ABSTRACT

Title of Thesis:	STAKEHOLDER CHALLENGES AND OPPORTUNITIES: APPLYING A SOCIO-ECOLOGICAL FRAMEWORK TO INTEGRATE HUMAN DIMENSIONS WITH U.S. WILDLIFE MANAGEMENT
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Wildlife practitioners face growing pressures to work at the interface of ecological and social issues yet the model they use in the United States, the North American Model of Wildlife Conservation (NAMWC), relies heavily on natural sciences. Inclusion of social science perspectives is needed to provide a consistent methodology to assess the current and desired conditions of both wildlife and humans. Current state wildlife practitioners offer a unique perspective into the challenges that exist barring this integration. Through semi-structured interviews with wildlife managers in Maryland and Florida, this research explores current definitions of the term stakeholder, stakeholder role, agency role, and the applicability of a socio-ecological approach for native versus nonnative species. Interviews revealed inherent

issues with the NAMWC, and challenges and opportunities for the integration of human dimensions. By understanding existing challenges and opportunities, agencies can begin to develop holistic solutions for the increasing demands of human-wildlife conflict.

STAKEHOLDER CHALLENGES AND OPPORTUNITIES: APPLYING A SOCIO-ECOLOGICAL FRAMEWORK TO INTEGRATE HUMAN DIMENSIONS WITH U.S. WILDLIFE MANAGEMENT

by

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Dedication

I dedicate this thesis to my mother, Donna Marie, and my brother, Justin Michael. We will always have Cherry Lane.

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List of Abbreviations

NAMWC	North American Model of Wildlife Conservation
SES	Socio-Ecological System
HWC	Human and Wildlife Conflict
HWI	Human and Wildlife Interactions
FWC	Florida Fish and Wildlife Conservation Commission
DNR	Maryland Department of Natural Resources
FWRI	Fish and Wildlife Research Institute
CCSSR	Center for Conservation Social Science Research
MAFWA	Midwest Association of Fish and Wildlife Agencies
PTD	Public Trust Doctrine
RAWA	Recovering America's Wildlife Act
HD	Human Dimensions

Chapter 1: United States Wildlife Management and the North American Model of Wildlife Conservation

Introduction

Human beings are rapidly growing in population and developing the landscape, requiring increasing habitat and encroaching on wilderness areas. According to one study, "the amount of urban land near [protected areas] is expected to increase around the world, on average, by more than three times between 2000 and 2030 (from 450,000 km^2circa 2000)" (McDonald et al., 2014, p. 63). As a result, many wildlife species are becoming increasingly threatened, adding to the need for management interventions. Other species which once faced extinction are now in a state of overabundance (Decker & Chase, 1997). Wildlife require food, and these sources often end up coming from agricultural lands, livestock, or even trash from human settlements. As humans and wildlife continue to compete for resources, instances of conflict will increase, potentially resulting in economic loss, death, and reduction or extinction of entire species. These issues will only be further exacerbated by a changing climate as species' ranges shift (Brooker et al., 2007).

Wildlife management strategies presently focus on maintaining species populations, relying heavily on a natural science perspective with some inclusion of human dimensions depending on the management interests and costs (e.g. Organ et al., 2012; Decker et al., 2012; Teel & Manfredo, 2009). However, human and wildlife

populations occupy an interconnected and continuously changing landscape, influencing one another both directly and indirectly. On a densely populated planet, it is illogical to propose separate ecological and societal management strategies without consideration of the other. Different human populations possess different cultural and economic values, norms, and institutions, which inform how they view and interact with wildlife by shaping their decision-making and activities. A manager who understands these underlying factors behind human responses can work with the community to co-manage wildlife in the area. Coexistence between the two requires an understanding of the social and natural sectors, and management strategies that will work for both. The results presented in this chapter explore the application of a socio-ecological framework to wildlife management as a way to incorporate social science methods and perspectives. This research proposes social science as an addition to wildlife management, rather than as a replacement (Manfredo, Vaske, et al., 2014).

Background

The current model of natural resource management employed by the United States is known as the North American Model of Wildlife Conservation, coined by Valerius Geist (Organ et al., 2012). The seven principles framing this model address both humans and wildlife in the creation of sound wildlife management and policy decisions. The first and foundational tenet of the model is the Public Trust Doctrine, which dictates that governing agencies manage natural resources for the benefit of the resource and the public (Smith, 2011). Understanding what that public benefit is first requires an agency to engage with its stakeholders, accomplished through the

inclusion of human dimensions, achieved through the use of social science. A human dimensions approach to wildlife management has grown increasingly popular since the late 1960s, utilizing social science to engage with stakeholders and subsequently applying the collected information, biological, social, and political, to wildlife management decisions (Manfredo, Vaske, et al., 1996; Decker & Chase, 1997). While the concept has existed for decades, many management agencies have yet to move beyond a natural science approach.

The view of social science as invalid hampers current wildlife management strategies. Although the inception of wildlife management has its roots in conservation, using biology to achieve this goal, there is a need to admit the limitations of the field in answering issues rooted in social systems. Principle number six, "Science is the proper tool to discharge wildlife policy," provides the opportunity to expose flaws within the model most clearly (Organ et al., 2012, p. ix). While the structure or intent of the sentence is not inherently problematic, issues have arisen from the interpretation of the word 'science'. For many, this principle excludes social science. This view reached the Montana House of Representatives in January 2019, when a bill was introduced stating that, with few exceptions, "the director, department, and commission may only use facts and science when making decisions" but "may not use social science, human dimensions, or people's attitudes, opinions, or preferences in decision-making processes related to fish and wildlife" (Manfredo et al., 2019, p. 1). Opponents of the inclusion of social science continue to believe natural sciences to be the only critical component of successful wildlife management. Yet the incorporation of human dimensions provides many benefits that can

strengthen existing and future policies. After a thorough review of 18 subfields within conservation social science, Bennett et al. (2017, p. 103) described 5 ways in which the field can contribute to conservation practices:

1. improve management practices and governance processes;
2. enable better conservation designs and models;
3. justify conservation actions;
4. help to achieve ecological outcomes; and
5. facilitate more socially equitable processes and outcomes.

In a 2020 paper, Dayer and Mengak assessed the inclusion of human dimensions courses in fisheries and wildlife undergraduate programs in the United States. The authors examined 62 degree programs within 37 overall National Association of University Fisheries and Wildlife Programs (NAUFWP) from 2017-2018:

> "We found 97% of degree programs requiring a human dimensions-type course (from a social science discipline such as public affairs, economics, sociology) and 100% offering such a course (when electives are included in analysis)...Yet, most commonly these human dimensions-type courses focused on public affairs (e.g., governance, law, management, policy, planning), which, if the only human dimensions exposure a student receives, is not comprehensive of the disciplines within the human dimensions field and excludes important insights from more traditional human dimensions disciplines such as social psychology, sociology, and recreation. It is not necessarily the case that these human dimensions-type classes are fish and

wildlife or natural resources-related, as in the case of the 40 human dimensions courses (i.e., "human dimensions" titled, society and natural resources, and other similar courses)" (Dayer & Mengak, 2020, p.7).

This is a large increase when compared to a similar 1997 survey by Robertson and Butler, which found that only approximately 40% (n=56) of programs offered a human dimensions course (Dayer & Mengak, 2020). While the increase in conservation social science courses is a promising sign, there must be alternative paths to train existing wildlife management practitioners who have completed their education.

Wildlife practitioners face growing pressures to work at the interface of ecological and social issues. Management actions often do not control an animal but focus on the management of human activities with the intended betterment of both. More effective management incorporates the cultural values, norms, and institutions of various stakeholder groups, including those of agency professionals, which inform their views and interactions with wildlife and overall conservation goals (Bennett et al., 2017; Sandbrook et al., 2013; Yee et al., 2021). Wildlife managers across the country must be able to not only understand the behavior patterns of animals, but the motivations and reasoning behind human action as well, and the drivers of conflict.

Elsawah et al. (2020) identified eight challenges to the development and adoption of socio-ecological models which would enable a manager to incorporate the methodology and data of both. Of the eight, this study contributes to the exploration of two, bridging epistemologies across disciplines, and representing human dimensions in SES (p. 3). As the practitioners of natural resource management

who actively use current methodology, wildlife managers offer a unique perspective into the challenges that exist barring further engagement with stakeholders. By understanding these existing challenges, agencies can begin to develop solutions, offering their employees a way to deal with the urgent demands of human and wildlife conflict, HWC. This study set out the following objectives:

1. Identify wildlife professionals' definitions of stakeholder, the stakeholder's role, and the agency's role.
2. Record any issues with the North American Model of Wildlife Conservation as identified by those utilizing it.
3. Identify any challenges wildlife practitioners see to the integration of human dimensions with current practices.
4. Offer opportunities for solutions to the emergent challenges drawn from both wildlife experts and the literature.
5. Explore the applicability of a socio-ecological approach to the management of native versus nonnative species.

Study Locations

Research focused on two study sites of interest in the United States, Florida and Maryland. The state of Florida hosts a variety of landscapes and populations, from coastal to forested, urban to agricultural. The population density of the state has also increased rapidly, both with general rises in human population and an influx of citizens seeking a warmer climate. Florida's population rapidly grew from less than half a million in 1900, to almost 16 million by the year 2000, with growth rates per decade ranging from 20 to 80 percent, compared to 10 to 20 percent across the United

States (Smith, 2005, p. 2). Due to climatic and geographic factors, the state is also home to a rich biodiverse population of wildlife (Stys et al., 2017). The landscape and wildlife variety combined with a diverse and dense human population have created a vast range and quantity of issues for natural resource managers to mediate.

The Florida Fish and Wildlife Conservation Commission (FWC), the state agency in charge of managing Florida's wildlife, began conducting wildlife research in the 1940s with funding from the Federal Aid in Wildlife Restoration Act, commonly referred to as the Pittman-Robertson Act. The agency has created additional research branches and designated wildlife management areas in the years since, establishing staff statewide. Florida has also recently invested in social science research through the establishment of the FWC Center for Conservation Social Science Research, CCSSR, in 2019 which enlists a team of social scientists for a variety of research, consultation, outreach, and training services (FWC Research Bulletin, 2019). Five times a year, a Conservation Commission composed of seven Commissioners, appointed by the Governor to serve five-year terms, meets to deliberate on regulation changes among other items. These meetings are held at various locations throughout the state to encourage a variety of stakeholder involvement (Florida Fish and Wildlife Conservation Commission, n.d.).

Similar to Florida, Maryland's variety of landscapes and land use designations cover a wide range, coastal to forested, urban to agricultural. The state's population is lower than that of Florida, but the density is higher (World Population Review, 2021). The state is also home to a variety of both terrestrial and marine species. The state is

similarly home to a wide range of species, and large game species, whose presence in populated areas often requires management interventions.

Maryland's wildlife management agencies have undergone multiple restructurings over the past century. The Conservation Commission was formed in 1916 and charged with the oversight of both marine and terrestrial species. Its reorganization in 1941 created five separate departments housed within the Board of Natural Resources. A final restructuring in 1969 created the Maryland Department of Natural Resources (DNR), an agency charged with management of the state's natural resources, including lands, waterways, and wildlife. The agency is composed of a wide range of divisions and services tasked with the management of the state's wide variety of natural resources (Maryland Department of Natural Resources, n.d.).

Species of Interest

Within Maryland and Florida, two case study species were selected: the native American Black Bear *Ursus americanus* and the nonnative feral hog *Sus scrofa*. These species were chosen due to their presence in both study locales, and their status as native and nonnative. Black bears have historically occurred throughout North America, although overexploitation and habitat loss have negatively impacted their current range (Scheick & McCown, 2014). Due to certain species traits, including an omnivore diet, high learning capacity, and behavioral plasticity, black bears have been extremely successful in adapting to urban areas (Baruch-Mordo et al., 2014). As human population size continues to increase and urban areas expand, it is imperative that wildlife managers be equipped with the tools to manage increasing conflict between humans and black bears. As this species naturally occurs in both Maryland

and Florida, both states actively manage and possess wildlife management plans (Florida Fish and Wildlife Conservation Commission, 2019; Maryland Department of Natural Resources, Wildlife and Heritage Service, 2004). However, there is ample opportunity and increasing need to fully incorporate human dimensions and social science into these plans to avoid future conflict and public controversy.

Invasive species are the primary factor threatening approximately 42% of threatened or endangered species in the United States, and the economic cost associated with environmental damages has been estimated to be approximately $120 billion per year (Pimentel, Zuniga, & Morrison, 2005). Feral hogs were first introduced to the United States by Spanish explorers in the 14th and 15th centuries, and rapidly increased in number due to their reproductive capacity and ability to adapt to new environments (McClure et al., 2015). As a nonnative species, they pose significant threat to both ecological and agricultural systems, as well as direct risk to human health from environmental contamination (McClure et al., 2015).

According to the Florida Fish and Wildlife Conservation Commission, feral hogs currently occur in all 67 counties of Florida, with populations occurring for hundreds of years (Florida Fish and Wildlife Conservation Commission, n.d.). Florida currently utilizes strategies including trapping and hunting to maintain their feral hog populations and limit damages. In Maryland, these animals are only just beginning to arrive from neighboring states, presenting the unique opportunity to provide the state with a transdisciplinary management plan for the control of future feral hog populations. Although *Sus scrofa* do not currently have any breeding populations within the state of Maryland, they are occasionally present due to moving populations

or the release of hogs into the wild. The Maryland Department of Natural Resources currently eradicates populations as they appear, but there is still concern that the problem could become increasingly difficult to control. These animals provide the opportunity to conduct a preliminary examination of the applicability of socio-ecological wildlife management to native and nonnative species.

Chapter 2: Applying a Socio-Ecological Framework to U.S. Wildlife Management

Overview

The first decision of any wildlife management action is prescriptive, asking what desired future conditions should be, leading to a realistic appraisal of policies and programs. It is essential for managers to understand the underlying human and animal behavior and actions that drive conflict between species. Demonstrated by existing literature, the evaluation of human behavior is accomplished through the integration of human dimensions and continuous stakeholder engagement (Bennett et al., 2017; Sandbrook et al., 2013; Yee et al., 2021). However, traditional natural and social sciences use dissimilar methods, concepts, and data analysis to conduct research. Without an applied method of combining distinct fields, knowledge remains isolated and only offers partial solutions for wider issues. A conceptual framework integrating ecological and social theory to understand the nature of these interactions and devise holistic solutions that apply knowledge and methods from both sciences is needed. Socio-ecological systems, or SES, research provides a natural framework for wildlife management as it recognizes these nuanced interconnections between culture and nature. This chapter explores the application of a socio-ecological approach to United States wildlife management, presenting a conceptual framework to demonstrate how these methods might be integrated.

Conceptual Approach: Socio-Ecological Framework

Socio-ecological systems research conceptualizes distinct subsystems and a hierarchy of variables in each into a singular interacting system, combining formerly isolated knowledge into one framework (Ostrom, 2009; Van Dolah et al., 2016; Binder et al., 2013). This does not signify that the two systems are isolated but provides a more accessible tool to understand the value in both subsystems. SES also addresses the complex and cyclical interactions that occur within and between the two realms across multiple temporal and spatial scales (Ostrom, 2009; Van Dolah et al., 2016; Lischka et al., 2018). When applied to wildlife management in the United States, SES provides a consistent methodology to assess the current and desired conditions of humans and wildlife, and possible management strategies to accomplish determined objectives.

Human-wildlife interactions, HWI, can be conceptualized as these two separate but integrated systems: social and ecological (Lischka et al., 2018). The social system consists of human components including various stakeholders and wildlife managers, diverse formal and informal institutions that influence human decisions, behavior, and values, and individual attributes such as socio-demographic characteristics, attitudes, values, and previous experience with wildlife. Within the social system is a hierarchy, beginning with individual members of the public. Higher organizational structures of human society, which include political, economic, and cultural constructs and values, dictate acceptable and unacceptable human activity. The ecological system contains all wildlife and related attributes, including demographics, reproductive status, temperament, and previous experience with

humans. This subsystem is organized by common ecological terms, from the individual to populations, communities, and finally entire ecosystems. Each level of organization is defined by the different interactions between individuals and external and internal influences (Lischka et al., 2018).

While these two systems are more easily viewed as distinct due to the methodologies, data collected and management techniques used, they are mutually influenced by shifts in each other. As human populations increase and expand to occupy more territory, a ripple effect is felt within the ecological subsystem as wildlife must shift ranges or adapt. If a species begins to decline, threatening a particular livelihood activity, all those impacted must be considered in proposed management action. Each stakeholder possesses a unique perspective and values in reference to the wildlife in question. These perspectives and values inform how humans view and interact with wildlife and are therefore essential to understand to propose a better fitting management method. The local ecosystem may be simultaneously facing a shift in predator-prey dynamics. The SES framework of human-wildlife interaction can serve to address these complex and dynamic issues, communicating across disciplines to develop successful management strategies. This integration also keeps wildlife agencies relevant and adaptable to constant change (Haubold, 2012; Manolis et al., 2009). Many management actions require rapid responses, necessitating proactive community measures. The active engagement of stakeholders ensures that a wildlife practitioner is equipped to accurately serve the beneficiary of the resource, the public.

A Socio-Ecological Systems Framework is Transdisciplinary

As the SES conceptual model of human-wildlife conflict traverses multiple disciplines and actors, the application of this framework in the creation of appropriate management action is done through a transdisciplinary approach. Transdisciplinarity is defined here as "a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge" (Lang et al., 2012, pp. 26-27; Jahn, Bergmann, and Keil, 2012). The proposed model not only crosses the barriers of the social and natural sciences, but it also calls for the inclusion of civil society in the form of all stakeholders associated with a conflict. Methods and data are pulled from the traditional disciplines of natural science and social science, as well as from stakeholders not trained in either but who possess local knowledge, all contributing to a final approach. The result is something that can no longer be broken down into individual disciplinary components or placed in a single discipline, but transverses all disciplines and creates a novel product. Collaboration between the traditionally separate groups also results in increased legitimacy and accountability for the problem and solutions (Lang et al., 2012). However, in order to be fully transdisciplinary, wildlife management must include stakeholders from the beginning of any proposed management process through its completion. While such an approach is needed, it has yet to be widely incorporated by managers across the United States.

The Issue of Cultural Carrying Capacity

The aim of this research was to investigate the current and potential inclusion of human dimensions into wildlife management in the United States. The primary intended audience is practitioners of traditional natural sciences and acting wildlife professionals. The phrase *cultural carrying capacity,* which appears in this paper, is recognizable to the widest range of acting professionals. However, this terminology is contentious in some disciplines that argue that such an umbrella term does not accurately depict the underlying science, calling for the examination of assumptions made by these theories (Dewar, 1984). The phrases *wildlife stakeholder acceptance capacity* (Decker & Purdy, 1988) and *potential for conflict index* (Manfredo et al., 2003) have also been previously used (Bennett, et al., 2017). These terms and others are likely more inclusive and acceptable; therefore, this study will use *wildlife stakeholder acceptance capacity* as a replacement for *cultural carrying capacity.* This term may be unknown to a large number of natural science professionals who do not actively engage with the topic of human dimensions. Therefore, future research should explore more representative phrases accessible to multiple disciplines that do not simplify the practice of conservation social science or represent a static value but initiate a conversation about where social science methodology might be included.

Visual Conceptual Model of a Socio-Ecological Management Framework

To help wildlife practitioners visualize how the interactions of humans and wildlife can be viewed and managed through a single socio-ecological framework, literature from Lischka et al. (2018) and Decker, Riley, Organ, Siemer, and Carpenter (2014) was used to build a preliminary conceptual model of socio-ecological wildlife

management. The socio-ecological system can be conceptualized as the product of two distinct but interacting systems which impact one another: ecological and social. The ecological system contains wildlife, while the social system contains humans, and the overlap of these two systems often results in human-wildlife conflicts. A socio-ecological framework shows how the two systems are interconnected, because while the activities and presence of wildlife have an effect on humans, likewise humans have values, needs, and activities that impact wildlife.

Wildlife species are assessed through natural sciences, informing both the current condition of a species and the biological carrying capacity of an area, and assisting practitioners in determining desired future conditions for wildlife. A comparison of current conditions with the desired future condition creates a gap analysis, identifying any management needs. Humans are assessed through social sciences, informing the current social conditions and the wildlife stakeholder acceptance capacity of an area, assisting managers in determining the stakeholder's desired future conditions. This value is not static, however, and can be increased through stakeholder education. A comparison of current social conditions with desired future conditions creates an additional gap analysis, identifying management needs.

The management needs of the ecological system, combined with those of the social system, together inform the collaborative management process. This process determines an agency's management objectives, which give direction to specific management actions that an agency and its partners might undertake. These actions can take the form of ecological management, altering the current conditions of a

species, addressing the management process and achieving the desired future condition. Management actions can also take the form of anthropogenic management, altering the social current conditions and similarly addressing the management process and achieving the desired future condition. The overall achievement of the merged desired future conditions ultimately decreased human-wildlife conflicts.

