

**Characterization and communicative analysis of wildlife managers and  
recreational users of Virginia's Wildlife Management Areas**

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## **(ABSTRACT)**

The Virginia Department of Game and Inland Fisheries (VDGIF) manages wildlife management areas (WMAs) to provide wildlife habitat and hunting and fishing opportunities, along with opportunities for compatible wildlife-related recreation. Despite having responsibility for managing 39 WMAs, comprising more than 200,000 acres, VDGIF had only anecdotal information about who recreated on Virginia's WMAs, to what extent, and how they felt about management of the WMAs. My goals were to (1) determine the types and amount of recreational use WMAs receive, (2) describe and compare VDGIF managers' and WMA users' current attitudes and perceptions toward land management, and (3) determine if a methods bias existed between surveys administered online and through U.S. mail.

I observed diverse recreational use totaling > 90,000 annual recreational user days on the 10 WMAs included in the study. Most visitors were satisfied with their visit, agreed with the use of most land management practices presented, and were willing to continue to visit a WMA if an annual fee was imposed.

Co-orientation analysis revealed low agreement and low accuracy, suggesting a need to improve awareness and recognition of managers' and stakeholders' attitudes toward land management. Addressing areas where agreement already exists, but may not be recognized, should be a top priority. Areas of greater disparity will prove difficult to address, but attention is critical to successfully implement WMA management objectives. Wildlife value orientations

differed between VDGIF managers and WMA users; VDGIF personnel were predominantly Utilitarian (54%, n=35), whereas WMA users were predominantly Pluralist (63%, n=381).

Value orientations did not relate strongly to opinions of land management.

Demographics differed between web and paper respondents, with slightly younger, more urban and more educated respondents electing to complete the web-based survey more often.

Value orientations toward wildlife and attitudes toward land management did not differ between web and paper respondents, suggesting little influence of values and attitudes on the survey mode selected.

Increasingly diverse stakeholders and limited funding sources continue to challenge state wildlife agencies. Specific engagement techniques should strengthen interpersonal relationships and collaboration between the agency and its stakeholders.

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## **Chapter 1:**

### **Introduction and Literature Review**

Natural resource managers often make decisions based, in part, on their perceptions about stakeholder views (Leuschner et al. 1989). However, studies suggest that the values, opinions, and perceptions of biologists charged with managing natural resources may often differ from those of their stakeholders (Peyton and Langenau 1985, Absher et al. 1988, Kearney et al. 1999, Bradley and Kearney 2007). As management of public lands becomes increasingly complex, many agencies want to know more about their stakeholders and involve them in developing management plans. Many agencies now recognize that public involvement is an important and necessary process in developing management goals; it can build acceptance and support from their stakeholders (Shindler et al. 2002) and to reduce conflict (Twight and Catton, Jr. 1975, Vining and Ebreo 1991, Martin et al. 2000), but the time and cost involved often may discourage an agency from using public involvement strategies (Absher et al. 1988).

The Virginia Department of Game and Inland Fisheries (VDGIF) owns and manages 39 wildlife management areas (WMAs) comprising over 200,000 acres that provide and enhance wildlife habitat and offer public hunting and fishing opportunities in Virginia. Little is known about area use or the full range of recreation that occurs there, in addition to hunting and fishing. To assess whether communication between VDGIF and WMA recreational users (stakeholders) can be strengthened, I used the co-orientation model to identify issues and educational needs related to land management practices currently implemented or considered for potential future use on these WMAs. I also examined wildlife value orientations to better understand the values and beliefs of VDGIF employees and a segment of their stakeholders and further explain co-

orientation results. By understanding the views and assumptions of their stakeholders, VDGIF can work to reduce conflict while better serving their constituents.

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 87.5 million people participated in wildlife-related recreation in the United States in 2006 (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). Over the last 15 years, wildlife watching participation has been increasing (71.1 million participants in 2006) while hunting and fishing participation declined slightly (33.9 million participants in 2006) nationwide (Figure 1-1). Broad demographic and social changes, such as urbanization and an aging population, have contributed to the decline in hunting and fishing participation in the U.S. (Bissell et al. 1998). Of the 23 million people who traveled away from their homes to view wildlife in 2006, more than 80% visited a public area to view wildlife (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). While in many cases, actual visitation to state parks, national parks, and wildlife refuges have remained relatively stable in recent years, these changes between consumptive and non-consumptive wildlife-related recreation participation may contribute to a shift in composition of users of public lands (Cordell et al. 2008).

WMAs provide opportunity for both traditional wildlife recreation (i.e., hunting and fishing) and non-consumptive wildlife-related recreation uses, the latter of which is perceived to be increasing (Cordell and Tarrant 2002, Cordell et al. 2002, U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). Declining participation in hunting and fishing is well documented (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006, La Roe et al. 2009), but little information exists regarding other stakeholders who recreate on public hunting and fishing lands (Decker and Chase 1997). Because WMA stakeholders and the ways in which they use WMAs appear to be changing, many state agencies are interested in learning more about their

stakeholders. Hunters, anglers, and non-consumptive users of WMAs may have different or conflicting attitudes about management of state lands. Those charged with managing natural resources should, within the constraints of their agency missions, look for common interests or overlap among the opinions and attitudes of consumptive and non-consumptive user groups (Jacobson and Marynowski 1997). With new stakeholders coming to the table, state agencies may need to re-evaluate traditional public relations efforts and tailor communication more effectively toward their changing constituencies.

This research applies useful and specific new knowledge about co-orientation theory to the human dimensions arena of wildlife science and will serve to improve communication between VDGIF and its stakeholders. The methodology and results likely will be of interest to other state natural resource agencies, which currently face similar issues of multiple use and funding deficits with their own WMAs.

## **Goals and Research Questions**

The overall goals of this research were to (1) identify the types of uses that presently occur on select WMAs in Virginia and estimate the extent of those uses, and (2) assess the current state of attitudes toward land management between VDGIF and its stakeholders who use Virginia's WMAs, and, where necessary, develop recommendations on how to improve communication. I addressed these goals by answering the following research questions:

1. What types of recreational use currently occur on WMAs in Virginia? How much annual use do WMAs receive? (*Chapter 2*)
2. How do agreement, accuracy, and congruency of the attitudes and opinions about common land management practices differ between VDGIF personnel and WMA users? (*Chapter 3*)

- a. How can communication between VDGIF personnel and WMA users be improved?
3. How do wildlife value orientations differ between VDGIF managers/biologists and WMA users? (*Chapter 3*)
  - a. Do wildlife value orientations help explain attitudes toward land management as expressed through co-orientation?
4. In the context of WMA recreational users, does a method bias exist between the administration and completion of web-based versus paper mail surveys? Do patterns exist among respondents that select either method? (*Chapter 4*)

### **Value framework**

In addition to applying co-orientation to compare opinions and attitudes of VDGIF employees and WMA users, I also incorporated value orientations of VDGIF employees and WMA users that influence their attitudes and beliefs toward wildlife. Many natural resource professionals believe that public values toward wildlife have changed dramatically in recent years, gradually shifting away from traditional values that emphasize the use and management of wildlife for human benefits (e.g., hunting and fishing participation) toward a preservationist attitude of wildlife and natural resources (Manfredo and Zinn 1996; Zinn et al. 2002; Teel et al. 2005, 2007). The shift away from traditional wildlife use will continue to influence wildlife management, and already has resulted in conflict between stakeholder groups with traditional and non-traditional views (Vaske and Donnelly 1999, Cordell and Tarrant 2002, Manfredo et al. 2003, Teel et al. 2005).

Values provide the foundation for an individual's belief system and act as his/her reference point for evaluating views of the world. Values form early in life and are further shaped by societal conditions, family, and friends. Values directly influence an individual's attitudes (i.e., favorable or unfavorable evaluations of an entity) and beliefs (i.e., thoughts about specific objects or issues) toward wildlife and natural resources (Vaske 2008). Value orientations are expressions or patterns of one's basic beliefs, providing insight into why individuals or groups hold the opinions they possess (Manfredo et al. 2003, Teel et al. 2007). Although values generally are difficult to change, basic beliefs concerning the application of those values to an individual's life within a specific context may vary widely, resulting in variability in attitudes and behaviors (Eagly & Chaiken 1993, Fulton et al. 1996, DeRuiter and Donnelly 2002, Teel et al. 2005). For example, an individual may have different attitudes or exhibit different behaviors based on circumstances, context, and environmental characteristics. Wildlife value orientations can help researchers make predictions about patterns of attitudes and behaviors associated with a set of wildlife issues (Fulton et al. 1996, Teel et al. 2005).

The utilitarian and the mutualism scales can be used to segment publics into 4 value orientation "types" that may respond similarly to management actions or wildlife issues (Teel et al. 2005, Figure 1-2). The utilitarian value orientation scale consists of utilitarian and hunting belief dimensions, whereas the mutualism value orientation scale consists of mutualism and caring belief dimensions. Given the primary goal for WMAs is maintaining and enhancing habitat for wildlife, understanding the orientation of different stakeholder groups toward animals and wildlife can help managers predict conflicts that may arise regarding wildlife-related recreation or disagreements related to land management on WMAs.

Utilitarians (as classified by a high score on the utilitarian scale and a low score on the mutualistic scale) believe that wildlife should be used and managed for the benefit of humans and human needs should be prioritized over those of wildlife. Mutualists (as classified by a low score on the utilitarian scale and a high score on the mutualistic scale) hold a protectionist view toward wildlife and natural resources and believe that humans and wildlife should co-exist in harmony. Pluralists (as classified by a high score on the utilitarian and the mutualistic scales) hold both utilitarian and mutualistic values, and their opinions can vary based on the circumstances of different issues. For example, an individual may not participate in hunting personally, but may support others' participation in the sport and enjoy eating game meat. Distanced individuals (as classified by a low score on the utilitarian and the mutualistic scales) may have less interest in wildlife-related issues, or simply hold neither utilitarian nor mutualistic views toward wildlife (Teel et al. 2005).

Natural resources managers may hold values toward wildlife and natural resources that differ from those of their stakeholders. Although it may be possible to influence public attitudes or beliefs toward a certain issue, attempting to change individuals' values is an unrealistic goal (Fulton et al. 1996, Vaske and Donnelly 1999). However, because value orientations influence attitudes toward wildlife, natural resource managers need to understand the values and value orientations of their stakeholders (Tarrant et al. 1997, Bright et al. 2000). Also, the agency can enhance communication between managers and their stakeholders by developing messages that incorporate knowledge of stakeholders' values (Purdy and Decker 1989, Muth and Jamison 2000). Knowledge of stakeholder value orientations can help managers identify the public's desired goals for management, choose publicly acceptable techniques to achieve those goals,

recognize conflicts that may arise from technique implementation, and develop a framework to evaluate public satisfaction with the techniques selected (Bright et al. 2000).

## **The co-orientation model**

Co-orientation attempts to measure the degree of understanding between members of two parties (in this case, an organization and its stakeholders) by identifying similarities and differences in viewpoints and assumptions these members hold. Co-orientation can be applied to understand two-way, symmetrical communication in which an organization communicates its values or position to its publics, actively listens to its publics' values or positions, and works to negotiate a solution that balances the needs and desires of both parties (Dozier et al. 1995, Grunig 2001). In other words, potential exists for stakeholders to influence the organization as much as the organization influences its stakeholders (Kutzschenbach and Bronn 2006). Co-orientation theory suggests that communicative behavior includes internal thinking as well as one's perceptions of the views that others hold and how those views align with their own (McLeod and Chaffee 1973, Figure 1-3). Co-orientation involves measuring three different relationships that are essential to meaningful communication: agreement, accuracy, and congruency.

Agreement refers to the extent to which an organization (e.g., VDGIF) and its stakeholders (e.g., WMA users) hold similar views toward a situation or issue (Brønn and Brønn 2003). The agreement relationship identifies the degree of similarity between the organization's definition (knowledge) and evaluations (opinions and attitudes) and the definition and evaluations of its stakeholders (Broom and Dozier 1990, Leong et al. 2008). While the co-orientation model identifies the construct as "agreement," high agreement between parties does

not always imply support. For example, both groups could disagree with an action or issue, yet agreement in the co-orientation sense remains high since the groups share similar views.

Understanding first how one party sees an issue is an important step to perceiving how someone else views the same issue.

Accuracy involves comparing one party's estimate of the attitudes and beliefs of the other party to that party's actual attitudes and beliefs (Figure 1-2). I applied two measures of accuracy in this case: first, what do VDGIF managers believe their stakeholders think about management practices, and second, what do the stakeholders believe VDGIF managers think about those same management practices (Figure 1-2)? In other words, each party develops an image of the other party's interpretation of the issue (Brønn and Brønn 2003).

Congruency (or perceived agreement) involves the extent to which each party's estimate of the other's attitudes and beliefs is similar to their own (Figure 1-2). This measure does not describe the relationship between the organization and its publics directly, as agreement and accuracy do, but rather, it examines how one side views the relationship between the two groups (Leong et al. 2007, 2008). Although not a direct measure of the relationship, congruency influences how one party deals with the other in the relationship (Broom and Dozier 1990), and may influence other communicative factors such as willingness to negotiate (Christen 2005). I applied two measures of congruency: VDGIF managers' perceived difference from their stakeholders, and WMA users' perceived difference from VDGIF (Figure 1-2).

The ability of one party to predict the other's views provides a measure of their co-orientation, and ultimately should influence communication (McLeod and Chaffee 1973). The co-orientation model provides a level of detail that goes a step above audience characterization, and may help decision makers in an agency who seek to improve communication with

stakeholders (Leong et al. 2008). Using the co-orientation model to thoroughly evaluate views and perceptions beyond the level of audience characterization then can lead to the development of possible prescriptive actions that may improve that relationship (Seltzer and Mitrook 2009). Inaccurate perceptions of either party can be recognized and corrected during the agreement stage. For example, if findings indicate that stakeholders have misconceptions about the definition or application of a given management technique (e.g., use of herbicides), VDGIF can attempt to provide more descriptive information about the technique to their stakeholders. When an organization wants to improve the effectiveness of its communication efforts, focusing on the accuracy component (i.e., recognizing the other party's position) usually is the first step.

Social trust also influences relationships between agencies and their publics. Previous research has described social trust in terms of perceived understanding or connectedness, namely through shared values, directions, goals, views, behaviors, and ways of thinking (Earle and Cvetkovich 1995, Winter et al. 1999). The belief that these characteristics and experiences contribute to a shared understanding between the entities usually results in greater trust. Social trust applied to an institutional setting can be defined as the willingness to rely on agencies or organizations with the responsibility for making management decisions and taking action (Siegrist et al. 2000). When salient value similarities are perceived to be high between managers and publics, the perceived risk for members of the public is lower because individuals charged with the management responsibility are acting on what are believed to be acceptable goals and procedures (Siegrist et al. 2000). Perceived similarity tends to predict social trust; people who perceive similar views with the managing agency tend to trust that agency more than those who do not (Siegrist et al. 2000, Cvetkovich and Winter 2003, Vaske et al. 2007).

Many researchers and agencies now recognize the importance of trust for maintaining and enhancing relationships with communities (Leahy and Anderson 2008). Stakeholders' perceptions of trust and legitimacy strongly relate to voluntary compliance with regulations even when stakeholders disagree with those regulations (Tyler 1998, Stern 2008a). Stakeholders are less likely to actively oppose management when they believe that managers are fair and honest with stakeholders (Stern 2008b). Cvetkovich and Winter (2003) found that trust in managers was strongly related to stakeholders' evaluation and acceptance of forest management practices. Additionally, organizations that are trusted by their stakeholders can work more effectively by reducing the need to continuously explain and defend management decisions and policies (Cvetkovich and Winter 2003). Public distrust in agencies can result in alienation, fear, skepticism, and opposition (Wondolleck and Yaffee 2000), which can have serious consequences for political and financial support of the agency or organization.

Collaborative, participatory decision making is more likely to result in lasting and satisfying decisions (Bierle and Konisky 2000). Successful participation has been associated with several attributes, including the quality of the deliberative process (e.g., fairness, quality of communication), two-way communication between the agency and the public, the commitment of the agency (Bierle and Konisky 2000), all of which the agency can influence. Decision makers employ collaborative methods to recognize public preferences and incorporate them into decisions, improve decisions by using local knowledge, enhance fairness and justice, and support public decisions through measurable collaboration efforts (e.g., x public meetings, 30-day public comment period) (Innes and Booher 2004). Collaborative decision making is an inclusive effort designed to solve problems through dialogue (Innes and Booher 2004), and should serve to separate people from the problem and separate interests from positions (Fisher et al. 1991).

Social trust has relevance for co-orientation theory, suggesting the perception of similar values and shared understanding enhances the relationship between an agency and its publics. In particular, salient value similarity may play an important role in understanding the congruency element (i.e., perceived agreement) of co-orientation. Co-orientation can help natural resource managers (1) identify areas of shared agreement (i.e., salient value similarities), (2) identify areas where dialogue and interaction may be appropriate to address disagreement or misunderstanding, and (3) develop and build collaborative relationships with stakeholders.

### **Potential co-orientation outcomes**

Four situations may result from co-orientation research: true consensus, dissensus, false conflict, and false consensus (Broom and Dozier 1990, Figure 1-4). True consensus occurs when both agreement and accuracy are high. In other words, the organization and its stakeholders share similar views on an issue and recognize the shared agreement. Dissensus occurs when low agreement and high accuracy exist; the organization and its stakeholders do not agree, but they recognize that this disagreement exists. There are two false states possible if either the organization or its stakeholders (or both parties) hold inaccurate views of the other's positions on the issue. High agreement and low accuracy result in false conflict. In false conflict, the organization and its stakeholders actually agree on an issue, but incorrectly believe that the other party holds an opposing position. False consensus occurs when both agreement and accuracy are low; the organization and its stakeholders do not agree, but mistakenly believe that they do agree on the issue.

The two false states can be particularly detrimental to public relations efforts between the organization and its stakeholders because miscommunication occurs. For example, perhaps

wildlife managers and users of public land both recognize the value of timber harvesting to create or enhance habitat for some wildlife, but the agency mistakenly believes that users do not support any harvesting and the users mistakenly believe that managers want to cut every tree on the property (i.e., high agreement and low accuracy). These misunderstandings can mask areas of understanding and agreement on the issue, making communication and collaboration more difficult.

Differences in perspectives and the lack of awareness of these differences can lead to unsuccessful efforts in communication, education, and collaborative planning (Kearney et al. 1999). Facilitating the exchange of perspectives between the agency and its stakeholders can strengthen communication. In true consensus and dissensus, the organization and its stakeholders express awareness of the other party's position. When dissensus occurs, a negotiation process that employs dialogue and two-way communication is appropriate to go beyond defending one's committed position (i.e., positional bargaining) and meet the real underlying concerns of the parties (Fisher et al. 1991). Positional bargaining is time-consuming and inefficient, and may prevent parties from reaching an agreement because defending a position serves to convince everyone involved of the impossibility for change or resolution. Positional bargaining also endangers ongoing relationships as a result of bitter feelings and dissatisfaction with the outcome. Principled negotiation offers an alternative to positional bargaining that involves separating the people from the problem (i.e., "be soft on people and hard on the problem" p.13), focusing on interests rather than positions, identifying options for mutual gain before making a decision, and basing the result on some objective standard (Fisher et al. 1991).

In false conflict and false consensus, accuracy, or the understanding of the other party's position, needs improvement. In false consensus (i.e., low agreement), opportunity exists for both internal and external strategies designed to change views and correct misperceptions of the organization and/or the stakeholders (Von Kutzschenbach and Brønn 2006, Leong et al. 2007). When false conflict occurs, communication plans frequently target an increase in congruency because agreement actually is present, but not realized by the organization or stakeholders (Von Kutzschenbach and Brønn 2006). Although disagreement itself can hinder effective communication, some communicative issues may improve substantially by focusing initially on correcting inaccurate perceptions and misunderstandings (i.e., accuracy and congruency).

Although organizations traditionally utilize manipulation or persuasion to attempt to influence views of stakeholders, in some cases, the organization can move its position (within its defined mission) closer to its stakeholders' views to improve communication efforts (Broom and Dozier 1990). While agency personnel are the technical "experts" in their fields, they ultimately make decisions and take management action on behalf of the values and goals of their constituents. By respecting and being responsive to stakeholders' desires, positions, and needs, agencies can improve legitimacy and their relationship with stakeholder groups. While some issues may require managers to educate stakeholders about the technical background and feasible management techniques for achieving desired goals, other issues may require managers to inform themselves about the values and goals of their stakeholders.

Two-way symmetrical communication methods, such as co-orientation, use conflict resolution strategies and negotiation to increase an organization's understanding of its stakeholders and their views. Traditionally, natural resource agencies have practiced asymmetrical two-way communication. In asymmetrical communication, an organization uses

persuasion and manipulation to shape public attitudes and behaviors through “one-way” media such as press releases, brochures, and mailings meant to control the flow and content of the information (Dozier et al. 1995, Shindler et al. 2002). Although organizations often invite stakeholders to provide comments or input during asymmetrical processes, stakeholders generally are not included at the table throughout the entire process; they are involved more as a formality rather than a cooperative engagement involved in true collaboration with the agency. Although both asymmetrical and symmetrical two-way communication can be effective under specific circumstances, organizations may find that many controversial and/or policy-related issues will be resolved more effectively through symmetrical communication in which open, interactive forms of negotiation are used rather than persuasion (Booher and Innes 2002, Shindler et al. 2002). Understanding other perspectives on an issue, and working toward areas of shared views, can improve not only communication, but also may result in a mutually beneficial outcome for all parties (Gregory and Keeney 1994, Dozier et al. 1995, Kearney et al. 1999, Grunig 2001).

When the results of co-orientation suggest that inaccurate perceptions exist, communication efforts between both parties can serve to strengthen relationships. Organizations can learn from their stakeholders by investigating and then incorporating knowledge of demographics, knowledge, values, and attitudes into decision making (Jacobson and Marynowski 1997). In many cases, discrepancies in agreement and accuracy can be mitigated with a well-designed communication program that addresses the identified deficits in knowledge and increases awareness about the issue (Broom and Dozier 1990). However, simply providing accurate information to an audience does not ensure understanding or public acceptance, especially when legitimacy and trust are compromised. People tend to use scientific information

along with personal experiences to make judgments about issues; therefore, it is very important to tailor public education programs specifically to the intended audience and ensure that they are engaged in the process (Shindler et al. 2002).

Recognizing factors associated with both successful and unsuccessful educational programs can allow agencies and personnel to make informed decisions of appropriate communication techniques based on the context and allow for necessary adjustments to the message. For example, Racevskis and Lupi (2006) found that rural survey participants in the Upper Peninsula of Michigan better understood the need to balance forest resource extraction and resource protection, whereas urban residents had greater interest in the recreational benefits from natural areas. Therefore, given the differences in respondents' attitudes toward natural areas, traditional wildlife agency messages focused on balancing forest use and protection likely would be most effective with rural residents, whereas more contemporary messages focused on personal recreational use of the forest may be more effective with urban residents (Racevskis and Lupi 2006). Because respondents use their experiences to relate to forest issues, tailoring the message directly to the intended audience(s) is a critical component for successful communication. Since many wildlife agencies simultaneously communicate with multiple stakeholders, the importance of understanding the interests of these diverse stakeholders becomes even more critical to successful public relations.

## **Opinions of natural resource managers and stakeholders**

Previous research in the outdoor recreation field has shown that managers' predictions of users' opinions vary widely. Managers seemingly are able to predict responses of their stakeholders to general management policies, but are less accurate with more specific or complex

issues when the possibility of user conflict exists (Hendee and Harris 1970, Absher et al. 1988). Managers of outdoor recreational sites also tend to predict accurately the opinions of users when public opinion aligns with their own (Absher et al. 1988). Historically, managers have greater awareness of the preferences of their traditional stakeholders (i.e., hunters, anglers, and trappers) who directly support the agency through license fees and excise taxes on hunting and fishing equipment. However, many state wildlife agencies have weaker relationships with other non-traditional recreational user groups (Decker and Chase 1997). Wellman et al. (1982) found that managers could predict the preferences of hikers in a national park, but were less accurate with predicting preferences of other recreational groups, such as off-road vehicle users at a national seashore. Peterson (1974) found that managers and users of the Boundary Waters Canoe Area generally agreed on the goals of wilderness management, but had different opinions regarding what constitutes appropriate activities for the site. Rosenthal and Driver (1983) found that managers successfully predicted user preferences for experiences, which may be easier than predicting preferences for specific management actions or situations.

Several studies in forestry and fisheries and wildlife employed the co-orientation approach to assess perceptions of managers, leaders, or resource providers and their stakeholders. In a study of three U.S. Forest Service planning processes, Twight and Paterson (1979) found that stereotyped misconceptions existed about the agency's position, and that stakeholders and the Forest Service exaggerated perceived disagreement. This research illustrates the concepts of separating people from the problem and interests from positions associated with principled negotiation as described by Fisher et al. (1991). Murphy and Dee (1992) compared the positions of corporate policymakers from DuPont and environmental activist leaders from Greenpeace. Surprisingly, they found value agreement between the two

parties, but participants perceived drastic differences between their own positions and the other party's position, which hindered communication efforts. Connelly and Knuth (2002) compared views of local residents regarding ecosystem restoration of the Hudson River estuary to views of local community leader groups. They found that (1) the two parties did not agree completely, but some overlap in their views occurred, and (2) community leaders could not predict accurately views of local residents because of low congruency between leaders and local residents (Connelly and Knuth 2002). Von Kutzschenbach and Brønn (2006) researched perceptions of sustainable development in the forest certification process between forest owners and end consumers of forest products. They found three states of co-orientation existed (i.e., dissensus, false consensus, and false conflict) for the components of sustainable initiatives they identified (i.e., social responsibility, environmental initiatives, and organizational initiatives). Von Kutzschenbach and Brønn (2006) presented strategies for improving the communicative environment, from organizational reflection and assumption surfacing, to improved stakeholder management and dialogue. Leong et al. (2008) used co-orientation to compare views of decision makers and local residents regarding deer management on open space lands owned by Cornell University. Decision makers and residents generally agreed that they desired some deer in the community, but the researchers identified other areas of false conflict and false consensus that could be addressed to improve communication effectiveness between the parties.

### **Co-orientation of natural resource managers and stakeholders**

Researchers have applied co-orientation to evaluate the effectiveness of communication in other fields, such as education (Williamson 2010), customer service (Jones 1993, Seltzer 2007), non-profit organizations (Waters 2007, Ryan 2009), transportation (Carson 2005), and

health care (Kelly et al. 2006), but co-orientation has been applied relatively infrequently in natural resources. Existing studies in natural resources focus more on the agreement relationship between opinions of managers and their stakeholders (Hendee and Harris 1970, Twight and Catton, Jr. 1975, Peyton and Langenau 1985, McCool et al. 1986, Leuschner et al. 1989, Phillips et al. 1998, Bradley and Kearney 2007), rather than including some measure of accuracy and/or congruency along with agreement to measure a deeper understanding (Twight and Paterson 1979; Absher et al. 1988; Connelly and Knuth 2002; Leong et al. 2007, 2008). Although some studies in natural resources employed co-orientation to examine communicative relationships, a gap in the research exists; researchers have yet to implement the full co-orientation model to examine the relationship between a state wildlife agency and a segment of its stakeholders.

The co-orientation model is a powerful research tool, but it appears underutilized in public relations research (Cutlip et al. 2000), especially in natural resources. Many existing co-orientation studies focus on the views and perceptions of stakeholders, but ignore views and perceptions of the organization (Kelly et al. 2006), which may result in ineffective or inappropriate communication efforts if inaccurate perceptions exist on either side. My research will draw from earlier two-way complete-design co-orientation studies in other fields and apply the concept with a wildlife agency and a segment of its stakeholders (i.e., recreational users of WMAs).

### **Mail vs. Web-based surveys**

Since the 1970s, researchers have observed gradual declines in the response rates for surveys regarding natural resource issues (Connelly et al. 2003). Because of this decline, practitioners need to carefully consider the administration of natural resources surveys.

Researchers should choose a distribution mode that meets the needs of the study, but also remains as economical as possible, given the individual circumstances and resources available.

### **Paper-based survey administration**

Practitioners frequently use mail surveys to collect information on a broad range of issues, especially in large projects when a reasonably accurate sample address list is available for a population (Vaske 2008). However, mail surveys can be expensive to administer due to postage and other supplies needed, and costs in time and personnel to prepare mailings, check in returned surveys, and enter data electronically for analysis. Mail surveys also take time to implement; they usually require several mailings that can span several weeks. Because mail surveys are self-administered, the practitioner has limited control over item completion mistakes on closed-ended items (e.g., filling in a number when a true/false answer is requested) and ensuring the intended participant actually completes the survey.

### **Web-based survey administration**

Practitioners turned to web-based surveys in recent years as more people gained access to the Internet. Electronic survey distribution often costs less than a comparable mail survey and usually results in a more rapid response (Ladner et al. 2002, Fleming and Bowden 2009, Greenlaw and Brown-Welty 2009). Web-based surveys also provide flexibility in survey format, including the option to skip questions not relevant to the respondent, initiate pop-up windows with additional information, and incorporate visual and audio components (Fleming and Bowden 2009). Also, practitioners can transfer web-based survey data quickly and efficiently to a spreadsheet for analysis, eliminating the need for data entry required by mail surveys. Previous

research has suggested other advantages of web-based surveys: the software can prevent item completion mistakes on closed-ended items (e.g., filling in a number when a true/false answer is requested), and respondents tend to leave fewer items blank or, alternatively, answer more questions in the web-based version when compared with a paper version (Kiesler and Sproull 1986). Web-based surveys have been most effective when administered to an educated population with access to the Internet (Bachmann et al. 1996, Greenlaw and Brown-Welty 2009).

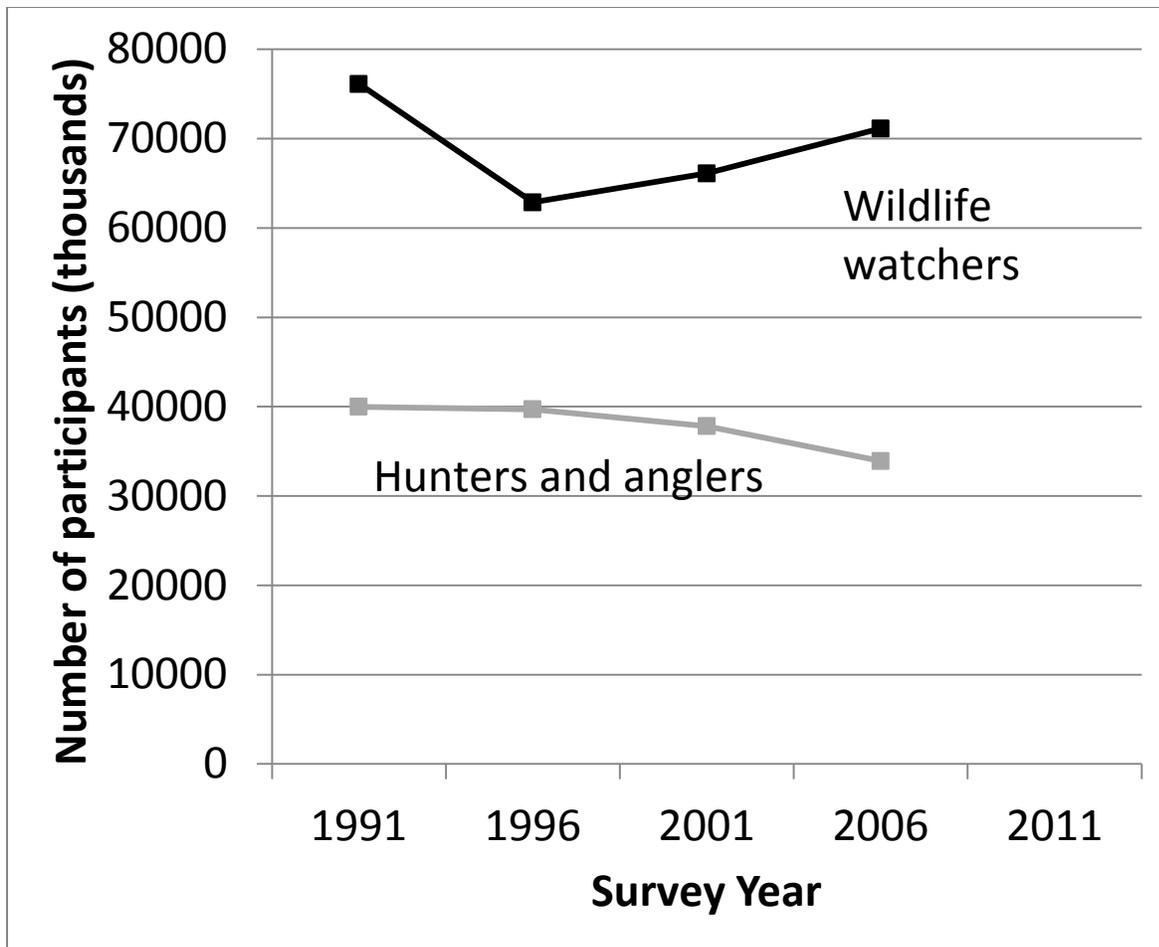
One disadvantage of web-based surveys remains the challenge of producing a random sampling frame. For example, a practitioner can obtain a web-based sampling frame of professionals where employees within an agency or organization all have access to e-mail addresses and access to the internet. While a practitioner can obtain a random sample of households to sample the general public in a mail or telephone survey, obtaining a representative sample for a web-based survey remains challenging because not all individuals have an e-mail account and/or access to the internet (Truell et al. 2002). Duda and Nobile (2010) questioned the use of online surveys, suggesting the near impossibility of generating a probability sample of the target population for a web-based survey. Respondent panels generated by companies that administer web-based surveys may come close to achieving a probability-based sample. These companies use alternative strategies, such as weighting the sample of contacts using Census data, employing broad search engines to locate email addresses, or providing means to access the internet to those without them (Cornicelli and Grund 2011); however, adequate representation of lower socioeconomic classes or those without internet access remains difficult to achieve.

Response rates from web-based surveys can vary greatly depending upon the targeted audience and their access to or use of the internet (Weible and Wallace 1998). While non-response bias remains a concern for any type of survey, web-based surveys typically receive low

response rates (Schuldt and Totten 1994, Tse 1998, Weible and Wallace 1998) making non-response particularly problematic (Fleming and Bowden 2009). Furthermore, practitioners rarely have another form of contact information (e.g., phone number, mailing address) to facilitate a formal check for non-response bias in web-based survey data. Additionally, respondents to web-based surveys tend to be more urban, younger individuals with access to the internet (Bachmann et al. 1996, Greenlaw and Brown-Welty 2009), which may pose validity concerns when this method is employed alone.

### **Mixed mode surveys**

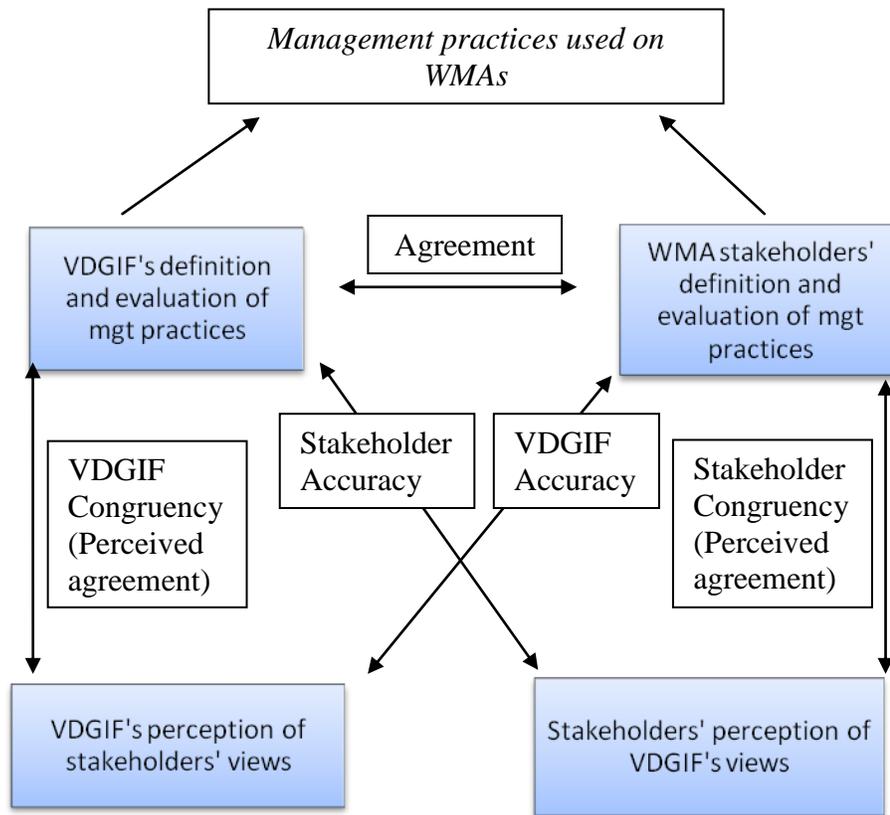
Mixed mode surveys, or those distributed using multiple methods of contact, allow researchers the opportunity to compensate for weaknesses in each mode and give respondents a choice of mode to complete the survey. One researcher found that when given the option for mode of completion (either mail or Web-based in this case), respondents replied to a greater extent and selected the Web-based option more frequently (Greenlaw and Brown-Welty 2009). However, when a researcher uses two or more different versions of a survey document, respondents may respond differently to each mode (Dillman 2000) because of differences in format or administration. Therefore, practitioners need to consider a methods bias check to identify any differences in responses.



**Figure 1-1.** Wildlife-related recreation participation reported by respondents to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006).

		Utilitarian Value Orientation	
		Low	High
Mutualism Value Orientation	Low	<i>Distanced</i>	<i>Utilitarian</i>
	High	<i>Mutualist</i>	<i>Pluralist</i>

**Figure 1-2.** Four types of respondents identified on the basis of their wildlife value orientations (adapted from Teel et al. 2005:8).



**Figure 1-3.** Co-orientation conceptual model (adapted from McLeod and Chaffee 1973:484) in the context of this study.

		<b>Accuracy</b>	
		<b>Low</b>	<b>High</b>
<b>Agreement</b>	<b>Low</b>	<i>False consensus</i>	<i>Dissensus</i>
	<b>High</b>	<i>False conflict</i>	<i>True consensus</i>

**Figure 1-4.** Potential outcomes of co-orientation research based on levels of agreement and estimates of agreement for the other party (accuracy). When accuracy is low (i.e., one group does not understand the position of the other), public relations efforts can be inhibited.

## Literature Cited

- Absher, J.D., L.H. McAvoy, R.J. Burdge, and J.H. Gramann. 1988. Public and commercial managers predicting recreationist opinions. *Journal of Park and Recreation Administration* 6:66-77.
- Bachmann, D., J. Elfrink, and G. Vazzana. 1996. Tracking the progress of e-mail vs. snail mail: gap narrows on response rates, but applications still limited. *Marketing Research* 8:31-35.
- Bierle, T.C., and D.M. Konisky. 2000. Values, conflict, and trust in participatory environmental planning. *Journal of Policy Analysis and Management*. 19:587-602.
- Bissell, S.J., M.D. Duda, and K.C. Young. 1998. Recent studies on hunting and fishing participation in the United States. *Human Dimensions of Wildlife* 3:75-80.
- Booher, D.E., and J.E. Innes. 2002. Network power in collaborative planning. *Journal of Planning Education and Research* 21:221-236.
- Bradley, G.A., and A.R. Kearney. 2007. Public and professional responses to the visual effects of timber harvesting: different ways of seeing. *Western Journal of Applied Forestry* 22:42-54.
- Bright, A.D., M.J. Manfredo, and D.C. Fulton. 2000. Segmenting the public: an application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin* 28:218-226.
- Brønne, P.S., and C. Brønne. 2003. A reflective stakeholder approach: co-orientation as a basis for communication and learning. *Journal of Communication Management* 7:291-303.
- Broom, G.M., and D.M. Dozier. 1990. Using research in public relations: applications to program management. Prentice Hall, Englewood Cliffs, New Jersey.

- Carson, K.E. 2005. A co-orientational analysis of public involvement perceptions in the transportation process. Thesis, University of South Florida, Tampa, Florida.
- Christen, C.T. 2005. The utility of coorientational variables as predictors of willingness to negotiate. *Journalism and Mass Communication Quarterly* 82:7-24.
- Connelly, N.A., T.L. Brown, and D.J. Decker. 2003. Factors affecting response rates to natural resource-focused mail surveys: empirical evidence of declining rates over time. *Society and Natural Resources* 16:541-549.
- Connelly, N.A., and B.A. Knuth. 2002. Using the co-orientation model to compare community leaders' and local residents' views about Hudson River ecosystem restoration. *Society and Natural Resources* 15:933-948.
- Cordell, H.K., C.J. Betz, and G.T. Green. 2002. Recreation and the environmental as cultural dimensions in contemporary American society. *Leisure Sciences* 24:13-41.
- Cordell, H.K., C.J. Betz, and G.T. Green. 2008. Nature-based outdoor recreation trends and wilderness. *International Journal of Wilderness* 14:7-13.
- Cordell, H.K., and M.A. Tarrant. 2002. Southern forest resource assessment highlights: changing demographics, values and attitudes. *Journal of Forestry* 100:28-33.
- Cornicelli, L., and M.D. Grund. 2011. Assessing deer hunter attitudes toward regulatory change using self-selected respondents. *Human Dimensions of Wildlife* 16:174-182.
- Cutlip, S.M., A.H. Center, and G.M. Broom. 2000. *Effective Public Relations*, Eighth ed. Prentice Hall, Upper Saddle River, New Jersey, USA.
- Cvetkovich, G., and P.L. Winter. 2003. Trust and social representations of the management of threatened and endangered species. *Environment and Behavior* 35:286-307.

- Decker, D.J., and L.C. Chase. 1997. Human dimensions of living with wildlife- a management challenge for the 21<sup>st</sup> century. *Wildlife Society Bulletin* 25:788-795.
- DeRuiter, D.S., and M.P. Donnelly. 2002. A qualitative approach to measuring determinants of wildlife value orientations. *Human Dimensions of Wildlife* 7:251-271.
- Dillman, D.A. 2000. *Mail and internet surveys: the tailored design method*. Second ed. John Wiley and Sons, New York, New York, USA.
- Dozier, D.M., L.A. Grunig, and J.E. Grunig. 1995. *Manager's guide to excellence in public relations and communication management*. Lawrence Erlbaum Associates, Mahwah, New Jersey, USA.
- Duda, M.D., and J.L. Nobile. 2010. The fallacy of online surveys: no data are better than bad data. *Human Dimensions of Wildlife* 15:55-64.
- Eagly, A.H., and S. Chaiken. 1993. *The psychology of attitudes*. Harcourt Brace Jovanovich, Orlando, Florida, USA.
- Earle, T.C., and G.T. Cvetkovich. 1995. *Social trust: toward a cosmopolitan society*. Praeger, Westport, Connecticut, USA.
- Fisher, R., W. Ury, and B. Patton. 1991. *Getting to Yes: Negotiating agreement without giving in*. Second edition, Penguin Books, New York, New York, USA.
- Fleming, C.M., and M. Bowden. 2009. Web-based surveys as an alternative to traditional mail methods. *Journal of Environmental Management* 90:284-292.
- Fulton, D.C., M.J. Manfredo, and J. Lipscomb. 1996. Wildlife value orientations: a conceptual and measurement approach. *Human Dimensions of Wildlife* 1:24-47.

