

Wildlife Management Area Study: Final Report

October 2011

Acknowledgments

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Executive Summary

The Commonwealth of Virginia owns a statewide system of 39 Wildlife Management Areas (WMAs) comprising more than 203,000 acres located in all geophysical regions. These lands are held in trust by the Virginia Department of Game and Inland Fisheries (DGIF) and managed to conserve and enhance habitats for Virginia's native wildlife species. Where feasible and compatible with habitat conservation goals, public access is provided and many citizens of the Commonwealth view WMAs as places to experience wildlife habitats at their very best. Anecdotal observations suggest that visitation has increased and diversified over the past few decades, but dependable information on users is not available. Accordingly, the Department initiated a study of WMA users and their opinions related to management practices in 2009, and finished it in October 2011.

As Virginia's social, demographic, and economic environments have changed, the public's interest in WMAs also has changed. During recent decades, DGIF has received requests to provide an increasing number of more diverse public recreation opportunities on WMAs. Although some of these new desired uses appear to be compatible with habitat management goals, others may not. The historic and continuing goal of Virginia's WMA management program is to: *Maintain and enhance habitats that support game and nongame wildlife while providing opportunities to hunt, fish, trap, and view wildlife. Other uses of WMAs may be allowed, as long as they do not interfere with these goals and uses of WMAs.*

The public input process for developing the Goals and Principles for Virginia's Wildlife Management Areas included the following:

- more than 4,000 face-to-face personal interviews with visitors at 10 selected WMAs (September 2009-2010)
- four focus group meetings with representatives of key stakeholder groups (October 2010)
- a follow-up mail and internet survey with interview participants who agreed to participate (March-April 2011)
- five public workshops for people who utilize the WMAs (March 2011), and
- a 4-week open public solicitation for comments on a draft of the goals and principles for Virginia's WMAs (August-September 2011). The WMA technical committee met on September 29, 2011, to consider public comments and revise the WMA goals and principles.

We incorporated input gathered from all phases of the public input process into the development and revision of the WMA goals and principles, which were intended to guide land management activities on WMAs and provide broad guidance for the development of site-specific land management plans on individual WMAs. The goals and principles focus primarily on the habitat, wildlife population, and human use components of wildlife management. No attempt was made to craft detailed management goals and objectives, and strategies to attain them, as these will be identified in site-specific WMA management plans. Revisions made to the goals and principles based on public comments included adding a conditional statement as an introduction to each goal that clearly states the historic and continuing priorities for WMA management, improving the clarity and understanding of terminology used in the document (e.g., social acceptance, wildlife-based recreation) by providing specific definitions or more detailed descriptions, establishing as a priority the important role of active habitat management practices on WMAs, and making more explicit the importance of hunting, fishing, and trapping as integral parts of WMA management and recognizing these uses as a priority on WMAs.

The goals and principles for Virginia's WMAs include:

- Habitat goal: *maintain, create, or enhance a variety of high quality habitats, suited to the site, that support healthy and diverse populations of game and nongame wildlife at optimum levels.*
 - Habitat principles recognize the necessity for implementing active land management strategies and practices.
- Wildlife population goal: *establish and manage populations of game and nongame wildlife compatible with maintaining habitat integrity, providing recreational opportunity, and serving the needs of the citizens of Virginia.*
 - Wildlife population principles include ensuring the sustainability of both game and nongame wildlife using hunting, trapping, and fishing as primary means of achieving wildlife population objectives.
- Recreation goal: *provide opportunities for wildlife-based recreation (hunting, fishing, trapping, wildlife viewing) and boating consistent with maintaining and enhancing wildlife habitat and populations.*
 - Recreation principles include prioritizing and continuing the historic emphasis given to wildlife-based recreation, while allowing other forms of recreation as long as they do not interfere with wildlife-based recreation activities.

Land Management Goals and Principles for Virginia's Wildlife Management Areas

Introduction

The Virginia Department of Game and Inland Fisheries (DGIF) maintains a statewide system of wildlife management areas (WMAs) and an associated management program. The historic and continuing goal of Virginia's WMA management program is to:

Maintain and enhance habitats that support game and nongame wildlife while providing opportunities to hunt, fish, trap, and view wildlife. Other uses of WMAs may be allowed, as long as they do not interfere with these goals and uses of WMAs.

The purpose of this effort was to incorporate public input into developing statewide goals and principles for management of WMAs in Virginia. This document contains goals and principles that will guide land management activities on WMAs and provide broad guidance for the development of site-specific land management plans on individual WMAs. Detailed management goals and objectives, and strategies to attain them, will be identified in site-specific WMA management plans.

At the time of this writing, DGIF manages 39 WMAs, comprising over 200,000 acres distributed throughout Virginia. Many citizens of the Commonwealth view WMAs as places to experience wildlife habitats at their very best. Practices used to achieve management goals are supported through funds generated primarily from hunting, fishing, and trapping license sales and Federal grant programs, especially those administered by the U. S. Fish and Wildlife Service (USFWS). Most of Virginia's WMAs were purchased, in part, with funds from the USFWS' Wildlife and Sportfish Restoration Program. These grant programs require DGIF to define the purpose (e.g., habitat conservation, hunting access, fishing access) for which the property is to be purchased, which then establishes that stated management intent in perpetuity or until such time that the original purpose is achieved.

DGIF acquired its first WMA in the 1930s. Since then, significant changes have occurred in Virginia. For example, Virginia's human population has almost tripled since 1940, and population centers have shifted from rural communities to growing urban metropolitan areas along interstate highways and the coast. As lifestyles have changed, Virginians' participation in wildlife-based recreation (i.e., hunting, fishing, trapping, and wildlife viewing) also has changed. In 1991, according to the USFWS,

approximately 1 million Virginians, age 16 or older (22%), either hunted or fished. By 2006, that number of participants had declined to 857,000 (15%). Similarly, in 1991, approximately 2 million Virginians, age 16 or older (44%), participated in some form of wildlife viewing (including wildlife photography). By 2006, only 36% of Virginians participated in this type of wildlife recreation within the Commonwealth.

As indicated in Virginia's Wildlife Action Plan, the loss or degradation of habitats constitutes the most serious threat to sustaining viable populations of Virginia's native wildlife. As Virginia's social, demographic, and economic environments have changed, the public's interest in WMAs also has changed. During recent decades, DGIF has received requests to provide an increasing number of more diverse public recreation opportunities on WMAs. Although some of these new desired uses appear to be compatible with habitat management goals, others may not. Again, the goal for Virginia's WMAs is to maintain and enhance wildlife habitat while providing opportunities to hunt, fish, trap, and view wildlife. Other uses of WMAs may be allowed, as long as they do not interfere with these goals and uses of WMAs.

The public input process for developing WMA goals and policies occurred during 2009-2011 and included more than 4,000 face-to-face personal interviews with visitors at 10 selected WMAs, a follow-up mail and internet survey with interview participants who agreed to participate, four focus group meetings with representatives of key stakeholder groups, five public workshops for people who utilize the WMAs, and public comments on a draft of this document received through letters and a link on the DGIF webpage. Input gathered in all phases of the public input process has been incorporated into the development of the WMA goals and principles.

Mission

The wildlife populations that Virginians enjoy exist, in part, because of the protection and management provided by DGIF on behalf of the citizens of the Commonwealth. As such, it is DGIF's responsibility to demonstrate good stewardship and application of science-based habitat management techniques (e.g., timber harvests, prescribed fire, agricultural techniques) on its lands that maintain and enhance habitats and produce optimum populations of native wildlife. All WMAs are managed in accordance with DGIF's mission statement, which is:

- To manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;

- To provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation and to work diligently to safeguard the rights of the people to hunt, fish and harvest game as provided for in the Constitution of Virginia;
- To promote safety for persons and property in connection with boating, hunting and fishing;
- To provide educational outreach programs and materials that foster an awareness of and appreciation for Virginia's fish and wildlife resources, their habitats, and hunting, fishing, and boating opportunities.

To this end, DGIF researchers, land managers, and biologists have coordinated their efforts to apply the best science-based habitat management practices to Virginia's WMAs while also managing for publicly accessible wildlife-based recreation. Land managers plan their efforts to assure consistency in application of habitat enhancement practices and compliance with laws and policies. DGIF staff currently employs a wide array of generally accepted, science-based habitat management practices designed to maintain, create, and enhance the quality of a diversity of upland and wetland habitats.

Goals for WMA management

This document contains goals and principles that will guide land management activities on WMAs and provide **broad** guidance for the development of site-specific land management plans on individual WMAs. This document does not provide detailed management goals and objectives, and strategies to attain them, which will be identified in site-specific WMA management plans. The following management goals for Virginia's WMAs are designed to reflect the habitat, wildlife population, and human use components of wildlife management. For the purpose of this document, the term "wildlife" includes birds, mammals, reptiles, amphibians, fish, and insects. Each goal is followed by a series of principles that reflect DGIF's position or directive for addressing that goal.

Goal: Manage to maintain, create, or enhance a variety of high quality habitats, suited to the site, that support healthy and diverse populations of game and nongame wildlife at optimum levels.

Principles:

Consistent with site-specific objectives for wildlife populations, habitats, user safety, the purpose for which each WMA was acquired, and subject to budgetary and personnel constraints, the Department will:

- Use science-based management techniques to create, enhance, or maintain wildlife habitat.
- Create, enhance, or maintain habitats to promote game and nongame wildlife.
- Conserve and manage diverse and unique habitats and features (e.g., caves, sinkholes, wetlands) for the benefit of wildlife species.
- Use native, naturalized, or non-invasive agricultural plant species to achieve habitat management goals on WMAs.
- Restore native vegetative species, habitats, and ecosystems.
- Mitigate the effects of exotic/invasive species on native species and habitats.
- Consider the goals of relevant national, regional, state, and local wildlife conservation plans and initiatives in the management of habitat on WMAs.
- Consider the role habitats on WMAs play in the surrounding landscape in the management of habitat on WMAs.
- Use WMAs as scientific research sites to study habitat, recognizing that such efforts may result in periodic or temporary restrictions of other normal uses.
- Utilize WMAs as educational resources to further public knowledge and understanding of science-based habitat management practices.

Goal: Establish and manage populations of game and nongame wildlife compatible with maintaining habitat integrity, providing recreational opportunity, and serving the needs of the citizens of Virginia.

Principles:

Consistent with site-specific objectives for wildlife populations, habitats, user safety, the purpose for which each WMA was acquired, and subject to budgetary and personnel constraints, the Department will:

- Promulgate, adopt, and enforce regulations that ensure the sustainability of wildlife and habitats.
- Utilize recreational hunting, trapping, and fishing as primary means of achieving wildlife population objectives.
- Conserve, restore, and, where necessary, propagate species identified in the Wildlife Action Plan as “species of greatest conservation need.”

- Reduce populations of exotic/invasive species or wildlife that cause damage to habitats or other populations.
- Consider the goals of relevant national, regional, state, and local wildlife conservation plans and initiatives in the management of wildlife populations on WMAs.
- Implement appropriate actions to reduce risk when confronted with wildlife health or human-wildlife disease threat.
- Consider the effects of wildlife populations on WMAs in the surrounding landscape.
- Use WMAs as scientific research sites to study wildlife populations, recognizing that such efforts may result in periodic or temporary restrictions of other normal uses.
- Utilize WMAs as educational resources to further public knowledge and understanding of wildlife populations.

Goal: Provide opportunities for wildlife-based recreation (hunting, fishing, trapping, wildlife viewing) and boating consistent with maintaining and enhancing wildlife habitat and populations.

Principles:

Consistent with site-specific objectives for wildlife populations, habitats, user safety, the purpose for which each WMA was acquired, and subject to budgetary and personnel constraints, the Department will:

- Consider recreational uses that are not wildlife-based or related to boating to be secondary, but may allow them if deemed compatible with wildlife-based or boating recreational uses of WMAs.
- Promote awareness of WMA hunting, trapping, and fishing seasons and regulations among all users.
- Develop infrastructure and facilities related to recreational use of WMAs as secondary to and consistent with the primary goals of maintaining and enhancing wildlife habitats and populations.
- Construct and maintain infrastructure or facilities related to recreational use of WMAs with the safety of users in mind and be consistent with the primary goals of maintaining and enhancing wildlife habitats and populations and the purpose for which each WMA was acquired.
- Provide access to WMAs for the purposes of wildlife-based recreation.

- Provide opportunities for disabled persons to participate in wildlife-based recreation and boating on WMAs.*
- Require prior approval by the Department for any organized group activity involving 12 or more simultaneous users of a WMA and use must be compatible with the primary goals of maintaining and enhancing wildlife habitats and populations.
- Consider the effects of recreational use of WMAs on neighboring landowners.
- Promote wildlife-based education regarding the primary goals of WMAs to increase awareness of why the areas exist and why they differ from other public lands.

*Virginia's Wildlife Management Areas received Federal financial assistance in Sport Fish and/or Wildlife Restoration. Under Title VI of the 1964 Civil Rights Act, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, the U.S. Department of the Interior prohibits discrimination on the basis of race, color, national origin, age, sex, or disability. If you believe that you have been discriminated against in any program, activity or facility as described above, or if you desire further information, please write to the Office for Human Resources, U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Room 300, Arlington, VA 22203.

Appendix A:

**A survey of Wildlife
Management Area users**

September 2009- September 2010

Executive summary

Number of contacts made at all 10 WMAs: 4,354 (includes repeated contacts, declined interviews)

Number of surveys completed at all 10 WMAs: 3,819 (88% response rate)

Number of returned business reply postcards: 329 (over 1,000 distributed)

Do you have a valid hunting or fishing license in VA? 84% Yes, 16% No

What activities were you participating in (only top 4 activities listed here)? 54% Hunting, 22% Fishing, 13% Shooting range use, 13% Hiking

If hunting, what was target species (only top 4 species listed here)? 58% Deer, 19% Dove, 8.5% Turkey, 7% Squirrel

If hunting, did you harvest anything? 19% Yes, 81% No

Satisfaction rating for this visit: 82% Satisfied, 9% Neutral, 9% Dissatisfied

Gender: 94% Male, 6% Female

Land management practices

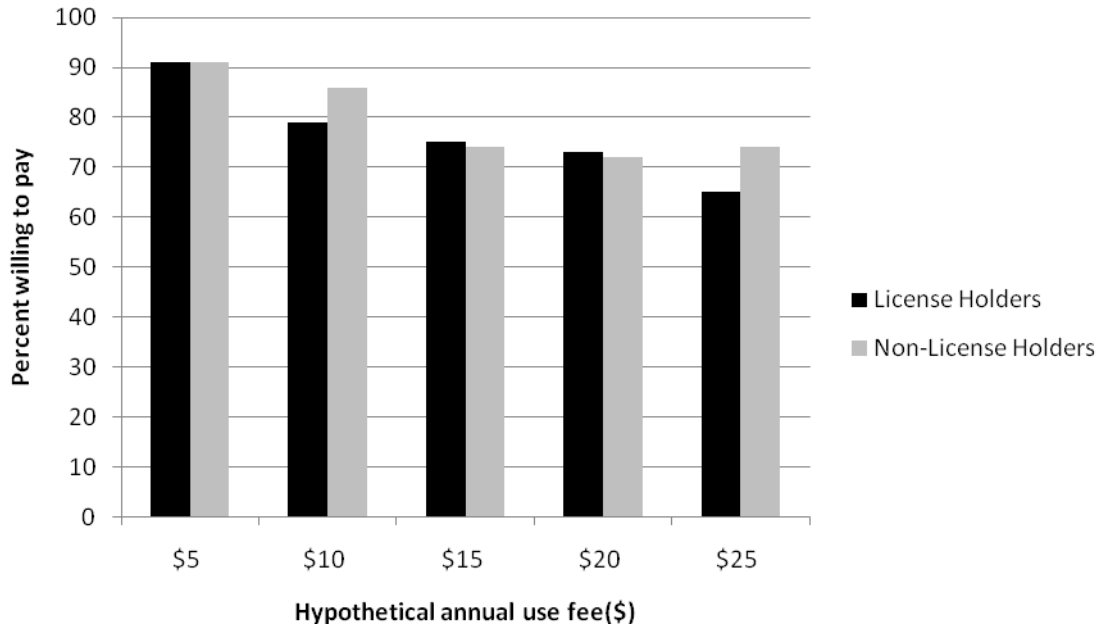
Practice (as described on the survey)	Rated 1-3 (oppose practice)	Rated 4 (neutral)	Rated 5-7 (support practice)
Logging some areas to create openings of promote growth of desired species of vegetation	14%	13%	73%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	11%	13%	76%
Use of herbicides to manage vegetation	46%	20%	34%
Mechanical techniques to manage vegetation, such as mowing or mulching	5%	8%	87%
Planting crops for wildlife food and habitat	4%	4%	92%

Who should have to pay to use WMAs?

Fee Options	Percent selecting option
All users of Virginia's WMAs, including hunting or fishing license holders, should pay an annual fee to use the areas.	17
Only those who do not hold a valid Virginia hunting or fishing license should have to pay a fee to use WMAs.	32
Virginia's WMAs should remain available to anyone who wants to use them at no cost.	51

If you had to pay a given amount for an annual permit (between \$5-25), would you still have used the WMA today?

	Yes	No
License holders	76%	24%
Non-license holders	79%	21%



Introduction

Most state wildlife agencies own and manage wildlife management areas (WMAs) primarily to maintain and enhance wildlife habitat and provide public hunting and fishing opportunities. These lands provide opportunity for both traditional wildlife recreation as well as other forms of outdoor recreation (e.g., hiking, horseback riding), provided recreational uses do not conflict with the main goal of managing wildlife habitat. Participation in these forms of non-consumptive outdoor recreational use is perceived to be increasing in recent years. Although declining participation in traditional wildlife recreation is well documented, little information exists regarding non-consumptive stakeholders who recreate on public hunting and fishing lands. Hunters and anglers already support the management and upkeep of WMAs through license fees and excise taxes on hunting and fishing equipment, but other user groups may not contribute to the operational costs of WMAs.

The main purpose of the WMA field survey and sight in range survey was to determine the type and frequency of recreational use on WMAs in Virginia, the satisfaction of visitors to the WMAs, and opinions of WMA users about land management and possible options for an annual WMA use fee. This information will provide an updated snapshot of WMA use for VDGIF managers, particularly for non-consumptive activities occurring on WMAs that may not be recognized.

Methods

We conducted surveys on 10 WMAs (2 per former DGIF administrative region): Amelia, Big Survey, Cavalier, Chickahominy, Clinch Mountain, Dick Cross, Goshen, Little North Mountain, Phelps, and Thompson. We surveyed users from September 5, 2009 through September 3, 2010. Virginia Tech staff, VDGIF staff, VT student volunteers, and CWF volunteers conducted brief 3-5 minute interviews with WMA visitors, usually as they were leaving the WMA.

Information collected during an interview included: a listing of the recreational activities that individual participated in on the day of the interview, their frequency of visitation,

satisfaction with the day's visit, opinions about land management practices, opinions about possible fee structures and their willingness to pay, and some general demographic information (e.g., gender, age, zip code, size of party; Appendix A). Business reply postcards were used as a means to reach visitors who were believed to be recreating on the area, but could not be contacted by the surveyor. During her/his shift, a roving interviewer would leave a business-reply postcard under windshield wipers of vehicles parked on the WMAs; the visitor then could answer the questions provided on the card and mail it back to Virginia Tech. Postcards included abbreviated questions about the visitors' activity and satisfaction with their visit on the date of contact.