Figure 1: Visual Conceptual Model of a Socio-Ecological Management Framework

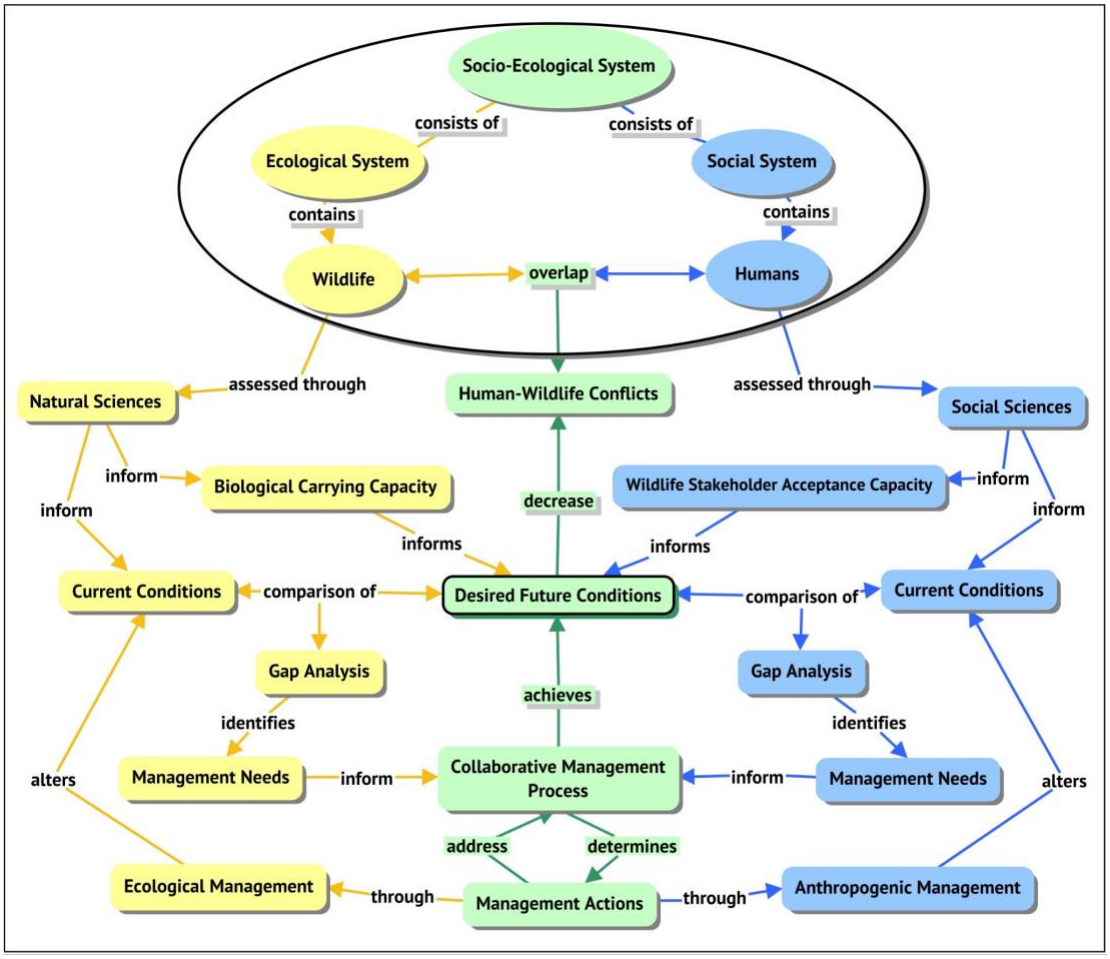

Figure 1: This figure displays a preliminary conceptual model of socio-ecological wildlife management. The overall socio-ecological system is displayed at the top,

demonstrating the ecological and social realms. Overlap between the two often creates conflict between humans and wildlife. Methods of assessing the ecological system through natural sciences are displayed in yellow, while methods of assessing the social system through social sciences are displayed in blue. The combination of both methods into a single collaborative management process is displayed in green. Arrows between boxes demonstrate the links between each and the cyclical impacts. A walkthrough of the system can be found within the text. (Information adapted from Lischka et al., 2018 and Decker, Riley, Organ, Siemer, & Carpenter, 2014. Created using CMap.)

Model Implications

The socio-ecological framework presented here provides a tool for wildlife practitioners to conceptualize the combined use of natural and social sciences in natural resource decision-making. The identification of the negative overlap between human and environmental issues is essential for managers to identify the source of the dispute and propose holistic solutions. Yet the incorporation of SES management is not an uncomplicated endeavor. The challenges highlighted by Elsawah et al. (2020) make clear steps that should be taken to achieve improved outcomes, socially and environmentally. SES natural resource management can provide a number of conservation benefits to decision-making, outreach, education, and communication (Bennett et al., 2017; Elsawah et al., 2020). Successfully applying this approach will require the full integration of the natural and social sciences at each stage of the management process. However, if wildlife agencies intend to accurately include social data, they must first identify and engage with their stakeholders.

Chapter 3: Challenges and Opportunities to the Inclusion of Human Dimensions in U.S. Wildlife Management

Overview

In calling for the inclusion of Human Dimensions, HD, with wildlife management in the United States, it is important to first understand why this has not yet been accomplished. Challenges to the adoption of a socio-ecological framework have been previously identified in existing literature (Elsawah et al., 2020). This research set out to explore these and other potential challenges, and subsequently opportunities, through the perspectives of current state-level wildlife managers who engage in this work daily. In recognizing that a framework appropriate for all species does not exist, native and nonnative species were also explored to understand the applicability of a socio-ecological approach for both. If challenges to the integration of social science methodology are identified, agencies can begin to work towards solutions to these issues, providing wildlife practitioners with the tools to manage wildlife for their benefit, as well as that of the public.

Study Methods

The methods outlined for this study were approved by the University of Maryland's Institutional Review Board (IRB Project 1609640-1) prior to any interviews. Each interviewee was informed of the methods, minimal risk, and confidentiality measures, and consent to audio record responses was obtained prior to beginning the interview.

Position and Bias

I am a 25-year-old Caucasian female and lifetime resident of the United States. As a Master's student studying the integration of social and natural sciences, I personally believe that human dimensions should be considered in wildlife management to promote more effective and equitable conservation policies and actions. As a stakeholder interested in the conservation of lands and wildlife, I am interested in how my contribution to the integration of management methods is viewed by practicing wildlife experts.

Preliminary Literature Review

Prior to the development of the study, a broad review of the literature was conducted using the Web of Science Core Collection database. While all document types were included, the location was restricted to the United States, and a custom timespan of the previous 10 years, 2009 through 2020, was selected. The primary search term used was wildlife management. Within this collection, the search within results feature was used to individually search for *social ecological system, human dimension**, and *adaptive management**.

All collected studies were consistently reviewed for the mention of both wildlife and human populations. This initial exploratory review revealed a growing body of literature over the past ten years calling for the incorporation of human dimensions considerations into wildlife management. However, this was not sufficient to assess the current application of such considerations within acting wildlife management agencies.

To assess the state of human dimensions inclusion and stakeholder engagement methods in current wildlife practice, management plans from the case study locales for study species were obtained and reviewed. The literature included the 2019 Florida Black Bear Management Plan, the 2004 Maryland Black Bear Management Plan, and the 2014-2018 USDA National Feral Hog Five Year Report. The websites for both state agencies, FWC and DNR, were also reviewed. Key data was pulled together which synthesized the ecological-based and human-based management methods currently employed by both states, as well as any engagement methods described. Web of science was again used to conduct searches for literature describing stakeholder engagement methods and the benefits of conservation social science.

An informal interview was conducted with a Maryland wildlife manager to better understand the state of the agency and its practices. A review of this information revealed a wide gap between the use of social science methods between the two states, and between the two species. The collected literature and preliminary information informed the creation of a standardized semi-structured interview instrument, developed to identify expert perceptions on the potential use of social science in wildlife management. After multiple rounds of edits to ensure reliability, the instrument remained unchanged through the remainder of the project (Barriball & While, 2013).

Study Areas and Species of Interest

Within methods of inquiry, the case study approach enables a researcher to study one example, or case, in more depth. Community case studies are possible

through the selection and examination of a community, defined by the trait they share that unites them in the study interest. The communities of interest selected for this study were the states of Maryland and Florida. Both states contain a wide variety of land use designations, including agricultural, urban, suburban, and rural. Landscapes also vary widely, from coastal beaches to dense forests. According to data from the US Census Bureau, the state of Florida was estimated to have a population of over 21 million citizens as of July 2019. In 2010, the population per square mile was estimated at 350.6. The state of Maryland was estimated to have a population of over 6 million citizens as of July 2019. However, the population per square mile was estimated at 594.8 in 2010. The high population densities of the two states increases the opportunity for overlap between human and wildlife populations, resulting in a similar increase in the need for wildlife management interventions (United States Census Bureau, 2019).

This study was bound to focus on two species of interest, the native black bear, *Ursus americanus*, and the nonnative feral hog, *Sus scrofa*. Black bears have historically existed in both Maryland and Florida and remain a topic of great interest for a variety of stakeholders. While feral hogs have existed in Florida for hundreds of years following introduction by Spanish explorers, they have not yet established a reproducing population in Maryland. Due to their ability to rapidly reproduce, there is growing concern over the species successfully establishing itself in Maryland. As a result of interactions, any community member who interacts with bears or feral hogs is a stakeholder. Therefore, while the state does not currently have a formulated plan for managing feral hogs, a preemptive plan for dealing with this possibility and

proactive education of stakeholders would likely benefit wildlife agencies. Black bears and feral hogs have implications for human dimensions work due to the overlap in their food sources and habitat with one another and with human populations. The native and nonnative species provided an avenue to examine any variation in interviewee preference for stakeholder engagement depending on the animal. However, experts were also questioned about their general views of the management of all species, and the term *wildlife* will be used to encompass this group.

Eligibility Rationale for Participants

Qualitative research fully captures and analyzes human behavior beyond ascribing a numeric value. An inductive approach gives a scientist the ability to examine a phenomenon within the context of the economic and social systems in which it exists. In qualitative research, there is no incorrectly biased sample, as the bias of participants is the subject of the research, welcoming context and complexity (Mayan, 2009; Rust et al, 2017). This purposive sampling, deliberately selecting participants, is effective in sample sizes and can provide robust data and internal validity (Tongco, 2007).

Eligible study participants were restricted to acting employees of the two state-level wildlife management agencies chosen, the Maryland Department of Natural Resources (DNR) and the Florida Fish and Wildlife Conservation Commission (FWC). Within Florida, a variety of positions, both biological and social, were easily identified and contacted due to the existence of the Center for Conservation Social Science Research within the agency. A similar center does not exist in Maryland which made identifying Maryland counterparts challenging and mostly unsuccessful.

All of the interviewees had completed undergraduate training in wildlife biology, management, and conservation. A number also held advanced degrees.

After a review of the two agency websites, a collective list of 50 potential interviewees was identified. Snowball sampling was also used; each interviewee was asked about potential additional interviewees. All 50 wildlife professionals identified through the website review were contacted to request an interview using a standardized email. A combined total of 17 interviewees participated in the study.

Many managers were unavailable when contacted for an interview due to species busy seasons or pandemic complications. Ultimately, 18 separate interviews were conducted, with 17 participants, 10 in Florida and 8 in Maryland. One interviewee from Maryland participated in both an informal and later, a formal interview. The smaller sample size does not indicate a lack of conclusive data, as the participants constituted a subset of a relatively small population. Additionally, interviews were conducted with practicing wildlife experts, and sought a deeper understanding of their specific cases (Rust et al, 2017). A study by Seidler (1974) determined that when using purposive sampling, a minimum of 5 participants are required for accurate data (Tongco, 2007). Participants from a variety of positions within state-level wildlife agencies were interviewed. For the purposes of reporting results, the term *manager* will be used loosely. This does not signify that an interviewee acted in a managerial role, or directly managed wildlife.

Table 1: Descriptive Breakdown of Study Participants

	Maryland	Florida	Totals
Interviews			
Total Interview Requests	**25**	**25**	**50**
Final Interview Counts	**7**	**10**	**17**
Work Duties			
> 50% related to SocSci	**1**	**4**	**5**
> 50% related to Ecology	**6**	**6**	**12**
FWC CCSSR	**n.a.**	**2**	**2**
Case Study Species			
Black Bear work	**3**	**10**	**13**
Feral Hog work	**1**	**3**	**4**
General Wildlife	**5**	**10**	**15**
Time in Agency			
1-5 years	**0**	**2**	**2**
5-10 years	**0**	**2**	**2**
10-20 years	**2**	**2**	**4**
> 20 years	**5**	**4**	**9**
Highest Education Level			
Undergraduate	**5**	**1**	**6**
Master's	**2**	**6**	**8**
PhD	**0**	**3**	**3**
Human Dimensions Training			
At University	**2**	**5**	**7**
Workplace Training	**4**	**9**	**13**
Did not specify	**2**	**1**	**2**

Table 1: The table above presents a descriptive breakdown of the total number of wildlife practitioners to be interviewed (N=17) across both states of the 50 contacted. Study participants were grouped by employing state; Florida interviewees (n=10), Maryland (n=7), and both combined. The Work Duties categorization was determined through participants' self-identified top responsibilities in their position. Case Study Species categories reflect whether participants discussed the study

species or wildlife in general; participants may be included across multiple categories. Time in Agency refers to the number of years each practitioner has been employed by the state wildlife agency. Highest Education Level reflects the most advanced degree obtained by each interviewee; participants were counted only once. Finally, Human Dimensions Training reflects whether interviewees participated in any human dimensions course either at a university or within the workplace. Practitioners who had a single course in human dimensions at the university level were counted; participants may be counted twice across the university and workplace training sections.

Data Collection: Semi-Structured Interview

Within this study, it was essential to engage with practicing wildlife professionals, as they have the experiential knowledge needed to assess where human dimensions can actively be applied to wildlife management. The participants also had varied educational and professional backgrounds, precluding the use of a standardized interview (Barriball & While, 2013). An in-depth, semi-structured interview enables a researcher to dive deeper into the narrative, linking the lived experiences of the participants to the systems in which they exist. A researcher may explore the needs, values, beliefs, and motives of respondents. While a survey can more quickly assess surface views of a larger population, the active researcher engagement within qualitative interviews ensures that all questions are answered individually by participants, eliminating undue influence from others, and enabling the use of probes for more information or clarification (Schensul, Schensul, and LeCompte, 1999). Just as the literature argues for increased engagement with stakeholders to develop

supported policies, wildlife professionals must also be engaged with to determine future management methods, and the challenges that might exist (Bennett et al., 2017; Sandbrook et al., 2013).

Due to the ongoing COVID-19 pandemic during the majority of the study, all interviews were conducted remotely, either by phone or Zoom video call. Each session began by reviewing the IRB approved consent form and obtaining the interviewee's verbal consent to be audio recorded. The interview proceeded with a list of pre-developed questions, and experts were often probed to further elaborate on their answers. Interviews were concluded by asking an open-ended question for any final comments and answering any questions from the interviewee. Immediately following each interview, the interviewee recorded any thoughts regarding the participant's willingness to respond, body language, tone of voice, and overall quality of the respondent (Barriball & While, 2013).

Data Analysis

Interview recordings were uploaded to the transcription software Otter.ai. Automatically produced transcriptions were then validated for accuracy by listening to the audio recording and ensuring the text accurately reflected what was said. Names were removed from the transcripts to protect interviewee privacy.

Transcripts were reviewed to begin identifying common themes throughout interviews. From this initial analysis, several main codes were developed: *Black Bear*, *Wild Hog, Education and Training, Stakeholder Definition and Role, Stakeholder Engagement Methods, Agency Role, Issues with NAMWC,* and *Challenges*. Further exploration was conducted using the qualitative analysis program MAXQDA.

Analyses completed include thematic coding and frequency analysis. Microsoft Excel was used to track the number of interviewees, both within state and in total, who discussed each theme. During the thematic coding, emergent codes were pulled from the text, including *Public Trust*. Within the primary code Challenges, emergent themes in order of most frequently mentioned included *Funding, Educational Background and Manager Training, Public Misrepresentation, Priorities of Political Leadership, Culture Shift, Time,* and *Priorities of Agency Leadership*. The frequency of each issue recorded separately for Maryland and Florida, and totaled across both states, was calculated, enabling all seven challenges to be ranked. The ranking order demonstrates issues that interviewees highlighted most frequently and should not be interpreted as a scale of importance or necessity. The complete codebook is available in the appendix.

Results from thematic coding and frequency analysis were written descriptively, and key quotes from wildlife professionals were included to support findings. A record of quotes which elicited various themes is available in the appendix. Summarized results were compared across states to identify differences in current management practices in addition to potential challenges to increasing stakeholder engagement.

Results

Stakeholder Definition

Before questioning how government wildlife managers presently engage with stakeholders, it is first important to understand how they define who is included

within the term. By defining perception of a stakeholder, interviewees revealed who they believe must be engaged with to successfully integrate human dimensions. It is interesting to note that all interviewees, across both states as well as those employed by the same agency, did not define the term stakeholder in the same way. Many initially recited the agency's definition in response to the question but diverged significantly when probed to elaborate.

Figure 2: Quantity of Interviewees per Stakeholder Definition

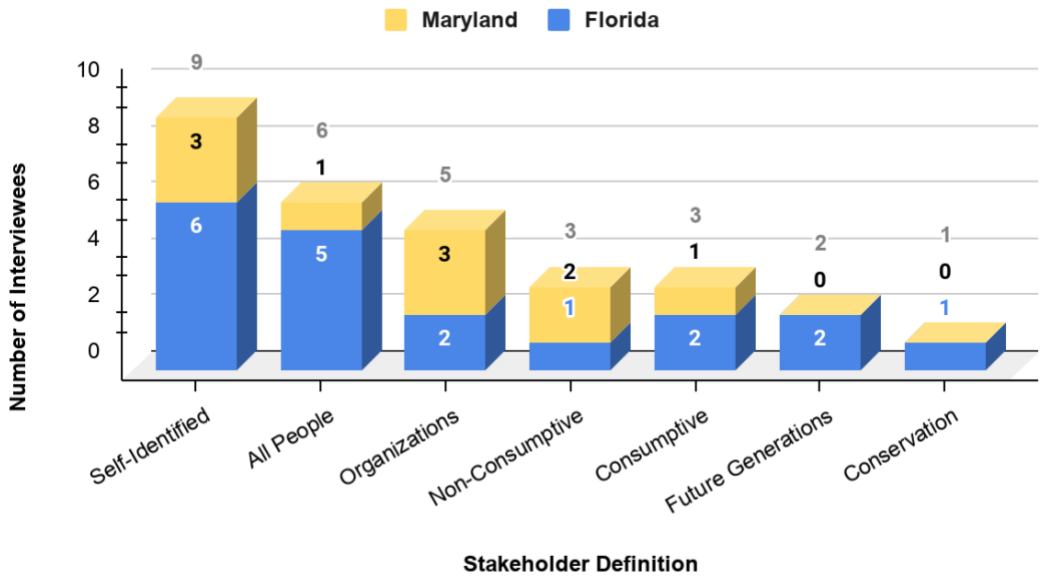

Figure 2: The above stacked column chart depicts the number of wildlife practitioners across both states (N=17) who included various emergent groups when asked to provide their personal definition of the term stakeholder. A total of 7 categories were identified through common phrases provided by interviewees. Individual totals within Florida (blue, n=10) and Maryland (yellow, n=7) are also displayed within each definition category. Final values for each emergent definition category, ranked from most frequent to least, include: Self-Identified (Total N=9, Florida n=6, Maryland n=3); All People (Total N=6, Florida n=5, Maryland n=1);

Organizations (Total N=5, Florida n=2, Maryland n=3); Non-Consumptive (Total N=3, Florida n=1, Maryland n=2); Consumptive (Total N=3, Florida n=2, Maryland n=1); Future Generations (Total N=2, Florida n=2, Maryland n=0); Conservation (Total N=1, Florida n=1, Maryland n=0). Challenges were ranked according to total quantity of interviewees. Ranking should not be interpreted as a scale of importance. Categories are also not exclusionary; respondents may be repeated in multiple categories.

Five of the seven Maryland wildlife managers offered a personal definition of who they view as stakeholder within their state. The views of these five interviewees diverged into multiple generally defined groups, with various combinations of the groups constituting the full stakeholder definition. The most common view, shared among three interviewees, was to define stakeholder as both internal and external organizations. Examples provided included The Humane Society and other NGOs, local government, park and forest services, sportsman groups, and law enforcement, among others. Two of these respondents also later mentioned public citizens outside of these organized groups as stakeholders, but only those with an active interest who engage through public meetings or publicly comment on draft rulings, otherwise self-identify.

One interviewee initially responded by describing stakeholders as exclusively consumptive users, those that contribute funding through the purchase of hunting licenses or firearms. However, as the interview progressed, the interviewee began to broaden their definition, including non-consumptive users of the resource, naming

self-selected volunteers, birders, and hikers. Just a short while later, this same interviewee broadened even further to include every tax-paying human in the state, whether they know they are a stakeholder or not. This interviewee was the only one to use this definition in the Maryland group. This progression demonstrates how some traditionally trained wildlife professionals might be able to adopt a broader understanding of the term stakeholder through a simple thought exercise. A different interviewee progressed similarly, initially defining stakeholder as consumptive users, broadening to include non-consumptive users, and later incorporating the public, but similar to previously discussed interviewees, only those who self-identify either through nuisance calling or attending public meetings.

The order in which the interviewees identified different stakeholders was telling. All five of the Maryland interviewees who responded to the question first described either organizations or consumptive users. Only after further discussion did interviewees begin to broaden and describe non-consumptive users of the resource, actively engaged citizens, and only once, every tax-paying citizen.

All ten of the Florida interviewees offered a personal definition of the term stakeholder. The most commonly discussed group, mentioned by six of the ten interviewees, were the self-identified citizens who actively engage through public meetings or nuisance calls, echoing comments made by Maryland managers. Following closely behind, however, with 50% of the wildlife managers including them was every human in the state, including those that don't know they are stakeholders. A single interviewee used this one group as their full definition,

believing it encompassed any and all other smaller groupings within it. Expanding on the definition, one particularly articulate respondent shared:

> *"there are stakeholders out there that don't know they are stakeholders. So we're providing the benefits of the conservation of fish and wildlife to everybody, but people don't really, they don't think they get that because we manage thousands of acres for particular species but that also provides clean air, clean water. And so they're benefitting from our management of those resources. And so they're a stakeholder, but they don't have as big a stake."*
>
> *-F8*

Only two interviewees in Florida mentioned consumptive users, although this is likely related to their positions in the game species section. Two managers also described stakeholders as internal and external organizations, with one manager noting that although self-identified members of the public are also stakeholders, organized groups are often the most influential, leading to concerns over public misrepresentation. Interestingly, one wildlife manager who often works with volunteers made the distinction between the term stakeholder and the general public:

> *"I mean, the way that you work with stakeholders and the way that you work with the general public on education is very different…But those that want to, those that are stakeholders, have enough of a stake in it to actually be more involved than just receiving educational information. So, yeah, I would make a distinction there. I'm sure that it is a spectrum to some degree, how involved people want to be. Sometimes, people just come to the, all they do is come to the commission meeting to tell us their point of view. And they aren't*

necessarily involved in any kind of a stakeholder process. So there is a spectrum there. But I guess in my mind, those two groups are somewhat separate."