- Greenlaw, C., and S. Brown-Welty. 2009. A comparison of Web-based and paper-based survey methods: testing assumptions of survey mode and response cost. *Evaluation Review* 33:464-480.
- Gregory, R., and R.K. Keeney. 1994. Creating policy alternatives using stakeholder values. *Management Science* 40:1035-1048.
- Grunig, J.E. 2001. Two-way symmetrical public relations: past, present, and future. Pages 11-30 in R.L. Heath, ed., *Handbook of Public Relations*. Sage Publications, Thousand Oaks, California, USA.
- Hendee, J.C., and R.W. Harris. 1970. Foresters' perceptions of wilderness-user attitudes and preferences. *Journal of Forestry* 68:759-762.
- Innes, J.E., and D.E. Booher. 2004. Reframing public participation: strategies for the 21<sup>st</sup> century. *Planning Theory & Practice*. 5:419-436.
- Jacobson, S.K., and S.B. Marynowski. 1997. Public attitudes and knowledge about ecosystem management on Department of Defense land in Florida. *Conservation Biology* 11:770-781.
- Jones, R.W. 1993. Co-orientation of a news staff and its audience. *Communication Reports* 6:41-46.
- Kearney, A.R., G. Bradley, R. Kaplan, and S. Kaplan. 1999. Stakeholder perspectives on appropriate forest management in the Pacific Northwest. *Forest Science* 45:62-73.
- Kelly, K.S., M.F. Thompson, and R.D. Waters. 2006. Improving the way we die: a co-orientation study assessing agreement/disagreement in the organization-public relationship of hospices and physicians. *Journal of Health Communication* 11:607-627.

- Kiesler, S., and L.S. Sproull. 1986. Response effects in the electronic survey. *The Public Opinion Quarterly* 50:402-413.
- Ladner, M.D., G.J. Wingenbach, and M.R. Raven. 2002. Internet and paper based data collection methods in agricultural education research. *Journal of Southern Agricultural Education Research* 52:40-51.
- LaRoe, L.M., K. Unger, and D. Abhat. 2009. Conservation at a Crossroad: as hunting declines, cash-strapped states seek new revenue to conservation. *The Wildlife Professional* 3(1): 26-31.
- Leahy, J.E., and D.H. Anderson. 2008. Trust factors in community-water resource management agency relationships. *Landscape and Urban Planning* 87:100-107.
- Leong, K.M., K.A. McComas, and D.J. Decker. 2007. Matching the forum to the fuss: using co-orientation contexts to address the paradox of public participation in natural resource management. *Environmental Practice* 9:195-205.
- Leong, K.M., K.A. McComas, and D.J. Decker. 2008. Formative co-orientation research: a tool to assist with environmental decision making. *Environmental Communication* 2:257-273.
- Leuschner, W.A., V.P. Ritchie, and D.F. Stauffer. 1989. Opinions on wildlife: responses of resource managers and wildlife users in the southeastern United States. *Wildlife Society Bulletin* 17:24-29.
- Manfredo, M.J., T.L. Teel, and A.D. Bright. 2003. Why are public values toward wildlife changing? *Human Dimensions of Wildlife* 8:287-396.

- Manfredo, M.J., and H.C. Zinn. 1996. Population change and its implications for wildlife management in the New West: a case study of Colorado. *Human Dimensions of Wildlife* 1:62-74.
- Martin, W.E., H.W. Bender, and D.J. Shields. 2000. Stakeholder objectives for public lands: rankings of forest management alternatives. *Journal of Environmental Management* 58:21-32.
- McCool, S.F., R.E. Benson, and J.L. Ashor. 1986. How the public perceives the visual effects of timber harvesting: an evaluation of interest group preferences. *Environmental Management* 10:385-391.
- McLeod, J.M., and S.H. Chaffee. 1973. Interpersonal approaches to communication research. *American Behavioral Scientist* 16:469-499.
- Murphy, P., and J. Dee. 1992. Reconciling the preferences of environmental activists and corporate policymakers. *Journal of Public Relations Research* 8:1-33.
- Muth, R.M., and W.V. Jamison. 2000. On the destiny of deer camps and duck blinds: the rise of the animal rights movement and future of wildlife conservation. *Wildlife Society Bulletin* 28:841-851.
- Peterson, G.L. 1974. A comparison of the sentiments and perceptions of wilderness managers and canoeists in the Boundary Waters Canoe Area. *Journal of Leisure Research* 6:194-206.
- Peyton, R.B., and E.E. Langenau. 1985. A comparison of attitudes held by BLM biologists and the general public towards animals. *Wildlife Society Bulletin* 13:117-120.
- Phillips, M.L., K.J. Boyle, and A.G. Clark. 1998. Managers and the public on endangered species management. *Wildlife Society Bulletin* 26:605-613.

- Purdy, K.G., and D.J. Decker. 1989. Applying wildlife values information in management: the wildlife attitudes and value scale. *Wildlife Society Bulletin* 17:494-500.
- Racevskis, L.A., and F. Lupi. 2006. Comparing urban and rural perceptions of and familiarity with the management of forest ecosystems. *Society and Natural Resources* 19:479-495.
- Rosenthal, D.H., and B.L. Driver. 1983. Managers' perceptions of experiences sought by skitourers. *Journal of Forestry* 81:88-90, 105.
- Ryan, S.M. 2009. Two sides to the story: a coorientation study of engo-employee relationship attitudes and linkages to organizational outcomes. Thesis, Royal Roads University, Victoria, British Columbia, Canada.
- Schuldt, B.A., and J.W. Totten. 1994. Electronic mail vs. mail survey response rates. *Marketing Research* 6:36-40.
- Seltzer, T. 2007. A coorientational approach for measuring organization-public relationships. Dissertation, University of Florida, Gainesville, Florida.
- Seltzer, T., and M. Mitrook. 2009. Two sides to every story: using co-orientation to measure direct and meta-perspectives of both parties in organization-public relationships. *Public Relations Journal* 3:1-24.
- Shindler, B. A., M. Brunson, and G.H. Stankey. 2002. Social acceptability of forest conditions and management practices: a problem analysis. Gen. Tech. Rep. PNW-GTR-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Siegrist, M., G. Cvetkovich, and C. Roth. 2000. Salient value similarity, social trust, and risk/benefit perception. *Risk Analysis* 20:353-362.

- Stern, M.J. 2008a. Coercion, voluntary compliance, and protest: the role of trust and legitimacy in combating local opposition to protected areas. *Environmental Conservation* 35:200-210.
- Stern, M.J. 2008b. The power of trust: toward a theory of local opposition to neighboring protected areas. *Society and Natural Resources* 21:859-875.
- Tarrant, M.A., A.D. Bright, and H.K. Cordell. 1997. Attitudes toward wildlife species protection: assessing moderating and mediating effects in the value-attitude relationship. *Human Dimensions of Wildlife* 2:1-20.
- Teel, T. L., A.A. Dayer, M.J. Manfredo, and A.D. Bright. 2005. Regional results from the research project entitled "Wildlife Values in the West." (Project Rep. No. 58). Project Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO: Colorado State University, Human Dimensions in Natural Resources Unit.
- Teel, T.L., M.J. Manfredo, and H.M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife* 12:297-305.
- Truell, A.D., J.E., Bartlett II, and M.W. Alexander. 2002. Response rate, speed, and completeness: a comparison of Internet-based and mail surveys. *Behavior Research Methods, Instruments, and Computers* 34:46-49.
- Tse, A.C.B. 1998. Comparing the response rate, response speed and response quality of two methods of sending questionnaires: e-mail vs. mail. *Journal of the Market Research Society* 40:353-361.
- Twight, B.W., and W.R. Catton, Jr. 1975. The politics of images: Forest managers vs. recreation publics. *Natural Resources Journal* 15:297-306.

- Twight, B.W., and J.J. Paterson. 1979. Conflict and public involvement: measuring consensus. *Journal of Forestry* 12:771-773, 776.
- Tyler, T.R. 1998. Trust and democratic governance. In Braithwaite, V. and M. Levi, eds. *Trust and governance*. Russell Sage Foundation, New York, pp. 269-294.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/www/abs/fishing.html>
- Vaske, J.J. 2008. *Survey research and analysis: application in parks, recreation, and human dimensions*. Venture Publishing, State College, Pennsylvania, USA.
- Vaske, J.J., J.D. Absher, and A.D. Bright. 2007. Salient value similarity, social trust, and attitudes toward wildland fire management. *Human Ecology Review* 14:223-232.
- Vaske, J.J., and M.P. Donnelly. 1999. A value-attitude-behavior model predicting wildland preservation voting intentions. *Society and Natural Resources* 12:523-537.
- Vining, J., and A. Ebreo. 1991. Are you thinking what I think you are? A study of actual and estimated goal priorities and decision preferences of resource managers, environmentalists, and the public. *Society and Natural Resources* 4:177-196.
- Von Kutzschenbach, M., and C. Brønn. 2006. Communicating sustainable development initiatives: applying co-orientation to forest management certification. *Journal of Communication Management* 10:304-322.
- Waters, R.D. 2007. *Advancing relationship management theory: coorientation and the nonprofit-donor relationship*. Dissertation, University of Florida, Gainesville, Florida.
- Weible, R., and J. Wallace. *Cyber research: the impact of the Internet on data collection*. *Marketing Research* 10:19-24, 31.

- Wellman, J.D., M.S. Dawson, and J.W. Roggenbuck. 1982. Park managers' predictions of the motivations of visitors to two National Park Service areas. *Journal of Leisure Research* 14:1-15.
- Williamson, J. 2010. "We serve you, right?" a case study adapting coorientation to customer service research. Dissertation, University of North Carolina, Chapel Hill, North Carolina.
- Winter, P.L., L.J. Palucki, and R.L. Burkhardt. 1999. Anticipated response to a fee program: the key is trust. *Journal of Leisure Research* 31:207-226.
- Wondolleck, J.M., and S.L. Yaffee. 2000. *Making collaboration work: lessons from innovation in natural resource management*. Island Press, Washington, D.C., USA.
- Zinn, H.C., M.J. Manfredi, and S.C. Barro. 2002. Patterns of wildlife value orientations in hunters' families. *Human Dimensions of Wildlife* 7:147-162.

## Chapter 2:

### Who's using wildlife management areas? An examination of recreational use of Virginia's public hunting and fishing lands and stakeholder attitudes toward land management and potential user fees

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 87.5 million people participated in wildlife-related recreation in the United States in 2006 (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). Broad demographic and social changes, such as urbanization and an aging population, have contributed to the gradual decline in hunting and fishing participation in the U.S. (Bissell et al. 1998). Over the last 15 years, increasing participation in wildlife watching has been observed (71.1 million participants in 2006) while hunting and fishing participation declined slightly (33.9 million participants in 2006) nationwide (Figure 2-1). Of the 23 million people who traveled away from their homes to view wildlife in 2006, more than 80% visited a public area to view wildlife (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). While in many cases, actual visitation to state parks, national parks, and wildlife refuges have remained relatively stable in recent years, these changes between consumptive and non-consumptive wildlife-related recreation participation may contribute to a shift in composition of public lands users (Cordell et al. 2008).

Declining participation in hunting and fishing is well documented (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006, La Roe et al. 2009), yet little information exists regarding other stakeholders who recreate on public hunting and fishing lands (Decker and Chase 1997). Hunters and anglers historically have supported the management and upkeep of public hunting and fishing lands through license fees and excise taxes imposed on hunting and fishing

equipment, but other user groups often have not contributed directly to operational costs. Because the types of stakeholders and the ways in which they use public hunting and fishing lands may be following the national trend, managers recognize the need to learn more about diversifying stakeholders. State wildlife agencies often lack reliable data on the types and amount of use that public hunting and fishing lands receive, especially regarding non-consumptive activities. Some current users may not share the “traditional” wildlife values that emphasize management and use of wildlife for human benefit (Manfredo et al. 2003). Given this shift, one might assume that hunters, anglers, and non-consumptive users of public hunting and fishing lands would display different or conflicting attitudes about management of state lands.

Many agencies purchase and maintain public hunting and fishing lands, in part, using funds obtained from the U.S. Fish and Wildlife Service’s (USFWS) Wildlife and Sport Fish Restoration (WSFR) program, which imposes excise taxes on an individual’s hunting and fishing equipment and ammunition purchases. The USFWS redistributes funds collected through the tax program to states to support habitat restoration and management projects, research, land acquisition, and public access to resources (USFWS 2011). Stipulations attached to funds obtained through this program may constrain management of these public hunting and fishing lands in ways that differ from those imposed on other public lands. For example, WSFR funding permits only “wildlife-related” recreation compatible with wildlife habitat management on land supported by the program. In contrast, the U.S. Forest Service must manage its public lands for a variety of human uses (i.e., multiple use), in addition to ecological considerations.

The public may not understand that public lands differ in their purpose and management goals, so they easily confuse public hunting and fishing lands with other public lands familiar to them. Additionally, many professionals recognize a shift in public opinion and values toward a

preservation orientation (Manfredo and Zinn 1996, Zinn et al. 2002, Teel et al. 2005, 2007), which may conflict with utilitarian views typically associated with active land-use management, such as timber harvest and management for hunting (Bengston 1994, Vaske and Donnelly 1999, Cordell and Tarrant 2002, Manfredo et al. 2003, Teel et al. 2005). WMAs differ from other types of public land with which stakeholders may be familiar, such as national forest, national parks, and state parks. Research suggests that 53% of Virginia citizens mistakenly believed general taxes funded VDGIF; however, hunters and anglers were more likely than non-hunters or non-anglers to correctly identify hunting and fishing licenses and excise taxes as the agency's primary funding mechanisms (Responsive Management 2005). Non-hunting or non-fishing license holders may be less informed about the purpose of various types of public land. As a result of this confusion among types of public land and changes in values of the public toward wildlife and the environment, many state and federal natural resource agencies have encountered opposition to some of their planned land management activities from individuals who fail to distinguish public hunting and fishing lands from other public lands.

While visitor satisfaction is a multi-dimensional concept drawn from multiple sources (e.g., weather, hunting/fishing success, interactions with other users; Vaske et al. 1986, Herrick and McDonald 1992), hunters and anglers often consider seeing and harvesting game as the most central evaluative criteria for their experience (Vaske et al. 1982). Hunters and anglers can choose an appropriate location where they may have the best chance of seeing game, but they have relatively little control over harvesting game and, more often than not, return home empty-handed. Alternatively, non-consumptive users usually hold broad goals less central to the activity (i.e., seeing nature, change from routine activities, spending time with family and friends) and have more control to select environments that provide the right conditions for them

to complete their activity (e.g., finish the hike, run the river). Consumptive users may hold more clear and measurable expectations for their visit to a WMA than non-consumptive users, leading to inherent differences in satisfaction in their visit (Vaske et al. 1982, Heywood 1987).

Many states now are examining ways to develop broad-based funding, especially for non-hunting and non-angling users of WMAs, to cover the costs of maintenance of facilities and management of wildlife habitat. The Board of Game and Inland Fisheries enacted a facilities use fee that went into effect on January 1, 2012. The new fee structure requires WMA users >16 years of age who do not possess a valid Virginia hunting, fishing, or trapping license or a Virginia boat registration to purchase an annual (\$23, cost of a hunting or fishing license) or daily (\$4) facilities use permit. Because of the changing climate surrounding wildlife conservation, state wildlife agencies need to engage with and involve diverse stakeholders and partners, beyond traditional users such as hunters and anglers, in decision-making (Jacobson et al. 2010). While it may be necessary for agencies to examine and enact access permits for financial reasons, caution is needed when determining the appropriate implementation and related public relation efforts. Some studies suggest the cost of a recreational user fee is minimized for the participant by the substantial costs of transportation, equipment, licenses, and incidentals associated with recreation participation (Bowker et al. 1999). However, the appropriate fee amount should balance the need for revenue with the desire to maintain public access for all (Richer and Christensen 1999). Although choosing the maximum fee deemed acceptable by managers may appear to maximize revenue quickly, a larger drop in participation associated with implementation of such a fee may occur (Richer and Christensen 1999).

My purpose for this research was to (1) determine the type and frequency of recreation in Virginia's wildlife management areas (WMAs) and (2) identify the attitudes of WMA

recreational users toward land management and possible user fee structures. Managers will benefit from an accurate characterization of WMA users as they continue to actively manage wildlife habitat and engage stakeholder groups regarding land management, wildlife populations, and recreational use concerns.

## **Methods**

### **Study sites**

Most state wildlife agencies own and manage public hunting and fishing lands, often called WMAs or game lands, to provide wildlife habitat and for public hunting and fishing. The Virginia Department of Game and Inland Fisheries (VDGIF) manages 39 WMAs that comprise >200,000 acres geographically distributed throughout Virginia from the border with Maryland on the Eastern Shore to the far southwest corner of the state (Figure 2-2). Wildlife habitat varies greatly among WMAs, from wetlands and estuaries, to agricultural land, to Appalachian Mountain forests. Virginia's WMAs provide opportunity for both traditional recreation (i.e., hunting and fishing) and non-consumptive wildlife-related recreation compatible with the missions of providing wildlife habitat and public hunting and fishing.

### **Survey design and implementation**

I surveyed visitors at 10 WMAs selected by agency personnel that represented the types of WMAs in Virginia. In selecting WMAs for study, DGIF chose two WMAs from every region throughout the Commonwealth, and constraining selection so those chosen represented the diversity of use, access options, habitat types, and recreational opportunities available at all WMAs. Project staff and volunteers conducted 3-5 minute interviews with WMA visitors >18 years of age from 5 September 2009 through 3 September 2010 (Appendix A). Depending upon

the particular WMA surveyed, the interviewer either (1) set up a recognizable check station at the main access road into the WMA or the specific area covered that day, or (2) traveled a pre-designated roving route with prescribed stops at access roads and/or parking areas within the WMA. My interview protocol satisfied the Virginia Tech Internal Review Board requirements for research involving human subjects (IRB approval #09-600).

I surveyed each WMA or designated subsection of a WMA on at least 24 randomly selected days (15 weekend days and 9 weekdays) over the 12-month survey period. On large WMAs or those with multiple access points, I segregated the WMA into separate subsections that a interviewer could cover reasonably in a day. Interviewers visited each subsection on at least 24 randomly selected days, except for a few instances when winter weather prevented access to the area. I selected sampling days at random distributed equally among strata (Saturdays, Sundays, and weekdays). I treated weekend days (i.e., Saturdays and Sundays) separately due to differences in hunting participation; regulations at the time of the survey permitted hunting on Saturdays, but prohibited hunting on Sundays. I established 3 sampling seasons based on hunting seasons and the calendar: fall = 5 September through 2 January, winter/spring = 3 January through 31 May, and summer = 1 June through 3 September. I treated holidays that fell on a weekday (e.g., Labor Day, Thanksgiving Day) as a Saturday because I expected significantly higher use on the holiday than that observed on an average weekday and comparable to an average Saturday during the normal open hunting season. In addition to the 24 general survey days, I conducted separate special surveys on several unique target days, such as hunting and fishing season opening days, when I predicted higher use than an average recreation day. Some of these special opening days occurred only on a single WMA, whereas other opening days were observed universally on all 10 WMAs.

In cases where direct contact with a visitor could not be made, the interviewer left a business-reply postcard under the windshield wipers of all unoccupied vehicles parked on the WMA; the visitor who received a card were asked to complete and then mail it to Virginia Tech. Interviewers maintained a log of cars encountered to ensure that he/she did not double count the same vehicle later in the day. Postcards included abbreviated questions about the visitors' activity and satisfaction with their visit on the date of contact. I conducted t-tests to identify any differences in reported mean satisfaction between postcard responses and interviews.

I developed estimates for recreational use at each of the 10 WMAs by first examining data on each day type (i.e., Saturday, Sunday, weekday) and use within the 3 defined seasons (i.e., fall, winter/spring, summer). I calculated use on opening days separately and added these data to the final estimate of recreational use. I tracked the number of individuals in a party and the activities of interviewees to estimate the number of annual recreation days (i.e., a visit to a WMA by 1 individual to participate in a single activity) for each of the 10 WMAs. I adjusted my estimate of recreation days to account for use during each day the visitor stayed on the WMA. For example, 2 individuals in a party who camped on the WMA for 4 days resulted in a total of 8 recreation days of camping for that WMA.

I developed a separate survey instrument for visitors to sighting-in ranges located at 4 of the 10 selected WMAs (Appendix B). Sighting-in ranges are facilities located on WMAs and available to the public for "sighting-in" weapons during hunting seasons or recreational shooting. VDGIF volunteers surveyed each range for 12 days (6 weekend days, 6 weekdays) from 1 September 2009 through 31 March 2010, which aligned with the period that ranges were open to the public annually. I used these completed range surveys to develop estimates of annual range

use (using the same methods as described for overall annual recreational use), which I then incorporated into my overall recreational use estimates.

## **Results**

I contacted 4,683 WMA users via interviews and postcards over the course of the field study. After excluding visitors who declined to participate, I obtained 3,972 completed surveys and postcards, yielding an 85% response rate. Interviewers completed 3,643 valid on-site interviews at the 10 WMAs sampled. Of > 1,000 postcards initially distributed, 329 were returned, yielding a postcard response rate of < 33%. Volunteers conducted 692 separate surveys with sighting-in range users during the open season for ranges.

### **Demographics**

Men aged 40 and older comprised the majority of respondents. Age of participants ranged from 18 to 82 years ( $\bar{x}$  =45 years, Figure 2-3). The largest proportion of users (26%, n=1,064) were between 40 and 49 years of age, and most (94%, n=3,469) were male.

Overall, 84% of participants (n=3,498) held a valid Virginia hunting and/or fishing license at the time of the interview; the proportion of license holders ranged from a low of 56% at Thompson WMA in Northern Virginia (where non-consumptive activities were quite common) to a high of 95% at Little North Mountain and Cavalier WMAs (Figure 2-4). The diversity of recreational activities in which users participated varied with season and the opportunities actually available at each WMA. About 15% of respondents reported participating in >1 activity during their visit (e.g., hunting and camping). Sixty-two percent of hunting and/or fishing license holders participated in >1 non-consumptive activity during their visit.

## **Recreational participation**

Forty-six percent of respondents (n=1,818) participated in some form of hunting during their visit, making hunting the most frequently reported activity. Respondents also participated frequently in fishing (18%, n= 730), using the sighting-in range (11%, n=442), and hiking or walking for purposes other than hunting, fishing, and wildlife watching (11%, n=442). Respondents commonly reported engaging in other activities, including camping (4%, n=163), wildlife watching (3.5%, n=145), boating (3.5%, n=138), and horseback riding (1%, n=42) at some WMAs. Certain activities occurred on all 10 WMAs surveyed (e.g., hunting) whereas other uses (e.g., wildflower viewing) occurred at only select WMAs where that recreational opportunity existed. In general, WMAs in northern Virginia (in the vicinity of Washington, D.C.) and the Richmond area received heavy use during hunting seasons. Other WMAs received moderate to heavy use through the spring and summer months as a result of the availability of fishing and spring wildflower viewing opportunities in addition to use during hunting seasons.

Hunters most frequently pursued deer (58% of hunting use, n=1,077), followed by dove (19%, n=350), turkey (8%, n=158), and squirrel (7%, n=131), and some respondents pursued multiple species during the legal season (Figure 2-5). Nineteen percent of all hunters interviewed (n=331) reported that they harvested wildlife on that particular day on the WMA. Most hunters who successfully harvested game pursued small game species, such as dove or squirrel.

Seventy-two percent of visitors (n=2,480) at all 10 WMAs reported visiting a WMA more than once during the 2009-2010 sampling season, while approximately 27% of respondents (n=947) reported never visiting previously or visiting on only 1 other occasion in the last 12 months (Figure 2-6). One-third of respondents (n=1,025) reported that they had visited another

WMA during the past 12 months. Of those that had visited another WMA, 64% (n=656) had visited only one other location.

## **Satisfaction**

I asked respondents to rate the satisfaction of their WMA visit on the day of the interview on a scale from 1 to 7, where 1=very dissatisfied and 7=very satisfied. Overall, 82% of respondents (n=3,311) reported that they were satisfied to very satisfied with their visit (rating > 4). Mean satisfaction ranged from 4.5 to 6.2 on individual WMAs (Figure 2-7). The two WMAs that placed on opposite ends of this range were located in the western part of the Commonwealth adjacent to each other; however, they attract different types of users. Little North Mountain WMA, primarily used for hunting, is a large WMA with relatively limited access, whereas, Goshen WMA provides access for non-consumptive activities (e.g., hiking) and river access for fishing and kayaking in addition to hunting. In addition to different user types, many dispersed access points made contacting users at Little North Mountain WMA difficult; here, I received an almost equal number of responses via business reply postcards (n=106) as face-to-face interviews (n=108).

Overall, the 2 methods of contact (i.e., interview and postcard) differed significantly, although this difference was relatively low practically (i.e., about 0.5 on a 1 to 7 scale). Those who completed a face-to-face interview rated their satisfaction slightly higher ( $\bar{x}$  =5.76, n=3,733) than did those who responded by postcard ( $\bar{x}$ =5.28, n=326). This trend was strongly influenced by differences between users replying by postcard ( $\bar{x}$ =4.26, n=106) and interview ( $\bar{x}$ =4.83, n=108) at Little North Mountain WMA, since relatively few postcards were distributed and received at other WMAs.

If the respondent reported dissatisfaction (rating < 4) with his/her visit (9%, n=373), the interviewer asked a follow-up question requesting the reason or reasons for that dissatisfaction. The most common reason for dissatisfaction was not seeing or harvesting game, or dissatisfaction with the game available (n = 169). In some cases, visitors reported dissatisfaction with WMA management activities or facilities (e.g., roads, trails; n = 69) or the state of overcrowding (n = 42) as reasons for dissatisfaction.

I compared satisfaction among hunting and fishing license holders and non-license holders who participated in non-consumptive recreational activities. Because of the smaller sample size of non-license holders, I compressed the 7-point scale to reflect 3 general positions for both license holders and non-license holders: satisfied (rated > 4), neutral (rated 4), and dissatisfied (rated < 4). Although both groups overall were satisfied with their visit, non-license holders (93%, n=598) expressed significantly greater satisfaction than did license holders (79%, n=2,694;  $t=-12.96$ ,  $p<0.0001$ ). Non-license holders expressed a slightly higher mean satisfaction rating than license holders at 9 of the 10 WMAs sampled. The exception was Cavalier WMA in southeast Virginia, where license holders ( $\bar{x}=5.45$ , n=205) expressed greater satisfaction than non-license holders ( $\bar{x}=4.45$ , n=12); however, this difference was not significant. A road wash-out following a serious coastal flood event during fall 2009 restricted access to a portion of Cavalier WMA through summer 2010. As a result, non-consumptive visitors to Cavalier WMA reported low satisfaction with the closure, especially because of limited access for non-consumptive activities during summer months. Meanwhile, hunters seemed pleased that access had been reduced in the late fall and spring hunting seasons as it afforded them with a more private hunting experience.

While most members of different user groups expressed satisfaction with their visit, hunters and anglers were less satisfied overall compared to other groups (Table 2-1). All horseback riders interviewed, and nearly all hikers and range users, reported high satisfaction associated with their visit to a WMA.

### **Land management practices**

Overall, respondents supported the use of logging (73%, n=2,478), prescribed fire (77%, 2,609), mechanical techniques for managing vegetation (87%, 2,958) and planting food plots for wildlife (92%, n=3,144, Table 2-2). However, I observed a more evenly divided response to the use of herbicides to manage vegetation (46% opposed, 34% supported; Table 2-2).

I also compared perceptions of management practices among hunting and/or fishing license holders and non-license holders. License holders expressed significantly greater support for the management practices presented to them than did non-license holders (Table 2-3). Non-license holders overall supported the use of logging, prescribed fire, mechanical techniques, and planting of food plots as well, though to a lesser degree. Both groups displayed some opposition toward the use of herbicides, but more so among non-license holders.

### **Willingness to pay an annual use fee**

Acquisition of Virginia's WMAs usually involved funds generated by the sale of hunting and fishing licenses (at least in part), and from excise taxes on the purchase of hunting and fishing equipment. I asked respondents to indicate who should have to pay an annual fee to use WMAs and offered 3 options: 17% of all respondents (n=592) believed all users of Virginia's WMAs, including hunting and fishing license holders, should pay an annual fee to use WMAs, 32% (n=1,070) believed only those who do not hold a valid Virginia hunting or fishing license

should have to pay an annual fee, and 51% (n=1,710) believed Virginia's WMAs should remain available to anyone who wants to use them at no cost (Table 2-4). Although the exact percentages varied among WMAs surveyed, and differed significantly ( $\chi^2 = 37.31$ , df=18, p=0.005), the overall relationship held at all 10 WMAs surveyed.

Sixty-four percent of horseback riders (n=21) and 58% of hikers (n=203) believed the WMA should remain available at no cost. While the minority believed that all users should pay to use WMAs in almost all cases, horseback riders (27%, n=9) and anglers (21%, n=145) supported the option of all users paying a fee to use WMAs more often than other recreational groups (Table 2-4). Most horseback riders believed that everyone or no one should have to pay to use WMAs; comparatively few horseback riders supported the option for only non-license holders to pay a fee (Table 2-4).

As a follow-up to the fee question, the interviewer asked if the respondent still would have used the WMA on that day if they had to pay an annual fee of \$5 to \$25 (one randomly generated hypothetical fee amount in \$5 increments presented to each respondent), regardless of whether they currently held a license. Over 90% of both license holders (n=450) and non-license holders (n=84) expressed willingness to pay an annual fee of \$5 (Figure 2-8). Approximately two-thirds (65%, n=343) of license holders still would have used the WMA if they had to pay a hypothetical \$25 annual fee, compared to 74% of non-license holders (n=50) (Figure 2-8). I found no statistically significant difference between the proportion of license holders and non-license holders willing to pay a fee ( $\chi^2=2.06$ , df=4, p=0.725).

### **Annual use estimates**

During the survey period of September 2009 to September 2010, I estimated >63,000 total recreation days occurred on the 10 selected WMAs, excluding use at the sighting-in ranges.

Estimates of annual recreational use, excluding sighting-in ranges, ranged from 1,000 recreation days at a largely undeveloped WMA distant from population centers (Big Survey WMA) to >11,000 recreation days at a WMA easily accessible for many uses, including swimming and kayaking (Goshen WMA). Among recreational activities pursued on most WMAs, hunting (23,274 recreation days) and fishing (12,606 recreation days) contributed to over half of estimated annual use on the 10 WMAs.

Estimated annual use at the 4 sighting-in ranges I sampled totaled 27,599 recreation days. Highest estimated use occurred at a WMA near the large population centers of Virginia Beach/Norfolk (Chickahominy WMA, 15,478 recreation days). Range use was relatively low at a WMA distant from population centers in western Virginia (Clinch Mountain WMA, 848 recreation days); however, weather closures at Clinch Mountain WMA prevented access for a large portion of the normal spring use period.

When I combined range survey data with data on other recreational uses, I estimated 91,202 recreation user days had occurred at the 10 WMAs sampled (Figure 2-9). The 3 WMAs attracting the greatest use annually were located in the “Urban Crescent” of Virginia, an area in the eastern part of the state with multiple urban centers and dense human populations. Use at these 3 WMAs comprised over half of the total recreation days for all 10 WMAs (50,103 recreation days), with heavy influence from sighting-in ranges at each WMA. Alternatively, the 4 WMAs with the lightest use were far from large population centers or had limited or poor access.

## **Discussion**

I observed diverse recreational use on the WMAs included in this study; use varied with opportunities available at a given WMA and proximity to population centers. Because of limited

availability of other types of public lands for wildlife-related recreation and a concentration of densely populated urban centers, WMAs situated in the Urban Crescent area of eastern Virginia received heavy use compared to more remote areas. Alternatively, WMAs situated in the mountainous, less densely populated areas of western Virginia received relatively low use, possibly due to greater access to other types of public lands, such as national forest. Although hunting and fishing remained dominant activities on many WMAs, non-consumptive activities, such as hiking, wildlife watching, wildflower viewing, camping, and sightseeing, were also popular pursuits. Since no historical use data exists to describe recreational use on WMAs previously, I cannot determine if overall use, consumptive use, or non-consumptive use has changed. However, if participation in non-consumptive recreation activities has increased, more direct conflict with hunting and fishing recreational users may result (Manfredo and Zinn 1996). For example, heavy use of the same area by both hunters and non-consumptive users may pose greater safety risk for both groups during hunting seasons. In addition to direct conflict, values and attitudes toward wildlife and land management also may differ between hunters and anglers and WMA users visiting for a different purpose (Duffus and Dearden 1990, Cordell et al. 2002, Cordell and Tarrant 2002).

My investigation suggests that these 10 WMAs receive > 90,000 annual recreation days annually. Sighting-in ranges were used heavily on most WMAs where they were available. For example, range use at one WMA located near the large population centers of Virginia Beach/Norfolk comprised nearly 70% of the total estimated annual use. Sighting-in ranges likely provide particularly important facilities to users who live in metropolitan and/or exurban population centers (e.g., the Urban Crescent of Virginia) where such facilities are not available at low cost or may be lacking completely. Sighting-in ranges receive use from both hunters

preparing for the hunting season and from recreational shooters; this diversity of interest likely contributes to overall heavy use and also provides support of such facilities through the WSFR funding derived from purchase of ammunition and hunting and fishing equipment.

Most WMA visitors expressed satisfaction with their visit to the WMA, and, consistent with earlier research, non-license holders reported slightly higher satisfaction than hunters and anglers (Vaske et al. 1982). Because hunters and anglers have very clear expectations for their experience, and are less likely to achieve the specific goal of bringing home fish or game, they tend to give lower satisfaction ratings than non-consumptive users (Vaske et al. 1982). Some hunters and anglers cited real or perceived conflict with non-consumptive users or disappointment with the quality of wildlife habitat as concerns that may have impacted their overall satisfaction. Additionally, respondents may have expressed more brief and critical satisfaction ratings via postcards than in face-to-face interviews as they had no contact with an interviewer who could better explain the project and the interview purpose.

Social desirability bias, or the desire to express oneself as positively as possible by providing a more socially acceptable response that fits within social norms, remains an important source of bias in surveys associated with marketing and social sciences research (Sudman and Bradburn 1974, Fisher 1993). Some research suggests that social desirability bias may influence recreation visitors participating in face-to-face interviews more so than those completing a self-administered survey (Mannesto and Loomis 1991, Leggett et al. 2003). WMA users may have been influenced by the presence of an interviewer and adjusted responses to align more closely with social norms rather than reporting the construct of interest accurately.

Many WMA users supported most land management practices presented to them; however, several practices, as stated (e.g., herbicide use), produced a more evenly-distributed

response. The public has expressed distaste toward herbicides historically (Fortier and Messier 2006), despite frequently observing or using herbicides in their daily lives; nevertheless, many expressed little support for their use to manage natural resources. While most WMA respondents supported herbicide application, a minority opposed this practice, indicating an area of potential conflict with WMA management. License holders supported active land management to a greater extent than did non-license holders. Hunters and anglers often hold a utilitarian or use-oriented view of wildlife and land management, which may conflict with environmentalist/preservationist views held by many non-consumptive users (Vaske and Donelley 1999). As non-consumptive recreational use increases, the probability of stakeholder conflict also may increase as non-consumptive users generally express less support for active management than traditional WMA users.

Many respondents reported visiting the same 1 or 2 WMAs repeatedly over the previous year and, for some, over the course of their lives. This deep connection provides the conditions for strong site attachment and an emotional bond. The connections that humans maintain with nature often extend well beyond the utility of a place; in fact, individuals often experience these powerful emotional attachments as a mechanism to protect and enhance their own self-identity (Cheng et al. 2003). Although natural resource managers may view management actions relative to their benefits for wildlife, they need to keep in mind that many local stakeholders view WMAs differently and may feel strong social and cultural significance beyond the physical attributes of the land (Eisenhower et al. 2000). Recreational pursuits that occur at a special place often contribute to a strong emotional attachment (Eisenhauer et al. 2000). This connection and the public nature of access to WMAs can lead to a personal sense of ownership (i.e., “my” WMA) and resistance to change and management activities that conflict with users’ personal values.

Some land management techniques that change the landscape or user access noticeably (e.g., timber harvest, road or gate closure) may elicit strong and emotional responses from people who experience place attachment with public lands. Managers need to recognize these strong feelings and emotional bonds to anticipate public reaction to management decisions and incorporate social and cultural factors into public lands management (Eisenhauer et al. 2000). Opportunities for engagement range from organized focus group or public meetings to better understand sense of place, or informal communication with stakeholders on WMAs, in agency offices, or other community venues.

While about half of WMA respondents believed no one should pay an annual fee to use WMAs, most respondents expressed willingness to continue to visit WMAs if an annual fee between \$5-25 was implemented. Most horseback riders and hikers believed the WMA should remain available at no cost, possibly because these users enjoyed the benefits of the WMAs with no direct cost at the time of the interview. These findings align with other research suggesting the public generally is receptive to recreation fees on public areas (Bowker et al. 1999), but also may resist paying for goods and services to which they have not contributed previously (Kerr and Manfreda 1991).

Research suggests that social trust between agency personnel and stakeholders contributes positively to the acceptance of a new fee program; stakeholders needed to believe the agency will implement the fee program as proposed, know that local areas would receive benefits from those fees, and perceive that funds will be used in ways they deem appropriate (Winter et al. 1999). As part of public relations efforts, agencies also need to clearly communicate the purpose of WMAs and how WMAs differ from other types of public land with which stakeholders may be familiar, such as national forest, national parks, and state parks.

A greater perceived stake in WMA management also may come along with the imposition of a user fee for non-hunting and non-angling users (Jacobson et al. 2010). Non-consumptive users of WMAs may demand more equal status with hunters and anglers as they become paying customers and contribute directly to WMA management. Alternatively, hunters and anglers often express strong concerns that inclusion of “new” stakeholders threatens their status as primary stakeholders of the WMAs, as well as access to quality wildlife habitat for hunting and fishing. The agency could use its website, on-site signage at kiosks, and interactive encounters, and other community media outlets (e.g., local newspapers, community newsletters) to help educate all recreational users (especially non-consumptive users) of WMA goals and priorities. According to WMA goals, WMAs provide the opportunity for a variety of recreational uses, but hunting and fishing has been and will continue to be a priority. Traditional users, including hunters and anglers, are likely to express strong concerns about changing the existing balance of power.

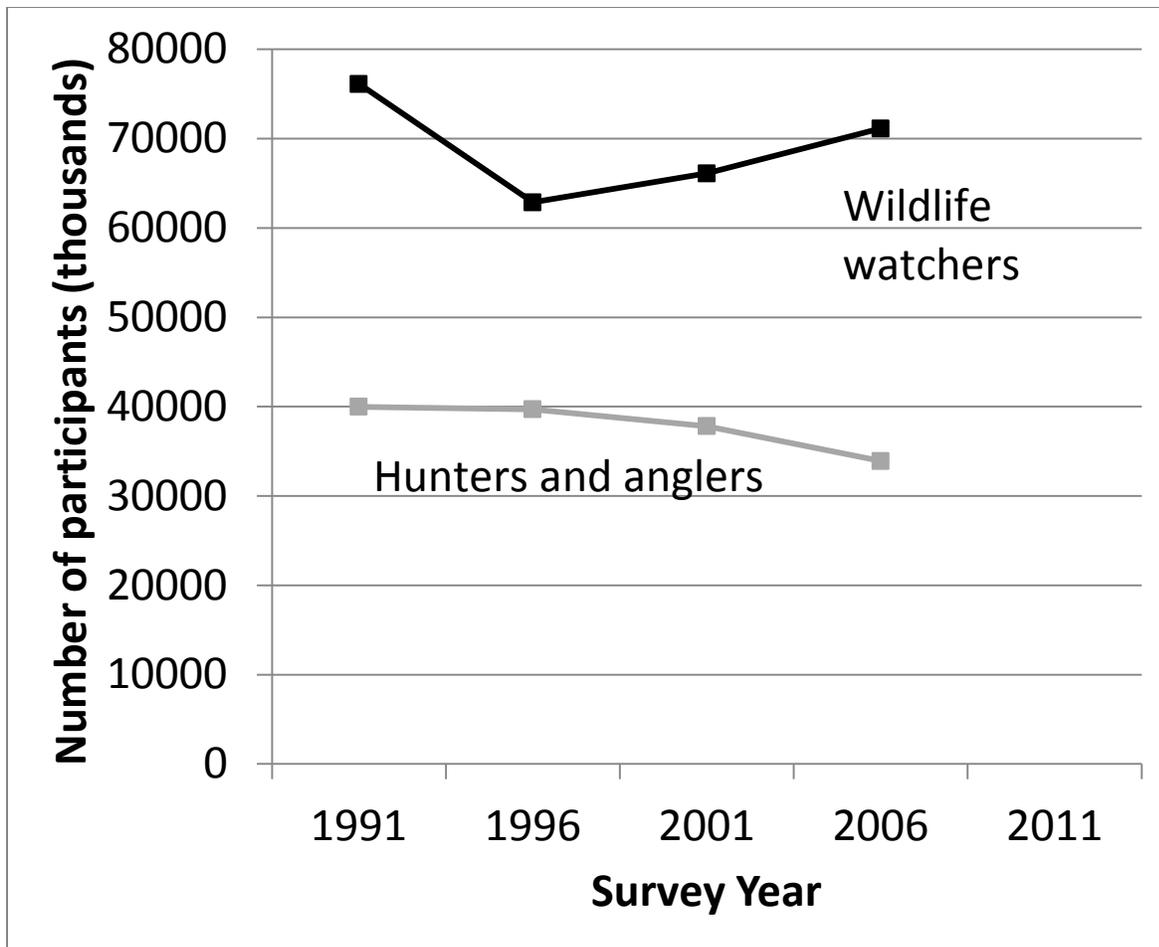
As values toward wildlife and the environment shift and constituencies of state wildlife agencies broaden in scope (Jacobson et al. 2010), knowing and understanding stakeholders’ positions on key environmental issues remains important. Taking pro-active measures to collaborate with stakeholders may prevent or alleviate controversial standoffs, foster interpersonal relationships and trust between agency personnel and stakeholders, and involve stakeholders in developing broad goals as a part of natural resources decision making processes (Innes and Booher 2004, Jacobson et al. 2010). While hunters and anglers have been the traditional stakeholders for most state wildlife agencies, broadening missions and constituencies may require a change in how agencies function and communicate with stakeholder groups, especially as previously unrecognized groups become paying customers. Developing

interpersonal relationships with the local community is especially important to garner public support and cooperation regarding WMA management (Stern 2008, Stern 2010).

