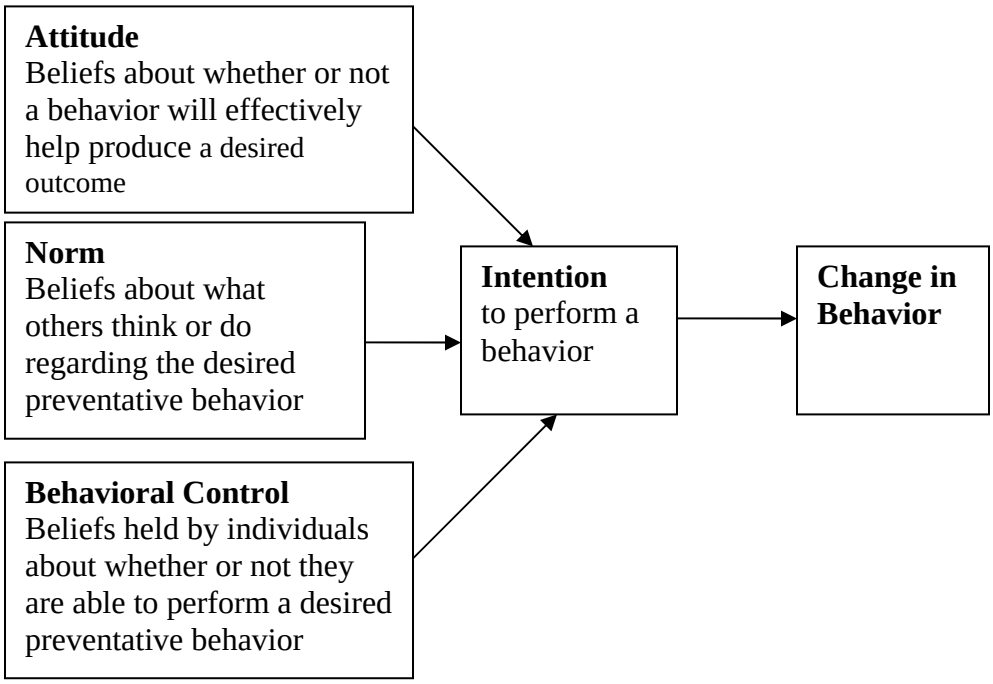

Figure 1. Theoretical Framework Used to Explore Barriers to Changing Behaviors, Adapted from the Theory of Planned Behavior

Attitudes, social norms and behavioral control beliefs held by important stakeholder groups regarding individual behaviors that might help stop the spread of invasive species are examined. In this study, attitude refers to whether or not people perceive that a behavior will effectively help produce a desired outcome. Norms refers to people's perception of what others think or do regarding the desired preventative behavior. Behavioral control beliefs refer to people's perceived level of self-efficacy to perform a behavior (see Table 1. for definitions of study variables). Ajzen (1991) correlates perceived control beliefs with another common factor in behavior change literature: self-efficacy. Bandura (1997) relates self-efficacy to ones' perceived internal control or ability to perform a behavior. In this study, perceive behavior control refers to any belief people might have about whether or not they are able to perform a desired preventative behavior. The goal of this study is to better understand the barriers that may prevent people from changing their behaviors to become part of the solution to deal with Oregon's invasive species.

Table 1. Definition of Study Variables

Study Variable	Variable Definition
Attitude	Beliefs about whether or not a behavior will effectively help produce a desired outcome
Norm	Beliefs about what others think or do regarding the desired preventative behavior
Perceived Behavioral Control	Beliefs held by individuals about whether or not they are able to perform a desired preventative behavior

The Human Dimensions of Invasive Species

The Theories of Planned Behavior and Reasoned Action have been instrumental in laying a foundation for identifying barriers to behavior change. As previously stated, these theories are based in health communication literature; the health arena is where the majority of literature resides that refers to these theories of behavior change. For the purposes of this study, there is very little literature available on research regarding the human dimensions of invasive species, and even less research that has applied the Theories of Reasoned Action or Planned Behavior to beliefs about behaviors that may help prevent the spread of invasive species. However, there has been limited research that supports the exploration of the attitudes and beliefs that stakeholder have about invasive species.

Internationally, there has been some recent research about attitudes towards invasive species. Polonsky et al. (2004) used focus groups to study the attitudes and behaviors of policy makers and land managers relating to the control of one invasive species in Australia. The researchers used a social marketing framework to suggest ways to design a program that promotes voluntary behaviors by persuading people to get involved and then offering desired benefits, while reducing prohibitive barriers. The authors advocate for understanding all stakeholders' attitudes and motivations in order for a policy campaign to be effective. Binimelis et al. (2007) acknowledged that human pathways contribute to biological invasions. The authors used two case studies to highlight the

human role in bioinvasions, and conclude that understanding stakeholder knowledge and values regarding invasive species is important in helping to shape management decisions. Jay and Morad (2006) examine the socioeconomic situation regarding invasive species in New Zealand and the way public perception has helped to shape public policy on biosecurity in this country.

These examples of research on the human dimensions of invasive species all advocate for an increased understanding of attitudes and perceptions of people who impact, or are impacted by invasive species. However, none of these examples use the Theory of Planned Behavior as a research framework to explore barriers that prevent stakeholders from changing their behaviors to help prevent the spread of invasive species. In order to provide background information to support the use of this theory, applications from literature on recreational and environmental behaviors will be referenced in the following sections.

Natural Resource and Recreational Applications of the Theory of Planned Behavior

Several researchers have used the Theory of Planned Behavior to frame and examine factors the influence recreational behaviors. Ajzen and Driver (1992) used the Theory of Planned Behavior to examine leisure behaviors such as jogging, boating and mountain climbing among college students. They found that attitudes, norms and perceived behavioral controls were good indicators of intention to perform the leisure behaviors. In a study about hunting behaviors, the Theory of Planned Behavior was found to be accurate in predicting hunting intentions and behaviors based on attitudes, norms and behavioral control beliefs (Hrubes and Ajzen, 2001). This study also found that wildlife-related values and lifestyles influence behaviors. The authors concluded that values were mediated by attitudes, beliefs and intentions.

Also within natural resource and recreational research there have been studies that use the Theory of Planned Behavior to understand beliefs in order to shape education and communication efforts. Bright et al. (1993) examined the Theory of Reasoned Action as a

model of behavior change. The goal of this study was to improve communications from land managers to the public about the National Park Service's controlled burn policy. Educational messages aimed at changing beliefs about the results of controlled burns effectively changed people's attitudes and led to increased support for controlled burn policies. Ham and Weiler (2005) examined the effectiveness of communication interventions aimed at encouraging visitors to stay on walking trails within a National Park. Using factors outlined by the Theory of Planned Behavior, they found that appealing to a social norm, in this case messaging that included a personal story or anecdote, was most effective at positively changing a person's intention to perform a behavior.

Review of Literature on Environmental Applications of the Theory of Planned Behavior

Because this study focuses on hobbyists whose recreational activities potentially impact the spread of invasive species, it is appropriate to reference applications of the Theory of Planned Behavior from recreational literature. However, the desired changes in behaviors in this study revolve around behaviors that impact the spread of invasive species, which may be more closely likened to literature about changing pro-environmental behaviors. The following section refers to examples of research that apply the tenants of the Theory of Planned Behavior to better understand barriers to changing behaviors to be more pro-environment.

Researchers in the environmental arena have acknowledged the Theory of Planned Behavior as a useful model to elucidate beliefs that may impact pro-environmental education campaigns. Ballantyne and Packer (2005) published an overview of theoretical approaches that have shaped free-choice learning research on pro-environmental behaviors. This paper highlights the Theory of Planned Behavior and supports the value of assessing audience behavioral, normative and control beliefs in order to create education messages that these factors in order to encourage intention to change behaviors to be more pro-environment. Another study used the Theory of Planned Behavior to

study “green consumer” behaviors such as purchasing organic produce (Sparks and Shepard, 1992). The study by Sparks and Shepard found that self-identity (how one identifies him/herself, including the groups with which one identifies) plays a significant role in influencing behavioral intentions. Researchers suggest that self-identity may be an interpretation of the unclearly defined variable of attitude, or may be a separate and important variable that shapes behaviors. In this study on barriers to changing behaviors to help prevent the spread of invasive species, self-identity is not examined directly, but falls under the norms category.

Research Objectives

The goal of this study is to better understand the attitudes, social norms and perceived behavioral controls that people have regarding behaviors that potentially impact the spread of invasive species. The Theory of Planned Behavior is simplified to provide a framework for examining the complex factors that contribute to decisions about changing behaviors. In this study, focus groups are used to explore the barriers that prevent key stakeholders, including gardeners, hunters, boaters, and anglers, from changing their behaviors to help prevent the spread of invasive species.

These stakeholder groups whose activities potentially spread invasive species were brought together for a series of focus group discussions. These groups were defined by a shared hobby and the groups were asked a series of questions structured around knowledge about invasive species, knowledge about activities that spread invasive species, barriers to making changes in behavior to stop the spread of invasive species, and ideas about ways to make behavior change easier and engage others in being part of the solution to stop the spread of invasive species. The questions posed by the facilitator to each group were crafted to reveal the attitudes, social norms and perceived behavioral controls that people have towards changing behaviors that may help to prevent the spread of invasive species. The discussion that ensued in each focus group became data as it was coded and sorted into themes and analyzed according to standard qualitative methodology.

The **objectives** of the study are to explore:

- Attitudes about performing a behavior that might help stop the spread of invasive species influence the level of intention to perform that behavior.
- Norms about performing a behavior that might help stop the spread of invasive species influence the level of intention to perform that behavior.
- Perceived Behavioral Controls about performing a behavior that might help stop the spread of invasive species influence the level of intention to perform that behavior.
- Whether stakeholder groups (gardeners, boaters, recreational fishers, and hunters) are different in their attitudes, norms and perceived behavioral control beliefs regarding behaviors that prevent the spread of invasive species.

Assumptions in this study include:

- Intention is an indicator of actual behavior change, based on the Theory of Reasoned Action.
- The focus groups that were chosen for this study were those groups who had some prior exposure to invasive species messaging.
- Those who are aware of invasive species are more likely to change behaviors to prevent the spread of invasive species.
- Understanding barriers to behavior change helps create effective outreach and education efforts.

METHODS

Background Information about Focus Group Methodology

Focus groups have been defined as carefully planned discussions crafted to reveal perceptions about a defined area of interest (Kruger, 1994). Focus groups, which were originally called focused interviews, originated as a method to evaluate audience responses to mass communication methods including radio, print and film (Merton and

Kendall, 1946). This methodology first gained recognition and sophistication during World War II when it was used to analyze the impact of Army training and morale films (Stewart and Shamdasni, 1990). The focus group research tool continues to be adapted for use in marketing, program evaluation and other communication arenas.

Focus groups, like surveys, are largely a qualitative research method. Qualitative research methods are valuable when examining a complex topic, such as social behaviors. In 2001, Knap and Propst conducted a study to evaluate the effectiveness of focus groups, as opposed to surveys, for recreation needs assessments. They found that focus groups offer a way to overcome some of the limitations of survey methodology, which can include a "superficial coverage of complex topics, inflexibility of the instrument throughout the study and an inability to deal with context of social life" (pg. 1). Focus groups are distinguished from other social science methodologies in that they involve multiple interacting individuals who all share a common experience. This shared experience can vary from all having seen the same film to identifying as part of the same stakeholder group (Merton and Kendall, 1942). The interaction among focus group participants facilitates a depth of information sharing as participants contribute ideas, learn from each other, and stimulate each others' perspectives and opinions. Because this study is structured around hobby groups, and explores social norms as a primary factor contributing to behavior change, it is important for the methodology to reflect the social aspects of the stakeholders' behavioral beliefs. This includes the accepted ways invasive species are perceived among those who share a hobby activity. It also includes normal or accepted ways of behaving regarding invasive species. In addition, factors contributing to behavior change are, by nature, extremely complex, further supporting the use of this methodology.

Focus groups are typically used for either exploratory or confirmatory means (Stewart and Shamdasni, 1990). For this study, the focus group methodology was chosen for its strength as a tool to explore an area of research where little is known, in this case, about barriers to changing behaviors in relation to invasive species. Focus group data can be

used to generate additional research hypotheses that can be tested using other, perhaps more quantitative, techniques. The qualitative nature of focus group data is useful in making generalized statements relative to a theory. However, in relation to a larger population, this data can only be descriptive, and not generalizable (Silverman, 2001). Exploratory focus group data often yields new and creative ideas and offers valuable information about the language and perspectives of respondents about the research topic Stewart and Shamdasni, 1990).

Focus groups are appropriately named because they have a focus: the research question at hand guides the degree to which the facilitator directs the group discussion. The presence of a facilitator who uses the group dynamics to elicit information by promoting discussion and keeping that discussion focused also defines focus group methodology (Stewart and Shamdasni, 1990). The role of facilitator is important in that he/she sets the agenda, provides structure and safety for the group and is therefore viewed as a leader by the group. The facilitator inevitably influences the outcome of the focus group. It is therefore important to employ a consistent facilitator when compiling data from multiple focus groups. Both the facilitator and the research assistant were present at each of the study's focus groups.

Use of Focus Groups and the Theories of Planned Behavior and Reasoned Action

As stated previously, there has been little research conducted on the human dimensions of invasive species, making focus group methodology an appropriate fit for the exploratory nature of this research. Focus groups provide a valuable methodology for gathering qualitative data on individual and social attitudes and behaviors. The founders of Theory of Planned Behavior, Ajzen and Fishbein, support the use of qualitative research to explore the salient beliefs about a behavior as a valuable starting point on which to build a body of research (Ajzen and Fishbein, 1980). Because there is very little literature that focused on beliefs that shape behaviors that impact the spread of invasive species, focus group methodology was chosen as an appropriate methodology for exploring this topic.

Several examples help illustrate how other focus groups have been used to explore barriers to behavior change from a variety of research arenas. Each of these studies referred to the Theory of Planned Behavior or the Theory of Reasoned Action to gather information about the attitudes, norms and behavioral control beliefs that influence the likelihood of people taking certain actions. The goal of each study was to gather information in order to understand barriers to changing behaviors in order to help motivate people to take actions that would increase their well being and/or the well being of their societies. Together, these studies revealed several barriers to changing behaviors. These barriers include beliefs about why a behavior will produce a desired outcome (attitudes), beliefs about how other perceived behaviors (norms) and beliefs about one's lack of ability to perform the desired behavior (perceived behavioral controls).

Negative attitudes often create barriers to changing behaviors. In a focus group study about the behavior of using sunscreen, men were reported less likely than women to use sunscreen. One attitude difference between men and women was men's perception that sunscreen was not effective at preventing burns (Abroms et al. 2003). This is an attitude belief because it is based on whether or not people think the behavior will produce the desired outcome, which in this case, is no sunburns. In a study by Lambert et al. (2001) about how parents perceive school lunch programs, one attitude that prevented parents from having their children participate in the school lunch program was a perception that the foods served were of poor nutritional quality. Similarly, in a study about beliefs towards foods enriched with omega-3 fatty acids, researchers found that a negative attitude towards these foods created a barrier that prevented people from incorporating them into their diet. The negative attitude was based in the perception that omega-3 fatty acids from functional foods were not as healthy as omega-3 fatty acids from marine sources (Patch et al., 2005).

Several focus group studies highlighted the importance of social norms in creating motivation for behavior change. Patch et al. (2005) conducted a focus group study to help health educators understand people's beliefs about food enriched with beneficial omega-3

fatty acids in order to help educators design messages to guide healthy dietary choices. Positive opinions among peer groups were a main factor that created motivation to incorporate these foods into one's diet. When health perceptions were studied by Drayton-Brooks and White (2004), they found that "health beliefs, attitudes and behaviors are not developed outside of social systems (pg. 84)." The social norms regarding health in any cultural or social unit were deemed one of the most important factors that shape behaviors. Brug et al. (1995) found that social influences were frequently mentioned as a determinant of whether or not fruits and vegetables were incorporated into a daily diet. Similarly, Abroms et al. (2003) found that social influences were main factors influencing both men and women to use sunscreen.

Focus group studies also revealed the strong role perceived behavioral controls can have in the process of changing behaviors. For example, Patch et al. (2005) found that although people had access to food enriched with omega-3 fatty acids, the cost of the products was not seen as worth the investment, particularly with people who were not completely convinced of the health benefits of these foods. This was considered a perceived behavioral control barrier because it involved a belief about why participants were not able to perform the behavior (i.e. too expensive). In a study by Brug et al. (1995) that based its study variables, in part, on the Theory of Reasoned Action, self-efficacy and other perceived behavioral controls were found to be barriers to incorporating more fruits and vegetables into a daily diet. Participants reported prohibitive barriers such as availability and price of fruits and vegetables, as well as a lack of ability to skillfully prepare these foods with ease.

The above focus group studies have been used to collect data about the attitudes, social norms and perceived behavioral controls that may inhibit, or motivate, people to change their behaviors to live more healthfully. Overall, focus groups have been shown to be an important tool for understanding current attitudes and beliefs in order to inform interventions or education campaigns that addresses people's current perceptions. In this study, focus groups are used to gather preliminary information about stakeholder attitudes

and beliefs regarding behaviors that spread invasive species. The data gathered will help inform the OISC and their partners as they design a statewide awareness and action plan to help prevent and control invasive species in Oregon.

Defining the Sample Population

The first step in recruiting participants for this study was to identify the stakeholder groups to be targeted in the study. To do this, the OISC committee members used their expert opinions and experience to identify user groups that were likely vectors for spreading invasive species and also potentially part of the solution. They then narrowed those choices to groups who they believed had received some invasive species education in the past in association with their hobby activity. These groups were considered the "low hanging fruit;" the groups who would most likely change behaviors because they were already aware of the problems associated with invasive species. The committee then voted and discussed to consensus five choices for study stakeholder groups. These included hunters, recreational fishers, boaters, exotic pet and aquarium owners, and gardeners. The methods for defining the sample population assume that the groups chosen include people who may be more aware of invasive species and the associated issues than the general public.

Recruiting Participants

Before recruiting any research participants, a study proposal had to be accepted by the Institutional Review Board (IRB). IRB approval is required for any study at Oregon State University (OSU) that involves human subjects. The mission of the IRB is to ensure that all human research participants are treated ethically and that their confidentiality is protected.

Initially, public records were used to contact people who have current boating, hunting and fishing licenses, as well as those who are master gardeners (public records of master gardeners are available through OSU extension services.) A typical focus group involves between eight and 12 people. This number has been found to be a balance between small

groups that may be dominated by a few individuals and groups too large to allow for meaningful participation of all participants (Stewart and Shamdasni, 1990).

A summary of participant demographic can be found in the results. This study collected data from five focus groups convened during the summer of 2007. 41 participants were involved in these five focus groups. However due to faulty recording equipment one focus group of gardeners (n=11) did not result in any audio recorded data and transcribed focus group data from only 29 participants were successfully obtained. The final focus groups consisted of gardeners (n=5), boaters (n=8), recreational fishers (n=8) and hunters (n=7). Each focus group was comprised of people who shared one of these hobbies in common. This was done to ensure a certain amount of homogeneity regarding the hobby activity at hand.