Interview protocol satisfied the Virginia Tech Internal Review Board requirements for research involving human subjects (IRB approval #09-600). As a result, we were not able to interview individuals under the age of 18 because of parental consent requirements. If an individual had already completed a questionnaire on an earlier visit to the WMA, this was noted and they were asked to answer a few short questions about the current visit. Repeat participants were asked about their activity, arrival time, satisfaction, and demographics; these interviews took less than one minute.

Each WMA or designated subsection of a WMA was surveyed on at least 24 randomly selected days (15 weekend days and 9 weekdays) over the 12-month survey period. On large WMAs and/or those with multiple access points, the WMA was segregated into separate subsections that a surveyor could cover reasonably in a day. Each subsection was surveyed on at least 24 randomly selected days, except for a few instances when winter weather prevented access to the area. Sampling days were selected at random, but were constrained to be equally distributed between Saturdays, Sundays, and weekdays, and in each of three seasons. Three sampling seasons arbitrarily were established based on hunting seasons and the calendar; they were defined as fall (September 5-January 2), winter/spring (January 3-May 31), and summer (June 1-September 3). Holidays (e.g., Labor Day, Thanksgiving Day) were treated as Saturdays since use was expected to be significantly higher than an average weekday and comparable to Saturday use.

In addition to the 24 general survey days, interviews were conducted separately on special target days, such as hunting and fishing season openers, when the volume of use was predicted to be higher than an average recreation day. These special target days included Sept. 5, 2009: opening day of dove season; Oct. 3, 2009: opening day of archery hunting; Oct. 31, 2009: opening day of muzzleloader hunting; Nov. 14, 2009: opening day of general firearms deer hunting; Apr. 3, 2010: opening day of fee fishing area; Apr. 10, 2010: opening day for spring gobbler hunting; and May 2, 2010: peak date for wildflower viewers. Some opening days were restricted to a single WMA (e.g., Thompson WMA wildflower viewing and Clinch Mountain WMA fishing), whereas all other opening days were observed on all WMAs.

We expanded information gained from surveys to develop estimates for recreational use at each of the 10 WMAs. We used party size and activities of those we interviewed to estimate the number of annual recreation days for each of the 10 WMAs. We also used recreational activities of those we interviewed to expand estimates of use for each of the frequently reported activities (e.g., hunting, fishing, hiking). Because many interviewees participated in more than one activity (e.g., camping and hunting, fishing and boating), some of the estimates for individual activities are inflated due to double-counting the individual under multiple activities. Also, estimates for large areas with multiple access points (e.g., Little North Mountain) are likely very conservative since it was difficult for interviewers to intercept users on site. On these areas with few completed interviews, estimates of recreational use are likely not as reliable.

We developed a separate range survey for use with visitors to the 4 shooting ranges at Amelia, Chickahominy, Clinch Mountain, and Phelps WMAs. Range surveys were conducted on a separate sampling schedule from regular WMA surveys, and were primarily conducted by CWF volunteers and DGIF staff. We surveyed at each range for a total of 12 days (6 weekend days, 6 weekdays) from September 1, 2009 through March 31, 2010. Because of road closures due to inclement winter weather, Clinch Mountain range was only surveyed for 6 days in the fall sampling period.

Completed range surveys were also used to develop estimates of annual use, which was incorporated into the overall recreational use estimates. Because of a less controlled survey

environment at the range, recreational use is likely overestimated. Some individuals from the same party filled out questionnaires during their visit, resulting in double counting of a given party. A summary of results from the range questionnaire is presented in Appendix C.

Results

We contacted 4,683 WMA users over the course of the field study. Of those contacts, 3,819 usable surveys were completed (88% response rate) at the 10 WMAs sampled. Chickahominy had the highest number of completed surveys (n=742), followed by Clinch Mountain (n=697) and Amelia (n=652) (Table 1). Relatively few surveys were completed at Big Survey and Little North Mountain WMAs. Three hundred twenty-nine business reply postcards were returned out of at least 1,000 that were distributed, yielding a response rate of 33% or less. Little North Mountain WMA had at least 12 access points; therefore, contacting visitors was more difficult; more postcards were returned from Little North Mountain than face-to-face surveys conducted. Individual WMA profiles can be found in Appendix B.

Table 1. Number of completed surveys (and returned postcards) during WMA field interview effort.

WMA									
Amelia	Big Survey	Cavalier	Chickahominy	Clinch Mtn.	Dick Cross	Goshen	Little North Mtn.	Phelps	Thompson
652	77 (6)	238	742 (32)	697	133	269 (34)	102 (112)	511 (57)	312 (85)

Demographics

The majority of respondents were middle-aged males (Figures 3 and 4). Over 25% of the respondents were between 40 and 49 years of age, constituting the largest proportion of WMA users. Any individual under 18 years of age could not be interviewed under Virginia Tech IRB

protocol, and was released following initial contact. The average group size at all 10 WMAs was around 2 individuals.

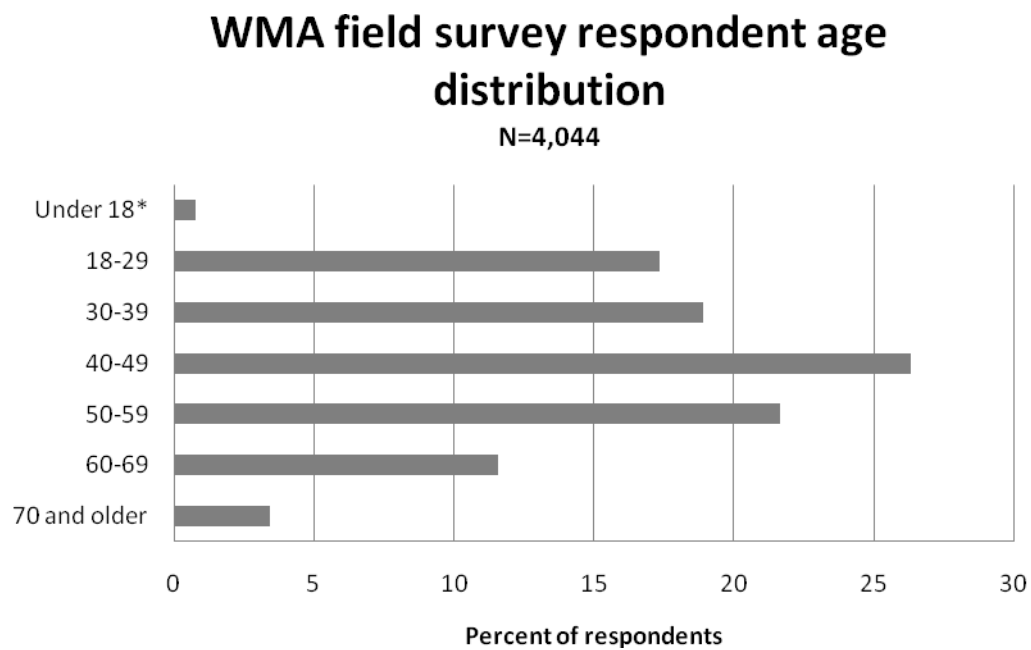


Figure 3. Age distribution of WMA field survey respondents. Minors under age 18* were not interviewed as per Virginia Tech IRB protocol.

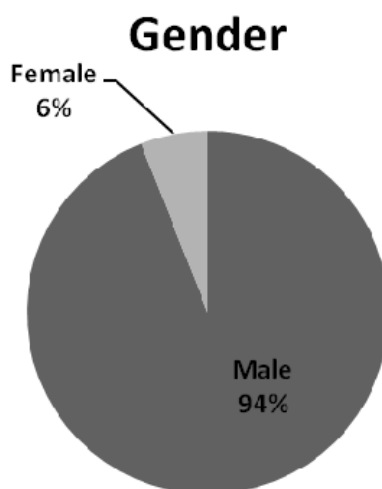


Figure 4. Gender proportions of WMA survey field participants.

Only a small proportion (3%) of participants required facilities for disabled users to utilize the WMA, and likewise, a small proportion (3%) utilized such facilities on the day they were interviewed (Figure 5). Facilities for disabled users may range from a reservation to use the Hogue Tract on the Phelps WMA (an area developed specifically for use by disabled individuals), to using the accessible fishing pier at Amelia Lake. Some respondents may be unaware of the availability of facilities for disabled users or believe that such facilities are lacking (e.g., a disabled hunter does not know about the Hogue tract). In other cases, the facilities themselves may be underused and some additional outreach may be necessary so that disabled users are aware of facilities available for their use.

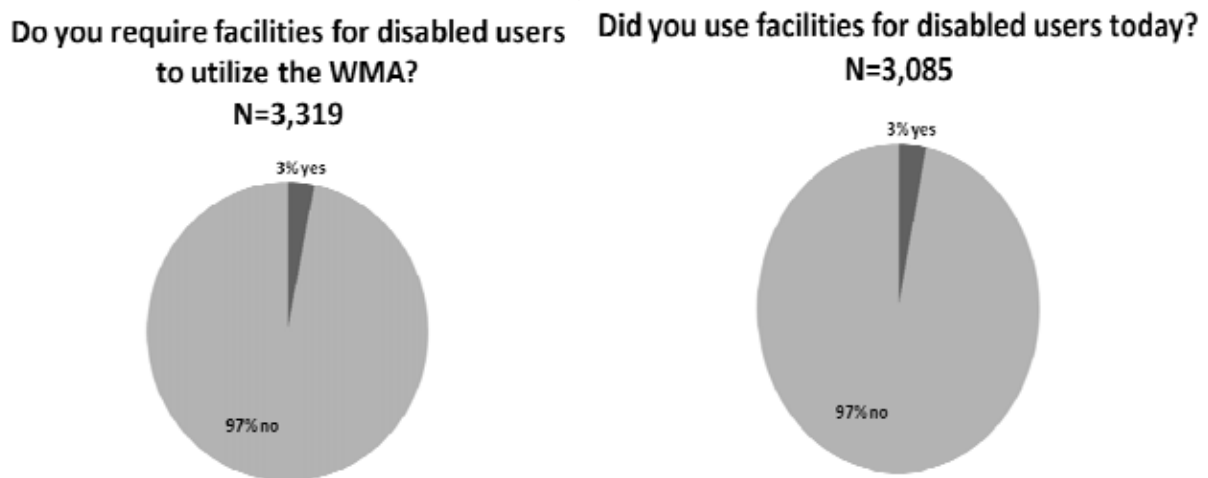


Figure 5. Participant responses regarding need for and use of facilities for disabled users on WMAs.

The majority of participants (84%) held a valid Virginia hunting and/or fishing license at the time of the interview (Figure 6). This proportion varied by WMA, from only 56% of respondents at Thompson WMA in Northern Virginia to 95% of respondents at Cavalier in the southeast and Little North Mountain in the west (Table 2). The proportions of user types also varied by WMA based on season and recreational opportunities available. For example,

compared to other WMAs included in the study, relatively large proportions of flower enthusiasts visited Thompson WMA in the spring, swimmers and kayakers used the Swinging Bridge access at Goshen WMA in the summer, and hikers visited Big Survey WMA year-round.

Do you have a hunting and/or fishing license?

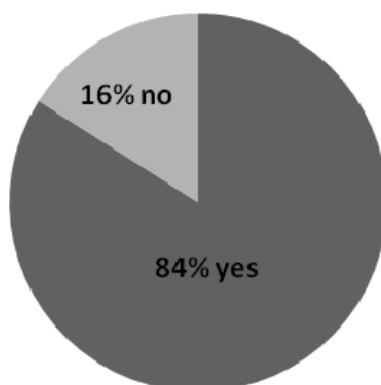


Figure 6. Proportion of survey respondents with a Virginia hunting and/or fishing license.

Table 2. Percent of WMA field interview respondents with a hunting and/or fishing license.

WMA									
Amelia	Big Survey	Cavalier	Chickahominy	Clinch Mtn.	Dick Cross	Goshen	Little North Mtn.	Phelps	Thompson
83	73	95	84	92	93	76	95	89	56

Many individuals interviewed reported participating in more than one activity during their visit. Of the respondents participating in at least one non-consumptive activity, 62% reported also holding a hunting and/or fishing license.

Recreational participation

Hunting was the most frequently reported activity during open seasons, with 54% of survey respondents (N=2,062) reporting hunting participation during their visit. Fishing (22%), using the sight-in range (13%), and hiking or walking for purposes other than hunting, fishing, and wildlife watching (13%) also were frequently reported activities among the WMAs sampled. Other activities including camping, wildlife watching, boating, and horseback riding were fairly common. Some activities occurred on all 10 WMAs surveyed (e.g., hunting) whereas other uses (e.g., wildflower watching) were concentrated at a few or a single WMA where the recreational opportunities existed. Activity participation varied by WMA based on resources available, availability of other public lands in the region, seasonality, and proximity to larger population bases. In general, WMAs in northern Virginia and the Richmond area (e.g., Chickahominy, Phelps) received heavy use during hunting seasons. Other WMAs, such as Clinch Mountain and Thompson, received moderate to heavy use through the spring and summer months because of the availability of fishing and wildflower viewing opportunities.

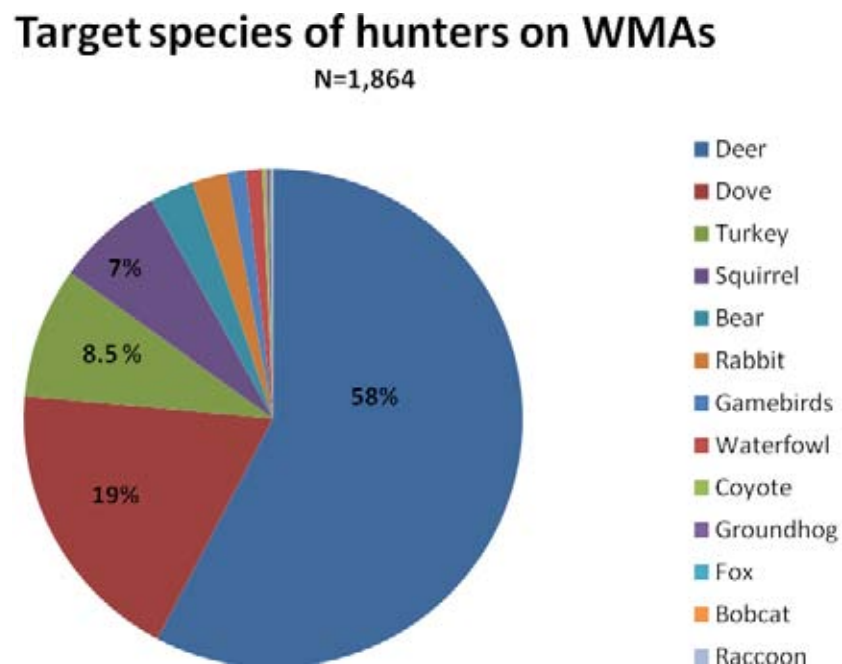


Figure 7. Game species targeted by hunters interviewed on WMAs in 2009 and 2010.

Hunters most frequently pursued deer (58% of hunting), followed by dove (19%), turkey (8%), and squirrel (7%; Figure 7). Species hunted varied by region and by WMA, and some respondents pursued multiple species during the legal season. Although hunting method varied by species and season, the dominant method was shotgun (46% of hunters), followed by rifle (22%), archery (16%), and muzzleloader (14%; Figure 8). Nineteen percent of all hunters interviewed reported that they harvested wildlife on that particular day on the WMA.

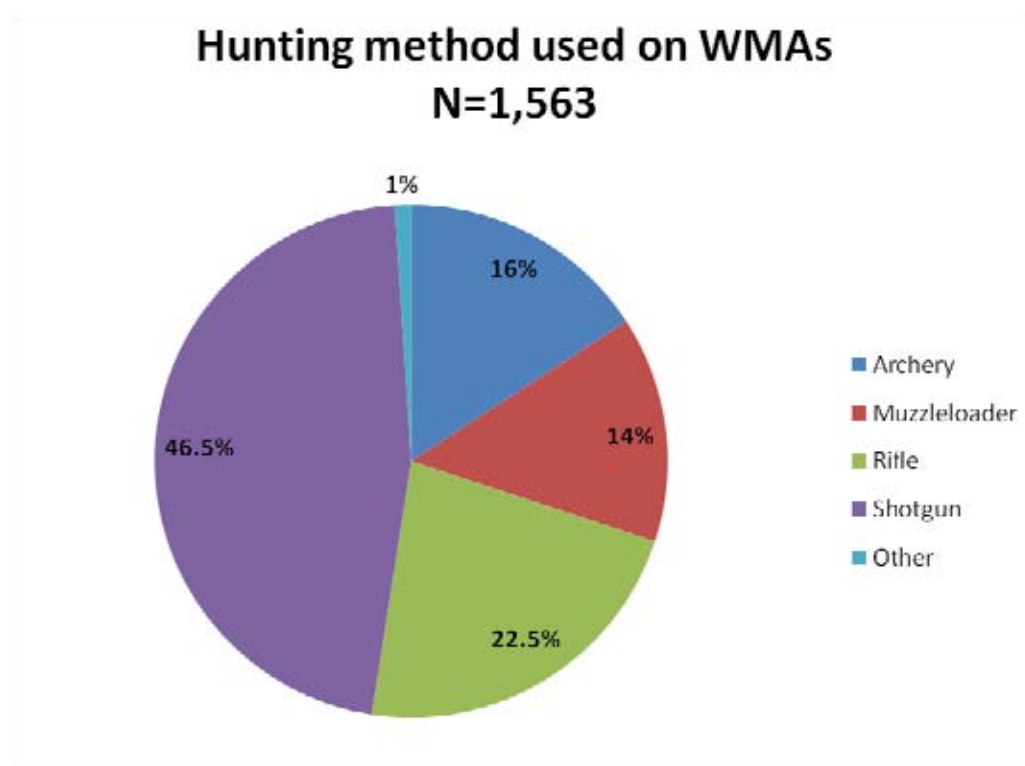


Figure 8. Method used by hunters interviewed on WMAs in 2009 and 2010.

We also asked visitors about how frequently they visit the WMA where the interview occurred and if they visited other WMAs in Virginia. About half of visitors reported that they visit the WMA most frequently in the fall while other responses were split between winter, spring, and summer (Figure 9). Respondents were able to give multiple responses for seasonal use, and some participants reported that they use the WMA consistently throughout all four seasons. When asked how often the participant visited the WMA where the interview was conducted, approximately 27% of respondents reported they had never visited or visited only

once in the last 12 months (Figure 10). The majority (32%) visited from 2-5 times in the past 12 months. Fifteen percent of respondents visited from 6-10 times, and 25% visited more than 10 times in the past 12 months. Over 70% of visitors at all 10 WMAs reported that they visited more than once during the 2009-2010 sampling season.

In what season did you visit the WMA most frequently?