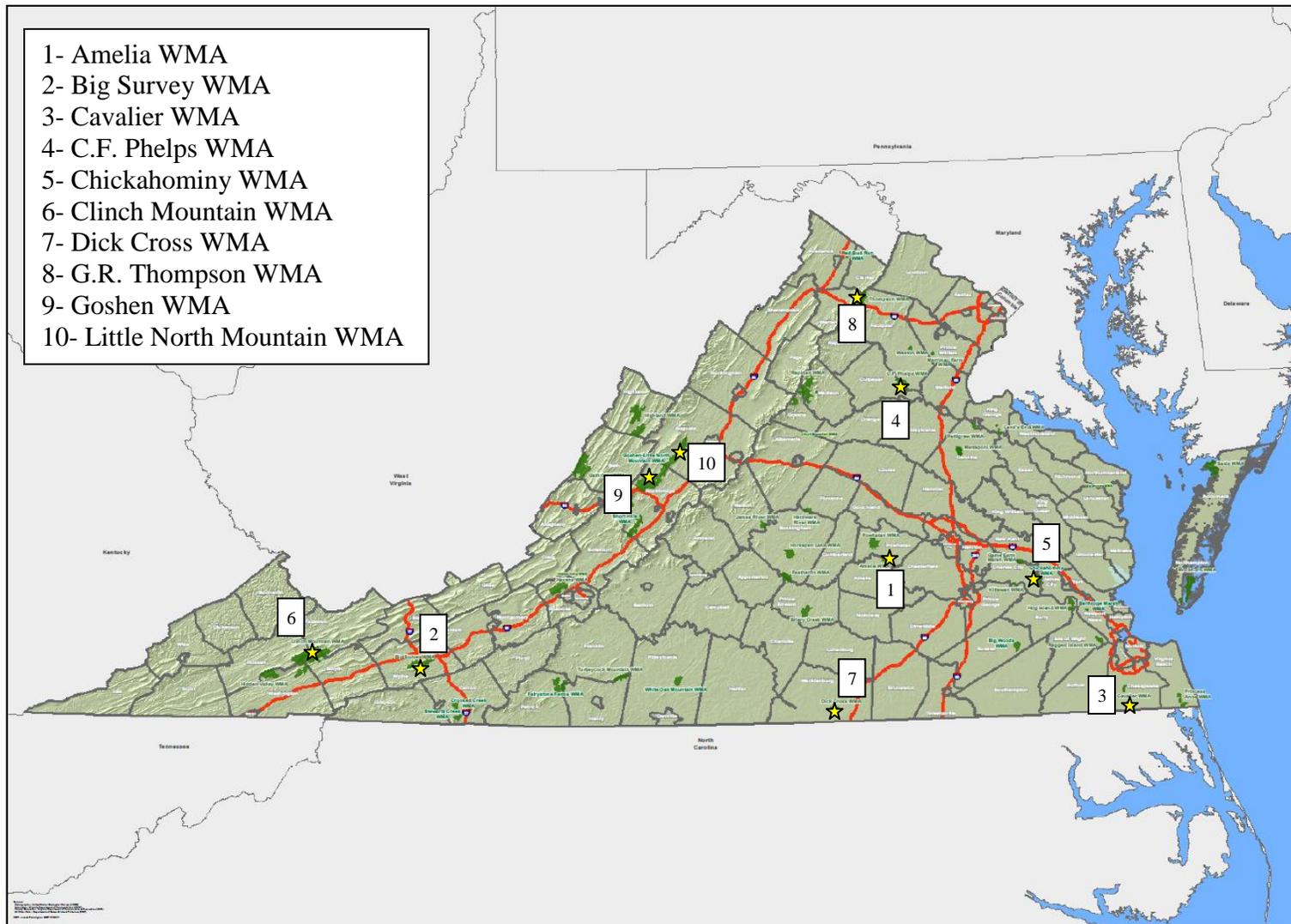
Hunting, fishing, and trapping remain integral components of WMA management and high priority uses of the WMAs, however, other recreational uses that may be compatible with these objectives. Free access to quality, actively managed wildlife habitat is dwindling, especially in Virginia and the eastern U.S., where most land is held in private ownership (Nelson et al. 2010). Without access to WMAs, hunting and fishing opportunities may be limited to only sportspersons with the financial means to purchase property, belong to a hunt club, or lease private lands to hunt. Agencies may retain the mission unique to WMAs (providing wildlife habitat and access for hunting and fishing), while also providing opportunities for non-consumptive users and justification for why some activities allowed on other types of public land are not compatible with WMA management. This may be achieved through dialogue at public meetings, media outreach efforts (e.g., news article, agency news release), on-site signage, or informal conversations between agency personnel and stakeholders.

Communicating with stakeholders (especially non-consumptive users) to describe land management techniques and anticipated outcomes or goals, as well as explain the preference for those techniques under the given circumstances may improve transparency of the agency. Considering the goals and values of WMA stakeholders may help direct agency management within the constraints placed on them financially and legislatively and also prevent controversial issues from surfacing later. A clear understanding from the perspectives of all parties can improve relationships of agency personnel with the local communities by recognizing shared goals and views and developing social trust that can reduce conflict and facilitate cooperative behavior (Leahy and Anderson 2008).

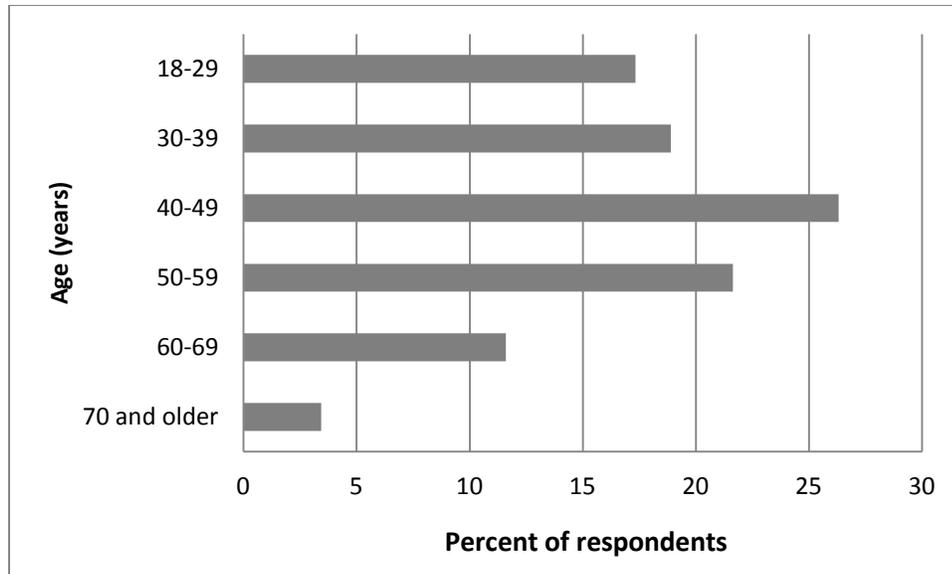
Recommendations provided as a result of previous research with WMAs in Michigan also may apply to the current situation in Virginia and other states. Nelson et al. (2006) suggested a 4-pronged approach for the state wildlife agency to improve public relations on a game area in Michigan: improving law enforcement, encouraging hunters to be good neighbors toward adjacent landowners, providing outlets for game area users to “police” themselves, and working with local groups and partners to achieve management objectives. Opportunities exist to collaborate with the community, such as Boy Scouts and local chapters of conservation groups, to achieve land management goals on WMAs. Regular recreational users and adjacent landowners, especially those deeply connected to the WMA, have the ability to assist with land management efforts and also report violations or vandalism to agency personnel with whom they have relationships. Local involvement can instill a greater sense of care and responsibility for a local WMA, improve public relations, and reduce vandalism and poaching with the help of the community members (e.g., Nelson et al. 2006, Stern 2008). Greater involvement with WMA management can foster a strong sense of place and feeling of ownership within stakeholders for the WMAs. Stakeholder commitment will help to ensure that these public hunting and fishing lands are available for wildlife-related recreational use and enjoyment well into the future.



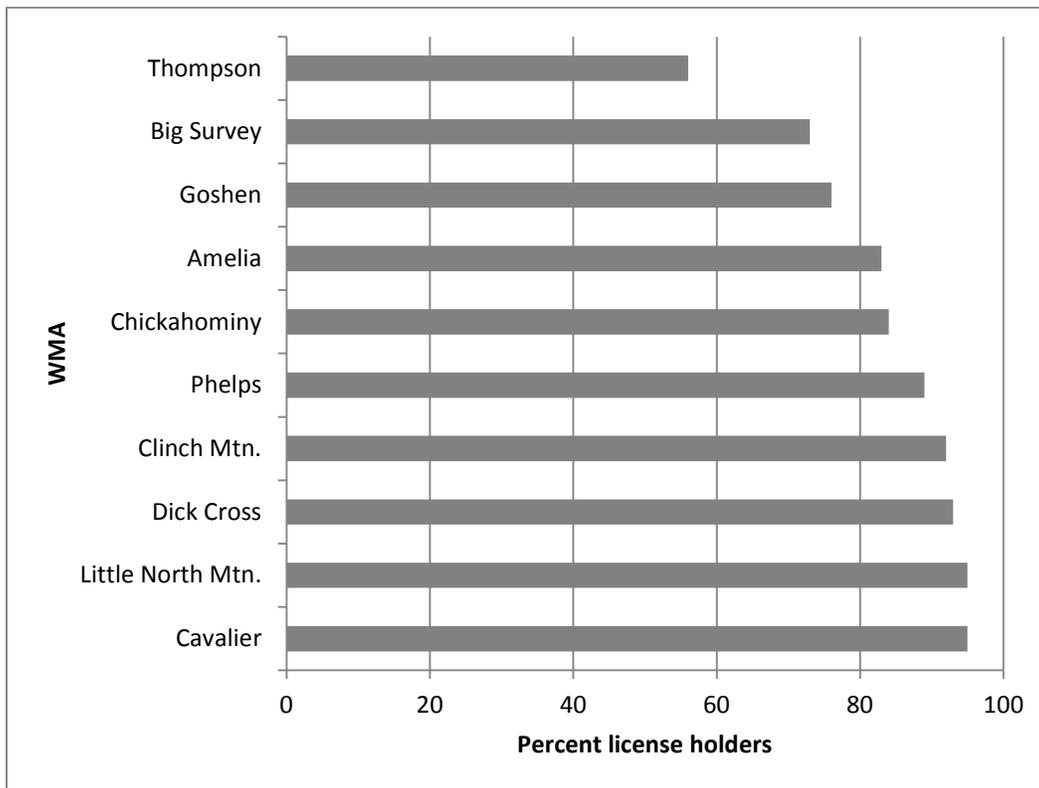
**Figure 2-1.** Wildlife-related recreation participation reported by respondents to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006).



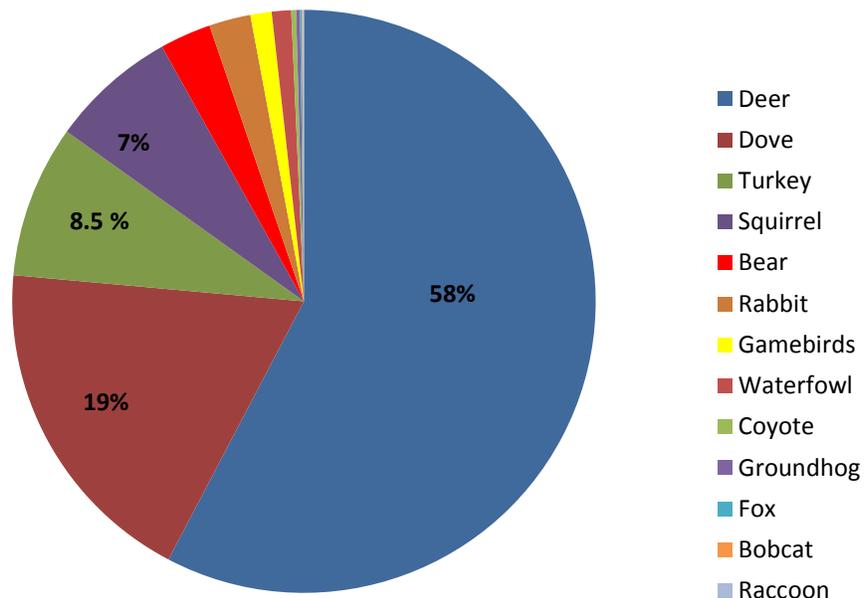
**Figure 2-2.** Map of Wildlife Management Areas (shown in green) in Virginia (adapted from Virginia Department of Game and Inland Fisheries) in 2011. Stars and numerical codes identify the 10 WMAs sampled in this study.



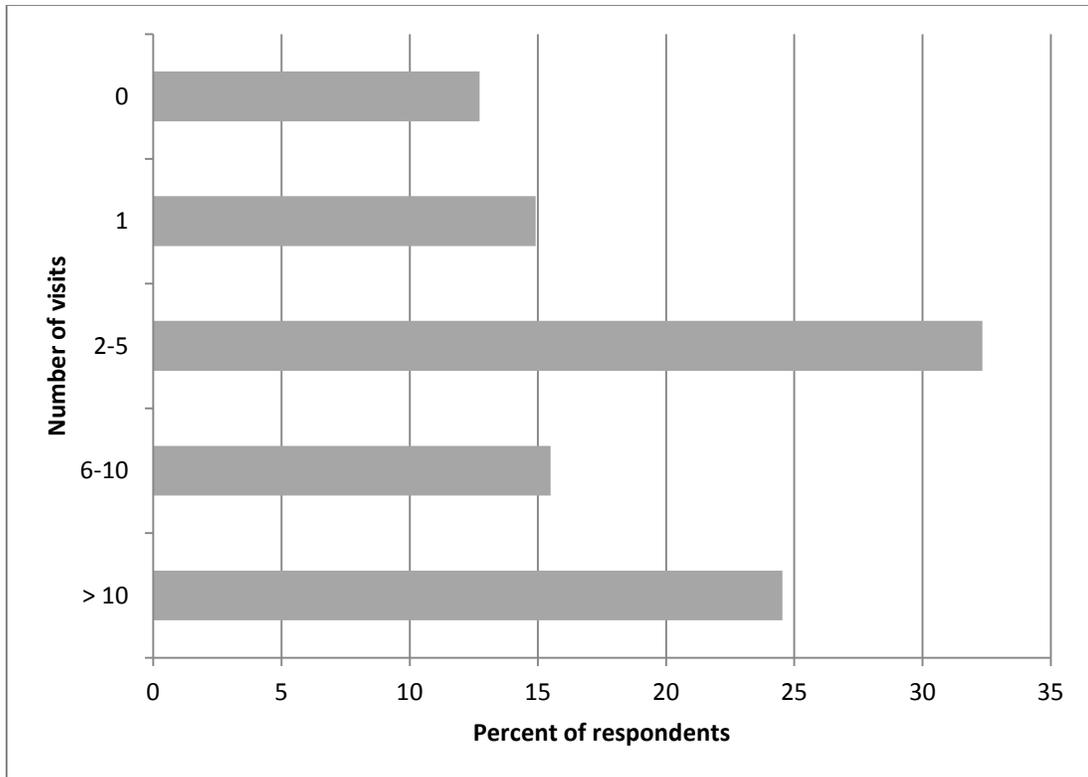
**Figure 2-3.** Age distribution of Virginia Wildlife Management Area (WMA) survey respondents, as collected by personal interviews in 2009 and 2010 (N=4,044).



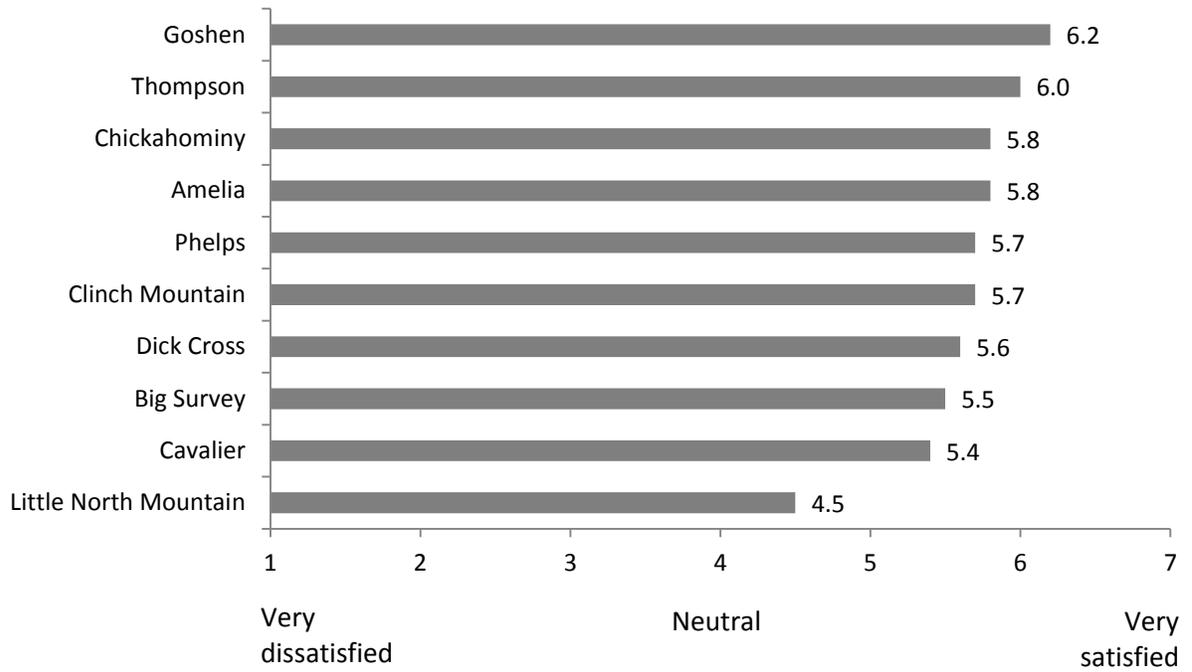
**Figure 2-4.** Percent of visitors to a Virginia Wildlife Management Area (WMA) that held a valid Virginia hunting, fishing, trapping, or sportsmen’s (combination of all 3) license, as collected by personal interviews in 2009 and 2010.



**Figure 2-5.** Game species targeted by hunters (n=1,864) on Virginia’s Wildlife Management Areas (WMAs), as collected by personal interviews in 2009 and 2010.



**Figure 2-6.** Frequency of previous visits (within the previous 12 months) reported by visitors to a Virginia Wildlife Management Area (WMA) (n=3,427) during personal interviews in 2009 and 2010.



**Figure 2-7.** Satisfaction ratings reported by visitors to a Virginia Wildlife Management Area (WMA) (n=3,427) during personal interviews in 2009 and 2010.

**Table 2-1.** Satisfaction ratings of visitors to a Virginia Wildlife Management Area (WMA), as collected by personal interviews in 2009 and 2010.

	<b>Rated 1-3 (dissatisfied)</b>		<b>Rated 4 (neutral)</b>		<b>Rated 5-7 (satisfied)</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
Hunters (n=1,854)	227	12%	244	13%	1,383	75%
Anglers (n=748)	84	11%	68	9%	596	80%
Hikers (n=450)	20	4%	16	4%	414	92%
Range users (n=463)	21	4%	18	4%	424	92%
Horseback riders (n=43)	0	0%	0	0%	43	100%
<b>All users (N=4,059)</b>	<b>373</b>	<b>9%</b>	<b>375</b>	<b>9%</b>	<b>3,311</b>	<b>82%</b>

**Table 2-2.** Opinions of visitors to a Virginia Wildlife Management Area (WMA) on practices used to manage habitat, as collected by personal interviews in 2009 and 2010.

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)		Rated 4 (neutral)		Rated 5-7 (agree w/ practice)	
	n	%	n	%	n	%
Logging some areas to create openings to promote growth of desired species of vegetation	498	15%	436	13%	2,478	73%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	370	11%	429	13%	2,609	77%
Use of herbicides to manage vegetation	1,575	46%	663	20%	1,161	34%
Mechanical techniques to manage vegetation, such as mowing or mulching	182	5%	266	8%	2,958	87%
Planting crops for wildlife food and habitat	123	4%	140	4%	3,144	92%

**Table 2-3.** Comparison (independent t-test) of expressed support for the use of select practices to manage habitat on Virginia Wildlife Management Areas (WMAs) by hunting and fishing license holders and non-license holders, as collected via personal interview in 2009 and 2010. An asterisk (\*) indicates a statistically significant difference ( $P < 0.05$ ).

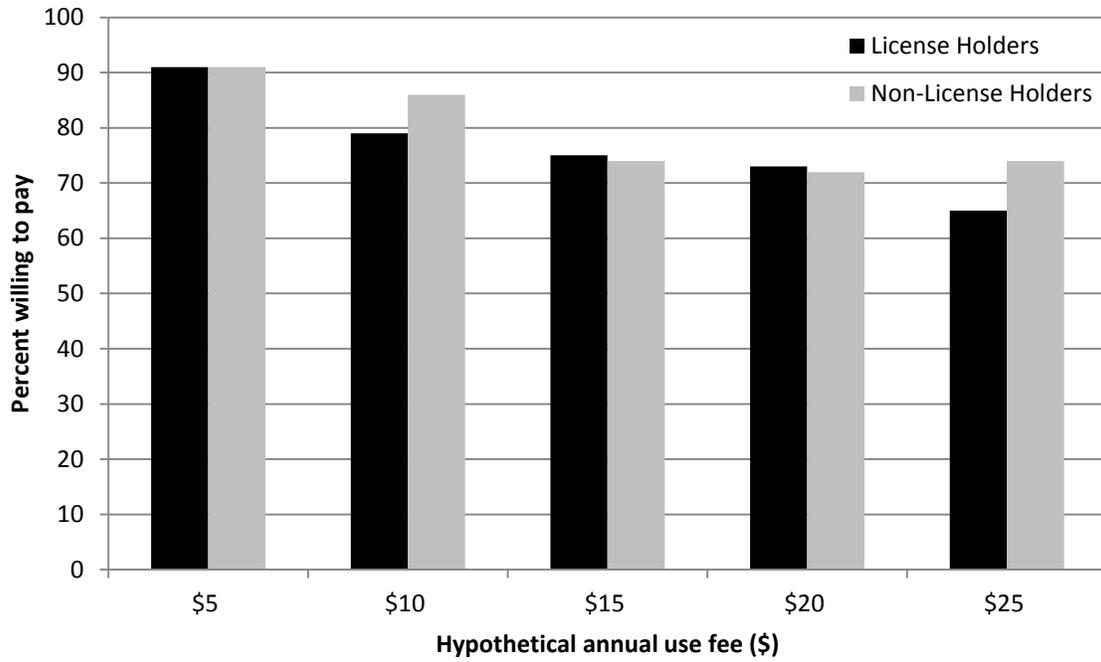
Land management practice	Mean rating <sup>a</sup>		Test statistic <sup>b</sup>	p-value
	License holders (N=2,855)	Non-license holders (N=541)		
Logging some areas to create openings of promote growth of desired species of vegetation	5.45	4.81	7.312	< 0.0001*
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	5.69	5.15	6.372	< 0.0001*
Use of herbicides to manage vegetation	3.69	3.22	5.029	0.030*
Mechanical techniques to manage vegetation, such as mowing or mulching	6.15	5.65	6.69	< 0.0001*
Planting crops for wildlife food and habitat	6.62	5.86	10.015	< 0.0001*

<sup>a</sup>Mean rating on a 7-point Likert scale where 1=strongly disagree with the use of the practice and 7=strongly agree with the use of the practice.

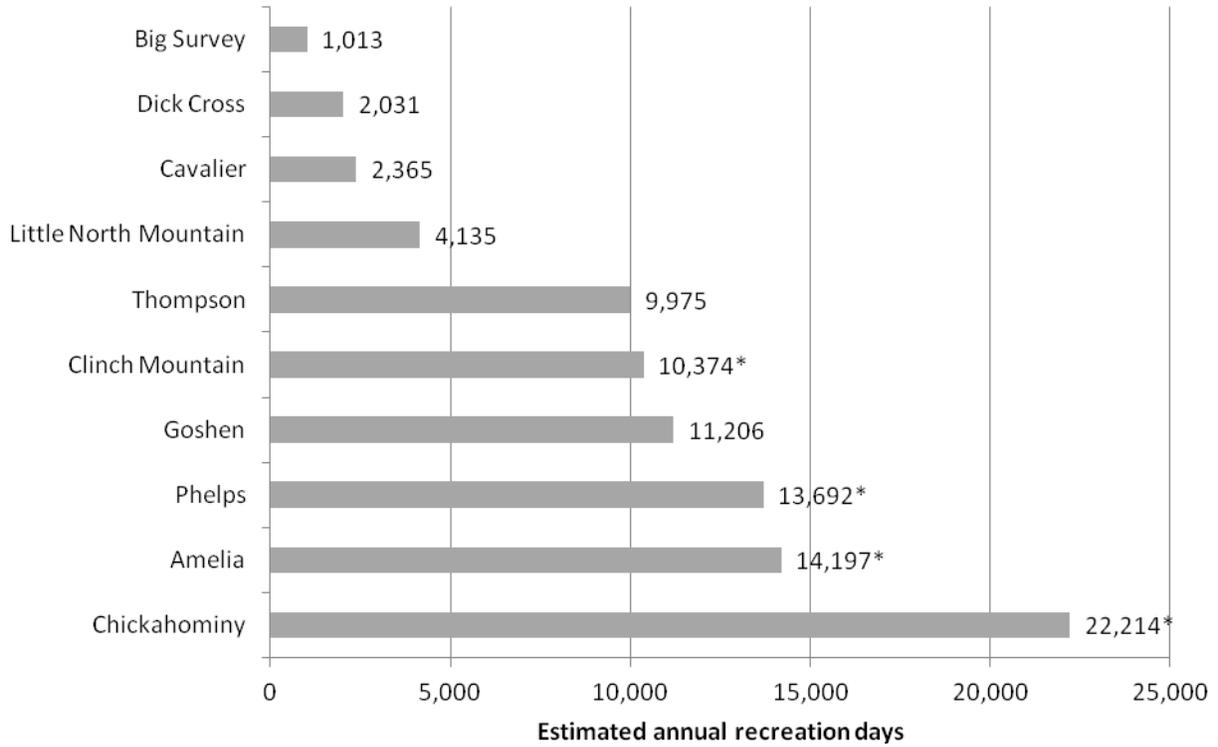
<sup>b</sup>Assuming unequal variances

**Table 2-4.** Opinions of visitors to a Virginia Wildlife Management Area (WMA) regarding who should have to pay an annual fee to use WMAs, as collected by personal interviews in 2009 and 2010.

	Hunters	Anglers	Hikers	Range Users	Horse-back riders	All users
All users should pay an annual fee	15% (n=217)	21% (n=145)	17% (n=61)	14% (n=60)	27% (n=9)	17% (n=592)
Only those who do not have a hunting and/or fishing license should pay an annual fee	34% (n=501)	35% (n=233)	25% (n=87)	32% (n=134)	9% (n=3)	32% (n=1,070)
WMAs should remain available to everyone at no cost	51% (n=746)	44% (n=294)	58% (n=203)	53% (n=223)	64% (n=21)	51% (n=1,710)



**Figure 2-8.** Willingness to pay an annual use fee, as expressed by hunting and fishing license holders (n=2,821) and non-license holders (n=460), collected via personal interview at 10 Wildlife Management Areas (WMAs) in Virginia in 2009 and 2010.



**Figure 2-9.** Estimated annual use (in recreation days) at 10 Virginia Wildlife Management Areas (WMAs), as determined from field surveys conducted from 5 September 2009 through 3 September 2010. Estimates include use of sighting-in ranges, where available (indicated by \*), from 1 September 2009 through 31 March 2010.

## Literature Cited

- Bowker, J.M., H.K. Cordell, and C.Y. Johnson. 1999. User fees for recreation services on public lands: a national assessment. *Journal of Park and Recreation Administration* 17:1-14.
- Cheng, A.S., L.E. Kruger, and S.E. Daniels. 2003. "Place" as an integrating concept in natural resources politics: propositions for a social science research agenda. *Society and Natural Resources* 16:87-104.
- Cordell, H.K., C.J. Betz, and G.T. Green. 2002. Recreation and the environmental as cultural dimensions in contemporary American society. *Leisure Sciences* 24:13-41.
- Cordell, H.K., and M.A. Tarrant. 2002. Southern forest resource assessment highlights: changing demographics, values and attitudes. *Journal of Forestry* 100:28-33.
- Decker, D.J., and L.C. Chase. 1997. Human dimensions of living with wildlife--a management challenge for the 21<sup>st</sup> century. *Wildlife Society Bulletin* 25:788-795.
- Duffus, D.A., and P. Dearden. 1990. Non-consumptive wildlife-oriented recreation: a conceptual framework. *Biological Conservation* 53:213-231.
- Eisenhauer, B.W., R.S. Krannich, and D.J., Blahna. 2000. Attachments to special places on public lands: an analysis of activities, reasons for attachments, and community connections. *Society and Natural Resources* 13:421-441.
- Fisher, R. J. 1993. Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research* 20:303-15.
- Fortier, J., and C. Messier. 2006. Are chemical or mechanical treatments more sustainable for forest vegetation management in the context of TRIAD? *The Forestry Chronicle* 82:806-818.
- Herrick, T.A., and C.D. McDonald. 1992. Factors affecting overall satisfaction with a river recreation experience. *Environmental Management* 16:243-247.

- Heywood, J.L. 1987. Experience preferences of participants in different types of river recreation groups. *Journal of Leisure Research* 19:1-12.
- Innes, J.E. and D.E. Booher. 2004. Reframing public participation: strategies for the 21<sup>st</sup> century. *Planning Theory & Practice*. 5:419-436.
- Jacobson, C.A., J.F. Organ, D.J. Decker, G.R. Batcheller, and L. Carpenter. 2010. A conservation institution for the 21<sup>st</sup> century: implications for state wildlife agencies. *Journal of Wildlife Management* 74:203-209.
- Jacobson, S.K., and S.B. Maryknowski. 1997. Public attitudes and knowledge about ecosystem management on Department of Defense land in Florida. *Conservation Biology* 11:770-781.
- Kerr, G.N., and M.J. Manfredo. 1991. An attitudinal based model of pricing for recreation services. *Journal of Leisure Research* 23:37-50.
- LaRoe, L.M., K. Unger, and D. Abhat. 2009. Conservation at a Crossroad: as hunting declines, cash-strapped states seek new revenue to conservation. *The Wildlife Professional* 3(1): 26-31.
- Leahy, J.E., and D.H. Anderson. 2008. Trust factors in community-water resource management agency relationships. *Landscape and Urban Planning* 87:100-107.
- Leggett, C.G., N.S. Kleckner, K.J. Boyle, J.W. Duffield, and R.C. Mitchell. 2003. Social desirability bias in contingent valuation surveys administered through in-person interviews. *Land Economics* 79:561-575.
- Manfredo, M.J., T.L. Teel, and A.D. Bright. 2003. Why are public values toward wildlife changing? *Human Dimensions of Wildlife* 8:287-396.

- Manfredo, M.J., and H.C. Zinn. 1996. Population change and its implication for wildlife management in the New West: a case study of Colorado. *Human Dimensions of Wildlife* 1:62-74.
- Mannesto, G., and J. B. Loomis. 1991. Evaluation of Mail and In-Person Contingent Value Surveys: Results of a Study of Recreational Boaters. *Journal of Environmental Management* 32 (2): 177-90
- Nelson, M.D., G.C. Liknes, and B.J. Butler. 2010. Map of forest ownership in the conterminous United States. U.S. Department of Agriculture, Forest Service, Northern Research Station, Forest Inventory and Analysis. Research Map NRS-2. Available at: [http://www.nrs.fs.fed.us/pubs/rmap/rmap\\_nrs2.pdf](http://www.nrs.fs.fed.us/pubs/rmap/rmap_nrs2.pdf)
- Nelson, C.M., E. Steffey, and E. Clark. 2006. State game and wildlife area recreation use assessment: Michigan's Maple River State Game Area, Fall 2005. p. 33-40 *in* Burns, R. and Robinson, K., comps. Proceedings of the 2006 Northeastern Recreation Research Symposium. Department of Agriculture, Forest Service, Northern Research Station. Gen. Tech. Rep. NRS-P-14. Newtown Square, Pennsylvania, USA.
- Responsive Management. 2005. Public opinion on fish and wildlife management issues and the reputation and credibility of fish and wildlife agencies in the southeastern United States: Virginia. Conducted for the Southeastern Association of Fish and Wildlife Agencies. Available at: [http://www.responsivemanagement.com/download/reports/SEAFWA\\_Virginia\\_Report.pdf](http://www.responsivemanagement.com/download/reports/SEAFWA_Virginia_Report.pdf)
- Richer, J.R., and N.A. Christensen. 1999. Appropriate fees for wilderness day use: pricing decisions for recreation on public land. *Journal of Leisure Research* 31:269-280.

- Stern, M.J. 2008. The power of trust: toward a theory of local opposition to neighboring protected areas. *Society and Natural Resources* 21:859-875.
- Stern, M.J. 2010. Payoffs vs. process: Expanding the paradigm for park/people studies beyond economic rationality. *Journal of Sustainable Forestry* 29:174-201.
- Sudman, S., and N.M. Bradburn. 1974. Response effects in surveys: a review and synthesis. Aldine, Chicago, Illinois, USA.
- Teel, T. L., A.A. Dayer, M.J. Manfredo, and A.D. Bright. 2005. Regional results from the research project entitled "Wildlife Values in the West." (Project Rep. No. 58). Project Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO: Colorado State University, Human Dimensions in Natural Resources Unit.
- Teel, T.L., M.J. Manfredo, and H.M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife* 12:297-305.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/www/abs/fishing.html>
- U.S. Fish and Wildlife Service. 2011. Wildlife and Sport Fish Restoration Program. Available at: <http://wsfrprograms.fws.gov/Subpages/AboutUs/WSFRProgramBrochure2011.pdf>
- Vaske, J.J., and M.P. Donnelly. 1999. A value-attitude-behavior model predicting wildland preservation voting intentions. *Society and Natural Resources* 12:523-537.
- Vaske, J.J., A.J. Fedler, and A.R. Graefe. 1986. Multiple determinants of satisfaction from a specific waterfowl hunting trip. *Leisure Sciences* 8:149-166.

- Vaske, J.J., M.P. Donnelly, T.A. Heberlein, and B. Shelby. 1982. Differences in reported satisfaction ratings by consumptive and nonconsumptive recreationists. *Journal of Leisure Research* 14:195-206.
- Winter, P.L., L.J. Palucki, and R.L. Burkhardt. 1999. Anticipated responses to a fee program: the key is trust. *Journal of Leisure Research* 31:207-226.
- Zinn, H.C., M.J. Manfredo, and S.C. Barro. 2002. Patterns of wildlife value orientations in hunters' families. *Human Dimensions of Wildlife* 7:147-162.

## **Chapter 3:**

### **Co-oriented attitudes of state wildlife agency personnel and stakeholders toward public land management**

Natural resource managers often make decisions based in part on their perceptions about stakeholder views (Leuschner et al. 1989). However, studies suggest that the values, opinions, and perceptions of biologists charged with managing natural resources differ from those of their stakeholders (Peyton and Langenau 1985, Absher et al. 1988, Kearney et al. 1999, Bradley and Kearney 2007). As management of public land becomes increasingly complex, effective agencies strive to learn more about their stakeholders and seek ways to involve the public in developing broad management goals and objectives.

Declining participation in hunting and fishing is well documented (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006, La Roe et al. 2009), but little information exists regarding other stakeholders who recreate on public hunting and fishing lands (Decker and Chase 1997). In 2006, 87.5 million people in the U.S. participated in wildlife-related recreation. Of the 71.1 million people that participated in wildlife watching, 23 million viewed wildlife away from their home; 80% of these wildlife watching participants traveled to public lands to view wildlife (U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). Because the composition of recreational use on public lands is believed to be changing, many state agencies want to learn more about their stakeholders.

Effective management of natural resources involves a combination of communication and collaboration that may vary according to management objectives and audience. In some situations, agency personnel need to disseminate information to increase awareness among

stakeholders, whereas, in other situations, managers may need to facilitate dialogue or negotiation with and among stakeholder groups. Those charged with managing natural resources may, within the constraints of their agency missions, identify common interests or overlap among the opinions and attitudes of consumptive and non-consumptive user groups to achieve mutual gain (Jacobson and Marynowski 1997). With new stakeholders coming to the table, many state agencies may need to re-evaluate whether traditional means of communication reach all stakeholders effectively and, where they do not, tailor new efforts toward reaching these changing constituencies.

Collaborative efforts can help the agency achieve desired management objectives with lower associated financial or personnel costs while also engaging stakeholders in management (Davenport et al. 2007). Collaborative projects also build a sense of agency legitimacy and may reduce conflict among stakeholder groups and with the agency (Bierle and Konisky 2000, Innes and Booher 2004). Greater responsibility for public lands may reduce vandalism and improve self-policing of other users, instill greater respect for the unique features, and increase awareness, understanding, and participation in active land management for wildlife (Wondolleck and Yaffee 2000). Building interpersonal relationships has benefits for management by incorporating local knowledge and effort, but will lighten the load of managers and reduce reactionary public relations for the agency.

### **Research Purpose**

The Virginia Department of Game and Inland Fisheries (VDGIF) owns and manages 39 wildlife management areas (WMAs) comprising >200,000 acres that provide and enhance wildlife habitat and offer wildlife-related recreational opportunities in Virginia. WMAs provide opportunity for both traditional wildlife recreation (i.e., hunting and fishing) and non-

consumptive wildlife-related recreation uses, the latter of which is perceived to be increasing (Cordell and Tarrant 2002, Cordell et al. 2002, U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). A shift in recreational use of WMAs may result in changing WMA stakeholders.

The co-orientation model is a powerful, but underutilized, research tool in public relations research (Cutlip et al. 2000), especially in natural resources. Many existing co-orientation studies focus on the views and perceptions of stakeholders, but ignore views and perceptions of the organization (Kelly et al. 2006), which may result in ineffective or inappropriate communication efforts if inaccurate perceptions exist on either side. This research was developed from earlier two-way complete-design co-orientation studies in other fields applied to a wildlife agency and a segment of stakeholders (i.e., recreational users of WMAs). Wildlife value orientations were incorporated to determine if these constructs help to describe managers' and stakeholders' views (Figure 3-1). My specific research questions were:

1. How do agreement, accuracy, and congruency of the attitudes and opinions about common land management practices differ between VDGIF managers/biologists and WMA users?
  - a. How can communication between VDGIF managers and biologists and WMA users be improved?
2. How do wildlife value orientations differ between VDGIF managers/biologists and WMA users?
  - a. Do wildlife value orientations help explain co-orientation results?

### **Co-orientation theory of communication**

Co-orientation theory attempts to measure the degree of understanding between members of two parties (in this case, an organization and its stakeholders) by identifying similarities and

differences in viewpoints and assumptions between parties. Co-orientation provides a framework for understanding views or beliefs of two parties and the recognition each has of the others' views or beliefs. This understanding of viewpoints and perceptions can then be applied to describe and enhance two-way, symmetrical communication in which an organization communicates its interest(s) or position(s) to its publics, actively listens to its publics' interest(s) or position(s), and works to negotiate a solution that balances the needs and desires of both parties (Dozier et al. 1995, Grunig 2001). In other words, stakeholders potentially can influence the organization as much as the organization influences its stakeholders (Von Kutzschenbach and Brønn 2006).

Co-orientation involves measuring 3 different constructs that frame the opportunity for effective communication: agreement, accuracy, and congruency. Agreement identifies the degree of similarity between the organization and stakeholders definitions (knowledge) and evaluations (opinions and attitudes) (Broom and Dozier 1990, Leong et al. 2008). While the co-orientation model identifies this construct as "agreement," high agreement between parties does not always imply support. For example, both groups could disagree with an action or issue, yet agreement in the co-orientation sense remains high since the groups share similar views. Accuracy compares one party's estimate of the attitudes and beliefs of the other party to that party's actual attitudes and beliefs. In other words, each party develops an image of the other party's interpretation of the issue (Brønn and Brønn 2003). Congruency (or perceived agreement) involves the extent to which each party's estimate of the other's attitudes and beliefs align with their own. This measure does not describe relationships between the organization and its publics directly, as agreement and accuracy do; it examines how one side views the relationship between the two groups (Leong et al. 2007, 2008).

The ability of one party to accurately recognize the other party's interest or position provides a measure of their co-orientation, and ultimately should predict the quality of communication (McLeod and Chaffee 1973). The co-orientation model provides a level of detail that is a step above audience characterization, and is useful particularly for decision makers in an agency who seek to improve communication and collaboration with stakeholders (Leong et al. 2008). Results from co-orientation evaluation can lead to the development of specific prescriptive actions designed to improve problematic aspects of a relationship (Seltzer and Mitrook 2009).

Relationships between agreement and accuracy may identify four different states of communication: true consensus, dissensus, false conflict, and false consensus (Broom and Dozier 1990, Figure 3-2). True consensus occurs when both agreement and accuracy are high. In other words, the organization and its stakeholders agree on an issue and believe that they agree. Dissensus occurs when the organization and its stakeholders do not agree, but they recognize that this disagreement exists (low agreement and high accuracy). Two false states occur if either the organization or its stakeholders (or both parties) hold inaccurate views of the other's positions on the issue. When agreement is high and accuracy is low, false conflict occurs. In false conflict, the organization and its stakeholders actually agree on an issue, but incorrectly believe that the other party holds an opposing position. False consensus occurs when both agreement and accuracy are low; the organization and its stakeholders hold different views, but may mistakenly believe that share agreement.

The two false states can be particularly detrimental to public relations efforts between the organization and its stakeholders because miscommunication obviously is occurring. These misunderstandings can mask areas of understanding and agreement on the issue, making

communication and collaboration more difficult. As members of the public desire more of a collaborative role in decision making, citizens have challenged the traditional view of agency personnel as technical “experts” in their field who ultimately should make decisions and take management action on behalf of the values and goals of their constituents (Selin and Chavez 1995). Co-orientation can be employed to help agencies make decisions with stakeholder views and interests in mind. In some cases, managers may need to enhance stakeholders’ understanding of the technical aspects or feasibility of using management techniques to achieve desired goals; in other cases, managers simply need to improve their understanding of the values and goals of their stakeholders. By respecting and being responsive to stakeholders’ desires, positions, and needs, agencies can improve their image and their relationship with stakeholder groups (Lafon et al. 2004).