Recruitment began by obtaining a list of 93 licensed Oregon boaters from the Oregon Marine Board, including their names and addresses. These potential participants were contacted through a mailed IRB approved letter introducing the project and including an invitation for participation (see appendix A). Enclosed in this letter was an informed consent form and a contact information form (see appendix B and C). Those recruited were asked to complete and sign both forms if they would like to participate. If they chose not to participate, they could complete and return the contact information sheet with the appropriate box marked for no participation.

Due to a low response rate from this method, and difficulty in obtaining other public records for recruitment purposes, the recruitment methods were modified. A networking system was used for recruiting a purposive sample of participants. Purposive sampling recruits participants who have more involvement or relevant perspective that than general public (Silverman, 2001). For each group, leaders of organizations who had access to the different user groups targeted were contacted. The researcher contacted Oregon Master Gardener coordinators, and lead fishing, hunting, and boating organizations (see appendix D for a list of all organizations contacted). These contacts were chosen based

on word-of-mouth networking starting with recommendations from members of the OISC, or through internet searching and follow-up communications. Due to unsuccessful attempts to recruit exotic pet owners and aquarium enthusiasts by using pet stores as networking organizations, and also due to limited time to collect data, no focus group took place with this group of stakeholders.

Most networking for participant recruitment was done by email, along with follow-up phone calls. For confidentiality purposes, most recruitment contacts preferred to contact potential participants directly, rather than give the researcher the participant's contact information to have the researcher contact them directly. To accommodate this preference, each recruitment contact was sent a 'request for recruitment' email (see appendix E) that included participant information (invitation letter, informed consent and contact information forms), along with a project overview (see appendix F). The 'request for recruitment' email included an invitation to directly distribute all the included information to any parties who may be interested in participating or those who may also be able to help recruit participants. All recruitment methods were approved by the IRB.

Those people interested in participating or gaining more information contacted the researchers directly, usually via email. Every person who initiated contact with the researcher received follow-up communications to help ensure participation (see appendix G). Through email communication, dates and locations were scheduled for each focus group.

Focus Group Format

In this study, each focus group was three hours long and took place either between 1pm to 4pm or 6pm to 9pm. The three locations for focus groups include the Corvallis Depot Meeting Suites in Corvallis, Oregon, the Oregon State University Extension Services Office in Beaverton, Oregon and the Oregon Public Broadcasting Station in Portland, Oregon. The meeting times and locations were determined based on the starting location and availability of the interested participants. All participants received a free catered meal

during the focus group. The first group of participants received mileage as compensation for their time and participation. Because of budget restrictions, all individuals from subsequent groups received a $50 stipend as compensation instead of mileage.

It is important to establish a consistent structure to obtain the desired results from a focus group study. This structure is shaped by the researcher's purpose, desire for specific information or exploration of participants' impressions and ideas (Stewart and Shamdasni, 1990). Each focus group followed the same format. (For a complete outline of the focus group format, agenda, questions, and activities, see appendix H). Individuals were invited to arrive early in order to complete any remaining paperwork and help themselves to the meal provided. In general, each focus group began by going over the agenda, having a time for introductions and sharing the goal and objectives of the focus group discussion. The usefulness and validity of the focus group data is largely dependent on the level of comfort participants feel to express their ideas and opinions (Kruger, 1994). Participants' level of comfort is partially dependent on the skill of the facilitator, but is also influenced by group dynamics and individual personalities. Led by the facilitator, each group took a few minutes to agree on some 'group guidelines' to help ensure a safe and confidential atmosphere for people to share thoughts and be heard.

A set of semi-structured questions were developed to elicit the attitudes, norms and perceived behavioral controls that influence behaviors that potentially spread invasive species. These questions were originally formatted based on input from the OISC. The questions were then reviewed and modified with the intention of covering each of the factors stated by the Theory of Planned Behavior to influence behavior change. The participants were asked a series of four main objective questions which built upon each other, each which was followed by a series of sub-questions. For the first two main objective questions, participants participated in a "platform activity" before transitioning from one question to the next. Before concluding each focus group, participants took part in a final "reflection activity". The goal of each of these activities was to create a

common platform of reference before moving on to a subsequent question, and to give participants an opportunity to be more active and/or change thinking patterns in order to encourage fresh thinking. The participants took a break in the middle of each three hour focus group, and were able to take breaks and eat the food provided as needed individually.

Main Objective Questions

In order to understand the level of knowledge about invasive species, and to create a common reference point for the remainder of the focus group discussion, each group began with questions framed around the objective of better understanding people's current level of awareness about invasive species. Understanding participants' knowledge about invasive species, including definitions, pathways and impacts, provides context for the results of this study. As stated, the focus group population was not selected to represent the general public. Instead they were chosen to represent the 'low-hanging fruit' part of the population who are already knowledgeable and interested in invasive species. These are the people most likely to become part of the solution to the spread of invasive species through hobby activities if future awareness and action campaigns can effectively address the beliefs that create barriers to changing their hobby activities. The questions asked to elicit this baseline knowledge about invasive species included:

- What does me the term 'invasive species' mean to you?
- Can you name any invasive species?
- How are invasive species introduced and/or spread?
- How important is the issue of invasive species to you?
- How do invasive species interact with other plants and animals?
- Do invasive species affect your life in any way? If so, how?

After this series of questions and the ensuing discussion, the facilitator shared a basic definition of invasive species to help provide a common framework for the remainder of the discussion. The definition for invasive species that was given was "a plant or animal that is not originally from around here and causes economic or ecosystem harm."

Participants then engaged in a platform activity where each person thought of an example of an invasive species that had affected him or her, the way it spreads and why it is unwanted. Everyone shared their examples in a round-robin format as the facilitator wrote these contributions on a flipchart (see appendix I for platform and reflection activity responses from each stakeholder group).

The second main objective question was how participants perceived their activities relative to the spread invasive species. The questions asked to elicit this information changed slightly depending on the hobby group involved in order to more specifically prompt people about their perceptions of the ways their hobby may contribute to the spread of invasive species. As an example, the questions used in the gardening focus groups included:

- Can you name any activities you do, or don't do, that may contribute to the spread of invasive species?
- Do you have invasive species in your garden area?
- Have you ever done anything about invasive species in your garden area?
- How do you know where your plants originally come from?
- What do you do with plants you don't want anymore?
- Has anyone ever had a 'volunteer' invasive species in your garden? If so, what did you do about it?
- Do you ever buy plants online?
- Have you ever asked at a store where your plants come from?
- What makes you choose the plants you buy?
- What makes you replace or remove plants from your garden?

During this part of the discussion, a research assistant took notes on the activities that people listed as contributing to the spread of invasive species. While participants took a short break after the conclusion of this set of questions (about half-way through the focus group discussion), the facilitator summarized participants' comments into a list of activities that may spread invasive species and wrote that list on a flipchart. When

participants returned from their break, the facilitators used this list to stimulate a platform activity for participants by reading the summarized list and asking if participants wanted to add anything to the list.

The third main objective question posed to each group was about the barriers that people perceived as preventing them from changing their behaviors. The main question was "what may prevent you from changing the activities that potentially spread invasive species?" The questions used to elicit responses were:

- What would it take for you to change the activities that may contribute to the spread of invasive species?
- Do you think you are capable of making a difference through your personal actions?
- Would making changes in your activities/behaviors be easy or difficult? Why?
- What kind of social pressure or 'usual' way of thinking does your hobby group have relating to invasive species? Have your friends or colleagues ever talked about invasive species?
- Are there any policies or accepted activities relating to behaviors that may spread invasive species? (as part of your hobby club or organization?)

The fourth main objective question was "What would make it easier for you to change the activities that potentially spread invasive species?" This series of questions was designed to gather people's ideas about solutions to help raise public awareness and engagement regarding invasive species. The questions asked to gather information on this topic included:

- What would help you change your behaviors?
- What ideas do you have about stopping the spread of invasive species overall?
- Where have you received any invasive species information in the past?
- What would have made this messaging more effective? How would you have conveyed this message?
- What activities would you like to be involved in that would help you change behaviors?

- Where would you most likely hear about and listen to messages about invasive species? (venues, media types. . .)

After discussing all of these questions, participants were asked to complete a short survey with five demographic questions and three questions about the importance of the hobby to the individual, as well as attitudes about preventative behaviors and the level of intention to change behavior to help stop the spread of invasive species (see appendix J for focus group questionnaire).

Before ending the focus group discussion, each group participated in one last reflection activity. Everyone was asked to take a minute and write on separate sticky notes:

1. Something that was new or surprising from the discussion
2. Something that was important from the discussion

When everyone was complete with their writing, people were asked to place each sticky note under one of the discussion group objectives. As a reminder to the participants, the main objective questions were written and hanging on a wall, as follows:

- Knowledge: What do you currently know about invasive species?
- Activities: How might your activities spread invasive species?
- Barriers: What may prevent you from changing the activities that potentially spread invasive species?
- Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

Once everyone was complete with posting their sticky notes where they felt it was most appropriate, a short discussion ensued about what people noticed about the groupings of the sticky notes and any other closing comments participants may have had.

This focus group study was designed to explore the attitudes, norms and perceived behavioral controls that create barriers that may prevent key stakeholders from changing their behaviors to help stop the spread of invasive species. Barriers existed with each of these variables. Before this format was used to gather data, it was tested during a pilot

focus group consisting of Oregon State University students and faculty who provided feedback that helped streamline to the format and focus the questions to meet the study objectives.

Recording Methods

After difficulty with a faulty recording technology at the first focus group of gardeners, a back-up audio cassette was added to the primary digital recorder (a DS-4000 digital audio recorder and a multi-directional microphone) that was used to audio record the discussions. Participants, the research assistant and the facilitator sat at tables oriented in a circle and the recording equipment was set up on a table in the center of this circle. The equipment was checked for proper function prior to the commencement of each focus group. A research assistant monitored the sound using headphones throughout the focus group to ensure proper recording. Recording began once all participants were seated and after they were informed that they would be recorded. All group dialogue was recorded and the equipment was turned off during the breaks.

A summary of each focus group was written by the facilitator, who was also the primary researcher, within a few days of completing each focus group. This summary includes the name of the group, the date, time and location, as well as the gender of the participants and the organizations they represented. This summary also includes some of the major themes that emerged from each group, as well as any group dynamics that may have shaped the discussion.

Transcription Methods

The digital recordings of the focus groups' dialogue were downloaded onto computers and transcribed using the DSS Player Lite program. This allows for frequent stopping and rewinding to aid in transcription. The audio recording was transcribed verbatim, as much as was possible, including many stalling words, such as 'like' and 'you know'. The level of detail for transforming the recorded dialogue into a transcript is determined by the

level of detail that is likely to be analyzed (Silverman, 2001). The transcriber had also been present at each focus group meeting as the research assistant.

A change in speaker was noted by starting on a new line. Names of speakers, aside from the facilitator and a few other non-participants (Sam Chan of Oregon Sea Grant and Jeff Douglas from OPB) were not recorded as it is difficult to accurately know who the speaker is at all times from audio recording alone. All new speakers who were participants were simply labeled as 'Participant' on a new line, followed by what they said. This also helps to ensure participant confidentiality.

To increase reliability of the transcribed data, it is customary to have a different person do a proofing round of transcribing (Silverman, 2001). Once the initial transcription was completed, the transcribed data was submitted for proofing to the primary researcher to ensure quality control. After converting the audio recording from DSS to WAV format, the proof reader listened to the audio recording while reading the transcript, stopping to make any changes or additions as necessary.

Preparing the Transcript Methods

When using focus group methodology, the data gathered is the interaction and dialogue that takes place during the meeting. Analysis of focus group dialogue takes place in overlapping stages. The first stage involves preparing the transcript by identifying data units (Bernard, 2006). To identify data units, the transcribed and proofed dialogue must first be broken into data units. To start, line numbers were added to the text to aid in the coding process. Data units included the participants' introductions of themselves, which generally include information their affiliations, as well as insights on why participants chose to participate in this study. All transcribed dialogue among participants, except the names of participants, is included. In order to maintain confidentiality, [name] is substituted in any areas of dialogue where a name is included in the middle of an idea, and the idea would lose meaning if this was not included. Parts of the dialogue where the facilitator is speaking are not included, nor are interruptions from other parties not

involved in the focus group or contributing to the focus group discussion at hand. Questions or clarifications about the study itself are also not included in the transcript preparation process (i.e. interruptions).

At times, one idea may be conveyed through a back and forth discussion among several participants. In other parts of the dialogue, one speaker may convey several distinct ideas in one paragraph. When two separate speakers continue one idea by speaking back and forth, this is indicated by including all the appropriate lines and indicating in brackets when another participants begins speaking (ex. ". . . species from other countries from getting here by either by ship, plane or shipping crate….[new speaker] and it doesn't necessary have to be another country unless you consider California a country.") In areas where it is not clear, the facilitator's question that prompts the response is also included in brackets.

Coding Methods

As the data units are being defined, simultaneously the researcher is recognizing major themes within the data and assembling a codebook that provides an outline of themes and theme definitions for data analysis. The same codes will be used to analyze all the data included in one study (Rubin and Rubin, 2005).

The coding process began with four primary codes that correspond to the main objective questions posed to each group. The initial primary themes were Knowledge, Activities Barriers, and Solutions. Activities were eventually assimilated into the Knowledge code as "pathways" because participants' responses did not indicate that activities were a separate area of significance to the research question, but instead were part of overall knowledge about invasive species. The second level of coding was done according to different themes that emerged from the data. Identifying the secondary codes as they emerge from the data, as opposed to based on the theory used enabled the researchers to be unconstrained and less biased when uncovering themes and areas of importance from the data.

The themes and codes that emerged from the data were compiled into a codebook that organized codes into an outline format of primary codes, secondary codes imbedded within primary codes, tertiary codes within secondary codes and, in some instances, quaternary codes within tertiary codes. Each code was given a definition to help ensure consistency when assigning data units to each code. This process entails many reiterations of coding and revising the codebook until each transcript conforms to a single codebook and all data units from each transcript are coded according to one or more themes in that final codebook (see appendix J for final codebook). Data units and their line numbers are assigned to one or more codes throughout the creation of the codebook. Some responses fit into multiple categories. In these cases, the section was copied and pasted into the different code areas and a note was made in parentheses as to which other code area also included this passage.

In this study, after all the data was reorganized according to the final codebook, the process of analyzing the data began.

Analysis Methods

In this study, data analysis began by sorting all of the data units that belonged to one code area into a single document to aid in summarizing the data. Listing, sorting, ranking, and comparing are some commonly used methods to summarize data corresponding to one code (Rubin and Rubin, 2005). Because one of the objectives of this study was to compare the stakeholder groups, the coded data units from each focus group were brought together during the analysis process. A separate document was created with assigned space for each group's responses in any one coded area (see appendix L for example) and all dialogue assigned to a code area was pasted into this new document. This allowed the researcher to compare the comments made in different groups on any one topic or theme.

Throughout this process it is also important to verify the credibility of data and examine personal questioning patterns (Silverman, 2001). In this study, inter-coder reliability was

tested with two academic professors to help ensure quality control. Inter-coder reliability is commonly used to help ensure the clarity and consistency of the codebook and its application to the data (Bernard, 2006). Random excerpts of focus group dialogue were given to those testing for inter-coder reliability, along with a codebook. The inter-reliability was roughly 80% and a few modifications were made to the codebook to increase clarity and specificity based on their input.

After ensuring quality control in the analyzing process, the coded and sorted data were then reviewed to reveal attitudes, beliefs and perceived behavioral controls based on the adapted Theory of Planned Behavior. One way this was done was by looking for data units that had been coded in one or more areas; this may have been an indication that these separate codes areas are connected (Rubin and Rubin, 2005). Exemplar quotes were pulled from the sorted data. These quotes were used to present a narrative of beliefs that shape people's attitudes, norms and perceived behavioral controls about behaviors that prevent invasive species. Stalling words were deleted from these quotes to help readability of the results.

The dialogue taking place during the focus group was analyzed separately and using different methods than the data gathered during the focus group questionnaire. The data from the questionnaires were entered into Excel for Windows and graphs were created to present an overview of participant demographic information.

RESULTS

Included in these results is information gathered from the dialogue that took place during four focus groups comprised of gardeners, hunters, boaters, anglers and hunters. These results also include information gathered via the demographics portion of the focus group questionnaire (see Figures 2., 3., 4., and 5.) but do not include data from platform or reflection activities.

Summary of Participant Demographics

The gardening group consisted of three males and two females. Multiple participants reported belonging to more than one gardening organization. The organizations represented include: Master Gardeners (four people), Hardy Plant Society (two people), American Horticultural Society (one person), Oregon Native Plant Society (one person), and Oregon Bonsai Society (one person). All participants were from region two, except one participant from region one (see appendix M for regions map). All participants had either graduated from college or had post graduate experience.

All seven hunter participants were male. The hunting groups and organizations represented include: Rocky Mountain Elk Foundation (two people), NRA (one person), Benton Bowmen (one person), Wapiti (one person), Traditional Archers of Oregon (one person), Estacada Rod and Gun (one person), Northwest Flyfishers (one person), Ducks Unlimited (one person), and Oregon Hunters Association (one person). All participants were from region two, although the participants commented that they travel all over the state to hunt. Four participants had either some college or had graduated from college and the rest had graduate school experience.

The eight recreational fishers included one female and seven males. The fishing organizations represented include: Oregon Bass (one person), Steelheaders (one person), Oregon Bass and Panfish Club (one person), Trout Unlimited (two people), Ifish (three people), Oregon Fishing Club (one person), Sierra Club (one person), Ospirg (one person), Native Fish Society (one person), Northwest Sportfishing Industry Association (two people), and Coastal Conservation Association (one person). Five participants were from region two, one was from region one, and two were from region six**.** Six participants had either some college or had graduated from college and the rest had graduate school experience.

The boaters consisted of one female and seven males. The boating organizations included: Rose City Yacht Club (one person), Oregon Women's Sailing Association (one

person), Multnomah Channel Yacht Club (one person), Columbia River Yachting Association (one person), and Boat/US (one person). All participants were from region two. Six participants had either some college or had graduated from college and the rest had graduate school experience. One participant had only high school experience, five participants had either some college or had graduated from college and the remaining two participants had graduate school experience.