-F4

Two definition groups newly identified by Florida and not previously described by Maryland were conservation experts identified through snowballing, and future generations. Two interviewees included future generations as benefactors of current management techniques. However, one of these interviewees had included every human in the state in the definition, while the other only defined stakeholder as internal and external organizations. According to the former:

"So it's, it's not strictly the people who are here now and, and wanting certain things out of their, their natural resources. It's also those future generations that you need to be thinking about in how you manage these things so that they are here for them to make future decisions on as well as the public is, it's a critical component in how you, how you target your programs."

-F7

In order to accomplish the goal of incorporating human dimensions into wildlife management, practicing and future wildlife professionals must be trained to recognize their constituents as the entire public present and future, and not exclusively previously engaged groups, those who self-identify, or organized associations. Of the generally defined groups, Maryland and Florida shared five: internal and external organizations, self-identifying public citizens, exclusively consumptive users, non-consumptive users and volunteers, and ultimately the full

public. Florida included an additional two, namely conservation experts identified through snowballing, and future generations.

Stakeholder Role in Wildlife Management

Shortly after interviewees were asked to provide a personal definition of the term stakeholder, they were questioned about what the role of the stakeholder should be in wildlife management. Once again, Florida described a wider range of roles the stakeholder should play, with four identified groupings compared to three identified by Maryland managers. These four categories derived from interviews included the stakeholder's role as an *Informant*, *One-Way Street*, *Equal Partner* or *Two-Way Street*, and *Situationally Dependent*. A brief definition of each defined category can be found in the table below.

Table 2: Stakeholder Role Defined Categories

Stakeholder Role Category	Stakeholder Role Definition	Maryland	Florida	Totals
Informant	Pay attention, donate money, obey laws, appreciate wildlife, pass information to the agency on status of resource or issues	**3**	**6**	**9**
One-Way Street	Agency provides public resources only, agency decides on any interaction with public, provides information about resource	**1**	**0**	**1**
Equal Partner or Two-Way Street	Decider of resource, tell agency what they want or how they want to see things, informal meetings, formal public meetings to provide opinions which are then synthesized by agency staff	**2**	**7**	**9**

	and considered, work alongside agency and remain engaged			
Situationally Dependent	Equal partner sometimes, BUT not always warranted, depends on the species or resource in question; ex. Endangered animal or invasive species	**0**	**2**	**2**

Table 2: The table above presents a descriptive breakdown of the four defined categories of stakeholder role as derived from interviews (N=14) in each state, Florida (n=8), Maryland (n=6), and both combined. The four categories of defined roles include Informant, One-Way Street, Equal Partner or Two-Way Street, and Situationally Dependent. Definitions are provided for each of the four categories. Participants may be counted multiple times within each defined role.

Similar to the differences that occurred when respondents defined stakeholder, wildlife professionals in both Maryland and Florida provided differing perspectives on the role the stakeholder should play. One of the most commonly defined roles, mentioned by nine of the 17 total interviewees, was the stakeholder as the informant, both providing information and input to agencies, and disseminating information to the wider public. A second role, also mentioned by nine interviewees, was of the stakeholder as an equal partner to wildlife management agencies. However, for the latter definition, of the nine respondents who included this, seven were from Florida. It is once again interesting to observe the divide in viewpoints of stakeholder roles, both across state boundaries and within them.

Of the seven interviewees in Maryland, six described their view of the role stakeholders should fulfill. Three managers viewed stakeholders as informants, who should pass information to the agency, disseminate information to their peers, and generally obey laws and donate funds. One interviewee described the interaction as a one-way street, where it is the state agency's duty to provide the public with information about a resource. *"So we have done stakeholder engagement with regard to letting them know what we want to do. It is unusual to have stakeholders come to us and tell us before any management has been done what they want us to do." (M3)* Two interviewees instead described the stakeholder's role as an equal partner, one who informs the agency of their needs with respect to a resource, and actively works with the agency to reach an acceptable management goal. However, these managers also clarified that this process does not regularly occur in Maryland yet, but they would like to progress towards the format. One interviewee outlined their hopes for the future of the agency:

> *"Ideally, I would like the public to be as involved as they would like to be, and to provide a process that allows that to happen. And that could involve everything from informal meetings with, with peers and colleagues discussing a particular issue or development of a plan. It could be more formal, public setting, where you're inviting them to, to provide their opinions on particular issues. And then afterwards, you know, agency staff would try to piece that all together and synthesize it, and then consider whether or not we need to make changes and what we're considering or what we're proposing."*
>
> *-M7*

From the ten managers interviewed in Florida, eight outlined their view of the stakeholder's role. All but one of the wildlife professionals described the stakeholder as an equal partner to the agency, one who should work with the agency in a 'two-way street' process, sharing their needs and remaining engaged throughout the entire process. One manager shared:

> *"Both have equal roles. That's what I see. As a management agency, making a decision based on the public opinion and feedback is essential. Public cannot manage the wildlife for the state because there should be a management authority or management agency, but the management agency needs to work with the public on making the decision of course. That level of engagement of stakeholders depends upon which species we are talking about, what management options we are talking about, to what extent we need public input on that one. So those kind of things should make a decision and I think that's what we are doing."*
>
> *-F9*

Six interviewees additionally viewed the stakeholder as more of an informant, who should pass information to the agency and obey laws yet hold the agency accountable as well. Two interviewees with a social science focus agreed with the stakeholder's role as an equal partner, but with one important distinction: stakeholder involvement is not always warranted depending on the species or resource in question. One stakeholder explained this stance:

> *"One of the one of the important things that I tried to impart on our managers and biologists is that it's always situationally dependent. For example, if you*

have a species that is under the Endangered Species Act, then it is what it is. Stakeholders won't have actual say in the decisions because it's federally mandated. But if it's something like managing or establishing a limit on catfish, you know, regulation, then you can involve stakeholders, you know, avid anglers and the people fishing on the side with a bucket and ask them how much, what's your ideal? What would make a satisfying day to you? And as long as it doesn't negatively impact the fishery, then you can make a decision with their input. So it really depends. I think, once FWC got the grasp of the need to engage stakeholders, the next challenge was figuring out how much and when, because they sort of flew straight to the other side and when everybody has to be involved in all decisions, they got really complex."

-F5

Public Trust

Although there was no interview question which specifically asked about the public trust mandate, ten of the 17 interviewees highlighted its importance in describing the purpose of their agency. The public trust doctrine dictates that "publicly owned resources, such as wildlife are entrusted to the government for safeguarding in the interest of all citizens" (Teel & Manfredo, 2009, p.129; Prukop & Regan, 2005). A social science proponent in Florida explained the role social science can play in maintaining the public trust.

"And so I think the importance of social science integration in any wildlife management is mainly due to the reason that we manage wildlife for people, to some, so that we can keep people and wildlife together and in a mutual

relationship. So for that we need to not only understand how wildlife behave or what are the needs and necessities of the wildlife, but also of the people. And so that's why social science is important."

-F9

Within the Maryland group, three interviewees mentioned the tenet, and the role their agency plays in governing natural resources for the benefit of the public. One interviewee explained that as an employee, their overall charge was to manage the species for the citizens of the state. A second interviewee described the same view of their role, stating that practitioners enter a public service job because they believe in serving the public and maintaining an open line of communication. The final respondent who spoke to the tenet reaffirmed the public's ownership of the resource. *"Well, the role of the public is huge, because I mean, it, you know, in our system of government, they actually own, the citizens own the resource. The government doesn't own it, the government manage it for the citizens." (M6)*

A total of seven Florida participants also spoke to the public trust principle. Interviewees recognized the way in which the public depends on state and federal wildlife and land managers to manage the public resource for the benefit of the resource, and the people. One interviewee labeled the public as the benefactor, relating wildlife management to a financial transaction.

"You've got these trustees, you know, this fiduciary responsibility that they have, or fiduciary relationship with the benefactors, beneficiaries, right? And the public, they're the beneficiaries. And just like you would, you know, with a monetary Trust Fund, have a relationship with your trustee, you know that,

we're doing all this for the public right, you know, I mean, none of us here, then we wouldn't have an audience to serve, and so they're foundational to the process."

-F6

Discussing the way in which Florida strives to uphold this principle, this interviewee added that a resource that belongs to all people should be managed separately from the legislature, a goal that the state is striving for.

Issues with the North American Model of Wildlife Conservation

During each interview, participants were asked to describe any problems, if they exist, with implementing the NAMWC that they have observed. Thirteen participants highlighted inherent issues with the model. These flaws include *Funding Structure and Sources* which particularly rely on consumptive users, the *Undue Influence of Super Stakeholders*, and a *Single Species Management Style.* The listed flaws related directly to the challenges with stakeholders described in the next section.

Table 3: Issues with the North American Model of Wildlife Conservation

Identified Issue	Description	Maryland	Florida	Totals
Funding Structure and Sources	❑ Funding source historically consumptive users ❑ Lack of general funds ❑ Funding designated for single species only ❑ Decreasing consumptive users	**6**	**5**	**11**

Undue Influence of Super Stakeholders	❑ Some species contentious for different stakeholder groups ❑ Squeaky wheel gets the grease ❑ Stakeholder with political connections can influence ❑ Organized groups also stronger influence ❑ Power imbalances between stakeholder groups	**2**	**4**	**6**
Single Species Management Style	❑ Strong emphasis on game management ❑ Focus on single species sometimes at expense of rare species or habitats ❑ Miss fine points of ecosystem animals exist in ❑ Lack of restoration focus	**2**	**3**	**5**

Table 3: The table above presents a descriptive breakdown of the three issues with the North American Model of Wildlife Conservation as derived from interviews (N=13) in each state, Florida (n=7), Maryland (n=6), and both combined. The three flaws include Funding Structure and Sources which particularly rely on consumptive users, the Undue Influence of Super Stakeholders, and a Single Species Management Style. Participants may be counted multiple times within each defined flaw. The three issues highlighted are not an exhaustive list, but those highlighted most frequently in the interviews conducted.

A large portion of respondents, seven across both states, discussed inherent flaws in the source of funds. Participants described how the model's funding structure was designed to rely on consumptive users. However, as users of wildlife resources have diversified beyond hunting and fishing, the model has not followed suit.

"While that's been a good model for us as a country and gotten us to where we are, and we're lucky, I think I think we're seeing, you know, the general public is, is not in that category of consumptive hunter...there's not a way for them to see themselves in that North American Model of Conservation that is not a way for them to contribute monetarily."

-F6

One respondent even stated that the model was completely fine except for the singular issue of funding. Because NAMWC is primarily funded by consumptive users, stakeholders within this designation have historically had disproportionate influence on management decisions and policies. This influence can also stem from the relationships wildlife practitioners are more likely to have with those who interact with the resource similarly. One respondent described the issue in detail:

"The whole problem with wildlife management in North America is that it's paid for entirely by hunters. And purchasers of firearms. The system is woefully broken and as a result, you get into crazy anomalies like the hunters and sportsmen have far too great a voice in the people who regulate them, because they are the source of their funding and because of this thing called regulatory capture which just occurs in agencies. So the whole system's broken."

-M1

A third problem highlighted by interviewees was an inherently flawed single species management style. Often due to the way management actions are funded, or because of the majority influence of consumptive stakeholders, there has historically

been a strong emphasis on management of game species. This can sometimes come at the expense of other species or habitat that may need restoration. If the main stakeholder view consulted is that of the sportsmen and women, it is likely that game species will be prioritized at the expense of others.

One interviewee shared their preference for the outdated model to be replaced entirely, save for the first tenet regarding the public trust. Another respondent stated that the model itself is fine, but what matters is the specific context in which it is used, elaborating that it might work within a hunting program, but possibly not in other spaces. As this interviewee continued, they also recognized the additional research needed on the specific people who are affected by the management.

Some Florida participants did recognize the progress their agency has made transitioning from the traditional model to a more modernistic one. As different generations of wildlife managers have entered the field, they have shifted away from a system where sportsmen and women are the core constituents. However these interviewees also highlighted the debt of gratitude owed to those consumptive users who have largely funded the practice.

Challenges to Stakeholder Engagement

During the latter half of each interview, managers were asked the question *Are there any challenges to incorporating more social science methods into wildlife management?* This open-ended question elicited a wide range of responses from all 17 of the interviewees, with repetition occurring both within each state and across the two. Interestingly, no interviewee answered that there were no challenges to increased stakeholder engagement. Within this overall theme, further analysis revealed seven

main challenges: *Funding, Educational Background and Manager Training, Public Misrepresentation, Priorities of Political Leadership, Culture Shift, Time*, and *Priorities of Agency Leadership*.

Figure 3: Quantity of Interviewees per Emergent Challenge to Stakeholder Engagement

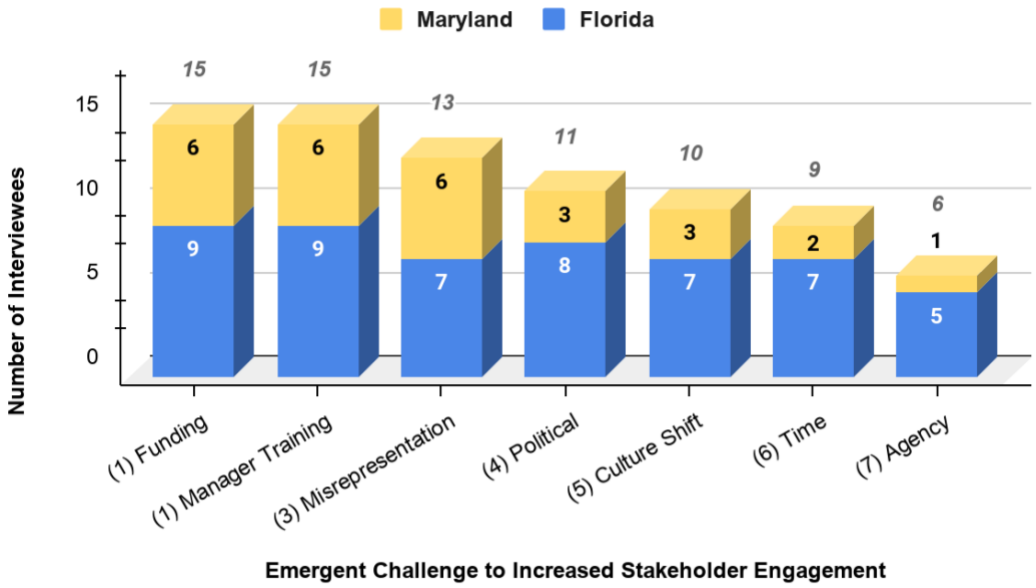

Figure 3: The above stacked column chart depicts the total number of interviewees across both states (N=17) whose transcript contained each individual emergent challenge to stakeholder engagement. Individual totals within Florida (blue, n=10) and Maryland (yellow, n=7) are also displayed within each challenge. Final values for each emergent theme, ranked from most frequent to least, include: Funding (Total N=15, Florida n=9, Maryland n=6); Educational Background and Manager Training (Total N=15, Florida n=9, Maryland n=6); Public Misrepresentation (Total N=13, Florida n=7, Maryland n=6); Priorities of Political Leadership (Total N=11, Florida n=8, Maryland n=3); Culture Shift (Total N=10, Florida n=7, Maryland n=3); Time (Total N=9, Florida n=7, Maryland n=2); Priorities of Agency

Leadership (Total N=6, Florida n=5, Maryland n=1). Challenges were ranked according to total quantity of interviewees. Ranking should not be interpreted as a scale of importance.

Funding (1)

When asked about the challenges of incorporating more social science methods into wildlife management, 15 of the 17 wildlife practitioners interviewed highlighted a lack of funding. This tied with *Educational Background and Manager Training* as the most highlighted challenges across both states.

In Maryland, six of the seven interviewees also discussed the theme, describing a lack of funds available for the purpose of engagement. Within the state, the frequency of *Funding* was equal to that of both *Educational Background and Manager Training* and *Public Misrepresentation*.

> *"There are only so many hours in a day, we only have so many people. If we had more money, we might be able to hire more staff. Or we could educate staff that we have more. It's just when you have a system that's running on basic capitalist rules, we can only do what the money allows us to do at this point."*
>
> *-M3*

In Florida, nine of the ten interviewees discussed the importance of sufficient funding to incorporate stakeholder engagement into a greater amount of wildlife management actions. Within the state, the theme of *Funding* was ranked equal to *Educational Background and Manager Training* with the highest frequency.

"The hurdle of having enough resources to do it is paramount. Having professionals trained who can take those positions, and also having the resources to hire them, and to engage and create those processes that inform and engage stakeholders and the public."

-F4

Interestingly, two interviewees, one from either state, referred to funding as a common scapegoat for a lack of greater stakeholder engagement. However, these interviewees also made clear that existing funding was still never enough to support needed conservation work.

"I wouldn't want to be on the record saying yeah, we don't need any more funding. Yeah, we can always use more funding, but, but I think that that's a common scapegoat, you know, to avoid the real issue of prioritizing what's important, and really what's important is engaging with a broader and more diverse public."

-F6

Educational Background and Manager Training (1)

At the beginning of each interview, interviewees were asked to describe their educational background along with any degrees they possessed. All 17 interviewees had some undergraduate training in wildlife biology, management, and conservation, with a majority holding Bachelor of Science degrees. Upper-level degrees included two Master of Business Administration, one Master of Education, five Master of Science in wildlife management, and three doctorates, including two in natural resources and one in human dimensions. When prompted to discuss whether their

program had included a course on the human dimensions of natural resource management, seven said they had. However upon further discussion, the majority of the human dimensions education was often from a single course or was an optional class. One manager who obtained a B.S. in Wildlife Ecology Conservation commented,

> *"At University of Florida I had one undergraduate level course in human dimensions. But as far as like, really diving in and learning about it, it's really more on the job training and fitting in with how the agency approaches certain things. And some people are better at it than others with like, Hey, this is something we need to engage with this group."*
>
> *-F10*

Another manager, who holds a Ph.D. in Range and Wildlife Management, explained their experience with human dimensions education:

> *"They were pretty much, the one course or so I had with Robert Giles I think were called like wildlife management one and two or something like that, in my bachelor's program, touched on the idea that you needed to think about the public in making some of your decisions. There was always the information that a lot of the funding was coming from Pittman Robertson, that's coming from hunting, especially license sales. So you know, hunters and fishermen are important, that has always been there, but Giles was the first one that talked about well, there are other users of wildlife resources and some of their opinions need to be incorporated into your thinking too. That was the first time I heard that. My master's program I don't, I don't recall. I*

don't recall much, much of anything from my master's program for the human dimensions. In my Ph.D. program, we touched on it a little bit, but not a whole lot. But that was that was more optional in what what I was selecting to go to is as courses at that time, I think some of the some of the sociology courses were were available while I studied there, but I tended not to take those."

-F7

Another interviewee with a M.S. in Wildlife Ecology was interested to learn that many universities do not have a program in human dimensions of wildlife yet. Their own education had a similar gap.

"I had never done that kind of stakeholder engagement, and even with the, you know, the help of facilitators and so forth, and it was challenging. So I didn't have those negotiation skills. I didn't have those facilitation skills. And often I think that when we're trained as wildlife biologists in graduate school, we don't get those skills. It's happening more now. But it wasn't happening at all when I was in school."

-F4

Interviewees from both states described an inability to ask managers to use social science tools without first providing some explanation. Although the majority of the managers interviewed attended school at a time when human dimensions of wildlife were not prioritized, agencies still have the ability to continue the training and development of their staff. Interviewees were asked whether they had participated in at least one training or workshop regarding human dimensions offered by their agency. A total of 13 had, including four from Maryland and nine from Florida.

However, 15 of the 17 wildlife practitioners interviewed highlighted a continued need for such manager training in social science methods. This tied with the challenge of *Funding* as the most frequent theme described by both states.

In Maryland, six of the seven interviewees also discussed *Educational Background and Manager Training*. However, in addition to *Funding*, the theme of *Public Misrepresentation* was also highlighted by an equal number of participants. One interviewee described a training previously offered to DNR employees in working with the public to reach consensus. However, the training ceased when the funds were gone. Many Maryland practitioners still recognized the importance of training.

> *"I mean, we've even tried to line up conflict resolution training for our staff, which I think every wildlife major should have." "So we, we try to train our staff, with, with basic conflict resolution stuff, and it's been a long time since we've had it and we're probably due for another training session."*
>
> *-M5*

Equal with *Funding*, nine of the ten interviewees within Florida also discussed the theme of *Educational Background and Manager Training.* 7 Florida managers additionally pointed to workshops led by Dr. Dan Decker and his team, titled "Thinking Like a Manager." Over the past ten years, hundreds of staff at FWC have been through some two-day, others a week-long, 'crash course' in "Thinking Like a Manager."

> *"I think the trainings are good, right? If we, if we wouldn't have, if we would not have invested so much time with Dan [Decker]. And vice versa and with*

us, we would not have had, we wouldn't be here today. Right? I wouldn't be here today talking, you know, giving you these answers about, you know, the priority importance of social science. And so, I think I think there's an inherent, you know, need for trainings that, that train people but also, I'm trying to put a, I guess, an exclamation point on help with the cultural shift, you know, over time. And it takes time."