Although congruency is described infrequently in co-orientation studies, perceived agreement may be particularly important for understanding the current relationships between an organization and its stakeholders. Salient value similarities, or perceived shared values between managers and stakeholders, are highly correlated with trust (Siegrist et al. 2000, Cvetkovich and Winter 2003, Vaske et al. 2007). Salient values similarity and trust influence public support of agency goals, objectives and management and cooperation with the agency; shared values also likely serve as determinants of effective communication (Elsbach 2004, Vaske et al. 2007). Trust can also reduce conflict between agencies and their stakeholders and facilitate cooperative behavior (Leahy and Anderson 2008).

Co-orientation has been used to identify and understand views held by organizations and stakeholders in education (Williamson 2010), customer service (Jones 1993, Seltzer 2007), non-profit organizations (Waters 2007, Ryan 2009), transportation (Carson 2005), and health care

(Kelly et al. 2006), but applied relatively infrequently in natural resources. Many previous studies in natural resources focused more on the agreement relationship between opinions of managers and their stakeholders (Hendee and Harris 1970, Twight and Catton, Jr. 1975, Peyton and Langenau 1985, McCool et al. 1986, Leuschner et al. 1989, Phillips et al. 1998, Bradley and Kearney 2007); few incorporated additional measures of accuracy and/or congruency that provide deeper understanding (Twight and Paterson 1979; Absher et al. 1988; Connelly and Knuth 2002; Leong et al. 2007, 2008). Several studies employed co-orientation, but a gap in the research exists; the full co-orientation model has yet to be used to examine the relationship between a state wildlife agency and a segment of its stakeholders.

### **Wildlife value orientations**

Values provide the foundation for an individual's belief system and act as his/her reference point for evaluating world views. Values form early in life as a product of societal conditions, family, and friends. Values directly may influence an individual's attitudes and beliefs toward wildlife and natural resources (Vaske 2008). Value orientations express one's basic beliefs, providing insight into why individuals or groups hold the opinions they possess (Manfredo et al. 2003, Teel et al. 2007). Although values generally are static and difficult to change, basic beliefs concerning the application of those values to an individual's life within a specific context may vary widely, resulting in variability in attitudes and behaviors (Eagly & Chaiken 1993, Fulton et al. 1996, DeRuiter and Donnelly 2002, Teel et al. 2005). Wildlife value orientations can help researchers make predictions about patterns of attitudes and behaviors associated with a set of wildlife issues (Fulton et al. 1996, Teel et al. 2005). Because the primary goal for WMAs is to maintain and enhance habitat for wildlife, understanding the wildlife value

orientations of different stakeholder groups can help managers predict conflicts that may arise regarding recreation or disagreements related to management of WMAs.

Researchers can employ utilitarian and mutualism scales to segment publics into 4 value orientation “types” that may respond similarly to management actions or wildlife issues (Teel et al. 2005, Figure 3-3). Utilitarians (as classified by a high score on the utilitarian scale and a low score on the mutualistic scale) believe that wildlife should be used and managed for the benefit of humans, and human needs should be prioritized over those of wildlife. Mutualists (as classified by a low score on the utilitarian scale and a high score on the mutualistic scale) hold a protectionist view toward wildlife and natural resources and believe that humans and wildlife should co-exist in harmony. Pluralists (as classified by a high score on both utilitarian and mutualistic scales) hold both utilitarian and mutualistic values, and their opinions vary based on the circumstances of different issues. Distanced individuals (as classified by a low score on the utilitarian and the mutualistic scales) express less interest in wildlife-related issues, or simply hold neither utilitarian nor mutualistic views toward wildlife (Teel et al. 2005).

Because value orientations influence attitudes toward wildlife, natural resource managers need to understand the value orientations of their stakeholders (Tarrant et al. 1997, Bright et al. 2000). Managers and their stakeholders can enhance efforts to improve communication by developing messages that incorporate awareness of each other’s views and perceptions (Purdy and Decker 1989, Muth and Jamison 2000). Knowledge of stakeholder value orientations can help managers learn more about the public’s desired goals for management, choose publicly acceptable and appropriate techniques to achieve those goals, pro-actively recognize conflicts that may arise from technique implementation, and develop a framework to evaluate public views of the techniques selected (Bright et al. 2000).

## Methods

VDGIF did not have a reliable sampling frame of people who recreate on WMAs. As part of an earlier field survey, I interviewed visitors at 10 WMAs selected by agency personnel that represented the types of WMAs in Virginia. In selecting WMAs for study, VDGIF chose two WMAs from every region throughout the Commonwealth, and constrained selection so those chosen represented the diversity of use, access options, habitat types, and recreational opportunities available at all WMAs. Project staff and volunteers conducted 3-5 minute interviews with WMA visitors >18 years of age from 5 September 2009 through 3 September 2010 (Appendix A). Depending upon the particular WMA surveyed, the interviewer either (1) set up a recognizable check station at the main access road into the WMA or the specific area covered that day, or (2) traveled a pre-designated roving route with prescribed stops at access roads and/or parking areas within the WMA. My interview protocol satisfied the Virginia Tech Internal Review Board requirements for research involving human subjects (IRB approval #09-600).

I surveyed each WMA or designated subsection of a WMA on at least 24 randomly selected days (15 weekend days and 9 weekdays) over the 12-month survey period. On large WMAs or those with multiple access points, I segregated the WMA into separate subsections that an interviewer could cover reasonably in a day. Interviewers visited each subsection on at least 24 randomly selected days, except for a few instances when winter weather prevented access to the area. I selected sampling days at random distributed equally among strata (Saturdays, Sundays, and weekdays). I treated weekend days (i.e., Saturdays and Sundays) separately due to differences in hunting participation; regulations at the time of the survey permitted hunting on Saturdays, but prohibited hunting on Sundays. In addition to the 24 general

survey days, I conducted separate special surveys on several unique target days, such as hunting and fishing season opening days, when I predicted higher use than an average recreation day.

At the end of the field interview, I asked WMA users if they would like to provide an email address or mailing address to complete the follow-up mail and web-based survey described in this chapter. Respondents electing to provide contact information did not significantly differ from those that did not (Table 3-1). I surveyed WMA users (n=1,516), using identical mail and internet instruments (Appendices C and D), and VDGIF managers and biologists (n=81), using an abbreviated version of the internet instrument (Appendix E) in March and April 2011.

I used Dillman's Tailored Design Method for mail survey development and implementation, which can be adapted for use with mail and/or internet surveys and involves multiple contacts with participants over the course of several weeks to attempt to increase response rates and reduce error (Dillman 2000). Participants contacted via mail received up to 4 mailings: an invitation letter and survey, a reminder postcard, a second letter and another copy of the survey, and a final reminder postcard. I used similar repeated contacts with participants who received a web-based survey; they received a weekly e-mail reminder for 3 weeks following initial contact and then a final notice 3 days before the return deadline. I discontinued mailings to an individual once he/she returned a survey via mail or online. Participants initially contacted by mail could elect to complete the internet version, if preferred.

The survey focused on 4 categories of habitat management practices: timber harvest, prescribed fire, chemical applications (herbicide), and mechanical techniques. Participants received a series of scenarios or conditions under which each management practice may be applied to gauge that participant's perception of acceptability for each option. Respondents indicated their level of agreement with each statement on a 5-point Likert scale, ranging from

strongly agree to strongly disagree with a neutral option as the midpoint of the scale. More detailed questions pertaining to specific practices in each of these 4 management categories examined how opinion or attitude may be shaped by various conditions, circumstances, justifications, or applications of the practice. This helped identify areas where conflict may arise, but also helped identify why stakeholders or agency personnel hold attitudes toward a given practice.

I used Chi-square tests to identify significant differences between VDGIF respondents' and WMA users' responses to land management items. I scrutinized significant differences further to determine whether practical significance existed for managers. When I observed a significant difference, I performed a follow-up Gamma test of association to verify (or contradict) Chi-square results, and to determine the magnitude and directionality of each significant difference (Babbie 2010). The gamma statistic, one type of proportional reduction in error (PRE) measure used with ordinal or nominal data, ranges from -1 to 1 and is easily interpreted; 0 indicates no relationship between the variables, whereas +/- 1 indicates a perfect relationship (Babbie 2010). In the social sciences, practitioners view a gamma of +/- 0.01 to 0.09 as a weak or uninteresting relationship, +/- 0.1 to 0.29 as a moderate relationship worth noting, and +/- 0.3 to 0.99 as evidence of an extremely interesting or strong relationship (Babbie et al. 2003). The p-value associated with each gamma statistic describes its significance. When a Chi-square test resulted in significance, but a follow up Gamma test resulted in non-significance, I took a conservative approach; I assumed non-significance or that strong evidence to support a practical significant difference did not exist.

A battery of 12 co-orientation questions asked respondents to predict the attitudes and opinions of the other party regarding several management practices. Participants first responded

to a battery of 9 items describing each of the 4 management practices from their own point-of-view. Three items each focused on ecological considerations, impacts to wildlife, and aesthetic considerations of the given management practice. Twelve co-orientation questions (3 questions each for 4 management practices) were presented a second time and I instructed respondents to reply as they perceived the other party would respond. I randomly selected the subset of 12 co-orientation questions to reduce respondent burden, while constraining selection to include 1 item from each focus area (i.e., ecological, wildlife, aesthetics). For analysis, I retained the 5-point Likert scale responses since most cell counts were large enough to meet the assumptions of the Chi-square test ( $>5$ ). I used Chi-square tests to identify differences in distributions between VDGIF managers and WMA users' categorical responses and predictions for management practice items (Babbie 2010), and, when Chi-square significance was found, performed a follow-up gamma test of association as described previously.

Because congruency data were not independent (i.e., each respondent provided their own responses and then predicted responses for the other group), I used Wilcoxon signed rank tests, the non-parametric equivalent of paired t-tests, to identify significant differences between groups' perceived agreement (Ott 1993). The signed rank test uses information about the size of the difference between 2 members of a pair; like the gamma statistic, the signed rank test describes directionality and magnitude of the difference (Ott 1993), but is appropriate given the relationship between an individual's responses and predicted responses.

To assess value orientations of VDGIF employees and stakeholders toward wildlife, I used an adapted version of the wildlife value orientation instrument designed by Teel et al. (2005). I modified the value orientation scale from that used in earlier research (e.g., Fulton et al. 1996, Teel et al. 2005) by (1) reducing the response scale from a 7-point to a 5-point Likert

scale, (2) retaining only the utilitarian and mutualism value orientation scales and dropping the ancillary scales, and (3) reducing the number of items to 3 within each dimension to reduce respondent burden. Respondents indicated their level of agreement with each statement on a 5-point Likert scale, ranging from strongly agree to strongly disagree with a neutral midpoint. To reduce the burden on respondents, I selected 16 statements from the original 25-question scale developed by Teel et al. (2005). The 16 statements I selected had the highest factor loadings in their study after dropping the ancillary belief dimensions (i.e., attraction and concern for safety belief dimensions). I presented identical value statements to both VDGIF managers/biologists and stakeholders in this survey effort.

I removed respondents from analysis who did not answer all 16 value orientation questions. I coded responses to each utilitarian and mutualism item based on whether the individual supported, opposed, or were neutral toward the orientation and to what degree. I calculated a final score for each individual on both orientations; the individual then was classified as “high” or “low” on the utilitarian and mutualism scale based on the midpoint of the range of possible scores. The comparison of respondents’ scores on both orientation scales resulted in their placement into 1 of 4 value orientation types: utilitarian, mutualist, pluralist, or distanced (Teel et al. 2005; see Figure 3-2). Although I classified respondents into 1 dominant value orientation type, many individuals identify at some level along the continuum on both the utilitarian and mutualist scales. I used contingency tables to compare demographic information (e.g., rural/urban background, education) with value orientation responses and identified significant differences using Chi-square tests.

I incorporated wildlife value orientation data into the co-orientation model to further explain why a given co-orientation state may exist. Wildlife value orientations that explain how

individuals view animals and wildlife also may influence how they define and evaluate land management practices. For example, those who display a utilitarian orientation toward wildlife also might support active land management, and thus also display a utilitarian viewpoint toward land management. In addition, value orientations held by an organization and/or stakeholders may influence perceptions of their relationship with the other group. For example, either group may believe their values are very different from those of the other party, which would make communication more difficult and likely less effective. In this case, predictions of accuracy and congruency may be low and misunderstandings may be present. Alternatively, where values held by the organization and its stakeholders align, one would expect to see greater understanding between the groups, more effective communication, and higher accuracy and congruency.

I later segregated WMA user respondents into consumptive/mostly consumptive (“consumptive”) and non-consumptive/mostly non-consumptive (“non-consumptive”) user groups based on their reported recreational activities for further analysis. I classified an individual as “consumptive” if he/she visited WMAs exclusively to hunt and/or fish or hunt and/or fish more often than engage in other non-consumptive activities in the past 12 months. An individual was classified as “non-consumptive” if he/she visited exclusively to participate in non-hunting/fishing activities or visited more frequently to participate in non-hunting/fishing activities than to hunt or fish.

I completed all data analyses with SPSS 20.0 (Statistical Programming for Social Sciences; IBM Corporation 2011), and removed individual VDGIF or WMA user respondents with missing data from that analysis. Participation in this research effort was voluntary,

confidential, and satisfied all requirements of the Virginia Tech Internal Review Board approval process (IRB #09-600).

## **Results**

### **Demographics**

I received 726 valid, completed surveys (including both web and mail forms) from WMA recreational users, yielding an overall response rate of 50%. Mean age of respondents was 49 years (range: 20-84 years), and 94% were male. Most respondents indicated that they currently live in a rural area (43%) or a metropolitan city (23%). Eighty-five percent (n= 615) of respondents reported that they held a valid hunting (n=485), fishing (n=449), trapping (n=14), and/or sportsmen's license (n=45) at the time of the survey. Five hundred sixty respondents (77%) visited at least 1 WMA in the 12 months prior to the survey, most frequently to hunt and/or fish, but many also participated in non-hunting and fishing activities such as hiking, camping, and wildlife watching, though to a lesser degree ("consumptive" users). One hundred sixty-six respondents (23%) visited a WMA in the 12 months prior to the survey to participate exclusively in non-hunting/fishing activities, or to participate most frequently in non-hunting/fishing recreational activities, though they may have hunted or fished on WMAs rarely or infrequently ("non-consumptive" users).

Seventy-seven VDGIF managers and biologists completed the abbreviated internet survey, yielding a response rate of 95%. Mean age of agency respondents was 48 years (range: 29-63 years), and 90% were male. Nearly 80% (n=61) held a Bachelor's degree or higher.

## **Attitudes toward land management**

With only a few exceptions, most WMA users agreed or strongly agreed with the use of timber harvesting, prescribed burning, herbicide, and mechanical management techniques, given the conditions described to them in this survey (Figure 3-4). A substantial number of WMA users expressed neutrality toward 2 items: “timber harvest if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species” (37% neutral), and “mechanical techniques, as long as noise generated by heavy machinery used does not disturb wildlife” (35% neutral). Users responded with similar levels of agreement, neutrality, and disagreement toward the “use of herbicides even if some wildlife species are displaced temporarily” (36% agreed or strongly agreed, 25% neutral, and 36% disagreed or strongly disagreed). I did not observe overall disagreement for any land management practice. While most respondents agreed with a practice, relatively few expressed strong agreement. I found no significant differences between consumptive and non-consumptive recreational users’ responses to land management practices.

In comparison, VDGIF staff reacted more variably to the management practice statements (Figure 3-5). Most VDGIF respondents disagreed with several items pertaining to timber harvesting: “if the resulting forest does not change noticeably” (47% disagreed or strongly disagreed), “if a small patch of trees (e.g., < 5 acres) is harvested at one time rather than a large patch” (47% disagreed or strongly disagreed), and “if only undesirable species of diseased trees are harvested instead of all trees from an area on the WMA” (76% disagreed or strongly disagreed). Many VDGIF respondents (38%) expressed neutrality toward harvesting if a few large trees were left behind to start a new forest. VDGIF respondents strongly agreed with most prescribed burning practices, except for “burning as long as wildlife are not injured or

killed as a result “(42% neutral). VDGIF respondents also supported most uses of herbicides, except for relatively similar levels of agreement, neutrality, and disagreement when “only undesirable species of vegetation were treated” (29% strongly agreed, 23% agreed, 17% neutral, and 30% disagreed or strongly disagreed). VDGIF respondents generally supported uses of mechanical techniques; the exception was the statement “as long as noise generated by heavy machinery used does not disturb wildlife” (52% disagreed or strongly disagreed). VDGIF respondents expressed stronger agreement than WMA users on some practices (e.g., prescribed burning).

### **Co-orientation**

Results from Chi-square tests revealed low agreement for both groups; both groups agreed on only 3 of the 12 co-orientation items: the “use of herbicides if they are safe for wildlife” ( $\chi^2=2.22$ ,  $p=0.696$ ), “mechanical techniques if potential pollution from heavy machinery is prevented” ( $\chi^2=0.43$ ,  $p=0.980$ ), and “prescribed burning if risks to neighboring landowners are minimized” ( $\chi^2=8.53$ ,  $p=0.074$ ). Based on the sign (+ or -) associated with the gamma statistic, for 6 of the 9 remaining items, VDGIF respondents generally expressed greater agreement with the stated land management practices than did WMA respondents.

Neither VDGIF managers nor WMA users accurately predicted the positions of the other group on the majority of co-orientation items. VDGIF managers predicted accurately WMA users’ positions on fewer than half the items: (1) “timber harvest, if it does not change the forest noticeably” ( $\chi^2=8.58$ ,  $p=0.073$ ), (2) “timber harvesting if only undesirable species or diseased trees are harvested instead of all trees” ( $\chi^2=15.94$ ,  $p=0.003$ ;  $G=-0.101$ ,  $p=0.193$ ), (3) “prescribed burning if the risk to neighboring landowners is minimized” ( $\chi^2=10.08$ ,  $p=0.039$ ;  $G=-0.085$ ,  $p=0.378$ ), (4) “mechanical techniques even if wildlife are displaced temporarily” ( $\chi^2=15.53$ ,

p=0.004; G=-0.083, p=0.312), and (5) “mechanical techniques, when used to maintain open fields and clearings” ( $\chi^2=4.91$ , p=0.296). WMA users predicted accurately VDGIF managers’ responses for only 2 items: (1) “herbicides if only undesirable species are treated” ( $\chi^2=53.53$ , p=<0.0001; G=-0.158, p=0.134), and (2) “mechanical techniques if potential pollution impacts were prevented” ( $\chi^2=4.57$ , p=0.334).

I used the sign (+ or -) associated with the gamma statistic to determine directionality of all significant differences associated with agreement and accuracy. Gamma test results indicated that VDGIF respondents underestimated WMA users’ support for all but one of the co-orientation items (i.e., “timber harvesting to improve habitat,” G=0.417, p=<0.0001). Similarly, WMA users’ underestimated VDGIF’s support for all but 3 of the co-orientation items: (1) “timber harvesting if only undesirable or diseased trees are removed” (G=-0.798, p= <0.0001), (2) “timber harvesting if the resulting forest does not change noticeably” (G=-0.608, p=<0.0001), and (3) “the use of herbicides if only undesirable species are treated” (G=-0.158, p=0.134).

Congruency, or perceived agreement, involves the similarities and differences between an individual’s responses and predicted responses for the other group. For most items, I observed low perceived agreement between groups according to Wilcoxon signed rank tests (p < 0.05). VDGIF respondents perceived their responses as being similar to those of WMA users on only 2 items: (1) “herbicides, if only undesirable species of vegetation are treated” (p=0.215), and (2) “mechanical techniques, if potential pollution impacts on wildlife from heavy machinery used are prevented” (p=0.117). WMA users perceived their responses as being similar to those of VDGIF managers on only 3 items: (1) “timber harvest, if only undesirable species or diseased trees are harvested instead of all trees from an area of the WMA” (p=0.429), (2) “prescribed burning, because it duplicates the role that fire historically has played in Virginia’s forests”

( $p=0.707$ ), and (3) " herbicides, to control invasive, non-native plant species on WMAs" ( $p=0.560$ ).

I analyzed the relationship between agreement (i.e., degree of similarity between groups) and accuracy (i.e., degree to which respondents successfully predict other group's responses) for WMA users (Table 3-2) and VDGIF respondents (Table 3-3) on the 12 co-orientation items to depict existing views and predictions of the other group's views regarding land management practices. For WMA users, I classified most items under low agreement and low accuracy (i.e., co-orientation state of false consensus), based on significant differences found between WMA user responses and WMA users' predictions of VDGIF manager responses (Table 3-2). I identified a state of true consensus for the acceptability of "mechanical techniques, if impacts of pollution on wildlife are prevented." In this scenario, WMA users and VDGIF managers both shared views on the item and WMA users accurately predicted VDGIF managers' responses on this item. Dissensus occurred for only 1 item as well ("herbicides if only undesirable species are treated"). Here, WMA users accurately predicted VDGIF's position, even though they recognized that they did not agree with VDGIF on the issue. In the state of false conflict, both groups actually agree on an issue, but they fail to accurately predict the other group's position and recognize that agreement exists (i.e., "acceptability of prescribed burning if risks are minimized," and "herbicides, if they are safe for wildlife").

WMA users expressed higher levels of agreement than VDGIF managers with the given management practices for 3 items of the 9 items for which agreement was low (33%). WMA users experienced low accuracy on 10 land management items; of these, WMA users underestimated the level of support from VDGIF managers on 8 items (80%).

VDGIF managers accurately predicted many of the responses of WMA users, which resulted in higher accuracy overall (Table 3-3). Dissensus occurred for 4 items, in contrast to only 1 item of dissensus demonstrated by WMA users. VDGIF personnel responses revealed that true consensus existed for only 1 item: the acceptability of “prescribed burning, if the risks to neighboring landowners are minimized.” In this scenario, WMA users and VDGIF managers both shared views on the item and VDGIF managers accurately predicted WMA users’ responses. VDGIF personnel perceived a state of false conflict for 2 items, 1 of which also occurred with WMA users (i.e., “herbicides, if they are safe for wildlife”).

VDGIF expressed higher levels of agreement than WMA users with the given management practices for 6 items of the 9 items for which agreement was low (67%). VDGIF managers experienced low accuracy on 7 land management items; of these, VDGIF managers underestimated the level of support from WMA users on 6 items (86%).

### **Wildlife value orientations**

Most WMA recreational users identified as predominantly Pluralists (63%), though a substantial proportion identified as Utilitarians (34%). Few individuals identified as Mutualists (3%) or Distanced (< 1%). Chi-square tests between wildlife value orientation type and demographic information indicated that Utilitarians were more likely to hold a hunting or fishing license ( $\chi^2 = 30.15$ ,  $p = < 0.0001$ ).

VDGIF managers identified as mostly Utilitarians (54%) or Pluralists (38%). Only 8% identified as Mutualists, and none were Distanced. VDGIF managers’ responses and WMA users’ responses differed significantly on several utilitarian and mutualism items (Table 3-4). In all cases of detected significant differences, WMA users overall expressed greater agreement with the value orientation items than VDGIF respondents. This may provide further evidence

indicating the large proportion of WMA users who identified as Pluralists (i.e., identified strongly with both the utilitarian and mutualism scales).

Because of the changes made to the value orientation scale used previously, I analyzed the statistical integrity of my methods. Cronbach's alpha values of 0.65 to 0.70 are considered adequate in human dimensions and recreation research (Vaske 2008); therefore, I observed acceptable internal consistency for both the utilitarian and mutualism value orientation scales (Table 3-4). I found identical internal consistency between my modified mutualism orientation and the scale used by Teel et al. ( $\alpha=0.87$ ), but lower internal consistency of my modified utilitarian orientation ( $\alpha=0.74$ ) than in Teel et al. ( $\alpha=0.83$ ; 2005). Two belief dimensions comprised each orientation. I observed similar dimension consistencies with the findings of Teel et al. (2005), with the exception of the utilitarian belief dimension where their Cronbach's alpha ( $\alpha=0.78$ ) was much higher than my result ( $\alpha=0.66$ ). Cronbach's alpha indicated adequate consistency for all modified versions of each of the 4 dimensions (i.e.,  $>0.65$ , Vaske 2008, Table 3-4).

### **Co-orientation and wildlife value orientations**

To determine if wildlife value orientations might help explain co-orientation states, I used Utilitarian (n=242) and Pluralist (n=406) wildlife value orientation types because these types were well-represented among both VDGIF respondents and WMA recreational users. Mutualists and Distanced individuals were removed from further analysis because of small sample sizes. I found no significant differences between Utilitarian and Pluralist VDGIF respondents on any items. For WMA users, I observed differences between responses of Utilitarian and Pluralist WMA users to land management on five items (Table 3-5). In other words, I found no trend among members of either wildlife value orientation type regarding their expressed position on

the land management practices. For WMA users, weak gamma values associated with each of the significant Chi-square results (all  $G < 0.25$ ) suggested these relationships held limited practical value.

## **Discussion**

Previous research indicates that a 50% response rate from a recreational survey may be potentially questionable (Dolsen and Machlis 1991). The self-selected nature of participants and relatively low response rate may introduce the potential for representativeness concern and non-response bias. However, because I obtained a relatively large sample pool ( $N > 1,000$ ), the study spanned a full year of random sample days during all seasons, and was conducted statewide, I obtained a diverse sample of WMA users in Virginia. Respondents in this survey effort looked much like the whole sample of users contacted during the field interviews: predominantly middle aged (field:  $\bar{x} = 45$  years, mail:  $\bar{x} = 49$ , range: 18-84), male (both 94%), hunting or fishing license holders (field: 84%, mail: 85%) who participated exclusively or primarily in hunting and/or fishing recreation (field: 75%, mail: 77%).

### **Attitudes toward land management**

In general, WMA recreational users displayed favorable views toward most of the land management practices presented to them, with only a few exceptions. These results suggest that current stakeholders support active management on WMAs. Previous research indicates general support for land management activities such as prescribed burning to reduce fuels (e.g., Cortner et al. 1984, Shindler and Toman 2003) and mechanical techniques for habitat management (e.g., Fortier and Messier 2006), in addition to generally negative perceptions of the use of herbicides (e.g., Fortier and Messier 2006). Support for most forms of land management is a critical finding

for VDGIF, given its established mission for these properties. Although WMA users tended to agree with the acceptability of the management practices as presented, respondents' highest disagreement was expressed toward timber harvesting (i.e., to improve habitat for some wildlife species, 30% disagreed or strongly disagreed; if only undesirable or diseased trees are removed, 20% disagreed or strongly disagreed). Both timber harvesting and herbicide application have controversial histories and are highly visible, even to many members of the public who express little interest in natural resources. The common perception of a timber harvest (i.e., clearcut) is not compatible with the predominant public values toward forests (Bliss 2000) and herbicides generally are not well received either (Fortier and Messier 2006). However, given that VDGIF has expressed interest in harvesting more timber from WMAs to provide early successional wildlife habitat and that the agency frequently applies herbicides to control vegetation, these areas may be of great importance and may require an investment of communication efforts.

While most WMA respondents supported land management, a minority opposed these practices, indicating areas of potential controversy in the future. Additionally, some respondents may have disagreed with a practice altogether regardless of the conditions (e.g., do not support timber harvest for any reason) or believed the condition was of little concern when employing the practice (e.g., mechanical techniques as long as noise generated does not disturb wildlife), which may have influenced responses and contributed to disagreement. For example, most agency respondents disagreed with the use of "mechanical techniques, as long as wildlife are not disturbed by noise generated by machinery." While disagreement with this statement does not imply that noise is a desired condition, but perhaps speaks to the difficulty of controlling for noise or the belief that machinery noise does not strongly influence wildlife.

Although recreational users generally supported most land management practices, as presented, attitudes expressed by VDGIF respondents toward these same practices varied; in fact, many expressed disagreement with some items. VDGIF personnel overall disagreed with 2 of the 3 timber management practices presented, including “removing only diseased or undesirable trees” and “only if the resulting forest is not changed noticeably.” Managers’ responses to these practices, as stated, likely reflected their greater knowledge of them (i.e., the feasibility, cost, or labor involved in implementing the practices). For example, VDGIF managers may not support removing only diseased trees from a forest because of the habitat value these trees have for wildlife and the difficulty and expense of a single-tree selection harvest. Similarly, they may realize the difficulty in using herbicides to treat only targeted species. This greater experience may cause VDGIF managers and biologists to read more into these statements, leading to their higher frequency of disagreement.

Situations where WMA users were mostly neutral (e.g., “timber harvest, if used to improve habitat for some species even if it reduces suitability for others;” “mechanical techniques, as long as noise generated does not disturb wildlife,” and “herbicides, even if wildlife are displaced temporarily”) represent opportunities for the agency to garner further support, and perhaps true consensus with their stakeholders. An effective education effort may provide further explanation or improve understanding of WMA users about these management practices. Key areas to focus on would be in providing clear explanation of (1) how a management practice is applied, (2) the implications or consequences associated with the use of a management practice vs. other possible options, or (3) the desired end goal, outcome, or condition the agency hopes to achieve.

## **Co-orientation**

VDGIF managers and WMA users held different views toward many items, suggesting that their attitudes toward land management practices differ. VDGIF managers and WMA users did share views on 3 items: (1) “prescribed burning, if the risk to neighboring landowners is minimized;” (2) “herbicides, if they are safe for wildlife;” and (3) “mechanical techniques, if pollution from heavy machinery is prevented.” The items on which they agreed represent issues of general public concern: wildfire risk, chemical safety, and preventing pollution. Thus, it should not be surprising that agreement occurred on these practices. While it is encouraging that agreement exists on some items, the fact that these parties recognized areas of disagreement also was beneficial. Starting with or returning to areas of agreement in discussions helps remind participants of values or attitudes they share and often helps the group work toward consensus when negotiating conflict-ridden topics (Fisher et al. 1991). For example, when a barrier or disagreement prevents progress during a discussion, reminding participants of the shared goal to prevent pollution may be a good starting point to recognize shared values and work together to move forward.

Clearly, ample room exists to improve accuracy for both VDGIF managers and WMA recreational users. Most land management practice items fell under false consensus (i.e., low agreement and low accuracy), especially from the perspective of WMA recreational users. In false consensus, opportunity exists for internal (i.e., within-group) strategies designed to offer alternative views and correct misperceptions and/or external strategies to collaborate the other party (Von Kutzschenbach and Brønn 2006, Leong et al. 2007). Some issues that consistently fell into false consensus, such as all 3 co-orientation items describing timber harvesting from the perspective of WMA users, likely represent controversial and potentially volatile issues. It is unknown whether this false consensus results from poor awareness, lack of understanding, or

simply opposition to the practice. To determine the true source of disagreement, agencies need further discussion and engagement with stakeholders. However, a stakeholder education program likely would improve users' understanding of a practice, its uses, and the agency's intended rationale for using the practice to maintain, create, or enhance wildlife habitat. Alternatively, engaging with stakeholders gives the agency the opportunity to learn about values, attitudes, and goals held by stakeholders and incorporate them into management decisions (Innes and Booher 2004).

When false conflict occurs, as it did with risk prevention in prescribed burning, herbicide safety for wildlife, and preventing pollution associated with mechanical techniques, parties have the opportunity to reach common ground quickly. Because agreement actually exists, but is not realized by the organization or stakeholders (Von Kutzschenbach and Brønn 2006), a simple communication "fix" might lead to this recognition. Managers should focus attention and energy on situations where false conflict exists because their relationships with stakeholders can be strengthened and greater trust built without either party drastically changing their position. Some communicative issues may improve substantially by focusing initially on correcting inaccurate perceptions and misunderstandings (i.e., accuracy and perceived agreement).

Accuracy measures, along with directionality of differences from the Gamma test of association, indicate that both groups underestimated the agreement the other group held toward many of the co-orientation items. These results speak to the importance of two-way communication to increase both VDGIF respondents' and WMA users' understanding of the other's position. By recognizing and adjusting for these underestimations, both groups may realize similar salient values and build social trust (Siegrist et al. 2000).

WMA users and VDGIF managers both expressed relatively low congruency, or perceived agreement. WMA users, as a whole, perceived little agreement between themselves and VDGIF managers and vice versa. Although both groups demonstrated about the same number of congruent items, the actual items believed to be congruent by each group did not match those where actual agreement occurred. Because salient values similarities tend to correlate with trust (Siegrist et al. 2000, Cvetkovich and Winter 2003, Vaske et al. 2007), my results indicate that a lack of trust could potentially be present between VDGIF managers and WMA users regarding land management. This state of perceived disagreement could result in conflict or unwillingness to cooperate from the perspectives of both parties (Leahy and Anderson 2008). Awareness and recognition of values and attitudes in natural resource decision-making may help to improve two-way communication between managers and recreational users.

Dissemination of information through pamphlets, brochures, information posted on WMA kiosks, press releases, and other forms of one-way communication may raise stakeholder awareness of the agency's position on land management. The agency produced a technical report that describes the array of management practices that could be used on WMAs and clearly identifies the goals and policies VDGIF has for its WMAs. Documents the agency produced as part of the WMA study, such as the technical report, will increase consistency of management technique information among agency employees and prepare them to communicate with stakeholders about land management. Although information dissemination helps raise awareness of the agency's land management positions, it may be ineffective for address complex or controversial issues; face-to-face interaction with stakeholders through discussion-based meetings, open houses, community events, and other forms of two-way communication are necessary to increase understanding between the agency and its WMA stakeholders. As Innes

and Booher (2004:426) claim, "...while educating the public is essential, it is not participation if it does not include the education of the agency." Interaction may be simple, as in informal discussions between land managers and visitors on-site, or more complex, as in organized stakeholder advisory committees that help the agency address a particular issue of interest. Disseminating information reaches a broad audience and often is relatively inexpensive, whereas face-to-face interaction may be costly (Absher et al. 1988, Force and Forester 2002), and generally include segmented audiences or only a few representatives from an interest group (Innes and Booher 2004). However, additional time spent in public involvement early and throughout the life of a project may minimize unplanned public relations issues during critical phases of project implementation (Force and Forester 2002).

Even though two-way communication efforts can be costly and take time, they often improve the relationships the agency has with its stakeholders and enhance the perceived legitimacy of and trust in the agency among stakeholders (Chase et al. 2002, Lafon et al. 2004). Lafon et al. (2004) noted improved stakeholder knowledge of bear management and agency image as a result of a collaborative planning effort in Virginia, as well as greater manager comfort with incorporating public values into management decisions. Clear communication of intentions and avenues for involvement, scheduling well-advertised meetings at convenient times, and establishing volunteer programs for community members to get involved in management activities may also contribute to interpersonal trust (Davenport et al. 2007).

Research suggests procedural justice, or the interpersonal component of public involvement procedures, may also be an important element of collaboration (Lind and Tyler 1988). Procedural justice involves perceptions about the fairness of decision making processes as well as the quality of treatment in both formal (e.g., public meeting) and informal (e.g.,

conversation with manager) interactions during the public involvement process. When participants feel that the decision making process was fair and they were treated fairly throughout, they often have favorable views toward the process itself. Participants also may tend to support (or at least not oppose) a decision that they believe was made fairly, even if they disagree with the outcome (Lind and Tyler 1988, Leahy and Anderson 2008).

### **Wildlife value orientations**

VDGIF managers and WMA recreational users both displayed predominantly Utilitarian and Pluralist wildlife value orientations. Not surprisingly, most agency employees believed that wildlife should be managed for human benefit, including use for hunting and fishing. While many Pluralists did not disagree with these views, some may orient toward mutualistic views under specific circumstances. For example, some Pluralists may approve of hunting and fishing, but may hold more of a protectionist attitude toward wildlife when it comes to trapping (Manfredo et al. 1999). Utilitarian and Pluralist views toward wildlife differ in some regards, they also share some views toward the treatment and use of wildlife, especially with respect to the utilitarian orientation. For example, many Pluralists believe that those who want to hunt should be provided the opportunity to do so, even though they may not participate themselves.

Because Pluralists identify with both utilitarian and mutualism orientations, their individual evaluation of a situation depends highly on the circumstances. For example, while they may support timber harvesting on a smaller or more selective scale, they may be entirely against clearcutting for aesthetic reasons. Because of the situational nature of Pluralist stakeholder opinions, special attention to those holding pluralistic views toward wildlife remains particularly important to the agency. Pluralistic stakeholders may become allies of the agency when communication is effective, the goals and justification for the desired management

technique are clear, and these goals are consistent with pluralistic values. On the other hand, pluralist stakeholders may oppose the agency if they receive information that sways their opinion on the issue or damages their trust in the agency. Effective communication with those holding a Pluralist value orientation toward wildlife may have greater influence on their position and help to identify areas of salient value similarity.

While wildlife value orientations have the potential to be informative regarding wildlife issues as described above, wildlife value orientation information did not explain attitudes toward land management for VDGIF respondents or WMA recreational users. Low likelihood of finding strong significant differences existed because Utilitarians and Pluralists share a number of utilitarian values. I removed Mutualist and Distanced individuals from analysis because of low sample sizes, but, if the sample contained greater numbers of these individuals, greater diversity and an increased potential for associations may have occurred between wildlife value orientations and attitudes toward land management. Specifically, a public survey such as the Values in the West study (Teel et al. 2005) may supply greater diversity in wildlife value orientations than a survey of more targeted interest groups, such as wildlife managers or outdoor recreational users, and allow for more detailed analysis. Because many of the recreational users on WMAs are hunters and anglers, a sample of on-site users may reflect more shared values with wildlife managers and biologists (many of whom are hunters and anglers) than a more diverse sampling of those with broader interests in WMA land management decisions (e.g., horseback riders, sightseers, local community members, adjacent landowners). As recreational use diversifies on WMAs, more stakeholder groups likely will get involved in land management decisions on WMAs.

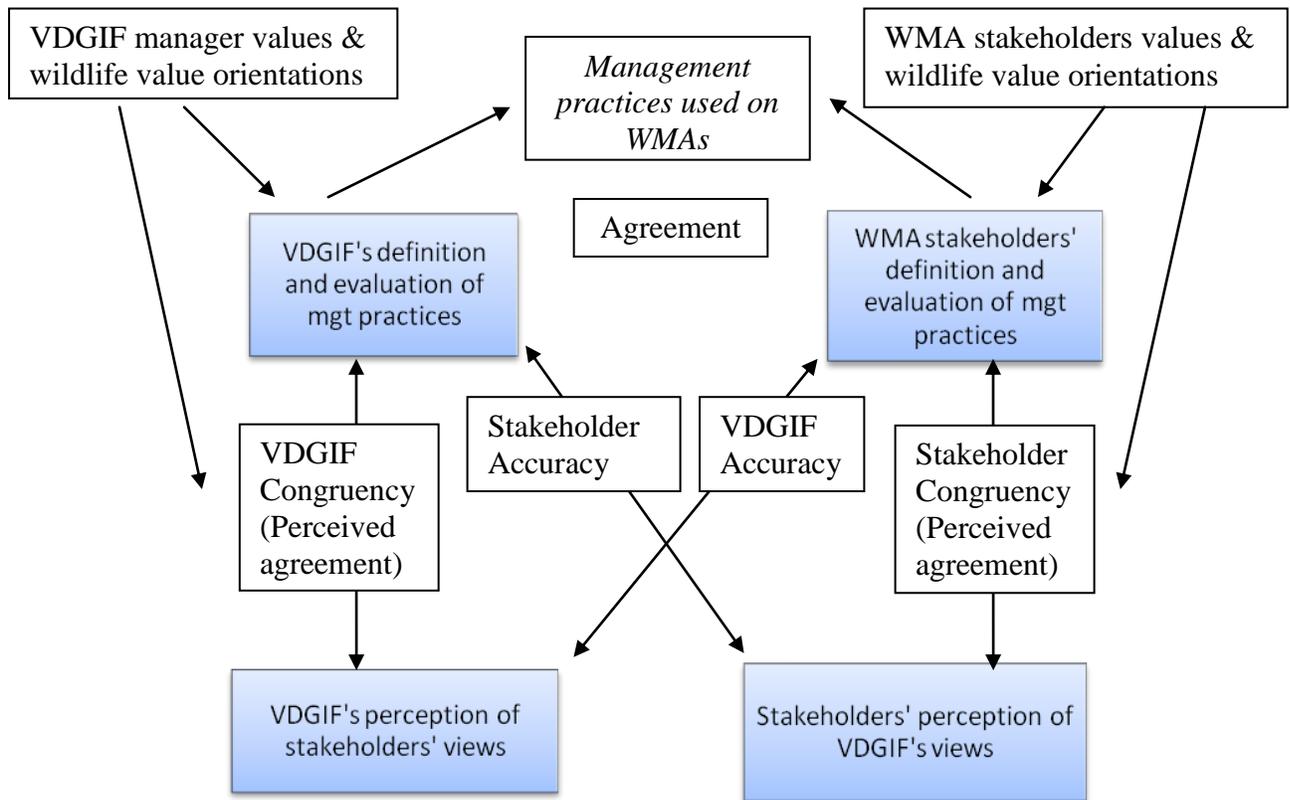
## **Further research**

Only a segment of VDGIF's stakeholders that utilize WMAs participated in this research, namely those who elected to participate during a previous on-site field survey. Therefore, I cannot extrapolate results of this research to describe all WMA recreational users in Virginia, or all stakeholder groups that engage with the state wildlife agency. However, this in-depth look at the shared views between a segment of WMA users and the state wildlife agency should help VDGIF as it directs public relations efforts more effectively, works to provide accurate information to targeted audiences, and develops opportunities for two-way communication with a wide range of stakeholders. My research also could help other natural resource agencies apply a similar methodology to assess co-orientation in their states, especially at a time when public values are believed to be changing and the public expects greater involvement in natural resource decision-making.

Future research should involve greater diversity of agency stakeholders, state wildlife agency issues beyond the recreational use of public lands, and application of the co-orientation methodology in more diverse contexts and issues. Additional application of the full co-orientation framework would benefit state agencies as they characterize the communicative state surrounding complex or controversial natural resource issues, such as global climate change or human-wildlife conflicts.

As natural resource professionals continue to involve the public in natural resources decision making, application of co-orientation may prove helpful in identifying successful lines of communication and those that need attention. Co-orientation can help managers identify and prioritize areas where efforts to improve communication would be most productive (i.e., areas where agreement exists, but is not recognized). Alternatively, efforts to improve communication

in areas lacking awareness and understanding may prove difficult; however, attention may be a priority for the agency or stakeholders to continue or initiate management efforts (e.g., timber harvest as an important tool for active management). Researchers and managers can apply the co-orientation framework when the goal is to focus on organization or agency relationships with one or several stakeholder groups. Co-orientation analysis could provide a better understanding of the scope of an issue and starting points for beginning to addressing it.



**Figure 3-1.** Co-orientation conceptual model (adapted from McLeod and Chaffee 1973:484)

along with value orientation factors that may influence the communicative relationship between Virginia Department of Game and Inland Fisheries (VDGIF) managers and people who recreate on wildlife management areas (WMAs).