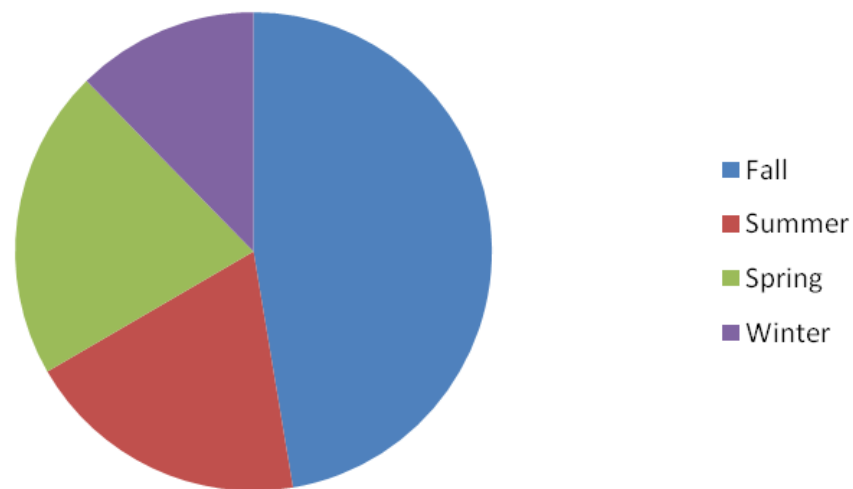


Figure 9. Seasonal use reported by WMA visitors in 2009 and 2010. Some respondents visited most frequently during more than one season.

**How many times have you visited this
WMA in the past year?
N=3,427**

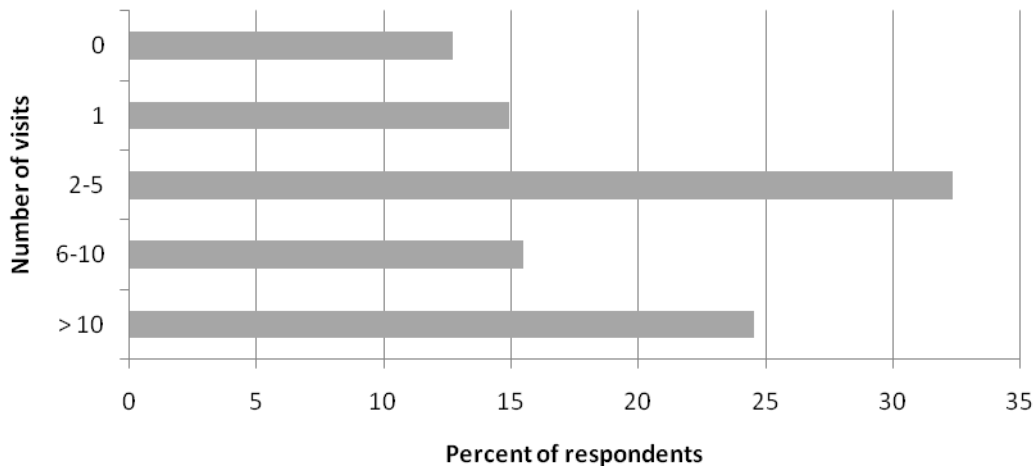


Figure 10. Frequency of visits to the WMA where the interview was conducted over the past 12 months.

One-third of respondents reported that they had visited another WMA during the past 12 months. Of those that had visited another WMA, 64% had visited only one other location (Figure 11). Twenty-two percent of respondents had visited 2 other WMAs. Approximately 9% of respondents reported that they had visited 5 or more WMAs over the last year.

If yes, how many other WMAs have you visited?

N=1,020

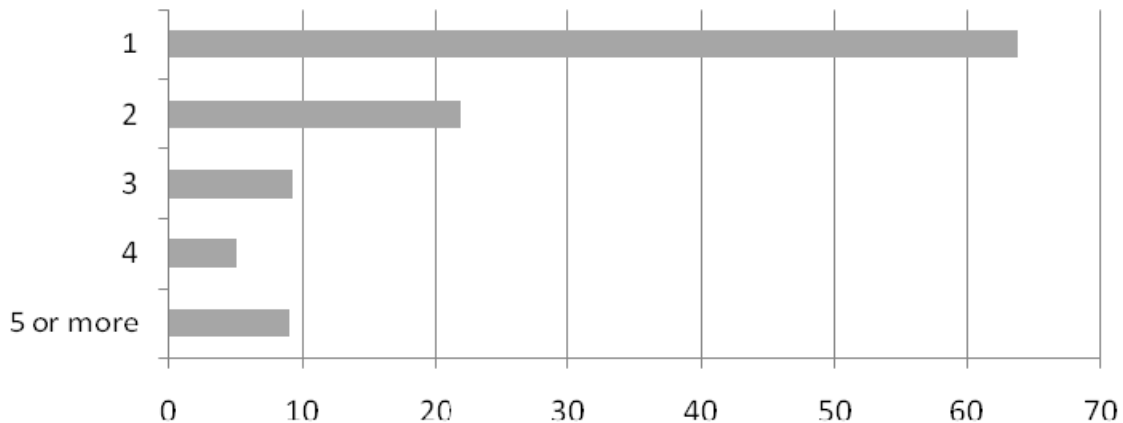


Figure 11. The number of other WMAs visited by interview participants in 2009 and 2010. Percentages shown represent the proportion of the 33% of participants that reported they had visited another WMA in the last 12 months.

While some individuals may travel around Virginia to multiple WMAs (e.g., those following the Wildlife and Birding Trail), many survey participants did not fully understand the difference between WMAs, National Forest, state parks, National Wildlife Refuges, and county parks and properties at the time of completing the interview. In many cases, participants considered these other types of public lands to be equivalent to WMAs and reported their use of these areas along with WMAs. While the trained regular interviewers were often able to help respondents properly make the distinction, some volunteers were unaware of the common mistake and did not catch erroneous responses. Therefore, some overestimates of the number of WMAs visited are likely included in these results. For example, one individual reported visiting 50 WMAs, which is more than the number that exists in Virginia currently.

Satisfaction

Respondents were asked to rate their satisfaction with their visit to the WMA on the day of the interview on a scale from 1 to 7, where 1=very dissatisfied and 7=very satisfied. Many factors may be involved in one's satisfaction rating, from the weather, to hunting or fishing success, to interactions with other users. Overall, most respondents (82%) reported that they were satisfied to very satisfied with their visit. Mean ratings ranged from 4.5 at Little North Mountain to 6.2 at Goshen (Figure 12). Although Little North Mountain and Goshen WMAs are adjacent to each other, they do attract different types of users; Little North Mountain is primarily used for hunting, whereas Goshen also provides access to the Maury River for fishing, kayaking, hiking and other non-consumptive activities. In addition to different user types, contacting users particularly was difficult at Little North Mountain due to the many dispersed access points; therefore, the majority of responses were received via business reply postcards rather than interviews. Respondents tended to be more brief and critical in postcard responses as compared to face-to-face interviews, and had no contact with an interviewer that could better explain the project and the purpose for the interview.

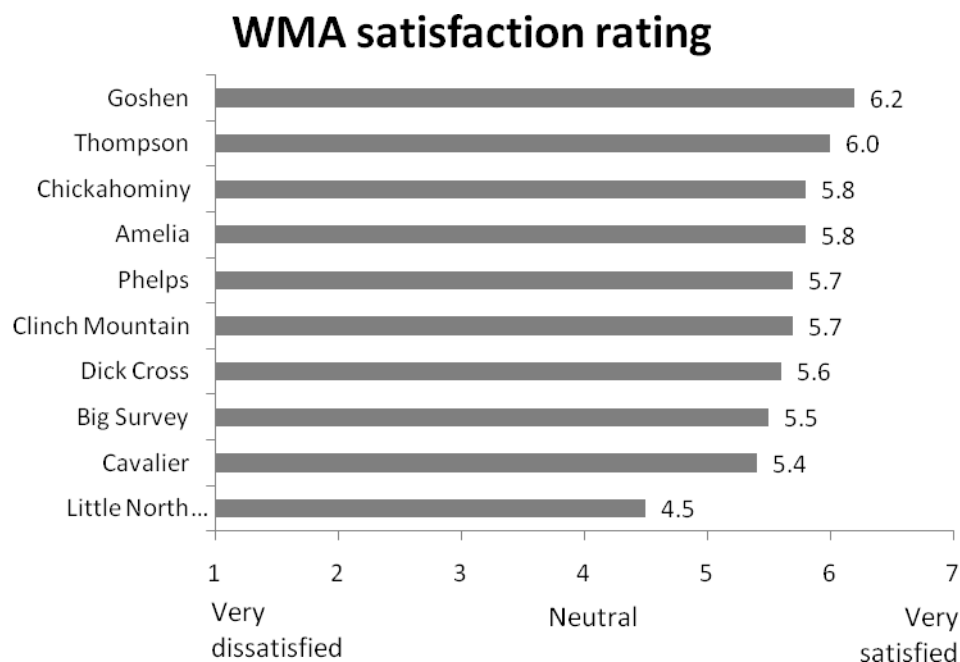


Figure 12. Respondents' mean satisfaction rating with their visit on 10 WMAs.

We conducted t-tests to identify any differences in reported mean satisfaction between postcard responses and interviews (Table 3). Overall, there was a significant difference in reported satisfaction between the two methods, although functionally this difference is relatively low (i.e., about 0.5 on a 1 to 7 scale). Those completing the face-to-face interview tended to rate their satisfaction slightly higher than those responding by postcard. A similar trend also was apparent at Little North Mountain; a significant difference was found again between postcard and interview satisfaction ratings, with those participating in an interview rating their visit slightly higher. Differences in satisfaction ratings between postcards and interviews were not significant at any of the other WMAs where postcards were used.

Table 3. T-test results comparing business reply postcard and face-to-face interview satisfaction ratings. An asterisk (*) indicates a statistically significant difference ($P < 0.05$).

	Method	Valid N	Mean satisfaction rating	Standard deviation	t value	p-value
Overall	Postcard	326	5.28	1.856	4.471	< 0.0001*
	Interview	3,733	5.76	1.531		
Little North Mtn.	Postcard	106	4.26	1.806	2.104	0.036*
	Interview	108	4.83	2.135		

If the respondent was dissatisfied with his/her visit (9%), the interviewer asked a follow up question requesting the reason or reasons for their dissatisfaction. Common reasons for dissatisfaction were: hunting or fishing trip was not successful, did not see any game, or the weather was poor. In rare occasions, visitors reported a conflict with another recreational user group or overcrowding on opening days of hunting seasons as reasons for dissatisfaction.

Satisfaction was then analyzed by hunting and fishing license holders and non-license holders participating in non-consumptive recreational activities. We also compressed the 7-point scale to reflect 3 general positions: satisfied (rated 5 or higher), neutral (rated 4), and dissatisfied (rated 3 or lower). The majority of both groups were satisfied with their visit (Table 4), with non-license holders (93%) significantly more satisfied than license holders (79%; Table

5). This trend is also apparent in mean satisfaction for each of the 10 WMAs sampled; for 9 of the 10 WMAs sampled, the mean satisfaction rating for non-license holders was slightly higher than license holders (Table 6). The exception was Cavalier WMA where license holders were generally more satisfied than non-license holders. However, a portion of Cavalier was closed following a flood event in the fall of 2009 and drive-in access was reduced through summer 2010. On average, non-consumptive visitors at Cavalier reported low satisfaction with the closure while many hunters were pleased that access had been reduced allowing a more private hunting experience.

Table 4. Satisfaction ratings for hunting and fishing license holders and non-license holders.

	Rated 1-3 (dissatisfied)	Rated 4 (neutral)	Rated 5-7 (satisfied)
License holders	10%	10%	79%
Non-license holders	4%	3%	93%

Table 5. Statistical comparison (independent t-test) of hunting and fishing license holder and non-license holder satisfaction.

Mean rating^a			
License holders (N=2,855)	Non-license holders (N=541)	Test statistic^b	p-value
5.61	6.29	-12.965	< 0.0001

^aMean rating on a 7-point Likert scale where 1=very dissatisfied with the visit and 7=very satisfied with the visit.

^b Assuming unequal variances

Table 6. WMA recreational users' mean satisfaction rating from 1 to 7 where 1=very dissatisfied and 7=very satisfied for license holders (n=3,396) and non-license holders (n=643) in 2009 and 2010. Significant differences (p-value < 0.05) in mean satisfaction between license holders and non-license holders at individual WMAs are indicated (*).

	WMA										
	Amelia	Big Survey	Cavalier	Chickahominy	Clinch Mtn.	Dick Cross	Goshen	Little North Mtn.	Phelps	Thompson	Overall
License holders	5.77*	5.33	5.45	5.72*	5.58*	5.59	6.05*	4.47*	5.63*	5.75*	5.61*
Non-license holders	6.22*	5.95	4.45	6.16*	6.69*	5.89	6.47*	6.33*	6.37*	6.38*	6.29*

The level of satisfaction did not differ among frequency of visits, from those visiting for the first time to those that visit over 10 times per year; approximately 10% were dissatisfied, 10% were neutral toward the visit, and 80% of visitors were satisfied (Figure 13). The majority of each of the user groups was satisfied with their visit, with hunters and anglers less satisfied than other groups (Table 7). All horseback riders interviewed, and nearly all hikers and range users, reported that they were satisfied with their visit to the WMA.

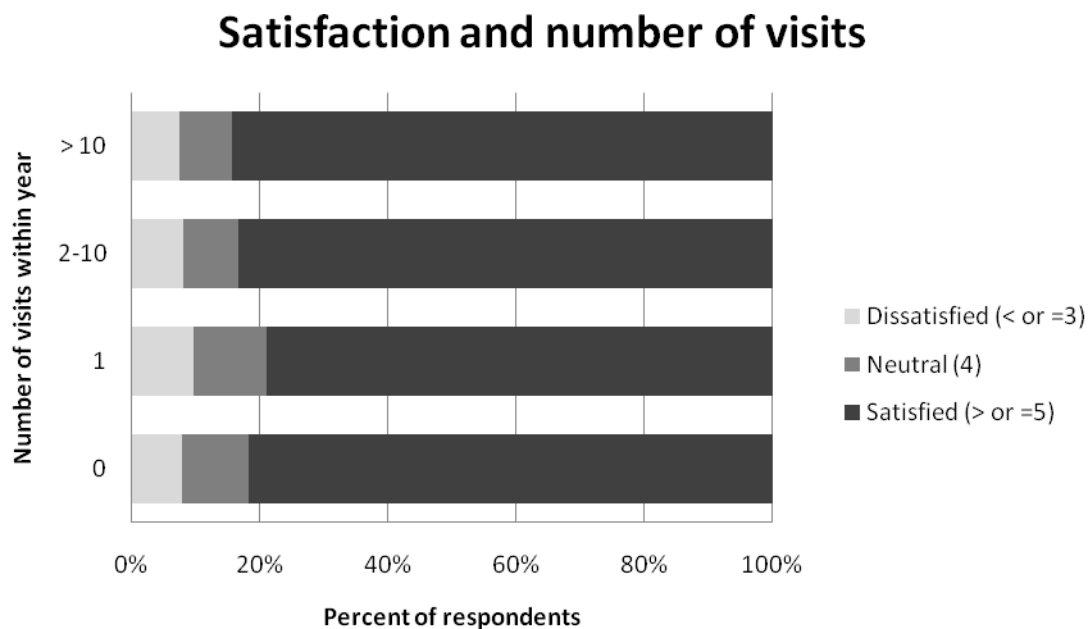


Figure 13. Percentage of respondents within each visitation class that reported dissatisfaction, neutrality, or satisfaction with their visit to the WMA.

Table 7. Satisfaction ratings of WMA users by select recreational user groups.

	Rated 1-3 (dissatisfied)	Rated 4 (neutral)	Rated 5-7 (satisfied)
Hunters (n=1,854)	12%	13%	75%
Anglers (n=748)	11%	9%	80%
Hikers (n=450)	4%	4%	92%
Range users (n=463)	4%	4%	92%
Horseback riders (n=43)	0%	0%	100%

Land management practices

Participants were asked about the opinions they hold about some management practices used to manage for wildlife habitat. We asked participants to rate their approval or disapproval on a 7-point scale where 1=strongly disagree with the use of the given management practice, and 7=strongly agree with the use of the management practice. Five general management practices were identified: logging, prescribed fire, herbicide application, mechanical techniques, and planting food plots.

Overall, responses suggest that participants were very supportive of logging (73%), prescribed fire (77%), mechanical techniques for managing vegetation (87%) and planting food plots for wildlife (92%). However, the majority of participants opposed the use of herbicides to manage vegetation (46%; Table 8).

Table 8. Overall responses to land management practices on WMAs 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)
Logging some areas to create openings of promote growth of desired species of vegetation	15%	13%	73%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	11%	13%	77%
Use of herbicides to manage vegetation	46%	20%	34%
Mechanical techniques to manage vegetation, such as mowing or mulching	5%	8%	87%
Planting crops for wildlife food and habitat	4%	4%	92%

We also compared responses to management practices between hunting and/or fishing license holders and those who do not hold a license. When compared to the overall proportions, license holders were significantly more supportive of all 5 management practices (Table 9). Non-license holders also were supportive of logging, prescribed fire, mechanical techniques, and planting of food plots to a lesser degree, and were the least supportive of the use of herbicides (Table 10). When mean responses were compared using an independent samples t-test, results indicated a statistically significant difference between responses of license holders and non-license holders for all 5 management practices (Table 11).

Table 9. Hunting and/or fishing license holder responses to land management practices on WMAs (n=2,863).

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	13%	12%	75%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	10%	11%	79%
Use of herbicides to manage vegetation	45%	19%	36%
Mechanical techniques to manage vegetation, such as mowing or mulching	5%	7%	88%
Planting crops for wildlife food and habitat	2%	3%	95%

Table 10. Non-license holder responses to land management practices on WMAs (n=543).

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	23%	17%	60%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	16%	20%	64%
Use of herbicides to manage vegetation	53%	20%	27%
Mechanical techniques to manage vegetation, such as mowing or mulching	10%	12%	78%
Planting crops for wildlife food and habitat	10%	10%	80%

Table 11. Statistical comparison (independent t-test) of hunting and fishing license holder and non-license holder responses to land management practices. An asterisk (*) indicates a statistically significant difference ($P < 0.05$).

Mean rating^a				
Land management practice	License holders (N=2,855)	Non-license holders (N=541)	Test statistic^b	p-value
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*

^aMean 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.

^b Assuming unequal variances

We also compared responses to the land management practice questions among four of the recreational activity groups that were well represented. As expected, hunters (Table 12) and anglers (Table 13) followed a similar trend as the license holder responses above (Table 9); they generally supported active management, except for the use of herbicides. Hikers were generally less supportive of logging and prescribed fire, and were the least supportive of herbicide application (Table 14) among the user groups. WMA users at the sight-in range also were very supportive of active land management in general (Table 15).

Table 12. Responses of hunters (n=1,485) regarding management practices at WMAs.

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	12%	12%	76%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	9%	12%	79%
Use of herbicides to manage vegetation	43%	21%	36%
Mechanical techniques to manage vegetation, such as mowing or mulching	5%	7%	88%
Planting crops for wildlife food and habitat	2%	2%	96%

Table 13. Responses of anglers (n=672) regarding management practices at WMAs.

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	16%	12%	72%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	11%	11%	78%
Use of herbicides to manage vegetation	46%	18%	36%
Mechanical techniques to manage vegetation, such as mowing or mulching	4%	8%	88%
Planting crops for wildlife food and habitat	3%	6%	91%

Table 14. Responses of hikers (n=352) regarding management practices at WMAs.

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	25%	15%	60%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	19%	15%	66%
Use of herbicides to manage vegetation	57%	17%	26%
Mechanical techniques to manage vegetation, such as mowing or mulching	11%	12%	77%
Planting crops for wildlife food and habitat	15%	10%	75%

Table 15. Responses of range users (n=418) regarding management practices at WMAs.