-F6

Public Misrepresentation (3)

A major component of the role of wildlife manager is to serve the interests of the public they represent. As most interviewees pointed out, a common pitfall of stakeholder engagement is failing to engage with a wide range of stakeholders who are truly representative of the larger population. Thirteen of the 17 wildlife practitioners interviewed highlighted a concern over public misrepresentation, ranking the theme third across both states.

The concern of misrepresentation was one of the most highlighted themes in Maryland, discussed by six of the seven interviewees. This ranked *Public Misrepresentation* equal to *Educational Background and Manager Training* and *Funding*. One interviewee discussed how the agency is forced to assume that the public is in agreement with a policy or management action if stakeholders do not voice an alternate opinion. Maryland practitioners also expressed a desire for stakeholders to actively engage with the agency more often.

"I think the biggest challenge is making sure that you've, you've touched base with, you know, all the, all the more important groups or individuals that may

have a stake in that particular issue. And that's sometimes hard to do. Especially if you, if you're relying on a public meeting, you know, you try to make a public meeting so that it's a good day, that week, a good time of day, a good time of the year, and you get as much participation as possible. But it may not always work out that way."

-M7

Comparatively, seven of the ten Florida interviewees discussed *Public Misrepresentation.* The themes *Culture Shift,* and *Time* were equally ranked as the fourth most highlighted challenges to further stakeholder engagement. Many managers highlighted Florida's commission meetings as a great place for all stakeholders to voice their needs and values, which would be considered before moving forward with a regulatory change. However these meetings still face the issue of accessibility and the challenge of accurately representing the full diversity of Florida's population.

"We have a system where we are supposed to consider public comment in a forum where not everybody is able to be engaged. The same people always come to commission events, right. You're not hearing a representative sample of your stakeholders."

-F5

Priorities of Political Leadership (4)

Additional impediments to the incorporation of new management strategies stem from the current political atmosphere and priorities. This challenge was the

fourth most highlighted across both Maryland and Florida, with 11 of the 17 interviewees discussing the theme *Priorities of Political Leadership*.

Within Maryland, three of the seven managers highlighted political priorities, tying with the theme *Culture Shift* as the fourth most discussed topic. Some interviewees recalled issues they had previously faced in pursuing conservation measures that were blocked by political leaders, or a different emphasis on enforcement of existing environmental regulations.

> *"We have lost much of the war about feral cats because of a particularly shrill insistence and very loud minority of people who have intimidated their legislators into allowing them to have feral cats established in the wild."*
>
> *-M1*

In Florida, eight of the ten managers discussed the power of political priorities, ranking as the third most highlighted topic in the state. However, one interviewee noted the ways in which the state has tried to avoid undue political impact.

> *"We have constitutional authority, and that was that was done deliberately in Florida some 75-80 years ago now, rather than as Floridians saw the futility and folly of, it being Fish and Wildlife, being managed on a local scale, and based on the whims and vagaries of local politicians. So our seven-member commission, when you watch that process, that's the end. In fact, the Florida Legislature does not even have the authority to adopt rules. They do control our purse strings, at least they give us spending authority for some of those dollars."*

-F1

Culture Shift (5)

Another frequently cited challenge highlighted by wildlife professionals in both Maryland and Florida was the need for a shift in culture, from the exclusive involvement of consumptive users of wildlife to the broader public. Of the 17 wildlife practitioners interviewees, ten discussed the theme *Culture Shift*, ranking it as the fifth most frequent challenge across both states.

Within Maryland, the theme *Culture Shift* was discussed by three practitioners, ranking equally with *Priorities of Political Leadership* as the fourth most highlighted challenge. However, not all wildlife practitioners agree with the need for the inclusion of human dimensions, and the traditional views are still prevalent in many parts of the country.

> *"Some of my colleagues were really opposed to bringing more people to the table, because more people means you might not like the end result. And if you control the dialogue, and control the debate, or lack thereof, you can somewhat dictate what happens."*
>
> *-M6*

In Florida, *Culture Shift* tied with *Time* and *Public Misrepresentation* as the fourth most highlighted challenge, with seven interviewees discussing it. One interviewee discussed their primary challenge as first convincing wildlife practitioners of the validity of social science research, and the need to incorporate human dimensions. Multiple practitioners also highlighted increasing stakeholder

engagement as a growing topic, requiring agencies to begin to adapt in order to remain relevant with their constituents.

> *"States need to recognize the need for public buy-in. There is a legitimate reason why the public should be involved in the process, and how an agency can manage people. If agencies want to be relevant, you need to embrace human dimensions. Even if you don't like some things that are said, recognize that they're important."*
>
> *-F2*

Time (6)

Over half of state level management officials in both Maryland and Florida highlighted time as yet another challenge to the incorporation of stakeholder engagement. Overall, nine interviewees discussed a lack of time for social science methods, ranking the theme as fifth of the seven across both states.

In Maryland, two of the seven interviewees highlighted a lack of time, ranking sixth within the state. Wildlife practitioners in the state discussed the theme of *Time* slightly differently than those in Florida. For DNR employees, engaging with stakeholders is a challenge because the agency does not have the manpower, or hours, to add the time-intensive process. Another interviewee discussed the impact of busy seasons, and the even smaller amount of time they have to spare during such seasons.

> *"We want them to understand what we are doing and we want to understand their point of view. But we have limited time and it takes more time to develop good communication with someone to, to establish that rapport, rapport so. So we do what we can with the time available. And since a lot of our work is*

time sensitive, meaning we work with nature's schedule, there are certain jobs that have to be done at certain times of year based on the natural histories of the species that we're managing, or the ecosystems that we're managing."

-M3

The total number of interviewees who discussed the theme of *Time* was nine, with seven of the ten Florida managers interviewed discussing it, tying in the state for the fourth most highlighted theme along with *Culture Shift* and *Public Misrepresentation*. Florida interviewees described the lengthy process that can result from continuously engaging with stakeholders, making the process not always possible.

"There's some things that, that are so fluid, and there's some decisions that we have to make relatively quickly. And so you can't always go through this deliberate, exhaustive, exhausting process with everything. I think you can go through a light version of a lot of it. And I think we've some others do that almost reflexively."

-F1

Priorities of Agency Leadership (7)

With the limited amount of time wildlife agencies have, various actions must be prioritized over others. Similar to the need for progressive political leadership, some wildlife practitioners also reflected on the impact leaders within agencies have on driving progress in choosing priorities. Across Maryland and Florida, six interviewees discussed the theme *Priorities of Agency Leadership*. In recognizing the forward strides Florida has made in a growing focus on human dimensions, five of

the wildlife managers attributed this progress to the leadership within their organization. In contrast, only one interviewee in the Maryland group highlighted the theme, ranking it as the least highlighted challenge in both states separately, as well as the two combined. One interviewee discussed how a management action may or may not get done simply due agency leadership's decision to arbitrarily prioritize certain items. However, another manager reflected on the positive impact training and workshops can have within an agency as employees advance in their careers and move into leadership positions.

> *"As we've done a series of workshops with sort of the same group of people, and as those folks moved into leadership positions, as they became a section leader or division director, it was their sort of behaviors and practices that modeled those new things that we wanted, engaging with stakeholders. And even working with our commissioners at our commission meetings, we don't even bring issues for their decision making without engaging stakeholders because that's one of the first things they ask, "What does the public think about this? What do our stakeholders think about these regulatory issues or management plans?" And so it's just sort of baked into what we do."*
>
> *-F8*

Stakeholder Engagement Opportunities and Benefits

During the semi-structured interview, no question was asked regarding opportunities for, or the benefits of, increased stakeholder engagement. However, in asking about challenges, some managers naturally discussed what they saw as the positive influence of stakeholder involvement, as well as potential avenues for

overcoming these obstacles. Further examination of state wildlife management plans, the Florida Black Bear Management Plan (2019), and the Maryland Black Bear Management Plan (2004), provided additional recommendations. A summary of stakeholder engagement opportunities and benefits is presented in the table below but does not present an exhaustive list.

Table 4: Opportunities for and Benefits of Stakeholder Engagement

Opportunities	❑ Public opinion surveys ❑ Nuisance calls from the public ❑ Community-wide focus groups and workshops ❑ Working groups ❑ Interviews ❑ Questionnaires ❑ Public forums ❑ Government policies ❑ Educational materials ❑ Communication and media outreach ❑ Volunteer programs ❑ Proactive engagement and determination of acceptable actions ❑ Measurable objectives; continuously assess progress and public acceptance
Benefits	❑ Engage with and inform constituents ❑ Increase stakeholder buy-in ❑ Increase public ownership of, and support for, conservation measures ❑ Build tolerance, acceptance, and support for coexisting with wildlife ❑ Bridge the gap between stakeholder groups ❑ Reduce or prevent human-wildlife conflict ❑ Maintain agency relevancy

Table 4: The table above summarizes opportunities for and benefits of increased stakeholder engagement in wildlife management. Data was compiled from interview transcripts (N=17), the Florida Black Bear Management Plan (2019), and the Maryland Black Bear Management Plan (2004). The compiled list is not exhaustive.

One Florida interviewee listed opportunities for the increased use of social science in wildlife management.

"I think we have to get beyond just the idea that social science is doing a survey and you know that was an easy avenue to increase awareness of our staff as to what social science can do for them. But I think we sort of downplay all the other aspects of it, there's government, there's education, communication, marketing, you know, there's all these other aspects of social science that we can pull in that are beneficial to the management of fish and wildlife."

-F8

A Maryland interviewee described the opportunity human-wildlife conflict provides to engage with and inform constituents. This exchange often reduces conflict and grows support for wildlife conservation measures. Reflecting on the history of DNR's engagement, one interviewee shared a positive experience they had bridging the gap between stakeholder groups.

"There was a big attempt about maybe 15 years ago, to really bring biodiversity into the fore...And we had these regional teams that were made up of different specialists, fisheries, and I kind of represented the biodiversity end of it for the regional team I was on it was, you know, fisheries people, forestry people, park type people. I mean, there was a little bit of everything. But it often comes down to being a, somewhat of a, the conflicts always seem to come down to the resource use versus the resource protection or

conservation. So I found that I was in conflict with one of the more user oriented, you could say exploitive, but that might be a little bit strong word to use. But we're often in conflict with them. But the good thing about it was, we often found some middle ground where they maybe got something and we got something. I mean, compromise can be a dirty word or not. And sometimes the compromise if it would result in really ultimate loss of that resource, and we kind of had to put our foot down and say, No, this is going to degrade things too much. And so then you have to do some facilitation and conflict resolution. But those are actually the best times in DNR's History."

-M6

In discussing the need for an overall culture shift, some managers discussed how the movement towards involving human dimensions could help ensure that wildlife management agencies remain relevant. Other interviewees also recognized the increased public support and ownership that would result from an open and continuous relationship with all stakeholders.

"It's clear that successful, successful programs need that public interaction. You know this social interaction. Your transparency and good outreach with the public builds trust and you know builds a relevancy for the agency in general and effectiveness for whatever programs you're, you're rolling out if you want those to be effective, long term, you need that public input. Public buy-in."

-F3

If social science methods were used more frequently in wildlife management, some interviewees described the positive impact this would have on the conservation of natural resources as well. Proactive community measures would give people the tools to be responsible and live in and around wildlife. A different Florida interviewee also highlighted the increased public buy-in that results from stakeholder involvement.

> *"States need to recognize the need for public buy-in. There is a legitimate reason why the public should be involved in the process, and how an agency can manage people. If agencies want to be relevant, you need to embrace human dimensions. Even if you don't like some things that are said, recognize that they're important."*
>
> *-F2*

The many methods of stakeholder engagement available may be unfamiliar to some wildlife practitioners, potentially due to a lack of social science training. Many managers are familiar with some or most of these methods yet are not able to utilize them due to the variety of challenges previously described: *Funding*, *Educational Background and Manager Training, Public Misrepresentation, Priorities of Political Leadership, Culture Shift, Time,* and *Priorities of Agency Leadership.* The benefits of incorporating human dimensions, described by interviewees and in the literature, have the potential to solve conflict between humans and wildlife. These benefits may also convince previously hesitant managers to engage with stakeholders. The challenge lies in communicating this information to existing practitioners and creating the pathways necessary to utilize conservation social science methodology.

Influence of Native vs. Nonnative Species on Human Dimensions Perspectives

This research used two case study species, black bears (*Ursus americanus*) and feral hogs (*Sus scrofa*), to explore variations that may exist for human dimensions applicability between native and nonnative species. Some interviewees were purposively selected for their involvement in management programs or the creation of a management plan for one of the two species. When asked whether a socio-ecological framework could be applicable for either of the case species or general wildlife, depending on the interviewee's role, 13 individuals discussed black bears, while four discussed feral hogs.

Native Species Influence: Black Bear (*Ursus americanus*)

As a native species occurring in both Maryland and Florida that has successfully adapted to urban areas, black bears can come into frequent conflict with humans (Baruch-Mordo et al., 2014). Bear stakeholders consist of a wide range of individuals, from consumptive users to external organizations seeking to protect the animals. This array of opinions can lead to wide disagreements between the desired future conditions and acceptable management policies in both states, necessitating the continued engagement of the public to determine publicly acceptable regulations.

Within the Department of Natural Resources, three Maryland practitioners discussed the black bear. Interviewees highlighted the public attention garnered by these charismatic megafauna, adding to the need for stakeholder engagement regarding their management. Four counties in Western Maryland are considered to be occupied by black bears, meaning the state has reproducing sows, although one

interviewee suspected that there could be more occupied territories than known. One black bear practitioner discussed the increasing species population within the state:

> *"When I started, our population was centered out here in the far western county where I am. And picture it as a wave moving, moving west to east across the panhandle...the population, the density has grown, has increased within this area. And then, you know, we're on the verge of busting into new areas with the bears, and in fact, dispersing juveniles. You know, we're seeing them in most of Central and Southern Maryland traveling through each year now. Whereas, you know, 15-20 years ago, it was an occasional thing to have a bear there. Now, every year we know we're going to have them in Central and Southern Maryland as they just disperse looking for territory. So the landscape while it looks on paper as though it's remained the same, it's really changed."*
>
> *-M2*

This interviewee continued to explain that while the bears are increasing their range and continuing to use the same areas they have historically occupied; human populations have also moved into these same territories. The agency's current goal is to allow the species to grow, but at a rate acceptable by the citizens.

Due to the increasing overlap of bear populations with that of humans, and the agency's goal to allow the species to grow at an acceptable rate, this species is an example of one which would benefit from the incorporation of stakeholders into management decisions. Maryland practitioners noted the usefulness of public opinion surveys in gauging public tolerance. A common issue was that of the public's

disregard for an issue until it impacts them directly, commonly referred to as not in my backyard, or NIMBY. Wildlife managers discussed their struggle to prematurely engage with those who are not directly impacted by bears. Yet as a species with a variety of stakeholder groups, and a high number of nuisance calls, black bears in Maryland would likely benefit from a socio-ecological approach.

Florida black bears were discussed by all ten interviewees from the state's group. This was likely due to the recent 2019 update of the Florida Black Bear Management Plan and contention surrounding the decision of whether or not to allow the species to be hunted to manage the population, after a recent hunt occurred in 2015 (Florida Fish and Wildlife Conservation Commission, 2019). One black bear manager described the state's record with the species as a massive conservation success story, having grown the population from a dwindling 300 animals to over 4,000 today. Yet this practitioner also warned that as human populations continue to steadily rise in the state, the agency will need to keep close watch over viable population numbers and increasing overlap. As bear populations have increased, so have the amount of nuisance callers reporting conflicts, and this is unlikely to stop.

> *"And the reality is, well the bear population kept growing, and there's nothing out there except cars and people that are going to be killing bear. So they're, once they're released, they keep growing. Our populations are growing at 10%. We, we can't support that. That's gonna, at some point, that's gonna, they're gonna start living in our neighborhoods, whether we want them to or not."*
>
> *-F2*

The agency's goal is to stabilize the bear populations at their current healthy number, as allowing it to continue to grow will increase conflict. One manager described that although the bears could continue to grow in number for some time before reaching biological carrying capacity, given that they would socially disperse themselves, the state would reach wildlife stakeholder acceptance capacity long before that. The social tolerance of a species is difficult to quantify, and the range of opinions across stakeholder groups regarding bears can be challenging to manage. Similar to Maryland, a socio-ecological management style can also benefit the Florida black bear. Florida practitioners described a strong public interest in proposed bear management actions, recounting previous debates between a wide range of stakeholder groups ranging from animal protection organizations to agricultural representatives. However, one interviewee noted that although the views differed widely, and compromise took time, each stakeholder learned how to effectively communicate and by the end of the process had come to an agreement on what should be done.

Nonnative Species Influence: Feral Hog (Sus scrofa)

As an invasive species first introduced to the U.S. in the 14th and 15th centuries, feral hogs are a significant threat to both Maryland and Florida (McClure et al., 2015). There are currently no known reproducing feral hog populations in the state of Maryland, though there are occasional issues with the release of pets, poorly managed agricultural facilities, or possibly migrating animals from other states. Due to their status as a nonnative species, and the destruction the species is able to cause,

wildlife management agencies in the state have a zero-tolerance policy in place for any hogs that might appear.

In comparison, feral hogs have existed in the state of Florida for hundreds of years and presently occur in all 67 counties (McClure et al., 2015; Florida Fish and Wildlife Conservation Commission, n.d.). One manager estimated there to be 500,000 in the state based on their trapping and monitoring program. Yet contrary to Maryland's objectives, Florida instead allows hog populations to exist for the benefit of the public.

Maryland's no tolerance policy for hogs has led to active patrolling for potential outbreaks to stop them before the species can take hold. One interviewee who deals with invasive species described the usefulness of public phone calls in reporting sightings of feral hogs in areas throughout Maryland, enabling the agency to respond swiftly in eradicating them. The agency will also often enlist the services of the local hunting community in dealing with the nonnative species. The feral hog management plan for the foreseeable future will remain the same, eliminating any invasive hogs in the state. Interviewees did not see the benefit of stakeholder involvement regarding feral hogs due to the singular management response. Managers were concerned that involving the public would lead to dissenting opinions that the species should be allowed in the state, possibly enjoyed by local hunters, but this would not impact the agency's decision.

While interviewees in Florida acknowledged the destruction caused by the large population of hogs in the state, the agency's goal is not to eradicate them, instead focusing their efforts on allowing land managers and private landowners to

manage the species as they see fit. One Florida practitioner who deals with the species explained this further:

> *"We don't really have a wild hog management program. We don't manage for them. They are exotic invasive invasive species, I should say. But they've been here for so long that is important hunting resource so we you know, we don't have a management program for them, but I do what I can to assist stakeholders with their needs and you can hunt wild hogs on most of our public areas most of the year when these areas are open for hunting."*
>
> *-F3*

Citizens throughout Florida hold a variety of opinions and needs in regard to the species, requiring a range of management assistance. One interviewee provided examples of this diversity, ranging from consumptive users who desire additional hogs on their property to continue sporting traditions to private landowners or public land management agencies who need the species fully removed from their landscape. Due to this diversity, the agency instead focuses on removing regulations, such as hunting seasons or bag limits, in an effort to serve everyone's needs, or through educating those who want to reduce damage to their lands about deterrents. While a wild hog management program does not technically exist in Florida, wildlife management still benefits from engaging with stakeholders to assess their variety of needs with respect to hogs and are therefore better able to serve the public.

Discussion

The way in which state and federal wildlife and land management agencies view the stakeholder, their role, the beneficiary of wildlife, and the agency's role

itself, influence pursued conservation policies. The NAMWC has traditionally not incorporated stakeholder dimensions with the other seven principles. The first tenet, however, mandates that wildlife be held in the public trust. Wildlife practitioners in both Maryland and Florida believe, to an extent, that the wildlife resource belongs to the public, and should be managed for their benefit. The disconnect lies in who managers believe should be engaged with to achieve conservation goals. Florida has implemented a process of engaging with stakeholders in many management decisions, striving to build trust and the long-term effectiveness of programs. Maryland's structure is currently more traditional. A shift to models of management which incorporate human dimensions first requires a review of the role of the stakeholder and of the agency.

Redefine the Stakeholder

All of the wildlife practitioners interviewed offered a different perspective on who is included when using the term stakeholder. The definitions offered consisted of various combinations of generally defined groups: internal and external organizations, self-identified public citizens, consumptive users, non-consumptive users, conservation experts, the full public, and future generations. The variety of answers both within and outside of state boundaries signals the need for agency discussions to reach a consensus defining the term. If wildlife professionals are to effectively fill their role, they must first agree on who it is that they represent. Beyond an agency's standardized definition, employees require a deeper understanding of who the term encompasses.

Redefine the Role of the Stakeholder

Once the term of stakeholder has an agreed upon definition, the next task is to define their role. Some interviewees believed them to be informants, passing information to the agency or disseminating it to their peers. Others saw the stakeholder as an equal partner, both informing the agency, and working alongside them to achieve desired outcomes. The distinction was made that stakeholders should be equal partners only when warranted, excluding management of endangered species and others. Managers must also be mindful of the differing power dynamics between the groups represented within the term of stakeholder.

The view of who constitutes a stakeholder, and what that stakeholder's role should be, are essential to define, as both are critical components in determining how programs are targeted and whose viewpoints are heard and considered. Multiple interviewees also recognized the increased public support and ownership that would result from an open and continuous relationship with all stakeholders. More than half also reaffirmed the importance of the public trust doctrine.

Remember the Beneficiary

The first and foundational tenet of the NAMWC (Geist & Organ, 2004) is the Public Trust Doctrine (PTD), which mandates that natural resources are held in public trust by governing agencies for the benefit of future generations (Smith, 2011). If the very authority of wildlife managers stems from the PTD, agencies must engage with all stakeholders to understand what that benefit is. However, practitioners, leadership, and the beneficiaries alike must first have a clear understanding of the doctrine for its effective application. A majority of interviewees spoke to the PTD when discussing

the wildlife agency's role, but their views of the definition of stakeholder and subsequent role did not align. A Florida interviewee described the need for a deeper understanding of the principle as a key aspect of shifting agency culture. *"Our biggest trajectory of helping people understand, make that shift of, they don't work for fish and wildlife, they don't work for the resource, they really work for people and provide benefits to people." (F8)* Some interviewees expressed the view that of the NAMWC tenets, the PTD is the only one which remains relevant to society.