		Accuracy	
		Low	High
Agreement	Low	<i>False consensus</i>	<i>Dissensus</i>
	High	<i>False conflict</i>	<i>True consensus</i>

**Figure 3-2.** Potential outcomes of co-orientation research based on levels of agreement and estimates of agreement for the other party (accuracy). When accuracy is low (i.e., one group does not understand the position of the other), public relations efforts can be inhibited (from Broom and Dozier 1990).

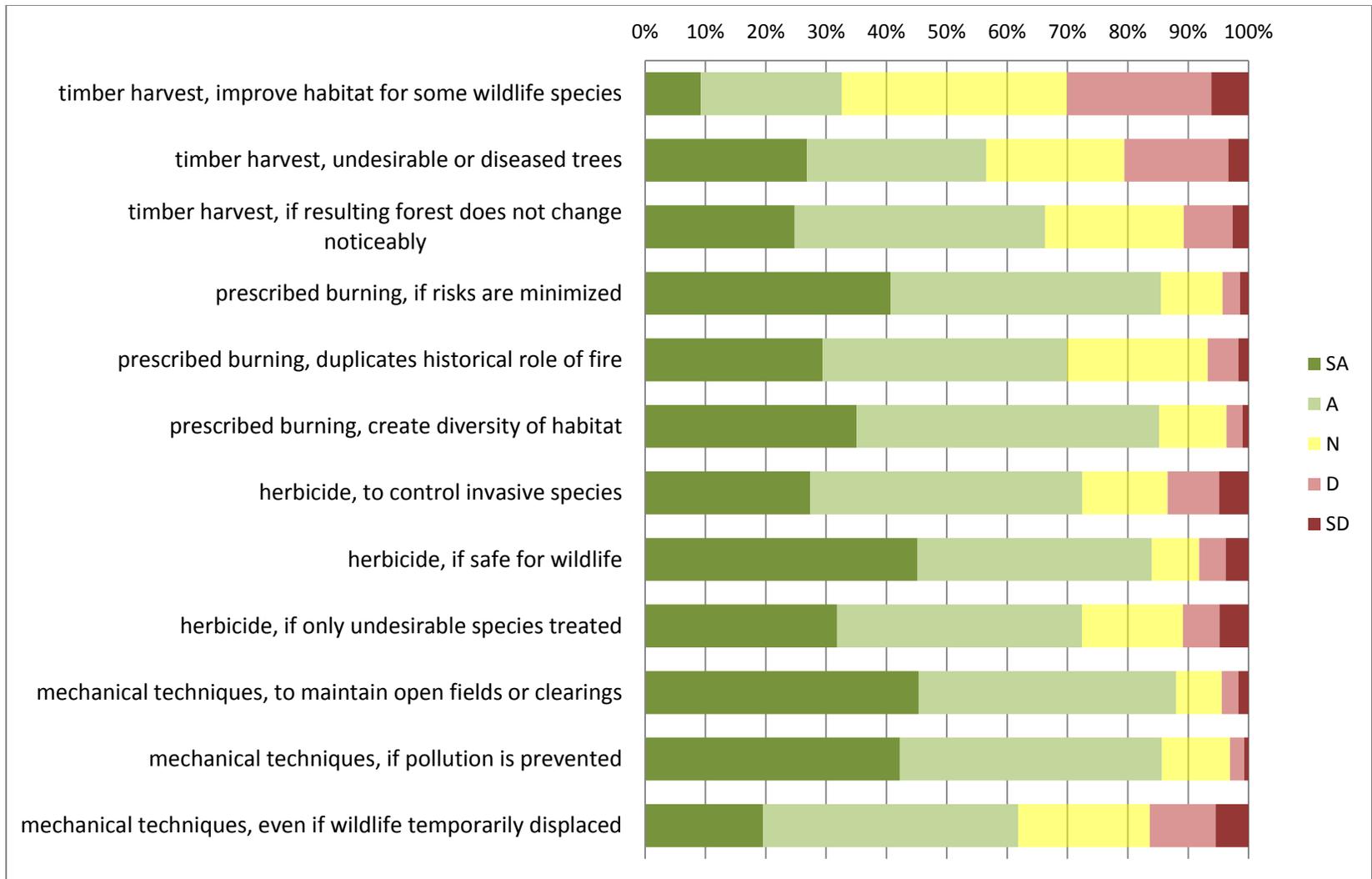
		Utilitarian Value Orientation	
		Low	High
Mutualism Value Orientation	Low	<i>Distanced</i>	<i>Utilitarian</i>
	High	<i>Mutualist</i>	<i>Pluralist</i>

**Figure 3-3.** Four types of respondents identified on the basis of their wildlife value orientations (adapted from Teel et al. 2005:8).

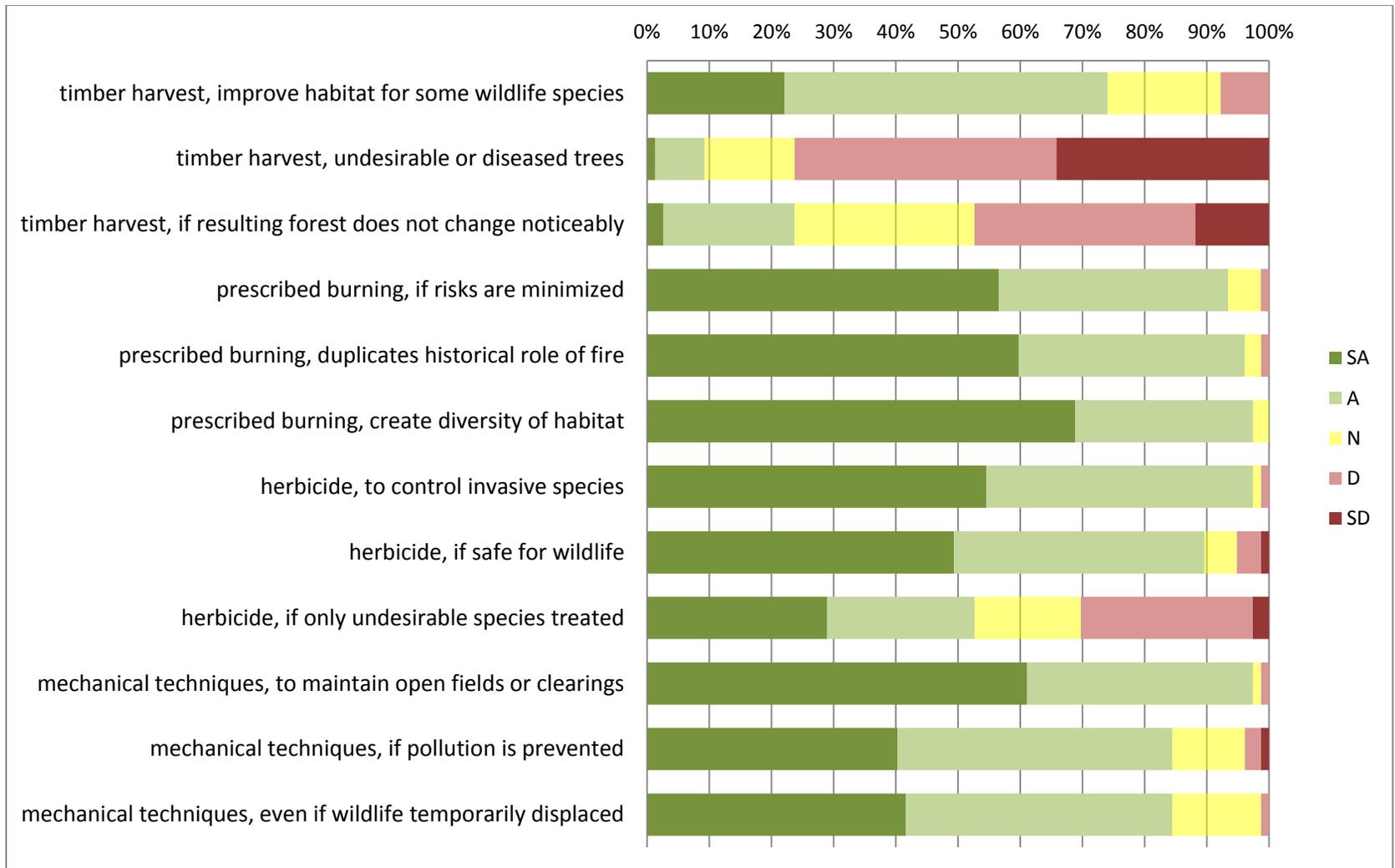
**Table 3-1.** Demographic comparison between on-site interview participants at Virginia wildlife management areas (WMAs) who elected to provide contact information for a follow-up survey and those who did not provide contact information.

	Provided contact information	Elected not to provide contact information	Statistical test for differences
Age	$\bar{x}$ = 44.78, sd=13.23	$\bar{x}$ = 43.12, sd=14.51	t=2.83, p=0.005*
Gender	Male: 95%, n=1,486 Female: 5%, n=74	Male: 93%, n=853 Female: 7%, n=65	$\chi^2$ =5.96, p=0.015* G=0.210, p=0.020*
Hunting/fishing license holder	Yes: 85%, n=1,340 No: 15%, n=241	Yes: 82%, n=766 No: 18%, n=164	$\chi^2$ =2.47, p=0.116
Satisfaction	$\bar{x}$ = 5.86, sd=1.48	$\bar{x}$ = 5.64, sd=1.52	t=3.47, p=0.001*

\* indicates significance at  $\alpha= 0.05$ .



**Figure 3-4.** Opinions of visitors to a Virginia Wildlife Management Area (WMA) on practices used to manage habitat, as collected by a follow-up survey in spring 2011 (SA=strongly agree, A=agree, N=neutral, D=disagree, SD=strongly disagree).



**Figure 3-5.** Opinions of Department of Game and Inland Fisheries personnel on practices used to manage habitat, as collected by a agency web survey in spring 2011 (SA=strongly agree, A=agree, N=neutral, D=disagree, SD=strongly disagree).

**Table 3-2.** Co-orientation state, magnitude, and directionality of differences in agreement and accuracy of visitors to a Virginia Wildlife Management Area (WMA) on practices used to manage habitat, as collected by a follow-up survey in spring 2011.

Practice	Condition	Chi square				Chi square				Co-orientation diagnostic
		statistic	p-value	Gamma statistic <sup>a</sup>	p-value	statistic	p-value	Gamma statistic <sup>b</sup>	p-value	
		<b>Low Agreement</b>				<b>Low Accuracy</b>				<b>False consensus</b>
timber harvest	improve habitat for some wildlife only	52.708	<0.0001	0.581	<0.0001	15.225	0.004	0.356	<0.0001	WMA users and VDGIIF managers have different attitudes and are unaware of the other group's attitudes
timber harvest	undesirable/diseased trees	158.452	<0.0001	-0.795	<0.0001	156.904	<0.0001	-0.798	<0.0001	
timber harvest	resulting forest does not change	88.041	<0.0001	-0.675	<0.0001	62.193	<0.0001	-0.608	<0.0001	
prescribed burning	duplicates historical role of fire	37.494	<0.0001	0.591	<0.0001	43.797	<0.0001	0.623	<0.0001	
prescribed burning	create diversity of habitat	35.161	<0.0001	0.601	<0.0001	51.31	<0.0001	0.678	<0.0001	
herbicides	control invasive species	34.399	<0.0001	0.578	<0.0001	50.209	<0.0001	0.662	<0.0001	
mechanical techniques	maintain open fields/clearings	10.095	0.039	0.334	0.001	23.682	<0.0001	0.502	<0.0001	
mechanical techniques	if wildlife displaced temporarily	27.975	<0.0001	0.481	<0.0001	24.338	<0.0001	0.431	<0.0001	
		<b>High Agreement</b>				<b>Low Accuracy</b>				<b>False conflict</b>
prescribed burning	risks to landowners are minimized	8.527	0.074			14.922	0.005	0.394	<0.0001	WMA users and VDGIIF managers have similar views, but WMA users do not recognize shared agreement
herbicides	safe for wildlife	2.218	0.696			16.522	0.002	0.37	<0.0001	
		<b>Low Agreement</b>				<b>High Accuracy</b>				<b>Dissensus</b>
herbicides	only undesirable species treated	45.154	<0.0001	-0.23	0.02	53.526	<0.0001	-0.158	0.134	WMA users recognize attitude differences with VDGIIF managers
		<b>High Agreement</b>				<b>High Accuracy</b>				<b>True consensus</b>
mechanical techniques	if pollution prevented	0.433	0.98			4.575	0.334			WMA users and VDGIIF managers have similar attitudes and WMA users recognize shared agreement

<sup>a</sup>0= no relationship, 1=perfect relationship; positive gamma values indicate DGIF managers expressed more agreement with the statement than WMA users.

<sup>b</sup>0= no relationship, 1=perfect relationship; positive gamma values indicate WMA users underestimated levels of agreement expressed by VDGIIF managers.

**Table 3-3.** Co-orientation state, magnitude, and directionality of differences in agreement and accuracy of Department of Game and Inland Fisheries (VDGIF) personnel on practices used to manage habitat, as collected by an agency web survey in spring 2011.

Practice	Condition	Low Agreement				Low Accuracy				Co-orientation diagnostic
		Chi square statistic	p-value	Gamma statistic <sup>a</sup>	p-value	Chi square statistic	p-value	Gamma statistic <sup>b</sup>	p-value	
		<b>Low Agreement</b>				<b>Low Accuracy</b>				<b>False consensus</b>
timber harvest	improve habitat for some wildlife species	52.708	<0.0001	0.581	<0.0001	46.042	<0.0001	0.417	<0.0001	VDGIF managers and WMA users have different attitudes and are unaware of the other group's attitudes
prescribed burning	duplicates historical role of fire	37.494	<0.0001	0.591	<0.0001	18.219	0.001	-0.301	<0.0001	
prescribed burning	create diversity of habitat	35.161	<0.0001	0.601	<0.0001	18.666	0.001	-0.37	<0.0001	
herbicides	control invasive species	34.399	<0.0001	0.578	<0.0001	21.236	<0.0001	-0.266	0.002	
herbicides	only undesirable species treated	45.154	<0.0001	-0.23	0.02	21.626	<0.0001	-0.228	0.005	
		<b>High Agreement</b>				<b>Low Accuracy</b>				<b>False conflict</b>
herbicides	if safe for wildlife	2.218	0.696			12.187	0.016	-0.262	0.005	VDGIF managers and WMA users have similar attitudes, but DGIF managers do not recognize shared agreement
mechanical techniques	if pollution prevented	0.433	0.98			12.977	0.011	-0.246	0.01	
		<b>Low Agreement</b>				<b>High Accuracy</b>				<b>Dissensus</b>
timber harvest	resulting forest does not change	88.041	<0.0001	-0.675	<0.0001	8.577	0.073			VDGIF managers recognize attitude differences with WMA users
mechanical techniques	maintain open fields/clearings	10.095	0.039	0.334	0.001	4.912	0.296			
timber harvest	only undesirable or diseased trees	158.452	<0.0001	-0.795	<0.0001	15.937	0.003	-0.101	0.193	
mechanical techniques	if wildlife displaced temporarily	27.975	<0.0001	0.481	<0.0001	15.534	0.004	-0.083	0.312	
		<b>High Agreement</b>				<b>High Accuracy</b>				<b>True consensus</b>
prescribed burning	if risks are minimized	8.527	0.074			10.085	0.039	-0.085	0.378	VDGIF managers and WMA users have similar attitudes and recognize shared agreement

<sup>a</sup> 0= no relationship, 1=perfect relationship; positive gamma values indicate VDGIF managers expressed more agreement with the statement than WMA users.

<sup>b</sup> 0= no relationship, 1=perfect relationship; negative values indicate VDGIF managers underestimated levels of agreement expressed by WMA users.

**Table 3-4.** Internal consistency analysis (Cronbach's alpha) of wildlife value orientation items (from Teel et al. 2005) and differences in responses (Chi-square analysis) between Virginia Department of Game and Inland Fisheries (VDGIF) managers and recreational users of Virginia's Wildlife Management Areas (WMAs).

	<b>Cronbach's <math>\alpha</math></b>	<b>Cronbach's <math>\alpha</math> if item removed</b>	<b><math>\chi^2</math></b>	<b>p-value</b>
<b>Utilitarian value orientation</b>	<b>0.74</b>			
<i>Utilitarian belief dimension</i>	0.66			
Humans should manage fish and wildlife populations so that humans benefit.		0.578	2.56	0.635
Fish and wildlife are present on Earth primarily for people to use.		0.514	30.08	<0.0001*
It is acceptable for a person to kill a wild animal if that person feels threatened.		0.638	26.61	<0.0001*
The needs of humans should take priority over fish and wildlife protection.		0.604	4.65	0.325
<i>Hunting belief dimension</i>	<b>0.75</b>			
We should strive for a world where there is an abundance of fish and wildlife for fishing and hunting.		0.781 <sup>†</sup>	21.62	<0.0001*
People who want to hunt should be provided the opportunity to do so.		0.661	1.92	0.750
Hunting is cruel and inhumane to the animals. (Reverse coded)		0.645	5.43	0.246
Hunting does not respect the lives of animals. (Reverse coded)		0.649	8.08	0.089
<b>Mutualism value orientation</b>	<b>0.87</b>			
<i>Mutualism belief dimension</i>	0.78			
We should strive for a world where humans and fish and wildlife can co-exist.		0.765	4.827	0.306
I view all living things as part of one big family.		0.680	8.75	0.068
Wildlife are like my family and I want to protect them.		0.687	35.24	<0.0001*
Animals should have rights similar to those of humans.		0.769	18.89	0.001*
<i>Caring belief dimension</i>	<b>0.80</b>			
I value the sense of companionship I receive from animals.		0.719	23.79	<0.0001*
I take great comfort in the relationships I have with animals.		0.704	14.94	0.005*
I care about animals as much as I do people.		0.835 <sup>†</sup>	11.47	0.022*
I feel a strong emotional bond with animals.		0.715	3.17	0.530

\* indicates significance at  $\alpha= 0.05$ .

<sup>†</sup> indicates improvement in internal consistency if item is removed from belief dimension.

**Table 3-5.** Utilitarian and Pluralist wildlife management area (WMA) users' responses to practices used to manage habitat, as collected by a follow-up survey in spring 2011 (significant differences only shown here). Generally low G statistics (< 0.25) suggest relatively weak relationships.

<b>Practice</b>	<b>Condition</b>	<b>Chi square statistic</b>	<b>p-value</b>	<b>Gamma statistic<sup>a</sup></b>	<b>p-value</b>
timber harvest	if I was certain trees would grow back	10.82	0.029	-0.172	0.01
timber harvest	only undesirable/diseased trees	10.07	0.039	-0.169	0.007
prescribed burning	as long as wildlife are not injured or killed	13.47	0.009	-0.247	< 0.0001
herbicide	even if some wildlife displaced temporarily	16.74	0.002	0.21	0.001
mechanical techniques	noise generated by heavy machinery does not disturb wildlife	15.89	0.003	-0.250	< 0.0001

<sup>a</sup> 0= no relationship, 1=perfect relationship; negative values indicate greater agreement among Pluralist WMA users than Utilitarian users

## Literature Cited

- Absher, J.D., L.H. McAvoy, R.J. Burdge, and J.H. Gramann. 1988. Public and commercial managers predicting recreationist opinions. *Journal of Park and Recreation Administration* 6:66-77.
- Babbie, E. 2010. *The practice of social research*, 12<sup>th</sup> edition. Wadsworth Cengage Learning, Belmont, California, USA.
- Babbie, E., F. Halley, and J. Zaino. 2003. *Adventures in social research: Data analysis using SPSS™ 11.0/11.5 for Windows*. Pine Forge Press, Thousand Oaks, California, USA.
- Bierle, T.C. and D.M. Konisky. 2000. Values, conflict, and trust in participatory environmental planning. *Journal of Policy Analysis and Management*. 19:587-602.
- Bliss, J.C. 2000. Public perceptions of clearcutting. *Journal of Forestry* 12:4-9.
- Bradley, G.A., and A.R. Kearney. 2007. Public and professional responses to the visual effects of timber harvesting: different ways of seeing. *Western Journal of Applied Forestry* 22:42-54.
- Bright, A.D., M.J. Manfredo, and D.C. Fulton. 2000. Segmenting the public: an application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin* 28:218-226.
- Brønn, P.S., and C. Brønn. 2003. A reflective stakeholder approach: co-orientation as a basis for communication and learning. *Journal of Communication Management* 7:291-303.
- Broom, G.M., and D.M. Dozier. 1990. *Using research in public relations: applications to program management*. Prentice Hall, Englewood Cliffs, New Jersey.
- Carson, K.E. 2005. *A co-orientational analysis of public involvement perceptions in the transportation process*. Thesis, University of South Florida, Tampa, Florida.

- Chase, L.C., W.F. Siemer, and D.J. Decker. 2002. Designing stakeholder involvement strategies to resolve wildlife management controversies. *Wildlife Society Bulletin* 30:937-950.
- Connelly, N.A., and B.A. Knuth. 2002. Using the co-orientation model to compare community leaders' and local residents' views about Hudson River ecosystem restoration. *Society and Natural Resources* 15:933-948.
- Cordell, H.K., C.J. Betz, and G.T. Green. 2002. Recreation and the environmental as cultural dimensions in contemporary American society. *Leisure Sciences* 24:13-41.
- Cordell, H.K., and M.A. Tarrant. 2002. Southern forest resource assessment highlights: changing demographics, values and attitudes. *Journal of Forestry* 100:28-33.
- Cortner, H.J., M.J. Zwolinski, E.H. Carpenter, and J.G. Taylor. 1984. Public support for fire management policies. *Journal of Forestry* 82:359-361.
- Cutlip, S.M., A.H. Center, and G.M. Broom. 2000. *Effective Public Relations*, 8th ed. Prentice Hall, Upper Saddle River, New Jersey, USA.
- Cvetkovich, G., and P.L. Winter. 2003. Trust and social representations of the management of threatened and endangered species. *Environment and Behavior* 35:286-307.
- Davenport, M.A., J.E. Leahy, D.H. Anderson, and P.J. Jakes. 2007. Building trust in natural resource management within local communities: a case study of the Midewin National Tallgrass Prairie. *Environmental Management* 39:353-368.
- Decker, D.J., and L.C. Chase. 1997. Human dimensions of living with wildlife—a management challenge for the 21<sup>st</sup> century. *Wildlife Society Bulletin* 25:788-795.
- DeRuiter, D.S., and M.P. Donnelly. 2002. A qualitative approach to measuring determinants of wildlife value orientations. *Human Dimensions of Wildlife* 7:251-271.

- Dillman, D.A. 2000. Mail and internet surveys: the tailored design method. Second ed. John Wiley and Sons, New York, New York, USA.
- Dozier, D.M., L.A. Grunig, and J.E. Grunig. 1995. Manager's guide to excellence in public relations and communication management. Lawrence Erlbaum Associates, Mahwah, New Jersey, USA.
- Eagly, A.H., and S. Chaiken. 1993. The psychology of attitudes. Harcourt Brace Jovanovich, Orlando, Florida, USA.
- Elsbach, K.D. 2004. Managing images of trustworthiness in organizations. In Trust and Distrust in organizations: Dilemmas and Approaches (p. 275-292). Russell Sage Foundation, New York.
- Fisher, R., W. Ury, and B. Patton. 1991. Getting to Yes: Negotiating agreement without giving in. Second edition, Penguin Books, New York, New York, USA.
- Force, J.E. and D.J. Forester. 2002. Public involvement in National Park Service land management issues. Social Science Research Review 3:1-28.
- Fortier, J., and C. Messier. 2006. Are chemical or mechanical treatments more sustainable for forest vegetation management in the context of TRIAD? The Forestry Chronicle 82:806-818.
- Fulton, D.C., M.J. Manfredo, and J. Lipscomb. 1996. Wildlife value orientations: a conceptual and measurement approach. Human Dimensions of Wildlife 1:24-47.
- Grunig, J.E. 2001. Two-way symmetrical public relations: past, present, and future. Pages 11-30 in R.L. Heath, ed., Handbook of Public Relations. Sage Publications, Thousand Oaks, California, USA.

- Hendee, J.C., and R.W. Harris. 1970. Foresters' perceptions of wilderness-user attitudes and preferences. *Journal of Forestry* 68:759-762.
- Innes, J.E. and D.E. Booher. 2004. Reframing public participation: strategies for the 21<sup>st</sup> century. *Planning Theory and Practice* 5:419-436.
- Jacobson, S.K., and S.B. Marynowski. 1997. Public attitudes and knowledge about ecosystem management on Department of Defense land in Florida. *Conservation Biology* 11:770-781.
- Jones, R.W. 1993. Co-orientation of a news staff and its audience. *Communication Reports* 6:41-46.
- Kearney, A.R., G. Bradley, R. Kaplan, and S. Kaplan. 1999. Stakeholder perspectives on appropriate forest management in the Pacific Northwest. *Forest Science* 45:62-73.
- Kelly, K.S., M.F. Thompson, and R.D. Waters. 2006. Improving the way we die: a co-orientation study assessing agreement/disagreement in the organization-public relationship of hospices and physicians. *Journal of Health Communication* 11:607-627.
- Lafon, N.W., S.L. McMullin, D.E. Steffen, and R.S. Schulman. 2004. Improving stakeholder knowledge and agency image through collaborative planning. *Wildlife Society Bulletin* 32:220-231.
- LaRoe, L.M., K. Unger, and D. Abhat. 2009. Conservation at a Crossroad: as hunting declines, cash-strapped states seek new revenue to conservation. *The Wildlife Professional* 3(1): 26-31.
- Leahy, J.E., and D.H. Anderson. 2008. Trust factors in community-water resource management agency relationships. *Landscape and Urban Planning* 87:100-107.

- Leong, K.M., K.A. McComas, and D.J. Decker. 2007. Matching the forum to the fuss: using co-orientation contexts to address the paradox of public participation in natural resource management. *Environmental Practice* 9:195-205.
- Leong, K.M., K.A. McComas, and D.J. Decker. 2008. Formative co-orientation research: a tool to assist with environmental decision making. *Environmental Communication* 2:257-273.
- Leuschner, W.A., V.P. Ritchie, and D.F. Stauffer. 1989. Opinions on wildlife: responses of resource managers and wildlife users in the southeastern United States. *Wildlife Society Bulletin* 17:24-29.
- Lind, E.A., and T.R. Tyler. 1988. *The social psychology of procedural justice*. Plenum Press, New York, New York, USA.
- Manfredo, M.J., C.L. Pierce, D. Fulton, J. Pate, and B.R. Gill. 1999. Public acceptance of wildlife trapping in Colorado. *Wildlife Society Bulletin* 27:499-508.
- Manfredo, M.J., T.L. Teel, and A.D. Bright. 2003. Why are public values toward wildlife changing? *Human Dimensions of Wildlife* 8:287-396.
- McCool, S.F., R.E. Benson, and J.L. Ashor. 1986. How the public perceives the visual effects of timber harvesting: an evaluation of interest group preferences. *Environmental Management* 10:385-391.
- McLeod, J.M., and S.H. Chaffee. 1973. Interpersonal approaches to communication research. *American Behavioral Scientist* 16:469-499.
- Muth, R.M., and W.V. Jamison. 2000. On the destiny of deer camps and duck blinds: the rise of the animal rights movement and future of wildlife conservation. *Wildlife Society Bulletin* 28:841-851.

- Ott, R.L. 1993. An introduction to statistical methods and data analysis, 4<sup>th</sup> edition. Duxbury Press, Wadsworth, Belmont, California, USA.
- Peyton, R.B., and E.E. Langenau. 1985. A comparison of attitudes held by BLM biologists and the general public towards animals. *Wildlife Society Bulletin* 13:117-120.
- Phillips, M.L., K.J. Boyle, and A.G. Clark. 1998. Managers and the public on endangered species management. *Wildlife Society Bulletin* 26:605-613.
- Purdy, K.G., and D.J. Decker. 1989. Applying wildlife values information in management: the wildlife attitudes and value scale. *Wildlife Society Bulletin* 17:494-500.
- Ryan, S.M. 2009. Two sides to the story: a coorientation study of engo-employee relationship attitudes and linkages to organizational outcomes. Thesis, Royal Roads University, Victoria, British Columbia, Canada.
- Selin, S., and D. Chavez. 1995. Developing a collaborative model for environmental planning and management. *Environmental Management* 19:189-195.
- Seltzer, T. 2007. A coorientational approach for measuring organization-public relationships. Dissertation, University of Florida, Gainesville, Florida.
- Seltzer, T., and M. Mitrook. 2009. Two sides to every story: using co-orientation to measure direct and meta-perspectives of both parties in organization-public relationships. *Public Relations Journal* 3:1-24.
- Shindler, B., and E. Toman. 2003. Fuel reduction strategies in forest communities. *Journal of Forestry* 101:8-15.
- Siegrist, M., G. Cvetkovich, and C. Roth. 2000. Salient value similarity, social trust, and risk/benefit perception. *Risk Analysis* 20:353-362.

- SPSS 20.0 Program. 2011. International Business Machines Corporation, Armonk, New York, USA.
- Tarrant, M.A., A.D. Bright, and H.K. Cordell. 1997. Attitudes toward wildlife species protection: assessing moderating and mediating effects in the value-attitude relationship. *Human Dimensions of Wildlife* 2:1-20.
- Teel, T. L., A.A. Dayer, M.J. Manfredro, and A.D. Bright. 2005. Regional results from the research project entitled “Wildlife Values in the West.” (Project Rep. No. 58). Project Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO: Colorado State University, Human Dimensions in Natural Resources Unit.
- Teel, T.L., M.J. Manfredro, and H.M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife* 12:297-305.
- Twight, B.W., and W.R. Catton, Jr. 1975. The politics of images: Forest managers vs. recreation publics. *Natural Resources Journal* 15:297-306.
- Twight, B.W., and J.J. Paterson. 1979. Conflict and public involvement: measuring consensus. *Journal of Forestry* 12:771-773, 776.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/www/abs/fishing.html>
- Vaske, J.J., J.D. Absher, and A.D. Bright. 2007. Salient value similarity, social trust, and attitudes toward wildland fire management. *Human Ecology Review* 14:223-232.
- Vaske, J.J. 2008. Survey research and analysis: application in parks, recreation, and human dimensions. Venture Publishing, State College, Pennsylvania, USA.

- Von Kutzschenbach, M., and C. Brønn. 2006. Communicating sustainable development initiatives: applying co-orientation to forest management certification. *Journal of Communication Management* 10:304-322.
- Waters, R.D. 2007. Advancing relationship management theory: coorientation and the nonprofit-donor relationship. Dissertation, University of Florida, Gainesville, Florida.
- Williamson, J. 2010. “We serve you, right?” a case study adapting coorientation to customer service research. Dissertation, University of North Carolina, Chapel Hill, North Carolina.
- Wondolleck, J.M., and S.L Yaffee. 2000. Making collaboration work: lessons from innovation in natural resource management. Island Press, Washington, D.C., USA.

## **Chapter 4:**

### **Mail and electronic survey administration: A case study with recreational users of Virginia's wildlife management areas**

Since the 1970s, response rates for surveys addressing natural resource issues have been declining gradually (Connelly et al. 2003). Consequently, administration of surveys in natural resources needs careful consideration from practitioners; they obviously should choose a mode of survey distribution that meets the needs of the study, but they also must consider economic concerns and the resources available. Mixed mode surveys, or those distributed using multiple methods of contact (e.g., U.S. mail, e-mail, phone, personal contact), allow researchers the opportunity to offer participants a suite of response mechanisms, from which they can choose how best to complete the survey. Implementing a mixed mode survey may increase response rates by making response more flexible for participants and decrease costs by making inexpensive alternatives available (Cornicelli and Grund 2011, Sexton et al. 2011). Offering multiple methods of response during a survey effort may accommodate stakeholders with different backgrounds or values and attitudes, but also may introduce unplanned bias or raise concerns about the validity and reliability of the data collected.

#### **Research purpose**

Greenlaw and Brown-Welty (2009) found that when they gave survey subjects options for mode of completion, response rate increased significantly and respondents selected the web-based option more frequently. However, respondents may reply differently to surveys administered by different modes (Dillman 2000) because of subtle differences in format or administration. This paper investigates whether methods bias was introduced to a survey by: (1) comparing response rates, speed, and completeness of surveys returned by users of Virginia

wildlife management areas (WMAs) via U.S. mail and the web, (2) determining if participants' demographics influenced the response mode they select, and (3) determining if the mode selected by the respondent conveys any probative explanation about the individual's values or attitudes. I examined these parameters using a survey of recreational users on public lands and their opinions about land management practices used on those lands.

### **Wildlife management areas in Virginia**

The Virginia Department of Game and Inland Fisheries (VDGIF) owns and manages 39 wildlife management areas (WMAs) comprising >200,000 acres that provide and enhance wildlife habitat and offer wildlife-based recreational opportunities on public land in Virginia. WMAs provide opportunity for both traditional wildlife recreation (i.e., hunting and fishing) and non-consumptive wildlife-based recreation uses, the latter of which is perceived to be increasing (Cordell and Tarrant 2002, Cordell et al. 2002, U.S. Fish & Wildlife Service and U.S. Census Bureau 2006). Because both WMA stakeholders and the ways in which they use WMAs appear to be changing, many state wildlife agencies are interested in learning more about WMA users.

### **Wildlife value orientations**

Managers and biologists need to understand the values of WMA users to successfully manage these areas, especially as WMA users diversify. Values provide the foundation for an individual's belief system and act as his/her reference point for evaluating views of the world. Value orientations express one's basic beliefs and provide insight into why individuals or groups hold the opinions they possess (Manfredo et al. 2003, Teel et al. 2007). The utilitarian and the mutualism scales allow researchers to segment publics into 4 value orientation "types" (i.e., Utilitarian, Mutualist, Pluralist, Distanced), each of which may respond differently to management actions or wildlife issues (Teel et al. 2005). Utilitarians believe in use and

management of wildlife for the benefit of humans and prioritizing human needs over those of wildlife. Mutualists hold a protectionist view toward wildlife and natural resources and believe humans and wildlife should co-exist in harmony. Pluralists hold both utilitarian and mutualistic values, and their opinions may vary based on the circumstances of different issues. Distanced individuals express less interest in wildlife-related issues, or simply hold neither utilitarian nor mutualistic views toward wildlife (Teel et al. 2005). Because the primary goal for WMAs involves maintaining and enhancing habitat for wildlife, understanding the orientation of different stakeholder groups toward animals and wildlife can help managers predict conflicts that may arise regarding wildlife-based recreation or disagreements related to land management on WMAs.

### **Mail and web-based survey administration**

Practitioners have frequently used mail surveys to collect information on a broad range of issues, especially in large projects when a reasonably accurate list of addresses is available for a population (Vaske 2008). However, mail surveys can be expensive due to costs associated with printing, envelopes, postage, and other supplies needed to create the instrument, and investments in time and personnel needed to prepare mailings, check in returned surveys, and enter data electronically for analysis. Mail surveys also take time to implement; they usually require several mailings that can span several weeks. Because mail surveys are self-administered, the practitioner has limited control over item completion mistakes on closed-ended items (e.g., filling in a number when a true/false answer is requested) and ensuring that the intended participant actually completes the survey.

Practitioners have turned to web-based surveys frequently in recent years as more people gain access to the Internet. Electronic survey distribution often cost less than a comparable mail

survey and frequently produces a more rapid response (Ladner et al. 2002, Fleming and Bowden 2009, Greenlaw and Brown-Welty 2009, Shannon and Bradshaw 2010). Web surveys also provide flexibility in survey format, including the option to skip questions not relevant to the respondent, initiate pop-up windows with additional information, and incorporate visual and audio components (Fleming and Bowden 2009, Sexton et al. 2011). Also, data submitted via a web-based survey can be transferred quickly and efficiently to a spreadsheet for analysis, eliminating the need for data entry required for mail surveys (Griffis et al. 2003). Previous research has suggested other advantages of web-based surveys: the software can aid in preventing item completion mistakes on closed-ended items, and respondents tend to leave fewer items blank or, alternatively, answer more questions in the web-based version when compared with a paper version (Weible and Wallace 1998). Web surveys have been most effective when administered to an educated population with access to and familiarity with the internet (Bachmann et al. 1996, Kaplowitz et al. 2004, Shih and Fan 2008, Greenlaw and Brown-Welty 2009).

One disadvantage of web surveys remains the challenge of producing a random sampling frame. Duda and Nobile (2010) questioned the use of online surveys, suggesting the near impossibility of generating a probability sample of the target population for a web-based survey. Respondent panels generated by companies that administer web-based surveys may come close to achieving a probability-based sample. These companies use alternative strategies, such as weighting the sample of contacts using Census data, employing broad search engines to locate email addresses, or providing means to access the internet to those without them (Cornicelli and Grund 2011); however, adequate representation of lower socioeconomic classes or those without internet access remains difficult to achieve.

Response rates from electronic surveys can vary greatly depending upon the targeted audience and their access to or use of the internet (Weible and Wallace 1998, Kaplowitz et al. 2004). For example, professionals within an agency or organization who all have e-mail addresses and Internet access can be reached efficiently via web-based surveys, whereas it is difficult to obtain a representative sample of the general public with a web-based survey, because not all individuals have an e-mail account and/or regular access to the Internet (Bachmann et al. 1996, Truell et al. 2002, Kaplowitz et al. 2004, Duda and Nobile 2010). Also, non-response bias may be a greater concern with web-based surveys compared to mail surveys (Fleming and Bowden 2009), especially when response rates are low, which happens more frequently with web surveys than mail surveys (Schuldt and Totten 1994, Tse 1998, Weible and Wallace 1998, Shih and Fan 2008, Shannon and Bradshaw 2010). Furthermore, practitioners rarely have another form of contact information (e.g., phone number, mailing address) to facilitate a formal check for non-response bias in web-based survey data.

## **Methods**

VDGIF did not have a reliable sampling frame of people who recreate on WMAs. As part of an earlier field survey, I interviewed visitors at 10 WMAs selected by agency personnel that represented the types of WMAs in Virginia. In selecting WMAs for study, DGIF chose two WMAs from every region throughout the Commonwealth, and constraining selection so those chosen represented the diversity of use, access options, habitat types, and recreational opportunities available at all WMAs. Project staff and volunteers conducted 3-5 minute interviews with WMA visitors >18 years of age from 5 September 2009 through 3 September 2010 (Appendix A). Depending upon the particular WMA surveyed, the interviewer either (1)

set up a recognizable check station at the main access road into the WMA or the specific area covered that day, or (2) traveled a pre-designated roving route with prescribed stops at access roads and/or parking areas within the WMA. My interview protocol satisfied the Virginia Tech Internal Review Board requirements for research involving human subjects (IRB approval #09-600).

I surveyed each WMA or designated subsection of a WMA on at least 24 randomly selected days (15 weekend days and 9 weekdays) over the 12-month survey period. On large WMAs or those with multiple access points, I segregated the WMA into separate subsections that an interviewer could cover reasonably in a day. Interviewers visited each subsection on at least 24 randomly selected days, except for a few instances when winter weather prevented access to the area. I selected sampling days at random distributed equally among strata (Saturdays, Sundays, and weekdays). I treated weekend days (i.e., Saturdays and Sundays) separately due to differences in hunting participation; regulations at the time of the survey permitted hunting on Saturdays, but prohibited hunting on Sundays. In addition to the 24 general survey days, I conducted separate special surveys on several unique target days, such as hunting and fishing season opening days, when I predicted higher use than an average recreation day.

At the end of the field interview, I asked WMA users if they would provide an email address or mailing address to complete the follow-up mail and web-based survey described in this chapter. Respondents electing to provide contact information did not significantly differ from those that did not (Table 4-1). I surveyed WMA users (n=1,516), using identical mail and internet instruments (Appendices C and D) in March and April 2011.

I designed the survey to investigate participation in recreational activities on WMAs, goals for WMA management, disturbances or conflict with other WMA users, attitudes toward

land management practices, and wildlife value orientations. Trends in responses to satisfaction with WMA management, wildlife value orientations, or attitudes toward land management may exist that could further explain method selection. For example, respondents with utilitarian or conservative views toward natural resources might prefer completing the paper version, whereas those with a protectionist viewpoint might prefer completing surveys online.

The paper version of this survey consisted of 12 pages and 118 questions bound in a booklet with a photo of a WMA on the front cover and simple clip-art images placed between batteries of questions to create “white space” (Appendix C). The web-based version consisted of the same 118 questions presented on 30 web pages with navigational buttons to allow the respondent to move forward and backward through the survey items (Appendix D). The web-based survey also included pre-designated branching based on the responses provided. This system directed respondents to pertinent follow-up questions for more information about their answer when requested, or skipped questions irrelevant to their responses. These same questions were visible to paper respondents, regardless of their selected response.

I used an adapted version of the wildlife value orientation instrument designed by Teel et al. (2005) to assess respondents’ value orientations toward wildlife. Respondents indicated their level of agreement with each statement on a 5-point Likert scale, ranging from strongly agree to strongly disagree with a neutral option in the center. To reduce the burden on respondents, I selected 16 statements from the original 25-question scale developed by Teel et al. (2005). The 16 statements I selected had the highest factor loadings in their study after dropping the ancillary belief dimensions (i.e., attraction and concern for safety belief dimensions).

The survey focused on 4 broad categories of habitat management practices: timber harvest, prescribed fire, chemical applications (herbicide), and mechanical techniques. I

provided participants with a series of scenarios or conditions under which each management practice may be applied to gauge that participant's perception of acceptability (or unacceptability) for each option. Respondents indicated their level of agreement with each statement on a 5-point Likert scale, ranging from strongly agree to strongly disagree with a neutral midpoint of the scale.

I used Dillman's Tailored Design Method for mail survey development and implementation, readily adapted for use with mail and/or internet surveys. It involves multiple contacts with survey participants over the course of several weeks as means to increase response rates and reduce error (Dillman 2000). I conducted the WMA user survey from 14 March through 2 May 2011. Participants received their survey in accordance with their stated preferred method of contact – either a paper survey in the mail or an email invitation with an individual password and a link to the online version of the survey. Participants contacted via mail received up to 4 mailings (Table 4-2): an invitation letter and survey, reminder postcard, second letter and copy of the survey, and a final reminder postcard. Participants contacted through mail could elect to complete the web-based version if they preferred. I used an abbreviated version of contacts for those who received web-based surveys; they received a weekly e-mail reminder for 3 weeks following initial contact and then a final notice 3 days before the return deadline. I discontinued contact with an individual once they returned a survey via either mode.

To minimize introducing other potential sources of bias, I purposefully made the web-based and paper surveys look as similar as possible; the questions and their formatting, sequencing, and length were identical in both modes. I compared response rate (including item non-response), response speed (number of days between the initial mailing and reception of a usable completed survey), and completeness (total percentage of completed responses by

participants on each survey) of mail and web-based surveys. I used independent sample t-tests to identify differences in response rate, speed, and completeness between mail and web-based surveys.