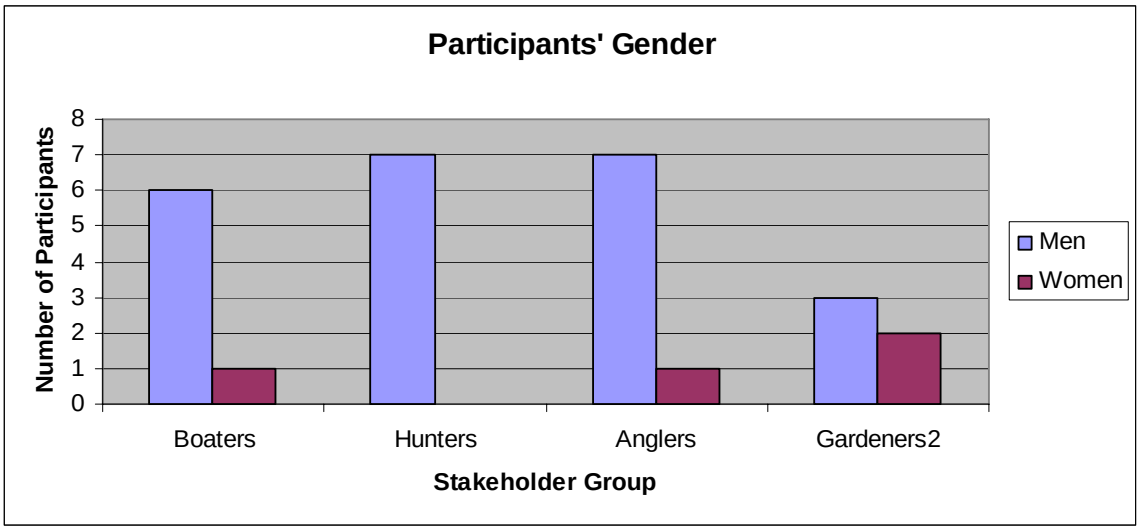

Figure 2. Participants' Gender Based on Questionnaire Results

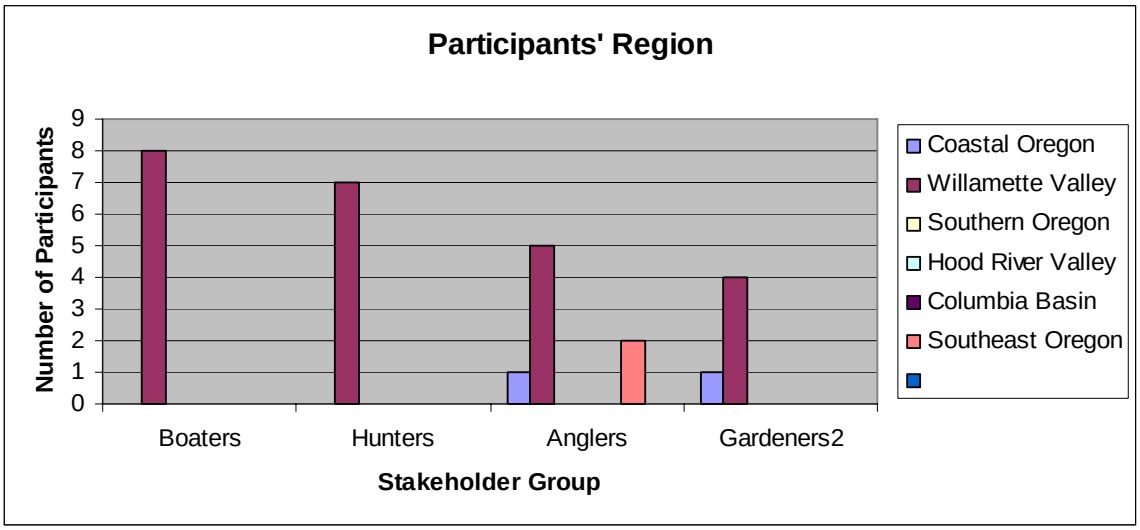

Figure 3. Participants' Region Based on Questionnaire Results

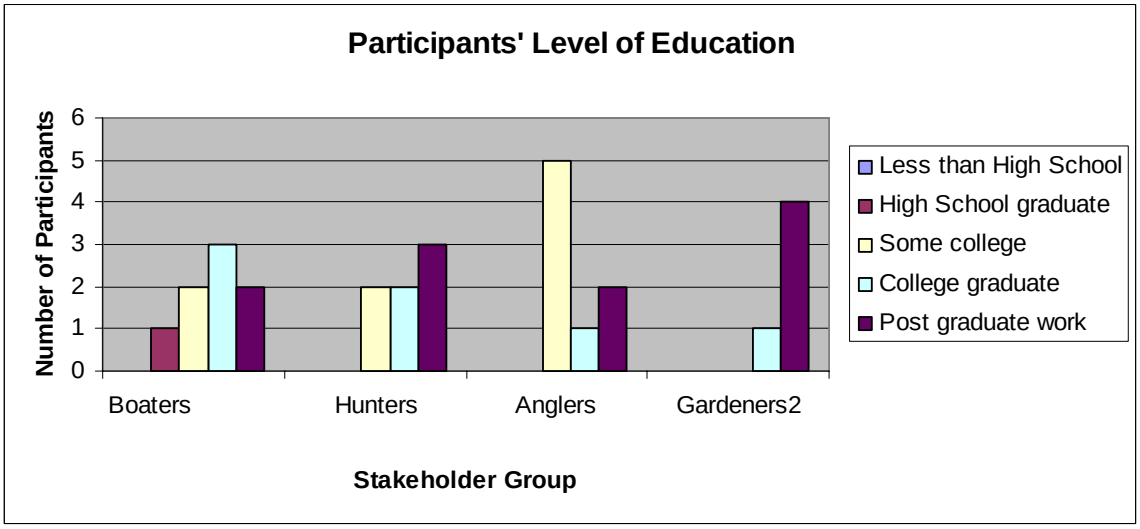

Figure 4. Participants Level of Education Based on Questionnaire Results

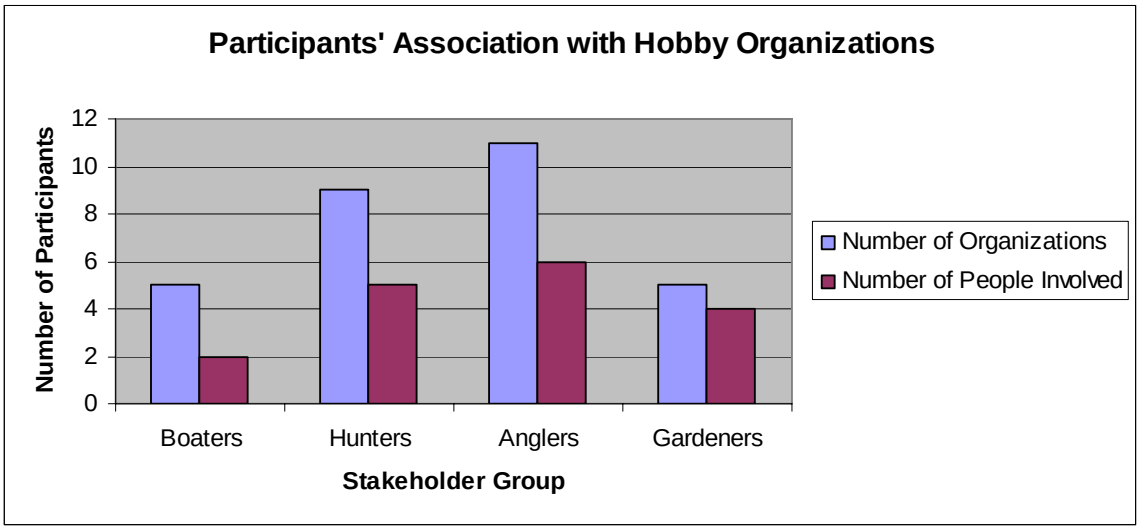

Figure 5. Participants' Association with Hobby Organizations

Knowledge about the Invasive Species: Definition, Pathways, and Impacts

Overall, focus group participants from each stakeholder group were able to provide examples of invasive species, discuss the complexities inherent in defining what an invasive species is, and were familiar with how invasive species are spread. They were also aware of many different ways that invasive species can negatively impact economies, ecosystems, recreational opportunities and intrinsic values. This section of the results is designed to provide information about the study population and their familiarity with invasive species to enable a more thorough understanding of the study population included.

Invasive Species Definitions

Through discussion, each group identified both aspects of the study's definition of invasive species: not from around here and causes harm. One gardener offered a definition of an invasive species as, "a species that is harmful to the economy, the environment or human beings that are non-native to the area. . . That's how I would define it." A recreational fisher echoed this, "how about a plant or animal that, through artificial introduction into a new environment could pose a negative impact on that area." Participants from each group were also able to identify some of the main themes common among invasive species. For example, invasive species often out-compete or displace

native populations. As one recreational fisher stated, “it gets to the level of public awareness [when] the species have the capacity to displace something that is native and important to us here.” Typically, invasive species reproduce or spread quickly and easily to form prolific populations. One hunter said,

> “It has to have the ability to reproduce beyond the reproductive capacity of whatever native species are there. So that it can actually take over. Most of the noxious weeds especially have a variety of reproductive strategies and dispersal methods so that they can succeed where natives can’t.”

A hunter also pointed out that a hallmark of originating from somewhere else is the absence of natural predators that have co-evolved together, “because generally the way that things become invasive is there is nothing around that will keep them in check.”

Each of the groups also generated significant conversation about the ‘gray areas’ that exist within the accepted definition of invasive species, and expressed some degree of confusion about defining invasive species. One prominent ambiguity highlighted by all the groups was the idea that ‘causes harm’ is based on perspective. Participants noted that many organisms that can be harmful were intentionally introduced for recreation or economic purposes. One boater asked, “bass in the Willamette River, are they native? They were introduced. Now they’ve wiped out perch, the bluegills, the crappie. We have hardly any!” The other ambiguity in defining invasive species is the uncertainty about the difference between non-native or exotic species and an invasive species; “I mean is there a difference between an invasive species and say exotic species?” a hunter asked. Another hunter asked, “what does ‘originally’ mean? I mean whose count are we using, the cave peoples, or recorded time, or first [described] by a management person?”

Invasive Species Pathways

Participants in each group were aware that invasive species can be spread through both human activities and by natural events. One boater highlighted the role of wildlife in spreading invasive species, “isn’t it true that animals, like for example birds, pick up seeds and bring ‘em in?. . .It is not only us and boats. It is part of nature too.” The examples for human actions that lead to the introduction or spread of invasive species

were coded within two categories. The first are intentional introductions, such as releasing unwanted aquarium species into a local waterway or stocking of preferred fish or game. A recreational fisher shared insight about the connection between the fishing industry and invasive species, “I think of the high cascade lakes that had no fish and now they’re all planted with fish. The trout that they planted obviously have some effect on the ecosystem.” A second example of an intentional introduction with unintentional consequences is a story provided by a hunter: “the European starlings were brought to the United States because some idiot decided that he liked their song and it spread.”

Human actions can also unintentionally lead to the spread of invasive species, such as unknowingly transfering a species to a new location via bilge water or as hitchkikers on clothes and equipment. **“**Moving the boat from one body of water to another surely can contribute to the spread of invasive species,” one boater said. A hunter shared,

> “we pick up weed seeds on our clothes and carry them home with us or carry them off to our next hunting [area]. . . .Getting in and out of the truck you don’t worry about brushing your clothes off. So we’ve had an effect without even thinking about it.”

Impacts of Invasive Species

Focus group participants had many comments about how invasive species impact Oregon and the participants personally. The perceived impacts of invasive species that emerged from the coding process included impacts on ecosystems, economies, recreational opportunities and also impacts on more intrinsic values.

Ecosystem Impacts

The harm caused to Oregon ecosystems by invasive species was an important perceived impact for all of the groups, and especially for gardeners and recreational fishers. One gardener stated,

> “there are parts of Tillamook Bay that have . . .some kind of water plant that is completely taking over. There is nothing else there. The clams, the crabs, and other sea life just don’t exist in those areas. And potentially, without being controlled, my understanding is it could fill up the whole bay.”

Fishermen made references to the chain of effects that lead to an invasive becoming a problem in an ecosystem, "they just disrupt and displace ecosystems and can alter it enough to eliminate what was there originally and affect your ability to persist." The boater group also made reference to ecosystem impacts, but they, in general, were less sure of the details of exactly how invasive species impacted ecosystems.

> "I can't think of an example where a marine invasive species affects me directly. . . There is this aquatic sub surface environment that it's really hard to register amongst public. . .It's a lot easier to talk about Canary reed grass or Himalayan blackberries because it's 'oh that is the evil one right there' and people can point to it."

Economic Impacts

Another perceived impact of invasive species mentioned by all of the groups was the harm these organisms can cause to economies. This includes reference to invasive species that impact industries or economies, result in social infrastructure damage that raises taxes, or requires restoration or maintenance that also costs society money. As one recreational fisher stated,

> "it's really the future of our fisheries here, the future of the economic livelihood for some of these towns, areas that traditionally had terrific fishing and marinas were flourishing and now people aren't showing up to fish, they aren't showing up to rent hotel rooms, rent boats and you know there is a huge economic impact on some of these areas because of these invasive species."

Boaters discussed invasive species that can clog intakes on their boats, and were able to extrapolate that experience to factories or municipal water sources.

> "If we have to start fighting the zebra mussels, quagga mussels or whatever it is that's clogging in the intakes of our boats, our water intakes or municipal systems and things like that. There is going to be an impact and it will be financial, for all of us. . . .We all have to pay for that."

This was especially important for the recreational fishers and boaters, although it was also mentioned by hunter and gardeners. For example, one hunter used the examples of Detroit Lake. "Yeah, for the fishing side it is really expensive! I mean usually what

happens is the poor marine owners and boat dock guys have to eat it because you have to poison the lake and then it's toast for a couple of years."

Recreational Opportunity Impacts

All groups were aware the invasive species can harm recreational opportunities. This was an especially important perceived impact for the boater and hunter groups. One hunter said, "we love to hunt clear cut . . .but the blackberries grow so fast that you can't find the trees or the clear cut in a year. . . you can't get to your favorite hunt spot." Invasive species also impact hunters by introducing diseases. One hunter stated, "you can kill six of them, but you can't eat any of the meat. . .It is diseases that threaten not only the populations, but the usefulness of going hunting and being able to fill your freezer." Invasive species potentially impact boaters by damaging their boats and other recreational equipment. As one boater remarked,

> "the zebra mussels are a prime example . . .[because they] can prevent your boat from running, cause it to overheat and the fix is not easy because it is all inside the engine, inside the intakes where it's not accessible. So it requires extensive repairs to correct."

Another boater noted, "I agree that personal costs, 'this will damage your boat' gets your attention pretty quickly, because boats are an investment personally." One gardener shared another way that invasive species impact recreational opportunities; "you spend a lot of time pulling them out (laughs)."

Intrinsic Impacts

The last perceived impact of invasive species, mentioned by all groups, is the way that invasive species harm the things that people value for intrinsic reasons. In this study, perceived intrinsic impacts refer to comments about people's sense of place, sense of beauty, the existence value of creatures, and the desire to leave the legacy of a healthy environment and intact resources to the next generations. One gardener commented, "you go out to some place where you've been to all your life and it's all covered with ivy! It just doesn't look as good." A recreational fisher explained why the issue of invasive

species is important to him by saying, “I’m a native Oregonian and I have seen a lot changes because of them.” Another recreational fisher stated his motivation for being involved with the issue of invasive species by stating, “I want to pass a legacy along to my kids, right?” I want my kids to have what I have and better. . .We are not leaving them something better now.” One hunter even used the term ‘existence value’ when he stated,

> “I think there is something, and several people have mentioned it, about an existence value to things. I haven’t heard that they had Koi in Mann Lake, but I’m dismayed because . . .[cutthroat trout] is basically a really rare species and thrives in that desert environment and it’s its terrible to think about something displacing that.”

Table 2. Perceived Impacts of Invasive Species by Stakeholder Group

	Intrinsic Impacts	Economic Impacts	Ecosystem Impacts	Recreational Impacts
Gardeners	Medium	Low	High	Low
Boaters	Low	Medium	Medium	High
Recreational Fishers	Medium	Medium	High	Medium
Hunters	Medium	Low	Medium	High

Each stakeholder focus group made reference to each of the four different impact categories throughout the focus group discussions. These impact categories were codes that emerged from the data sorting and analysis process. Based on the number and degree of references made in each value category, the researcher assigned ‘low, medium or high’ for each stakeholder groups, in order to demonstrate the degree to which each stakeholder group referenced the different value categories relative to each other.

Barriers to Changing Behaviors

This study employs a simplified model of the Theory of Planned Behavior as a framework to better understand the beliefs that may prevent stakeholders from changing their behaviors to help stop the spread of invasive species. The desired behaviors are those that will help prevent the introduction and spread of invasive species. Focus group discussions revealed barriers to adopting preventative behaviors in attitudes, norms and perceived behavioral controls.

Attitude Barriers

According to the Theory of Planned Behavior, attitudes influence intention to perform a behavior. Attitudes in this study are identified by comments about whether or not people believe that preventative behaviors are effective at producing a desired outcome. One attitude that creates a possible barrier to changing behaviors is the belief that some of the desired behaviors that might help stop the spread of invasive species, such as using bleach to clean boats or using pesticides to control invasive plants, are considered more harmful than invasive species to the environment. Another attitude barrier includes the belief that working to stop the introduction and spread of invasive species is a losing battle; due to globalization, climate change and other land-use changes, it feels inevitable that invasive species will take over.

Belief: Preventative Behaviors may be More Harmful than Invasive Species

The first attitude belief that may create a barrier to change is the belief that preventative behaviors may be more harmful than invasive species. To start, participants were concerned about the adverse impacts of using herbicides or pesticides to control or eradicate invasive pests and plants. One example was given by a gardener who said,

> "back on the farm in the 40's and the 50's, we dealt with the Canadian thistle with. . .the 1940's version of whatever paraquat was. There are clearly ecological negatives about using herbicides, for example to control invasive species that may have all kinds of other unrecognized detriments, not just to the ecology but to people and the animals and the use of that particular land."

A boater echoed this by saying, "what you do for it is sometimes worse than what is causing it. I've seen that before, like DDT and that kind of thing. I mean Roundup! I mean roundup is one of the most [harmful] things there is along the river banks."

Boaters and recreational fishers were also concerned about using soap and bleach on boats and equipment to get rid of invasive species because of the possible detrimental effects these substances can have on water ecosystems and on the equipment itself. Two boaters discussed, "so what does bleach do when it runs back into the lake? . . . [new

speaker] What is the worst of the two evils, I guess." A recreational fisher expressed concern about his/her equipment if bleach is used to clean the boat,

> "I like to do my part, but not if it is going to harm something else. For instance, if I have to use bleach, what about all the vegetation? What about my boat? What about the carpet in my boat, and all the fabrics? … I'm sure we are not talking about 100% bleach, but even a 50% solution... That is pretty caustic and I use bleach in my yard to kill weeds so that I don't have to use herbicides. I know what it can do to weeds, I know what it does to carpeting and other fabrics, and so what is it going to do to my fiberglass, long term?"

Another boater was concerned about excess soap being released into the environment, "the whole idea of soap going in the water creating phosphorus . . . you create the environment for the invasive species to take a foot hold."

Belief: Invasive Species is a Losing Battle

The second attitude belief that may influence intention to perform preventative behaviors is the belief that the fight against invasive species is a losing battle. According to many participants, invasive species is just one aspect of much larger detrimental changes taking place in the environment. This was expressed in each focus group. In different groups these changes were attributed to different causes, including global climate change, changes in land use, and pollution issues. For example, one boater stated,

> "I see changes that are taking place over time and even seasonal changes. One of the things is more and more vegetation in the water, even way up river. And I think it has to do with the fact that the river is warming. . . And I think that changes the environment and allows even native plants to do things that [are] not normal. Because, you know, we've changed their environment. Now native plants are becoming a problem."

Two hunters pointed to global climate change as an exacerbating force that contributes to the spread of invasive species,

> "I think that with global change being more of an issue that people are aware of, that we can expect to see the invasiveness of these species increase. . .[new speaker] Biomes are gonna be shifting and so there is gonna be more opportunity for these species to move into areas."