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	10%	12%	78%
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	7%	13%	80%
Use of herbicides to manage vegetation	44%	21%	35%
Mechanical techniques to manage vegetation, such as mowing or mulching	3%	6%	91%
Planting crops for wildlife food and habitat	1%	2%	97%

Willingness to pay an annual fee

Virginia's WMAs were usually acquired (at least in part) with funds generated by the sale of hunting and fishing licenses, and from excise taxes on the purchase of outdoor recreational equipment. All survey participants were asked who should have to pay an annual fee to use WMAs and were given three options: 17% of all respondents believed all users of Virginia's WMAs, including hunting and fishing license holders, should pay an annual fee to use WMAs, 32% believed only those who do **not** hold a valid Virginia hunting or fishing license should have to pay an annual fee, and 51% believed Virginia's WMAs should remain available to anyone who wants to use them at no cost (Figure 14). These percentages varied among WMAs surveyed. Although the option for all users to pay is the minority in all cases, a slightly higher percentage of participants at Thompson and Amelia WMAs believed that all users should contribute to use WMAs (Table 16), possibly due to larger proportions of survey respondents that did not hold hunting or fishing licenses.

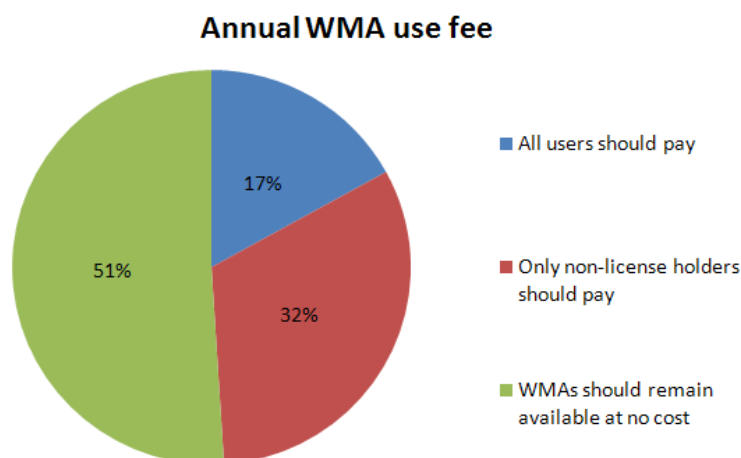


Figure 14. Responses to three fee options presented describing who should be responsible for paying an annual use fee to utilize the WMAs.

Table 16. Percentage of WMA recreational users selecting each of three potential annual WMA fee options. The Chi square test of independence indicates a relationship between the variables ^a.

	WMA									
	Amelia	Big Survey	Cavalier	Chicka-hominy	Clinch Mtn.	Dick Cross	Goshen	Little North Mtn.	Phelps	Thompson
All users should pay an annual fee	20	10	17	17	17	18	12	13	16	24
Only those who do not have a hunting and/or fishing license should pay an annual fee	31	36	28	28	32	34	29	35	37	33
WMAs should remain available to everyone at no cost	49	54	54	54	51	47	59	52	46	44

^a $\chi^2 = 37.31$, df=18, p=0.005

Horseback riders and hikers were most supportive of the WMA remaining available at no cost, presumably because these users currently utilize WMAs without contributing directly to their maintenance and upkeep. While the minority believed that all users should pay to use WMAs in almost all cases, horseback riders and anglers were more supportive of all users paying a fee to use WMAs than other recreational groups (Table 17).

Table 17. Percentages of respondents from the most frequently surveyed user groups regarding who should have to pay to use WMAs.

	Hunters	Anglers	Hikers	Range Users	Horseback riders
All users should pay an annual fee	15%	21%	17%	14%	27%
Only those who do not have a hunting and/or fishing license should pay an annual fee	34%	35%	25%	32%	9%
WMAs should remain available to everyone at no cost	51%	44%	58%	53%	64%

We asked participants a second question giving them a random selection of a hypothetical annual fee ranging from \$5-25 in \$5 increments. The interviewer asked if the respondent still would have used the WMA today if the given annual fee was in place. Over 60% of all users responded that they would be willing to pay the fee amount presented to them (Figure 15). In most cases, non-license holders were slightly more willing to pay than license holders. Over 90% of both license holders and non-license holders were willing to pay an annual fee of \$5, which declined to just over 60% as the annual fee increased to \$25.

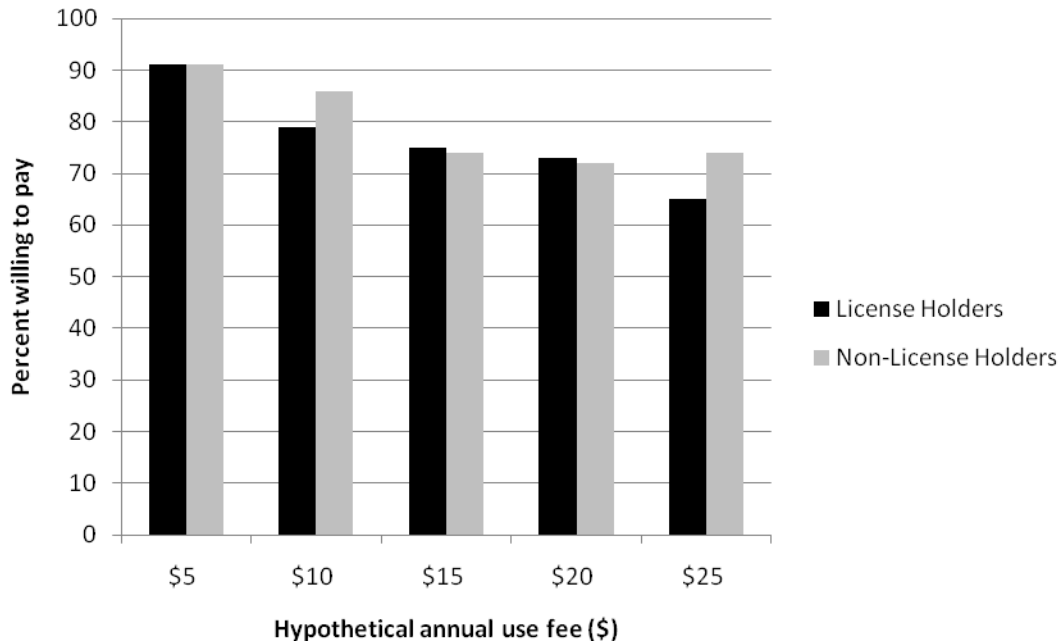


Figure 15. Hunting and fishing license holders’ and non-license holders’ willingness to pay an annual WMA use fee. No statistically significant difference was observed between group responses.

We also calculated the expected annual revenue from the 10 WMAs included in the study as a result of a fee structure imposed by the Board of Game and Inland Fisheries to take effect on January 1, 2012. The new fee structure would require WMA users without a valid hunting, fishing, or trapping license or a boat registration to purchase an annual (\$23, cost of a hunting or fishing license) or daily (\$4) facilities use permit. Estimated annual revenue from the 10 WMAs included in this study exceeds \$370,000 (Table 18).

We used annual recreational use estimates along with percentages of non-license holder respondents that claimed they would pay an annual fee to use the WMAs to develop revenue estimates. We assumed that all WMA users required to pay a facilities use fee would in fact do so (100% compliance with the regulation) and that each user day represents an individual user. Because many users visit the WMA repeatedly over the course of a year, it is difficult to identify distinct users. At least 8% of field survey respondents completed a survey on an earlier visit, and over 70% of respondents reported that they visited the WMA more than once over the past 12 months; therefore, these revenue figures are likely overestimated.

Table 18. Calculations of anticipated revenue from annual or daily fee imposed on recreational users without a hunting, fishing, or trapping license. These calculations assume 100% compliance with the fee and that each user day represents an individual user. Both assumptions result in an overestimation of expected revenue.*

						Estimates of fee revenue*		
WMA	Estimated annual visits	Percent holding hunting or fishing license	Estimated # of user days by individuals without license	Percent of users without a license willing to purchase \$25 annual	Percent of users without a license willing to purchase \$5 annual	Estimated revenue from annual permit (\$23)	Estimated revenue from daily permit (\$4)	Total estimated revenue
Amelia	7,810	0.83	1328	0.67	0.94	\$20,459.86	\$1,647.41	\$22,107.27
<i>Amelia range</i>	6,388	0.68	2044	0.80	0.80	\$37,609.60	\$1,308.16	\$38,917.76
Big Survey	1,013	0.73	274	0.50	0.75	\$3,145.37	\$410.27	\$3,555.63
Cavalier	2,365	0.95	118	1.00	1.00	\$2,719.75	\$473.00	\$3,192.75
Chickahominy	6,736	0.84	1078	0.77	0.95	\$19,087.13	\$941.96	\$20,029.09
<i>Chickahominy range</i>	15,478	0.71	4489	0.90	0.90	\$92,914.43	\$1,615.90	\$94,530.34
Clinch Mountain	9,505	0.92	760	0.75	1.00	\$13,116.90	\$760.40	\$13,877.30
<i>Clinch Mtn. range</i>	869	1.00	0			\$0.00	\$0.00	\$0.00
Dick Cross	2,031	0.93	142	1.00	0.90	\$3,269.91	\$0.00	\$3,269.91
Goshen	11,206	0.76	2689	0.80	0.77	\$49,485.70	\$1,656.70	\$51,142.39
Little North Mountain	4,135	0.95	207	0.67	0.90	\$3,186.02	\$827.00	\$4,013.02
Phelps	8,828	0.89	971	0.75	0.87	\$16,751.13	\$844.84	\$17,595.97
<i>Phelps range</i>	4,865	0.85	730	0.90	0.90	\$15,104.27	\$262.68	\$15,366.96
Thompson	9,975	0.56	4389	0.80	0.91	\$80,757.60	\$3,195.19	\$83,952.79
TOTALS	91,203		19,218			\$357,607.66	\$13,943.51	\$371,551.17

Content analysis of additional comments

About half (n=1,864) of respondents provided additional comments at the end of the interview. While these comments covered a broad range of topics in support of current conditions and expressing the desire for improvement, some general categories and re-occurring themes were clear. Many respondents commented in support of the facilities provided on the WMA or believed the need for improvement existed. Comments included satisfaction with WMA management (n=183), more law enforcement patrols of the area needed (n=47), maintenance of roads, trails and facilities and requesting amenities such as restrooms or trashcans (n=313), comments about land management practices (n=159), and longer hours/seasons at the sight-in ranges (n=130). Many users' comments called for improved access to the WMA, such as better maintenance for roads and trails, opening access to gated roads, improved maps and signage, instituting a user access fee, or better boating and/or disabled access.

Some users had comments about wildlife and fisheries or land management pertaining to their experience with the WMA. Comments included what the respondent believed was appropriate (or inappropriate) land management, increased fish stocking, providing more food or habitat for game species, managing habitat for non-game species, or increasing populations of species or species groups. Some participants commented on regulations, including support for or against license fees or requirements, quota hunts, or hunting seasons. Others made comments referring other recreational users or user groups, including issues such as problems with crowding, concerns about safety, and conflict with other WMA user groups.

Appendix AA. WMA field survey
questionnaire

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)

- ☐ Biking
☐ Boating/canoeing/kayaking
☐ Camping
☐ Fishing (go to Q10)
☐ Other: _____

- ☐ Hiking or walking (for purposes other than hunting, fishing, or wildlife watching)
☐ Horseback riding

- ☐ Hunting (go to Q6-9)
☐ Shooting range use
☐ Trapping (go to Q8-9)
☐ Wildlife watching

6. If hunting, what was the target species?

- ☐ Bear
☐ Coyote
☐ Deer
☐ Dove
☐ Fox
☐ Other: _____

- ☐ Game birds (grouse, quail, woodcock)
☐ Groundhog
☐ Rabbit

- ☐ Raccoon
☐ Squirrel
☐ Turkey
☐ Waterfowl (ducks and geese)

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

- ☐ Archery
☐ Black powder (muzzleloader)
☐ Other: _____
☐ Rifle
☐ Shotgun

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?

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?

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

Appendix AB. Individual WMA profiles including common recreational activities, targeted species during hunting seasons, and responses to land management practices.

Amelia

Most common activities reported.

Shooting range: 33%

Hunting: 26%

Fishing: 27%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 6%

Boating/canoeing/kayaking: 8%

Sightseeing/viewing the area: 3%

Wildlife watching: 2%

Horseback riding: 1.5%

If hunting, what was the target species?

0% Bear	<1% Groundhog
< 1% Coyote	2% Rabbit
41% Deer	11% Squirrel
41% Dove	6% Turkey
0% Fox	2% Waterfowl (ducks and geese)
1% Game birds (grouse, quail, woodcock)	0% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	11	13	76
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	7	12	81
Use of herbicides to manage vegetation	40	22	38
Mechanical techniques to manage vegetation, such as mowing or mulching	2	7	91
Planting crops for wildlife food and habitat	2	3	95

Big Survey

Most common activities reported.

Hunting: 46%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 45%

Scouting for game: 3%

Wildlife watching: 3%

If hunting, what was the target species?

11% Bear	0% Groundhog
0% Coyote	0% Rabbit
83% Deer	6% Squirrel
0% Dove	14% Turkey
0% Fox	0% Waterfowl (ducks and geese)
0% Game birds (grouse, quail, woodcock)	0% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	28	31	40
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	21	28	51
Use of herbicides to manage vegetation	69	7	24
Mechanical techniques to manage vegetation, such as mowing or mulching	11	28	61
Planting crops for wildlife food and habitat	7	11	83

Cavalier

Most common activities reported.

Hunting: 71%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 7%

Scouting for game: 5%

Sightseeing/viewing the area: 4%

Trapping: 2%

Wildlife watching: 1.5%

If hunting, what was the target species?

6% Bear	0% Groundhog
0% Coyote	3% Rabbit
26% Deer	0% Squirrel
63% Dove	5% Turkey
1% Fox	< 1% Waterfowl (ducks and geese)
2% Game birds (grouse, quail, woodcock)	0% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	4	9	87
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	3	7	90
Use of herbicides to manage vegetation	35	22	43
Mechanical techniques to manage vegetation, such as mowing or mulching	2	4	94
Planting crops for wildlife food and habitat	1	2	97

Chickahominy

Most common activities reported.

Hunting: 46%

Shooting range: 28%

Fishing: 11%

Boating/canoeing/kayaking: 7.5%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 3%

Camping: 2%

Scouting for game: 2%

If hunting, what was the target species?

0% Bear	0% Groundhog
0% Coyote	< 1% Rabbit
65% Deer	13% Squirrel
9% Dove	11% Turkey
0% Fox	4% Waterfowl (ducks and geese)
0% Game birds (grouse, quail, woodcock)	< 1% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	9	10	81
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	10	13	77
Use of herbicides to manage vegetation	47	20	33
Mechanical techniques to manage vegetation, such as mowing or mulching	7	7	86
Planting crops for wildlife food and habitat	1	3	96

Clinch Mountain

Most common activities reported.

Fishing: 49%

Hunting: 30.5%

Camping: 7.5%

Sight-seeing: 7%

Wildlife watching: 5%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 2.5%

Scouting for game: 1%

Shooting range: <1%

If hunting, what was the target species?

6% Bear	0% Groundhog
< 1% Coyote	4% Rabbit
84% Deer	2% Squirrel
0% Dove	7% Turkey
0% Fox	0% Waterfowl (ducks and geese)
< 1% Game birds (grouse, quail, woodcock)	0% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	22	4	74
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	10	10	80
Use of herbicides to manage vegetation	46	18	36
Mechanical techniques to manage vegetation, such as mowing or mulching	3	5	92
Planting crops for wildlife food and habitat	2	3	95

Dick Cross

Most common activities reported.

Hunting: 75.5%

Camping: 6.5%

Sightseeing/viewing the area: 5%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 4%

Fishing: 4%

Wildlife watching: 3%

Scouting for game: 1.5%

Horseback riding: 1.5%

If hunting, what was the target species?

0% Bear	1% Groundhog
0% Coyote	12% Rabbit
30% Deer	4% Squirrel
53% Dove	7% Turkey
0% Fox	0% Waterfowl (ducks and geese)
0% Game birds (grouse, quail, woodcock)	0% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	22	11	67
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	15	4	81
Use of herbicides to manage vegetation	38	22	40
Mechanical techniques to manage vegetation, such as mowing or mulching	3	3	93
Planting crops for wildlife food and habitat	1	1	98

Goshen
(Includes Swinging Bridge Access, LNM)

Most common activities reported.

Hunting: 37%

Camping: 18%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 17%

Fishing: 8%

Viewing area/sightseeing: 4%

Scouting for game: 4%

Boating/canoeing/kayaking: 4%

Wildlife watching: 2%

If hunting, what was the target species?

16 % Bear	0% Groundhog
1% Coyote	0% Rabbit
85% Deer	3% Squirrel
0% Dove	10% Turkey
0% Fox	0% Waterfowl (ducks and geese)
2% Game birds (grouse, quail, woodcock)	2% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	21	16	63
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	17	19	64
Use of herbicides to manage vegetation	51	19	30
Mechanical techniques to manage vegetation, such as mowing or mulching	7	12	81
Planting crops for wildlife food and habitat	8	9	83

Little North Mountain

Most common activities reported from September 2009 –early May 2010

Hunting: 83%

Wildlife watching: 6%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 5%

Camping: 2%

Firewood cutting/collecting: 1.5%

Fishing: 1%

If hunting, what was the target species?

5% Bear	0% Groundhog
1% Coyote	0% Rabbit
77% Deer	3% Squirrel
0% Dove	19% Turkey
0% Fox	0% Waterfowl (ducks and geese)
2% Game birds (grouse, quail, woodcock)	1% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	18	29	53
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	12	23	64
Use of herbicides to manage vegetation	34	22	44
Mechanical techniques to manage vegetation, such as mowing or mulching	7	9	83
Planting crops for wildlife food and habitat	4	4	92

Phelps

Most common activities reported.

Hunting: 65%

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 9%

Fishing: 8%

Shooting range: 5%

Horseback riding: 4%

Wildlife watching: 2%

Camping: 1.5%

Scouting for game: 1%

If hunting, what was the target species?

< 1% Bear	< 1% Groundhog
< 1% Coyote	3% Rabbit
59% Deer	9% Squirrel
21% Dove	9% Turkey
0% Fox	1% Waterfowl (ducks and geese)
2% Game birds (grouse, quail, woodcock)	< 1% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	12	2	86
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	11	13	76
Use of herbicides to manage vegetation	49	20	31
Mechanical techniques to manage vegetation, such as mowing or mulching	5	7	88
Planting crops for wildlife food and habitat	3	4	93

Thompson

Most common activities reported.

Walking/hiking (for purposes other than hunting, fishing, or wildlife watching): 47%

Hunting: 31.5%

Wildflower watching: 13%

Fishing: 13%

Wildlife watching: 11.5%

Scouting for game: 1%

Horseback riding: 1%

If hunting, what was the target species?