In addition to demographic comparisons, I compared content of responses given by WMA users electing to complete the web survey and those who completed the mail survey. I asked respondents to report their satisfaction with WMA management on a 7-point scale, where 1= very satisfied and 7= very dissatisfied. I used Chi-square tests to identify differences in expected and observed distributions between paper and web-based survey responses to land management practice items (Babbie 2010). When I identified a significant difference, I then performed a Gamma test of association to verify (or contradict) Chi-square results, and determined the magnitude and directionality of a significant difference (Babbie 2010). The gamma statistic, a proportional reduction in error (PRE) measure used with ordinal or nominal data, ranges from -1 to 1 and is easy to interpret; 0 indicates no relationship between the variables, whereas +/- 1 indicates a perfect relationship (Babbie 2010). Babbie et al. (2003) suggested that a gamma of +/- 0.01 to 0.09 indicates a weak or uninteresting relationship, +/- 0.1 to 0.29 indicates a relationship worth noting, and +/- 0.3 to 0.99 provides evidence of an extremely interesting or strong relationship (Babbie et al. 2003). An associated p-value describes the significance of the gamma statistic.

## **Results**

### **Demographics**

Mean age of respondents to web-based (n=175) and paper surveys (n=553) differed significantly ( $t=3.19$ ,  $p=0.001$ ), with web-based respondents slightly younger ( $\bar{x}=46.8$ ,  $sd=12.5$ ,

range=20-76) than paper survey respondents ( $\bar{x}$ =50.3,  $sd$ =12.7, range=20-84). Gender of respondent did not differ between survey methods ( $\chi^2=0.951$ ,  $p=0.329$ ). Web-based survey respondents had completed higher levels of formal education than paper survey respondents ( $\chi^2=54.69$ ,  $p<0.0001$ ;  $G=0.458$ ,  $p<0.0001$ ). Strong evidence suggested that web-based respondents lived more frequently in urban areas as compared to paper respondents ( $\chi^2=28.54$ ,  $p<0.0001$ ;  $G=0.318$ ,  $p<0.0001$ ).

### **Response rate**

Of the 1,227 surveys I distributed by U.S. mail, 71 were undeliverable; therefore, my adjusted mail distribution was 1,156 surveys. Of those respondents contacted initially by mail, 553 responded by mail and 36 elected to complete the web-based survey. I had a 47.8% response rate ( $n=553$ ) for the paper survey.

I initially sent 360 emails with a link to the web-based survey, of which 55 ultimately proved to be undeliverable, resulting in an adjusted web-based total distribution of 305 surveys. Of these, 139 individuals responded using the web-based survey (response rate of 45.6%). However, if I include the 36 individuals who initially were contacted by mail, but elected to complete a web-based survey, the response rate to the on-line option would be 51.3% ( $n=175$ ).

Overall, I received 728 valid mail and web-based survey responses from WMA recreational users, which yielded a combined mode response rate of 49.8%.

### **Response speed**

Due to potential delays in processing and delivery of business reply mail, I accepted paper surveys for 2 weeks after the announced closing date; however, the web-based survey was closed officially on 2 May. With paper surveys, I observed a large spike in returns on 23 March approximately 10 days following initial mail out, and then several smaller spikes roughly a week

following each reminder and the second mailing of the survey (Figure 4-1). For web-based surveys, most respondents completed the survey within 2 days of notification; 22% of all web-based responses (n=39) were received on the first day. I observed spikes in the number of responses on the day each email reminder was distributed, with diminishing returns thereafter (Figure 4-2).

### **Response completeness**

Of the 118 total question items, mean response completeness was 102 items (86% of the questionnaire). Paper survey respondents completed, on average, 86% of the questionnaire ( $\bar{x}$ =101.4,  $sd$ =10.79) compared to 88% ( $\bar{x}$ =103.8,  $sd$ =6.97) for respondents to the web-based survey, a slight but significant difference ( $t$ =1.648,  $p$ =0.0005). I observed a wider range of individual response completeness for mail surveys (5-100%) than web-based surveys (58-100%).

I also analyzed item non-response, or conversely, the percentage of respondents who provided an answer for each item. Overall, open-ended questions received the poorest completion rate (20-40% of respondents provided an answer), whereas most other items in the survey received very high (>80%) completion rates. For the one open-ended item requested of all respondents (Question # 5), slightly more paper survey respondents offered answers (35%,  $n$ =217) than did web respondents (31%,  $n$ =54).

### **Response content**

WMA recreational users ( $n$  = 728) generally expressed satisfaction with WMA management ( $\bar{x}$ =2.75,  $sd$ =1.5 on a 7-point scale where 1= very satisfied and 7=very dissatisfied.); satisfaction did not differ between respondents who completed a paper survey ( $\bar{x}$ =2.72,  $sd$ =1.5,  $n$  = 553) and those who completed a web version ( $\bar{x}$ =2.82,  $sd$ =1.5,  $n$  = 175) ( $t$ =-0.753,  $p$ = 0.452). More than 60% of paper and web-based respondents identified as Pluralists,

and >30% identified as Utilitarians (Table 4-3). However, I found no evidence that respondents selected a mode of survey completion based on wildlife value orientation type ( $\chi^2 = 1.84$ ,  $p = 0.607$ ).

Respondents overall did not differ in attitudes toward land management practices as stated (Table 4-4). I found significant Chi-square results for several items describing each management practice, but, in most cases, non-significant gamma test results contradicted these results. Significant Chi-square and gamma test results associated with low gamma statistic values ( $G < 0.2$ ) suggested low to moderate relationships worth noting in 5 cases: (1) “timber harvest, if used to promote the growth of trees that produce food for wildlife,” (2) “prescribed burning, if used to increase food resources available to wildlife,” (3) prescribed burning, if the risks to neighboring landowners are minimized,” (4) “herbicides, to keep access roads and trails free of overgrown vegetation,” and (5) “herbicides, if their effects are confined only to the area treated” (Table 4-4). In all 5 cases, positive gamma values suggest that paper survey respondents expressed greater agreement with the use of each practice under the conditions given than web-based survey respondents.

## **Discussion**

Although I offered participants 2 modes of survey completion (i.e., paper copy via mail or web-based), not surprisingly, most respondents completed the survey using the method of contact they initially requested during prior interactions with field interviewers. Preference for mode of contact appears to strongly align with one’s demographic characteristics; rural, older, and less educated respondents opted to complete the paper survey more often and younger, urban, more educated respondents opted to complete the web-based version more often.

Preference for mode of contact did not strongly relate to one's wildlife value orientations or attitudes toward land management. This finding of demographic differences, but non-significant differences in attitudes, is consistent with previous work with self-selected respondents in natural resources (Cornicelli and Grund 2011).

Because of the non-probability sample of participants, results may not adequately extrapolate to all WMA users or the full suite of types of users that recreate on WMAs. However, because I obtained a relatively large sample pool ( $N > 1,000$ ) and the statewide field survey spanned a full year of random sample days during all seasons, I believe this represented a diverse sample of WMA users in Virginia. Respondents in this survey effort looked much like the whole sample of users contacted during the previous field interviews: predominantly middle aged (field:  $\bar{x} = 45$  years, mail/web:  $\bar{x} = 49$ , range: 18-84), male (both 94%), hunting or fishing license holders (field: 84%, mail/web: 85%) who participated exclusively or primarily in hunting and/or fishing recreation (field: 75%, mail/web: 77%).

I received a lower response rate than expected, given that participants demonstrated interest in recreational participation and WMA management and actually volunteered information on how best to contact them in the future. Dolsen and Machlis (1991) suggest that <50% response rate to a recreational survey requires questioning to address possible issues with representativeness and reliability. Previous research suggests that recreationists and representatives of other special populations typically display higher response rates than do participants in surveys of the general public because of the saliency of the topic and their clear interest (Wellman et al. 1980). However, factors beyond topic saliency influence participants, including survey and question length, general appearance (e.g., font size, white space), complexity of the questions, and burdens of memory recall (Brown et al. 1989). My survey was

long (12 pages in paper version) and included over 100 questions, some of which may have been perceived as repetitive and mentally taxing. For example, I asked participants to recall the level of their participation in activities that occurred up to 12 months in the past. They also predicted attitudes of others whom they likely do not know well. The complexity and length of the survey may have dissuaded some participants from responding, even if they had interest in the topic, because the perceived physical and mental costs outweighed the perceived benefits (Brown et al. 1989).

While every effort was made to construct equivalent surveys, some differences associated with mode may have impacted respondents and their responses. For example, paper survey respondents had full access to all questions at once to assess the survey length, could move more freely among batteries and questions, and could come back to easily browse through the survey later. Web-based respondents viewed shorter web pages with one or two batteries of questions at a time, received guidance from the web program to lead them through the questions in order and prevent from some respondent error (e.g., entering text instead of a numerical value), and likely completed all survey questions in one sitting due to the perception of not gaining re-entry to the web-form.

I observed similar response rates for web-based (51%) and paper surveys (48%), with the web-based response rate slightly higher than paper survey; alternatively, previous research suggests that mail surveys tend to receive higher response rates than email or internet surveys (Schuldt and Totten 1994, Bachmann et al. 1996, Tse 1998, Weible and Wallace 1998, Kwak and Radler 2002, Shih and Fan 2008, Shannon and Bradshaw 2010, Lesser et al. 2011). Web-based contact often provides immediate and strong response following the first contact, but response often declines over time (Griffis et al. 2003, Shannon and Bradshaw 2010). Emails are

easy to delete or ignore because of the widely held perception of electronic contact as a quick, informal method of communication (Ranchhod and Zhou 2002), yet they remain an efficient and inexpensive way of contact that fits today's mobile and busy lifestyles. Several individuals contacted initially by mail elected to complete the web-based survey; this change in mode selection likely increased the web-based survey response rate and suggests strengthening preferences for submitting responses online.

Similar to other studies, younger, urban, educated respondents completed the web-based survey, aligning with characteristics of those who likely use the internet frequently (Bachmann et al. 1996, Weible and Wallace 1998, Greenlaw and Brown-Welty 2009, Kwak and Radler 2002, Ranchhod and Zhou 2002, Kaplowitz et al. 2004, Graefe et al. 2011). Previous work implicates a learning curve of familiarity, regular use, and knowledge of the internet that contributes to accessibility and desire to respond electronically (Kwak and Radler 2002, Ranchhod and Zhou 2002). While the internet may become a more feasible mode of contact as more people become regular users, internet contact currently does not offer a feasible method of gaining reliable understanding of the attitudes of the general public. Web-based surveys may prove beneficial for reaching particular homogenous groups, members of organizations, and agency employees that have access to the internet and use email regularly (Bachmann et al. 1996, Kaplowitz et al. 2004).

Returns of completed paper surveys clustered around the reminders and the second mailing, likely in response to having received a concrete paper reminder. Longer processing times for bulk mail likely delayed responses received via U.S. mail slightly, lengthening the period between respondent reception of the survey and its return. Mail is a more reliable, but costly, mode of contact, and may hold some greater perceived social pressure to respond than exists

with email contact (Brown et al. 1989). Mail has proven to be better at reaching heterogenous groups of participants, such as WMA recreational users, where practitioners would find difficulty in reaching a representative sample by email exclusively. Most individuals have access to a mailing address, whereas not all potential participants are reached via electronic communication.

Web-based respondents demonstrated significantly higher response completeness than paper respondents. Additionally, paper respondents displayed a much wider range of survey completeness (5-100%) than web-based respondents (58-100%). Research suggests that respondents completed web-based surveys, on average, more thoroughly than paper surveys (Kiesler and Sproull 1986, Kwak and Radler 2002, Truell et al. 2002). Respondents' familiarity with technology (e.g., willingness to type in responses to open ended comments quickly rather than write them) or the less overwhelming delivery method of one or two batteries of questions on screen at a time rather than a 12-page survey with the full length visible at once may have contributed to greater item-response for the web-based survey. The pre-designated branching system incorporated into the web-based version may also have contributed to higher completion rates, since respondents' attention was directed toward questions relevant to their responses. Some respondents may have been overwhelmed by the length of the paper survey and completed only those questions that were most salient or interesting and skipped the more difficult or irrelevant questions.

Although I detected demographic differences between paper and internet respondents, core value orientations toward wildlife and attitudes toward land management did not differ between modes, providing support for combining responses received from multiple modes to answer questions relating to values and attitudes of recreational users of WMAs. Other studies have demonstrated little attitudinal and behavioral differences between mail and web-based

surveys (Griffis et al. 2003, Cornicelli and Grund 2011, Graefe et al. 2011), suggesting that mode may have less influence when the targeted information from a survey includes values, attitudes, and behavior.

Practitioners should exert caution when determining if responses obtained from different modes can be combined legitimately (deLeeuw 2005), and should base the decision on the specific research objectives and characteristics of the target population. The most appropriate survey mode depends to a great extent on the research questions or information desired, resources available (i.e., time and funding), and characteristics of the target population. Web-based surveys are cheaper to implement and garner faster responses, in most cases. Even though mail surveys tend to generate higher response rates than web-based surveys (Schuldt and Totten 1994, Bachmann et al. 1996, Tse 1998, Weible and Wallace 1998, Kwak and Radler 2002, Shih and Fan 2008, Shannon and Bradshaw 2010, Lesser et al. 2011), practitioners may elect to use mail less frequently as postage costs increase and more communication occurs electronically. However, web-surveys still present administration challenges, especially gaining a representative sample of broad, heterogenous populations (Bachmann et al. 1996, Truell et al. 2002, Kaplowitz et al. 2004, Duda and Nobile 2010). Using multiple modes of contact over the course of the survey or giving respondents the choice for mode of survey completion may allow researchers to compensate for the costs of different survey types, increase the perceived importance of the survey for participants, and decrease the perceived personal cost of participation. However, consistency between modes is of utmost importance to ensure as much similarity as possible between experiences of respondents completing either mode, while recognizing the inherent differences between response modes.

Additional research should address the feasibility of internet surveys in various contexts and continue to identify benefits and costs of different modes (e.g., mail survey, web-based survey, face-to-face interviews) for gathering human dimensions information from different target audiences. Although one survey method may be more feasible when answering certain research questions with a particular target population under specific conditions and constraints, the same method may not be effective under a different scenario. For example, a web-based survey may be the most appropriate way to survey natural resources professionals who have internet access and a work email address, but may not be effective to survey older, rural hunters.

Additional research into applications of mail and electronic surveys will improve current and future natural resources survey administration and aid natural resources professionals as they work to better understand their stakeholders. Future research should involve administering mixed mode surveys with various target natural resources populations, including probability-based samples (i.e., general public surveys) when possible. This research will develop further understanding of the benefits and pitfalls of employing any single survey method, especially as the popularity of web-based surveys increases for financial and practical reasons. Practitioners may consider mixed-mode survey implementation, when possible, which offers such benefits as increased overall response rates and decreased costs (Cornicelli and Grund 2011, Sexton et al. 2011). This research supports the value of mixed mode implementation when targeted information involves respondent demographics since respondents drawn to complete paper and web-based surveys differed in age, education, and urban/rural residence. Younger, urban, more educated respondents may be consistently overrepresented in web-based surveys, which could lead to bias if not recognized and addressed.

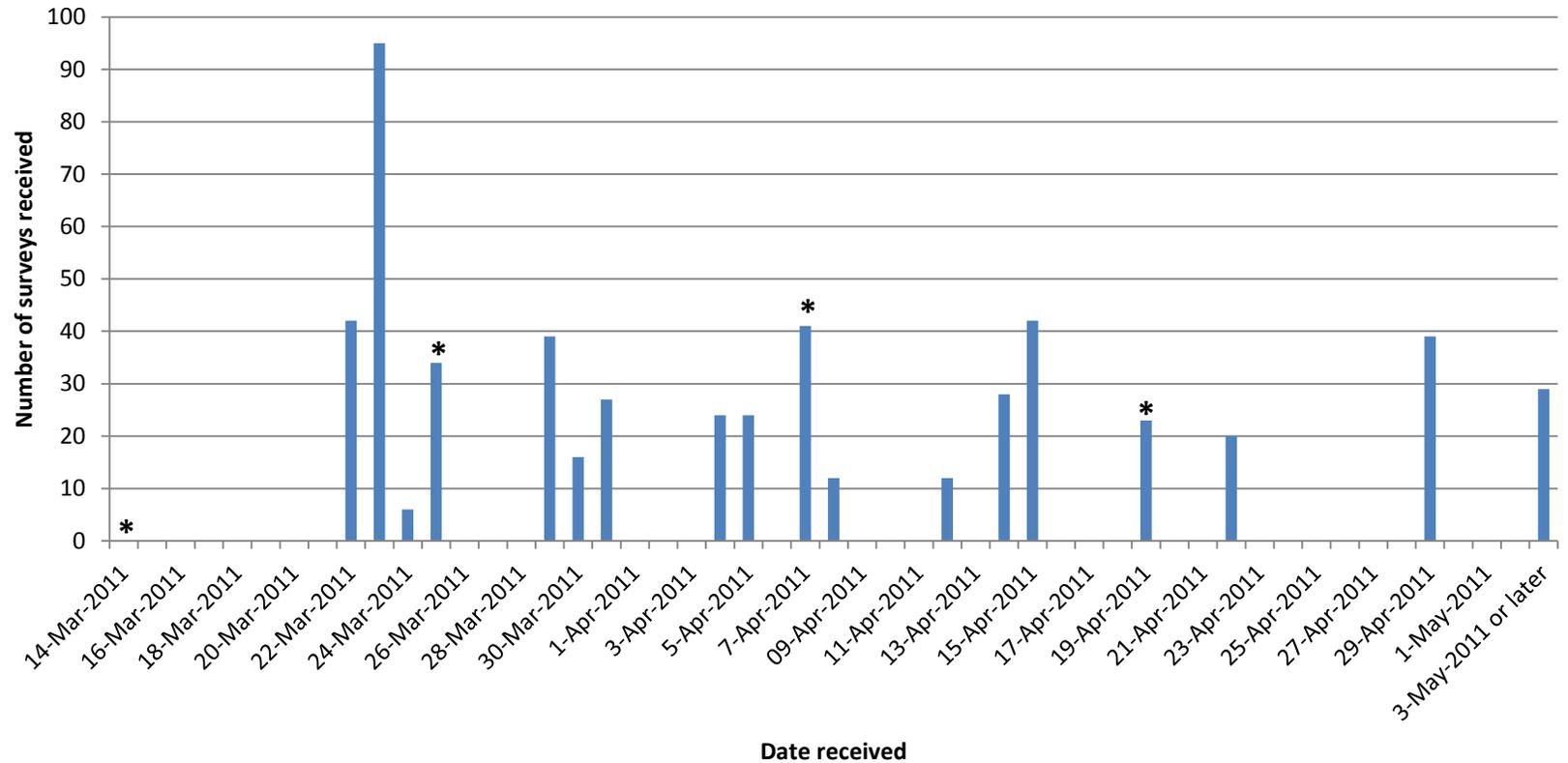
**Table 4-1.** Demographic comparison between on-site interview participants at Virginia wildlife management areas (WMAs) who elected to provide contact information for a follow-up survey and those who did not provide contact information.

	Provided contact information	Elected not to provide contact information	Statistical test for differences
Age	$\bar{x}$ = 44.78, sd=13.23	$\bar{x}$ = 43.12, sd=14.51	t=2.83, p=0.005*
Gender	Male: 95%, n=1,486 Female: 5%, n=74	Male: 93%, n=853 Female: 7%, n=65	$\chi^2$ =5.96, p=0.015* G=0.210, p=0.020*
Hunting/fishing license holder	Yes: 85%, n=1,340 No: 15%, n=241	Yes: 82%, n=766 No: 18%, n=164	$\chi^2$ =2.47, p=0.116
Satisfaction	$\bar{x}$ = 5.86, sd=1.48	$\bar{x}$ = 5.64, sd=1.52	t=3.47, p=0.001*

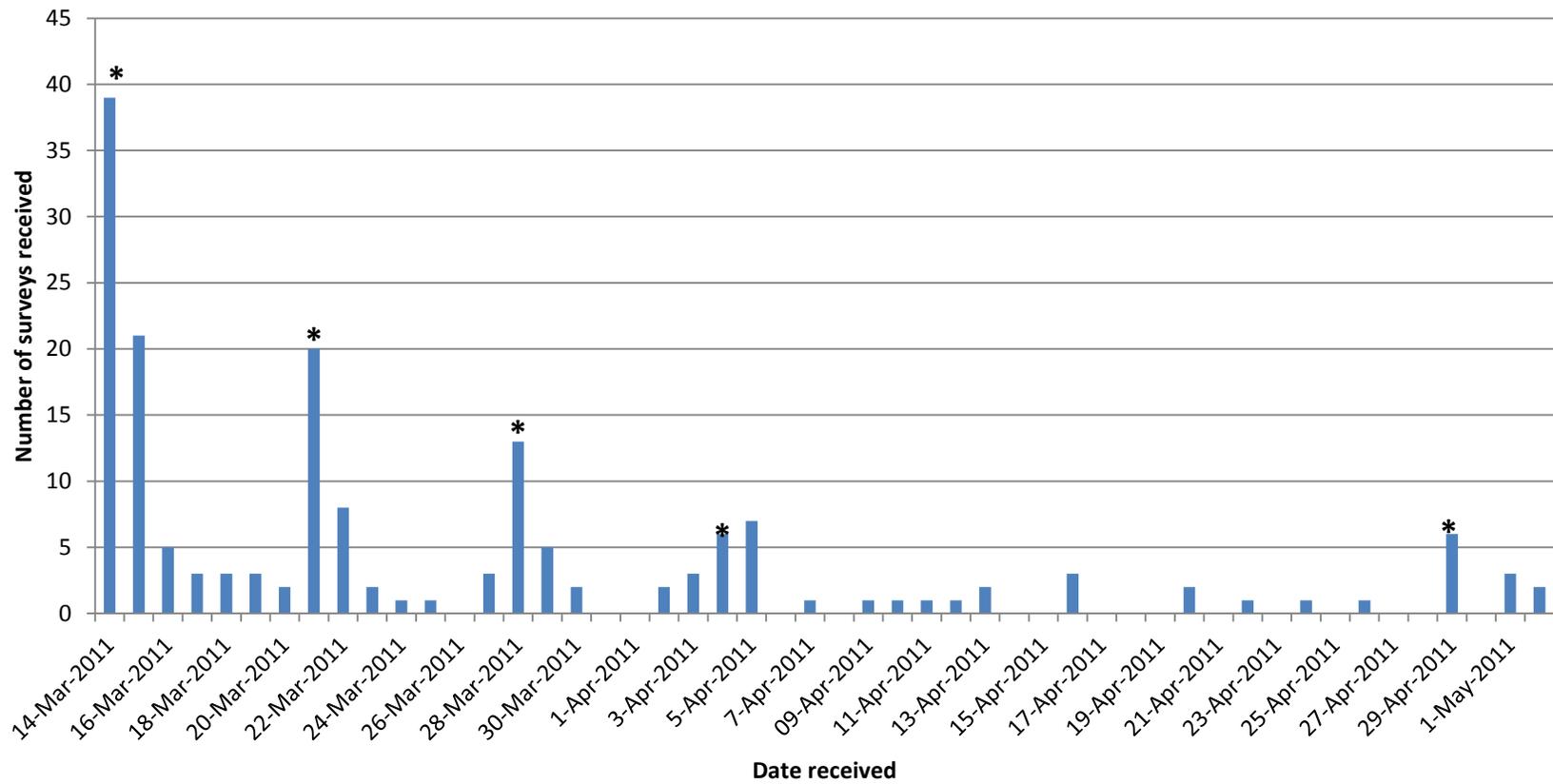
\* indicates significance at  $\alpha$ = 0.05.

**Table 4-2.** Survey administration timeline for a survey effort of Virginia’s wildlife management area (WMA) recreational users in spring 2011.

<b>Survey distribution stage</b>	<b>Date (2011)</b>
1 <sup>st</sup> contact for WMA mail and web surveys	March 14
1 <sup>st</sup> reminder for WMA web survey	March 21
Reminder/thank you postcard (mail only)	March 25
2 <sup>nd</sup> reminder for WMA web survey	March 28
3 <sup>rd</sup> reminder for WMA web survey (with closing date)	April 4
2 <sup>nd</sup> full mailing of mail survey and cover letter to non-respondents	April 7
2 <sup>nd</sup> postcard identifying closing date of survey (mail only)	April 19
Final reminder email for WMA web survey (with closing date)	April 29
Closing date of WMA survey (mail surveys postmarked, web survey closed)	May 2



**Figure 4-1.** Response speed (i.e., frequency of surveys returned over time) for surveys returned by U.S. mail of Virginia’s wildlife management area (WMA) recreational users in spring 2011. An \* indicates the approximate dates when I distributed initial and reminder mailings.



**Figure 4-2.** Response speed (i.e., frequency of surveys returned over time) for web-based surveys of Virginia’s wildlife management area (WMA) recreational users in spring 2011. An \* indicates the approximate dates when I distributed the initial email and reminders.

**Table 4-3.** Frequency of wildlife value orientation types (as described by Teel et al. 2005) among paper and web-based respondents to a survey of Virginia wildlife management area (WMA) recreational users in spring 2011.

		<b>Wildlife value orientation types</b>				
		Utilitarian	Mutualist	Pluralist	Distanced	<i>Total</i>
<b>Mode</b>	Paper	35% (n=158)	3% (n=14)	62% (n=281)	< 1% (n=2)	455
	Web	31% (n=49)	5% (n=7)	64% (n=100)	0	156
	<i>Total</i>	207	21	381	2	611

**Table 4-4.** Results of Chi-square and gamma test analysis for differences in responses of paper and web-based respondents to a survey of Virginia wildlife management area (WMA) recreational users in spring 2011.

<b>Timber harvest conditions</b>	<b>X<sup>2</sup></b>	<b>p-value</b>	<b>G</b>	<b>p-value</b>
Provide food for wildlife	10.65	<b>0.031*</b>	0.185	<b>0.016*</b>
Resulting forest is not changed	11.92	<b>0.018*</b>	0.052	0.446
Small patch is harvested	4.12	0.390		
Funds generated stayed on WMA	5.71	0.222		
Certain trees would grow back in the area	6.59	0.159		
Only undesirable or diseased trees	9.59	<b>0.048*</b>	0.060	0.341
Improve habitat for some species	4.31	0.365		
Precautions to prevent erosion	5.83	0.212		
Few large trees left behind to start new forest	7.16	0.128		
<b>Prescribed burning conditions</b>	<b>X<sup>2</sup></b>	<b>p-value</b>	<b>G</b>	<b>p-value</b>
Increase food resources for wildlife	15.34	<b>0.004*</b>	0.154	<b>0.042*</b>
Risks to neighboring owners minimized	11.37	<b>0.023*</b>	0.151	<b>0.044*</b>
Duplicates role of fire in Virginia forests	1.68	0.794		
Create diversity of habitat for wildlife	4.40	0.354		
Control invasive, non-native vegetation	2.07	0.724		
Reducing amount of fuel	4.53	0.340		
As long as wildlife are not injured or killed	2.19	0.700		
Benefit native plants and trees	5.62	0.229		
Benefit plant species dependent on fire	3.57	0.468		
<b>Herbicide conditions</b>	<b>X<sup>2</sup></b>	<b>p-value</b>	<b>G</b>	<b>p-value</b>
Control invasive, non-native plants	11.64	<b>0.020*</b>	-0.016	0.824
Do not harm wildlife	15.71	<b>0.003*</b>	0.113	0.128
Only undesirable plants are treated	13.57	<b>0.009*</b>	0.090	0.199
To keep access roads and trails open	17.44	<b>0.002*</b>	0.205	<b>0.002*</b>
Wildlife not exposed to chemicals that will accumulate in their bodies	13.70	<b>0.008*</b>	0.078	0.301
Effects confined to area treated	12.62	<b>0.013*</b>	0.169	<b>0.015*</b>
Control vegetation that impedes growth of desired vegetation	9.78	<b>0.044*</b>	0.120	0.087
Even if some species displaced temporarily	6.48	0.166		
Negative consequences to water prevented	5.29	0.259		
<b>Mechanical technique conditions</b>	<b>X<sup>2</sup></b>	<b>p-value</b>	<b>G</b>	<b>p-value</b>
Maintain access roads and trails	1.61	0.807		
Create habitat that provides food for wildlife	6.13	0.190		
Prevent establishment of invasive, non-native vegetation	0.673	0.955		
Control invasive, non-native vegetation	0.561	0.967		
Noise generated does not disturb wildlife	3.46	0.484		
Precautions to prevent erosion	13.87	<b>0.008*</b>	-0.030	0.711
Create or maintain open fields	1.94	0.747		
Potential pollution impacts on wildlife prevented	5.17	0.271		
Even if some species displaced temporarily	3.98	0.409		

\* indicates significance at  $\alpha = 0.05$ .

## Literature Cited

- Babbie, E. 2010. *The practice of social research*, 12<sup>th</sup> edition. Wadsworth Cengage Learning, Belmont, California, USA.
- Babbie, E., F. Halley, and J. Zaino. 2003. *Adventures in social research: Data analysis using SPSS™ 11.0/11.5 for Windows*. Pine Forge Press, Thousand Oaks, California, USA.
- Bachmann, D., J. Elfrink, and G. Vazzana. 1996. Tracking the progress of e-mail vs. snail mail: gap narrows on response rates, but applications still limited. *Marketing Research* 8:31-35.
- Brown, T.L., D.J. Decker, and N.A. Connelly. 1989. Response to mail surveys on resource-based recreation topics: a behavioral model and an empirical analysis. *Leisure Sciences* 11:99-110.
- Burch, Jr., W.R. 1964. Two concepts for guiding recreation management decisions. *Journal of Forestry* 62:707-712.
- Connelly, N.A., T.L. Brown, and D.J. Decker. 2003. Factors affecting response rates to natural resource-focused mail surveys: empirical evidence of declining rates over time. *Society and Natural Resources* 16:541-549.
- Cordell, H.K., C.J. Betz, and G.T. Green. 2002. Recreation and the environmental as cultural dimensions in contemporary American society. *Leisure Sciences* 24:13-41.
- Cordell, H.K., and M.A. Tarrant. 2002. Southern forest resource assessment highlights: changing demographics, values and attitudes. *Journal of Forestry* 100:28-33.
- Cornicelli, L., and M.D. Grund. 2011. Assessing deer hunter attitudes toward regulatory change using self-selected respondents. *Human Dimensions of Wildlife* 16:174-182.

- deLeeuw, E.D. 2005. To mix or not to mix data collection modes in surveys. *Journal of Official Statistics* 21:233-255.
- Dillman, D.A. 2000. *Mail and internet surveys: the tailored design method*. Second ed. John Wiley and Sons, New York, New York, USA.
- Dolsen, D.E., and G.E. Machlis. 1991. Response rates and mail recreation survey results: how much is enough? *Journal of Leisure Research* 23:272-277.
- Duda, M.D., and J.L. Nobile. 2010. The fallacy of online surveys: no data are better than bad data. *Human Dimensions of Wildlife* 15:55-64.
- Fleming, C.M., and M. Bowden. 2009. Web-based surveys as an alternative to traditional mail methods. *Journal of Environmental Management* 90:284-292.
- Graefe, A., A. Mowen, E. Covelli, and N. Trauntvein. 2011. Recreation participation and conservation attitudes: differences between mail and online respondents in a mixed-mode survey. *Human Dimensions of Wildlife* 16:183-199.
- Greenlaw, C., and S. Brown-Welty. 2009. A comparison of Web-based and paper-based survey methods: testing assumptions of survey mode and response cost. *Evaluation Review* 33:464-480.
- Griffis, S.E., T.J. Goldsby, and M.C. Cooper. 2003. Web-based and mail surveys: a comparison of response, data, and cost. *Journal of Business Logistics* 24:237-258.
- Kaplowitz, M.D., T.D. Hadlock, and R. Levine. 2004. A comparison of web and mail survey response rates. *Public Opinion Quarterly* 68:94-101.
- Kiesler, S., and L.S. Sproull. 1986. Response effects in the electronic survey. *The Public Opinion Quarterly* 50:402-413.

- Kwak, N., and B. Radler. 2002. Comparison between mail and web surveys: response pattern, respondent profile, and data quality. *Journal of Official Statistics* 18:257-273.
- Ladner, M.D., G.J. Wingenbach, and M.R. Raven. 2002. Internet and paper based data collection methods in agricultural education research. *Journal of Southern Agricultural Education Research* 52:40-51.
- Lesser, V.M., D.K. Yang, and L.D. Newton. 2011. Assessing hunters' opinions based on a mail and a mixed-mode survey. *Human Dimensions of Wildlife* 16:164-173.
- Manfredo, M.J., T.L. Teel, and A.D. Bright. 2003. Why are public values toward wildlife changing? *Human Dimensions of Wildlife* 8:287-396.
- Ranchhod, A., and F. Zhou. 2002. Comparing respondents of e-mail and mail surveys: understanding the implications of technology. *Marketing Intelligence and Planning* 19:254-262.
- Schuldt, B.A., and J.W. Totten. 1994. Electronic mail vs. mail survey response rates. *Marketing Research* 6:36-40.
- Sexton, N.R., H.M. Miller, and A.M. Dietsch. 2011. Appropriate uses and considerations for online surveying in human dimensions research. *Human Dimensions of Wildlife* 16:154-163.
- Shannon, D.M., and C.C. Bradshaw. 2010. A comparison of response rate, response time, and cost of mail and electronic surveys. *Journal of Experimental Education* 70:179-192.
- Shih, T.H., and X. Fan. 2008. Comparing response rates from web and mail surveys: a meta-analysis. *Field Methods* 20:249-271.
- Teel, T. L., A.A. Dayer, M.J. Manfredo, and A.D. Bright. 2005. Regional results from the research project entitled "Wildlife Values in the West." (Project Rep. No. 58). Project

Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO:  
Colorado State University, Human Dimensions in Natural Resources Unit.

Teel, T.L., M.J. Manfredo, and H.M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife* 12:297-305.

Truell, A.D., J.E., Bartlett II, and M.W. Alexander. 2002. Response rate, speed, and completeness: a comparison of Internet-based and mail surveys. *Behavior Research Methods, Instruments, and Computers* 34:46-49.

Tse, A.C.B. 1998. Comparing the response rate, response speed and response quality of two methods of sending questionnaires: e-mail vs. mail. *Journal of the Market Research Society* 40:353-361.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/www/abs/fishing.html>

Vaske, J.J. 2008. *Survey research and analysis: application in parks, recreation, and human dimensions*. Venture Publishing, State College, Pennsylvania, USA.

Weible, R., and J. Wallace. 1998. Cyber research: the impact of the Internet on data collection. *Marketing Research* 10:19-24, 31.

Wellman, J.D., E.G. Hawk, J.W. Roggenbuck, and G.J. Buhyoff. 1980. Mailed questionnaire surveys and the reluctant respondent: an empirical examination of differences between early and late respondents. *Journal of Leisure Research* 12:164-173.

## **Chapter 5:**

### **Synthesis and Discussion**

#### **Recreational use of WMAs in Virginia**

Perceived increases in non-consumptive recreational use nationwide may indicate a shift in composition of consumptive and non-consumptive public lands users (U.S. Fish and Wildlife Service and U.S. Census Bureau 2006). The public already has limited access to public hunting and fishing areas, particularly in the eastern U.S. (Nelson et al. 2010); WMAs may serve as one of the few types of public lands available primarily dedicated to hunting and fishing recreation.

Traditionally, stakeholders have expected state wildlife agencies to provide and manage game populations for hunting, whereas now, non-game management, managing for biodiversity, and providing wildlife watching opportunities fall under their jurisdiction. These areas of interest receive strong support from the public, especially as society shifts toward a preservationist attitude toward wildlife (Zinn et al. 2002, Manfredo et al. 2003, Teel et al. 2005, 2007). I found that many WMA users held a pluralist value orientation, which draws from both the utilitarian and mutualism value orientations. While the general public may be shifting toward a preservationist attitude (Zinn et al. 2002, Manfredo et al. 2003, Teel et al. 2005, 2007), many WMA users still hold values that align (or at least do not strongly oppose) traditional utilitarian values. However, as more non-consumptive users utilize WMAs, more preservationist attitudes may emerge and lead to conflict over WMA management with traditional users and the agency.

In order to maintain WMAs for wildlife habitat and hunting and fishing, state wildlife agencies may exert some effort publicizing the mission for WMAs clearly and consistently through pamphlets, brochures, social media, and informational sheets (available online and on-

site), regulations, and personnel interactions with users. The public has pressured VDGIF to permit more and more activities on WMAs (and likely will continue); therefore, communicating with diverse stakeholders will remain critical to the success of the wildlife conservation institution (Jacobson et al. 2010). The implementation of an annual user fee may also contribute to conflict among stakeholders as all users become “paying customers.”

While the 10 WMAs selected for the study by VDGIF somewhat represent the types of WMAs they manage, some differences exist between these 10 and the other 29 WMAs. Most of the 10 WMAs selected were located near population centers and/or received overall heavy use; therefore, those selected areas for this study may function as “flagship areas” for the WMA program. The sample did not represent small (<1,000 acres; e.g., Merrimac Farm WMA [~300 acres]), remotely located (e.g., Gathright WMA) WMAs, those with limited access (e.g., Havens WMA), or WMAs with unique historical elements or partnerships that impact management (e.g., Pettigrew WMA managed jointly with U.S. Army Fort A.P. Hill). A few WMAs (e.g., Land’s End WMA) do not permit hunting at all, changing the dynamic of the types of use that occur there (i.e., exclusively non-consumptive), and the types of individuals drawn to visit the site, usually for wildlife viewing opportunities or sightseeing.

The 10 selected WMAs (i.e., mostly flagship areas of the WMA program) currently face issues such as crowding, stakeholder conflict, and concern over land management practices, likely before other WMAs in more remote locations or those with greater limitations on recreational activities (e.g., no hunting) will face those issues. These flagship areas represent not only some of the most well-known and highly used WMAs, but also serve as early indicators of new or emerging issues facing Virginia’s WMAs. For example, Phelps WMA in Northern Virginia receives high visitation in the summer months from Hispanic users swimming and

picnicking at the adjacent Rappahannock River. VDGIF prohibits swimming on WMAs; nonetheless, the volume of use near Phelps has caused environmental impacts (e.g., erosion, garbage) impacting the site and wildlife-related recreational users. This situation offers opportunity to reach out to the Hispanic community and provide education regarding the mission and value of WMAs, perhaps by targeting Spanish-speaking users through interpretive materials (e.g., signs, brochures) or interaction at community events. VDGIF will continue to face emerging use concerns as free access to public areas for recreational purposes dwindles and more non-consumptive users recreate on WMAs. Pressure from visitors participating in activities not directly connected with wildlife-related recreation continues to threaten the mission of WMAs.

The subset of WMA users interviewed and surveyed may not directly represent all users of Virginia's WMAs or the range of VDGIF stakeholders beyond the WMAs. VDGIF stakeholders statewide have expanded in scope as a result of perceived changes in public values and attitudes toward wildlife and the environment. However, the subset of users participating in this research effort provides a good starting point and first indication of (1) areas of need for communication and education efforts, and (2) levels of difficulty of addressing these areas. This research also creates precedence for application of use surveys or co-orientation with other state wildlife agencies and their particular stakeholder groups and issues.

### **Attitudes toward land management**

I found that WMA users generally accepted timber harvesting, prescribed burning, use of herbicides, and mechanical techniques, as presented and described (e.g., to provide food for wildlife), which offers some support for active management on WMAs. Previous research suggests general support for land management activities such as prescribed burning to reduce forest fuels (e.g., Cortner et al. 1984, Shindler and Toman 2003) and mechanical techniques for

habitat management (e.g., Fortier and Messier 2006), but generally negative perceptions of the use of herbicides (e.g., Fortier and Messier 2006). Given the mission of WMAs (i.e., to create, maintain, and enhance wildlife habitat), active land management remains a critical element in that process. However, non-consumptive users generally accepted active land management to a lesser degree than traditional users, which may exacerbate conflict between traditional and non-consumptive users (Vaske et al. 1999, Cordell and Tarrant 2002, Manfredo et al. 2003, Teel et al. 2005). Differences in attitudes toward land management practices may impact WMA management decisions; additionally, geographic context (i.e., “not in my backyard” syndrome) may override general perceptions of land management in some cases (Brunson 1993).

My results suggest that timber harvesting and the use of herbicides present challenges to the agency given higher levels of disagreement from WMA users, and likely more confusion about application, precautions taken by managers during and after implementation, and desired outcomes. However, given that VDGIF has expressed interest in harvesting more timber from WMAs to provide early successional wildlife habitat and that the agency frequently applies herbicides to control vegetation, these areas may be of great importance and may require an investment of communication efforts. Alternatively, areas where shared views exist may require less effort or garner positive results more quickly than perceived (e.g., prescribed burning if the risks to neighboring landowners are minimized, mechanical techniques if pollution is prevented), thus providing some areas of success while making headway on more difficult issues.

Agency personnel expressed more critical evaluations of land management practices, particularly of descriptions of timber harvest. These critical evaluations of land management likely stem from the greater knowledge of professionals regarding the feasibility and implications of management practice use. Because managers have experience with

implementing techniques, and often understand the degree of difficulty or likelihood of success when using a given management practice, they subconsciously may evaluate practices with more skepticism or realism than their stakeholders. For example, agency personnel mostly disagreed with removing only dead or diseased trees during a harvest operation, possibly because they understood the importance of dead standing wood for some wildlife, as well as the difficulty of implementing a single-tree selection harvest. Bradley and Kearney (2007) demonstrated differences in how managers and stakeholders perceive timber harvesting; foresters tended to categorize forest scenes based on silvicultural practices whereas stakeholders based perceptions largely on pattern of disturbance, size of the opening, and degree of re-vegetation. This study and others provide additional evidence for the importance of considering the “lens” through which managers and stakeholders make their evaluations of land management.

While most state agencies were established to manage game species, nationwide trends suggest non-consumptive recreation participation has been increasing (U.S. Fish and Wildlife Service and U.S. Census Bureau 2006). However, game management and non-game management are not mutually exclusive. Many management practices, such as using timber harvesting or prescribed fire to maintain an open field, provide benefits for non-game wildlife at the same time that they support game species. One possible marketing technique for WMAs that may appeal to diverse stakeholder groups may involve remarketing the WMAs as “conservation areas” rather than wildlife management areas (or game lands in some other states). A formal name change would likely concern traditional users and agency personnel regarding a perceived refocus of WMA management and may not be necessary to make WMA management relevant to broader stakeholder groups. Since WMAs do provide habitat for all wildlife (i.e., not just game), VDGIF can also highlight the diversity or non-game aspect in addition to game management in

communications with the public to simultaneously fit with a more preservationist attitude toward wildlife held by many members of society.