Challenges to Stakeholder Engagement

Table 5: Challenges and Opportunities to Stakeholder Engagement

Table 5: The above table provides a summary of the seven emergent challenges described by interviewed state-level wildlife practitioners (N=17). Challenges include Funding, Educational Background and Manager Training, Public Misrepresentation, Priorities of Agency and Political Leadership, Culture Shift, and Time. Interviews, combined with a review of the literature, also provided opportunities for addressing each of the challenges. Opportunities included Diversify Funding Structure, Manager Training and Education, Engage All Stakeholders: Prioritize Marginalized Groups, Guiding Principles for Agency and Political Leadership, Create Cultural Change, and Allocate More Time and Resources to Stakeholder Engagement.

Funding

The highest ranked challenge to incorporating human dimensions, identified by 15 interviewees, was a lack of funding. Traditionally, state wildlife management agencies have received a large portion of funds through the Federal Aid in Wildlife Restoration Act, commonly referred to as the Pittman-Robertson Act. The U.S. Fish and Wildlife Service website states, "Funds from an 11 percent excise tax on sporting arms and ammunition [Internal Revenue Code of 1954, sec. 4161(b)] are appropriated to the Secretary of the Interior and apportioned to States on a formula basis for paying up to 75 percent of the cost approved projects. Project activities include acquisition and improvement of wildlife habitat, introduction of wildlife into suitable habitat, research into wildlife problems, surveys and inventories of wildlife problems, acquisition and development of access facilities for public use, and hunter education programs, including construction and operation of public target ranges" (United States Fish and Wildlife Service, n.d.). PR Funds are distributed with stipulations for

their use. Beyond traditional funding sources, wildlife practitioners in Maryland and Florida detailed a wide distinction between additional resources they each possess.

Interviewees in Maryland explained that the other 25 percent of their funding must be raised by the agency, which is typically accomplished through the sale of hunting and fishing licenses. The funds from license sales provide flexibility in spending and give the manager more power in pursuing different actions. However, one respondent explained that the hunting license fee has not been increased for many years, even after hunters have approached their agency willing to contribute more. An increase in fee would require a legislation change at the state level, relying on the aid of political leadership. General funds are also sourced from a line item within the state's budget, although this was said to cover a low percentage.

One particularly articulate interviewee provided an overview of the Maryland DNR's funding structure. The department is divided into multiple sections, Game Management, the Natural Heritage Service, Land Management, and Wildlife Conflict Resolution. PR Funds are not generally open to the discretion of the wildlife manager, but rather their availability often depends on the management action. For example, within the Wildlife Conflict Resolution section, Pittman-Robertson funds can be used to support nuisance calls from the public. However, if the call requires an on-site visit, or generational operations, those funds are no longer available. PR funding was initially designed for conservation measures. However, the interviewee described how Maryland has shifted to require more conflict resolution, and the funding structure should be altered to match. This update would require an amendment at the USFWS level.

Although some interviewees in Maryland expressed an interest in incorporating wider stakeholder engagement practices, much of the funding the agency does have can only be used for certain activities. Funding that has been designated for education mostly refers to hunting education. *"Congress stipulates things like this money for wildlife education is to educate people about how to shoot only." (M1)* A different interviewee described an upcoming public opinion survey the agency would be conducting through a contractor. While the manager wished to use the same methodology and same contractor, the choice would instead be dictated by the project's lowest bidder.

The Wildlife Heritage Service oversees the state's non-game species, including endangered plants and animals. Contrary to other divisions, this section is funded through some alternate sources, described by one respondent as a limited pool.

> *"In the department of natural resources, the wildlife and heritage service receives no tax money, no general tax funds, although people assume since we're the government we should, we do not. Every penny that we've got is either volunteered by people through a tax check off form or paid specific taxes having to do with the purchase of firearms or hunting license dollars or federal grants."*
>
> *-M1*

Any grant money is distributed between terrestrial and aquatic conservation work. The received PR funds come with restrictions for use and are not applicable to individual rare plant work or most invertebrates. Due to these limits, interviewees

identified it as a good source for some work, but less so for non-game or endangered species managers.

All of the sources compiled together create a finite amount of funding, and one that is subject to fluctuations following changes in administration. Wildlife practitioners described additional issues created by a limited funding pool, including limited equipment, a shortage of staff, and therefore only a certain number of hours of manpower available, and fewer management actions possible from this. One Maryland interviewee reflected on these issues, explaining

> *"There are only so many hours in a day, we only have so many people. If we had more money, we might be able to hire more staff. Or we could educate staff that we have more. It's just when you have a system that's running on basic capitalist rules, we can only do what the money allows us to do at this point."*
>
> *-M3*

Staff shortages are not just an issue in Maryland, but rather one most states face, especially in urban or rural urban areas.

As the historical primary source of funding, interviewees shared the frustrations some sportsmen have voiced regarding wildlife agencies incorporating the needs of new stakeholder voices. Traditional hunters and fishermen believe they deserve the most influence, due to their significant monetary contributions. Yet whether funding is derived from consumptive or non-consumptive users of wildlife should not influence where those funds are able to be used, as everyone benefits from the wildlife resource. This does, however, signal the need for a more diverse funding

structure, one where non-consumptive users are also able to contribute monetarily. In this domain, the state of Florida can offer guidance for a potential path forward.

As a low tax state, Florida has its own challenges with revenue streams and funding. Although funds are also sourced from the Pittman-Robertson Act, the state is comparatively less dependent on hunting and fishing license revenues, with one interviewee identifying consumptive users as supplying only a third of the agency's budget. In the 1970s, a forward-thinking Florida Legislature created an ambitious land acquisition program and ensured a relatively stable and arguably ample source of monies to be able to manage those lands. Known as the Land Acquisition Trust Fund, funding is sourced from real estate documentary stamp fees, providing a substantial pool of money. These resources are shared with other land managing agencies within Florida, including the Department of Environmental Protection, the Parks and Recreation system, the Florida Forest Service, and five independent water management districts. Yet even with the number of agencies the funds are split between, the Land Acquisition Trust Fund remains a significant portion of funding for FWC. In particular, the division of Habitat and Species Conservation, which has principal authority for managing conservation lands, relies heavily on this fund. One interviewee described this as a double-edged sword: the continual influx of people in Florida increases valuations and transactions, increasing the agency's revenue, but the larger and denser human population adds pressure to the wildlife manager's task. Florida wildlife practitioners also enjoy greater budgetary flexibility. One interviewee highlighted the recent passing of the Wilderness Act, believing that will also increase funds.

Within FWC, the Fish and Wildlife Research Institute (FWRI) has its own funding sources, enabling flexibility in research decisions. One unique aspect of FWC's structure is the recent creation of the Center for Conservation Social Science Research (CCSSR), within the FWRI. The center focuses primarily on the human dimensions of wildlife and natural resource management, employing staff fully trained in social science methodology. As the center is housed within the research branch of FWC, one interviewee reflected on the freedom they have for allocating their own funds and pursuing great incorporation of human dimensions. However, this interviewee also noted that not all states are quite as lucky.

> *"I know of colleagues in other wildlife agencies who don't have a research center, and they struggle with that because they don't have enough resources or support devoted to the actual science part of social science. And that is definitely a challenge. So that's, that's definitely, I would say a major challenge to incorporating social science methods."*
>
> *-F5*

However, even with the greater source of funding, nine interviewees still highlighted it as a major challenge for themselves and other state wildlife agencies who wish to adapt a similar approach. The more funding you have, the more things you can accomplish, and the list of potential projects never ends. For the purposes of maintaining Florida's current management, interviewees affirmed that they have adequate funding. However, they added that conservation dollars are never enough to complete all conservation work identified as high priority, and they lack the funding to complete every project they see as necessary. Yet relative to other states, FWC still

counts themselves lucky. Other wildlife agencies have far fewer resources, and species are not equally funded, again often due to the traditional funding sourced through game and fishing programs.

For accurate and effective stakeholder engagement, practitioners trained in social science methodology are a necessity, either directly on staff or contracted through outside organizations. However, this is greatly limited by available funding, which influences the manpower and time available, or the ability to contract with outside researchers, to fully utilize a socio-ecological management process. As a result, a manager in this position will oftentimes choose to forgo any social science component. Florida managers recognize that similar to their past, some wildlife agencies may view the many hurdles to stakeholder engagement as insurmountable.

> *"The hurdle of having enough resources to do it is paramount. Having professionals trained who can take those positions, and also having the resources to hire them, and to engage and create those processes that inform and engage stakeholders and the public."*
>
> *-F4*

Other states could likely integrate human dimensions if funding was available. Yet funding was not the only issue identified by interviewees. In order for agencies to choose to direct their funds towards stakeholder engagement, they must first recognize it as a priority. One interviewee in Florida shared that although they would not turn down additional funding, they viewed the issue of a lack of funds as a scapegoat. Practicing managers must also receive training in social science methods.

Educational Background

Although Dayer and Mengak (2020) highlighted a large increase in HD courses in undergraduate fisheries and wildlife management programs, results from this study echoed the minimal amount or absence of social training in the wildlife profession. Yet there is a need to offer the same education to existing practitioners. A common practice in many managing agencies across fields is that of ongoing training and workshops for staff. Through such events, employees are able to gain skills they may have missed during their education, or those that have been brought to the forefront more recently. Although the majority of the managers interviewed attended school at a time when human dimensions of wildlife were not prioritized, agencies still have the ability to continue the training and development of their staff.

In the past, Maryland employees participated in training on the topic of reaching public consensus and basic conflict resolution training. One interviewee even described how the agency invited a psychologist to accompany them to a regional meeting to assist in engaging people at one point. These internal workshops and practices ceased, however, when the funding was no longer directed to such workshops. No information was provided regarding why funding changed.

Although internal trainings in public engagement are not currently common in Maryland, interviewees recognized their value and are interested in bringing them back. One manager who was sent to a public consent building workshop at the National Conservation Training Center in West Virginia described the experience as *"one of the most worthwhile trainings that I've ever had." (M2)* Another practitioner expressed a desire to line up conflict resolution training, which they believed every

wildlife manager should have. As noted by one interviewee, *"it takes certain skills to be able to communicate well with your stakeholders, and understand how they are feeling, trying to be empathetic towards their viewpoints." (M3)* However, this manager immediately expressed the concern that state employees might take extra time to communicate with stakeholders, time that they do not have due to being on nature's schedule.

Of the ten managers interviewed in Florida, seventy percent pointed to workshops led by Dr. Dan Decker and his team, titled "Thinking Like a Manager." Over the past ten years, hundreds of staff at FWC have been through some two-day, others a week-long, 'crash course' in "Thinking Like a Manager." One interviewee noted that the week-long course was preferable, as it took at least that long to begin to understand the necessity of stakeholder engagement, and how to utilize social science for this purpose. According to one proponent of social science at FWC, many staff at the agency are now sufficiently trained in these subjects.

> *"The thinking like a manager training workshops that Dan and I have done, we always included here's a primer on what social science is and how it is part fish and wildlife conservation. The last training that we did a couple years ago, we realized we're preaching to the choir here in terms of staff understanding what human dimensions is, and how sociology can note them."*
>
> *-F8*

However, even after completing this training, another social science practitioner observed that wildlife managers still found it difficult to set measurable objectives when dealing with humans. It was also noted that the biggest problem

traditional wildlife managers have is remembering to incorporate input from people who were not identified as stakeholders in their education. These comments do not point to an issue with the training done by Dr. Dan Decker, but rather the remaining need for staff with a degree in social science. Such a professional is needed on staff both for the proper assessment and inclusion of stakeholder needs, as well as an accessible communication of the science. Some traditional managers may view their role as just managing wildlife, misunderstanding that there is a social system connected to it. Others may recognize the importance of stakeholder input but avoid social science out of a fear of misunderstanding or misuse. As one ecologically focused manager said, *"We've been trained to manage wildlife. We've not been trained to manage people. We've not been trained to communicate with people in a way that's not a bunch of technical jargon." (F2)*

Two managers highlighted a second short training offered by FWC on the topic of wildlife management in the context of political climate and people, which is followed by a discussion of how to apply that within their specific agency. The Center for Conservation and Social Science will also occasionally provide staff outside of the center with free training in designing surveys and analyzing social science data. The intended audience of these training varies. Some are voluntary, depending on the position one is in, while others are geared towards management or all staff. Another manager was provided the opportunity to attend a year-long course at the National Conservation Leadership Institute, NCLI, learning how to mitigate conflict. One key factor that should be noted is both the existence and quantity of funds which FWC is willing to direct to ongoing manager training. One interviewee

reflected on Florida's luck, both in having the resources to prioritize stakeholder engagement, and those in leadership positions that saw it as an important pathway to pursue. States with more limited resources will require guidance from other agencies in learning how to engage the public more actively in their decision making.

> *"I just think that those hurdles for other states, the hurdle of having enough resources to do it is paramount. Having professionals trained who can take those positions and also having the resources to hire them, and to engage and create those processes that inform and engage stakeholders and the public."*
>
> *-F4*

Public Misrepresentation

A major component of the role of wildlife manager is to serve the interests of the public they represent. Without stakeholder engagement, the agency no longer represents the entire public. As many interviewees pointed out, a common pitfall of stakeholder engagement is failing to engage with a wide range of stakeholders who are truly representative of the larger population.

If the wildlife agency is to accurately represent their public, all voices, including those historically excluded, must be weighed appropriately. If selective voices are given higher priority than others, too many people are left in possible conflict with wildlife. Many experts expressed a desire for a more engaged public. In Maryland, interviewees recognized a pattern where the general public does not make an effort until after regulations have been set. Sportsmen who disagree with the information in their hunting guides and attempt to share their needs afterwards are informed that they did indeed have the opportunity to engage, but that time has

passed. In response, wildlife practitioners are continuously seeking to understand how to proactively engage all groups, whether this be by getting the word out to a wider audience or expressing to the entire public how important and needed their opinions are.

Though Florida has a large and rapidly growing population, by not engaging with the representatives from the entire public, one interviewee admitted that they fail to achieve their motto. The misrepresentation of the interests of local stakeholders can stem from many sources. It is no longer sufficient to exclusively consider the voices that have historically been prioritized, those of the consumptive users. The number of people who hunt in Florida are miniscule compared to the overall population, yet they are a vocal group, so the agency has a clear understanding of their concerns. Sportsmen are generally easy to identify, using license databases or interacting at check stations. However, the general public is not part of the category of consumptive hunter, yet still want to enjoy the resource, or alternatively may not even be aware of that opportunity but would engage if they knew it existed. The lack of engagement with non-consumptive users is not a new concern but stems from issues with the North American Model of Wildlife Conservation. One interviewee explained:

> *"We are not doing a good job including non-consumptive users. We are still stuck in the mode of hunters and fishermen. And, you know, that's who we speak to. And we have to somehow figure out how to properly, not only properly communicate, but honestly harness [non-consumptive users] to support wildlife."*
>
> *-F2*

In the same way that Florida acknowledged years ago that it was necessary to include social engagement at all, the agency is now grappling with engaging all populations, including those who may not know FWC exists but are still affected by management actions, or groups that have failed to be included previously. Florida is an incredibly diverse state, both ecologically, ethnically, and racially, yet the most represented participants remain the typical stakeholder; interest groups with a long history with FWC and local or state government. For all of their progressive strides in social engagement, three interviewees highlighted that the agency does not have a positive performance history of reaching out to marginalized communities who, despite their exclusion, coexist or conflict with wildlife and are affected by management actions. This issue is perpetuated when an agency lacks a diverse staff, one which represents the community's interests and is able to address language barriers. If educational materials and public meetings are only offered in a single language, English, entire populations are actively excluded. The lack of purposeful diverse engagement can once again be traced to inherent issues in the North American Model of Wildlife Conservation. One interviewee described the historical and ongoing negative practices:

> *"There's not a way for them to see themselves in that North American Model of Conservation that's not a way for them to contribute monetarily. You know, in some cases, if you get down low enough, there's not even a way for them to communicate with us if they speak a different language, for example, and we don't have staff that look like them or talk like them."*
>
> *-F6*

Another expert specifically pointed to the exclusion of urban Hispanics as a major stakeholder group within Florida, describing a lack of programs designed to engage these communities. The lack of effort and funding directed toward minorities and historically underrepresented groups prevents their representation in wildlife management considerations, leaving communities in a vulnerable and unequal position. If no effort is made to engage with marginalized groups, an agency cannot claim to represent the entire public.

Commission meetings that are open to the public, or online comment periods, are intended to provide any stakeholder who may not have been considered earlier with the opportunity to voice their opinions. Many managers highlighted Florida's commission meetings as a great place for all stakeholders to voice their needs and values, which would be considered before moving forward with a regulatory change. Yet this commentary still grapples with the challenge of accurately representing all comments. At times, only the loudest or most insistent voice in public meetings or online is considered. Interviewees described the stakeholders who attend these meetings as like-minded individuals and missing from the discussion are those who hold different values, or simply did not have the capacity to attend the meetings. Even with a truly representative group of participants, the fair and equal consideration of all views is easily threatened by what experts deemed the super stakeholder. This term refers to those that are well connected and hold great power and influence, at times even able to sway political leadership, and can refer to a single person or an organized group. One Florida expert shared the following story as a prime example of the super stakeholder’s problematic influence:

"We have a system where we are supposed to consider public comment in a forum where not everybody is able to be engaged. The same people always come to commission events, right. You're not hearing a representative sample of your stakeholders. So, I have had the case where I've worked with biologists and managers to look at a conservation issue. It was a regulation, a fishing regulation. We solicited feedback from a wide variety, which I would consider a representative sample of the public and, it was scalloping, scallop anglers, I guess they would be considered, I'm not sure, scallopers. And they decided our results indicated one opinion about the regulation. Our biologists presented that information at a commission meeting. And there were some members of a local marina from that area who came, made a big stink about it, and then the ruling wasn't changed in the direction that the survey indicated. We had done an entire scientific process to gauge public opinion, representative public opinion. And then the commissioners sided with the few members of engaged public that showed up at a commission meeting. So sometimes we end up with our decisions being captured by the people who show up to commission meetings. Other times when they say, please log our public comments and make a decision, those comments don't get used. But I think it's an issue. It's a politically important issue that might determine what they actually do with those comments. They're always logged, and they're always quote unquote, taken into consideration. But my issue with them is very rarely derived from a representative sample, actually, never by

definition, and sometimes they get higher precedence than actual scientific results."

-F5

To achieve a more equal representation, the most important action is the collection of information. In addition to the public comments collected through meetings and online forums, wildlife professionals also consider those made by nuisance callers. One expert noted, however, that these typically represent a negative view only, and assessing those who do not call to complain is difficult. A more recent additional medium of information collection is social media. Although the internet can also be used to share information and educate the public, there is also the opportunity for misinformation. In an age of global online access, any one person has the power to share an opinion or statement, whether or not it is true, and many people do not have the capacity to distinguish between a reliable source and an inaccurate one. When misinformation is shared, it can have a negative impact on public opinions or understanding. If the public does not receive accurate and reliable information, the opinion they express based on that misinformation does not match with their actual behavior. Interviewed social scientists described how due to the impossibility of surveying every member of the public, they use a sample of general attitudes and behavior to draw predictions regarding future actions or issues. However, if the public shares opinions based on faulty social media that do not reflect their actual behavior, and wildlife agencies make predictions based on that misinformation, management actions will fail.

Priorities of Political Leadership

Additional impediments to the incorporation of new management strategies stem from the current political atmosphere and priorities. Some managers described waiting years to pursue priority actions due to a fear of those currently in office, choosing instead to hope for a more progressive leader in the future. Political leadership also influences both the amount of funding provided to wildlife management agencies, as well as where that funding should be directed. Funding is often accompanied by a list of requirements and restrictions, which limit the scope of work possible. One practitioner described numerous instances where a project was denied, due to environmental regulations or funding. Years would pass when suddenly an identical project would be proposed, but this time approved. The only difference between the two proposals was the change in political leadership that had occurred in the years that passed. The same wildlife manager also described challenges the agency has faced because of the weakening of critical environmental regulations by the Supreme Court, or other powerful bodies.

> *"And of course, depending on who's hitting in the governor's office, or in the press, or in the presidency, particularly in a state level, who's sitting in the governor's office, you see different emphasis on enforcement of existing environmental regulations."*
>
> *-M6*

When considering the presence of invasive swine, which have not taken hold in Maryland, one manager affirmed that DNR would be able to control their population only if the state has the social courage to do so. The interviewee

elaborated by pointing to a different case study, *"We have lost much of the war about feral cats because of a particularly shrill insistence and very loud minority of people who have intimidated their legislators into allowing them to have feral cats established in the wild." (M1)* Successful wildlife management requires not just agency leadership alone, but positive political leadership as well. In the case of invasive species management, the inclusion of human dimensions input might not be beneficial. However, it would be possible to still engage with stakeholders, but rather to explain why species must be eradicated to avoid harm to the landscape or other species.

In discussing Florida's progress towards a more socio-ecological management strategy, one manager pointed to the enlightened political leadership, who placed a heavy premium on increasing stakeholder engagement and the use of social science. Political figures were also highlighted as having the positive foresight to develop additional means for funding all areas of wildlife management, enabling managers to serve a larger population rather than solely hunters. In an unusual action, The Fish and Wildlife Agency was granted additional authority, as described by one interviewee:

> *"We have constitutional authority, and that was that was done deliberately in Florida some 75-80 years ago now, rather than as Floridians saw the futility and folly of, it being Fish and Wildlife, being managed on a local scale, and based on the whims and vagaries of local politicians. So our seven-member commission, when you watch that process, that's the end. In fact, the Florida Legislature does not even have the authority to adopt rules. They do control*

our purse strings, at least they give us spending authority for some of those dollars."