2% Bear	0% Groundhog
0% Coyote	1% Rabbit
81% Deer	11% Squirrel
0% Dove	7% Turkey
0% Fox	0% Waterfowl (ducks and geese)
3% Game birds (grouse, quail, woodcock)	1% Other

Responses to land management practices

Practice (as described on the survey)	Rated 1-3 (disagree w/ practice)	Rated 4 (neutral)	Rated 5-7 (agree w/ practice)
Logging some areas to create openings of promote growth of desired species of vegetation	20	16	64
Prescribed burning of some areas to reduce fuel loading or to promote growth of desired species of vegetation	17	14	70
Use of herbicides to manage vegetation	58	17	25
Mechanical techniques to manage vegetation, such as mowing or mulching	14	13	73
Planting crops for wildlife food and habitat	16	9	75

Appendix AC. Range field survey and summary of results.

Virginia WMA Range User Survey

Interviewer's name _____ Date _____ Time _____

WMA _____

Day of the week ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday

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 are in your group today? _____

4. How many times have you visited this range this season (September 2009- March 2010)? _____

5. What is your purpose for visiting this range today?
☐ Sight-in for hunting ☐ Recreational shooting
☐ Other: _____

6. 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

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

8. 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

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

10. 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. 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 a fee to use the areas.
☐ Only those that do not hold a valid Virginia hunting or fishing license should have to pay to use WMAs.
☐ Virginia's WMAs should remain available to anyone who wants to use them at no cost.

11. If you had to pay an annual fee of \$ _____ to use Virginia's wildlife management areas, regardless of whether or not you hold a valid Virginia hunting or fishing license, would you still have used this wildlife management area today? ☐ Yes ☐ No

12. (Ask only if non-hunting/fishing license holder) If you did not hold a valid Virginia hunting or fishing license, and 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

13. What is your home zip code? _____ 14. Gender ☐ Male ☐ Female

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

Figure 1. Virginia wildlife management area sight-in range field questionnaire.

Summary of WMA range survey results

Four ranges were sampled on 12 randomly selected days between September 1, 2009 and March 31, 2010.

Number of surveys completed at Amelia, Chickahominy, Clinch, and Phelps ranges: 692

Do you have a valid hunting or fishing license in VA? 74% Yes, 26% No

Reason for visiting the range: Recreational shooting- 51%, Sight-in for hunting- 60% (*some visitors selected both reasons*)

Satisfaction rating for this visit to the range: 87% Satisfied, 5% Neutral, 8% Dissatisfied

Satisfaction rating for range season (Sept.-Mar.): 32% Satisfied, 7% Neutral, 61% Dissatisfied

Gender: 94% Male, 6% Female

Who should have to pay to use WMAs?

Fee Options	Percent selecting option
All users of Virginia's WMAs, including hunting or fishing license holders, should pay an annual fee to use the areas.	37%
Only those who do not hold a valid Virginia hunting or fishing license should have to pay a fee to use WMAs.	32%
Virginia's WMAs should remain available to anyone who wants to use them at no cost.	31%

If you had to pay a given amount for an annual permit (between \$5-25), would you still have used the WMA today?

	Yes	No
License holders	80%	20%
Non-license holders	90%	10%

Summary of sight-in range survey results by WMA

	WMA			
	Amelia	Chickahominy	Clinch Mtn.*	Phelps
Number of surveys completed	171	350	25	146
Percent of respondents with a VA hunting or fishing license	68	71	100	85
Average group size	1.9	2.6	1.9	1.6
Number of times visited this range in the last 12 mos.	3.4	4.6	2.8	3.5
Average satisfaction with today's visit (1=low to 7=high scale)	6.0	5.9	6.5	6.7
Average satisfaction with range season (September-March, 1=low to 7=high scale)	4.7	2.2	3.8	5.1
All users of Virginia's WMAs, including hunting or fishing license holders, should pay an annual fee to use the areas.	16%	47%	8%	12%
Only those who do not hold a valid Virginia hunting or fishing license should have to pay a fee to use WMAs.	40%	31%	40%	47%
Virginia's WMAs should remain available to anyone who wants to use them at no cost.	44%	22%	52%	41%

* Because of road closures due to inclement winter weather, Clinch Mountain range was only surveyed for 6 days in the fall sampling period.

Most frequent additional comments: Open the pistol range, longer range season (open year-round)

Appendix B:

**Recreational use estimates for 10
Wildlife Management Areas**

September 5, 2009 – September 3, 2010

Introduction

Most state wildlife agencies own and manage wildlife management areas (WMAs) primarily to maintain and enhance wildlife habitat and provide public hunting and fishing opportunities. These lands provide opportunity for both traditional forms of wildlife-related recreation (e.g., hunting fishing, trapping) as well as other forms of outdoor recreation (e.g., hiking, horseback riding), provided such recreational uses do not conflict with the main goal of managing wildlife habitat.

Although declining participation in traditional forms of wildlife-related recreation is well documented, little information exists regarding non-consumptive stakeholders who recreate on public hunting and fishing lands. However, participation in non-consumptive outdoor recreational use is perceived to be increasing. Hunters and anglers already support the management and upkeep of WMAs through their expenditures on license fees and excise taxes paid on hunting and fishing equipment, whereas other user groups may not be making a contribution to cover the operational costs of WMAs.

Our purpose in conducting the WMA use survey was to (1) determine the type and frequency of recreational uses that occur on a select group of WMAs in Virginia, and (2) develop an annual estimate of use on these WMAs. These estimates will provide managers within the Virginia Department of Game and Inland Fisheries (VDGIF) with important information about user groups and intensity of use, particularly for non-consumptive activities occurring on WMAs.

Methods

Each WMA was surveyed at least 24 days (15 weekend days and 9 weekdays) over the 12-month survey period between September 5, 2009, and September 3, 2010. On large WMAs and/or those with multiple access points, the WMA was segregated into separate subsections that a surveyor could cover reasonably in a day. Each subsection was surveyed at least 24 days, except for a few instances when winter weather prevented access to the area. Sampling days were selected at random, but were constrained to be distributed equally among Saturdays, Sundays, and weekdays, and in each of three seasons. Three sampling seasons arbitrarily were

established based on hunting seasons and the calendar; they were defined as fall (September 5-January 2), winter/spring (January 3-May 31), and summer (June 1-September 3). Holidays (e.g., Labor Day, Thanksgiving Day) were treated as Saturdays because use was expected to be significantly higher than an average weekday and more comparable to Saturday use.

In addition to the 24 general survey days, separate interviews also were conducted on special days, such as hunting and fishing season openers, when the volume of use was expected to be higher than an average recreation day. These special days included Sept. 5, 2009: opening day of dove season; Oct. 3, 2009: opening day of archery hunting; Oct. 31, 2009: opening day of muzzleloader hunting; Nov. 14, 2009: opening day of general firearms deer hunting; Apr. 3, 2010: opening day of fee fishing area; Apr. 10, 2010: opening day for spring gobbler hunting; and May 2, 2010: peak date for wildflower viewers. Some opening days were restricted to a single WMA (e.g., Thompson WMA wildflower viewing and Clinch Mountain WMA fishing), whereas all other opening days were observed on all WMAs.

Estimates for recreational use at each of the 10 WMAs were developed by first examining data on day type (e.g., Saturday, Sunday, weekday) and use within the 3 defined seasons. Use occurring on opening days was calculated separately and added to the final result. We used number in the party and activities of those we interviewed to estimate the number of annual recreation days (i.e., a visit to a WMA by one individual to participate in a single activity) for each of the 10 WMAs. We also used recreational activities of those we interviewed to expand estimates of use for each of the frequently reported activities (e.g., hunting, fishing, hiking). Because many interviewees participated in more than one activity (e.g., camping and hunting, fishing and boating), some of the estimates for individual activities likely are inflated due to double-counting the individual under multiple activities. Recreation days were adjusted to account for use during each day the visitor stayed on the WMA. For example, two individuals camping on the WMA for 4 days would result in a total of 8 camping recreation days for that WMA. Also, estimates for large WMAs with multiple access points (e.g., Little North Mountain) likely are very conservative because it was difficult to interview all users on site. On WMAs where fewer interviews actually were conducted, estimates of recreational use derived from a smaller pool of users will be less reliable.

Although some sight-in range use was accounted for in the WMA field survey, we conducted a separate range survey at each of the 4 WMAs that had ranges. Range surveys were conducted primarily by Conservation Work Force (CWF) volunteers and VDGIF staff. Each range was surveyed 12 days (6 weekend days, 6 weekdays) from September 1, 2009 through March 31, 2010. Because of road closures due to inclement winter weather, Clinch Mountain range was surveyed only 6 days in the fall sampling period and was not sampled in the spring season.

Completed range surveys were used to develop estimates of annual range use, which then were incorporated into the overall recreational use estimates for the entire WMA. Because survey administration was not consistent at all ranges, recreational use likely is overestimated. For example, several individuals from the same party were found to have completed a questionnaire during their visit, resulting in at least a doubling of the count for that party.

Results

Estimates of annual recreational use, excluding sight-in ranges, ranged from 1,000 recreation days at Big Survey WMA to over 11,000 recreation days at Goshen WMA (Figure 1). We estimated over 63,000 total recreation days occurred on the 10 WMAs sampled from September 2009-September 2010. Among recreational activities pursued on most WMAs, hunting and fishing predominated. However, non-consumptive activities such as hiking, wildlife watching, sightseeing, and wildflower viewing were common at some WMAs. Because we conducted a separate sight-in range survey to estimate annual range use, all range use recorded during the WMA field survey was excluded from this analysis to prevent double counting.

Estimated annual use (exlcuding range estimates)

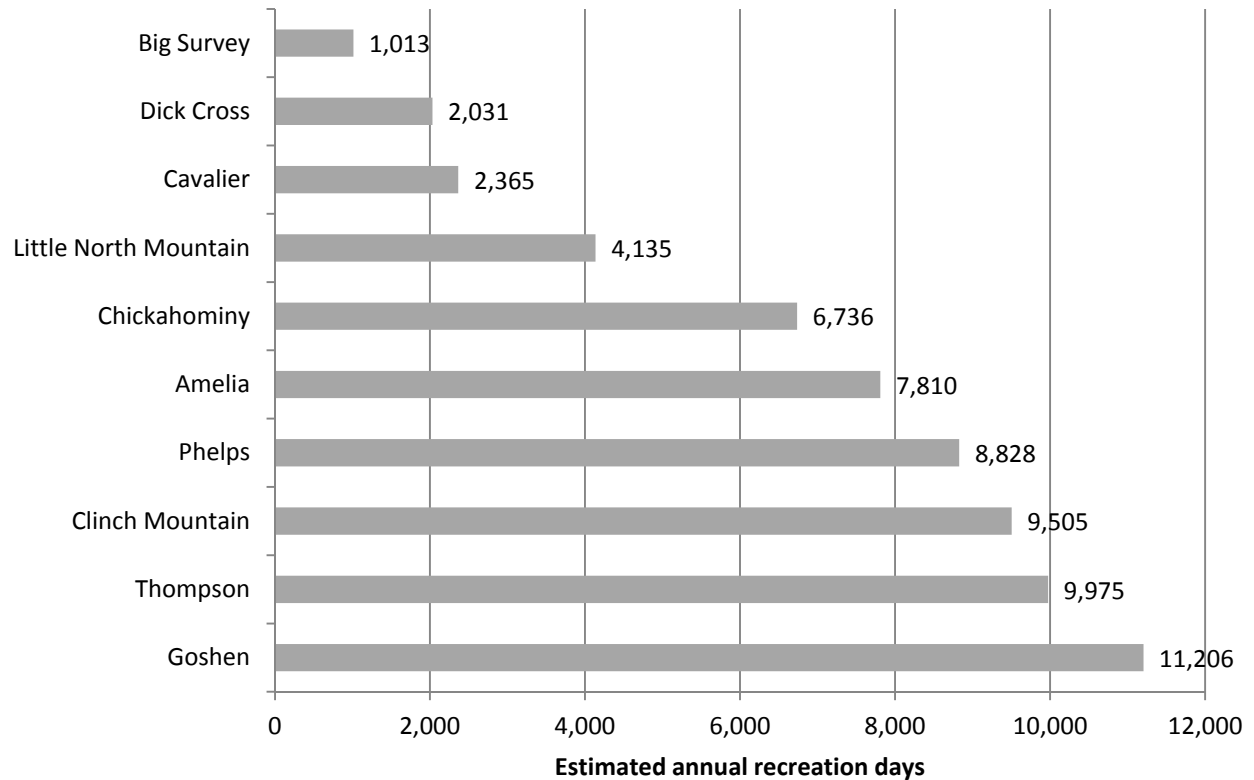


Figure 1. Estimated annual recreation user days (excluding sight-in range use) from the WMA field survey from September 5, 2009 through September 3, 2010.

The sight-in range survey yielded an estimate of annual use of over 27,500 recreation days at the 4 ranges sampled (Figure 2). Highest estimate use occurred at Chickahominy (15,478 recreation days), followed by Amelia (6,387 recreation days) and Phelps (4,864 recreation days). Range use at Clinch Mountain was relatively low (848 recreation days), and no use was recorded for the spring season because of winter weather road closures. Although range survey data are informative, protocol inconsistencies noted previously inflated the estimates and thus reduced the quality of the data collected.

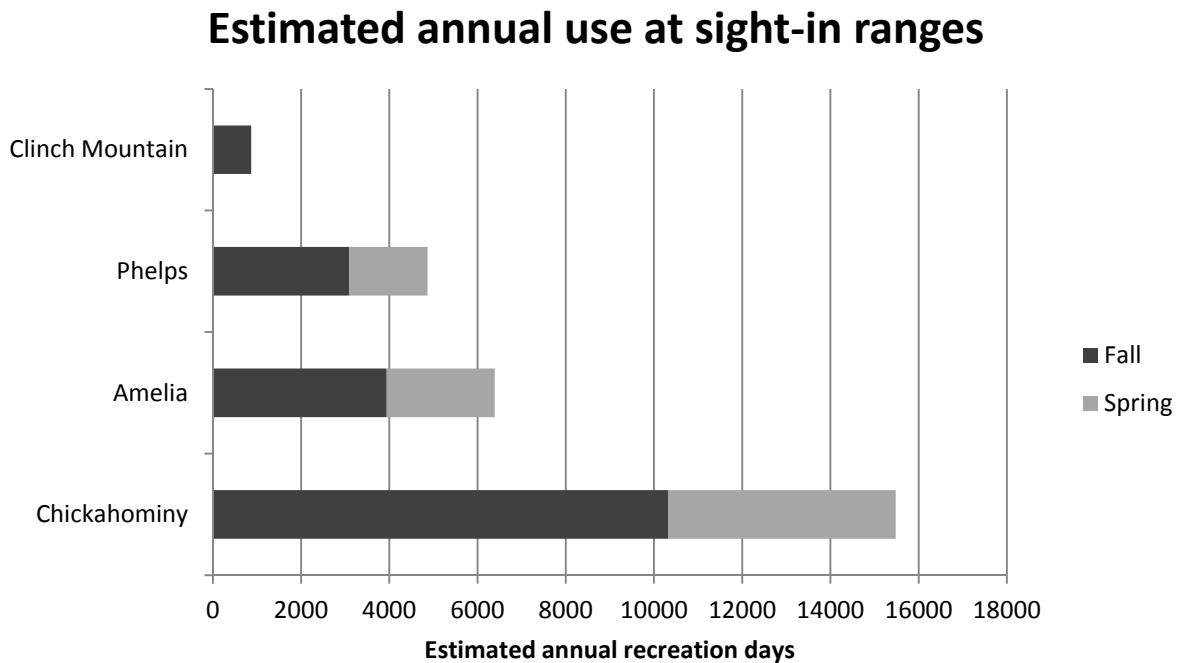


Figure 2. Estimated annual recreation user days from range survey data collected between September 1, 2009 and March 31, 2010.

When range survey data were combined with data on other recreational uses, we found over 91,000 recreation user days had occurred at the 10 WMAs sampled (Figure 3). Chickahominy, Amelia, and Phelps WMAs had the largest numbers of annual recreation days, together comprising over half of the total for all 10 WMAs. Range use contributes heavily to overall use at WMAs with ranges. However, range use at Clinch Mountain was relatively low compared to other recreational activities occurring there; we were unable to ascertain whether Clinch Mountain's more remote location away from population centers, the availability of other public ranges in the area (e.g., provided by U.S. Forest Service), or the presence of substantial privately owned forestland in southwest Virginia contributed to this lower use. Poor winter weather, and resultant road closures, obviously contributed to lower use of the Clinch Mountain range during the year of sampling.

Estimated annual use (including range estimates)

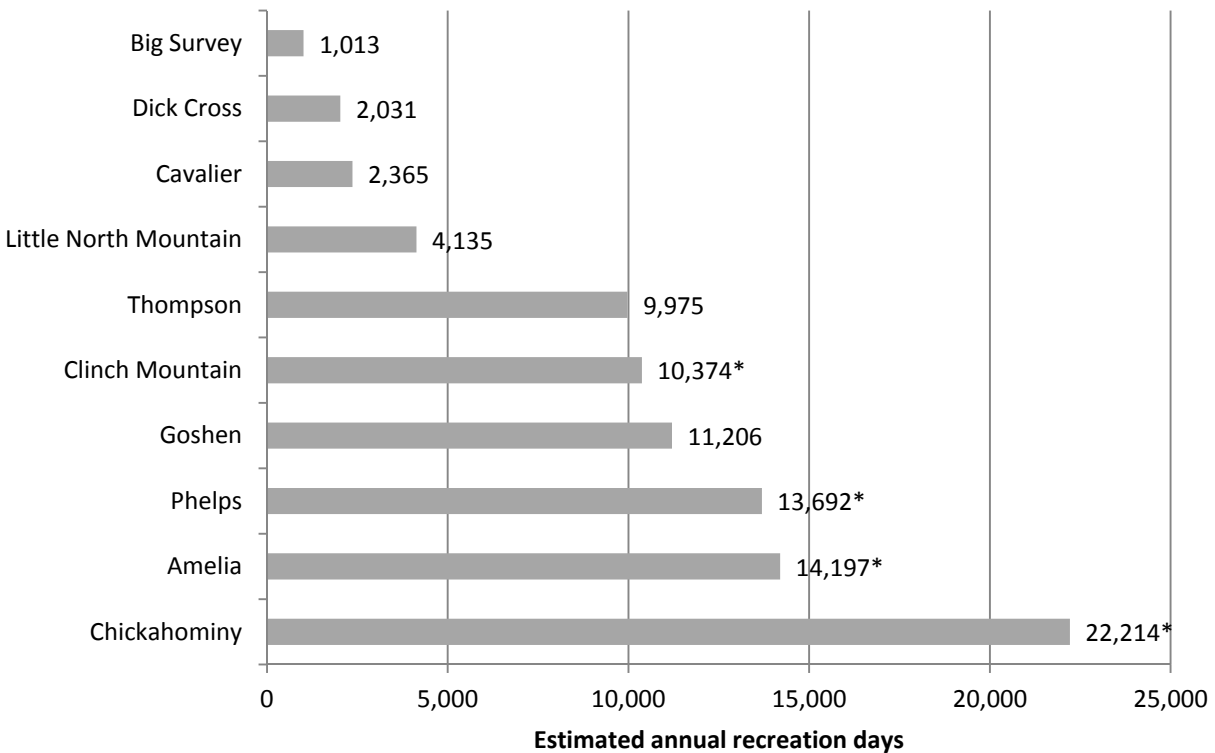


Figure 3. Estimated annual recreation user days from the WMA field survey from September 5, 2009 through September 3, 2010, including estimated use of sight-in ranges* from September 1, 2009 through March 31, 2010.