Recreational fishers shared a similar sentiment when they expressed how ubiquitous invasive species are, and how widespread and common their pathways for introduction are, "most of the things we buy and need come from clear around the world. . .It is impossible to keep out all the other things, like native species from other countries, from getting here by either by ship, plane or shipping crate." A hunter contributed his perspective about the relative ineffectiveness of small personal behavior changes compared to the much larger issue of invasive species that are spread by hitchhiking on transport trucks,

> "it's one thing to encourage hunters to brush their dogs and clean the mud on their tires, but then I see semi's full of hay going back and forth across Oregon. They come from Eastern Oregon to here, and I'm sure that there is stuff going from here to Eastern Oregon. So what makes the most sense as to where to actually put your effort?"

Another hunter asked,

> "What can be done? I think invasive species is something that education is only gonna take it so far because a lot of these ways of dispersal are things we can't do much about, especially with disease vectors and those sorts of things. . .they're small and easily moved. . . .We aren't gonna stop the problem."

Recreational fishers made similar comments about the difficulty in managing invasive species that spread by spores,

> "the thing I worry about is the microscopic versions of some of the things we are talking about. . . it is real easy to see a plant. . . on your boat, or your gear, but I think there are things that are going to be real difficult for us to say *I* can make a difference on."

Related to participants' perceptions that invasive species are inextricably connected to much broader global changes and environmental problems is participants' belief that individual actions don't make any difference in the battle to prevent or control invasive species. One gardener shared a personal example,

> "let's suppose that before I die I actually have my property invasive plant free. Given the ivy and the laurel and the blackberries in the surrounding areas. . . if I do that it will be like [name of an island] in the middle of the

> Pacific Ocean. I mean, I won't have done much, other than having the personal satisfaction of doing it."

Another gardener echoed this perspective in saying,

> "it seems like most of these things kind of sneak up on us, and don't really get noticed until you get to the point where it is a problem.. . .then it borders on being too late to actually take decisive action.. . ..so we're constantly fighting something."

Norm Barriers

In addition to attitude, the Theory of Planned Behavior identifies norms as a factor that influences intention to perform a behavior. Social norms are defined in this study as people's perception of what others think or do regarding the desired preventative behaviors. Participants discussed two different perceived social norms that create barriers to changing behaviors to help stop the spread of invasive species. First is the perception that institutions, such as nursery retailers and government organizations, don't care enough about invasive species. The second perceived norm is that the general public doesn't know or care about invasive species.

Belief: Institutions Don't Regulate Invasive Species Prevention

The first norm belief that emerged as a potential barrier to change is the perception that institutions are not doing their part in the fight against invasive species. The boater, recreational fisher, hunter and gardener groups all expressed concern and frustration about a perceived lack of government support in regulating invasive species and enforcing these regulations. There was an overall perception that without this support, no real change can occur. One recreational fisher said, "the Marine Board needs to clean up their act at the launches to make sure that there, you are not picking up [invasive aquatic weeds] because they're ignoring their own [areas]. Marine Board [is in charge of] maintaining the launches. That should be part of their stuff." Another recreational fisher stated,

> "I think the general public isn't educated and I think the state probably isn't doing a good enough job to educate the public via signage and things like that. . .and plus fines that can be levied against violators. It needs to be something where someone sees a sign [and] they understand what the

> implications are and they understand that if they are going to bait fish and drop bait into this lake they can potentially be fined a great deal of money."

Without government commitment to helping to prevent invasive species, participants reported that making changes in personal behavior felt futile. A recreational fisher shared, "the funds aren't available to do everything. . . so it's spreading faster than anybody can do anything about it." A boater stated,

> "I've launched in and hauled out in marinas where they have warning signs that it's against the law to transport, I think it was the water milfoil, anywhere from that body of water, which was apparently infected. But there wasn't anybody enforcing it, you are kind of on your own volition as to whether you wanted to obey the law or not."

One fisher suggested that without enforcement of penalties, people will not change their behaviors,

> "make it a concerted effort to actually put a real penalty behind that and advertise. . . there is a million dollar fine and it's gonna cost you your house, your livelihood and your family's livelihood and everything for a while. . . and then it would make a difference. . when there is no penalties, no teeth to enforce it. . .they are not gonna catch me, they aren't gonna try. . . there is just no reason, if you want to do it, why anything should stop you."

Each group expressed frustration, as well as some confusion, about the level of regulation and enforcement regarding invasive species. The gardeners especially, were confused about the how the sale of invasive nursery plants is regulated. The following conversation is one example of confusion about these regulations;

> "I think the nurserymen, they get a list now of invasive species that they can't sell . . . [new speaker] they still sell ivy and . . .all kinds of stuff . . .[new speaker] I don't think they are supposed to . . .[new speaker] they're not supposed to, but there is no enforcement . . .[new speaker] there is no enforcement but …. I do think there is a list somewhere."

At a different time, a gardener expressed frustration about the perceived lack of regulation, "they also sell butterfly bushes you know. If there was money in it, they would sell Himalayan blackberries!"

Belief: The Public Doesn't Know or Care Enough about Invasive Species

The second norm barrier is the belief that the general public and resource user doesn't know or care enough about invasive species. Statements about this belief fell under two categories. The first is that other people are both uninformed and uninterested, and thus any efforts are hopeless; because it potentially only takes one introduction to result in an invasion, changing personal behaviors doesn't effectively prevent the spread of invasive species in context of others who have not changed behaviors. The other part of this belief is that other people may not know about invasive species, but with the right education, they could be transformed into being part of the solution. These comments were often combined with the belief that the participants present in the focus groups were among the most educated and committed regarding invasive species.

Some participants in each group expressed a somewhat hopeless outlook about getting the general public to care and take action to help manage invasive species. One boater said,

> "I don't think people care; I don't think the general population cares. [new speaker] right, why would they care? Why would my brother-in-law and sister-in-law, my wife's family, who never fish, who have never been on a boat. . they are dry-land wheat farmers! Why do they care? They don't care!"

Another boater expressed both hope and overwhelmed feelings when asked if his behaviors make a difference;

> "what I do probably can make a difference. Although, I always have in the back of my mind that whatever I do, that probably a hundred other people are doing the same thing and having the same potential for spreading invasive species."

A fisherman stated,

> "I think there is a group of us that are very responsible, but I think there is an equal or probably greater group that is irresponsible unfortunately, that really probably doesn't care. . . What they don't seem to realize [is] it does ultimately affect them as it becomes a broader problem."

A boater shared,

> "the ones that care, they already know about it for the most part, but the ones that really don't care, you know their out there taking double catch limits anyway. They're not rinsing their boats. They're just hauling it up the road. Those are the ones that I call the good old boy club.

Perceived Behavioral Controls

Perceived behavior controls, which in this study refers to people's perception of whether or not they feel that they are able to perform a desired preventative behavior, comprise the third major factor influencing behavior change according to the Theory of Planned Behavior. In this study, a common control belief barrier to changing behavior was the sentiment among the participants that they didn't know how to effectively perform preventative behaviors. They felt they lacked information about what is required in order for preventative behavior to be effective. Another perceived behavior control barrier included the perception that performing preventative behaviors is too difficult; that the behaviors took too much time or energy.

Belief: I Don't Know Enough about the Desired Preventative Behavior

The first perceived behavior control barrier that emerged was participants' belief that they do not have the information they need to feel capable and empowered to make a difference regarding invasive species. To start, participants from each focus group expressed confusion and frustration because they did not understand the changes in behavior that were being asked of them. As one recreational fisher said, "we need more guidance. We need to know what is going to kill this plant or this animal." Similar requests for more information were articulated in each group, but to a slightly lesser extent in the gardener group. Two boaters discussed their confusion about messaging they had heard in the past about the importance of washing your boat to help stop the spread of invasive species. They discussed, "'clean your boat.' What does that mean?. .[new speaker] very, very good point. Because to clean the boat for a friend that you went fishing with and cleaning my boat are two different things." A recreational fisher referred to education he had received in the past,

> "I think for a lot of this stuff the water temperature has to reach at least over 140 degrees, or something like that, before it even kills some of those organisms. And a lot of car washes, regular car washes, the water is just not that hot . . [new speaker] So is this even realistic?"

A gardener expressed her confusion about the right action to take regarding yard waste contaminated by invasive species,

> "the question is what do you do with it? [referring to yard waste containing anthracnose-contaminated debris]. The temptation was for me to put it with the yard debris. I didn't do it. I put it in the garbage. I filled up my garbage can with it because I assume it was gonna go to the landfill. But it would seem to me that if it goes to where all the other yard debris goes from the Portland area, it's just like in Eugene, it's mixed all up. . . It's resold and one assumes that the companies that do that properly compost the things, but then there are things, like fungus, that don't necessary die when you properly compost them."

Another gardener echoed this, "my problem is figuring out what to do after I pull. Just because you pull a piece of ivy doesn't mean that it dies."

Each focus group revealed concern about not being able to identify invasive species, and referred to this as a barrier to changing behavior; if someone doesn't know a species is invasive, or doesn't know to be on the lookout for invasive species, it stands to reason that they aren't likely to change behaviors to prevent this unknown. Gardeners conversed about a common invasive, and in the process uncovered confusion about whether or not this plant was an invasive, "so can you describe that laurel because I'm thinking of a different type of laurel that is not like that. . . [new speaker] yeah, look in your neighborhood for a hedge . . .[new speaker]a lot of people don't realize that it is invasive either." Similarly, a couple of recreational fishers revealed an area of confusion, "we don't have Hydrilla in Oregon, do we? Isn't that Eurasian Milfoil? . . . [new speaker]I've seen it in the Santiam, I have seen it in McKenzie. I have seen it in numerous lakes. If is not Hydrilla, I need re-education." A hunter summed up the need for more information, "So I'd like to know what the invasive species are, where they're at, so at least we could shake our clothes out if we know, because I don't know!" These and other expressions of

confusion often led to discussion about a need for more education, and specifically a need for images in invasive species messaging.

Many participants from each focus group spoke about wanting to know more about the specific circumstances where invasive species are a concern. This is connected to suggestions from each group to include specific or local information in any education messaging. In particular, participants had questions about how long invasive species can survive in various conditions and how this relates to the likelihood of introducing and spreading invasive species. For example, two recreational fishers conversed,

> "I just never thought that could be a problem because I didn't think that salt water species could live in fresh water [laughing]. . . [new speaker] it's a whole different cellular structure it takes to survive in fresh water versus salt water. There are very few creatures that make that transition so it will be something we can use some education about: what creatures can survive in salt water environment to a fresh water environment."

Similarly, a boater asked,

> "if [participant name] took his boat all the way to Florida and he picked it up, took it out of the water in Florida and came all the way home [let's say] 7 to 10 days later, are there still invasive species that [have accumulated] in the boat that can do harm 7 to 10 days later or a month later, or six months later? . . . Or is it the sort of thing that if I'm in this body of water and I go to another body of water the next day, then I ought to be concerned? I don't know the answer."

Belief: Preventative Behaviors are Too Difficult

The second perceived behavior control barrier was the belief that the preventative behaviors are too difficult to perform. Participants from each focus group indicated that the desired preventative behaviors were not reasonable or easy to do, creating a barrier to changing behaviors. A hunter shared his belief that cleaning gear between hunting sites is not an easy behavior for hunters to perform; "I think it is pretty hard for example, to clean mud out of muddy tires. . . .It's easy enough to brush your clothing, maybe brush your dog, that kind of thing, but even a car wash is not going to do it." One boater said,

> "It's gonna [take] some pretty good motivation to get the average boater to actually concentrate on cleaning off his boat. And the other thing is the

> potential for the mollusks or the zebra mussels to be up inside your water intake and cooling system on your boat. It's gonna . . .be very difficult for the average boater to even know if that is a problem."

A recreational fisher echoed the idea that invasive species are so opportunistic that normal actions will not be successful in controlling them,

> "you can't see a spore. You can have a spore inside your raft or your reel and fish the next day. [It] is still wet under there. That is all it needs, is moisture. . . I mean if we get into the lower level of biology where it's that small of a thing, I don't know how you solve it**."**

Another recreational fisher said, "if you say 'you should spray your boat off with bleach' it's just not gonna happen so I don't think it's realistic to expect people to do something like that. It has to be simple." Another recreational fisher said, "One of my boats is 22 feet long and has several motors on it and the thought of cleaning the whole thing down with bleach. . . it is not very practical."

Solutions to Barriers

The focus group discussions not only yielded dialogue about the possible barriers to changing behaviors, but also provided an opportunity for participants to discuss their ideas for overcoming these barriers to changing behavior to help stop the spread of invasive species. Participants shared a myriad of ideas ranging from increasing infrastructure support to ideas about ways to effectively educate stakeholders about preventative behaviors. An emphasis was also placed on ways to engage the public in being part of the solution to invasive species.

Solution: Institutional Support

When asked what they needed in order to make personal changes in behavior easier and more effective, focus group participants responded they needed increased infrastructure and regulatory support from government and other institutions. This included a desire for boat and truck washing stations, areas to wash equipment if fishing or hunting in the back county, as well as plant labels that include information about a plant's potential to

become invasive. Recreational fishers, boaters and hunters all expressed the need for washing stations in order to make washing boats, rigs and other equipment feasible. As one boater said, “typically around boat ramps in Oregon you don’t find a wash rack where you can clean things off.” One hunter expressed the difficulty of washing a truck rig during a hunting expedition, “you are gonna be carrying seeds in the mud . . .every time we hit a bump from here to wherever you are going you are dropping things off and, and [a wash station] is just not available.” In addition, anglers also requested infrastructure support on a smaller scale for washing boots and waders when in the field; “I know they used to have an area when you cross the fence and there was a bucket there and you were suppose to step in it.”

Gardeners expressed a need for clear and consistent plant labels at nurseries and other places where plants are purchased.

> “there should be some truth in labeling on the part of the nursery industry in identifying for people that if they buy this plant, it may spread. . .Everywhere I go we hear about the new scourge of the butterfly bush and yet I had the head person three years ago pick the best one out for me. She didn’t say anything about it being invasive. I would have never bought it!”

Gardeners also talked about the Sunset gardening book, which is the “bible for gardeners.” Because it is regionally focused, this book does not include much information about invasive species in Oregon. One gardener quoted what the book said about English Ivy, “What it says about ivy is ‘appreciated by some gardeners for its ability to cover quickly, reviled by others for its invasive tendencies.’ It’s not even listed in the back.”

Solution: Educate Stakeholders about Preventative Behaviors

Participants expressed that more specific information about the desired preventative behavior would help them change behaviors regarding invasive species. To start, participants expressed the need for more specific information about what actions to take to prevent the introduction of invasive species and also what actions to take if they were in a place that already had invasive species. One hunter suggested, “I think you have to demonstrate that the individual can make the difference. . . But it has to be crafted in such

a way that it's a clear message of why and what I can do." Participants requested specific and simple messages. One hunter said, ""something concise that says. 'here is the problem we have in the area you are going and here is what you can do about it or here is how you can help.' Make it that simple." An angler also commented, "keep it simple, direct, to the point."

To effectively help prevent the spread of invasive species, participants repeatedly mentioned that they needed to know what the invasive species of concern looked liked. One boater said, "the milfoil and some of these other plant species, I have no idea what that looks like. So if it jumped up and bit me on the nose I wouldn't know it." A hunter said, "I wouldn't know this grass you are talking about if it fell on my head. . .You gotta show them a good, clear picture of what it looks like out in the sticks . . .then I'll pull it up for you." A recreational fisher echoed this sentiment, "Just saying, 'watch out for zebra mussel or mitten crabs' What is a mitten crab? What does it look like? . . How am I gonna watch for a mitten crab if I don't have a picture?" Again and again, participants noted that much of the invasive species messaging they had seen in the past did not give them the information they needed to identify important invasive species. One angler said, "I have seen a few reward posters for mitten crabs or green crabs or whatever at some of the launches, but . . .they're usually small, . .a drawing,. . . faded or weathered."

Many suggestions for where invasive species education would be most helpful were focused on some of the hobby-related venues of each focus group. For example, gardeners mostly suggested disseminating information via the master gardener program and other gardening clubs. Gardeners also suggested that the extension agencies may be a great venue for disseminating knowledge about invasive species due to the charismatic personalities of many of these educators; "any successful venture like this has to have some charismatics. And one of the major things that you're gonna need to do is to identify who those people are and get them involved." One hunter highlighted the value of disseminating education through hunting organizations, "you actually need to have club people picking out their favorite hunting areas and say "ok, this is ours. We will kind

of take care of it. Once a year we will do a big sweep and do the best we can." An angler similarly spoke about the important role of hobby clubs in educating their hobby group, "clubs is where I heard most about. . .'make sure *all* the weeds are off your boat and your trailer. Don't drag something from here to over there.'"

Boating, hunting and fishing are each activities that are regulated to some degree by government, whether through boater certification and registration, purchase of fishing or hunting licenses, safety checks, or through enforced catch limits. Focus group participants from these groups suggested that one effective way to educate others in their stakeholder group about invasive species was to include invasive species education at the places where these hobby groups interfaced with government. According to the focus group participants, the advantage of this would be that every person engaged in one of their hobbies would have to receive invasive species information on a regular basis. One recreational fisher said, "Obtaining your mandatory boaters license. . [would be a good place to offer invasive species] education because that reaches a certain demographic. It doesn't reach everyone but definitely helps." A hunter advocated for including invasive species education in hunter education courses, "hunter education courses in Oregon are mandatory for young and first time hunters"

All groups mentioned the value of informative signage, both in areas where hobby group members gather, as well as in areas where people would potentially come into contact with invasive species. Their suggestions included retail outlet bulletin boards, boat shows and sportsman shows, clubs and marinas, launching ramps, fuel docks, and the Harbor Master's office. "I think that clubs and marinas and any place where you put your boat into the water there could be signs and information posted." Hunters thought that signs would be most helpful at game reserves, hiking trails, entrance areas to parks, places where hunters sight rifles, hunting roads, campgrounds, and parking areas. "[signs] would be a great thing to put along the side of hiking trails. Just give people one or two species, that if you see these plants out there. . stomp them or pull them, or how not to spread them." Another hunter said,

> "there are certain main corridors that have a high travel of hunters. . . have the game officers that are doing the check points handing out pamphlets [say] 'thanks for stopping. Do you have any idea about the impact that weeds cause every single year in this area?'"

A recreational fisher said, "I think that a lot of it goes back to having adequate signage so people, when they get to the boat ramp, they understand you know what is in this water and what can you transfer."

Solution: Engage the Public in Solution Activities

Participant beliefs about how much the general public does or does not know and care about invasive species is connected to participants' ideas about what would get others to be more aware and invested in the issue of invasive species. Some participants attributed their investment in helping with the issue of invasive species as a product of their knowledge of invasive species. A hunter indicated that the right education would convince people to care;

> "in people's minds, you only have so much energy and so much time and you know if you can identify a problem, then you are on your way to doing something, but you have to involve people and, and get them to take a part in that, you know, and make it important to them. And I'd say that education is probably the biggest way to do that. If you can, you can show people how this impacts them somehow then, then you are gonna move them toward action..."

In addition to increased education about preventative behaviors for stakeholders, participants also suggested employing activities to engage the general public in being more invested in the issue of invasive species. One gardener said,

> "the general public is probably getting too much information. They're probably throwing up their arms and saying 'too much information! It's overload'. And probably don't pay attention to anything anymore. You know, you hear about global warming, you hear about all these invasive things. I think, in a sense, people don't care anymore."