-F1

It is the role of state wildlife management agencies to manage wildlife for the public trust. However, this might not be possible, or be made more difficult, due to opposing political views. History has created and prioritized wildlife as something that belongs to all people. Wildlife agencies, therefore, should be funded and given the power to take care of the public trust resource separate from the political legislature. One interviewee described one of their primary tasks as figuring out how to influence elected officials for the benefit of the public trust.

"Ultimately, me as trust manager, I'm working for, on paper, working for the trustee, right? The commissioners, the southern commissioners here in Florida. And in the North American model, well, those trustees are the ones who are really kind of tasked with thinking about the other aspects of Fish and Wildlife Management. And traditionally the manager has been the biologist. But I think I said it earlier that the trustee, the commissioner, is also, in addition to social science, is thinking about other things, has to take into account economics, politics. Politics is a big factor, but other social, economic perspectives and so, again, I'm saying I'm repeating but I think it's important to trust the, the commissioner has traditionally been tasked with thinking about the social, economic, political perspective."

-F6

Commissioners in Florida often do not have a biological background on purpose. This removes their 'biological blinders,' and enables them to consider social aspects as well. However, while these commissioners do have the final say on many regulations, they often leave the final decision to the scientists they employ, but only if the political conditions allow. In the opinion of one interviewee, *"I think they do try to look at things objectively, but it's always subjective because of public opinion. And politics." (F5)* Those in leadership roles are also subject to the persuasions of super stakeholders, or those with a high level of influence. Managers described additional difficulty when well-connected super stakeholders speak directly to political authorities, influencing their decision to support their own interests, rather than the combined interest of the public.

While describing the challenges political whims can have on management priorities, one manager provided the following explanation:

> *"A biological problem with a biological solution equals zero. That is zero because the solution cancels out the problem, and so you're good. A political problem with a political solution is the net zero, you're good, the solution cancels out the problem. However, when you have a biological problem with a political solution, then you end up with a biological problem and a political problem."*
>
> *-F10*

Yet ensuring political leadership figures properly prioritize and utilize stakeholder engagement would require an overall culture shift.

Culture Shift

Another frequently cited challenge highlighted by wildlife professionals in both Maryland and Florida is the need for a culture shift. The traditional institutional culture within wildlife management recognizes agencies as experts in the biology or natural history of a system or species. The cultural belief holds that this science, and this science alone, is the way to achieve conservation. People do not need to be consulted because they are not the experts.

The lack of stakeholder engagement appears to be a generational issue as well. One Maryland interviewee discussed how generations ago in the 1950s, hunting was the only tool available to manage wildlife populations, and the natural sciences prevailed. In the present day, however, there are many additional tools and methods that can be used to promote the co-habitation of humans and wildlife. Many of these tools arose from the needs of a diverse stakeholder base. However, many states still struggle with the cultural transition needed to incorporate these methods. A few years ago, when the topic of increasing stakeholder inclusion within Maryland was proposed, a few practitioners expressed concerns that including more stakeholders would only lead to issues.

> *"Some of my colleagues were really opposed to bringing more people to the table, because more people means you might not like the end result. And if you control the dialogue, and control the debate, or lack thereof, you can somewhat dictate what happens."*
>
> *-M6*

One practitioner believes that there will always be old school managers, who want to work without considering the human side. At the Mid-Atlantic regional meeting one wildlife professional stated *"We don't buy into that social crap. Here in West Virginia, we run a bit of a benevolent dictatorship." (M2)* However, for agencies to remain relevant to all people, all people need to be included in the conversation.

One social science proponent in Florida took their fight to the grassroots level, aiming to convince on the ground managers and scientists that social science methodology is what should be used to gain input and opinions on how to manage a species.

> *"My primary challenge was A, convincing people, convincing managers and biologists, that they needed to take into consideration people's opinions. And B, convince them that social science is a science, and that we have this level of rigor, and the same scientific method, just different contexts as quote unquote traditional science."*
>
> *-F5*

In the case of Florida, the state continues to progress towards a more co-managerial relationship, one that is more modernistic than the North American Model, although not without challenges. Although a diverse funding structure may have played a crucial role, wildlife managers highlighted that this change in funding only occurred following a shift in culture. Interviewees discussed the slow shift, which took place within the agency as natural staff turnover occurred. The newer employees had the importance of human dimensions ingrained in them during their

educational careers. Unfortunately, culture shifts take time, and convincing existing and more traditional staff to recognize the importance of engaging with stakeholders is not without difficulty. Oftentimes this drastic change has been faced with pushback, with professionals arguing that collaborative management won't work, takes too much thinking, or is not the way things have historically been done. One wildlife manager shared their own experience:

> *"Some folks are even saying money derived from the fishing and hunting licensing, and from the excise taxes, that shouldn't even be spent on social science. And that just appalls me that people still think that way. So I guess that would be something I would watch out for is just to know that that attitude is still alive and well in some corners of the country."*
>
> *-F8*

Time

State level management officials in both Maryland and Florida highlighted time as yet another challenge to the incorporation of stakeholder engagement. While the managers were clear that they want the public to understand the work they do, and understand the public's needs as well, they have limited time to do so. Engaging with stakeholders, especially a representative population, is no quick task. Wildlife practitioners often face time sensitive work, following nature's schedule. One manager went on to explain:

> *"There are certain jobs that have to be done at certain times of year based on the natural histories of the species that we're managing, or the ecosystems that we're managing. So we have to be able to plan enough ahead, so that we*

can set up a good rapport with our local stakeholders. And some people will take a little longer than others to understand what we're trying to say, and it takes us a little longer to explain to them in a way that they will understand."

-M3

The issue of time can be linked to one of the primary issues highlighted by most interviewees: funding. A restricted pool of funds dictates the number of staff on hand, and the training they may or may not receive. According to interviewees, additional time and resources would enable them to be more proactive in both the education of and engagement with stakeholders. *"When you have a system that's running on basic capitalist rules, we can only do what the* money allows us to do at this point." *(M3)* Time is also linked to the priorities of both agency and political leadership. State agencies must be willing to invest the time to devise a plan for the incorporation of conservation social science. It takes additional time to train existing staff, and likely many years for an overall culture shift to occur. Managers in Florida highlighted that even after the CCSSR was created, it took time for staff to realize the center even existed and begin to utilize the resources it offered.

Priorities of Agency Leadership

In the management of wildlife, all species are not allocated an equal number of resources. For some, this can be attributed to their secure existence and absent need for intervention. However, there are species or habitats which would benefit from funding and management intervention, yet they are not made a top priority due to their lack of popularity with human populations. Interviewees highlighted the fundamental problem as simply choosing what to do, because by choosing what

conservation to do, or what management to do, they also decide what management won't be done.

In the same way that wildlife management leadership can prioritize different species, they can likewise allocate resources to various data collection. From the creation of an overall wildlife management plan to the amendment of a regulation, wildlife professionals decide what data to include to reach an overall decision. Unfortunately, according to practitioners in Florida, agencies have not yet prioritized the methods needed to assess human dimensions of wildlife. FWC's mission statement pledges to make decisions based on the best available science. The issue with this statement is its failure to clarify what the state classifies as science. Florida practitioners highlighted a disconnect between the commissioners and their perception of social science as valid and rigorous. While it's written that science will be considered, agencies do not yet value social science as equal to biological science.

In recognizing the forward strides Florida has made in a growing focus on human dimensions, many wildlife managers attributed this progress to the leadership within their organization. Higher level employees within FWC choose which management actions should be prioritized, a decision that inevitably chooses one source over potential others. One practitioner reflected on the positive influence of a previous director who championed increased engagement with stakeholders to understand what the public really needed. Once in a higher leadership role, this manager issued a directive that every employee had the responsibility to engage with stakeholders in order to understand that the work is done for the benefit of people. The agency also benefits from social science workshops and training provided during

a wildlife manager's time in the role at every level. When a practitioner is trained to manage collaboratively, and consider both wildlife and the public, they carry this viewpoint forward, sometimes into more influential roles.

> *"As we've done a series of workshops with sort of the same group of people, and as those folks moved into leadership positions, as they became a section leader or division director, it was their sort of behaviors and practices that modeled those new things that we wanted, engaging with stakeholders. And even working with our commissioners at our commission meetings, we don't even bring issues for their decision making without engaging stakeholders because that's one of the first things they ask, "What does the public think about this? What do our stakeholders think about these regulatory issues or management plans?" And so it's just sort of baked into what we do."*
>
> *-F8*

In the case of Florida, the focus on stakeholder engagement was driven primarily by the state's growing popularity. FWC is a relatively large agency with a very demographically diverse and rapidly increasing population. The communities from southern Florida up to the edge of Alabama hold vastly different values and needs, and as such, one management strategy designed by an agency operating out of the center axis in the south would not accurately represent every single community. However, interviewees also highlighted further areas for growth, including engaging with a much more diverse and representative sample of the population.

Multiple interviewees referred to funding as a common scapegoat for a lack of greater stakeholder engagement. While they were quick to point out that conservation

dollars are never sufficient to address all work identified as high priority, they also highlighted that this subject is frequently used to avoid the real issue of prioritizing engagement with a broader and more diverse public. As one wildlife manager pointed out: *"We have a huge amount of people down here, and it's a very diverse group of people. And we don't engage with most of them and that's the problem. And the reason we don't is because it's not a priority." (F6)*

Maryland faces similar struggles in determining which voices to include in management decisions. As a state that also contains many different lifestyles and landscapes, managers assess different wildlife stakeholder acceptance capacities from different areas. This puts them in a position where they can choose which voices to include, and which to ignore. Due to the traditional funding source within the state, which comes almost entirely from sportsmen, the managers feel the hunters should have the greatest, or possibly only, influence. As one interviewee put it, *"Hearing from hundreds of thousands of Maryland hunters, they own the wildlife managers, regulatory captured by them, identify with them, deep down think they're right and everyone else is wrong." (M1)*

Further addressing the principle of regulatory capture, the same manager shared the following description and example:

> *"[Regulatory capture is] the phenomenon that occurs whenever someone who regulates an industry gets close with, and works with all the time, and starts to empathize with them, and have lunch with them, and like them, and essentially join their community. It's human nature and its very, very insidious and difficult to stop. Most people who are guilty of regulatory capture aren't even*

aware that they're guilty of it. They see themselves as working cooperatively with, whatever but, regulatory capture is where your job is to set the regulations for fisheries, and fisherman Bob comes in and sees you at happy hour and tells you about how bad things are going for his wife and kids because they're so poor, you feel sorry for them and consciously or not you work harder to make sure that he makes a better living, sometimes at the expense of the resource, which is supposed to be your primary charge. Happens in every industry and every regulatory agency."

-M1

Opportunities to Increase Stakeholder Engagement

Diversify Funding Structure

With the steady rise of urban areas and increasing human populations, greater demands are being placed on wildlife management agencies (McDonald et al., 2014). Additional resources should therefore follow. Increasing the amount of funding available is not an easy task, but an accomplishable one through diversification. Lessons can be learned from Florida's funding structure. With new stakeholders utilizing the wildlife resource, the majority of funding should no longer be sourced from consumptive users. However, the collection of funds from non-consumptive users mandates that those users be similarly involved in decisions regarding natural resources where they might be impacted. Non-consumptive users can contribute to available funds through alternative methods. A report prepared by the Midwest Association of Fish and Wildlife Agencies (MAFWA) compiled a list of such possible funding sources. Florida interviewees discussed a number of these, including

a general fund, license fees, grants, fines, income tax checkoffs, and others (President's Ad Hoc Committee on Alternative Funding Midwest Association of Fish and Wildlife Agencies et al., 2006). State wildlife management agencies which already use the proposed strategies may benefit from reevaluating fees that have not been increased in years, as highlighted by one Maryland practitioner. A publicly acceptable fee increase could be determined through engagement with acting wildlife professionals, previous license purchasers, and interested members of the public. One Maryland manager also highlighted the Recovering America's Wildlife Act (RAWA), citing it as a potential significant new resource. This bill, introduced in 2019 and still under deliberation, would provide funding for "(1) the conservation or restoration of wildlife and plant species of greatest conservation need; (2) the wildlife conservation strategies of states, Indian tribes, or territories; or (3) wildlife conservation education and recreation projects" (H.R.3742 - Recovering America's Wildlife Act of 2019).

> *"And what RAWA will do, if it is passed, will be to take monies from energy extraction leases on federal lands. So if there's coal mining or fracking or some kind of oil production on federal lands, there will be money from those leases that will go directly back towards conservation. Yeah, if this passes, knowing how much money energy extraction produces, we expect expect that there will be somewhere between $1.3 billion and $3 billion that will be dispersed to all of the state and tribal entities, which is an order of magnitude higher than what we've had to play with, and work with, to this point a while it's, it's incredible. And it's a, it would be an amazing thing to have that kind of financial resource to back up the work that we would like to do. So instead*

of cutting positions, or asking people to do more with less, we would be able to do more with more."

-M3

An increase in funding will not have the desired effect if large constraints remain on what funds can be spent on. Interviewees highlighted the complexities of current funding designations, expressing a desire for restrictions to be eased to allow the inclusion of new methods, increased management actions, and greater attention on non-game species. A social science practitioner in Florida reflected on the positive impact of a more flexible structure and ability to direct funds at the discretion of the CCSSR. The greater amount of funding available in Florida enabled a subsequent increase in funding directed toward engaging with the public. However, meaningful engagement with an increasing number of stakeholders in any agency will require practitioners trained in social science. Those states with a higher amount of funding can establish social science divisions to partner with existing departments. States with a more restricted funding pool can instead focus on training existing staff.

Manager Training and Education

Undergraduate fisheries and wildlife management programs across the U.S. have seen a large increase in the incorporation of HD courses (Dayer and Mengak, 2020). Any percentage other than 100% of programs incorporating conservation social science is lacking and does not prepare students for what they might encounter in the field. The definition of what constitutes a social science course must also be offered in the context of natural resources. These classes, once offered, should also be mandatory requirements rather than an optional avenue. Agencies would also benefit

from adding social science specialists to their staff or contracting with agencies who are able to properly engage with stakeholders, having been trained in the methods.

State wildlife agencies have also utilized ongoing manager training programs and workshops to educate existing staff on newer methods that they may not have encountered in their own education. FWC has invested a large amount of time and resources in HD training for their staff, a format other states could follow. For such workshops to be effective, they must be offered regularly, be accessible to all staff, and possibly be mandatory. The development of agency training programs also requires funding, time, and active prioritization.

It is doubtful that any state wildlife management agency would send an anthropologist into the field to conduct a bear survey. The same should hold true for sending an ecologist to assess human populations without first providing them with the training to do so.

Engage All Stakeholders: Prioritize Marginalized Groups

When assessing the values and needs of stakeholders for any management action, it is crucial to interact with a representative sample of the larger population. This group does not only reflect non-consumptive users, but the full population. While it is challenging to engage with such a wide range, there are actions both managers and the public can take to ensure their voices are considered.

One interviewee described the different formats public meetings can take depending on the species. For more controversial species with a passionate stakeholder base, the traditional open meeting format can do more harm than good. The vocal and impassioned stakeholder will again speak with the loudest and most

incessant voice, overshadowing the opinions of other groups and thereby skewing the overall social assessment. In these situations, wildlife professionals benefit from a divided format with different roles. While one manager focuses on educating any interested parties, another can consult with stakeholders individually to record each opinion present. Practitioners also can include private comment boxes where stakeholders can submit a statement and remain anonymous. These methods enable the wildlife agencies to assess a more holistic view of their population's needs. It should be noted that for these practices to yield the intended results, stakeholders must also fulfill their role. The public should remain informed about local issues and educate themselves about the ecological system they exist within. Stakeholders must also remain engaged and present with wildlife management agencies. Although the agency has the responsibility to consider their entire population, this is more readily accomplished through a responsive public.

Wildlife agencies must also prioritize acquiring staff who reflect and can engage with underrepresented communities. There should be a particular focus and active effort to engage with minorities and address existing language barriers. Many experts highlighted potential stakeholders that would likely become more actively engaged if the effort was made to educate them about the resources at their disposal. Any engagement action must be meaningful and truly collaborative to achieve success. Bennett et al. described possible issues stemming from inaccurate methods: "the uncritical and ineffective application of collaboration and participatory approaches may simply reproduce previous injustices, namely inappropriate representation, uneven power dynamics, and the resultant lack of equity and

legitimacy" (Bennett et al, 2019, p.10). If an agency fails to consider the experience of any community, the resulting action may be harmful for both humans and wildlife.

Guiding Principles for Agency and Political Leadership

Positions of leadership, both within an agency and politically, play a large part in where funding is directed and what it can be used for. In addition to the decision of whether or not to utilize social science, leadership also decides who will be engaged with, if human dimensions are, in fact, included. The choice of what is prioritized is determined by the people who are at the table making the decisions, who each possess their own biases on the most important conservation measures and relevant stakeholders. The issue of shifting leadership priorities can perhaps be partially solved through the creation of a set of guidelines, something Florida has previously tested through multiple iterations. Manolis et al. (2009) found that through the use of adaptive leadership principles and a manager's modelling exercise, the agency devised new regulations that were supported by a wider audience of stakeholders. One wildlife professional shared the following story:

> *"We had a chairman that was really big on the North American Model. And so we floated an idea past him to try to help solidify some guiding principles amongst the board, and we felt like it was good timing, so if it's not good timing, you wouldn't want to do it, but we had the right leadership on the board, and the right makeup, and the right timing to discuss guiding principles…a list of twelve things that they, it might have been ten things, that they identified: always take into account stakeholder perspective, and ethical behavior, the commissioner, just these guiding principles for high level. And*

so we made sure that the stakeholder input was in there. We were really advocating for that as trust managers and staff...You know what I mean, to remind you who the benefactor is here, the beneficiary is, and who we really work for, which is the people."

-F6

Due to the similar decisions that must be made by political officials and agency management, the recommended solutions would serve to direct both leadership areas alike. Manolis et al. (2009) devised eight exploratory leadership principles intended to guide conservation-science leadership. Those principles are the following:

(1) Recognize the social dimension of the problem

(2) Cycle frequently through action and reflection

(3) Get and maintain attention

(4) Combine strengths of multiple leaders

(5) Extend influence through networks of relationships

(6) Time efforts strategically

(7) Nurture productive conflict

(8) Cultivate diversity

Haubold (2012) experimentally applied these ideas to imperiled species management in the state of Florida. Initial findings suggested positive impacts. "Using adaptive leadership principles in a collaborative effort to better conserve imperiled species in Florida led to, in some cases guarded, but nevertheless unanimous, support of new conservation rules. While the durability of these rules

remains to be tested, previously dissatisfied, vocal stakeholders, are now willing to let their concerns be tested through the process" (Haubold, 2012, p. 355).

Based on the literature, and the ideas highlighted by interviewees, this research supports the eight guiding principles for leadership defined by Haubold. We also propose that these principles be instituted across agencies in an effort to guide leadership towards better adaptive management strategies. These ideas are not meant to be an exhaustive list of solutions, but rather provoke thought and the integration of new ideas, external organizations, and stakeholders, into present management practices.

Create Cultural Change

The incorporation of human dimensions (HD) classes into undergraduate fisheries and wildlife management programs, and additional ongoing manager training, will both support an overall transition into a more socio-ecological management approach. True change, however, will require HD to be fully ingrained in the culture. As highlighted by some interviewees, a culture shift has already been occurring in the general population for years. Increasing users of natural resources are non-consumptive users. Management agencies must follow the trends of the public if they are to remain relevant and effective.

The NAMWC worked when hunting was the only tool available to manage wildlife populations. In the present day, human populations have increased, and practitioners have devised new tools to access a diverse stakeholder base. If managers understand the process, tools, needs, and benefits of conservation social science, a culture shift will follow. Social science must also be recognized as a true science,

with an equal level of rigor and methodological process, to that of other natural sciences. If the US wildlife management culture is able to be shifted, the funding will likely follow.

Allocate More Time and Resources to Stakeholder Engagement

Fully engaging in the application of a socio-ecological management strategy is a time intensive process, a luxury that is not afforded to all decisive actions. Wildlife managers with social science training, or specialized social science practitioners within the agency, would be able to make the necessary quick judgement regarding how to integrate the values and needs of the human population with management decisions. Increased funding would allow agencies to hire more employees or educate existing staff in social science or enable them to specialize in certain areas. Practitioners also pointed to the ability more time and resources would grant to proactive stakeholder engagement. As interviewees pointed out, current managers are all well-educated and highly functioning professionals. They simply require the time to be trained in social science methods to subsequently begin to fully engage with a representative sample of all stakeholders.

Benefits of Conservation Social Science

Without prompting, study participants made clear the value they place on meaningful and representative stakeholder engagement. The integration of the public with the agency ensures that wildlife managers remain relevant and continually adaptable to changing needs and values. Some interviewees expressed the concern that they would not be able to include the public, as much of their job must be carried out quickly. Proactive community measures allow a practitioner to understand the

needs of the public they serve, enabling them to rapidly respond to emerging issues in ways acceptable and beneficial to a fully integrated community. Stakeholder engagement does not require that stakeholders be included in daily management decisions. Rather, state agencies, the public, external organizations, and other stakeholders can collaboratively decide acceptable policies that will then be utilized by managers. If a trial period of the policy is found to be unacceptable or harmful to one group, stakeholders can convene once again to further examine emergent issues (Haubold, 2012). However, conservation social science must also be carried out correctly, with trained practitioners fully engaged from the beginning of the process to the end, designing the methods used and interpreting the results (Robinson et al., 2019).

Many wildlife practitioners already recognize the value human dimensions engagement brings to the agency. Bennett et al. (2017) highlighted five ways social science strengthens conservation measures, supporting the achievement of ecologically and socially equitable processes and outcomes. However, a socio-ecological model of wildlife management applicable to every region or species does not exist. The focus should instead be on the interdisciplinary training of wildlife practitioners, enabling them to identify ways in which the co-management of natural resources can be used for native or nonnative species management.