A summary of key findings and tables that depict estimated annual use for each WMA follow. The first table for each WMA represents recreational use by activity and cannot be summed because many users participated in multiple activities during their visit. The second table for each WMA presents a recreational use estimate based on the number of visitors observed (“regular seasonal use”) and does not account for users participating in multiple activities. The regular seasonal use is summed with the observed use on the special opening days, and then summed across seasons to provide an overall recreational use estimate. WMAs that were surveyed using multiple routes are described separately and overall estimates for recreational use on the WMA as a whole are calculated last. All values are reported as annual

recreation days, which represents one individual's "visit" of up to one day to participate in recreational activities on the WMA.

Amelia WMA

- Use of the sight-in range (6,387 recreation days) was the most popular activity, followed by fishing (3,816 recreation days), and boating (1,342 recreation days).
- Recreational use in the fall (2,862 recreation days) was diverse, whereas spring (2,816 recreation days) was dominated primarily by range use, hunting, and fishing.
- Fishing at Amelia Lake was popular year-round; heaviest use occurred during winter/spring (2,013 recreation days).

Big Survey WMA

- Annual recreational use was lowest of the 10 WMAs surveyed (1,013 recreation days).
- Hiking was the most popular use (662 recreation days), and occurred year-round (heaviest in fall).
- Overall recreational use was highest in the fall season (772 recreation days).

Cavalier WMA

- Hunting was the dominant recreational activity (1,296 recreation days).
- Recreational use was heaviest in the fall season (1,548 recreation days), almost double the use of spring and summer combined.
- The culvert washout in November 2009 negatively affected use as vehicular access to the WMA was limited until mid-summer 2010.

Chickahominy WMA

- Use of the sight-in range was heavy (15,478 recreation days) whenever it was open and available, during both fall (10,318 recreation days) and spring (5,159 recreation days). When range use was combined with other recreational uses, Chickahominy had the highest estimated annual use (22,214 recreation days) among all 10 WMAs.
- Overall use was heaviest in fall (3,268 recreation days), but remained relatively high throughout the year.
- Perimeter parking areas were used relatively infrequently (451 recreation days), but provided important access points to the WMA during hunting seasons.
- Boating (1,249 recreation days), fishing (1,648 recreation days), and hunting (1,777 recreation days) all were significant recreational uses.

Clinch Mountain WMA

- Camping (2,331 recreation days), fishing (3,652 recreation days), and hunting (2,009 recreation days) all were significant recreational uses.
- Busiest seasons were summer (3,308 recreation days) and fall (4,400 recreation days).
- Winter/spring use was relatively light (1,412 recreation days), partially due to heavy winter snowfall that kept portions of the WMA closed through the winter of 2009-2010.
- Use of the sight-in range was very light (868.67 recreation days), compared to other WMAs with ranges.

Dick Cross WMA

- Hunting was the dominant use (946 recreation days).
- Fall (1,219 recreation days) was busier than the other seasons combined.
- Field trials (364 recreation days) were a significant use during the winter/spring season.
- Annual recreational use was second lowest of the 10 WMAs surveyed (2,031 recreation days).

Goshen WMA

- The Guys Run access road served as an important access point to the area for hunting (4,335 recreation days) and camping (4,064 recreation days).
- Use on other portions of the area was relatively consistent year-round, but heaviest in the spring (2,097 recreation days) and summer (2,195 recreation days).
- Swimming, although prohibited, was a significant use at the Swinging Bridge Access (802 recreation days).
- Hiking was the most popular recreational activity (1,440 recreation days) on areas covered by the roving route.
- Goshen had the highest estimated annual use of WMAs without a sight-in range (11,206 recreation days), likely due to hunting volume and multi-day camping visits.

Little North Mountain WMA

- Hunting was the dominant recreational activity (2,957 recreation days).
- Use was heavy during fall (3,308 recreation days), but light during spring (578 recreation days) and summer (248 recreation days).
- Little North Mountain Route B (Shillings, Jackson, Dump Road, and Denfield access roads; 2,507 recreation days) seemed to be more popular access sites than those that were part of Route A (McCray, Trimble, Craigsville Res., Doubles, BSA, Strickler, & Boundary access roads; 1,627 recreation days).

Phelps WMA

- Hunting (1,532 recreation days) dominated recreational use of the main tract.
- Recreational use of the main tract was heaviest in fall (1,981 recreation days) and very light during spring (601 recreation days) and summer (619 recreation days).
- Use of the Kelly's Ford tract was highest in the summer (2,792 recreation days), with swimmers (1,704 recreation days) dominating use, despite the fact that the activity is prohibited.
- Use of the sight-in range (4,864 recreation days) dominated recreational use among perimeter parking areas, followed by field trial events (591 recreation days) and horseback riding (569 recreation days).

Thompson WMA

- Hiking (4,858 recreation days), wildflower viewing (3,107 recreation days), and wildlife watching (1,902 recreation days) were the most popular activities along the western accesses to the area (off Freezeland Road).
- Overall recreational use was highest in winter/spring (4,846 recreation days), mostly due to wildflower viewing and bird watching during April and May.
- Hiking (1,161 recreation days), hunting (898 recreation days), and fishing (466 recreation days) at Thompson Lake were the dominant activities along the eastern accesses to the area (off Leeds Manor Road).

Amelia WMA

<i>Regular use</i>	Boating	Fishing	Hiking	Horseback riding	Hunting	Range	Wildlife watching	Other
Fall Season (9/5-1/2)	118.34	627.67	275.34	51	619.34	3,940	5.67	447.67
Winter/Spring Season (1/3-5/31)	705	2,013.67	173	86.67	239	2,447.5	51.34	613.34
Summer Season (6/1-9/3)	519	1,175	22.67					90
TOTAL	1,342.34	3,816.34	471.01	137.67	858.34	6,387.5	57.01	1,151.01

<i>Season</i>	Regular seasonal use	Dove Opener	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Range use	Total seasonal use
Fall Season (9/5-1/2)	2,862.67	283	105	55	119		3,940	7,364.67
Winter/Spring Season (1/3-5/31)	2,816.34					19	2,447.5	5,282.84
Summer Season (6/1-9/3)	1,550							1,550

Estimated annual recreation days for Amelia	14,197.5
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Big Survey WMA

<i>Regular use</i>	Hiking	Hunting	Wildlife watching	Other
Fall Season (9/5-1/2)	464.34	244.34	106.67	101
Winter/Spring Season (1/3- 5/31)	80	8		40
Summer Season (6/1-9/3)	117.34			99.34
TOTAL	661.68	252.34	106.67	240.34

<i>Season</i>	Regular seasonal use	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	692	46	18	16		772
Winter/Spring Season (1/3- 5/31)	104				11	115
Summer Season (6/1-9/3)	126.34					126.34

Estimated annual recreation days for Big Survey	1,013.34
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Cavalier WMA

<i>Regular use</i>	Biking	Hiking	Hunting	Trapping	Wildlife watching	Scouting	Sightseeing	Other
Fall Season (9/5-1/2)		94.67	890	64.67		177.34	57	77.67
Winter/Spring Season (1/3- 5/31)	60	127.34	406	76.67	7.34		30	143.34
Summer Season (6/1-9/3)					22.67	49.67	36	81.34
TOTAL	60	222.01	1296	141.34	30.01	227.01	123	302.35

<i>Season</i>	Regular seasonal use	Dove Opener	Archery Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	1,300.67	193	55		1,548.67
Winter/Spring Season (1/3- 5/31)	616.67			10	626.67
Summer Season (6/1-9/3)	189.67				189.67

Estimated annual recreation days for Cavalier WMA	2,365
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Chickahominy WMA

<i>Check station regular use</i>	Boating	Camping	Fishing	Hiking	Hunting	Range	Wildlife watching	Scouting	Sightseeing	Other
Fall Season (9/5-1/2)	404	184.67	331	30.34	1759	10,318.67	39.67	287.67	361	47.34
Winter/Spring Season (1/3-5/31)	259.34	198.67	902.67	249.34		5,159.34	14.67	44	122.67	237.34
Summer Season (6/1-9/3)	586.34	81.34	415		18		45.34	72	117.34	225.34
TOTAL	1,249.68	464.68	1,648.67	279.68	1,777	15,478.01	99.68	403.67	601.01	510.02

<i>Season</i>	Regular seasonal use	Dove Opener	Archery Opener	Muzzle Opener	Firearm Opener	Turkey Opener	Range use	Total seasonal use
Fall Season (9/5-1/2)	3,089	168	182	6	148		10,318.67	13,911.67
Winter/Spring Season (1/3-5/31)	1,533.34					12	5,159.34	6,704.67
Summer Season (6/1-9/3)	1,145.67							1,145.67

Estimated annual recreation days for Chickahominy check station	21,762.35
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<i>Perimeter parking area regular use</i>	Boating	Camping	Fishing	Hiking	Hunting	Range	Wildwatch	Scouting	Sightseeing	Other
Fall Season (9/5-1/2)				13.34	337.34		7.67	5.67		
Winter/Spring Season (1/3-5/31)				15.34						
Summer Season (6/1-9/3)										
TOTAL				28.68	337.34		7.67	5.67		

<i>Season</i>	Regular seasonal use	Dove Opener	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total seasonal use
Fall Season (9/5-1/2)	179.67			122	12		313.67
Winter/Spring Season (1/3-5/31)	68.67					69	137.67
Summer Season (6/1-9/3)							0

Estimated annual recreation days for Chickahominy perimeter parking	451.34
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Total recreation days for Chickahominy WMA (i.e., check station + perimeter)	22,213.69
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Clinch Mountain WMA

<i>Regular use</i>	Biking	Boating	Camping	Fishing	Hiking	Hunting	Range	Wildlife watching	Sightseeing	Scenic driving	Other
Fall Season (9/5-1/2)	26.67		1,322.67	1075	163.34	2,009.34	868.67	252	614.34	30.67	440.67
Winter/Spring Season (1/3- 5/31)				400	106.67			106.67		26.67	140.34
Summer Season (6/1-9/3)		389	1,008.67	2,177.67	294.34			9	63	615	18
TOTAL	26.67	389	2,331.34	3,652.67	564.35	2,009.34	868.67	367.67	677.34	672.34	599.01

<i>Season</i>	Regular seasonal use	Archery Opener	Muzzle Opener	Firearm Opener	Turkey Opener	Fee Fish Opener	Range use	Total Seasonal Use
Fall Season (9/5-1/2)	4,400	127	166	91			868.67	5,652.67
Winter/Spring Season (1/3- 5/31)	686.67				136	590		1,412.67
Summer Season (6/1-9/3)	3,308.67							3,308.67

Estimated annual recreation days for Clinch Mountain	10,374
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Dick Cross WMA

<i>Regular use</i>	Biking	Fishing	Hiking	Horseback riding	Hunting	Wildlife watching	Sightseeing	Field Trial	Other
Fall Season (9/5-1/2)			26.67	47.67	752.67	7.67	55		63
Winter/Spring Season (1/3-5/31)		36.67	50.34		193.67	14.67	214.58	364.77	
Summer Season (6/1-9/3)	45.33	9					36		9
TOTAL	45.33	45.67	77.01	47.67	946.34	22.34	305.58	364.77	72

<i>Season</i>	Regular seasonal use	Dove Opener	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total seasonal use
Fall Season (9/5-1/2)	916.33	248	2	29	24		1,219.33
Winter/Spring Season (1/3-5/31)	698.67					14	712.67
Summer Season (6/1-9/3)	99.34						99.34

Estimated annual recreation days for Dick Cross	2,031.34
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Goshen WMA

<i>Guys Run regular use</i>	Boating	Camping	Fishing	Hiking	Horseback riding	Hunting	Wildlife watching	Scouting	Sightseeing	Swimming	Other
Fall Season (9/5-1/2)		4,058.67	11.34	51	22.67	4,303.34	5.67	319.34	224.67		182
Winter/Spring Season (1/3- 5/31)		5.34	4.67	19	7	31.67	2.34		58.67		63
Summer Season (6/1-9/3)*											
TOTAL		4,064.01	16.01	70.00	29.67	4,335.01	8.01	319.34	283.34		245.00

	Regular Seasonal Use	Archery Opener	Muzzle Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	5,020.67	37.00	20.00	78.00		5,155.67
Winter/Spring Season (1/3- 5/31)	137.67				14.00	151.67
Summer Season (6/1-9/3)*						

*Guys Run gates closed during summer season

Estimated annual recreation days for Goshen Guys Run	5,307.34
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<i>Goshen roving regular use</i>	Boating	Camping	Fishing	Hiking	Horseback riding	Hunting	Wildlife watching	Scouting	Sightseeing	Swimming	Other
Fall Season (9/5-1/2)	113.67	95.34	32	293.34		766.67	73.34	70.34	160		235.34
Winter/Spring Season (1/3- 5/31)	58.67	94.67	256.67	660					58.67	232.67	593
Summer Season (6/1-9/3)	140.34	27	140.34	417					317	570	752
TOTAL	312.68	217.01	429.01	1370.34		766.67	73.34	70.34	535.67	802.67	1,580.34

	Regular Seasonal Use	Archery Opener	Muzzle loader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	1,465.34	14	63	64		1,606.34
Winter/Spring Season (1/3- 5/31)	2,077.00				20	2,097.00
Summer Season (6/1-9/3)	2,195.00					2,195.00

Estimated annual recreation days for Goshen Roving*	5,898.34
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*includes Swinging Bridge access on LNM WMA

Estimated annual recreation days for Goshen WMA (i.e., Guys Run + Goshen Roving)	11,205.68
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Little North Mountain WMA

<i>Regular use at LNM A</i>	Camping	Hiking	Hunting	Wildlife watching	Firewood cutting	Fishing	Other
Fall Season (9/5-1/2)	26.67	80	906.58				32.34
Winter/Spring Season (1/3- 5/31)		247.67	84.67	71.34	36.67		295.68
Summer Season (6/1- 9/3)	54	54			90.67		
TOTAL	80.67	381.67	991.25	71.34	127.34		328.02

	Regular season use	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	939	37	18	50		1,044
Winter/Spring Season (1/3- 5/31)	433				6	439
Summer Season (6/1- 9/3)	144.67					144.67

*includes McCray, Trimble, Craigsville Res., Doubles, BSA, Strickler, & Boundary Access

Estimated annual recreation days for LNM A*	1,627.67
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<i>Regular use at LNM B</i>	Camping	Hiking	Hunting	Wildlife watching	Firewood cutting	Fishing	Other
Fall Season (9/5-1/2)	61.33	114.67	1,917.00	68.67	61.34	61.34	68.67
Winter/Spring Season (1/3- 5/31)		41.67	49	34.34			83.34
Summer Season (6/1-9/3)					86		18
TOTAL	61.33	156.34	1,966.00	103.01	147.34	61.34	170.01

	Regular seasonal use	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	2,100.34	28	33	103		2,264.34
Winter/Spring Season (1/3- 5/31)	107				32	139
Summer Season (6/1-9/3)	104					104

*includes Shillings, Jackson, Dump Road, & Denfield Access

Estimated annual recreation days for LNM B	2,507.34
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Estimated annual recreation days for LNM (i.e., LNM A + LNM B)	4,135
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Phelps WMA

<i>Phelps check station regular use</i>	Biking	Boating	Camp- ing	Fishing	Hiking	Horse- back riding	Hunting	Range	Trappi- ng	Wildlife watch- ing	Scouting	Swimm- ing	Field Trial	Other
Fall Season (9/5-1/2)				152	15.34	15.34	1,327		7.67		137			104.67
Winter/Spr ing Season (1/3- 5/31)				166.67	114.67	16	160							190
Summer Season (6/1- 9/3)				230.67	126.34	18	45.34				54.34	68		307.34
TOTAL				549.68	256.35	49.34	1,532.34		7.67		191.34	68		602.01

	Regular Season Use	Dove Opener	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	1,981	71	38	52	32		2,174
Winter/Spr ing Season (1/3- 5/31)	601.34					15	616.34
Summer Season (6/1- 9/3)	619						619

Estimated annual recreation days for Phelps check station	3,409.34
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<i>Kelly's Ford regular use</i>	Biking	Boating	Camping	Fishing	Hiking	Horseback riding	Hunting	Range	Trapping	Wildlife watching	Scouting	Swimm- ing	Field Trial	Other
Fall Season (9/5-1/2)		23			103.34		15.34				23			26.67
Winter/Sprin g Season (1/3- 5/31)		34.34		127	143		8							92.67
Summer Season (6/1- 9/3)	68	222.34	34.34	581.34	211.34					52.34		1,704.34		1,848
TOTAL	68	279.68	34.34	708.34	457.68		23.34			52.34	23	1,704.34		1,967.34

	Regular Season Use	Dove Opener	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Total Seasonal Use
Fall Season (9/5-1/2)	172.34		16	14	8		210.34
Winter/Sprin g Season (1/3- 5/31)	317.34					5	322.34
Summer Season (6/1- 9/3)	2,792.34						2,792.34

Estimated annual recreation days for Phelps Kelly's Ford	3,325
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<i>Perimeter parking area regular use</i>	Biking	Boating	Camping	Fishing	Hiking	Horseback riding	Hunting	Range	Trapping	Wildlife watching	Scouting	Swimming	Field Trial	Other
Fall Season (9/5-1/2)			618	13.34	22.68	324.3	588.34	3,094		164	23		591	22.67
Winter/Spring Season (1/3-5/31)				14.67	99.34	209.34	330.67	1,770.5						76.67
Summer Season (6/1-9/3)				22.67	18	36	27			18				54.34
TOTAL			618	50.68	140.02	569.68	946.01	4,864.5		182	23		591	153.68

	Regular Season Use	Dove Opener	Archery Opener	Muzzle Opener	Firearm Opener	Turkey Opener	Range use	Total Seasonal Use
Fall Season (9/5-1/2)	1,107.34	97	25	90	118		3,094	4,531.34
Winter/Spring Season (1/3-5/31)	449.34					49	1,770.5	2,268.84
Summer Season (6/1-9/3)	158							158

Estimated annual recreation days for Phelps perimeter parking areas	6,958.17
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Estimated annual recreation days for Phelps (i.e., check station + Kelly's Ford + perimeter)	13,692.5
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Thompson WMA

<i>Thompson East regular use</i>	Biking	Boating	Camping	Fishing	Hiking	Horseback riding	Hunting	Wildlife watching	Wildflowers	Other
Fall Season (9/5-1/2)	5.67			201	292	34	822	23		250.34
Winter/Spring Season (1/3-5/31)		7.34	142.34	220.67	729.67		76.67	206	152	120
Summer Season (6/1-9/3)	9			45	139.67			9		108
TOTAL	14.67	7.34	142.34	466.67	1,161.34	34	898.67	238	152	478.34

<i>Season</i>	Regular seasonal use	Archery Opener	Muzzle Opener	Firearm Opener	Turkey Opener	Wildflower target day	Total seasonal use
Fall Season (9/5-1/2)	1,316.34	31	29	39			1,415.34
Winter/Spring Season (1/3-5/31)	1,538.67				14		1,552.67
Summer Season (6/1-9/3)	346.67						346.67