Another gardener expressed a similar sentiment, but in a more local context, "well, if you just want to talk about this watershed of the Willamette, there are so many things going wrong . . .that will be a long time before many folks or everybody knows about it."

In order to increase public investment in preventing and eradicating invasive species, participants suggested engaging people in social activities that help eradicate invasive species. As one boater said, “I think that what I, or any other individual boater or fisherman does, can have an effect combined with the whole of everybody else.”

When asked to brainstorm ideas for getting citizens actively involved in being part of the solution to the problem of invasive species, participants shared enthusiastic ideas about volunteer events like weed pulls, incentive programs and contests to motivate people to get involved and make changes within a social context. A gardener shared one example,

> “if they can actually get that [the state park] cleared out [of ivy]. . . I’m hoping that it will have a beneficial effect on the larger community. Say ‘this is what happens when you get your work done. Isn’t this great!’ and then you‘ll mobilize others who this is their home.”

A hunter also suggested weed pull activities as a way to engage people, and highlighted the social motivation of these events, “it helps if there is a big group of you together. I mean me going out and pulling a couple of weeds is like’ woopty do’.It would be a lot better if . . .we spent an afternoon, and somebody fed us some lunch . . .and then we pull a bunch of weeds, put them in a pile and burn them all. That kind of feels better.”

The following is a summarized list of engagement activities suggested by participants:

- **Weed pull events** include those in parks, or on private property and led by an organization such as the Nature Conservancy, as well as programs like the adopt-a-highway program or other litter clean-up efforts that would get people pulling invasive species along the highway as a visible way to engage people. Weed pull events were suggested most by the gardener participants, and least by the boater group.
- **Incentive programs** include offering tax incentives to private property owners for getting rid of invasive species, offering a service to exchange a pulled invasive with a native plant, and also offering incentives to shoot

invasive animals such as squirrels and starlings. Hosting Catch-the-Invasive contests for creatures such as crabs, goldfish, and sticklebacks was also mentioned by boaters and recreational fishers.

- **Education opportunities** include visible Master Gardener projects, hosting an annual Invasive Day (like Earth Day), piggy-backing invasive species education booths or displays at existing hobby events such as fin clipping parties, master gardener programs, and boat shows, ands also having educational displays or talks at placed like OMSI, Oregon Aquarium, Hatfield and state parks and even sporting goods stores.
- **Opportunities to educate others** include contacting government representatives, being asked to host an educational booth or lead an educational talk, and encouraging master gardeners to educate people about invasive species.
- **Involve youth** includes incorporating invasive species education and activities in existing youth organizations such as boy scouts, sea scouts, yacht club junior programs, the wood magic program, and the Fish and Wildlife Angler Education Program. It also included adding an invasive species component to science curriculums and targeting activities such as SOLV weed pulls and OMSI events to families with children. Boaters, anglers and hunters were especially eager to engage youth.

In summary, participants had a broad array of ideas about how to engage people in becoming part of the solution to invasive species. These ideas ranged from getting people involved in eradication activities, creating social norms about invasive species by targeting messaging to places where hobbyists often are, and increasing the infrastructure support needed to enable people to make changes in behavior to help prevent the spread of invasive species.

DISCUSSION

The goal of this study was to explore the attitudes, norms and perceived behavioral controls that create barriers that may prevent key stakeholders from changing their behaviors to help stop the spread of invasive species. The focus group participants represent a portion of the population that is already relatively knowledgeable about invasive species. Adopted from the communication literature on behavior change, the Theory of Planned Behavior was simplified and used as a model to provide a framework for examining the beliefs that influence attitudes, norms and perceived behavioral controls that shape people's behaviors. The study found six barriers to changing behaviors that were common among all stakeholder groups: two attitudes, two norms and two perceived behavioral controls. The same questions that helped elucidate these barriers also helped to reveal participants' ideas for addressing these barriers to more effectively engage people in being part of the solution to invasive species.

Discussion of Barriers

The two **attitude barriers** highlighted in this study include:

- Beliefs that preventative behaviors (e.g. using bleach to rinse a boat or using pesticides to control an invasive plant) may be more harmful to the environment than the invasive species.
- Beliefs that invasive species are too interconnected to other environmental problems and are too ubiquitous for any one person's actions to have significant impact.

The two **norm barriers** highlighted in this study include:

- Beliefs that there is a lack of institutional support to prevent invasive species and without support from institutions, personal behavior changes have no real efficacy.

- Beliefs that the general public does not know and/or care enough about invasive species to make changes in behavior, and without popular support for preventative behaviors, personal behavior changes have no real efficacy.

The two **behavioral control barriers** highlighted in this study include:

- Beliefs that more specific information is needed in order to be an effective change agent regarding invasive species.
- Belief that the preventative behaviors are too difficult to perform

Although it was important to define the constructs of attitude, norms and perceived behavioral controls for the purpose of data analysis, there is a high degree of interconnectedness among these complex variables that influence the level of intention to perform a change in behavior. For example, the attitude belief that the fight against invasive species is a losing battle seems to be connected to perceived behavioral control beliefs that the preventative behaviors are too difficult to perform. When people think of invasive species in a broad, global context, the problem becomes overwhelming. The perceived preventative behaviors to address this overwhelming problem become beyond the scope of what an individual feels capable of doing. Similarly, attitude barriers connect closely with norm barriers. Participants reported feeling like their personal behaviors may not be effective at stopping the spread of invasive species because these personal actions are taking place in a social context of others who are not performing preventative behaviors. The norm belief that the general public does not know and/or care enough about invasive species corresponds to behavior control beliefs about whether or not one is able to perform a behavior. Because invasive species is an issue where only one introduction can result in an ‘invasion,’ this belief corresponds to participants’ belief that changing their own behaviors would not make any difference in the context of many others who are not making behavior changes.

Discussion of Solutions

Three major recommendations surfaced from the focus group dialogues. These are based on participants' comments throughout the focus group studies about what might help to make behavior change easier or their ideas about what might help educate and engage others in caring enough about invasive species to make changes in behaviors. These suggested solutions correspond tightly to participants' discussion of barriers to behavior change. The solutions suggestions include:

- Increase institutional support via regulations and infrastructure
- Increase education to stakeholders about the desired preventative behaviors
- Engage the public in activities focused on being part of the solution to invasive species

Each of these proposed solutions could help address one or more of the barriers to changing behaviors revealed by the focus group data. However, it is important to note that more research is needed to verify the effectiveness of participants' ideas about addressing barriers to change. For example, many participants advocated for more education for the general public as a solution. This contradicts some statements made during the focus groups about people feeling overwhelmed with information. The assumed linear relationship between knowledge and action is also contradicted by theory that explores the interaction of knowledge, attitude, and behavior variables, referred to as KAB. Recent research has found that the relationship between these variables is not necessarily linear but is instead much more complex and interactive in multiple ways (Chaffee and Roser, 1986).

Another important consideration in the discussion of the effectiveness of proposed solutions by focus group participants is the fact that participants cited inaccurate information in several instances. For example, participants believed that the Oregon Marine Board owned and operated Oregon boat launches, while other participants thought that Hydrilla is currently an invasive species issue in Oregon. Both of these statements made by participants are not true. This leads to interesting questions about the usefulness of suggestions based on inaccurate information, as well as highlighting

possible areas for future education efforts. Despite these considerations, there is value in understanding the solutions proposed by focus group participants to address barriers to changing behaviors, both because it further illuminates the perceived barriers, while also revealing what might feel like empowering tools for change to participants who are potentially part of the solution against invasive species (see Table 3).

Addressing Attitude Barriers

Involving people in engagement activities may help impact attitude barriers that prevent stakeholders from changing behaviors to help stop the spread of invasive species. By involving people in social activities that do make a difference at a small scale, such as community weed pull events, people may experience that their actions can make a difference, which could help balance the overwhelming sentiment that the fight against invasive species is a losing battle.

Specific and local information about the desired preventative behaviors may help address the beliefs that some preventative behaviors are more harmful than the invasive species themselves; if people know how much bleach is needed or have enough information to choose from a variety of preventative actions against invasive species, they may feel more empowered to be a part if the solution against invasive species.

Addressing Norm Barriers

A suggestion from participants, which may help address social norm barriers, is to engage the public in the issue of invasive species through activities that help to eradicate invasive species. A few participants indicated that they felt that their personal preventative actions made a difference. However, the majority of participants indicated that the issue and impacts of invasive species seem so ubiquitous that the participation of all citizens, as well as institutions, is required in order to make the difference that is needed. Engagement activities, such as English Ivy pulls coordinated by Oregon organizations like SOLV, help people feel a sense of accomplishment and empowerment in the fight against invasive species. The benefit of engagement activities such as weed pull events is that a person can see the difference they are making; when even one tree is

freed from ivy as a result of a small group of people's efforts, there can be little doubt that individual actions make a difference. At the same time as they are physically removing invasive species, people are also creating social ties that help alter the normative beliefs that may be a barrier to change; they are creating new social constructs where taking action against invasive species is valued as important.

Throughout each of the focus groups, the power of hobby groups for addressing existing normative beliefs was illuminated. This was often where people had received information in the past about the harm caused by invasive species. Hobby-related groups are also where participants reported having received peer support or advice for doing things like cleaning weedy debris off of boat propellers or not purchasing invasive plants. In light of the barriers created by a lack of social norms, targeting information to hobby groups provides a way to create social networks of people who all hold similar values and accepted hobby behaviors regarding invasive species. Participants had many ideas about the different ways that hobby groups could be used as a nexus for spreading invasive species awareness and norms, including adding invasive species information and links to popular websites used by different hobby groups, or by including an invasive species component into the process for obtaining hobby licenses, certifications, etc. . .. Another suggested venue for hobby group dissemination of messaging is to place signs at popular recreation sites where hobbyists visit and are at danger of interacting with and spreading invasive species. Hobby groups and other associations where people gather who all share common activities that are potential pathways for the spread of invasive species offer enormous potential for creating social norms regarding invasive species. These groups provide not only a distribution point for specific and local invasive species messaging, but also offer the peer support that people may need in order to really change behaviors. This may address the barrier belief that one person's changed behavior may not make a significant difference, but there is power in the combined behaviors of many people.

Addressing Perceived Behavioral Control Barriers

The participants in this study requested more specific and clear information about the desired preventative behaviors that help to prevent the spread of invasive species. As

previously stated, the participants in this study are those who are assumed to already have a relatively high awareness and concern about invasive species. Participants expressed a lack of confidence in their ability to accurately identify invasive species in the field. They felt they didn't know the detailed information, such as how hot the water has to be to kill hitchhiking invasive species or how long invasive species can live out of water, that would allow them to be effective at helping to prevent the spread of invasive species when engaged in their hobby activity. More specific and clear guidelines about what actions people can do to make a difference regarding invasive species, as well as more information sources, and better images of invasive species, were all suggested by participants as tools they needed to feel empowered to make a difference. These comments imply that participants are willing to change behaviors, but believe that they can't do so effectively. They already have knowledge about invasive species; the information they feel they need is more specific, local and about the preventative behaviors, rather than the issue itself.

Participants from all groups also felt that infrastructure changes were needed in order for changes in personal behavior to feel reasonable and effective. Overall, people seemed to feel that without institutional support, the fight against invasive species was both overwhelming and ineffective. Increasing institutional support in the form of equipment washing stations and better labeling of potentially invasive plants might help address perceived behavioral control barriers by making behavior change easier.

Table 3. Belief Barriers to Change and Suggested Solutions

Study Variable	Belief Barrier to Change	Suggested Solutions
Attitude	Preventative Behaviors may be More Harmful than Invasive Species	Specific and local information about preventative behaviors
	Invasive Species is a Losing Battle	Engage the public in solution activities
Norm	Institutions Don't Regulate Invasive Species Enough	Institutional support via regulation and enforcement
	The Public Doesn't Know or Care Enough about Invasive Species	Educate hobby groups about preventative behaviors
		Engage the public in solution activities
Perceived Behavioral Control	I Don't Know Enough about the Desired Preventative Behavior	Specific and local information about preventative behaviors
	The Preventative Behavior is Too Difficult	Institutional support via wash stations, signs, images etc. . .

Do the Stakeholder Groups Require Different Messaging?

In general, the focus groups have been treated as one large study population throughout the reporting of Results and in the Discussion because the data revealed very few noteworthy differences among stakeholder groups. This may also, in part, be attributed to the exploratory and qualitative nature of this research; the purpose of this study was to investigate the general themes of barriers to behavior change in order to provide a

foundation on which to base further research. This study did not employ methods to directly compare the significance of comments made by difference groups.

The sorting of coded data did, however, highlight one area were the comments made by distinct groups emerged as more different than similar. A difference among groups was apparent in conversations about perceived impacts of invasive species. For example, boaters cited damage to their personal boating equipment as one of the major impacts of invasive species, while gardeners seemed to be more concerned with the overall ecosystem impacts of invasive species. Therefore, informing boaters how zebra mussels could clog boat intake pipes or how aquatic weeds can foul a boat propeller may motivate boaters to care about invasive species and take actions to prevent their spread. Similarly, gardeners may be most motivated by learning how invasive species negatively impact ecosystems through habitat destruction and the creation of monocultures. Fishermen and hunters were very aware of the complexities and economic costs of invasive species, both to fisheries and also to the ecosystems and resources they depend on for their hobby. These findings suggest a need for future research to better understand what differences, if any, are needed for invasive species messaging targeted to different stakeholder groups. This study's results indicate that perceived impacts might be one area to explore more fully in future research on this topic.

Discussion of Methods

As previously stated, there is very little literature available on the human dimensions of invasive species, making exploratory research necessary and useful. The use of qualitative methodology was appropriate to gather general information about attitudes and beliefs regarding behaviors that impact the spread of invasive species. Focus groups were chosen, in part, to encourage some of the social interaction, which is one of the variables that influences behavior change, to occur. Interestingly, a lack of social norms emerged as one of the most important perceived barriers to changing behaviors to prevent the spread of invasive species.

The use of focus groups was also useful in uncovering complex interactions of factors without constraining participants' input. This complexity is apparent in both the data units that were coded in more than one area, as well as in the discussion about the overlap between different barrier variables. It was important to clearly define the variables adapted from the Theory of Planned Behavior in order to organize salient comments into attitude, norm and perceived behavioral control beliefs. However, it was also apparent that these factors influence each other and overlap in their definitions. Focus group methodology both allowed these complexities to emerge while also providing a method for organizing findings systematically by using a theory as a framework for examining behavior change.

Weaknesses of this study include a low number of participants in some of the focus groups; the gardener study had only five participants, partially because many interested participants had participated in the first gardener focus group that was subject to faulty recording equipment. However, because the findings between focus groups were relatively similar, and because consistent methods were used in collecting and analyzing the data, the total sample size could be treated as one large group with 29 participants.

There was also a high degree of homogeneity among the focus group participants regarding region and level of education. Initially, this study aimed to include a population representative of each stakeholder group throughout Oregon, which did not happen given the recruitment methods used. Heavily weighting recruitment efforts in regions outside of the Willamette Valley may help include perspectives from a more representative sample of Oregon's stakeholders. However, due to the sample size and purposive recruitment methods, the data gathered cannot be used to generate conclusions about the stakeholder populations overall.

Using focus group methodology, it is far from possible to draw definite conclusions about the relative importance or degree of relationship of the different variables examined. Future research may build upon this study's finding to further investigate these factors

influencing behavior change. A follow-up study may employ a survey that asks questions based on the six barriers to behavior change to stakeholders in different hobby groups. This might help further elucidate the similarities and differences between different stakeholders regarding their beliefs about behaviors that prevent the spread of invasive species. This study would also help clarify the interactions between these different factors and the relative degree of importance these factors have in the intention to perform preventative behaviors. Because there is so little research about the human dimensions of invasive species, it is an exciting field for research. The possibilities for innovative and meaningful research are seemingly infinite.

Discussion of Findings in Associated with the Theory of Planned Behavior

This study supports the use of the Theory of Planned Behavior as a useful model for exploring possible barriers to behavior change. The intention of this study was not to prove or disprove this theory, nor was the theory intended to reveal ways to address barriers to behavior change. Because there is so little research about the human dimensions of invasive species, and even less about stakeholders' beliefs about changing behaviors to prevent the spread of invasive species, the use of this theory was intended to provide a framework for exploring the complex factors that may create barriers to changing behaviors. The Theory of Planned Behavior was also useful in guiding the analysis of data. Using the Theory of Planned Behavior helped in synthesizing and creating a narrative of information gathered in this study. This information is intended to provide a foundation on which to build future research about the human dimensions of invasive species and also help inform those wanting to create more effective invasive species education campaigns.

This study employed a simplified and adapted Theory of Planned Behavior as a model for exploring behavior change regarding individual behaviors that can help prevent the spread of invasive species. The Theory of Planned Behavior states that attitudes about a behavior (will the behavior produce the desired outcome), social norms about a behavior (what do others expect me to do and how much to I care about their opinions) and

behavioral control beliefs (am I able to perform the behavior) influence intention to perform a behavior. Findings from this study suggest that a lack of social norms may have contributed to a lack of intention to change behaviors among focus group participants. This theory assumes that intention is the best predictor of behavior change. However, a new twist revealed in this application of the Theory of Planned Behavior suggests that intention to act is influenced by a perception of whether or not others, such as institutions or the general public, intend to change behaviors.

Several reviews and meta-analyses have supported the usefulness of the Theories of Planned Behavior and Reasoned Action in revealing connections between attitudes, behavioral controls, norms and intention and how these factors relate to changes in individual behaviors (Blue, 1995; Godin and Kok, 1996; Hausenblas et al., 1997; Albaraccin, 2001). It is important to note, however, that these theories have also been critiqued in the literature for their limited usefulness to campaigns aimed at changing behaviors, and one of the impetuses for this study was the need for more information in order to design an effective invasive species awareness and action campaign in Oregon. For example, Ogden (2003) looked at a sample of studies from four major health psychology journals between 1997 and 2001 that tested or applied one or more social cognition theories, including the Theory of Planned Behavior and the Theory of Reasoned Action. She found that when one or more variables described by these theories did not predict the modeled outcome, the researchers did not reject the model, but instead used various explanations to account for the discrepancy. Other researchers accepted the model, but with the caveat of incorporating additional variables or making other modifications to the model. In this study, the Theory of Planned Behavior was indeed simplified to fit the broad, exploratory scope of this study. It was also important to clearly define the variables of attitude, norm and perceived behavioral control beliefs.

However, several researchers, including Ogden (2003), have acknowledged that these theories can be applied as models to provide a useful framework for the development of interventions to create health-related behavior change. Similarly, Fishbein and Yzer

(2003) support the use of theory to help identify the beliefs that need to be addressed before people will develop positive intentions to perform a behavior.

Discussion of Management Applications

The application of the Theory of Planned Behavior in this study indicates that there are several attitude, social norm and behavioral control beliefs that create barriers to changing behaviors to prevent the spread of invasive species. Based on the Theory of Planned Behavior, these barriers would indicate that the study participants do not have a strong intention to change behaviors to help prevent the spread of invasive species.

The barriers to behavior change, as well as the solutions suggested by participants, indicate that participants want to help stop the spread of invasive species, but feel unable or unwilling to change behaviors without other changes taking place first. For example, participants want infrastructure and policy changes, as well as assurance that the general public cares and contributes to the solution to invasive species. The dialogue among focus group participants indicated that without these changes, they feel a lack of efficacy in helping to stop the spread of invasive species; without these other changes happening first, personal behavior changes feel futile. Because there is so little previous research available to guide management decisions for engaging stakeholder in the fight against invasive species, this study offers valuable insights for resource managers who want to encourage behavior changes that prevent the introduction and spread of invasive species.