One Size Does Not Fit All: Native vs. Nonnative Species

The exploration of management goals with respect to black bears and feral hogs in Maryland and Florida revealed that a socio-ecological framework may not be applicable to all species. While it is beneficial for wildlife practitioners to include

human populations in the consideration of most management actions, some species with the goal of eradication may not benefit from stakeholder engagement in determining an agency's desired future condition. Managers also highlighted endangered species as another that may not require as much human dimensions consideration. However, while this may be true in regard to decision-making and policy creation, agencies would still benefit from educating constituents about a species, gaining stakeholder buy-in and ownership of policies, and proactively developing a toolkit of management actions acceptable and beneficial to the public they serve.

Native Species Influence: Black Bear (*Ursus americanus*)

As a charismatic megafauna, black bears commonly attract a wide variety of parties interested in their presence, whether in favor of or against. Natural resource agencies are better able to manage such a species, and a widely varied public acceptance limit, through the continued inclusion of the public. However, it is not enough to gauge the public's opinion only once early on, but stakeholders must be an equal partner throughout the full management process to create fully supported policies and buy-in. The wide range of opinions can be better managed through the continued incorporation of human dimensions. With the public as an equal partner in the management of black bears, the agency can work alongside them to develop accepted management policies while simultaneously educating the public about the species' needs and ways to better coexist. In the case of the native black bear species, both Maryland and Florida wildlife management agencies could achieve greater public buy-in and less human and wildlife conflict through the continued

consideration of both the social and ecological realms. If one group shares the opinion that bears should not be allowed in their neighborhood, and later discover that the management agency decided to allow bears and respond to nuisance calls only, they would likely be resistant and interpret this action as a policy which actively ignores them.

The Maryland Department of Natural Resources highlighted one major conflict stemming from bears in the state is their resource scavenging, whose source often ends up being human trash bins or bird feeders. Interviewees noted difficulty in convincing those stakeholders that have zero tolerance for the species of ways in which they can coexist, such as securing their trash or altering their bird feeding habits. Yet wildlife practitioners feel that the bears have a right to be there, and other members of the public feel the same or enjoy seeing the species.

The Florida Fish and Wildlife Conservation Commission actively engages with Bear Stakeholder Groups, BSGs, both during the creation of a management plan and at regular intervals afterwards. For a species that garners a large amount of public interest, stakeholders often want a role beyond the initial creation of the management plan, sometimes including continued oversight of management activities. Interviewees explained how an agency can respond to this need when stakeholders stay involved and communicate their interest in doing so. Yet the same interviewees also highlighted that this level of engagement might not be required for every species.

> *"So it depends on the species again. So for example, you wanted to talk about how we manage bears, we do have Bear Stakeholder Groups, which continue to meet because that's a species that a lot of people have a vested interest in.*

And they want to stay engaged in what it is that we're doing. They want to, they want oversight. They want to know what we're doing. They want to know how we're doing it. They want to have some influence on what it is that we do to manage bears."

-F4

Continued engagement, increased public education, and transparent management of a species enables a stakeholder to better understand why a management decision might be made, how a human population can coexist in an occupied territory, and increase community buy-in.

Nonnative Species Influence: Feral Hog (*Sus scrofa*)

Interviewees from both Maryland and Florida were skeptical about the use of a socio-ecological framework in managing invasive feral hogs. In the case of Maryland, no breeding hog populations currently exist in the state, and their current goal remains eliminating any of the animals that appear. Interviewees held the view that social engagement is not necessary, due to the fact that the desired future condition will not be altered even if stakeholders request something different. Yet a socio-ecological framework may still be beneficial for managers in engaging with their public in a different way. Those stakeholders who are in support of hogs being allowed on the landscape, and who have gone so far as to call some of the managers interviewed to request the addition of hogs to their land for hunting, would benefit from better outreach and education. Agencies who choose to partner with their audience and provide transparency behind their management decisions would gain the ability to proactively develop agency responses or tools for the public. If a wildlife

manager can determine the likely sources of conflict or the stakeholder's position regarding a species or policy, they are better equipped to serve their role of managing for the benefit of the resource and the public.

For Florida, where hogs have existed on the landscape for hundreds of years, natural resource agencies do not intend to eliminate the species. The hunting of hogs has become a cultural tradition for many Floridians, and these consumptive users would likely resist any attempts to alter these policies. Yet the interviewees were already aware of these opinions through social interactions. The agency interacts with stakeholders to determine the best ways to assist them. This is often completed through the Wild Hog Damage Management Program, which seeks collaborative solutions or provides assistance to landowners and land managers in solving their property damage or agricultural damage issues. Managers are equipped to respond to the public's needs as they arise, removing nuisance animals, enabling citizens to hunt the hogs themselves, or connecting them with contractors who will hunt the hogs for them. This range of available resources and response tactics arose from the agency's proactive engagement with their constituents. Yet again, although the creation of management goals for an invasive species such as a feral hog may not benefit from a socio-ecological approach, public education and the proactive development of agency response tools are still strengthened through community engagement.

Is the North American Model of Wildlife Conservation Still Relevant Under Its Current Form as Practiced?

As previously discussed, the current practice of wildlife management is based on seven components from the original North American Model of Wildlife

Conservation. Organ et al. (2012) have suggested that the principles are a product of their time and thus no longer relevant to present society: “Wildlife conservation in Canada and the U.S. developed under unique temporal and social circumstances, and the resulting Model reflects that. Had it formed in another time and under other circumstances it would likely be different” (p. 2).

By identifying pieces of the NAMWC that are no longer effective in the United States, experts can begin to devise approaches which will advance wildlife conservation and increase support for policies. Interviewees highlighted flaws in the agency’s funding structure and sources, the undue influence of super stakeholders, and an inherently flawed single species management style. Other practitioners echoed the opinions of Organ et al. (2012), calling for the NAMWC to be replaced in its entirety. Florida interviewees noted that their agency has already begun this transition, shifting to a more modernistic and relevant model. Other states would likely benefit from mirroring this transition.

In order to integrate wildlife beneficiaries with management decisions, agencies will increasingly need to engage with stakeholders. Yet in considering the possibility of transitioning to a fully socio-ecological management framework, each interviewee across both states noted a number of challenges to accomplishing this goal: Funding, Educational Background and Manager Training, Public Misrepresentation, Priorities of Political Leadership, Culture Shift, Time, and Priorities of Agency Leadership. Working to solve these challenges is not without difficulty, but discussions around each also revealed potential avenues forward. This study proposes the following solutions to begin addressing the integration of human

dimensions with wildlife management: diversification of the funding structure, increased manager training and HD education, the engagement of all stakeholders with the prioritization of marginalized groups, guiding principles for both agency and political leadership, the creation of agency-wide cultural change, and the allocation of more time and resources to conservation social science. A new framework for wildlife management in the United States is needed if agencies are to address the highlighted challenges to integrating social dimensions with natural resource management. A revised North American Model of Wildlife Conservation that prioritizes human dimensions will serve managers in their efforts to decrease conflict between humans and wildlife.

Chapter 4: Conclusion

Introduction

With the growing population of humans, and their increasing overlap with wildlife, natural resource practitioners will face increasing responsibilities occurring at the intersection of ecological and social issues. A socio-ecological model of wildlife management provides a natural framework to enable managers to incorporate the methodology and data of both social and ecological systems. Semi-structured interviews with current state wildlife managers in Maryland and Florida revealed differences both across and within state lines regarding foundational wildlife beliefs. The view of who constituted a stakeholder varied widely, from exclusively consumptive users, to internal and external organizations, and finally the entire public. The role of this stakeholder also encompassed a broad range, that of solely an informant to a fully equal partner. In discussing the wildlife agency's role, many interviewees discussed the public trust doctrine, reaffirming their constituents as the beneficiaries of the wildlife resource.

Interviews also revealed seven challenges to the integration of human dimensions with existing management practices. Wildlife professionals highlighted a lack of manager training, an outdated funding structure, public misrepresentation, fluctuating priorities of agency and political leadership, traditional agency culture, and the lack of time invested in human dimensions inclusion. Although these issues will not be addressed easily, they are not irresolvable barriers. In discussing these

challenges, interviewees inherently discussed opportunities for their resolution, including the diversification of the funding structure, manager training and education, the engagement of all stakeholders with the prioritization of marginalized groups, the creation of guiding principles for agency and political leadership, cultural change, and the allocation of more time and resources to stakeholder engagement.

This research also explored the applicability of a socio-ecological framework, applied specifically to a native species, the black bear, and nonnative, the feral hog. Increased engagement with stakeholders was shown to benefit wildlife agencies managing native bears, informing managers of the variety of public interests in an area and increasing stakeholder support of policies. However, for a nonnative species like the feral hog, a socio-ecological framework may not be beneficial in the early creation of management goals. Yet later engagement with the public would serve to educate about the damage the species causes, and proactively develop management actions acceptable to constituents.

The current foundation of wildlife management in the United States, the North American Model of Wildlife Conservation, was effective for the time period in which it was created yet grows increasingly outdated. Mitigating human and wildlife conflict will require the integration of human dimensions through the use of social science, enlisting the stakeholder as an equal partner throughout the entire management process.

Contributions to Wildlife Management Theory and Practice

Study results first revealed wide differences in wildlife professionals' definitions of stakeholder, the stakeholder's role, and the agency's role in Maryland

and Florida. Analysis next explored current expert perceptions on the proposed inclusion of social science in wildlife management, identifying seven challenges, and resulting opportunities, to achieving this incorporation. This research also highlighted issues with the existing North American Model of Wildlife Conservation that should be addressed to produce a framework relevant to today's society. A proposed socio-ecological framework was applied to native black bears and nonnative feral hogs revealing areas where such an approach could be utilized to include stakeholder input, and areas that require an altered format to instead educate the public.

This project improves upon current adaptive management and the creation of socially and ecologically responsible policies through the production of a replicable conceptual model of wildlife management which incorporates social and natural sciences. The proposed socio-ecological framework of wildlife management supports the continued study and application of the interconnected systems of humans and wildlife, creating a template of wildlife management that can adapt to a changing social environment. Two challenges highlighted by Elsawah et al. (2020) to the adoption of an interdisciplinary structure, bridging epistemologies across disciplines and representing human dimensions in SES, were also explored in this study. Increasing understanding of how different cultural and economic values, norms, and institutional structures inform human views and experiences with wildlife, will improve co-management opportunities for the benefit of both wildlife and human communities.

Final Conclusion

The transition from a more traditional management structure to a socio-ecological approach is a continuous process. Due to Florida's rapid population growth, wildlife management agencies have no choice but to adapt to address new socio-economic and political issues in the state. The state of Maryland has a smaller population, and therefore has not yet needed to change their approach. Yet if Maryland's development steadily increases, the state can look to Florida, and others, to understand new methods they can utilize moving forward, and avoid any early mistakes made by states testing the processes. By understanding existing and future challenges, natural resource agencies can develop holistic approaches, enabling their employees to deal with the increasing demands of human and wildlife conflict.

Wildlife managers are being called upon to incorporate human dimensions in their conservation and management approaches to produce more robust policies and actions. However, these practitioners are being asked to solve complex issues rooted in social systems with limited tools based primarily on natural sciences. To address the cultural values, norms, and institutions of the various stakeholders that intersect with native and nonnative wildlife populations across the country, wildlife managers must integrate human dimensions into current management. Continuous public engagement will ensure that wildlife managers are able to remain relevant and adaptable to changing needs and values and develop proactive community measures. The proposed integration of social dimensions with natural resource management will enable agencies to effectively respond to the increasing and urgent demands of human wildlife conflict.

Appendices

Appendix 1: Interview Recruitment Email

Dear [Wildlife Management Professional],

My name is Taylor Gedeon and I am a Master's student at the University of Maryland, College Park working with Dr. L. Jen Shaffer, Dr. Jen Mullinax, and Dr. Michael Paolisso. I am writing to request an interview with you about wildlife management in the United States due to your position as a professional in the field. [Recommender name] recommended that I speak with you as a leading expert on [Feral Hog/Black Bear/wildlife] management in the state of [Maryland/Florida] with key knowledge and insights.

Our research examines traditional ecological-based wildlife management and proposed social science methods, conceptualizing the two into a single management framework. The goal of this study is to reveal areas in current management where social science can be introduced and assess wildlife manager perceptions on the use and feasibility of social science inclusion, using [Feral Hogs/Black Bears/wildlife] in the state of [Maryland/Florida] as a case study.

If you are willing to be interviewed, we could set up an appointment for a video call (or phone, should you prefer this). The interview would last about an hour, and I would ask you about current wildlife management methods and the introduction of social science methods. I would also ask you to review a conceptual model linking

social and ecological science methods and provide any feedback to improve the model. As an interviewee, we would like to audio record your interview, although you may choose not to have your interview audio recorded. All of the information you provide during our interview will be completely confidential in accordance with the University of Maryland's Institutional Review Board. To ensure confidentiality, notes and transcriptions from our interview will only be accessible through a password-protected account by our research team, and all of your identifying information will be anonymized for any write up of project findings.

We would greatly appreciate your assistance. If you agree to participate in an interview, please respond to this email with the dates and times that would best accommodate your schedule.

If you have any questions or concerns, please don't hesitate to respond to this email or get in touch by phone at [number]. Thank you kindly for your consideration.

Regards,

Taylor Gedeon

Appendix 2: Interview Consent Form

Institutional Review Board
1204 Marie Mount Hall ● 7814 Regents Drive ● College Park, MD 20742 ● 301-405-4212 ● irb@umd.edu

CONSENT TO PARTICIPATE

Project Title	*Human-Wildlife Conflict or Coexistence: Reinventing the Management Model Using a Socio-Ecological Framework*
Purpose of the Study	*This research is being conducted by Taylor Gedeon at the University of Maryland, College Park. We are inviting you to participate in this research project because you currently practice and are knowledgeable about wildlife management in the United States. The purpose of this research project is to reveal areas in current management where social science can be introduced and assess wildlife manager perceptions on the use and feasibility of social science methods in management.*
Procedures	*As a participant in this research project, you will be interviewed for about an hour (by phone or video call) during which you will be asked semi-structured questions about current wildlife management methods and potential social science methods being introduced. You will also be asked to review a conceptual model linking social and ecological science methods and provide any feedback to improve the model. A sample interview question is: Could you describe your top responsibilities as a wildlife manager?* *As an interviewee, we would like to audio record your interview using digital recorders. We will transcribe and study these recordings for key themes and information. Neither your name nor any other identifying information will be associated with the audio recording or transcription. We will store these audio recordings on password-protected computers. If you prefer to not have your interview audio*

	recorded, please inform the interviewer prior to the interview.
Potential Risks and Discomforts	*There are no known risks from participating in this research study. Participants may skip any question they do not wish to answer.*
Potential Benefits	*There are no direct benefits from participating in this research. We hope that, in the future, other people might benefit from this study through improved understanding of the inclusion of social science in wildlife management in the United States.*
Confidentiality	*Only the principal investigator, Gedeon, and their faculty advisor, Shaffer, will have access to interview data that includes personal identifiers. Personal identifiable information to be collected from participants during interviews will include name, state where you work, organization where you work, position you hold in organization, and educational background. Any potential loss of confidentiality will be minimized by storing collected interview data in, including interviewer notes and audio recordings, in a password protected electronic folder on a personal laptop and external hard drive. This folder will only be accessible to Gedeon and Shaffer. The data will be kept indefinitely. No identifying information will be included in any write up of project findings or any other external use of project data.* *If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.*

Right to Withdraw and Questions	*Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.* *If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigators:* ***Taylor Gedeon*** ***University of Maryland College Park*** ***tgedeon@umd.edu*** ***845.282.3829*** ***L. Jen Shaffer*** ***University of Maryland College Park*** ***Department of Anthropology*** ***0110 Woods Hall*** ***lshaffe1@umd.edu*** ***301.405.1441***
Participant Rights	*If you have questions about your rights as a research participant or wish to report a research-related injury, please contact:* University of Maryland College Park Institutional Review Board Office 1204 Marie Mount Hall College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678 *For more information regarding participant rights, please visit:* https://research.umd.edu/irb-research-participants *This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.*

Statement of Consent	*Your consent indicates that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study.* *Prior to the interview, the interviewer will request your verbal consent, which will be audio recorded. If you agree to participate, please verbally indicate your consent when prompted.*

Appendix 3: Interview Instrument

Interviewer Note: Questions in blue are follow-up questions that will only be used if the interviewee did not already address the information in a previous answer.

Human-Wildlife Conflict or Coexistence: Reinventing the Management Model Using a Socio-Ecological Framework

Key-Informant Interview Instrument

Interviewee:

Organization:

Date:

Interviewer:

Section 1: Background Information & Field Experience

1. Could you confirm where you work and the position that you hold within this organization? [use to verify info and fill in above]

    1.1. Are you originally from [Florida/Maryland]?

2. Could you tell me about your educational background? What degree(s) do you possess?

3. Could you talk about your time working in this field?

    3.1 How many years have you worked in the field?

3.2 How many years have you worked on the management of [Black Bears/Feral Hogs/Wildlife]?

3.3 What kinds of projects have you worked on?

4. Could you describe your top responsibilities as a wildlife manager?

5. Could you describe any problems, if they exist, to the current model of wildlife management that [Florida/Maryland] uses that you've observed?

Section 2: Conceptual Model Feedback

[BEFORE showing model]

6. Could you describe the current condition of [Black Bears/Feral Hogs] in the state of [Florida/Maryland] at this time?

7. What would the preferred future look like with respect to [Black Bears/Feral Hogs] in the state of [Maryland/Florida]?

[Brief explanation of model and walkthrough of key components – Model Explanation.docx, Model.pdf]

8. In its present form, would this model be useful for managing [Feral Hogs/Black Bears/Wildlife] in [Florida/Maryland]? Creating a management plan?

8.1. Would this address any of the desired future conditions you mentioned earlier?

9. What changes, if any, would you suggest making in this model to improve it for wildlife management? (add or remove pieces, alter timelines, etc)

9.1. Are there places where social science and/or stakeholders are currently included that are good places to have this information and/or participation? Why?

9.2. Where else, if not shown currently, would you include social science information and/or stakeholders?

9.3. Are there places where social science and/or stakeholders are currently included that are not good places to have this information and/or participation? Why?

10. Could you describe some of the challenges you believe you might face in using this model to do wildlife management in [Florida/Maryland]?

10.1. What sort of challenges do you believe might exist at a national level if this model were adopted?

Section 3: Social Science Methods in the Wildlife Management Process

11. What information is used to create or update a wildlife management plan?

11.1. Who is involved in the update or creation of management plans? How are they identified?

11.2. If stakeholders are involved, how are they identified?

12. Who do you define as a stakeholder in the management of [Feral Hogs/Black Bears/Wildlife] in [Maryland/Florida]?

12.1. Does your personal definition differ from that of your organization?

13. How are the stakeholders you identify actively involved in the management of [Feral Hogs/Black Bears/Wildlife] in [Maryland/Florida]?

13.1. At what point(s) in the management process are they involved?

13.2. Are stakeholders involved in meetings to discuss proposed rulings?

13.3. Are these meetings open to the public or previously identified stakeholders only?

14. What does your organization do with comments from the public comment period?

14.1. How much attention do you pay? How much does your organization try to incorporate comments or compromise on proposed rulings?

14.2. Does anyone in your organization ever follow up with a commenter for more information or feedback?

14.3. If yes, could you describe an example of when you or a colleague followed up with a commenter?

15. What do you personally see as the role of the public in wildlife management?

15.1. Is it the role of the state/county agency to educate the public and manage wildlife alone, or do the public have a role to serve too? If not, who else should be involved and how?

16. Could you describe some of the challenges you believe you might face in using this model to do wildlife management in [Florida/Maryland]?

16.1. What sort of challenges do you believe might exist at a national level if this model were adopted?

17. Is there anything I haven't asked about that you believe is important with regards to human dimensions in the wildlife management plan process?

18. Do you have any questions for me? Is there anyone else I should speak with regarding this topic?

Appendix 4: Demonstrative Quotes for Themes

4.1 Stakeholder Definition

Who do you define as a stakeholder in the management of [Feral Hogs/Black Bears/Wildlife] in [Maryland/Florida]?

"I mean, the way that you work with stakeholders and the way that you work with the general public on education is very different…But those that want to those that are stakeholders have enough of a stake in it to actually be more involved than just receiving educational information. So, yeah, I would make a distinction there. I'm sure that it is a spectrum to some degree, how involved people want to be. Sometimes, people just come to the all they do is come to the commission meeting to tell us their point of view. And they aren't necessarily involved in any kind of a stakeholder process. So there is a spectrum there. But I guess in my mind, those two groups are somewhat separate."

-F4

"There are stakeholders out there that don't know they are stakeholders. So we're providing the benefits of the conservation of fish and wildlife to everybody, but people don't really, they don't think they get that because we manage thousands of acres for particular species but that also provides clean air, clean water. And so they're benefitting from our management of those resources. And so they're a stakeholder, but they don't have as big a stake."

-F8

"Well, technically, everyone who is in Maryland, every human being who is in Maryland is a stakeholder. Anyone who pays taxes because we are a tax funded agency. You can get more specific anyone who's interested in conservation or game management. You can get more broad anybody who's interested in clean air and clean water, because the work that we do affects the air and water. It depends on how you If you want to split people or lump people, it's just everybody is is a stakeholder. Everybody has a stake in what we do. Some people are content to allow us to do what we do because they don't really pay attention to that particular aspect of their world. Even though, what we do affect how their world is."

-M3

"Internal stakeholders we view as sort of other branches of our own Department of Natural Resources, specifically, department, the police force, the law enforcement branch of our, which is natural resource police. And we'd like to, you know, know that the laws that we are thinking about changing are enforceable, and get their opinion on them. We also invite other branches, like Forest Service, if, you know, for example, you know, a particular forest might be impacted, we will invite them. External stakeholder groups would be groups like, you know, our local sportsman groups, and humane society, and a broader subset of those folks."