Estimated annual recreation days for Thompson East*

3,314.68

*along Leed's Manor Road, includes Thompson Lake

<i>Thompson West regular use</i>	Biking	Boating	Camping	Fishing	Hiking	Horseback	Hunting	Wildlife watching	Wildflowers	Other
Fall Season (9/5-1/2)				197.34	773.67		400			311.67
Winter/Spring Season (1/3-5/31)				220.67	3850	32		1,875.34	3,107.34	844.67
Summer Season (6/1-9/3)			72	153	235.00			27		63.34
TOTAL			72	571.01	4,858.67	32	400	1,902.34	3,107.34	1,219.68

<i>Season</i>	Regular seasonal use	Archery Opener	Muzzleloader Opener	Firearm Opener	Turkey Opener	Wildflower target day	Total seasonal use
Fall Season (9/5-1/2)	1,444	28	24	28			1,524
Winter/Spring Season (1/3-5/31)	4,488				12	226	4,726
Summer Season (6/1-9/3)	410.67						410.67

Estimated annual recreation days for Thompson West*	6,660.67
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* along Freezeland Road and Fire Tower Trail

Estimated annual recreation days at Thompson (i.e., Thompson East + Thompson West)	9,975.35
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Overall recreational use estimates (recreation days)

WMA	Biking	Boating	Camping	Dog field trial	Firewood cutting	Fishing	Hiking	Horseback riding	Hunting^a
Amelia		1,342.34				3,816.34	471.01	137.67	1,439.34
Big Survey							661.68		343.34
Cavalier	60.00						222.01		1,554.00
Clinch Mountain	26.67	389.00	2,331.34			4,242.67	564.35		2,529.34
Dick Cross	45.33			364.77		45.67	77.01	47.67	1,263.34
Chickahominy		1,249.68	464.68			1,648.67	308.36		2,833.34
Goshen		312.68	4,281.02			445.02	1,440.34	29.67	5,411.68
Little North Mountain			142.00		274.68	61.34	538.01		3,264.25
Phelps	68.00	279.68	652.34	591.34		1,308.70	854.05	619.02	3,131.69
Thompson	14.67	7.34	214.34			1,037.68	6,020.01	66.00	1,503.67
TOTAL REC DAYS	214.67	3,580.72	8,085.72	956.11	274.68	12,606.09	11,156.83	900.03	23,273.99

WMA	Scenic driving/sightseeing	Scouting	Sight-in range^b	Swimming	Trapping	Wildflower viewing^c	Wildlife watching	Other
Amelia			6,387.50				57.01	1,151.01
Big Survey							106.67	240.34
Cavalier	123.00	227.01			141.34		30.01	302.35
Clinch Mountain	1,349.68		868.67				367.67	599.01
Dick Cross	305.58						22.34	72.00
Chickahominy	601.01	409.34	15,478.01				107.35	510.02
Goshen	819.01	389.68		802.67			81.35	1,825.34
Little North Mountain							174.35	498.03
Phelps		237.34	4,864.50	1,772.34	7.67		234.34	2,723.03
Thompson						3,485.34	2,140.34	1,698.02
TOTAL REC DAYS	3,198.28	1,263.37	27,598.68	2,575.01	149.01	3,485.34	3,321.43	9,619.15

^a includes estimates of regular activity use plus observed use on 5 special opening hunting days

^b data from a separate sight-in range user questionnaire

^c includes estimates of regular wildflower viewing plus observed use on wildflower target day

Appendix C:

**Wildlife Management Area
Focus Group Report**

October 2010

FOCUS GROUP SUMMARY

Four focus group meetings were held on weeknight evenings in October that lasted approximately two hours. One additional focus group meeting was cancelled due to low expected attendance, but two participants submitted their comments via email.

Approximately 150 individuals who recreate on WMAs were invited to attend the focus group meetings. Invitees were selected because they had previous contact with the Virginia Department of Game and Inland Fisheries (VDGIF) regarding WMAs, or because they had participated in the WMA field survey that took place on 10 WMAs from September 2009-September 2010. Of those invited, thirty-four individuals attended a focus group meeting or submitted comments via email. Twenty-five participants were men and nine were women.

During the meetings, participants responded to a series of questions (indicated in bold below) posed by the facilitator. An overall summary of responses from all meetings is provided below. Please see individual meeting summaries for more detail along with selected direct quotes that help illustrate particular themes or key points in that discussion. The views expressed at these meetings represent only the participating individuals and should not be considered representative of all WMA users.

What recreational uses or activities do you believe would be appropriate (or not appropriate) on wildlife management areas?

Most participants accepted or even encouraged non-consumptive activities on WMAs, but felt that they should be both secondary to and compatible with the primary uses of hunting and fishing. Some participants noted the importance of bringing in a new constituency to help support the WMAs in the face of declines in hunting and fishing participation.

Do you think the overall goal for land management on wildlife management areas should be to allow the vegetation to mature naturally without much human intervention or should VDGIF actively manage portions of the WMA to create desired habitats?

Most participants felt that WMAs should be actively managed for wildlife habitat. Some participants noted that the missions for other types of public lands (e.g., National Park, National Forests) involve preserving habitat, so it is not necessary for WMAs to protect land as a “museum.” Many participants indicated the opportunity to actively manage some areas of the WMA, while preserving other areas that may be inaccessible to equipment or habitat for a rare or infrequent species. However, some participants, particularly those at the meeting in the Southwest, felt that forested WMAs should not be managed but rather left to Mother Nature.

Timber harvesting is one way to manage portions of the WMA, and can be applied in a variety of ways and to achieve different outcomes. What is your opinion about harvesting timber on wildlife management areas?

Most participants were generally supportive of timber harvesting, when applied in the appropriate area and done responsibly. If participants had objections to timber harvesting, it was often associated with larger clearcuts. Those individuals were usually supportive of smaller patch cuts or selective cuts as an alternative. However, some participants, particularly those at the meeting in the Southwest, objected to all forms of timber harvesting because of aesthetic concerns.

Prescribed burning involves the use of monitored fire under specific environmental conditions to achieve management objectives. What is your opinion about the use of prescribed burning on wildlife management areas?

Participants were generally supportive of prescribed burning. Most groups brought up the importance of the conditions associated with a prescribed burn, such as time of year and weather conditions. Most believed that prescribed burning was good to clear out the understory of the forest and benefit wildlife.

Herbicides are chemicals applied to prevent or slow the growth of vegetation that is deemed undesirable. What is your opinion about the use of herbicides on wildlife management areas?

Participants were somewhat supportive of the use of herbicides in certain conditions, but were often very concerned about implications such as drift to unintended areas and impacts on water resources. Some felt that a targeted approach was more acceptable than broadcast spraying, but would be ineffective and costly under some circumstances, such as treating invasive species. Others suggested using other management practices whenever economical and practical, while considering herbicides as a last resort.

Mechanical techniques involve the use of machinery to maintain roads, parking areas, trails, boat ramps or fishing accesses, and/or to do vegetation management. What is your opinion about the use of mechanical techniques on wildlife management areas?

Participants were generally supportive of the use of mechanical techniques to manage vegetation and the upkeep of facilities. Some participants supported the use of mechanical techniques when used on a larger scale, but felt that the smaller scale treatments were more like “manicuring” the WMA rather than necessary tasks. Some participants felt that mechanical techniques were acceptable for maintenance of roads and facilities, but were not acceptable when used in conjunction with land management practices.

What do you see as being the most pressing issue with wildlife management areas today?

Pressing issues raised varied somewhat among focus group meetings. In the Tidewater region, the commonly reported issues were dealing with the challenges of vandalism on WMAs and the lack of funding to meet management objectives. In the Southwest, the most pressing issue reported was making sure that hunters and anglers retain priority on the WMAs rather than catering to non-consumptive users. In Northern Virginia, the most pressing issue for participants was managing conflict between user groups, most notably between hunters and non-hunters. In the Shenandoah Valley, the most pressing issue was attracting a new user base to support and fund management on the WMAs, as well as retaining priority for hunters and anglers.

Some wildlife management areas have shooting ranges available for public use. What is your opinion about the inclusion of these facilities on wildlife management areas?

Participants were generally supportive of the range facilities. Most brought up the challenges faced on the ranges, such as vandalism, litter and crowding. However, most participants believed that range facilities were necessary to concentrate sighting-in at a safe location and provide a place for public shooting. Some believed that range facilities should be expanded and offered at more WMAs. Many participants thought that a user fee would be one way to curb some of the vandalism and create more accountability for those that use the ranges.

Do you have any other thoughts about management of Virginia's WMAs that you would like to share?

Many participants supported some kind of user fee on the WMAs, whether it be charged of all users (even those that already have a hunting or fishing license) or just those who do not already have a license. Many noted the significance of having public lands on which to hunt and participate in wildlife-related recreation activities, and the importance of retaining these places to pass on to the next generation.

Additional comments varied by meeting, and can be viewed in the individual meeting summaries.

Appendix D:

Wildlife Management Area Workshop Report

March 2011

Executive Summary

Wildlife management areas (WMAs) are managed by the Virginia Department of Game and Inland Fisheries to provide and enhance wildlife habitat, as well as to provide opportunities for hunting, fishing, and other compatible outdoor recreational activities.

In March 2011, 5 evening workshops were held across Virginia to involve the public in developing goals for recreational use and land management on wildlife management areas (WMAs). Over the course of the workshop series, 112 individuals attended to provide their input. Attendees represented a wide range of interests, including hunters, anglers, adjoining landowners, equestrian users, native plant enthusiasts, hikers, and wildlife watchers. The goals and ideas shared at the workshops will inform the development of a statewide policy-level management plan for Virginia's WMAs, which will be available for review and comment in summer 2011.

Several common themes heard in the recreational use discussions included providing accessible information to users so that they can make informed decisions about when to use the WMAs, retaining primary use of the WMAs for hunters and anglers, allowing a broad range of compatible uses, and increasing opportunities for use by youth and disabled individuals. In the discussion of wildlife habitat and land use, common themes included managing for a wide variety of habitat types to support a diversity of native wildlife species, actively managing habitat for game species, and controlling and preventing the establishment of invasive species.

In many of the discussions, participants believed that more communication of information (e.g., hunting seasons, regulations, rationale for land management activities) as well as increased enforcement of regulations (e.g., use of ATVs, littering) would benefit both recreational use and wildlife habitat management on WMAs.

Notes taken at each of the workshop meetings and the number of dots participants put on each item (to indicate high priority for that item) are on the following pages.

Management Goals for Wildlife Management Areas

Tuesday, March 8, 2011 – Warrenton, VA

28 participants

Habitat question: What should the landscape on WMAs look like? What composition of habitat types should VDGIF strive to attain on its WMAs?

- Eliminate/control invasive/exotic species (19 dots)
- Balance non-game and game species management (12 dots)
- Manage for native plant species (11 dots)
- Preserve unique features (9 dots)
- Manage for large blocks of forest and protect wildlife corridors (8 dots)
- Maintain a “healthy” ecosystem and ecological integrity (6 dots)
- Manage aquatic habitats (6 dots)
- Balance management of habitats (5 dots)
- Protect water quality (5 dots)
- Appropriate management of unique/rare habitat/plant species (4 dots)
- Manage for game species since they provide the funding (4 dots)
- Manage for native wildlife (i.e., not non-natives) (4 dots)
- Work with localities on land use issues (i.e., give WMAs a voice in the community) (4 dots)
- Manage for all (a broad range) of species (3 dots)
- Passive management (less is more!) (3 dots)
- Diversity of cover types (2 dots)
- Consider topography (e.g., steep terrain, mountainous areas) (2 dots)
- Allow nature to take its course/ use adaptive management to incorporate natural events into management activities (2 dots)
- Consider ecological features (e.g., wetlands) (1 dot)
- Manage to balance certain wildlife populations (i.e., “enough” of wildlife species x but keep populations in check) (1 dot)
- Consider the local demographics surrounding the WMA (i.e., more management in populated areas) (1 dot)
- Actively manage for wildlife habitat (1 dot)
- Manage for select species (0 dots)
- Landscape should match/resemble the surrounding area (0 dots)
- Consider physiographic regions (e.g., appropriate management within climate, topography and regional constraints) (0 dots)
- Make provisions for recreational access during land management (0 dots)
- Manage habitat for the safety of visitors (e.g., dangerous tree limbs in parking areas) (0 dots)

Recreational use question: What should the goals for management of recreational use of WMAs be?

- Designate horseback riding as a recognized/compatible use of WMAs (18 dots)
- Provide better maps & trail markings on the Dept. web site and on the WMAs (15 dots)
- WMA users should know that hunting is a primary use of the areas (12 dots)
- Increase emphasis on nongame/wildlife diversity programs on WMAs (10 dots)
- Provide more opportunities for handicapped hunters/wounded warriors—at least one area in each region (8 dots)
- Foster more conservation of native plants and access to be able to view them (8 dots)
- Foster relationships with other groups (e.g., Potomac Appalachian Trail Club) to improve mapping & trail maintenance (8 dots)
- Provide an easy-to-read guide to when hunting occurs and when it doesn't to make it easier for people to figure out when they can engage in other forms of recreation without interfering with or worrying about hunters—both on web site and at WMAs (7 dots)
- Promote youth hunting events on WMAs as a trial for statewide events (e.g., youth bear hunt day) (6 dots)
- Increase enforcement efforts on WMAs (will be even more important if new rules, e.g., fees, are implemented) (4 dots)
- If there is a use fee, hikers/horseback riders/birdwatchers should have equity in benefits of management (e.g., facilities for those users) (4 dots)
- Specify times on Thompson WMA for trillium viewing & bird watching (during peak warbler migration) when no turkey hunting would be allowed (4 dots)
- Educate users as to what effects their use has on the wildlife resources (3 dots)
- Educate users about their effects on other users (2 dots)
- Require all users to wear blaze orange during seasons when hunters are required to (2 dots)
- Create one-stop shopping if a user fee is charged so users don't have to go to several different agencies to pay fees (e.g., Forest Service, Park Service, state parks, state forests; also some discussion about logistics of collecting fees, concerns about creating expectations of greater services provided if people pay a fee) (2 dots)
- More outdoor education workshops on WMAs to inform people of allowable uses (2 dots)
- Publish and post more information about uses & events going on at WMAs (e.g., when and where field trials are occurring) (1 dot)
- Provide maps and notices that delineate potential areas of conflict between users (e.g., where & when field trials are occurring) (1 dot)
- Educate people about the existence of WMAs and what uses are permitted on them (0 dots)
- Increase awareness that access on all WMAs and in certain parts of WMAs is not equal (i.e., some roads not suitable for passenger cars) (0 dots)

- Conduct a survey of license buyers to assess whether they think all WMA users should pay a fee (0 dots)

Management Goals for Wildlife Management Areas

Wednesday, March 9, 2011 – Newport News, VA

10 participants

Habitat question: What should the landscape on WMAs look like? What composition of habitat types should VDGIF strive to attain on its WMAs?

- Manage habitat for species in decline (6 dots)
- Plant more crop fields to maximize production (6 dots)
- Increased waterfowl management (e.g., impoundments, wetlands) (6 dots)
- Manage WMA to support hunting activity regardless of the surrounding landscape (6 dots)
- Manage for a variety of game species (e.g., deer, turkey, quail, waterfowl) with a variety of management techniques (5 dots)
- Actively manage (3 dots)
- Mix of managed and unmanaged habitat (3 dots)
- More dove fields (2 dots)
- Provide habitat to increase small game hunting opportunities (2 dots)
- Manage aquatic habitat for game fish (1 dots)
- Variety of habitat types (0 dots)
- Consider regional characteristics (0 dots)
- Less intensively management habitat (naturally occurring) (0 dots)
- Changing management with changing species composition (0 dots)
- Managing to local landscape (0 dots)
- Manage for early successional habitat (0 dots)

Recreational use question: What should the goals for management of recreational use of WMAs be?

- Hunting should be regarded as the primary use of WMAs (11 dots)
- Develop restrictions/rules for non-hunters during hunting seasons to create safety zones & prevent interference with hunting (9 dots)
- Manage for a variety of nature-related uses (not just hunting) (4 dots)
- Increase revenue to support more active management of WMA lands (4 dots)
- Increase opportunities for training of dogs on WMAs (3 dots)

- Use WMAs as a laboratory to demonstrate that hunting and other uses are compatible (3 dots)
- Increase emphasis for youth and novice hunters on WMAs (2 dots)
- Increase emphasis & access (create more opportunity) for handicapped hunters (2 dots)
- Increase number and variety of sight-in ranges on WMAs (1 dot)
- Implement mandatory blaze orange for non-hunters (for safety, respect for other users) (1 dot)
- Increase safety/hunter awareness for hunters and non-hunters, e.g., different safety colors for non-hunters (0 dots)
- Fees: group discussion of potential fees for WMAs revealed a mix of opinions—some participants wanted no fee, others felt a fee that exempted license buyers would be a good idea. Several participants expressed concern about changing the mix of stakeholders if non-hunters became paying customers of WMAs. (This discussion not rated for priorities).

Management Goals for Wildlife Management Areas

Thursday, March 10, 2011 – Richmond, VA

8 participants

Habitat question: What should the landscape on WMAs look like? What composition of habitat types should VDGIF strive to attain on its WMAs?

- “Wildlife” is inclusive- manage for all species (native emphasis) (5 dots)
- Good habitat for turkeys, waterfowl, dove, small game (4 dots)
- Maintain a variety of habitat types, e.g. mature forest, openings at various stages of succession (4 dots)
- Timber harvest areas should naturally regenerate (4 dots)
- Majority should represent the natural landscape (3 dots)
- Food plots, more intensively managed areas should also be there (2 dots)
- Need to address invasive species, including pro-actively to prevent invasions (2 dots)
- Preserve unique features, e.g. vernal pools (1 dots)
- If water on the property, manage carefully- native species emphasis (1 dots)
- Amphibians important to ecosystem- avoid practices that harm them, need to ID sensitive areas (1 dots)
- Habitat for birds- like to observe (1 dots)
- Maintain buffers for safety (bullets carrying off property) (1 dots)
- Consider seasons when cutting timber to avoid negative impacts on birds, other species (1 dots)
- Create/maintain wild areas- island surrounded by agricultural areas (0 dots)
- Reservoirs of genetic integrity (0 dots)

Recreational use question: What should the goals for management of recreational use of WMAs be?

- Hunting, fishing, and trapping preserved (7 dots)
- Fee comments (5 dots)
 - Pay fee at WMA is benefits equestrian use
 - Fee would control vandalism and litter
 - Fee is okay if supports management of facilities
 - Every individual would need permit?
 - Concern with guests
 - Hunting or fishing license as permit, stamp for WMA use
- Field trial policy for all WMAs (3 dots)
- Encourage wildlife watching (2 dots)
- Public notice of hunting seasons on the web and on-site (2 dots)
- Monitor activities that may damage habitat, keep them in check (2 dots)
- Expand sight in ranges- more ranges, longer season and hours (2 dots)
- Manage hours of ranges for “quiet time” in mornings (quality of experience for other activities (2 dots)
- Consider reinstating pistol use (1 dot)
- Better maps for hiking and trails on the website, topographic maps, horse trailer parking (1 dot)
- Better signage on-site (1 dot)
- Safety during hunting seasons- regulation to require blaze orange (1 dot)
- More accessible fields for horse camping (1 dot)
- Equestrian use (1 dot)
- Hiking opportunities (0)
- Non-motorized water sports (0 dots)
- WMAs as education laboratories (school groups) (0 dots)

Management Goals for Wildlife Management Areas

Wednesday, March 16, 2011 –Verona, VA

36 participants

Habitat question: What should the landscape on WMAs look like? What composition of habitat types should VDGIF strive to attain on its WMAs?