In situations where the goal is to change personal behaviors, the findings of this study suggest that the most effective way to begin addressing barriers to behavior change is by targeting social norms. One way to do this may be through hobby institutions such as yacht clubs, the master gardener program, garden clubs or membership organizations such as the Rocky Mountain Elk Foundation or Trout Unlimited. By targeting invasive species awareness and engagement to hobby groups, it may be possible to create a nexus of people who feel empowered or excepted to act in ways that minimize the spread of invasive species. This may help overcome barriers to changing behaviors by addressing

the need for increased social norms that support behaviors that are part of the solution to invasive species.

CONCLUSION

In conclusion, this study served to elucidate some of the norms, attitudes and behavioral control beliefs that influence the intentions of some gardeners, anglers, hunters and boaters to change behaviors to help prevent the spread of invasive species. Attitude barriers highlighted in this study include beliefs that 1) preventative behaviors may be more harmful to the environment than the invasive species and 2) invasive species are too interconnected to other environmental problems and are too ubiquitous for any one person's actions to have significant impact. This study revealed two beliefs about social norms (or the lack of) that create barriers to change, including: 1) without institutional support to help control or prevent the spread of invasive species, my personal behaviors don't make a difference and 2) a lack of knowledge and engagement on the part of the general public renders my personal behavior changes ineffective. The behavioral control barriers highlighted in this study include beliefs held by participants that 1) they need more specific information in order to be effective change agents regarding invasive species and 2) some of the preventative behaviors are too difficult to perform.

This study sets a precedent by employing the Theory of Planned Behavior to explore behavior change in regards to invasive species. This theory states that attitudes, norms and behavioral controls influence intention to perform a behavior, which is a predictor of actual behavior change. This theory was used to guide research to better understand factors that may create barriers to changing behaviors to help stop the spread of invasive species. This topic has not been well researched or referenced in previous literature. This study applies the Theory of Planned Behavior in a new context: behaviors that impact the spread of invasive species. This study also contributes to literature about the human dimensions of invasive species, an area where there is a dearth of information. A new dimension of social norms emerged in the context of this study; the findings indicate that people's beliefs about whether or not other people will also change behaviors influences

the level of intention to change personal behaviors. There is ample opportunity for future studies that build on this research by investigating the factors that shape the general public's awareness and involvement in the fight against invasive species, as well as how to effectively target those stakeholder groups whose activities potentially spread invasive species.

The findings of this study also have important management implications for those who organizations that seek to help prevent the introduction and spread of invasive species by engaging hobbyists such as hunters, fishers, boaters and gardeners. According to this theory, there are several barriers that may prevent behavior change in the context of invasive species prevention. Many of the barriers indicated that people want to be part of the solution to invasive species, and are even willing to change behaviors, but feel like their behaviors have no real significance in a society where so many other people and activities contribute to the spread of invasive species. Findings also indicated that there is a need for more specific and local information regarding invasive species.

One possible way to overcome these barriers may be to target invasive species education and activities to hobby groups. This creates a possibility of establishing social norms and expectation to perform behaviors that help prevent invasive species. It also creates a focal point to create specific and locally relevant suggestions for behavior change. Changing social norms may be a pragmatic tool for fragmented and under-funded agencies that aim to engage citizens in being part of the solution to invasive species. Large-scale infrastructure or policy changes may not be within the scope of those such as the Oregon Invasive Species Council. It may not be realistic in a management situation to address each of the reasons why participants felt that individual actions would not contribute significantly to the campaign against invasive species. This may be more practical, as opposed to other broad methods with longer time frames suggested by this study's finding, such as changing policy and infrastructure or educating every citizen. This study suggests that encouraging social expectation to perform behaviors that minimize the risk

of spreading invasive species may be an effective first step to overcoming barriers that prevent people from becoming part of the solution.

Appendices

Appendix A. Mailed 'Invitation to Participate' Letter to Boaters

July 30, 2007

Dear Prospective Participant:

Invasive species are an issue of growing concern in Oregon. As a graduate student at Oregon State University in the Marine Resource Management program, I am working with the Oregon Invasive Species Council. Together, we are conducting research about invasive species awareness from stakeholder groups whose actions potentially impact the spread of invasive species. This information will be used by the Oregon Invasive Species Council to design outreach and education materials to prevent and control the spread of invasive species. This information will also be used in a master thesis.

As someone who is interested in boating, I need your help to better understand what you and other boaters know about invasive species and how your activities may potentially contribute to the spread of invasive species. I am asking you to consider participating in a one-time, three hour focus group study with other members of your stakeholder group.[1] You participation is voluntary. If you would like to participate in this study, please sign the enclosed informed consent form and contact information form and return to the address below. If you would not like to participate, please check to appropriate box on the contact information form and return to the same address. If we do not hear from you, we will follow up by phone to request your participation. Your participation is very important to me. I hope you will agree to be a part of this important study.

Please read the enclosed informed consent form carefully. Feel free to contact me with any questions you may have about this research, the survey, and your rights as a volunteer, and anything else that is not clear. If you choose to participate, the input you provide in this study will be kept confidential to the extent permitted by law. Any comments you make during this study will be analyzed and presented in such a way that you cannot be identified. There are no foreseeable risks to you as a participant in this project; and you will be offered a $50 stipend for your participation. Your participation in this focus group will help us gather invaluable data to help better engage stakeholder groups in controlling the spread of harmful invasive species.

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[1]Your responses will be added together with others and recorded as a group. If the results of this study are published your identity will not be made public. **Your participation in this study is voluntary** and you may refuse to answer any question(s) for any reason.

Appendix A. Mailed 'Invitation to Participate' Letter to Boaters (Continued)

Thank you for your willingness and time to participate in this study. If you have any further questions about the study please don't hesitate to get in touch with the principal investigator for this study, Sam Chan, Tel. 503-679-4828, Samuel.chan@oregonstate.edu or Co-investigator Gwenn Kubeck, Tel. 610-389-5089, gkubeck@coas.oregonstate.edu. If you have any questions about your rights as a survey participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at (541) 737-4933 or IRB@oregonstate.edu.

Respectfully,

Gwenn Kubeck
Candidate, M.S. Marine Resource Management
College of Oceanic and Atmospheric Sciences, 104 Ocean Admin,
Oregon State University
Corvallis, OR 97330
gkubeck@coas.oregonstate.edu

Appendix B. Informed Consent Form for Study Participation

Project Title: Understanding Resource Users' Awareness, Attitudes and Actions to Guide the Oregon Invasive Species Council Education and Awareness Campaign
Principal Investigator: Sam Chan, Oregon Sea Grant
Co-Investigator: Gwenn Kubeck, Marine Resource Management

WHAT IS THE PURPOSE OF THIS STUDY?
You are being invited to take part in a research study designed to gather information about what different natural resource user groups know about invasive species. As a member of a stakeholder group who have a stake in Oregon's environment, I will be asking you questions about your invasive species awareness and your group's activities in a focus group (i.e. group interview) setting with other members of your stakeholder group. The information collected will be analyzed and presented to the Oregon Invasive Species Council. The Oregon Invasive Species Council will use this information to design an effective awareness campaign to help reduce the introduction and spread of invasive species. In addition, these results will also be published in a Master of Science graduate student project and presented at meeting and conferences.

WHAT IS THE PURPOSE OF THIS FORM?
This consent form gives you the information you will need to help you decide if you want to participate in this study. Please read the form carefully. You may ask any questions about the research, the possible risks and benefits, your rights as a volunteer, and anything else that is not clear. When all of your questions have been answered, you can decide if you want to be in this study or not.

WHY AM I BEING INVITED TO TAKE PART IN THIS STUDY?
You are being invited to take part in this study because you have been identified as a member of a stakeholder group whose activities can help in preventing the introduction and spread of invasive species and (i.e. you are a gardener, boater, hunter, exotic pet or aquarium owner or fishermen). The goal of this project is to gain a better understanding of what you and others in your stakeholder group know about invasive species, how your actions may or may not impact the spread of invasive species and your overall perceptions of invasive species. Your participation in this study will help us gain insights that will lead to the creation of outreach and education material to prevent the spread of invasive species. We hope you will participate.

WHAT WILL HAPPEN DURING THIS STUDY AND HOW LONG WILL IT TAKE?
You are being asked to participate by attending a one-time focus group meeting that will last no longer than three hours. During this time, you will be in a room with other members of your stakeholder group. As a group you will be asked to respond to a series of questions through discussion.

Appendix B. Informed Consent Form for Study Participation (Continued)

You will have an opportunity to sign a photo release form. Your decision to sign or not sign the photo release form will not influence your participation in this study in any way. No photos will be taken of any participants who have not signed the photo release form.

The media may be present during the focus group process. No names or affiliations of any participants will be included in any media coverage. Media partners have agreed to allow researchers (Dr. Sam Chan
or Gwenn Kubeck) to review any material before it is printed or otherwise distributed.

WHAT ARE THE RISKS OF THIS STUDY?
Your participation in this study is voluntary and the risks associated with your involvement are considered minimal. There is a possibility that you may experience disagreeable feelings due to conflicting opinions within the stakeholder group.

WHAT ARE THE BENEFITS OF THIS STUDY?
You will not benefit from being in this study directly, aside from receiving some snacks during the focus

group. You will receive a $50 stipend for participation in this study. As a participant in this study, you will have the opportunity to interact with other members of your stakeholder group and potentially gain increased awareness about invasive species. Your participation in this study will contribute to the creation of outreach and education materials designed to engage people in preventing or controlling the spread of invasive species.

WILL I BE PAID FOR PARTICIPATING?
You will receive a $50 stipend for participating in this study.

WHO WILL SEE THE INFORMATION I GIVE?
One aspect of this focus group study involved audio-taping questions and discussion. If you choose to be in this study, your participation in the focus group will also be audio-taped. This audio tape will be used to transcribe the focus group discussion and each participant will be assigned an anonymous number in the transcription process in order to maintain confidentiality. Only the researchers will have access to this audio tape and the audio tape will be destroyed after transcription is complete. Your name will not be associated with any specific comments in any written or oral presentation. The transcribed data will be analyzed into major themes and presented as the overall group response.

You will be asked to provide your name, contact information and affiliation upon agreeing to participate in this study. Federal government regulatory agencies and the Oregon State University Institutional Review Board (a committee that reviews and approves research studies) may inspect and copy records pertaining to this research.

Appendix B. Informed Consent Form for Study Participation (Continued)

However, your name and information will not be connected to any particular comments in any written or oral presentation to the Oregon Invasive Species Council or in conjunction with any report or presentation.

DO I HAVE A CHOICE TO BE IN THE STUDY?
Participating in this focus group study is voluntary. You may choose to participate in all of this study or not at all. You may choose not to respond to any specific questions asked of you. You may stop participating at any time in which case you will be asked to leave the room where the focus group is taking place.

WHAT IF I HAVE QUESTIONS?
You may ask questions about his study any time proceeding, during or after the focus group study. Please direct your questions about the study to Gwenn Kubeck at gkubeck@coas.oregonstate.edu or Sam Chan at samuelchan@oregonstate.edu.
If you have questions about your rights as a participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-4933 or by email at IRB@oregonstate.edu

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

_____
Participant's Name (printed)

_____
Signature of Participant

_____
Date

Appendix C. Contact Information Form for Participants

This is the Contact Information Form regarding the project entitled: Understanding Resource Users' Awareness, Attitudes and Actions to Guide the Oregon Invasive Species Council Education and Awareness Campaign.

Please begin by reading the enclosed letter of invitation and the informed consent form. Your participation in this study is voluntary. If you would like to participate in this study, please check the appropriate box below and include the signed informed consent form to the address below. We will then contact you to establish a date and time for participation.

If you choose not to participate in this study, please check the appropriate box below and return this form to us and we will not contact you again. Thank you.

First and Last Name:_____

Phone Number:_____

Address:_____

E: Mail:_____

Hunting Affiliation (s):_____

_____

Please circle yes or no for each question below:

Are you 18 years or older?	Yes	No
Do you have a current boating license?	Yes	No
Do you have a current fishing license?	Yes	No
Do you have a current hunting license?	Yes	No
Are you currently a master gardener?	Yes	No
Would you like to participate in this study?	Yes	No

If you have any further questions about the study please do not hesitate to get in touch with the Co-investigator for this study, Gwenn Kubeck, Tel. 610-389-5089, gkubeck@coas.oregonstate.edu. If you have any questions about your rights as a survey participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at (541) 737-4933 or IRB@oregonstate.edu

Appendix D. List of Recruitment Contacts

This appendix provides lists of organizations contacted in order to recruit participants for each focus group.

Gardeners

41 people were contacted in order to recruit gardener participants. The request for recruitment email was distributed to the Oregon Master Gardeners listserv via the coordinator of that program. Those contacted include:
Clackamas County Master Gardeners
Umatilla County Master Gardeners
Wasco County Master Gardeners
Douglas County Master Gardeners
OSU County Master Gardeners
Linn/Benton County Master Gardeners
Portland County Master Gardeners
Portland Garden Club

Hunters

46 people were contacted in order to recruit hunter participants. The request for recruitment email was distributed to several groups including:
Oregon Department of Fish and Wildlife
Rocky Mountain Elk Foundation
Oregon Hunters Association
Oregon Ducks Unlimited
Northwest Flyfishers
Oregon Foundation for Blacktail Deer
Foundation for North American Wild Sheep
National Wild Turkey Foundation
Oregon Bow Hunters
Oregon Chapter of the Mule Deer Foundation
Oregon Chapter of the Ruffed Grouse Society
Oregon Department of Fish and Wildlife
Oregon Chapter of Safari Club International
Wild Turkey Federation

Boaters

In addition to the 93 mailed invitations for participation, 29 people were contacted in order to recruit boater participants. The request for recruitment email was distributed to several groups including:
Columbia River Yachting Association
Rose City Yacht Club
Oregon Marine Board
Waverly Yacht Club
Devils Lake Water Improvement Districts
Columbia River Yacht Club

Appendix D. List of Recruitment Contacts (Continued)

Boaters (continued)
Hayden Island Yacht Club
Hood River Yacht club
Multnomah Yacht Club
Tyee Yacht Club
Vancouver Sailing Club
Willamette Yacht Club

Recreational Fishers
55 people were contacted in order to recruit recreational fisher participants. The request for recruitment email was distributed to several groups including:
Trout Unlimited (various Oregon chapters)
The Association of Northwest Steelheaders
Oregon Bassmasters
Northwest Fly Fishers Club
Oregon Fish and Wildlife
Northwest Sportfishing Association
Oregon Bass and Panfish Club
Central Oregon Fly Fishers
Umpqua Valley Fly Fishers
Emerald Bass Club
Columbia River Bassmasters
Santiam Fly Fishers
Stonefly Maidens Fly Fishing Club
Clackamas Fly Fishers of Oregon
Middle Rogue Steelheaders
Oregon B.A.S.S. Federation
Roseburg Veteran Bassmasters
Southern Oregon Fly Fishers

Exotic Pet Owners and Aquarium Hobbyists (did not result in a focus group due to lack of participant recruitment)
29 people were contacted in order to recruit exotic pet owners and aquarium hobbyist participants. The request for recruitment email was distributed to several groups and pet stores including:
Greater Portland Aquarium Society
OSU Sea Grant Extension and Hatfield Marine Science Center
Northwest Herptile Keepers Association
Oregon Herpetological Society
World of Wet Pets (Portland)
Northwest Koi and Goldfish Club
Oregon Zoo

Appendix D. List of Recruitment Contacts (Continued)

Exotic Pet Owners and Aquarium Hobbyists (continued)
Oregon Aquaculture Association
Oregon Coast Community College
Animal House Pet Store
Audubon Society

Appendix E. Email Letter Distributed to Recruitment Contacts

Dear {Recruitment Contact},

As you may know, both terrestrial and aquatic invasive species are a major threat to watershed health, recreational activities and local economies in Oregon. Oregon Sea Grant and the Oregon Invasive Species Council (OISC) are working to create a statewide education campaign to increase awareness and public engagement regarding invasive species. Data is currently being gathered on the levels of awareness, attitudes and behaviors of aquatic and terrestrial resource users regarding invasive species. Part of this project, entitled "Understanding Resource Users' Awareness, Attitudes and Actions to Guide the Oregon Invasive Species Council Education and Awareness Campaign," involves hosting a series of stakeholder focus groups during the summer of 2007. We would really appreciate your help to recruit focus group participants!

Focus groups are group interviews. We will be hosting four focus groups, each one involving one stakeholder group of six to twelve individuals. The stakeholder groups involved will be boaters/fisherman, hunters, exotic pet and aquarium owners, and gardeners. The primary objectives of this study are to:
Assess current level of invasive species awareness
Better understand what people believe about how their activities impact the introduction or spread of invasive species
Better understand the barriers that prevents people from changing their activities and/or behaviors
Gain insight on some effective messaging that may lead people to change their activities that may be pathways for the introduction or spread of invasive species

The results of this study will be presented as a masters thesis project in the Marine Resource Management Department at Oregon State University and also presented to the OISC for use in developing their statewide invasive species awareness campaign.

We need six to twelve {gardeners} to participate in the {gardener} focus group. The participants should be interested in {gardening} and not necessarily in any professional invasive species field. Each person should be from Oregon and the group should represent different {gardening} groups and regions in Oregon. This focus group study will take place in {early July, 2007}, so timing is certainly an issue. Specific dates, times and the meeting location will be determined after the participants are recruited and depending on their preferences. The focus group is a three hour endeavor involving group responses to questions and discussion. Travel expenditures will be reimbursed and food will be provided. This project is IRB approved and will maintain the confidentiality of all participants. The overall goal is to gather information from participants in order to better inform the creation of an education campaign to prevent the spread of harmful invasive species.

I have attached three documents intended for potential focus group participants: the invitation letter, the consent form and the contact information form. There are

Appendix E. Email Letter Distributed to Recruitment Contacts (Continued)

instructions on these forms for those who would, or would not, like to participate. If you have any possible participants in mind, what would be really helpful is for you to introduce me and the project to them. Again, I would greatly appreciate any help you could offer.

Please feel welcome to call or email me anytime with questions or comments. I really appreciate your help and input and look forward to working with you more as this study unfolds.

Sincerely,
Gwenn Kubeck
Oregon State University
College of Oceanic and Atmospheric Sciences
Marine Resource Management Program
gkubeck@coas.oregonstate.edu
(610) 389-5089 cell

Appendix F. Overview of Project for Recruitment Contacts

Gwenn Kubeck
Marine Resource Management Program
Oregon State University and Oregon Sea Grant
gkubeck@coas.oregonstate.edu
(610) 389-5089 cell

Project Title: Understanding Resource Users' Awareness, Attitudes and Actions to Guide the Oregon Invasive Species Council Education and Awareness Campaign

Description:
The Oregon Invasive Species Council (OISC) would like to develop an education campaign to increase awareness and public engagement regarding invasive species issues in Oregon. In order to create an effective awareness campaign, data must first be gathered on the current state of awareness, attitudes and behaviors of aquatic and terrestrial resource users regarding invasive species. To gather this information, graduate student, Gwenn Kubeck, will host a series of stakeholder focus groups over the summer of 2007. Focus groups are group interviews. We will host four focus groups, each one involving one stakeholder group of six to twelve individuals. The stakeholder groups involved will be boaters, fisherman, hunters and gardeners. The primary objectives of this study are to:
Assess current level of invasive species awareness
Better understand what people know or believe about how their activities impact the introduction or spread of invasive species
Better understand the barriers that prevents people from changing their activities and/or behaviors
Gain insight on some effective messaging that may lead people to change their activities that may lead to the introduction or spread of invasive species

The results of this study will be presented as a masters thesis project and also presented to the OISC for use in developing their invasive species awareness campaign.