-M4

4.2 Stakeholder Role

How are the stakeholders you identify actively involved in the management of [Feral Hogs/Black Bears/Wildlife] in [Maryland/Florida]?

What do you personally see as the role of the public in wildlife management?

"So we have done stakeholder engagement with regard to letting them know what we want to do. It is unusual to have stakeholders come to us and tell us before any management has been done, what they want us to do. We do have public hearings for that sort of thing we do have both in reach and outreach within DNR and into the public into our partners"

-M3

"Ideally, I would like the public to be as involved as they would like to be, and to provide, know, a process that allows that to happen. And that could involve everything from informal meetings with, with peers and colleagues discussing a particular issue or development of a plan. It could be more formal, public setting, where you're inviting them to, to provide their opinions on particular issues. And then afterwards, you know, agency staff would try to piece that all together and synthesize it, and then consider whether or not we need to make changes and what we're considering or what we're proposing."

-M7

"Both have equal roles. That's what I see. As a management agency, making a decision based on the public opinion and feedback is essential. Public cannot manage the wildlife for the state because there should be a management authority or management agency, but the management agency needs to work

with the public on making the decision of course. That level of engagement of stakeholders depends upon which species we are talking about, what management options we are talking about, to what extent we need public input on that one. So those kind of things should make a decision and I think that's what we are doing."

-F9

4.3 Agency Role (Public Trust)

Could you talk about your time working in this field?

Could you describe your top responsibilities as a wildlife manager?

"I'll tell you what, I work for the state and I'm one of the ones that I firmly believe that, you know, I work for every citizen of the state and you'll get people in my in my position. That will tell you they work for the hunters, because the hunters are, are paying for the and that's not that's not the case, you know, you know, we are charged to manage this population of, you know, this species for the citizens of the state period."

-M2

"Well, the role of public is huge, because I mean, it, you know, in our system of government, they actually own, the citizens own the resource. The government doesn't own it, the government manage it for the citizens."

-M6

"And so I think the importance of social science integration in any wildlife management is mainly due to the reason that we manage wildlife for people to Some so that we can we can keep people and wildlife together and in a in a

mutual relationship. So for that we need to not only understand how wildlife behave or what are the needs and necessities of the wildlife, but also of the people. And so that's why social science is important"

-F9

4.4 Issues with NAMWC

Could you describe any problems, if they exist, to the current model of wildlife management that [Florida/Maryland] uses that you've observed?

"Yes certainly. The whole problem with wildlife management in North America is that it's paid for entirely by hunters. And purchasers of firearms. The system is woefully broken and as a result, you get into crazy anomalies like the hunters and sportsmen have far too great a voice in the people who regulate them, because they are the source of their funding and because of this thing called regulatory capture which just occurs in agencies. So the whole system's broken."

-M1

"[NAMWC] was set up on, you know, a funding mechanism relying on hunters. Right, you know, and thinking thinking about, you know, the harvest and the consumption. And I guess what I'm hitting on is is that while that's been a good model for us, as a country and gotten us to where we are, and we're lucky, I think I think we're seeing, you know, the general public is, is not in that category of consumptive hunter, but still wants to enjoy and somewhat, let's face it, some of them don't, you know, don't even know that the opportunity exists, you know, but probably would like to go out and enjoy if

they knew about it. But But my point is, is that we're not engaging with them, right? There's there's not, there's not a way for them to see themselves in that North American model of conservation that it's not a way for them to contribute monetarily. You know, in some cases, you get down low enough, there's not even a way for them to communicate with us if if they speak a different language, for example, and we don't have staff that look like them or talk like them, you know, so, right."

-F6

"The North Americans plan has become more of the, the true guidance document and we, we have actually started to train our staff in that sort of model. Some of the problems that are there are, you know, it tends to, whether it tries to or not, tends to focus on some of the consumptive uses of wildlife. And it's been a struggle trying to kind of change those into the more non consumptive users are still users out there. We're still managing wildlife for future generations as much as we are for current generations, but not necessarily for future generations that are always going to be consumptive users of it. I think the model itself has started to change a little bit as different generations of wildlife managers come up and use it. It's all kind of it's all kind of changing anyway, and addressing a lot of those problems. The biggest problem traditional wildlife managers like me have is, is remembering to always incorporate stakeholder input from people who, who you would not traditionally call stakeholders in your training."

-F7

4.5 Challenges to Increasing Stakeholder Engagement

Could you describe some of the challenges you believe you might face in using this model to do wildlife management in [Florida/Maryland]?

4.5.1 Funding

Is funding within the agency primarily driven by consumptive users? Or has the agency diversified funding sources? Is there a lack of funds? Opportunities for funding?

> *“There are only so many hours in a day, we only have so many people. If we had more money, we might be able to hire more staff. Or we could educate staff that we have more. It's just when you have a system that's running on basic capitalist rules, we can only do what the money allows us to do at this point."*
>
> *-M3*

> *"The hurdle of having enough resources to do it is paramount. Having professionals trained who can take those positions, and also having the resources to hire them, and to engage and create those processes that inform and engage stakeholders and the public."*
>
> *-F4*

> *"I know of colleagues in other wildlife agencies who don't have a research center, and they struggle with that because they don't have enough resources or support devoted to the actual science part of social science. And that is definitely a challenge. So that's, that's definitely, I would say a major challenge to incorporating social science methods."*

-F5

4.5.2 Educational Background and Manager Training

A review of classes taken during interviewees' education, whether these contained human dimensions or did not. Additionally, any workshops offered by the agency during their career, or if they have simply learned by doing over time.

> *"We've been trained to manage wildlife. We've not been trained to manage people. We've not been trained to communicate with people in a way that's not a bunch of technical jargon."*
>
> *-F2*
>
> *"The thinking like a manager training workshops that [Dan Decker] and I have done, we always included here's a primer on what social science is and how it is part fish and wildlife conservation. The last training that we did a couple years ago, we realized we're preaching to the choir here in terms of staff understanding what human dimensions is, and how sociology can note them."*
>
> *-F8*

4.5.3 Public Misrepresentation

Does stakeholder input only reflect the loudest person? How are differing views weighted appropriately? Are consumptive and non-consumptive users included? Is the sample of stakeholders the agency engages with representative of the greater population?

> *"We are not doing a good job including non-consumptive users. We are still stuck in the mode of hunters and fishermen. And, you know, that's who we*

speak to. And we have to somehow figure out how to properly, not only properly communicate, but honestly harness [non-consumptive users] to support wildlife.

-F2

"In Florida, a big stakeholder group that is traditionally not thought of in wildlife management are our inner-city Hispanics. They're a growing population. They have some opinions on wildlife but a lot of it's not what has traditionally been the, they're not a hunting and fishing segment that our managers have traditionally focused on. They're more of a non-consumptive user or opportunistic user of wildlife, that sort of thing. We haven't had a lot of programs targeted at that. So we have several groups like that, we have Hispanics as a whole, we have Cubans as a subset of that in inner city areas that we haven't focused on a lot."

-F7

"We have a system where we are supposed to consider public comment in a forum where not everybody is able to be engaged. The same people always come to commission events, right. You're not hearing a representative sample of your stakeholders. So, I have had the case where I've worked with biologists and managers to look at a conservation issue. It was a regulation, a fishing regulation. We solicited feedback from a wide variety, which I would consider a representative sample of the public and, it was scalloping, scallop anglers, I guess they would be considered, I'm not sure, scallopers. And they decided our results indicated one opinion about the regulation. Our biologists

presented that information at a commission meeting. And there were some members of a local marina from that area who came, made a big stink about it, and then the ruling wasn't changed in the direction that the survey indicated. We had done an entire scientific process to gauge public opinion, representative public opinion. And then the commissioners sided with the few members of engaged public that showed up at a commission meeting. So sometimes we end up with our decisions being captured by the people who show up to commission meetings. Other times when they say, please log our public comments and make a decision, those comments don't get used. But I think it's an issue. It's a politically important issue that might determine what they actually do with those comments. They're always logged, and they're always quote unquote, taken into consideration. But my issue with them is very rarely derived from a representative sample, actually, never by definition, and sometimes they get higher precedence than actual scientific results."

-F5

4.5.4 Priorities of Political Leadership

The influence of political leadership, and political atmosphere on pursued wildlife management policies, what is and is not funded.

"And of course, depending on who's hitting in the governor's office, or in the press, or in the presidency, particularly in a state level, who's sitting in the governor's office, you see different emphasis on enforcement of existing environmental regulations."

-M6

"A biological problem with a biological solution equals zero. That is zero because the solution cancels out the problem, and so you're good. A political problem with a political solution is the net zero, you're good, the solution cancels out the problem. However, when you have a biological problem with a political solution, then you end up with a biological problem and a political problem."

-F10

"We have constitutional authority, and that was that was done deliberately in Florida some 75-80 years ago now, rather than as Floridians saw the futility and folly of, it being Fish and Wildlife, being managed on a local scale, and based on the whims and vagaries of local politicians. So our seven-member commission, when you watch that process, that's the end. In fact, the Florida Legislature does not even have the authority to adopt rules. They do control our purse strings, at least they give us spending authority for some of those dollars."

-F1

4.5.5 Culture Shift

Do older generations hold persisting beliefs in managing wildlife only, driven by consumptive user values? Is a younger generation more open to including stakeholders?

"Some folks are even saying money derived from the fishing and hunting licensing, and from the excise taxes, that shouldn't even be spent on social

science. And that just appalls me that people still think that way. So I guess that would be something I would watch out for is just to know that that attitude is still alive and well in some corners of the country."

-F8

"So I guess it's there's a couple layers to this. One layer is sort of institutional culture. You know, a lot of a lot of times, we are recognized as, we as in FWC are recognized as experts in the biology or natural history of a system or a species or something like that. And a lot of the culture is that natural science will explain all and through natural science you achieve conservation. and we don't need to talk to people or we don't need to engage people because we're the experts. So I'm not sure if that's inherent to wildlife management as a concept. If that's sort of a, a cultural phenomenon that happens a lot by agencies, but that was my primary challenge was A, convincing people, convincing managers and biologists, that they needed to take into consideration people's opinions. And B, convince them that social science is a science, and that we have this level of rigor, and the same scientific method, just different contexts as quote unquote traditional science."

-F5

"States need to recognize the need for public buy-in. There is a legitimate reason why the public should be involved in the process, and how an agency can manage people. If agencies want to be relevant, you need to embrace human dimensions. Even if you don't like some things that are said, recognize that they're important."

-F2

4.5.6 Time

There is limited time available to complete wildlife management actions. Some decisions must be made quickly, eliminating the possibility of stakeholder engagement. A lack of funding also contributes to fewer manpower hours. Managers must decide which actions are completed, and which are not.

"We want them to understand what we are doing and we want to understand their point of view. But we have limited time and it takes more time to develop good communication with someone to to establish that rapport, rapport so. So we do what we can with the time available. And since a lot of our work is time sensitive, meaning we work with nature's schedule, there are certain jobs that have to be done at certain times of year based on the natural histories of the species that we're managing, or the ecosystems that we're managing. So we have to be able to plan enough ahead, so that we can set up a good rapport with our local stakeholders. And some people will take a little longer than others to understand what we're trying to say and it takes us a little longer to explain to them in a way that they will understand."

-M3

"Well some of the challenges is, well, as far as probably lack of manpower or a lack of staff to be able to maybe specialize and in certain areas. I mean, we do have I mean, we get calls and and we have to, you know, triage them, especially during our busy times. And, and sometimes we don't have the time to, to actually, you know, reach out to more of our stakeholders to, to get, you

know, to either educate them or to bring them into what we're doing. It's it, you know, sometimes it's all we can do to keep our heads above water, if you know what I mean. So, and I find myself, you know, yes, thinking about how we can be more proactive, that's my challenge, my personal challenge is having the time or the resources to be."

-M5

"There's some things that that are so fluid, and there's some decisions that we have to make relatively quickly. And so you can't always go through this deliberate, exhaustive, exhausting process with everything. I think you can go through a light version of a lot of it. And I think we've some others do that almost reflexively."

-F1

4.5.7 Priorities of Agency Leadership

Where do leadership positions within the agency direct manpower and funding? Who are they managing wildlife for? Who do they prioritize in this management?

"As we've done a series of workshops with sort of the same group of people, and as those folks moved into leadership positions, as they became a section leader or division director, it was their sort of behaviors and practices that modeled those new things that we wanted, engaging with stakeholders. And even working with our commissioners at our commission meetings, we don't even bring issues for their decision making without engaging stakeholders because that's one of the first things they ask, "What does the public think

about this? What do our stakeholders think about these regulatory issues or management plans?" And so it's just sort of baked into what we do."

-F8

"We have a huge amount of people down here, and it's a very diverse group of people. And we don't engage with most of them and that's the problem. And the reason we don't is because it's not a priority."

-F6

"Hearing from hundreds of thousands of Maryland hunters, they own the wildlife managers, regulatory captured by them, identify with them, deep down think they're right and everyone else is wrong."

-M1

4.6 Stakeholder Engagement Opportunities/Benefits

Proposed benefits of engaging with stakeholders as identified by interviewees. Opportunities to increase this engagement highlighted by interviewees without prompting.

"I think it's a good idea that the social side of this thing is something that's often missing from biological science. I mean, you will hear people say things like, I just don't understand why they can't understand what we want to do here. Why can't we get their support? And you know, the answer is that because you're missing something on the on the other side on the blue side of this equation, and I think that'd be helpful for people."

-M1

"My personal opinion is that having an open relationship with your stakeholders can only lead to better outcomes." "So more and more we are doing it because we have to, because we are just unable to do our job if we don't explain to the public upfront what it is we're doing."

-M3

"I was the chair of a Diamondback Terrapin Working Group on the Maryland Diamondback Terrapin Working Group for many years. And there was a lot of conflict between conservation of Diamondback terrapins and Watermen, and commercial Waterman. And so there was some efforts to alleviate some of those things. The same thing with snapping turtles, there still is a flowing commercial harvest reptile that we got in Maryland, but there still is a commercial harvest of snapping turtles and I was a coach here of a working group for that. And that, that that committee, that working group was actually made up of mostly Watermen with some scientists and resource agency people like myself in it. And so that was really interesting, because you got to see the other side of the coin, you know, what people are making a living off of the resource, what they're up against, and walk in their shoes a little bit. So I think when you get involved in these things, it's actually learning for everybody. It's not just we're not just the people running the show we actually learn from it too. That make, makes us, it probably makes us more human and makes us better resource managers because we become better people managers."

-M6

"It's clear that successful, successful programs need that public interaction. You know this social interaction. Your transparency and good outreach with the public builds trust and you know builds a relevancy for the agency in general and effectiveness for whatever programs you're, you're rolling out if you want those to be effective, long term you need that public input. Public buy-in." "And so there's a lot of need to inform, and the human wildlife conflict can provide opportunity to inform, reducing, that is really important to continuing and growing support for wildlife conservation."

-F3

"As far as the future goes, I mean, I think I think stakeholder engagement is critical. You have to have people involved. Because in order to be successful, you have that buy in at all levels. And so at some point in time, no matter what you do with wildlife it's gonna impact people. It's better to have them engaged and have a voice early on to help achieve that."

-F10

4.7 Influence of Native vs. Nonnative Species on Human Dimensions Perspectives

How are the stakeholders you identify actively involved in the management of [Feral Hogs/Black Bears/Wildlife] in [Maryland/Florida]? In its present form, would this model be useful for managing [Feral Hogs/Black Bears/Wildlife] in [Florida/Maryland]? Creating a management plan?

“Yeah. I mean, your question Can Yeah, can be used. I mean, yeah, I think it absolutely depends on what level right you know...But when you're the actual

manager making the call on stone crabs, right, you know, and you're, you got a million things going on, right and COVID-19 a pandemic, you know, and you got commissioners calling you and public yelling at you do this, do that. And I think it's hard, you know, for the individual manager to say, Oh, wait a second. Let me let me stop and and pull My, you know, my Dan Decker diagram, you know, or manual, you know, the the 60-page manual I have here and start going through it. And so, a couple different things. One is I think the trainings are good, right?...I remember earlier in this conversation talking to you that I was I was trying to distinguish, I forget what but distinguish between adaptive versus technical. You know, and that's, you know, that's, I think that's a part of some Dan's trainings, but, you know, there's, there's technical things you can do, right to fix something, fix a problem, you know, but then there's adaptive challenges that, you know, really need, you know, more adaptive solutions, you know, and changing the way you think."

-F6

"I think most states are far enough along where this kind of stuff is something they'd be willing to sit down and invest the time to figure out if it would work for them. They would have states like Florida and probably Missouri is another more advanced one, it's actually done a lot of this, saying yup it really helps, it helps us make better decisions, it helps us make decisions that stick with the public rather than constantly coming back for complaints and things like that. I think it would be useful for more states. I don't know how it works in the marine side. The marine side is where we have most of our public

controversy where we're actually telling people you can or cannot do this thing that affects your livelihood and how much money you make, that sort of thing. I don't know if they use things like this, or how well it works in that environment, but it works pretty well in the traditional wildlife side of things. The big difference is all the stuff we do doesn't tend to impact a lot of people who are making money. It affects some of the eco-tour people and things like that. But the fisheries decisions, every decision they're making is affecting a lot of peoples' livelihoods, and people are much more vocal when you're talking about their pocketbooks and specifics."

-F7

4.7.1 Native Species Influence: Black Bear (*Ursus americanus*).

How are the stakeholders you identify actively involved in the management of Black Bears in [Maryland/Florida]? In its present form, would this model be useful for managing Black Bears in [Florida/Maryland]? Creating a management plan?

"Oh, yes. Yeah. Yeah. I mean, definitely, I mean, my I, like I said, I consider myself more of the blue side, but I speak, sometimes daily, if not weekly, to our deer biologists or bear biologists or, you know, whoever that I need to, to, to, to bounce stuff off of, or, you know, because we as as far as the those of us are in wildlife response or more of the people human conflict side, we, we are we we come across maybe wildlife diseases quicker, because we get the calls on sick or injured animals. So then we will will funnel that back to our species biologists that rather quickly we know we have forms we have, you know, whether it be CWD, Chronic Wasting Disease, whether it be you know, mange

in bears, or rabies or whatever, we we always forward that back to our species biologists who know what the populations doing then, okay, know, what's been what it's been affected by."

-M5

"if you know ahead of time Oh man, we're gonna have to deal with black bear hunting again in two years or Goliath Grouper, you know, in three years, then then maybe we do a managers model. You know, that we're, we get we have time, right? And we could set up a And we do this for some of our thing, we'll set up about three days, you know, and ask, you know, some people to get together and really, you know, go through each of the steps, identify all the stakeholders, identify the desired future condition, you know, and then evaluate where you're at in that gap, and then, you know, fundamentals. And so yeah, we do use it, but if you don't have some leaders, that that almost make it mandatory. You know, it's, what happens is people get busy, right, and they kind of fall back to what their habits are, right? You know, they're there. That's inherent, you know, and can go back to your tribe, you know, and so if you were brought up in that biology green box tribes with things get stressful you're going, that's where you're going to go back to you know what I mean? Your tribe and and and it's it's hard when you're in the thick of it to really step back and analyze, you know the bigger picture."

-F6

4.7.2 Nonnative Species Influence: Feral Hog (*Sus scrofa*)

How are the stakeholders you identify actively involved in the management of Feral Hogs in [Maryland/Florida]? In its present form, would this model be useful for managing Feral Hogs in [Florida/Maryland]? Creating a management plan?

> *"I would not bring stakeholders to the table. The feral swine stakeholders are essentially hunters and pet people. People who are pet swine aficionados who have their swine free roaming or breaking the law. So I would not invite them to the table. And feral swine hunters have a goal and a set of beliefs that are antithetical to where I would want to get on a feral swine plan. The ecological and agriculture and economic damage from feral swine is so great that, to me, bringing someone to the table who, who likes to shoot them and would like to see them populate the area for their own gain is, to me that would be...I don't think they have a moral place at the table."*
>
> *-M1*

> *"Well, it depends on if, if the managers goal is to get rid of the species altogether, then yeah, maybe it's not a you know, it's not as applicable there. For example, we had nutria in, in Maryland. And yeah, there's an example where you know, but still parts of it are. I mean, it's still very helpful to get the stakeholder input and all that because of the, I don't know, it's just there, you're, you're almost using the model in reverse in that situation where it might be a good tool for you to show the stakeholders to get the information about the damage the species is causing. Whereas Normally, I think with native wildlife, we're using the stakeholders to you know, to collect*

information about what you know what they value with the with the population and the species. So I guess think of it maybe as a, you know, as a two way street, of course, and it may be more more applicable that way. I'd be interested to see what the hog biologists think."

-M2

"With hogs, you know that. Boy, I can only imagine what those guys are thinking because they've got the challenge of now you've got Outfitters and guides that are making their income on hog hunts and they don't want to you know, which We're lucky we don't have hogs established yet. So, you know, we don't have that. We've already decided that, you know, we won't allow that. But yeah, that those are some tough challenges. But again, this this should work in getting that information out why you should not want the hogs taking hold. Yeah, I do think it could be applicable those ways."

-M2

"Hogs, we got this conundrum in Florida, in that hogs are really bad for the environment but they're also a game species in wildlife management areas. So they make revenue, and they're panther food and they're also things hunters want to hunt. So it'll be interesting to see what you find out about how they handle all that. If you talk to agency, if you talk to our department of environmental protection and the parks people, they're like your Maryland people, hogs are bad all the time, everywhere, kill every single one you see, we gotta get rid of them completely. And the commissions sort of this well we know they're bad, and they're bad for the environment, but they're a game

species, and people want to hunt them, and they generate revenue, and all this other stuff. It's been a sticky point for us. Every year we have fewer and fewer hunters so I think the question will ultimately get down to to the environmental damages outweighing the needs of constituents but we'll see."

-F7

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