### **Co-oriented attitudes toward land management**

According to Siegrist et al. (2000), stakeholders who believe they share similar views with the managing agency tend to trust the agency more than those who do not. Congruency was generally low for both DGIF managers and WMA users' suggesting low perceived agreement by both groups. This perception of few shared values may indicate a lack of trust in the agency and in its stakeholders regarding land management issues (Siegrist et al. 2000, Cvetkovich and Winter 2003, Vaske et al. 2007). Trust is important for facilitating cooperative behavior (Elsbach 2004, Leahy and Anderson 2008) and reducing conflict (Leahy and Anderson 2008, Stern 2008). Alternatively, distrust in the agency may have severe implications, including fear, skepticism and opposition (Wondolleck and Yaffee 2000).

Generally, license holders participating in the field interview supported active management to a greater extent than non-license holders. Traditional users of WMAs (i.e., hunters and anglers) have maintained close financial and advisory relationships with the agency historically and may be in position to act as communication channels within the social system and help the agency reach non-consumptive recreational users (Rogers 1995). Interpersonal channels (i.e., face-to-face interaction) may be particularly effective for the transfer of new ideas, especially when parties recognize shared similarities (Rogers 1995). Many hunters and anglers interact with non-consumptive users on a regular basis (both on-site and in other venues) and could also serve as a peer resource of information regarding the WMA mission and Wildlife and Sport Fish Restoration program, land management, and other topics. Similarities among WMA

recreational users may strengthen bonds between traditional and non-consumptive users and influence the effective transfer of information.

Although VDGIF generally understood the positions of WMA stakeholders (i.e., moderate overall accuracy), overall low accuracy for WMA users indicated they had little understanding of VDGIF positions on land management. Clearly expressing the agency's position on land management to both traditional and non-consumptive stakeholder groups through conversations at public meetings, information posted on WMA kiosks, social media, and in personal conversations between personnel and recreational users or community members will serve to build relationships and trust. Perceptions of trust often influence support of agency goals, objectives, and management decisions and may also contribute to effective communication (Vaske et al. 2007).

I observed differences in views (i.e., agreement) and predictions of the other party's views (i.e., accuracy); yet I have little information about whether either party actually understood the management practices as presented and had accurate knowledge of the definition, application, and implications of management. Knowledge and understanding may have particular importance for stakeholders who know little about natural resources and may not understand the feasibility or appropriateness of a given management technique under the circumstances (e.g., Jacobson and Marynowski 1997), or may not connect intermediate management actions with the desired end goal. In addition to information about stakeholders' knowledge and understanding of land management, researchers and state agencies also need a clear understanding of agency personnel positions on land management. Agency responses to land management were not universal, suggesting variation in individual positions (Leong et al. 2008). If the agency is to promote a consistent message, it must be sure its staff is conveying a

consistent and clear statement on land management at the intra-agency level. Including knowledge questions in a similar co-orientation survey to clarify meanings and implications of management techniques would build on my findings.

Opportunity exists for both the agency and WMA stakeholders to work toward improving communication with and among stakeholders. Managers may choose to prioritize and highlight areas of high agreement and low accuracy, where VDGIF and WMA users share views, but may not recognize the commonality. Attention to these areas may provide the easiest and fastest positive results; however, VDGIF may hold these management practices as less of a priority to implement because of high costs or low practicality on WMAs (e.g., prescribed burning on small WMAs in populated areas). Greater difficulty may exist for the resolution of areas of false consensus (low agreement and low accuracy) between VDGIF and WMA users, but VDGIF attention remains critical to continue active management on WMAs for wildlife habitat. In some cases, VDGIF likely views some of the more controversial forms of management (e.g., timber harvest) or those used most frequently (e.g., herbicides) as methods of first choice, which will make these management issues more difficult to address up front. They may, however, provide more substantial benefits for the continued management of WMAs.

Communication efforts may involve correcting misperceptions that some stakeholders may hold about the rationale for management and what a particular management strategy actually entails. The recently completed WMA Technical Report describes a suite of land management practices available for use on WMAs, how they are applied, and the implications or desired end goal of using these practices thus providing a useful tool for communicating agency positions on land management. While VDGIF developed this document as a resource for agency personnel, it describes management practices consistently and reduces confusion among

personnel about management practices, their implementation, and the implications. Using the Technical Report as a resource can prepare agency personnel to effectively discuss land management with stakeholders even if the public does not have open access to such a document.

Two-way communication efforts remain costly and take time, making implementation challenging for an agency with limited resources (Innes and Booher 2004). Interactive meetings and recurring dialogue with stakeholders (e.g., stakeholder advisory committees) and other two-way communication techniques require repeated input over time from agency personnel and long-term commitments to projects and issues (Innes and Booher 2004). If resources are limited, the use of two-way communication, dialogue, and collaboration may be most effective for those issues that present the most controversial or the most critical situations for WMA management and agency priorities statewide (Booher and Innes 2002, Shindler et al. 2002). One-way communication techniques (e.g., brochures, news releases, information on web site) may offer great benefits when employed to address the right issues with the right audiences. For example, if the agency needs to make the general public aware of a new regulation, news releases, newsletter articles, and information on the website are appropriate methods for disseminating information quickly to a broad audience. However, developing those regulations may require public involvement or collaboration strategies to incorporate public values and build legitimacy (Innes and Booher 2004).

Alternatively, VDGIF can open lines of communication with WMA stakeholders to improve communication and engage stakeholders in decision making (e.g., submitting comments to a draft plan, attending a public meeting). VDGIF can collaborate with stakeholder groups or other interest groups on management actions (e.g., invasive species removal, trail maintenance) and encourage stakeholders to voice concerns or requests collectively to the agency in a

constructive way. Constructive collaboration will likely go further than sporadic or unorganized, heated complaints, and will serve to strengthen interpersonal relationships between VDGIF personnel and stakeholders, especially with local community members.

## **Agency implications and recommendations**

Communication efforts should serve to strengthen relationships between the agency and its stakeholders (Davenport et al. 2007, Stern 2008). Building trust in management processes may involve clearly communicating methods available for involvement, meeting at convenient times for stakeholder groups, and developing and maintaining volunteer programs to involve community members directly in management (Davenport et al. 2007). Agencies can build trust with regards to management outcomes by hiring local employees and contractors and patronizing local businesses, as well as incorporating local knowledge into programs and decision making (Davenport et al. 2007). Agency efforts to maintain positive public perception of legitimacy and transparency invest in building trust relationships, resulting in positive long-term outcomes for the agency (Elsbach 2004).

Agencies also should consider collaborating with and accepting help from partners willing to aid with WMA maintenance, management, and agency projects; for example, local chapters of conservation organizations (e.g., National Wild Turkey Federation, The Nature Conservancy), outdoor recreation organizations and interest groups (e.g., Appalachian Trail Conservancy), or local community groups (e.g., Boy Scouts, Friends of WMA groups) express willingness to participate in volunteer work days on WMA to remove invasive species, plant food plots, or construct and maintain access roads and trails. These volunteer initiatives can help the agency achieve desired WMA objectives with lower associated financial or personnel costs

(Davenport et al. 2007). Collaborative projects also build a sense of public responsibility and concern for the WMA that may transcend controversial situations and contribute to a WMA land ethic among users (Wondolleck and Yaffee 2000). Greater responsibility for WMAs may reduce vandalism and improve self-policing of other users, instill greater respect for the unique features of a WMA, and increase awareness, understanding, and participation in active land management for wildlife (e.g., Nelson et al. 2006, Stern 2008). Building interpersonal relationships has benefits for WMA management by incorporating local knowledge and effort, but will lighten the load of managers and reduce reactionary public relations for VDGIF.

State wildlife agencies are facing challenges involving diversifying stakeholders and funding sources along with rising costs and reduced personnel (Jacobson et al. 2010). In the late 1800s, sportsmen recognized a need for management and enhancement of game populations available for hunting and fishing; state wildlife agencies were established in response to that need. Many agencies continue to address this mandate, but now have responsibility for much broader issues, including managing non-game wildlife, conservation efforts to support biodiversity, and providing wildlife-related recreational opportunities that go beyond hunting and fishing (e.g., wildlife watching). While the mission and foundation of state wildlife agencies may have changed little over time, the expectations placed on them have expanded, which proves challenging at a time when budgets and personnel declines preclude many management activities (Jacobson et al. 2010). State fish and wildlife agencies may continue to embrace public involvement strategies and develop and maintain interpersonal relationships with stakeholder groups to uphold their mission and serve as stewards for the natural resources that the public values and enjoys (Jacobson et al. 2010). Working with increasingly diverse stakeholders on

complex natural resource issues with limited resources will remain a challenge for state wildlife agencies that will not be addressed easily.

## Literature Cited

- Booher, D.E., and J.E. Innes. 2002. Network power in collaborative planning. *Journal of Planning Education and Research* 21:221-236.
- Bradley, G.A., and A.R. Kearney. 2007. Public and professional responses to the visual effects of timber harvesting: different ways of seeing. *Western Journal of Applied Forestry* 22:42-54.
- Brunson, M.W. 1993. "Socially acceptable" forestry: what does it imply for ecosystem management? *Western Journal of Applied Forestry* 8:116-119.
- Cordell, H.K., and M.A. Tarrant. 2002. Southern forest resource assessment highlights: changing demographics, values and attitudes. *Journal of Forestry* 100:28-33.
- Cortner, H.J., M.J. Zwolinski, E.H. Carpenter, and J.G. Taylor. 1984. Public support for fire management policies. *Journal of Forestry* 82:359-361.
- Cvetkovich, G., and P.L. Winter. 2003. Trust and social representations of the management of threatened and endangered species. *Environment and Behavior* 35:286-307.
- Davenport, M.A., J.E. Leahy, D.H. Anderson, and P.J. Jakes. 2007. Building trust in natural resource management within local communities: a case study of the Midewin National Tallgrass Prairie. *Environmental Management* 39:353-368.
- Elsbach, K.D. 2004. Managing images of trustworthiness in organizations. In *Trust and Distrust in organizations: Dilemmas and Approaches* (p. 275-292). Russell Sage Foundation, New York.
- Fortier, J., and C. Messier. 2006. Are chemical or mechanical treatments more sustainable for forest vegetation management in the context of TRIAD? *The Forestry Chronicle* 82:806-818.

- Innes, J.E., and D.E. Booher. 2004. Reframing public participation: strategies for the 21<sup>st</sup> century. *Planning Theory & Practice*. 5:419-436.
- Jacobson, S.K., and S.B. Marynowski. 1997. Public attitudes and knowledge about ecosystem management on Department of Defense land in Florida. *Conservation Biology* 11:770-781.
- Jacobson, C.A., J.F. Organ, D.J. Decker, G.R. Batcheller, L. Carpenter. 2010. A conservation institution for the 21<sup>st</sup> century: implications for state wildlife agencies. *Journal of Wildlife Management* 74:203-209.
- Leahy, J.E., and D.H. Anderson. 2008. Trust factors in community-water resource management agency relationships. *Landscape and Urban Planning* 87:100-107.
- Leong, K.M., K.A. McComas, and D.J. Decker. 2008. Formative co-orientation research: a tool to assist with environmental decision making. *Environmental Communication* 2:257-273.
- Manfredo, M.J., T.L. Teel, and A.D. Bright. 2003. Why are public values toward wildlife changing? *Human Dimensions of Wildlife* 8:287-396.
- Nelson, M.D., G.C. Liknes, and B.J. Butler. 2010. Map of forest ownership in the conterminous United States. U.S. Department of Agriculture, Forest Service, Northern Research Station, Forest Inventory and Analysis. Research Map NRS-2. Available at: [http://www.nrs.fs.fed.us/pubs/rmap/rmap\\_nrs2.pdf](http://www.nrs.fs.fed.us/pubs/rmap/rmap_nrs2.pdf)
- Rogers, E.M. 1995. *Diffusion of innovations*, 4<sup>th</sup> ed. The Free Press, New York, New York, USA.

- Shindler, B. A., M. Brunson, and G.H. Stankey. 2002. Social acceptability of forest conditions and management practices: a problem analysis. Gen. Tech. Rep. PNW-GTR-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Shindler, B., and E. Toman. 2003. Fuel reduction strategies in forest communities. *Journal of Forestry* 101:8-15.
- Siegrist, M., G. Cvetkovich, and C. Roth 2000. Salient value similarity, social trust, and risk/benefit perception. *Risk Analysis* 20:353-362.
- Stern, M.J. 2008. The power of trust: toward a theory of local opposition to neighboring protected areas. *Society and Natural Resources* 21:859-875.
- Teel, T. L., A.A. Dayer, M.J. Manfredo, and A.D. Bright. 2005. Regional results from the research project entitled "Wildlife Values in the West." (Project Rep. No. 58). Project Report for the Western Association of Fish and Wildlife Agencies. Fort Collins, CO: Colorado State University, Human Dimensions in Natural Resources Unit.
- Teel, T.L., M.J. Manfredo, and H.M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. *Human Dimensions of Wildlife* 12:297-305.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Available at: <http://www.census.gov/prod/www/abs/fishing.html>
- Vaske, J.J., J.D. Absher, and A.D. Bright. 2007. Salient value similarity, social trust, and attitudes toward wildland fire management. *Human Ecology Review* 14:223-232.

Vaske, J.J., and M.P. Donnelly. 1999. A value-attitude-behavior model predicting wildland preservation voting intentions. *Society & Natural Resources* 12:523-537.

Wondolleck, J.M., and S.L. Yaffee. 2000. *Making collaboration work: lessons from innovation in natural resource management*. Island Press, Washington, D.C., USA.

Zinn, H.C., M.J. Manfredo, and S.C. Barro. 2002. Patterns of wildlife value orientations in hunters' families. *Human Dimensions of Wildlife* 7:147-162.

**Appendix A.** Virginia's wildlife management areas field interview form and postcard

## Virginia WMA User Survey

Interviewer's name \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

WMA \_\_\_\_\_ Location \_\_\_\_\_

Day of the week .....  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday  Sunday

*Hello, my name is \_\_\_\_\_. I am working with Virginia Tech and the Virginia Department of Game and Inland Fisheries. We are trying to learn more about how much and what kind of use Virginia's wildlife management areas receive. I would like to ask you a few questions about your visit today. It should take only a few minutes. Is that OK? If they decline, note how many people in the vehicle (Q3) and try to determine what activity they were engaged in (Q5). Declined interview: \_\_\_\_\_*

1. Do you currently hold a valid Virginia hunting or fishing license? .....  Yes  No      2. What is your age? (If less than 18 years, do not continue.) \_\_\_\_\_

3. How many people in your group today? \_\_\_\_\_ 4. What time did you arrive on the WMA today? \_\_\_\_\_

5. What activities did you engage in on this WMA today? (Check all that apply)

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Biking                    | <input type="checkbox"/> Hiking or walking (for purposes other than hunting, fishing, or wildlife watching) | <input type="checkbox"/> Hunting (go to Q6-9)  |
| <input type="checkbox"/> Boating/canoeing/kayaking | <input type="checkbox"/> Horseback riding   | <input type="checkbox"/> Shooting range use    |
| <input type="checkbox"/> Camping                   |   | <input type="checkbox"/> Trapping (go to Q8-9) |
| <input type="checkbox"/> Fishing (go to Q10)       |   | <input type="checkbox"/> Wildlife watching     |
| <input type="checkbox"/> Other: _____              |   |  |

6. If hunting, what was the target species?

- |                                       |   |  |
|---------------------------------------|---|--|
| <input type="checkbox"/> Bear         | <input type="checkbox"/> Game birds (grouse, quail, woodcock) | <input type="checkbox"/> Raccoon                     |
| <input type="checkbox"/> Coyote       | <input type="checkbox"/> Groundhog                            | <input type="checkbox"/> Squirrel                    |
| <input type="checkbox"/> Deer         | <input type="checkbox"/> Rabbit                               | <input type="checkbox"/> Turkey                      |
| <input type="checkbox"/> Dove         |   | <input type="checkbox"/> Waterfowl (ducks and geese) |
| <input type="checkbox"/> Fox          |   |  |
| <input type="checkbox"/> Other: _____ |   |  |

7. If hunting, what was your hunting method today?

- |  |                                  |
|--|----------------------------------|
| <input type="checkbox"/> Archery                     | <input type="checkbox"/> Rifle   |
| <input type="checkbox"/> Black powder (muzzleloader) | <input type="checkbox"/> Shotgun |
| <input type="checkbox"/> Other: _____                |                                  |

8. If hunting or trapping, did you harvest any animals?

Yes  No

9. If yes (harvested animals), how many and what species?: \_\_\_\_\_

10. If fishing, where did you fish today? \_\_\_\_\_

11. Do you require facilities for disabled users to participate in activities on the WMA? .....  Yes  No

12. Did you use facilities designed for disabled users today? .....  Yes  No

13. How many times have you visited this WMA in the past 12 months? .... \_\_\_\_\_

14. In what season do you visit this WMA the most?

Spring  Summer  Fall  Winter

15. Have you visited any other WMAs in Virginia in the last 12 months? ....  Yes  No

16. If yes, how many other WMAs have you visited in the last 12 months? ..... \_\_\_\_\_

17. On a scale from 1 to 7, where 7=very satisfied, 1=very dissatisfied, and 4 is neutral, how satisfied are you with your experience at this WMA today? .....  1  2  3  4  5  6  7

18. If rating is 3 or less, what was responsible for your dissatisfaction and how could your experience be improved?

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19. Virginia's wildlife management areas are managed to provide a variety of habitat types, including mature forest, forest openings, and grasslands, that will support public use related to fish and wildlife. In the absence of human intervention, much of the land on wildlife management areas would revert to mature forest with few openings or grasslands. To maintain the desired variety of habitat types, the Department of Game and Inland Fisheries must implement a variety of land management practices periodically. Please indicate your approval or disapproval of each of the following potential land management practices on this WMA by selecting a number from 1 to 7, where 7= strongly agree, 1=strongly disagree, and 4 is neutral.

a. Logging some areas to create openings or promote growth of desired species of vegetation	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
b. Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
c. Use of herbicides to manage vegetation	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
d. Mechanical techniques to manage vegetation, such as mowing or mulching	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
e. Planting crops for wildlife food and habitat (e.g. corn, beans, sunflowers)	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

20. With few exceptions, Virginia's wildlife management areas were acquired with funds generated by the sale of hunting or fishing licenses and from excise taxes on hunting and fishing equipment. Currently, anyone can use WMAs at no cost.

Choose one of the following scenarios that best represents your opinion:

- All users of Virginia's WMAs, including hunting or fishing license holders, should pay an annual fee to use the areas.
- Only those who do **not** hold a valid Virginia hunting or fishing license should have to pay a fee to use WMAs.
- Virginia's WMAs should remain available to anyone who wants to use them at no cost.

21. If you had to pay an annual fee of \$\_\_\_\_\_ to use Virginia's wildlife management areas, regardless of whether you hold a valid Virginia hunting or fishing license, would you still have used this wildlife management area today? .....  Yes  No

22. (Ask only if non-hunting/fishing license holder) Knowing that you currently do not hold a valid Virginia hunting or fishing license, if you had to pay an annual fee of \$\_\_\_\_\_ to use Virginia's wildlife management areas, would you still have used this wildlife management area today? .....  Yes  No

23. What is your home zip code? \_\_\_\_\_ 24. Gender .....  Male  Female

25. Do you have any other comments about this WMA?

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Thank you for your time. Would you be interested in providing your contact information for a follow-up mail survey? (If yes, have them fill out their name and address on a notecard) .  Yes  No

WMA: \_\_\_\_\_ Location: \_\_\_\_\_ Today's date: \_\_\_\_\_  
*Virginia Tech and the Virginia Department of Game and Inland Fisheries are trying to learn more about how much and what kind of use Virginia's wildlife management areas receive. Please take the time to fill out this postcard about your visit today and drop it in the mail.*

1. Do you currently hold a valid Virginia hunting or fishing license? Yes No
2. What is your age? \_\_\_\_\_ 3. What is your home zip code? \_\_\_\_\_
4. How many people in your group today? \_\_\_\_\_
5. What time did you arrive on the WMA today? \_\_\_\_\_ AM or PM
6. What time did you leave the WMA today? \_\_\_\_\_ AM or PM
7. What activities did you engage in on the WMA today?  
 Hunting     Wildlife watching     Hiking     Other: \_\_\_\_\_

8. On a scale from 1 to 7, where 7=very satisfied, 1=very dissatisfied, and 4 is neutral, how satisfied were you with your experience at this WMA today?

1    2    3    4    5    6    7

9. *If your rating is 3 or less*, what was responsible for your dissatisfaction and how could your experience have been improved?

\_\_\_\_\_  
\_\_\_\_\_

**Appendix B. Virginia's wildlife management areas  
sighting-in range interview form**

## Virginia WMA Range User Survey

Interviewer's name \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

WMA \_\_\_\_\_

Day of the week     Tuesday    Wednesday    Thursday    Friday    Saturday    Sunday

---

1. How many people are in your group today? ..... \_\_\_\_\_
2. How many times have you visited this range this season (September 2009- March 2010)? ..... \_\_\_\_\_
3. What is your purpose for visiting this range today?
- Sight-in for hunting                       Recreational shooting
- Other: \_\_\_\_\_
- 

4. On a scale from 1 to 7, where 7=very satisfied, 1=very dissatisfied, and 4 is neutral, how satisfied are you with your experience at the range today?

1    2    3    4    5    6    7

5. *If your rating is 3 or less*, what was responsible for your dissatisfaction and how could your experience be improved?

\_\_\_\_\_

\_\_\_\_\_

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6. On a scale from 1 to 7, where 7=very satisfied, 1=very dissatisfied, and 4 is neutral, how satisfied are you with the season that the range is open (September through March)?

1    2    3    4    5    6    7

7. *If your rating is 3 or less*, what was responsible for your dissatisfaction and how could your experience be improved?

\_\_\_\_\_

\_\_\_\_\_

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8. *With few exceptions, Virginia's wildlife management areas were acquired with funds generated by the sale of hunting or fishing licenses or from excise taxes on hunting and fishing equipment.*

*Choose one of the following scenarios that best represents your opinion:*

- All users of Virginia's WMAs should pay an annual fee to use the areas.
- People who currently hold a valid Virginia hunting or fishing license should not have to pay to use WMAs.
- Virginia's WMAs should be available to anyone who wants to use them at no cost (as they currently are).

9. Would you be willing to pay an annual fee of \$ \_\_\_\_\_ to use this WMA if more funds were then available to manage WMAs in Virginia? .....     Yes    No

10. Would you be willing to pay a daily fee of \$ \_\_\_\_\_ to use this WMA for a day if more funds were then available to manage WMAs in Virginia? .....     Yes    No

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10. What is your home zip code? \_\_\_\_\_    11. Gender     Male    Female    12. Age? \_\_\_\_\_

13. Do you have any other comments about the range facilities at this WMA?

\_\_\_\_\_

\_\_\_\_\_

**Appendix C.** Virginia's wildlife management area recreational user mail survey, cover letters, and postcards

# Wildlife Management Areas in Virginia

## Recreational User Survey



We want to thank you for your participation! Our objective in conducting this survey is to understand the values and opinions of recreational users of Virginia's Wildlife Management Areas.

This number is used only to ensure that you do not receive duplicate mailings. *Your name will never be connected to your answers or this survey.*



**The Virginia Department of Game and Inland Fisheries owns 38 wildlife management areas, or WMAs, totalling nearly 200,000 acres of public lands in Virginia. This survey does not refer to other types of public land in Virginia, such as National Parks, National Forests, or state parks.**

1. From the list of WMAs provided below, select and rank the **2 areas** you visited most during the period from **January 1, 2010 through December 31, 2010**, where 1 = most frequently visited, and 2 = next most frequently visited. *(If you have only visited 1 WMA, make only one selection).*

Did not visit a WMA in the stated time period . . . . .	<input type="text"/>	Hog Island (Surry and Isle of Wight Counties) . . . . .	<input type="text"/>
Amelia (near Richmond) . . . . .	<input type="text"/>	Horsepen Lake (Buckingham County) . . . . .	<input type="text"/>
Big Survey (near Wytheville) . . . . .	<input type="text"/>	James River (Nelson County) . . . . .	<input type="text"/>
Big Woods (Sussex County) . . . . .	<input type="text"/>	Land's End (near King George) . . . . .	<input type="text"/>
Briery Creek (near Farmville) . . . . .	<input type="text"/>	Little North Mountain (Augusta and Rockbridge Counties) . . . . .	<input type="text"/>
Cavalier (near Chesapeake) . . . . .	<input type="text"/>	Merrimac Farm (near Quantico MCB) . . . . .	<input type="text"/>
C.F. Phelps (Fauquier County) . . . . .	<input type="text"/>	Mockhorn Island (Eastern Shore) . . . . .	<input type="text"/>
Chickahominy (near Williamsburg) . . . . .	<input type="text"/>	Pettigrew (near Fredericksburg) . . . . .	<input type="text"/>
Clinch Mountain (near Saltville) . . . . .	<input type="text"/>	Powhatan (near Powhatan) . . . . .	<input type="text"/>
Crooked Creek (near Galax) . . . . .	<input type="text"/>	Princess Anne (near Virginia Beach) . . . . .	<input type="text"/>
Dick Cross (Mecklenburg County) . . . . .	<input type="text"/>	Ragged Island (near Newport News) . . . . .	<input type="text"/>
Fairstone Farms (near Martinsville) . . . . .	<input type="text"/>	Rapidan (near Shenandoah National Park) . . . . .	<input type="text"/>
Featherfin (near Farmville) . . . . .	<input type="text"/>	Saxis (Accomack County) . . . . .	<input type="text"/>
Game Farm Marsh (New Kent County) . . . . .	<input type="text"/>	Short Hills (near Natural Bridge) . . . . .	<input type="text"/>
Gathright (near Covington) . . . . .	<input type="text"/>	Stewarts Creek (near Galax) . . . . .	<input type="text"/>
Goshen (near Lexington) . . . . .	<input type="text"/>	Thompson (near Front Royal) . . . . .	<input type="text"/>
Hardware River (Fluvanna County) . . . . .	<input type="text"/>	Turkeycock Mountain (near Martinsville) . . . . .	<input type="text"/>
Havens (near Roanoke) . . . . .	<input type="text"/>	Weston (Fauquier County) . . . . .	<input type="text"/>
Hidden Valley (near Abingdon) . . . . .	<input type="text"/>	White Oak Mountain (Pittsylvania County) . . . . .	<input type="text"/>
Highland (Highland County) . . . . .	<input type="text"/>		

2. Do you currently have a valid Virginia hunting, fishing, or trapping license? *Please check all that apply.*

- I do not currently have a valid license       Trapping license  
 Hunting license       Sportsmen's license (combination hunting, fishing, trapping)  
 Freshwater fishing license

3. We are interested in learning more about the types of outdoor recreational activities in which you participate **while at Virginia's Wildlife Management Areas (WMAs)**. For each activity below, please estimate the total number of visits you devoted to each activity during the period from **January 1, 2010 through December 31, 2010** at all WMAs you visited in Virginia.

	Did not participate (0 visits)	1-5 visits	6-10 visits	more than 10 visits
Hunting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fishing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of Shooting Range	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dog field trial event	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horseback riding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hiking or walking (for purposes other than hunting, fishing, or wildlife watching)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scouting for game	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildlife watching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildflower viewing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Camping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boating, kayaking, or canoeing (for purposes other than fishing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scenic driving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sightseeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. If you hunted on a Virginia WMA from January 1, 2010 through December 31, 2010, what was your target species? (check all that apply)

- Did not hunt on WMAs       Turkey       Small game (squirrel, rabbit, upland game birds)  
 Deer       Dove  
 Bear       Waterfowl (ducks and geese)  
 Other: \_\_\_\_\_

5. The primary purpose of Virginia's WMAs is to provide wildlife habitat. However, numerous activities may be permitted on WMAs. How important should providing opportunities to participate in the following activities be as management goals for Virginia's WMAs are developed? Please circle a number from 1 to 5 for each of the following activities where 1= very important and 5= not important at all.

	Very important					Not at all important				
	1	2	3	4	5	1	2	3	4	5
Providing hunting opportunities										
Providing fishing opportunities										
Providing trapping opportunities										
Providing opportunities to use a shooting range										
Providing opportunities for dog field trial events										
Providing horseback riding opportunities										
Providing hiking opportunities										
Providing wildlife watching opportunities										
Providing other opportunities (please list) :										

Are there any recreational activities that you believe should **not** be permitted on WMAs? Please specify.

---



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---



---



Very dissatisfied

Very satisfied

6. On a scale from 1 to 7, where 1 = very satisfied and 7 = very dissatisfied, how satisfied are you with the management of Virginia's WMAs? .....

1 2 3 4 5 6 7

The next two questions refer to your interactions with other recreational users on WMAs.

7. How often have other recreational users disturbed your hunting experience on WMAs?

- I do not hunt on WMAs (Skip to #8)
- Never (Skip to #8)
- Infrequently (Continue to #7a)
- Frequently (Continue to #7a)

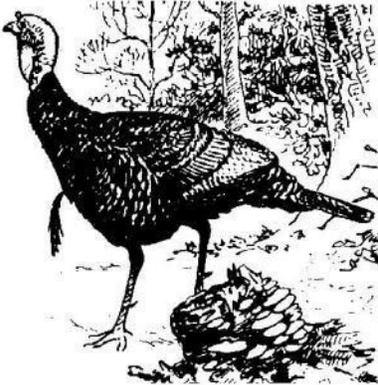
7a. Please identify the specific recreational activity or activities that disturbed your hunting experience.

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8. How often have hunters interfered with your enjoyment of your recreational activity on WMAs?

- Never (Skip to #9)
- Infrequently (Continue to #8a)
- Frequently (Continue to #8a)

8a. Please identify the specific recreational activity or activities that hunters disturbed.

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9. Please indicate the extent to which you agree or disagree with each of the following statements about the overarching goals of WMA management in Virginia.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The habitat on WMAs should be determined by nature, not management efforts by humans.	<input type="checkbox"/>				
Recreational impacts to native wildlife species on WMAs should be limited.	<input type="checkbox"/>				
WMA managers should focus on conserving native wildlife species.	<input type="checkbox"/>				
WMA managers should focus on fostering diverse wildlife communities rather than enhancing conditions for a specific species or small group of species.	<input type="checkbox"/>				
WMA managers should focus on providing habitat for game species.	<input type="checkbox"/>				
WMA managers should focus on creating a variety of habitat types.	<input type="checkbox"/>				
WMA managers should create open fields and clearings for wildlife in addition to managed forestlands.	<input type="checkbox"/>				



10. Please indicate the extent to which you agree or disagree with each of the following statements related to **timber management**. Timber management usually requires the harvest (the cutting and removal) of trees from a designated area.

***Harvesting timber is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to promote the growth of trees that produce food for wildlife (e.g., acorns, berries).	<input type="checkbox"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="checkbox"/>				
if a small patch of trees (e.g., less than 5 acres) is harvested at one time rather than a large patch.	<input type="checkbox"/>				
if money generated from the sale of timber is used specifically to maintain and enhance wildlife habitat on that WMA.	<input type="checkbox"/>				
if I was certain that trees would grow back in the cut area.	<input type="checkbox"/>				
if only undesirable species or diseased trees are harvested instead of all trees from an area on the WMA.	<input type="checkbox"/>				
if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="checkbox"/>				
if precautions are taken to prevent soil erosion.	<input type="checkbox"/>				
if a few large trees are left behind to start a new forest.	<input type="checkbox"/>				

11. Please indicate the extent to which you agree or disagree with each of the following statements related to **prescribed burning**. Prescribed burning is the use of a monitored fire under specific environmental conditions to achieve specific management objectives.

***Prescribed burning is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to increase food resources (e.g., berries) available to wildlife on WMAs.	<input type="checkbox"/>				
if the risks to neighboring landowners is minimized.	<input type="checkbox"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="checkbox"/>				
if used to create a diversity of wildlife habitat on WMAs.	<input type="checkbox"/>				
to control invasive, non-native vegetation on WMAs.	<input type="checkbox"/>				
to minimize the effects of future fires by periodically reducing the amount of fuel on the ground.	<input type="checkbox"/>				
as long as wildlife are not injured or killed as a result.	<input type="checkbox"/>				
to benefit native plants and trees on WMAs.	<input type="checkbox"/>				
to benefit plant species that are dependent on fire for reproduction and survival.	<input type="checkbox"/>				



12. Please indicate the level of your agreement or disagreement with each of the following statements related to **herbicides**. Herbicides are chemicals applied to retard or prevent the growth of undesirable vegetation.

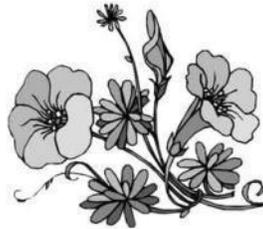
***The use of herbicides is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="checkbox"/>				
if they do not harm wildlife.	<input type="checkbox"/>				
if only undesirable species of vegetation are treated.	<input type="checkbox"/>				
to keep access roads and trails free of overgrown vegetation.	<input type="checkbox"/>				
if wildlife are not exposed to chemicals that will accumulate in their bodies.	<input type="checkbox"/>				
if their effects are confined only to the area treated.	<input type="checkbox"/>				
to control vegetation that impedes the growth of desirable native tree species.	<input type="checkbox"/>				
even if some species of wildlife are displaced temporarily.	<input type="checkbox"/>				
if negative consequences to water resources on or near the WMA are prevented.	<input type="checkbox"/>				

13. Please indicate the extent to which you agree or disagree with each of the following statements related to the use of **mechanical techniques**. Mechanical techniques are practices *unrelated to timber harvest* that use equipment ranging from mowers to heavy machinery to manage vegetation.

***The use of mechanical techniques is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to maintain WMA access roads and trails.	<input type="checkbox"/>				
to create habitat that provides food for wildlife (e.g., berries).	<input type="checkbox"/>				
to prevent the establishment of invasive, non-native species of vegetation.	<input type="checkbox"/>				
to control invasive, non-native vegetation species.	<input type="checkbox"/>				
as long as noise generated by heavy machinery used does not disturb wildlife.	<input type="checkbox"/>				
if precautions are taken to prevent soil erosion.	<input type="checkbox"/>				
to create or maintain open fields and forest clearings.	<input type="checkbox"/>				
if potential pollution impacts on wildlife from heavy machinery used are prevented.	<input type="checkbox"/>				
even if some species of wildlife are displaced temporarily as a result of the use of these management techniques.	<input type="checkbox"/>				



14. Please indicate the level of your agreement or disagreement with each of the following statements related to the Virginia Department of Game and Inland Fisheries (VDGIF).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
VDGIF does a good job of informing the public about its management activities.	<input type="checkbox"/>				
VDGIF seeks public input regarding management activities.	<input type="checkbox"/>				
VDGIF uses public input to shape management decisions.	<input type="checkbox"/>				

15. We also are interested in your perceptions of what agency personnel think about some of the management practices presented in this survey. For each of the following items, please select the box that you believe best represents how **VDGIF wildlife managers would respond** regarding use of **timber management** on WMAs.

***Wildlife managers think timber harvesting is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="checkbox"/>				
if only undesirable species or diseased trees are harvested instead of all trees from an area on the WMA.	<input type="checkbox"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="checkbox"/>				



16. For each of the following items, please select the box that you believe best represents how **VDGIF wildlife managers would respond** regarding use of **prescribed burning** on WMAs.

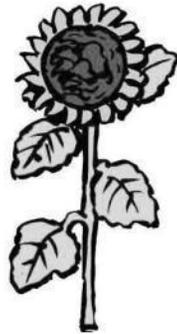
***Wildlife managers think prescribed burning is acceptable...***

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if the risks to neighboring landowners is minimized.	<input type="checkbox"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="checkbox"/>				
if used to create a diversity of wildlife habitat on WMAs.	<input type="checkbox"/>				

17. For each of the following items, please select the box that you believe best represents how VDGIF wildlife managers would respond regarding use of herbicides on WMAs.

**Wildlife managers think the use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="checkbox"/>				
if they do not harm wildlife.	<input type="checkbox"/>				
if only undesirable species of vegetation are treated.	<input type="checkbox"/>				



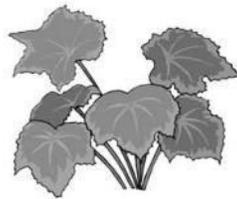
18. For each of the following items, please select the box that you believe best represents how VDGIF wildlife managers would respond regarding use of mechanical techniques on WMAs.

**Wildlife managers think the use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to create or maintain open fields and forest clearings.	<input type="checkbox"/>				
if potential pollution impacts on wildlife from heavy machinery used are prevented.	<input type="checkbox"/>				
even if some species of wildlife are displaced temporarily as a result of the use of these management techniques.	<input type="checkbox"/>				

19. Virginia's WMAs are visited by a wide variety of users, including hunters, anglers, wildlife watchers, and hikers. The following statements have been used in other studies to characterize the wide range of values that people hold toward animals. Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Humans should manage fish and wildlife populations so that humans benefit.	<input type="checkbox"/>				
We should strive for a world where there is an abundance of fish and wildlife for fishing and hunting.	<input type="checkbox"/>				
I feel a strong emotional bond with animals.	<input type="checkbox"/>				
It is acceptable for a person to kill a wild animal if that person feels threatened.	<input type="checkbox"/>				
I value the sense of companionship I receive from animals.	<input type="checkbox"/>				
We should strive for a world where humans and fish and wildlife can co-exist.	<input type="checkbox"/>				
I view all living things as part of one big family.	<input type="checkbox"/>				
Fish and wildlife are present on Earth primarily for people to use.	<input type="checkbox"/>				



	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Wildlife are like my family and I want to protect them.	<input type="checkbox"/>				
People who want to hunt should be provided the opportunity to do so.	<input type="checkbox"/>				
Animals should have rights similar to those of humans.	<input type="checkbox"/>				
Hunting is cruel and inhumane to the animals.	<input type="checkbox"/>				
I take great comfort in the relationships I have with animals.	<input type="checkbox"/>				
Hunting does not respect the lives of animals.	<input type="checkbox"/>				
The needs of humans should take priority over fish and wildlife protection.	<input type="checkbox"/>				
I care about animals as much as I do people.	<input type="checkbox"/>				

20. Please tell us a little more about yourself. This information is used to help us understand differences in values and opinions among groups of WMA users. Your responses are strictly confidential. Your name will never be associated with this section or this survey.

What is your 5-digit home zip code? \_\_\_\_\_

Which of the following best describes the area where you live currently?

- |  |  |
|--|--|
| <input type="checkbox"/> A rural area                        | <input type="checkbox"/> Small city (25,001 to 50,000 people)                      |
| <input type="checkbox"/> Small town (up to 5,000 people)     | <input type="checkbox"/> Large city or metropolitan area (more than 50,000 people) |
| <input type="checkbox"/> Large town (5,001 to 25,000 people) |  |

What is your age? ..... \_\_\_\_\_

Are you .....  Male  Female

What is the highest level of formal schooling you have completed?

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Some high school            | <input type="checkbox"/> Some college, Associate's degree, or vocational/technical degree | <input type="checkbox"/> Bachelor's degree    |
| <input type="checkbox"/> High school graduate or GED |   | <input type="checkbox"/> Post-graduate degree |

**Thank you for completing this survey! Your opinions are valuable to us and will help us better understand recreational users of Virginia's Wildlife Management Areas.**

22. If you have any additional comments, please write them in the space below.

Questions? Email Amy at [acarroz@vt.edu](mailto:acarroz@vt.edu) or call Amy at 1-540-231-0961



**VirginiaTech**

College of Natural Resources  
and Environment

Department of Fisheries and Wildlife Sciences

Mail Code 0321  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

March 14, 2011

«Name»

«Street»

«City», «State» «Zip»

Dear «Name»:

We are contacting you to ask for your help in an important study of recreational visitors to Virginia's Wildlife Management Areas (WMAs). The purpose of this study is to learn how you use WMAs and what opinions you may hold about management of wildlife and the land. By understanding visitors' opinions and attitudes about management, the Virginia Department of Game and Inland Fisheries can continue to create and enhance wildlife habitat and provide recreational opportunities on WMAs.

During a field survey on WMAs between September 2009 and August 2010, you expressed interest in participating in a follow-up mail survey to tell us more about how you feel about management of Virginia's WMAs. We invite you to participate in this portion of the study by completing the enclosed questionnaire. Accuracy of any conclusions we make depends on all opinions being represented. Even if you rarely recreate on WMAs or know little about wildlife, your participation will help us to better understand how users of Virginia's WMAs feel about management of these lands.

The enclosed questionnaire will take less than 25 minutes to complete. This survey is voluntary and there is no more than minimal risk associated with your participation. When you return your completed questionnaire, your name will be deleted from the mailing list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential. The code number on the front of the survey is used solely to track responses so that we do not bother you with unnecessary reminders after you respond.

Once you have completed the questionnaire, please place it in the enclosed business-reply envelope and mail it back to us as soon as possible. If you would prefer to complete the survey online, please visit <https://www.web2.cnre.vt.edu/ncontent/WMA/> and enter the code number on the front cover of your paper survey as your password to access the electronic version. If you have any questions regarding this questionnaire or study, please feel free to contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu).

Thank you very much for completing and returning the enclosed questionnaire. Your input is very important.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

*Invent the Future*

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY  
*An equal opportunity, affirmative action institution*



**VirginiaTech**

College of Natural Resources  
and Environment

Department of Fish and Wildlife Conservation  
100 Cheatham Hall (Mail Code 0321)  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

April 5, 2011

«Name»

«Street»

«City», «State» «Zip»

Dear «Name»:

About three weeks ago, we sent you a questionnaire seeking information about your use of Virginia's Wildlife Management Areas (WMAs) and your opinions about wildlife and land management practices. As of today, we have not received your completed questionnaire. If you have completed the questionnaire in the last few days and mailed it back to us, please accept our sincere thanks.

We are writing to you again because every questionnaire is important. During a field survey on WMAs between September 2009 and August 2010, you expressed interest in participating in a follow-up mail survey to tell us more about how you feel about management of wildlife and the land on WMAs. For results to represent opinions of recreational users on WMAs, it is important that every questionnaire be completed and mailed back to us. Even if you rarely recreate on WMAs or know little about wildlife, your participation is needed. Accuracy of any conclusions we make depends on all opinions being represented.

The enclosed questionnaire will take less than 25 minutes to complete. This survey is voluntary and there is no more than minimal risk associated with your participation. When you return your completed questionnaire, your name will be deleted from the mailing list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential. The code number on the front of the survey is used solely to track responses so that we do not bother you with unnecessary reminders after you respond.

We have enclosed another copy of the questionnaire in case you did not receive the first copy or it was misplaced. Please place your completed questionnaire in the enclosed business-reply envelope and mail it back to us as soon as possible. If you would prefer to complete the survey online, please visit <https://www.web2.cnre.vt.edu/ncontent/WMA/> and enter the numerical password on the front cover of your paper survey to access the electronic version of the survey. If you have any questions regarding this questionnaire or study, please feel free to contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu).