Background and Significance:
Both terrestrial and aquatic invasive species are a threat to watershed health in Oregon. Invasive species out-compete native plants and animals, which can adversely affect commercial and recreational use of watershed resources. Invasive species can also alter watershed function, thereby reducing water quality and the health of watershed ecosystems. In some cases, the introduction of just one organism to an ecosystem can result in an 'invasion.' Invasive species can enter an ecosystem through a myriad of intentional and unintentional pathways.

The purpose of Oregon's state-level Invasive Species Council is to conduct a coordinated and comprehensive effort to keep invasive species out of Oregon and to eliminate,

reduce, or mitigate the impacts of existing and new threats from invasive species through prevention, collaboration, coordination and education. A major component towards

Appendix F. Overview of Project for Recruitment Contacts (Continued)

accomplishing this mission involves informing the general public about invasive species, and targeting education efforts towards user groups that affect the pathways by which invasive species are spread.

The Oregon Invasive Species Council (OISC) has received professional consultation regarding the development of a Statewide Awareness Campaign Plan. The council sees the need for public opinion research to ensure that campaign messaging and visuals are specifically targeted to the right audiences in order to effectively convey messages about preventing and controlling the spread of invasive species. Part of this research involves better understanding the activities of stakeholder groups that may impact the spread of invasive species, as well as the barriers that might prevent people from changing these behaviors. For example, invasive species may be transported in the ballast water of boats. A possible change in behavior to mitigate this pathway for introduction would be to encourage boaters to empty ballast water before leaving a waterway. A focus group study would help gather in-depth data from resource user groups in order to better understand what these groups know about invasive species, while also gaining insight on what gets people to take action and change behaviors that may impact the spread of invasive species.

Focus Group Logistics:
We need eight to twelve participants for each focus group study (gardeners, hunters, boaters, fisherman). The participants do not need to be associated with any professional invasive species field. Each person should be from Oregon and the group should represent different groups and regions in Oregon. The focus group studies will take place in July through September, 2007. Specific dates, times and the meeting location will be determined after the participants are recruited and depending on their preferences. The focus group is a three hour endeavor involving group response to questions and discussion. Reimbursement for mileage accrued for travel to and from the study site, as well as food will be provided. This project is IRB approved and will maintain the confidentiality of all participants. The overall goal is the gather information from participants in order to better inform the creation of an education campaign to prevent the spread of harmful invasive species.

Appendix G. Sample Initial Email Communication to Participants
This email communication was sent out to those people who expressed interest in participating in this study.

Dear {Participant Name},

Thank you so much for your willingness to participate in this study! It will be a very worthwhile event that greatly contributes to the creation of a statewide education campaign to help stop the spread of invasive species.

This study will take place sometime in early August and last three hours. I will be arranging dates, times and a meeting place once I have a list of participants in order to make sure that the location and time work for the majority of interested participants.

I am attaching three documents for you. I would appreciate it if you fill out and return in hard copy the contact information form and informed consent form to the address below. These are logistics involved in any study.

Please contact me with any questions you may have, and thank you again!

Sincerely,
Gwenn Kubeck
Marine Resource Management Masters Program
College of Oceanic and Atmospheric Sciences

Oregon State University
104 COAS Administration Building
Corvallis, OR 97330
gkubeck@coas.oregonstate.edu
(610) 389-5089 cell

Appendix H. Focus Group Outline for Facilitator

This is a sample of the outline used by the facilitator to conduct each focus group. The format remained the same for each focus group, with slight changes to the questions asked to make the questions relevant to each particular hobby group.

Boaters
8/24/07
6pm to 9pm
OSU Extension Services, Beaverton

- Set-up
- Set out entrance station
- name tags, markers and sign-in sheet
- Forms- Stipend reimbursement, photo release and informed consent and contact info (as needed)
- Set out food
- Get education materials ready (to be offered at the conclusion of the focus group)
- Organize chairs in round-table set-up with table in the center
- Set each space with pad of sticky notes, pen and bottle of water
- Write and post Focus Group Goal and Agenda on one sheet
- Write main objective questions (with headings), each one on a separate sheet of flip-chart paper and tape around the room or on a wall
- Have flip charts ready:
- #1: Blank sheet, Group Guidelines, Examples with pathway and why harmful, Solution Brainstorm
- #2: Blank sheet, Definition of Invasive Species, Activities, Reflection Activity Instructions
- Have reflection activity supplies (post-it notes and markers) ready
- Have questionnaire ready to hand out
- Check recording equipment and have extra tapes and batteries handy

Overview:

*Have people sign-in, make a name tag, and complete any remaining forms. Invite them to get food and look around before taking a seat

Welcome

Thank you for participating in the Oregon Invasive Species Council focus group study. We are interested in your awareness and behaviors in relation to both terrestrial and aquatic invasive species. The information we gather will help inform a statewide education campaign to prevent the spread of invasive species. At this time, Oregon Public Broadcasting is looking ahead to do a year-long campaign about invasive species and they are also interested in what you have to say in order to best target messages to their audiences. We want to get citizens involved in preventing the spread of invasive species and we need your help to know how to do that!

Appendix H. Focus Group Outline for Facilitator (Continued)

- Introduce myself and importance of this project to me
- Have assistant introduce herself and her role-

(To be present at the focus groups in order to help me with the data later.-Will be taking notes throughout study to give context to what people are saying. Will be getting up periodically to check recording equipment)

- Logistics
- Cell phones off, please
- Bathrooms
- Food
- Stipend forms
- Tape recorder-Everything you say will be confidential; your names will not be used in connection to any specific comments in any report or presentation.

Agenda

Time	Activity	Purpose
6:00pm- 6:30pm	Overview Agenda Introductions Group Guidelines	Understand focus group goals; to get to know each other and build trust
6:30pm-7:15pm	Questions and Discussion (Q 1, Q2)	Gather information
7:15pm-7:30pm	Break	Eat, Socialize
7:30pm-8:30pm	Questions and Discussion (Q3, Q4)	Gather information
8:30pm-8:35pm	Focus Group Questionnaire	Gather information
8:35pm-8:45pm	Break	Stretch, Socialize
8:45pm-8:55pm	Reflection Activity	Reflect together on focus group goals
8:55pm-9:00pm	Closing	Final comments Thank You!

Introductions

Starting with myself as an example, share briefly:
1. Name
2. Affiliation
3. Why did you decide to participate in this study?

Focus Group Goal: To uncover the personal barriers that prevents people from stopping the spread of invasive species.

Appendix H. Focus Group Outline for Facilitator (Continued)

*** Some people expressed interest in learning about IS during this time. I think everyone will learn more about invasive species during this time, but the purpose of this time is to get information from all of you. You will have an opportunity to collect some great IS education materials after the study to take home with you.

The objective of this meeting is to create dialogue among participants based on these questions:
1. AWARENESS: What do you currently know about invasive species?
2. ACTIVITIES: How might your activities spread invasive species?
3. BARRIERS: What may prevent you from changing the activities that potentially spread invasive species?
4. SOLUTIONS: What would make it easier for you to change the activities that potentially spread invasive species?

Group Guidelines
The strength of the focus group format is the interactive discussion that takes place among the participants. In order to create a safe and trusting environment where everyone feels comfortable to share, I want to begin by agreeing on a few basic group guidelines. To be time conscious, I have started with some general group norms. Please raise your hand if you agree to each one as I read it, and if not we can discuss.
1. Share air time
2. Encourage everyone to participate
3. Avoid interrupting a speaker
4. Avoid side conversations

Any addition guidelines people want to add?

Roles
My role here is to encourage everyone to share and ensure that the group guidelines are followed. I will be introducing a series of questions that are open for discussion. I will be keeping track of time to stay with our agenda and helping everyone stay focused on the objectives.

Your role is get comfortable, share your thoughts, ideas and questions, and interact as a group.

Please feel free to ask questions at any time

Before we begin, does anyone have any questions?

Appendix H. Focus Group Outline for Facilitator (Continued)

Questions and Discussion:

1. To start, can anyone tell me what the term 'invasive species' means to you?

- Can you name any invasive species?
- How are invasive species introduced and/or spread?
- How important is the issue of invasive species?
- How do invasive species interact with other plants and animals?
- Do invasive species affect your life in any way? If so, how?

Platform Interactions (have definition of IS already written on flip chart)
Present definition of invasive species: A plant or animal that is not originally from around here and causes economic or ecosystem harm
Ask everyone to take a minute and write down one example of an IS that has affected you, the way it spreads and why it is unwanted. Go around and share and Gwenn will write bullets on flipchart for examples of IS, pathways for spread and why unwanted

2. Can you name any activities you do, or don't do, that may contribute to the spread of invasive species?

Prompts:

- Have you ever noticed weeds or animals stuck on your boat? Trailer? Boating equipment (fishing, waterskiing, et. . .)?
- Do you ever wash your equipment after boating or before moving to a new waterway?
- If you fish from your boat, have you ever used live bait (illegal in Oregon)?
- Have you ever not been able to boat in an area due to invasive species?
- Have you ever been checked by a park ranger or other enforcement officer?
- How do you clean your boat and equipment?
- How do you get rid of ballast, or holding tank water on your boat?

Platform Interaction:
Lupe will take notes during discussion that highlight the key activities that people mention. When everyone goes on break, we can write those on a flip chart. When people return, we can go over and ask for questions or if we missed any.

Break (2:15-2:30)-write mentioned activities on sheet, change tapes and batteries

3. What would it take for you to change the activities that may contribute to the spread of invasive species?

- Do you think you are capable of making a difference through your personal actions?
- Would making changes in your activities/behaviors be easy or difficult? Why?

Appendix H. Focus Group Outline for Facilitator (Continued)

- What kind of social pressure or 'usual' way of thinking relating to invasive species? Have your friends or colleagues ever talked about IS?
- Are there any policies or accepted activities relating to behaviors that may spread invasive species? *(as part of a boating organization)*

4. What would help you change your behaviors?
- What might help make behavior change easier?
- What ideas do you have about stopping the spread of invasive species overall?
- Where have you received any invasive species information in the past?
- What would have made this messaging more effective? How would you have conveyed this message?
- What activities would you like to be involved in or lead that would help you get involved and interested in changing your behaviors?
- Where would you most likely hear about and listen to messages about invasive species? (venues, media types. . .)

Focus Group Questionnaire-distribute with instructions about names and confidentiality

Break (8:35-8:45)-collect questionnaires; set out educational material; write list of mentioned solutions; change tapes

Reflection Activity: (Have direction written on flip chart)
Directions: Take a minute to write on separate sticky notes:
1. Something that was new or surprising
2. Something that was important
    * this will be shared with the group when everyone is complete

Once everyone is finished, have people put match each of their post it notes one with one of the objectives
Show by example: Once everyone is seated, look at the objective sheets and reflect on what questions we covered the most, least. . . Does this seem appropriate given the overall focus group goal?

Closing
- Any last comments that people wanted to share but didn't get to?
- How this study and people's participation will help inform a statewide education campaign. Support from media, etc. . .
- Reminder about stipend forms
- Hand out education materials
- Thank you!

Appendix I. Flipchart and Activity Notes

Below are the responses from each focus group to the platform and reflection activities. The platform activity responses were written on flip charts, and the reflection activity involved participants placing written sticky notes on large pieces of paper hung on the walls, each which had one of the main question objectives as a heading. The flipchart notes and large pieces of paper with participant comments were transcribed for posterity after each focus group was complete.

Gardeners 7.19.07

Platform Activity #1: Examples, Pathways and Impacts

Examples	Pathways	Why unwanted
Nutria	Reproduce quickly	Erosion
Passion Flower	Runners	Chocks plants
Stinky Bob	Seed (people, animals)	Suppress habitat
Japanese knotweed	Runners, flowing down streams	Hard to kill
Scott broom	Seed (wind dispersal, disturb land)	Chocks native plants
Blackberries	Seeds, birds	Hard to get rid of
Dandelion	Seed	Take over everything
Butterfly bush	Seed, wind	Overshadow plants
Popper trees	Roots, wind	Spread quickly, take over
Sharp shooter	Nursery plants	Destroys crops
False bromes (grass)	Wind	Takes over shaded area
Pampas	Nursery plants	Take over

Platform Activity #2: Activities that Can Spread Invasive Species

- Educate others
- Buying plants
- Sharing plants
- Cleaning tools (clothing, boots)
- Being informed (looking for labels)
- Managing current plants (cutting back black berries, manual removal, goats, before goes to seed)
- Exporting plants
- Construction equipment

Final Reflection Activity:

Knowledge: What do you currently know about invasive species?

- New and surprising: That all Buddlia may not be invasive
- Need to educate general public on importance of invasive species
- What was important: that even for the experience gardener there isn't substantial information available for decision making

Appendix I. Flipchart and Activity Notes (Continued)

- Something important: wide range of invasive plants. The number of plants that are invasive
- New and surprising: Degree of invasiveness of Ivy
- Getting out info
- Ideas on how to educate public on invasive species
- New and surprising: There's a bigger list of invasive species than I thought
- Surprising: We focused on horticulture (not agriculture) and very little on animals
- New and Surprising: The widespread difference in what is considered to be an invasive species in different areas of the state
- Important: The desire for more media coverage about invasive species

Activities: How might your activities spread invasive species?

- Important: thinking about how people spread invasive species and how easy it can be to change behavior , i.e. clean one's tools

Barriers: What may prevent you from changing the activities that potentially spread invasive species?

- Important: That education happen with business and municipality as well as gardeners
- Surprising: How much is unknown about how and why IS are regulated at state or federal level
- MG still using round up

Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

- All of one plant is bad
- What is new and surprising: garden clubs involved with eradication?-Great!
- SOLV program investigate further
- Something important: better info sharing through media
- Existence of weed control board
- Important: The various ways to possibly have outreach about the need to address invasive species as a definite problem. Many options that are viable
- Important: Education is the key have to inform and motivate the individual to take action
- New/ surprising: other gardeners are talking about a "solve" like model to address invasive and education on invasives.

Appendix I. Flipchart and Activity Notes (Continued)

Recreational Fishers 7.31.07
Platform Activity #1: Examples, Pathways and Impacts

Example	Pathway	Why Harmful?
Mitten Crab	Boats	Crowds other species, clogs canal filters
Zebra Mussel	Boats transfer/bilge	Prolific, crowds out, impacts culverts and damns
Zebra Mussel	Boots	Alters habitat, reduces hurts bare feet, lowers oxygen
Tui Chub	Live bait	Destroy ecosystem,
Sunfish	Stocking	Overwhelm system
Blackberries	Birds, wildlife	Inhibits access to banks
Grass carp	Intentional release to clear water	Eat all vegetation
Brown bullhead	Stocking	Disrupt ecosystem

Platform Activity #2: Activities that Can Spread Invasive Species

- Stocking
- Baitfish
- Boats and Trailers
- Shipping (global market)
- Ballast
- Aquarium Tanks
- Boots and Fishing Gear
- Rinsing Boats (Salt to Fresh)
- Hunting Decoys
- Travel

Final Reflection Activity:

Knowledge: What do you currently know about invasive species?

- How little education there seems to be with the public
- How important boat cleaning is vs. the problem of live bait fishing
- Role of watersports participants in the spread of invasives
- That someone believed that species weren't transported by travel

Activities: How might your activities spread invasive species?

- Something important: education, education, education, outreach!

Appendix I. Flipchart and Activity Notes (Continued)

Barriers: What may prevent you from changing the activities that potentially spread invasive species?

- Finding financial resources to fund a broad education program
- There is only $15K in budget for invasive species in OREGON. Need more!
- I was surprised by the division between approached to solving illegal introductions vs. accidental introductions
- The concern of everyone in the room

Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

- Balance between education and enforcement
- New to me: transport of invasive species via felt soles on waders. . use bleach to prevent
- That we need to work together as fishermen vs. our species group alone

Gardeners 8.12.07
Platform Activity #1: Examples, Pathways and Impacts

Example	Pathway	Why Harmful?
English Ivy	Planted Intentionally & birds	Chokes trees and vegetation, kills trees
Scotch broom	Ornamental, strong seeds	Changes soil so other plants can't grow; fire hazard
Laurel	Ornamental, birds	Smothers, nothing can live beneath
H. Blackberry	Birds, animals, runners	Out competes, makes areas inaccessible
P. loosestrife	wind, water	Chokes plants, fish in waterways
Mint	Rhizomes	Monoculture
Butterfly Bush	Garden stores, seeds	Impossible to eradicate harmful to butterflies
Bindweed	Seeds?	smothers

Platform Activity #2: Activities that Can Spread Invasive Species

- Incomplete composting
- Yard debris
- Boots and clothing/tools
- Decorative plants/nurseries (Farmers Market)
- Plant swaps
- Dump on roadsides
- Attraction to "new plants"
- Online?

Appendix I. Flipchart and Activity Notes (Continued)

- Booths
- Not removing
- Hitchhiking on plants

Final Reflection Activity:

Knowledge: What do you currently know about invasive species?

- New and Surprising: The amount of money spent to eradicate scotch broom along highways in Oregon.
- Something important: trying to predict and prevent the spread of future invasive species. Trying to get a handle as soon as possible in the process to stop newly invasive problem plants from spreading. Recognizing the lag time that takes place
- How much Oregon spends to control scotch broom
- A wider public education on the economic impact of invasive species on Oregon economy
- Something surprising: standards for selling invasive plants by nurseries are voluntary- I thought they are prevented from doing so by the state
- How master gardeners are involved in such wide ranging detailed activities
- The story of the state patrolman who stopped the Zebra mussel infected boat on the way to lake Washington
- The extent of state eradication of scotch broom- what were the forces that started this activity

Activities: How might your activities spread invasive species?

- Something surprising: Hardy fuchsias sprout in the woods at the coast from debris people [dump]

Barriers: What may prevent you from changing the activities that potentially spread invasive species?

- New or surprising: variety of motivators for diff. people
- Facts
- Fear ($)
- Love of place
- Visual etc….
- Not new, but how futile a persons own intention to eradicate seems to be

Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

- Important: brainstorm of solutions
- Educate the kids
- Instill sense of place

Appendix I. Flipchart and Activity Notes (Continued)

- Important: people from Western Oregon getting together to share info and feelings about what to do to educate the public about invasives
- New- although obvious designate invasiveness of labels
- Something important- Oregon is/spending a lot o f $ on this issue. Awareness is out there about invasive plants
- The potential role of the state nursery establishment to positively address the problem through voluntary means

Boaters 8.24.07
Platform Activity #1: Examples, Pathways and Impacts

Example	Pathway	Why Harmful?
Zebra/Quagga Mussel	Bilge; attached to boats and trailers	Clogs water intake; affects natives by its' eating habits
Milfoil	Aquariums; attached to trailers	Clogs intakes; Takes over; decreased oxygen levels
Milfoil	Aquariums; Bilge	Chokes lakes; costly abatement; crowds out natives
Goldfish	Aquariums	Don't belong; out of place; impacts other organisms
Bullfrogs	Food source	Eats everything; competes with natives
Nutria	Fur trade	Diseased; Wipes out cats; harms crops; erosion
Green Crab	?	Kills Dungeness

Platform Activity #2: Activities that Can Spread Invasive Species

- Cleaning boat 9salt to fresh
- Ballast/ bilge water
- Vegetation on boats and trailers (animals too)
- Dumping bait
- Dumping aquariums
- Transporting boats to different bodies of water (*this one was highlighted)
- Flushing motor
- Food source (Stocking)

Appendix I. Flipchart and Activity Notes (Continued)

Final Reflection Activity

Knowledge: What do you currently know about invasive species?

- Aquatic weeds, mussels
- Interest and knowledge of people present
- Important-Intense curiosity to learn more!
- Invasive species appear to evolve from a small, non-noticeable problem to a large significant problem that would be extremely costly and difficult to resolve
- New or Surprising-That some of the invasive species can actually affect your boat, i.e. zebra mussels. I perceived invasive species as more of an ecosystem issue
- Surprised to see level of interest from such a variety of users. Good thing!
- New or suprising-I'm surprised that mollusks can live about 30 days out of water

Activities: How might your activities spread invasive species?

- Important-The amount of potential problems from milfoil and zebra mussels

Barriers: What may prevent you from changing the activities that potentially spread invasive species?

Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

- Attention to the youth and future education
- Important-My level of knowledge/understanding is similar with my peers
- Surprising-My peers also feel compelled to do something to help
- Important-even though I may not be spreading invasive species, I can do something to spread the word on preventing the spread of invasive species
- New-Important motivator is damage to boats
- Existence of an invasive species council

Appendix I. Flipchart and Activity Notes (Continued)

Hunters 9.9.07
Platform Activity #1: Examples, Pathways and Impacts

Examples	Pathways	Why is it harmful?
Milfoil	Seed fragments boats, motors, trailers (Duck hunting)	Chocks near-shore areas, Shade out plants
Brachipodeum	Wind blow seeds	Displaces desirable species, changes ecology, monoculture
Tansy Ragwort	Travel (horse hunting), livestock feed	Displaces natives, can be poison
Blackberries	Birds, animals via seeds	Chokes out everything
Cheat Grass	Hay, vehicles, animals, clothing (seeds) wind	Out competes, changes fire regime

Disease (whirling, chronic waste)	Exotic sheep hatcheries	Kills animals, can't eat the meat
Ticks, fleas, lice	Boats, travel globally, pets	Kills animals

Platform Activity #2: Activities that Can Spread Invasive Species

- Animal feed
- Intentional introductions
- Gardens or stocking
- Transport on tires, clothing, shoes, dogs
- Travel from spot to spot
- Global trade and travel
- Game farms-escapes
- Activities that help:
- Cleaning vehicles, clothing, dog etc..
- Pulling invasives
- Conservation efforts to eradicate
- Education

Final Platform Activity:

Knowledge: What do you currently know about invasive species?

- New: what the Rocky Mountain Elk Foundation is doing with respect to invasive species and the importance to elk/deer
- New or Surprising: Mann Lake has koi
- How many invasive species we have to be concerned with
- Important: We all have a deep concern about our environment
- Important: emphasis on educating youth

Appendix I. Flipchart and Activity Notes (Continued)

- How many different things are considered invasive species, how little knowledge most people do not have about invasive species

Activities: How might your activities spread invasive species?

- Surprising: The level of activity (mainly financial support) that Rocky Mountain Elk spends on invasive species and the level of interest in invasive species
- Surprising: that there is a great interest from fellow hunters in education others about invasive species

Barriers : What may prevent you from changing the activities that potentially spread invasive species?

- Important: Most hunters who are experience care about invasive species
- Difficult to pin point solutions for control of invasive species
- Surprising: hunting organizations may not have as many members as I thought-to increase organizational support would increase education venue about invasive species

Solutions: What would make it easier for you to change the activities that potentially spread invasive species?

- How many people care about it and are willing to do something
- Important: to create a story that connects natural resources users to the threats and habitat loss invasive species
- Important: Issue needs:
- Knowledge
- Education
- Focus

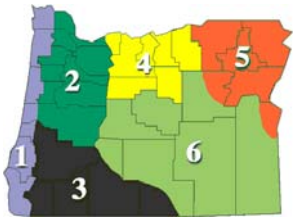
Appendix J. Sample Focus Group Questionnaire

Directions: Please answer each question. As in the entire study, your confidentiality will be fully protected; any information provided will not be connected to your name in any way. We need your name for coding purposes only.

1. Name:_____

2. What is the highest level of education you have completed? Please choose only one
Less than high school
High school graduate
Some college
College graduate
Post graduate work

3. What region do you live in? Please choose only one



- ☐ Region 1 (Coastal Oregon)
- ☐ Region 2 (Willamette Valley)
- ☐ Region 3(Southern Oregon)
- ☐ Region 4(Hood River Valley)
- ☐ Region 5 (Columbia Basin)
- ☐ Region 6 (Southeast Oregon)

4. Please list all of the fishing organizations you belong to:_____

5. Out of all your leisure activities, how important is gardening to you?
Please choose only one
The most important
Very important
Somewhat important
The least important

6. What three words describe best how you feel about changing your activities or behaviors to help stop the spread of invasive species?
Please choose only three.
Excited
Frustrated
Happy
Angry
Pleased
Annoyed

7. Will you change your activities or behaviors to help stop the spread of invasive species?
Please choose only one

Definitely	Maybe
Probably	No

Appendix K. Codebook for Data Analysis

This codebook was used to guide coding of data from hunter, gardener, recreational fisher and boater focus groups. After the transcribed dialogue was broken into data units that represented distinct ideas, each data unit was assigned to one or more codes. Unless otherwise noted, each code includes all groups.

Primary Theme Abbreviations:
K-Knowledge
P-Pathways
B-Barriers
S-Solutions

Primary Theme	Secondary Theme	Tertiary Theme	Quaternary Theme	Includes:
K	Definition	What is the baseline for 'native'		Statements and questions about how and when an organism is considered 'native'. This includes discussion about non-natives that have been accepted over time as non-invasive
K	Definition	'Causes harm' is based on perspective		Statements and questions that address the ways that different perspectives may view 'harm' differently; discussion about the difference between native noxious species and invasive species

Appendix K. Codebook for Data Analysis (Continued)

K	Definition	Introduced and causes harm		Definitions of invasive species based on NISC definition of invasive species. Also includes discussion of common themes for invasive species (ex. no predators in new environment, can withstand diverse conditions, reproduces quickly, etc. . .)
K	Examples			Stories and examples of invasive species that have caught people's interest and attention
K	Pathways	Nature		Introduction or spread of invasive species via natural pathways such as birds, wildlife, flooding, wind, seeds, or asexual reproduction
K	Pathways	Human Action	Biological Control *Recreational Fishers, Boaters, Gardeners*	Intentional transfer of species as a biological control, with unintended invasive consequences
K	Pathways	Human Action	Stocking *Recreational Fishers, Boaters, Hunters*	Intentional transfer of species for fisheries, fur trade, etc, game farm species, etc. . .
K	Pathways	Human Action	Bait and Aquarium Release *Recreational Fishers, Boaters*	Intentional transfer of species from release of live bait or unwanted . . .

Appendix K. Codebook for Data Analysis (Continued)

K	Pathways	Human Action	Equipment (Related to K-Pathways-Mobility with Hobby)	Unintentional transfer of species by transfer in bilge and ballast water, attachment to boats, trucks, clothes, pets, and other recreational equipment
K	Pathways	Human Action	Mobility with Hobby (Related to Pathways-Human Action-Equipment)	Unintentional transfer of species in relation to a hobby (e.g. boaters visit different bodies of water and hunters hunt in different areas, and gardeners collect plants during travel)
K	Pathways	Human Action	Ornamentals *Gardeners, Hunters, Boaters*	Intentional Introduction of species for ornamental purposes. This includes plant swaps, and the nursery and garden store trade.
K	Pathways	Human Action	Animal Feed and Crops *Hunters, Gardeners*	Unintentional transfer of hitchhiking species in animal feed (e.g. hay) and other crops
K	Pathways	Human Action	Human Disturbance *Hunters*	Changes in land use patterns create an opportunity for invasive species to gain foothold
K	Pathways	Human Action	Yard Waste and Composting *Gardeners*	Incomplete composting leads to introduction and spread of invasives

Appendix K. Codebook for Data Analysis (Continued)

K	Pathways	Human Action	Other	Other modes of transfer that lead to introduction or spread of invasive species
K	Impacts	Intrinsic Value		References to a sense of place or beauty, existence values, and leaving a legacy for youth (the difference between this and 'personal value' is that intrinsic value does not indicate time or money costs)
K	Impacts	Economic Value		Impacts industries and economies, uses up money for restoration
K	Impacts	Ecosystem Value		Changes ecosystems, creates competition for resources, introduces disease
K	Impacts	Personal Value		Affects personal recreational opportunities or property value, and has implied personal time or money cost
B	Need for more education	Confusing Topics/ Knowledge Gaps		Topics participants are unclear about, or topics were incorrect information is given by participants (will be added to with Sam's comments)

Appendix K. Codebook for Data Analysis (Continued)

B	Need for more education	People want to know more		Statements expressing desire to learn more. A belief that education is what is needed before change can occur
B	Overwhelmed	Out of control! The problem is bigger than me!		The problem of invasive species of too complicated or too large for any change to occur. Also includes a connection between invasive species and things out of a person's control, such as global trade or global climate change
B	Overwhelmed	I don't know what to do! There are no good solutions!		The solutions or behavior changes people are familiar with are too hard, or not believed to be effective.
B	Overwhelmed	Concerned about alternatives *Gardeners, Recreational Fishers, Boaters*		The solutions that people are familiar with have adverse consequences (e.g. use of bleach to clean equipment, use of herbicides or pesticides)
B	Not me!	*Gardeners, Recreational, Boaters*		I want to do what I want to do. Invasive species don't affect me. I don't affect it invasive species

Appendix K. Codebook for Data Analysis (Continued)

B	Lack of enforcement and/or government commitment			Statements indicating that the government is not doing enough, not creating or enforcing rules and not committing enough funds to this issue
B	Other people don't care enough			Statements about other people who are not taking responsibility or changing behaviors
S	Communication Venues	Internet		Participant suggestions and comments relating to the internet
S	Communication Venues	Group Organizations and Clubs		Participant suggestions and comments relating to group organizations and clubs (e.g. Master Gardener program, The Nursery Association, yacht clubs, Ducks Unlimited, etc. . .)
S	Communication Venues	Youth Programs *Gardeners, Boaters, Hunters*		Participant suggestions and comments relating to educating youth
S	Communication Venues	Media *Gardeners, Boaters, Recreational Fishers, Hunters*		Participant suggestions and comments relating to TV, newspapers and other media sources

Appendix K. Codebook for Data Analysis (Continued)

S	Communication Venues	Government *Boaters, Recreational Fishers, Hunters*		Participant suggestions and comments relating to government venues for education and outreach (e.g. with boating registration and education cards, enforcement of catch limits, etc. . .)
S	Communication Venues	Boat Ramps and Signs *Boaters, Recreational Fishers, Hunters*		Participant suggestions and comments for boat ramps and other areas for signage
S	Communication Venues	Game Reserves *Hunters*		Participant suggestions and comments for education at game reserves
S	Communication Venues	Other *Gardeners*		Other participant suggestions and comments for education venues
S	Communication Messaging	Examples of Good Messaging		Participant suggestions and comments about effective messaging examples
S	Communication Messaging	Fear Factor		Participant suggestions and comments about the effectiveness of including a fear or shock factor in messaging
S	Communication Messaging	Facts and Numbers *Gardeners, Recreational Fishers*		Participant suggestions and comments about the effectiveness of including facts and numbers in

Appendix K. Codebook for Data Analysis (Continued)

S	Communication Messaging	Personalized or local messages		Participant suggestions and comments about the effectiveness of using personalized and local information in messaging, including specific details about invasive species and what actions to take
S	Communication Messaging	Include images		Participant suggestions and comments about the effectiveness of including images in messaging
S	Communication Messaging	Prevention as the best strategy *Recreational Fishers, Boaters, Hunters*		Participant suggestions and comments about the effectiveness of emphasizing prevention in messaging
S	Communication Messaging	Success Stories *Recreational Fishers*		Participant suggestions and comments about the effectiveness of including success stories in messaging
S	Communication Messaging	Tone of Messaging *Recreational Fishers, Boaters*		Participant suggestions and comments what tone should be adopted in messaging
S	Communication Messaging	Other *Gardeners*		Other suggestions and comments about effective messaging

Appendix K. Codebook for Data Analysis (Continued)

S	Structural	Washing Stations *Recreational Fishers, Boaters, Hunters*		Washing stations for boats and truck rigs would make it easier for people to change personal behaviors
S	Structural	Hotline *Boaters*		A hotline to report invasive species would make it easier for people to change personal behaviors
S	Structural	Better information sources *Gardeners*		Better information sources about invasive species would make it easier for people to change personal behaviors
S	Structural	Nurseries and Labels *Gardeners*		Labels on nursery plants would make it easier for people to change personal behaviors
S	Structural	Hay Exchange Stations *Hunters*		Hay exchange stations would make it easier for people to change personal behaviors
S	Personal	Educate Others about Invasive Species		Educating others is something I can do that makes a positive difference regarding invasive species
S	Personal	Educate Self *Gardeners, Recreational Fishers, Boaters*		Educating myself is something I can do that makes a positive difference regarding invasive species

Appendix K. Codebook for Data Analysis (Continued)

S	Personal	Physical Removal		Physically removing invasive species is something I can do that makes a positive difference regarding invasive species
S	Personal	No live bait *Boaters*		Not using live bait is something I can do that makes a positive difference regarding invasive species
S	Personal	Support groups and agencies with money *Hunters*		Supporting groups and agencies with money is something I can do that makes a positive difference regarding invasive species
S	Participants suggestions about how to involve citizens in ACTIONS			Participant suggestions for involving citizens in actions that engage them in stopping the spread if invasive species.

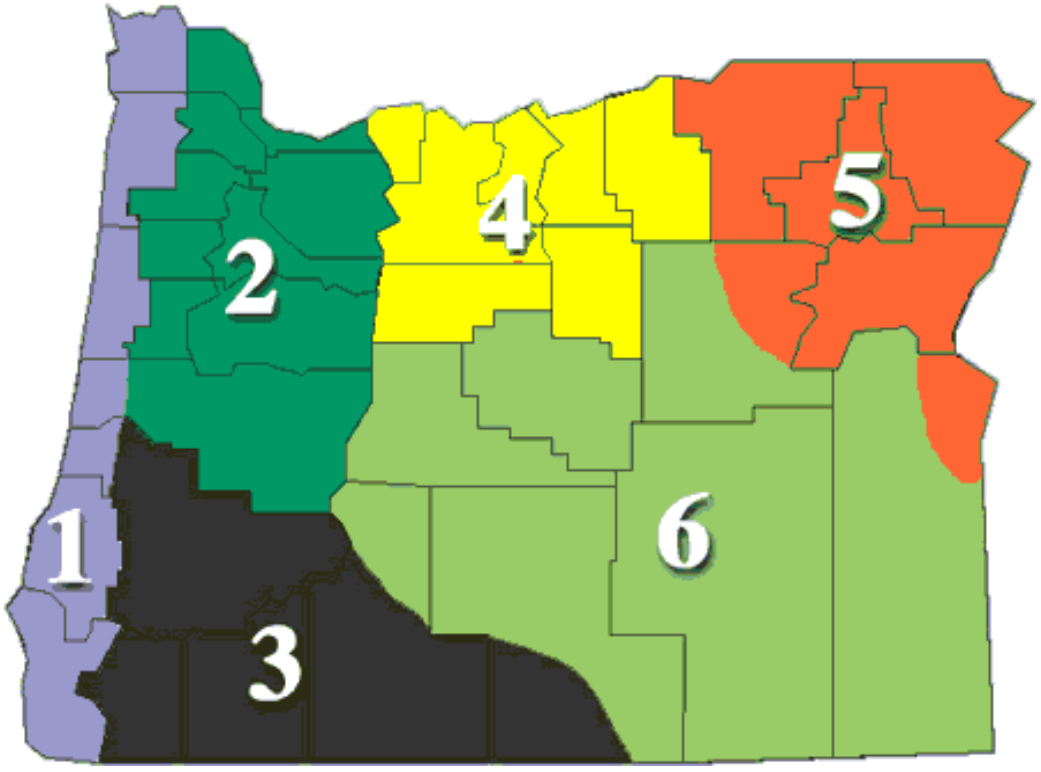
Appendix L. Sample of Coded and Sorted Data

After assigning each data unit to one or more codes according to the final codebook, the data was sorted into documents that included all data units belonging to one code from each focus group. Columns are used to keep comments from each stakeholder group separate. Sorting aids in summarizing and extracting themes from the data..

Knowledge-Definitions-What is the baseline for 'native'

Boaters	Gardeners	Hunters	Fishers
What is the baseline for 'native" (219-227) Participant: do you ever think of, well blackberries as an invasive species? Himalaya blackberries. . [new speaker] (laughs) and they've been here for a long time . . .[new speaker]that is non native and they're, you know, they're very aggressive . . [new speaker] yeah. .	What is the baseline for 'native" (371-376) And to get (laugh) and Samuels' question is how, how, how far back do you need to go (laughs). . .[new speaker] to say ok we are gonna do it as of 200 years ago or 50 years ago . . [facilitator clarifies, "to say what was, what was native and what was local?]. . .[new speaker]yeah, that was an interesting question, all right	What is the baseline for 'native" (131-134) are we gonna identify invasive species of interest maybe? or, I mean is there, is there a difference between like an invasive species and say exotic species, you know, (?) invasive species I mean would a, would a, would a partridge be considered invasive or just an exotic? I guess that's kind of where I'm curious (279-281) ok lets' what does originally mean? I mean whose count are we using the cave peoples, or recorded time, or first [described] by a management person or what originally. . I mean, pick a date (284-287, 291-297) you can pick too long a time frame and we're all invasive species so… [new speaker]I think that is up to a personal definition. Are you are looking at a couple of hundred years or how do you look at it?. . [new speaker] Is it about economical value or. .. .[new speaker]Well, it depends. Commercial value, you know, if it became a valuable, if it cost somebody money then that would have been the day that you have to pay to get rid of something, then that would have maybe been recorded because there would be no other reason to grouse about something you didn't like unless it was getting in your way, if it was a farmer or a cattle man. You know, they don't like wolves, they don't like this. . . It probably having something to do with commercial value because if it was costing you, or something they didn't like where.. . I'm guessing. I don't know	What is the baseline for 'native' (185-193) I think I heard something a few years ago about the base line for any native plant, animal, living product inside the US that dates back a couple hundred years. Does any body know the answer to that? I mean there was a study maybe dating all the way from Lewis and Clark. There was a major study made on all the plant life and animals that they encountered and I got the impression that anything that was recorded back that date was native. . .

Appendix M. Map of Regions in Oregon from Focus Group Questionnaire



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