Thank you very much for completing and returning the enclosed questionnaire. Your input is very important.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

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*An equal opportunity, affirmative action institution*



**Douglas W. Domenech**  
*Secretary of Natural Resources*

**COMMONWEALTH of VIRGINIA**  
*Department of Game and Inland Fisheries*

**Robert W. Duncan**  
*Executive Director*

Dear Wildlife Management Area User:

Thank you for your interest in our study of WMA users. Attached is a survey related to that study which is being conducted by Virginia Tech for the Department of Game and Inland Fisheries. When we interviewed you at one of our Wildlife Management Areas (WMA) last year, you expressed a willingness to participate further in discussions on this topic; we now are seeking your additional input regarding the management of WMAs across the Commonwealth. We hope to learn more about your thoughts and feelings regarding recreational opportunities and land management on WMAs.

The questions included in this survey are meant to discover and examine recreational uses that occur on WMAs, including primary uses such as hunting, angling and wildlife watching and other uses such as horseback riding, sightseeing, and hiking. Questions have been designed to probe the wide range of values about wildlife and land management that are held by this diverse group of recreational users. Some of the questions that appear in this survey will be used to compare our results with the results from similar surveys conducted in other states. For instance, question 19 will not be used to make WMA management decisions; rather this information will be used to identify opportunities to educate the public about our mission and WMA management objectives.

We appreciate your willingness to continue assisting us with this study. By completing this survey, you will provide valuable information that will help improve our understanding of the attitudes and beliefs of WMA users.

If you have any questions, please feel free to contact me.

David Norris  
VDGIF WMA Study Chair  
3801 John Tyler Memorial Hwy  
Charles City, VA 23030  
[David.Norris@dgif.virginia.gov](mailto:David.Norris@dgif.virginia.gov)

3801 John Tyler Memorial Hwy, Charles City, Virginia 23030  
(804) 829-6580 *Equal Opportunity Employment, Programs and Facilities* FAX (804) 829-6788

Last week, we sent you a questionnaire seeking your opinions about wildlife and land management practices on Wildlife Management Areas (WMAs) in Virginia. During a WMA field survey, you expressed interest in participating in a follow-up mail survey to tell us more about your opinions. We invite you to participate in this portion of the study.

If you have already completed the questionnaire and mailed it back to us, please accept our sincere thanks. If not, please do so today. Your response is important because future land management decisions on WMAs may be influenced by the opinions and attitudes of visitors such as yourself.

If you did not receive the questionnaire or it was misplaced, please ask for another copy by contacting me at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu). Thank you for your cooperation!

Sincerely,  
Amy Carrozzino, Research Associate  
Dept. of Fisheries & Wildlife Sciences  
Virginia Tech, Blacksburg, VA



Over the last month, we sent you two questionnaires seeking your opinions about wildlife and land management practices on Wildlife Management Areas (WMAs) in Virginia. If you would like to have your opinions included in this study, please complete and return the survey to me by **May 2, 2011**.

If you have already completed the questionnaire and mailed it back to us, please accept our sincere thanks. If not, please do so today. Your response is important because future land management decisions on WMAs may be influenced by the opinions and attitudes of visitors such as yourself. Without your response, conclusions that we draw from questionnaires that we have already receive from other recreational users may be inaccurate.

If you did not receive the questionnaire or it was misplaced, please ask for another copy by contacting me at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu). Thank you for your cooperation!



Sincerely,  
Amy Carrozzino, Research Associate  
Dept. of Fish & Wildlife Conservation  
Virginia Tech, Blacksburg, VA

**Appendix D.** Virginia's wildlife management area recreational user web-based survey and email contacts

## Wildlife Management Area Visitor Survey

This study is part of an effort by Virginia Tech and the Virginia Department of Game and Inland Fisheries to learn more about how recreational visitors use Wildlife Management Areas (WMAs) in Virginia and their opinions of wildlife and land management. Even if you rarely recreate on WMAs or know little about wildlife, your participation is valuable.

You should enter the password (PIN number) you received in the invitation e-mail or on your paper copy of the questionnaire to begin the survey. This number is used only to determine if you have completed a questionnaire. *Your responses to this survey are confidential and never will be associated with your name or contact information.* By completing and submitting the survey, you indicate that you consent to participating in this research effort.

You can navigate forward or backward in the survey using the directional arrow buttons at the bottom of each page. Your responses are not submitted until you click on the "send answers" button on the last page.

Enter your PIN number:



---

Questions? Contact Amy Carrozzino, Virginia Tech, acaroz@vt.edu  
VT IRB Approval Number: 09-600

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## Wildlife Management Area Visitor Survey

Completed

The Virginia Department of Game and Inland Fisheries owns 38 wildlife management areas, or WMAs, totalling nearly 200,000 acres of public lands in Virginia. This survey does not refer to other types of public land in Virginia, such as National Parks, National Forests, or state parks.

1. Did you visit any WMAs in Virginia during the period from **January 1, 2010 through December 31, 2010?**

Yes  No

---

Questions? Contact Amy Carrozzino, Virginia Tech, acaroz@vt.edu  
VT IRB Approval Number: 09-600

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Web Page 3:

**Wildlife Management Area Visitor Survey**

Completed 

1 a. From the drop-down list of WMAs provided below, select the WMA(s) you visited most frequently and next most frequently during the period from **January 1, 2010 through December 31, 2010**. (If you have only visited one WMA, select only the most frequently visited WMA)

Most frequently visited WMA:

Next most frequently visited WMA:

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
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Web Page 4:

**Wildlife Management Area Visitor Survey**

Completed 

2. Do you currently have a valid Virginia hunting, fishing, or trapping license?  
Yes  No

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
Powered by Apian SurveyPro Survey Software

Web Page 5:

### Wildlife Management Area Visitor Survey

Completed

2a. What type of Virginia license do you have currently? *Please select all that apply.*

- Hunting license
- Freshwater fishing license
- Trapping license
- Sportsmen's license (combination hunting, fishing, trapping)

<< Last
Pause
Next >>

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB Approval Number: 09-600  
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Web Page 6:

### Wildlife Management Area Visitor Survey

Completed

3. We are interested in learning more about the types of outdoor recreational activities in which you participate **while at Virginia's Wildlife Management Areas (WMAs)**. For each activity below, please estimate the total number of visits you devoted to each activity during the period from **January 1, 2010 through December 31, 2010** at all WMAs you visited in Virginia.

	Did not participate (0 visits)	1-5 visits	6-10 visits	more than 10 visits
Hunting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fishing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use of Shooting Range	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dog field trial event	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horseback riding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hiking or walking (for purposes other than hunting, fishing, or wildlife watching)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scouting for game	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildlife watching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildflower viewing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Camping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boating, kayaking, or canoeing (for purposes other than fishing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scenic driving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sightseeing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please list below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<< Last
Pause
Next >>

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB Approval Number: 09-600  
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### Wildlife Management Area Visitor Survey

Completed 

4. If you hunted on a Virginia WMA from **January 1, 2010 through December 31, 2010**, what was your target species? (check all that apply)

<input type="checkbox"/> Did not hunt on WMAs	<input type="checkbox"/> Dove
<input type="checkbox"/> Deer	<input type="checkbox"/> Waterfowl (ducks and geese)
<input type="checkbox"/> Bear	<input type="checkbox"/> Small game (squirrel, rabbit, upland game birds)
<input type="checkbox"/> Turkey	
Other: <input type="text"/>	

<< Last      Pause      Next >>

---

Questions? Contact Amy Carrozzino, Virginia Tech, acaroz@vt.edu  
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### Wildlife Management Area Visitor Survey

Completed 

5. The primary purpose of Virginia's WMAs is to provide wildlife habitat. However, numerous activities may be permitted on WMAs. How important should providing opportunities to participate in the following activities be as management goals for Virginia's WMAs are developed? Please circle a number from 1 to 5 for each of the following activities where 1= very important and 5= not important at all.

	Very important		Not at all important		
	1	2	3	4	5
Providing hunting opportunities	<input type="radio"/>				
Providing fishing opportunities	<input type="radio"/>				
Providing trapping opportunities	<input type="radio"/>				
Providing opportunities to use a shooting range	<input type="radio"/>				
Providing opportunities for dog field trial events	<input type="radio"/>				
Providing horseback riding opportunities	<input type="radio"/>				
Providing hiking opportunities	<input type="radio"/>				
Providing wildlife watching opportunities	<input type="radio"/>				
Other (please list below)	<input type="radio"/>				



Are there any recreational activities that you believe should **not** be permitted on WMAs? Please specify.

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu

VT IRB Approval Number: 09-600

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Web Page 9:

**Wildlife Management Area Visitor Survey**

Completed 

6. On a scale from 1 to 7, where 1=very satisfied and 7=very dissatisfied, how satisfied are you with the management of Virginia's WMAs?

Very satisfied      Very dissatisfied  
1 2 3 4 5 6 7  


---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
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Web Page 10:

**Wildlife Management Area Visitor Survey**

Completed 

*Questions 7 and 8 refer to your interactions with other recreational users on WMAs.*

7. How often have other recreational users disturbed your hunting experience on WMAs?  
 I do not hunt on WMAs     Never     Infrequently     Frequently

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
Powered by Aplian SurveyPro Survey Software

Web Page 11:

**Wildlife Management Area Visitor Survey**

Completed 

7a. Please identify the specific recreational activity or activities that disturbed your hunting experience.

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
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Web Page 12:

**Wildlife Management Area Visitor Survey**

Completed 

8. How often have hunters interfered with your enjoyment of your recreational activity on WMAs?

Never  Infrequently  Frequently

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
Powered by Aplian SurveyPro Survey Software

Web Page 13:

**Wildlife Management Area Visitor Survey**

Completed 

8a. Please identify the specific recreational activity that hunters disturbed.

**<< Last    Pause    Next >>**

---

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB Approval Number: 09-600  
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Web Page 14:

**Wildlife Management Area Visitor Survey**

Completed 

9. Please indicate the extent to which you agree or disagree with each of the following statements related to the overarching goals that underlie management of WMAs in Virginia.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The landscape that develops on WMAs should be determined by nature, not management efforts by humans.	<input type="radio"/>				
Recreational impacts to native wildlife species on WMAs should be limited.	<input type="radio"/>				
WMA managers should focus on conserving native wildlife species.	<input type="radio"/>				

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Web Page 15:

### Wildlife Management Area Visitor Survey

Completed

10. Please indicate the extent to which you agree or disagree with each of the following statements about the overarching goals of WMA management in Virginia.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
WMA managers should focus on fostering diverse wildlife communities rather than enhancing conditions for a specific species or small group of species.	<input type="radio"/>				
WMA managers should focus on providing habitat for game species.	<input type="radio"/>				
WMA managers should focus on creating a variety of habitat types.	<input type="radio"/>				
WMA managers should create open fields and clearings for wildlife in addition to managed forestlands.	<input type="radio"/>				

<< Last
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### Wildlife Management Area Visitor Survey

Completed

11. Please indicate the extent to which you agree or disagree with each of the following statements related to **timber management**. Timber management usually requires the harvest (the cutting and removal) of trees from a designated area.

**Harvesting timber is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to promote the growth of trees that produce food for wildlife (e.g., acorns, fruits, berries).	<input type="radio"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="radio"/>				
if a small patch of trees (less than 5 acres) is harvested at one time rather than a large patch.	<input type="radio"/>				
if money generated from the sale of timber is used specifically to maintain and enhance wildlife habitat on that WMA.	<input type="radio"/>				
if I was certain that trees would grow back in the cut area.	<input type="radio"/>				

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**Wildlife Management Area Visitor Survey**

Completed 

12. Please indicate the extent to which you agree or disagree with each of the following statements related to **timber management**. Timber management usually requires the harvest (the cutting and removal) of trees from a designated area.

**Harvesting timber is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if only undesirable species or diseased trees are harvested instead of all the trees from an area on the WMA.	<input type="radio"/>				
if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="radio"/>				
if precautions are taken to prevent soil erosion.	<input type="radio"/>				
if a few large trees were left behind to start a new forest.	<input type="radio"/>				

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**Wildlife Management Area Visitor Survey**

Completed 

13. Please indicate the extent to which you agree or disagree with each of the following statements related to **prescribed burning**. Prescribed burning is the use of a monitored fire under specific environmental conditions to achieve specific management objectives.

**Prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to increase food resources (e.g., berries) available to wildlife on WMAs.	<input type="radio"/>				
if the risks to neighboring landowners is minimized.	<input type="radio"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="radio"/>				
if used to create a diversity of wildlife habitat on WMAs.	<input type="radio"/>				
to control invasive, non-native vegetative species on WMAs.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

Completed

14. Please indicate the extent to which you agree or disagree with each of the following statements related to **prescribed burning**. Prescribed burning is the use of a monitored fire under specific environmental conditions to achieve specific management objectives.

**Prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to minimize the effects of future fires by periodically reducing the amount of fuel on the ground.	<input type="radio"/>				
as long as wildlife are not injured or killed as a result.	<input type="radio"/>				
to benefit native plants and trees on WMAs.	<input type="radio"/>				
to benefit plant species that are dependent on fire for reproduction and survival.	<input type="radio"/>				

<< Last
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### Wildlife Management Area Visitor Survey

Completed

15. Please indicate the extent to which you agree or disagree with each of the following statements related to **herbicides**. Herbicides are chemicals applied to retard or prevent the growth of undesirable vegetation.

**The use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="radio"/>				
if they do not harm wildlife.	<input type="radio"/>				
if only undesirable species of vegetation are treated.	<input type="radio"/>				
to keep access roads and trails free of overgrown vegetation.	<input type="radio"/>				
if wildlife are not exposed to chemicals that will accumulate in their bodies.	<input type="radio"/>				

<< Last
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### Wildlife Management Area Visitor Survey

Completed

16. Please indicate the extent to which you agree or disagree with each of the following statements related to **herbicides**. Herbicides are chemicals applied to retard or prevent the growth of undesirable vegetation.

**The use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if their effects are confined only to the area treated.	<input type="radio"/>				
to control vegetation that impedes the growth of desirable native tree species.	<input type="radio"/>				
even if some species of wildlife are displaced temporarily.	<input type="radio"/>				
if negative consequences to water resources on or near the WMA are prevented.	<input type="radio"/>				

<< Last
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### Wildlife Management Area Visitor Survey

Completed

17. Please indicate the extent to which you agree or disagree with each of the following statements related to the use of **mechanical techniques**. Mechanical techniques are practices unrelated to timber harvest that use equipment ranging from mowers to heavy machinery to manage vegetation.

**The use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to maintain WMA access roads and trails.	<input type="radio"/>				
to create habitat that provides food for wildlife (e.g., berries).	<input type="radio"/>				
to prevent the establishment of invasive, non-native species of vegetation.	<input type="radio"/>				
to control invasive, non-native vegetation species.	<input type="radio"/>				
as long as noise generated by heavy machinery used does not disturb wildlife.	<input type="radio"/>				

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**Wildlife Management Area Visitor Survey**

Completed 

18. Please indicate the extent to which you agree or disagree with each of the following statements related to the use of **mechanical techniques**. Mechanical techniques are practices unrelated to timber harvest that use equipment ranging from mowers to heavy machinery to manage vegetation.

**The use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if precautions are taken to prevent soil erosion, to create or maintain open fields and forest clearings.	<input type="radio"/>				
if potential pollution impacts on wildlife from heavy machinery used are prevented, even if some species of wildlife are displaced temporarily.	<input type="radio"/>				

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**Wildlife Management Area Visitor Survey**

Completed 

19. Please indicate the extent to which you agree or disagree with each of the following statements related to the Virginia Department of Game and Inland Fisheries (VDGIF).

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
VDGIF does a good job of informing the public about its management activities.	<input type="radio"/>				
VDGIF seeks public input regarding management activities.	<input type="radio"/>				
VDGIF uses public input to shape management decisions.	<input type="radio"/>				



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### Wildlife Management Area Visitor Survey

Completed 

20. We also are interested in your perceptions of what agency personnel think about some of the management practices presented in this survey. For each of the following items, please select the option that you believe best represents how **VDGIF wildlife managers would respond** regarding the use of **timber management** on WMAs.

**Wildlife managers think timber harvesting is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
as a means to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="radio"/>				
if only undesirable species or diseased trees are harvested rather than all trees from an area on the WMA.	<input type="radio"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

Completed 

21. For each of the following items, please select the option that you believe best represents how **VDGIF wildlife managers would respond** regarding the use of **prescribed burning** on WMAs.

**Wildlife managers think prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if the risks to neighboring landowners is minimized.	<input type="radio"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="radio"/>				
as a means to create a diversity of wildlife habitat on WMAs.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

Completed 

22. For each of the following items, please select the option that you believe best represents how **VDGIF wildlife managers would respond** regarding the use of **herbicides** on WMAs.

**Wildlife managers think the use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="radio"/>				
if the chemicals used do not harm wildlife.	<input type="radio"/>				
only when undesirable species of vegetation are treated.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

Completed 

23. For each of the following items, please select the option that you believe best represents how **VDGIF wildlife managers would respond** regarding the use of **mechanical techniques** on WMAs.

**Wildlife managers think the use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to create or maintain open fields and forest clearings.	<input type="radio"/>				
if potential pollution impacts on wildlife from heavy machinery are prevented.	<input type="radio"/>				
even if some species of wildlife are displaced temporarily.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

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24. Virginia's WMAs are visited by a wide variety of users, including hunters, anglers, wildlife watchers, and hikers. The following statements have been used in other studies to characterize the wide range of values that people hold toward animals. Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Humans should manage fish and wildlife populations so that humans benefit.	<input type="radio"/>				
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.	<input type="radio"/>				
I feel a strong emotional bond with animals.	<input type="radio"/>				
It is acceptable for a person to kill a wild animal if that person feels threatened.	<input type="radio"/>				
I value the sense of companionship I receive from animals.	<input type="radio"/>				
We should strive for a world where humans and fish and wildlife can co-exist.	<input type="radio"/>				

<< Last
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### Wildlife Management Area Visitor Survey

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25. Please indicate the extent to which you agree or disagree with each of the following statements about your values toward animals.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I view all living things as being part of one big family.	<input type="radio"/>				
Fish and wildlife are present on Earth primarily for people to use.	<input type="radio"/>				
Wildlife are like my family and I want to protect them.	<input type="radio"/>				
People who want to hunt should be provided the opportunity to do so.	<input type="radio"/>				
Animals should have rights similar to those of humans.	<input type="radio"/>				

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### Wildlife Management Area Visitor Survey

Completed

26. Please indicate the extent to which you agree or disagree with each of the following statements about your values toward animals.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Hunting is cruel and inhumane to the animals.	<input type="radio"/>				
I take great comfort in the relationships I have with animals.	<input type="radio"/>				
Hunting does not respect the lives of animals.	<input type="radio"/>				
The needs of humans should take priority over fish and wildlife protection.	<input type="radio"/>				
I care about animals as much as I do people.	<input type="radio"/>				

<< Last
Pause
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Questions? Contact Amy Carozzino, Virginia Tech, [acaroz2@vt.edu](mailto:acaroz2@vt.edu)  
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### Wildlife Management Area Visitor Survey

Completed

27. Please tell us a little more about yourself. This information is used to help us understand differences in values and opinions among groups of WMA users. Your responses are strictly confidential. Your name never will be associated with this section or the survey.

What is your 5-digit home zip code?

Which of the following best describes the area where you live currently?

- Rural area
- Small town (up to 5,000 people)
- Large town (5,001 to 20,000 people)
- Small city (25,001 to 50,000 people)
- Large city or metropolitan area (more than 50,000 people)

What is your age?

Are you  Male  Female

What is the highest level of formal schooling you have completed?

- Some high school
- High school graduate or GED
- Some college, Associate's degree, or vocational/technical degree
- Bachelor's degree
- Post-graduate degree

<< Last
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Questions? Contact Amy Carozzino, Virginia Tech, [acaroz2@vt.edu](mailto:acaroz2@vt.edu)  
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Web Page 33:

**Wildlife Management Area Visitor Survey**

28. If you have any additional comments, please type them in the space below before submitting your responses.

[<< Last](#)   [Pause](#)   [Send Answers](#)

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Web Page 34:

**Wildlife Management Area Visitor Survey**

Thank you for participating in the WMA Visitor Survey!  
Your opinions are valuable to us and will help us better understand recreational users of Virginia's Wildlife Management Areas.

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
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VirginiaTech

College of Natural Resources  
and Environment

Department of Fisheries and Wildlife Sciences

Mail Code 0321  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

March 14, 2011

Dear «Name»:

We are contacting you to ask for your help in an important study of recreational visitors to Virginia's Wildlife Management Areas (WMAs). The purpose of this study is to learn how you use WMAs and what opinions you may hold about management of wildlife and the land. By understanding visitors' opinions and attitudes about management, the Virginia Department of Game and Inland Fisheries can continue to create and enhance wildlife habitat and provide recreational opportunities on WMAs.

During a field survey on WMAs between September 2009 and August 2010, you expressed interest in participating in a follow-up mail survey to tell us more about how you feel about management of Virginia's WMAs. We invite you to participate in this portion of the study by completing this online questionnaire. Accuracy of any conclusions we make depends on all opinions being represented. Even if you rarely recreate on WMAs or know little about wildlife, your participation will help us to better understand how users of Virginia's WMAs feel about management of these lands.

The questionnaire can be accessed at <https://www.web2.cnre.vt.edu/ncontent/WMA/> using **your unique password («PIN»)**. The questionnaire will take less than 25 minutes to complete. This survey is voluntary and there is no more than minimal risk associated with your participation. When you complete the questionnaire, your name will be deleted from the email list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential. The password is used solely to track responses so that we do not bother you with unnecessary reminders after you respond.

If you would prefer to receive a paper copy of the questionnaire or you have questions regarding this questionnaire or study, please feel free to contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu).

Thank you very much for completing the questionnaire. Your input is very important.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

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*An equal opportunity, affirmative action institution*



VirginiaTech

College of Natural Resources  
and Environment

Department of Fisheries and Wildlife Sciences

Mail Code 0321  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

April 29, 2011

Dear «Name»:

We contacted you several times over the past month to ask for your help in an important study of recreational visitors to Virginia's Wildlife Management Areas (WMAs). If you have already completed the questionnaire, please accept our sincere thanks. If not, there are still a few days remaining to do so. **If you would like to have your opinions included in this study, please complete the survey by Monday, May 2 at 5:00 PM when the web survey will be closed.** Your response is important because future land management decisions on WMAs may be influenced by the opinions and attitudes of visitors such as yourself. Without your response, conclusions that we draw from questionnaires that we have already received from other recreational users may be inaccurate.

The questionnaire can be accessed at <https://www.web2.cnre.vt.edu/ncontent/WMA/> using **your unique password («PIN»)** and will take approximately 20 minutes to complete. This survey is voluntary and there is no more than minimal risk associated with your participation. When you complete the questionnaire, your name will be deleted from the email list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential.

If you have questions regarding this questionnaire or study, please contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu). Thank you for your time.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

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**Appendix E.** Virginia Department of Game and Inland Fisheries personnel web-based survey and cover letters

## Wildlife Management Area Agency Survey

This study is part of an effort by Virginia Tech and the Virginia Department of Game and Inland Fisheries to learn more about the relationship of values and opinions between WMA users and VDGIF managers and biologists. Even if you have limited involvement with the WMAs, your participation is valuable.

You should enter the password (PIN number) you received in the invitation e-mail to begin the survey. This number is used only to determine if you have completed a questionnaire. *Your responses to this survey are confidential and never will be associated with your name or position.* By completing and submitting the survey, you indicate that you consent to participating in this research effort.

You can navigate forward or backward in the survey using the directional arrow buttons at the bottom of each page. Your responses are not submitted until you click on the "send answers" button on the last page.

Enter your PIN number:



Start

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu

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## Wildlife Management Area Agency Survey

Completed 

1. The primary purpose of Virginia's WMAs is to provide wildlife habitat. However, numerous activities may be permitted on WMAs. How important should providing opportunities to participate in the following activities be as management goals for Virginia's WMAs are developed? Please circle a number from 1 to 5 for each of the following activities where 1= very important and 5= not important at all.

	Very important		Not at all important		
	1	2	3	4	5
Providing hunting opportunities	<input type="radio"/>				
Providing fishing opportunities	<input type="radio"/>				
Providing trapping opportunities	<input type="radio"/>				
Providing opportunities to use a shooting range	<input type="radio"/>				
Providing opportunities for dog field trial events	<input type="radio"/>				
Providing horseback riding opportunities	<input type="radio"/>				
Providing hiking opportunities	<input type="radio"/>				
Providing wildlife watching opportunities	<input type="radio"/>				
Other (type in below)	<input type="radio"/>				



Are there any recreational activities that you believe should **not** be permitted on WMAs? Please specify.

Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu

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Web Page 3:

**Wildlife Management Area Agency Survey**

Completed 

2. On a scale from 1 to 7, where 1=very satisfied and 7=very dissatisfied, how satisfied are you with the management of Virginia's WMAs?

Very satisfied      Very dissatisfied  
1 2 3 4 5 6 7  


**<< Last      Pause      Next >>**

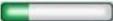
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Web Page 4:

**Wildlife Management Area Agency Survey**

Completed 

3. Please indicate the extent to which you agree or disagree with each of the following statements about the overarching goals of WMA management in Virginia.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The landscape that develops on WMAs should be determined by nature, not management efforts by humans.	<input type="radio"/>				
Recreational impacts to native wildlife species on WMAs should be limited.	<input type="radio"/>				
WMA managers should focus on conserving native wildlife species.	<input type="radio"/>				
WMA managers should focus on fostering diverse wildlife communities rather than enhancing conditions for a specific species or small group of species.	<input type="radio"/>				

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Web Page 5:

### Wildlife Management Area Agency Survey

Completed 

4. Please indicate the extent to which you agree or disagree with each of the following statements about the overarching goals of WMA management in Virginia.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
WMA managers should focus on providing habitat for game species.	<input type="radio"/>				
WMA managers should focus on creating a variety of habitat types.	<input type="radio"/>				
WMA managers should create open fields and clearings for wildlife in addition to managed forestlands.	<input type="radio"/>				

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Web Page 6:

### Wildlife Management Area Agency Survey

Completed 

5. Please indicate the extent to which you agree or disagree with each of the following statements related to **timber management**. Timber management usually requires the harvest (the cutting and removal) of trees from a designated area.

**Harvesting timber is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to promote the growth of trees that produce food for wildlife (e.g., acorns, fruits, berries).	<input type="radio"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="radio"/>				
if a small patch of trees (less than 5 acres) is harvested at one time rather than a large patch.	<input type="radio"/>				
if money generated from the sale of timber is used specifically to maintain and enhance wildlife habitat on that WMA.	<input type="radio"/>				
if I was certain trees would grow back in the cut area.	<input type="radio"/>				

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### Wildlife Management Area Agency Survey

Completed

6. Please indicate the extent to which you agree or disagree with each of the following statements related to **timber management**. Timber management usually requires the harvest (the cutting and removal) of trees from a designated area.

**Harvesting timber is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if only undesirable species or diseased trees are harvested instead of all the trees from an area on the WMA.	<input type="radio"/>				
if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="radio"/>				
if precautions are taken to prevent soil erosion.	<input type="radio"/>				
if a few large trees were left behind to start a new forest.	<input type="radio"/>				

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### Wildlife Management Area Agency Survey

Completed

7. Please indicate the extent to which you agree or disagree with each of the following statements related to **prescribed burning**. Prescribed burning is the use of a monitored fire under specific environmental conditions to achieve specific management objectives.

**Prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to increase food resources (e.g., berries) available to wildlife on WMAs.	<input type="radio"/>				
if the risks posed to neighboring landowners is minimized.	<input type="radio"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="radio"/>				
if used to create a diversity of wildlife habitat on WMAs.	<input type="radio"/>				
to control invasive, non-native vegetative species on WMAs.	<input type="radio"/>				

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### Wildlife Management Area Agency Survey

Completed 

Completed

8. Please indicate the extent to which you agree or disagree with each of the following statements related to **prescribed burning**. Prescribed burning is the use of a monitored fire under specific environmental conditions to achieve specific management objectives.

**Prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to minimize the effects of future fires by periodically reducing the amount of fuel on the ground.	<input type="radio"/>				
as long as wildlife are not injured or killed as a result.	<input type="radio"/>				
to benefit native plants and trees on WMAs.	<input type="radio"/>				
to benefit plant species that are dependent on fire for reproduction and survival.	<input type="radio"/>				

<< Last
Pause
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600

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### Wildlife Management Area Agency Survey

Completed 

Completed

9. Please indicate the extent to which you agree or disagree with each of the following statements related to **herbicides**. Herbicides are chemicals applied to retard or prevent the growth of undesirable vegetation.

**The use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="radio"/>				
if the chemicals used do not harm wildlife.	<input type="radio"/>				
if only undesirable species of vegetation are treated.	<input type="radio"/>				
to keep access roads and trails free of overgrown vegetation.	<input type="radio"/>				
if wildlife are not exposed to chemicals that will accumulate in their bodies.	<input type="radio"/>				

<< Last
Pause
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600

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### Wildlife Management Area Agency Survey

Completed

10. Please indicate the extent to which you agree or disagree with each of the following statements related to **herbicides**. Herbicides are chemicals applied to retard or prevent the growth of undesirable vegetation.

**The use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if their effects are confined only to the area treated.	<input type="radio"/>				
to control vegetation that impedes the growth of desirable native tree species.	<input type="radio"/>				
even if some species of wildlife are displaced temporarily.	<input type="radio"/>				
if negative consequences on water resources on or near the WMA are prevented.	<input type="radio"/>				

<< Last
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600  
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### Wildlife Management Area Agency Survey

Completed

11. Please indicate the extent to which you agree or disagree with each of the following statements related to the use of **mechanical techniques**. Mechanical techniques are practices unrelated to timber harvest that use equipment ranging from mowers to heavy machinery to manage vegetation.

**The use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to maintain WMA access roads and trails.	<input type="radio"/>				
to create habitat that provides food for wildlife (e.g., berries).	<input type="radio"/>				
to prevent the establishment of invasive, non-native species of vegetation.	<input type="radio"/>				
to control invasive, non-native vegetation species.	<input type="radio"/>				
as long as noise generated by heavy machinery used does not disturb wildlife.	<input type="radio"/>				

<< Last
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600  
 Powered by Apian SurveyPro Survey Software

### Wildlife Management Area Agency Survey

Completed 

Completed

12. Please indicate the extent to which you agree or disagree with each of the following statements related to the use of **mechanical techniques**. Mechanical techniques are practices unrelated to timber harvest that use equipment ranging from mowers to heavy machinery to manage vegetation.

**The use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if precautions are taken to prevent soil erosion to create or maintain open fields and forest clearings.	<input type="radio"/>				
if potential pollution impacts on wildlife from heavy machinery used are prevented, even if some species of wildlife are displaced temporarily.	<input type="radio"/>				

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600

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### Wildlife Management Area Agency Survey

Completed 

Completed

13. Please indicate the extent to which you agree or disagree with each of the following statements related to VDGIF's interaction with the public.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
VDGIF does a good job of informing the public about its management activities.	<input type="radio"/>				
VDGIF seeks public input regarding management activities.	<input type="radio"/>				
VDGIF uses public input to shape management decisions.	<input type="radio"/>				



<< Last
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600

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### Wildlife Management Area Agency Survey

Completed 

14. We also are interested in your perceptions of what WMA users think about some of the management practices presented in this survey. For each of the following items, please select the option that you believe best represents how **WMA users would respond** regarding the use of **timber management** on WMAs.

**WMA users think timber harvesting is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if used to improve habitat for some wildlife species, even if it reduces the suitability of habitat for other species.	<input type="radio"/>				
if only undesirable species or diseased trees are harvested rather than all trees from an area on the WMA.	<input type="radio"/>				
if the resulting forest on the WMA is not changed noticeably.	<input type="radio"/>				

[<< Last](#)   [Pause](#)   [Next >>](#)

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600  
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### Wildlife Management Area Agency Survey

Completed 

15. For each of the following items, please select the option that you believe best represents how **WMA users would respond** regarding the use of **prescribed burning** on WMAs.

**WMA users think prescribed burning is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
if the risks to neighboring landowners is minimized.	<input type="radio"/>				
because it duplicates the role that fire historically has played in Virginia's forests.	<input type="radio"/>				
if used to create a diversity of wildlife habitat on WMAs.	<input type="radio"/>				

[<< Last](#)   [Pause](#)   [Next >>](#)

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600  
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### Wildlife Management Area Agency Survey

Completed 

16. For each of the following items, please select the option that you believe best represents how **WMA users would respond** regarding the use of **herbicides** on WMAs.

**WMA users think the use of herbicides is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to control invasive, non-native plant species on WMAs.	<input type="radio"/>				
if the chemicals used do not harm wildlife.	<input type="radio"/>				
only when undesirable species of vegetation are treated.	<input type="radio"/>				

[<< Last](#)   [Pause](#)   [Next >>](#)

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Questions? Contact Amy Carrozzino, Virginia Tech, acaroz@vt.edu  
VT IRB approval number: 09-600  
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### Wildlife Management Area Agency Survey

Completed 

17. For each of the following items, please select the option that you believe best represents how **WMA users would respond** regarding the use of **mechanical techniques** on WMAs.

**WMA users think the use of mechanical techniques is acceptable...**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
to create or maintain open fields and forest clearings.	<input type="radio"/>				
if potential pollution impacts on wildlife from heavy machinery are prevented.	<input type="radio"/>				
even if some species of wildlife are displaced temporarily.	<input type="radio"/>				

[<< Last](#)   [Pause](#)   [Next >>](#)

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Questions? Contact Amy Carrozzino, Virginia Tech, acaroz@vt.edu  
VT IRB approval number: 09-600  
Powered by Apian SurveyPro Survey Software

### Wildlife Management Area Agency Survey

Completed

18. Virginia's WMAs are visited by a wide variety of users, including hunters, anglers, wildlife watchers, and hikers. The following statements have been used in other studies to characterize the wide range of values that people hold toward animals. Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Humans should manage fish and wildlife populations so that humans benefit.	<input type="radio"/>				
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.	<input type="radio"/>				
I feel a strong emotional bond with animals.	<input type="radio"/>				
It is acceptable for a person to kill a wild animal if that person feels threatened.	<input type="radio"/>				
I value the sense of companionship I receive from animals.	<input type="radio"/>				
We should strive for a world where humans and fish and wildlife can co-exist.	<input type="radio"/>				

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600  
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### Wildlife Management Area Agency Survey

Completed

19. Please indicate the extent to which you agree or disagree with each of the following statements about your values toward animals.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I view all living things as being part of one big family.	<input type="radio"/>				
Fish and wildlife are present on Earth primarily for people to use.	<input type="radio"/>				
Wildlife are like my family and I want to protect them.	<input type="radio"/>				
People who want to hunt should be provided the opportunity to do so.	<input type="radio"/>				
Animals should have rights similar to those of humans.	<input type="radio"/>				

<< Last
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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
 VT IRB approval number: 09-600  
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Web Page 21:

### Wildlife Management Area Agency Survey

Completed

20. Please indicate the extent to which you agree or disagree with each of the following statements about your values toward animals.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Hunting is cruel and inhumane to the animals.	<input type="radio"/>				
I take great comfort in the relationships I have with animals.	<input type="radio"/>				
Hunting does not respect the lives of animals.	<input type="radio"/>				
The needs of humans should take priority over fish and wildlife protection.	<input type="radio"/>				
I care about animals as much as I do people.	<input type="radio"/>				

<< Last Pause Next >>

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600

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Web Page 22:

### Wildlife Management Area Agency Survey

Completed

21. Please tell us a little more about yourself. Your responses are strictly confidential. Your name never will be associated with this section or the survey.

What is your age?

Are you  Male  Female

What is the highest level of formal schooling you have completed?

- Some high school
- High school graduate or GED
- Some college, Associate's degree, or vocational/technical degree
- Bachelor's degree
- Post-graduate degree

Please select the option below that best describes your current position with VDGIF:

In what VDGIF Region do you currently work?

- Region 1 (Tidewater)
- Region 2 (Southside)
- Region 3 (Southwest)
- Region 4 (Northern VA)
- Richmond Headquarters
- Statewide

<< Last Pause Next >>

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600

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Web Page 23:

**Wildlife Management Area Agency Survey**

22. If you have any additional comments, please type them in the space below before submitting your responses.

[<< Last](#)   [Pause](#)   [Send Answers](#)

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600  
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Web Page 24:

**Wildlife Management Area Agency Survey**

Thank you for participating in the WMA Agency Survey!

Your opinions are valuable to us and will help us better understand the relationship between opinions of WMA recreational users and VDGIF managers and biologists.

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Questions? Contact Amy Carrozzino, Virginia Tech, acarroz@vt.edu  
VT IRB approval number: 09-600  
Powered by Aplan SurveyPro Survey Software



VirginiaTech

College of Natural Resources  
and Environment

Department of Fisheries and Wildlife Sciences

Mail Code 0321  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

March 15, 2011

Dear «First»:

As you may know, Virginia Tech and DGIF conducted a large number of field interviews with wildlife management area (WMA) users between September 2009 and August 2010. As part of this effort, we asked WMA users if they would participate in a follow-up survey to tell us more about how they feel about management and use of Virginia's WMAs.

We invite you to participate in the wildlife and fisheries professional portion of this survey effort by completing a similar online questionnaire. Accuracy of any conclusions we make depends on all opinions being represented. Even if you do not work closely with the WMAs or know little about the study, your participation will help us to better understand how managers and biologists view wildlife and land management, as well as better understand the results we obtain from the follow-up survey with WMA users.

The questions in this survey have been designed to examine the wide range of values and opinions held by the diverse group of recreational users that utilize WMAs. Several of these questions have been used in other studies to better understand the values people hold toward animals.

The questionnaire can be accessed at <https://www.web2.cnre.vt.edu/nccontent/DGIF/> using **your unique password («PIN\_number»)** and will take about 15-20 minutes to complete. This survey is voluntary and there is no more than minimal risk associated with your participation. When you complete the questionnaire, your name will be deleted from the email list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential. The password is used solely to track responses so that we do not bother you with unnecessary reminders after you have responded.

If you have questions regarding this questionnaire or study, please feel free to contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu).

Thank you very much for completing the questionnaire. Your input is very important.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

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VirginiaTech

College of Natural Resources  
and Environment

Department of Fisheries and Wildlife Sciences

Mail Code 0321  
Blacksburg, Virginia 24061  
540/231-5573 Fax: 540/231-7580  
[www.fishwild.vt.edu](http://www.fishwild.vt.edu)

April 14, 2011

Dear «First» «Last»:

This is the final reminder regarding the WMA web survey. If you would like to have your opinions included in this study, please submit your responses by **Monday, April 18 at 5:00 PM** at which time the survey will be closed.

The questionnaire can be accessed at <https://www.web2.cnre.vt.edu/ncontent/DGIF/> using **your unique password («PIN\_number»)** and will take about 15-20 minutes to complete. The questions in this survey have been designed to examine the wide range of values and opinions held by the diverse group of recreational users that utilize WMAs. Several of these questions have been used in other studies to better understand the values people hold toward animals.

This survey is voluntary and there is no more than minimal risk associated with your participation. When you complete the questionnaire, your name will be deleted from the email list and will never be connected to your answers, thus you will remain anonymous and your responses will be confidential.

If you have questions regarding this questionnaire or study, please feel free to contact Amy Carrozzino at (540) 231-0961 or [acarroz@vt.edu](mailto:acarroz@vt.edu).

Thank you very much for completing the questionnaire. Your input is very important.

Sincerely,

Amy L. Carrozzino  
Research Associate

Steve L. McMullin  
Associate Professor

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**Appendix F. Approval letters from the Virginia Tech  
Internal Review Board (IRB)**



**Office of Research Compliance**  
Carmen T. Green, IRB Administrator  
2000 Kraft Drive, Suite 2000 (0497)  
Blacksburg, Virginia 24061  
540/231-4358 Fax 540/231-0959  
e-mail [ctgreen@vt.edu](mailto:ctgreen@vt.edu)  
[www.irb.vt.edu](http://www.irb.vt.edu)  
FWA00000572 (expires 1/20/2010)  
IRB # is IRB00000687

DATE: August 28, 2009

MEMORANDUM

TO: Amy Carrozzino  
Steve L. McMullin  
James A. Parkhurst

FROM: Carmen Green 

SUBJECT: **IRB Exempt Approval:** "Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas", IRB # 09-600

I have reviewed your request to the IRB for exemption for the above referenced project. The research falls within the exempt status. Approval is granted effective as of August 28, 2009.

As an investigator of human subjects, your responsibilities include the following:

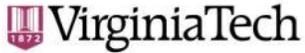
1. Report promptly proposed changes in the research protocol. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

cc: File

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**Office of Research Compliance**  
Institutional Review Board  
2000 Kraft Drive, Suite 2000 (0497)  
Blacksburg, Virginia 24061  
540/231-4991 Fax 540/231-0959  
e-mail moored@vt.edu  
www.irb.vt.edu  
FWA00000572( expires 1/20/2010)  
IRB # is IRB00000667

DATE: October 13, 2009

MEMORANDUM

TO: Amy Carrozzino  
Steve L. McMullin  
James A. Parkhurst

FROM: Carmen Green 

SUBJECT: **IRB Amendment 1 Approval:** "Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas", IRB # 09-600

This memo is regarding the above referenced protocol which was previously granted approval by the IRB on August 28, 2009. You subsequently requested permission to amend your IRB application. Approval has been granted for the requested protocol amendment, effective as of October 13, 2009.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in the research proposal. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

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**MEMORANDUM**

**DATE:** September 14, 2010

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective September 14, 2010, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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**MEMORANDUM**

**DATE:** October 8, 2010

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective October 8, 2010, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File



**MEMORANDUM**

**DATE:** February 10, 2011

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective February 10, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File



**MEMORANDUM**

**DATE:** February 21, 2011

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective February 21, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File



**MEMORANDUM**

**DATE:** February 25, 2011

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective February 24, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File



**MEMORANDUM**

**DATE:** March 3, 2011

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective March 3, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2010**

Protocol Expiration Date: **9/13/2011**

Continuing Review Due Date\*: **8/30/2011**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

*Invent the Future*

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File



**MEMORANDUM**

**DATE:** August 24, 2011

**TO:** Amy Carrozzino, Steve L. McMullin, James A. Parkhurst

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

**PROTOCOL TITLE:** Development of a Land-Use Management Plan for Virginia's Wildlife Management Areas

**IRB NUMBER:** 09-600

Effective September 14, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the continuation request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

**PROTOCOL INFORMATION:**

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**

Protocol Approval Date: **9/14/2011 (protocol's initial approval date: 9/14/2010)**

Protocol Expiration Date: **9/13/2012**

Continuing Review Due Date\*: **8/30/2012**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Date*	OSP Number	Sponsor	Grant Comparison Conducted?

\*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office ([irbadmin@vt.edu](mailto:irbadmin@vt.edu)) immediately.

cc: File