- A variety of habitats to produce a variety of wildlife (19 dots)

- There is a need for some “intensively” managed practices (e.g., clearcuts, fire) to produce habitat needed by wildlife (19 dots)
- Maximize level of intensive management with emphasis on game species (14 dots)
- Maximize, with biologist guidance, use of timber harvest to enhance early succession habitats and game species (12 dots)
- When considering anything more than “routine” maintenance, seek input and opinion from diverse experts and residents/users/stakeholders (including use of pesticides and herbicides) (9 dots)
- Certain areas have a need to remain “untouched”, remote habitats (9 dots)
- Game species = more money available for management; other species benefit from game management (8 dots)
- Use Dept. of Corrections as labor force to accomplish management goals (7 dots)
- Communicate information about habitat and need for management (e.g., these are not static environment) and why manage (7 dots)
- Generate website information on management goals/objectives and practices being considered for management- with justification and rationale (site specific) (6 dots)
- Following application of a management practice/operation, perform necessary monitoring and follow-up; make needed repairs adjustments to achieve goals (5 dots)
- Rely on biologists to provide the guidance and information on what is needed/appropriate (5 dots)
- Conduct regular inventory to assess management needs/population status (5 dots)
- Establish a percentage or number on habitat types needed or desired (3 dots)
- Manage for diversity (3 dots)
- Manage to provide ecosystem services (3 dots)
- Manage for native species (3 dots)
- Consider “human impact” factor when developing management plans (a human carrying capacity) (3 dots)
- Apply management in more easily accessible areas (2 dots)
- Management can be applied on an as needed bases, even in remote areas (2 dots)
- Where appropriate, manage for unique habitats not in great abundance locally (2 dots)
- Provide funding/incentives to abutters to correct/modify impacts affecting WMAs (2 dots)
- Be cautious to avoid making “mistakes” (e.g., introducing invasives) and correct past problems (1 dot)
- Consider moratorium on genetically modified species (1 dot)
- Streamline management initiation process- let VDGIF biologists determine and do it (limited input from stakeholders) (1 dot)
- More aggressive management needed, but may be site specific in terms of need (1 dot)
- If you have a balanced habitat, you’ll get a balanced wildlife population (0 dots)
- Maintain “farmland” habitats where appropriate; investigate cooperative agreements with local farmers (0 dots)
- Consider use of outside contractors to perform habitat work (0 dots)

- Consider implications of management (or lack thereof) occurring on adjoining lands (i.e., impacts inflicted on WMAs) (0 dots)
- Use genetically modified seed and herbicides where appropriate (0 dots)

Recreational use question: What should the goals for management of recreational use of WMAs be?

- Allow horseback riding, bird watching, mountain biking (31 dots)
- Don't restrict horseback fox hunting (buy a hunting license) (22 dots)
- All users of WMAs should have a hunting and fishing license (15 dots)
- Involve many and diverse users (10 dots)
- Illegal use of ATVs on WMAs needs to be controlled (more law enforcement) (10 dots)
- Limited commercialization (7 dots)
- Keep all WMA roads closed outside of the hunting seasons (7 dots)
- Don't limit non-hunting use- spring and fall are times for birding (6 dots)
- DGIF website should provide info on Birding Trail/Wildlife sites on WMAs and peak hunting periods (6 dots)
- Is there an impact on recreational experience by too many people on a WMA? (5 dots)
- User groups enter into agreements/partnerships for maintenance (4 dots)
- Keep undeveloped areas undeveloped- no developed recreation (4 dots)
- Limit non-hunting use to times when hunting isn't open (i.e., Sundays and closed season) (3 dots)
- Keep all WMA roads closed year round (3 dots)
- Require blaze orange for everyone when blaze orange is required for hunters (2 dots)
- Uses need to be balanced (heavy use and cause resource problems (2 dots)
- More gates on WMAs to restrict illegal activity (2 dots)
- Establish zones to restrict user conflicts (times of year or specific areas) (2 dots)
- Use WMAs for education, appreciate for wildlife (1 dot)
- Multiple and diverse uses are okay and fine with paying a fee (1 dot)
- Capture revenue from tourism industry (1 dot)
- Clearly identify if hunting and bird watching are occurring at Bird Trail sites (1 dot)
- Require hunter safety class for every use of WMAs (for safety reasons) (1 dot)
- Develop more sighting in ranges to spread use out (0 dots)
- A special use permit may be preferable to buying a hunting license (0 dots)
- Question on how fee would be applied to children or large groups (0 dots)
- Consider that bird watchers and non-consumptive users aren't taking any resources (0 dots)
- No access fee- dilutes current game warden emphasis (0 dots)
- More handicapped accessibility to ranges and WMAs (0 dots)
- Hunting is primary use and anything that interferes shouldn't be allowed (0 dots)

- More publicity of WMAs to encourage tourism (0 dots)
- Having to buy license and take hunter safety course- might be objectionable to some people (0 dots)
- Allowing anti-hunters to buy an access license instead of hunting license will encourage conflicts on WMAs (0 dots)

Management Goals for Wildlife Management Areas

Thursday, March 17, 2011 – Wytheville, VA

32 participants

Habitat question: What should the landscape on WMAs look like? What composition of habitat types should VDGIF strive to attain on its WMAs?

- Perform management specifically to enhance deer (20 dots)
- Enforce litter laws, which can affect wildlife and habitat quality (14 dots)
- Emphasize focus on enhancing game species management (deer, turkey, grouse, bear) (13 dots)
- Rely on biologists for expertise on management (12 dots)
- When considering possibility of doing timber harvest, examine/evaluate larger environmental impacts- make sure forest will come back (12 dots)
- Examine feasibility of providing additional water sources (including wetlands) (10 dots)
- Create a diversity of habitat types (6 dots)
- Need to provide additional transition habitats (edges) (6 dots)
- Manage for native wildlife, balanced (6 dots)
- Assure that soft mast sources are maintained or enhanced (5 dots)
- Utilize a rotation concept to ensure the presence of many different habitat types at all times (5 dots)
- Need for more “active” management (4 dots)
- Communicate to public/users about habitat, management, and reasons for managing (e.g., at kiosks on WMAs) (4 dots)
- Examine larger landscape that adjoins WMA and utilize information sources (e.g., soil maps) (4 dots)
- Consider using WMAs as American Chestnut re-establishment sites (4 dots)
- Management must be a balance- a mix of active and “hands off” (3 dots)
- Maintain large blocks of undisturbed (i.e., intact) habitats (3 dots)
- Renewed focus on forest openings, species dependent (grouse, woodcock)- do necessary timber harvests to create openings (3 dots)
- When conducting timber harvests, pay attention to ensuring maintenance of hard mast (3 dots)
- Establish native warm season grasses, where suitable to habitat conditions (2 dots)

- Do not allow invasive species to encroach (1 dot)
- Take into consideration habitat conditions on adjoining lands (0 dots)
- Leave WMAs, or parts thereof, to nature (i.e., passive management) (0 dots)

Recreational use question: What should the goals for management of recreational use of WMAs be?

- Provide horseback riding trails (26 dots)
- More bear hunting with dogs opportunities, particularly at Big Survey (15 dots)
- Diversified uses encouraged for kids (13 dots)
- Maintain shared recreational use of the WMAs (13 dots)
- Maintain ban on ATVs (12 dots)
- Exclusive hunter use during hunting season (10 dots)
- Dog training/field trials compatible on WMAs (seasonal regulation to avoid/minimize wildlife impacts (8 dots)
- Maintain some areas where existing road access stays closed to public traffic (8 dots)
- Hiking/foot trails (5 dots)
- Implement use fee stamp for all users (5 dots)
- Maintain horseback field trials (4 dots)
- Keep some areas closed to bear hunting with dogs (4 dots)
- Exempt license buyers from user fee method (3 dots)
- Maintain camping opportunities (3 dots)
- Encourage birding/wildlife watching opportunities (2 dots)
- If user fee, one incorporated stamp/permit for all uses (2 dots)
- No recreation or WMA use fee (2 dots)
- Consider safety zones designated at high use facilities (2 dots)
- Maintain and improve public access from numerous locations (2 dots)
- Hunters pay the bills- first priority (1 dot)
- Additional shooting/sight-in ranges should be located in isolated back-country (1 dots)
- No horseback riding (0 dots)
- Maintain low user conflicts (seasons, locations of facilities, segregating users, education, respect for other users) (0 dots)
- Build additional sight in ranges (0 dots)
- Opposed to trapping on the WMAs (0 dots)
- More open gates during hunting seasons (0 dots)

Appendix E:

**Goals and Principles for
Virginia's Wildlife
Management Areas: Public
Comments**

August- September 2011

The public input process for developing the Goals and Principles for Virginia's Wildlife Management Areas (WMAs) occurred during 2009-2011 and included the following:

- more than 4,000 face-to-face personal interviews with visitors at 10 selected WMAs (September 2009-2010)
- a follow-up mail and internet survey with interview participants who agreed to participate (March-April 2011)
- four focus group meetings with representatives of key stakeholder groups (October 2010)
- five public workshops for people who utilize the WMAs (March 2011), and
- a 4-week open public solicitation for comments on a draft of the goals and principles. The WMA technical committee met on Thursday, September 29, 2011, to consider public comments and work on revisions to the goals and principles.

Input gathered in all phases of the public input process has been incorporated into the development and then the revision of the goals and principles.

The draft goals and principles (referred to as "policies" in earlier versions of the document) focused on the habitat, wildlife populations, and recreational use components of WMA management. A draft document was available for public comment from August 2 through September 5, 2011. All of the emails, letters, and input submitted through a link on the Virginia Department of Game and Inland Fisheries website were compiled into this document. To condense the document, we removed duplicate comments (i.e., identical comments that an individual submitted multiple times in various sections of the comment form) and made note of that replication as a "special note." We also rearranged and collated comments by category to aid in review of the content; as a result, comments were placed under the most relevant goal (e.g., land management for wildlife under the habitat goal) regardless of where the comment originally had been entered into the system. Comments that did not align directly with one of the three goals were placed in a new section labeled "additional comments." Individual comments were kept intact even if they covered multiple topics; the comment was placed in the most appropriate category based on amount or clarity of content. If a participant provided identifying information (e.g., name, address, phone number or email) in their comment, we removed this information to maintain anonymity. Otherwise, we did not edit or change comments in any way.

The WMA technical committee within the Agency met on Thursday, September 29, 2011, to consider public comments and work on revisions to the plan. Revisions made to the plan, based on input, included the following:

- making more explicit the importance of hunting, fishing, and trapping as integral parts of WMA management and recognizing these uses as a priority on WMAs;

- inserting a conditional statement as an introduction to each goal that clearly states the historic and continuing priorities for WMA management;
- establishing as a priority the important role of active habitat management practices on WMAs; and
- improving the clarity and understanding of terminology used in the plan (e.g., social acceptance, wildlife-based recreation) by providing specific definitions or more detailed descriptions.

Appendix F:

Land management on Virginia's Wildlife Management Areas: A technical report

Chapter 1: Introduction

The Commonwealth of Virginia owns a statewide system of Wildlife Management Areas (WMAs) located in all geophysical regions. These lands are held in trust by the Virginia Department of Game and Inland Fisheries (DGIF) and managed to conserve and enhance habitats for Virginia's native wildlife species. Where feasible and compatible with habitat conservation goals, this management program also provides public access to habitat and wildlife resources, and many citizens of the Commonwealth view WMAs as places to experience wildlife habitats at their very best. Practices used to achieve these goals are supported through funds generated from hunting, fishing and trapping license sales and Federal grant programs, especially those administered by the U. S. Fish & Wildlife Service (USFWS).

Most of Virginia's WMAs were purchased in part with federal funds from the USFWS' Wildlife and Sportfish Restoration Program (WSFR). These grant programs require DGIF to establish the purpose (e.g., habitat conservation, hunting access, fishing access, endangered species restoration) for which the property is to be purchased and establish management intent in perpetuity or until such time that the original purpose for purchase is achieved.

The DGIF acquired the first WMA in the 1930s, and during the intervening decades, significant changes have occurred in Virginia. Since 1940, for example, Virginia's human population has almost tripled, shifting away from rural communities to the growing urban metropolitan areas along the interstates and coasts. As lifestyles have changed, Virginians' participation in wildlife-associated recreation has also changed. In 1991, according to the U. S. Fish and Wildlife Service, approximately 1 million Virginians, age 16 or older (22%), either hunted or fished. By 2006, that number of participants had declined to 857,000 (15%). Similarly, in 1991, approximately 2 million Virginians age 16 or older (44%) participated in some form of non-consumptive wildlife-associated recreation such as bird watching or photography. By 2006, that number had increased to 2.1 million, representing 36% of the Commonwealth's population.

As Virginia's social, demographic, and economic environments have changed, the public's interest in WMAs has also changed. During recent decades, the DGIF has been pressured to

provide an increasing number of more diverse public recreation opportunities on WMAs. While some of these uses are compatible with habitat management goals, others are not.

As indicated within Virginia's Wildlife Action Plan, the loss or degradation of habitats constitute the most serious threat to the sustainable management and conservation of Virginia's wildlife resources. Accordingly, the DGIF's primary management objective on WMAs is to maintain and enhance wildlife habitats to produce optimum populations of native wildlife. All other uses, including hunting, fishing, wildlife watching, and other human activities, are secondary and must be compatible with the primary wildlife habitat and population management goal. At the time of this writing, the DGIF manages 39 WMAs comprised of more than 200,000 acres spread across Virginia from the border with Maryland on the Eastern Shore to the far southwest corner of the state.

WMA Mission

The wildlife populations that Virginians enjoy exist, in part, because of the protection and management provided by the DGIF on behalf of the citizens of the Commonwealth. As such, it is the DGIF's responsibility to demonstrate good conservation practices on its lands for the development, maintenance and enhancement of habitats and the production of optimum populations of native wildlife. All WMAs are managed consistently with the DGIF's mission statement, which is:

- To manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;
- To provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation and to work diligently to safeguard the rights of the people to hunt, fish and harvest game as provided for in the Constitution of Virginia;
- To promote safety for persons and property in connection with boating, hunting and fishing;

- To provide educational outreach programs and materials that foster an awareness of and appreciation for Virginia's fish and wildlife resources, their habitats, and hunting, fishing, and boating opportunities.

To this end, DGIF researchers and practitioners continue to coordinate efforts to apply the best science-based habitat enhancement practices to Virginia's WMAs while also managing for publicly accessible wildlife-oriented recreation. Land managers have invested substantially in planning efforts to assure consistency of habitat enhancement practices and compliance with laws and policies. DGIF staffs currently employ a wide array of generally accepted, science-based land management practices designed to maintain and enhance the quality of upland, forest and wetland habitats.

Chapter 2: Current status of Virginia's Wildlife Management Areas

The Planning Process

The DGIF uses a 4-step planning process to identify management strategies for individual WMAs. These steps are:

1. Evaluation and inventory of a property

The DGIF's Land Acquisition Committee evaluates potential acquisitions to determine wildlife presence and abundance, habitat management opportunities, and recreational potential. Characteristics that may contribute to goals outlined in the Wildlife Action Plan are also considered. Evaluations generated by the Acquisition Committee are considered further by the Department's Senior Leadership Team and the Board of Game and Inland Fisheries prior to initiating purchase agreements.

2. Identifying management goals, objectives, and strategies

As part of the initial evaluation, DGIF staff identifies the primary purpose for acquisition by describing the property's resources, management potential, acquisition need, purchase objective, and the expected benefits and results. These characteristics are used to derive management goals, objectives and strategies after the acquisition is completed. These management goals, objectives and strategies are described fully in each WMA's Site Master Plan.

3. Creating a WMA management plan and implementing management actions to meet the specified goals

The DGIF's WMA management and science staffs coordinate the initiation and implementation of individual WMA site master plans. These plans outline the management activities that will be employed to meet the conservation goals described during the purchasing process. The WMA plan also outlines activities required to comply with soil and water conservation regulations and provisions of WSFR or other grant programs used to acquire the WMA.

4. Evaluating the Success of Management

As part of the process of site master plan revision, land management and science staffs evaluate the success of past management actions and wildlife response to those actions. This information is used to evaluate the current wildlife and habitat status on the property and to identify additional management actions needed to meet the conservation and recreation goals for the property.

DGIF Wildlife Management Area Status

The DGIF owns 39 WMAs in Virginia comprised of more than 203,000 acres of habitats and recreational lands. The WMAs are a significant portion of Virginia's public landownership and are distributed in 34 counties/cities across Virginia. The areas range from the wetlands of the Eastern Shore to the forested mountains of far southwest Virginia. Over 95% of Virginians live within 50 miles of at least one WMA.

The WMAs are also sited within all three physiographic regions of the Commonwealth. Eleven WMAs (34,000 ac) are located in the Coastal Plain physiographic region; 14 WMAs (35,000 ac) are in the Piedmont; and 14 WMAs (127,000 ac) are in the Mountains (Blue Ridge and Ridge & Valley physiographic regions).

Applied management varies, and characteristics such as size, latitude, elevation, topography, hydrology, accessibility, resident species, and activities on adjacent parcels influence the variety and quality of habitats and wildlife on WMAs. In general, WMAs are managed to provide forest, open land (native forbs and grasses), or wetland habitats. Unique landscape features, such as shale barrens, beaches, talus slopes, rocky outcrops, karst areas, open water, and developed areas (such as sighting in ranges, houses, work centers, etc.), make up a small percentage of the landscape. A more thorough summary of the Coastal Plain, Piedmont, and Mountain WMAs follows.

Coastal Plain WMAs

The wetlands of the Coastal Plain provide habitat for numerous waterfowl species as well as shorebirds and marsh birds. Forested lands generally consist of deciduous species with a small component of coniferous trees and mixed deciduous/coniferous stands, while the open land is comprised of crop fields and native forbs and grasses. A diversity of wildlife, including deer, turkey, and quail, utilize the Coastal Plain WMAs. Additionally, the Coastal Plain is home to 235 of the Species of Greatest Conservation Need (SGCN) described within Virginia's Wildlife Action Plan. The SGCNs found on these WMAs include rare species such as piping plover and Northern diamond-backed terrapin and more common species that are in decline, such as the northern bobwhite, whip-poor-will, least weasel, and eastern box turtle.

Virginia's Coastal Plain is bordered by the Piedmont to the west and the Chesapeake Bay and Atlantic Ocean to the east. The Coastal Plain represents 20% of Virginia's land mass and has the highest human population density of any physiographic region. The DGIF manages over 34,000 acres on 11 WMAs within the Coastal Plain.

Saxis and Mockhorn WMAs, located on Virginia's Eastern Shore, feature a variety of coastal marsh, beach, and hummock habitats. Further south, the Princess Anne WMA conserves coastal habitats along Back Bay. Collectively, these three WMAs are comprised of more than 14,000 acres of coastal habitats and provide a wide assortment of recreational opportunities. Likewise, these areas protect significant portions of Virginia's coast that DGIF's Wildlife Action Plan describes as being, "...one of the most important areas for migratory bird staging in North America."

Located within the City of Chesapeake, the Cavalier WMA is more than 4,500 acres of Coastal Plain forest land. It was purchased in 2005 for the purpose of restoring habitats similar to those currently found within the Great Dismal Swamp. Restoration of these habitats will benefit a variety of species ranging from game animals like white-tailed deer and black bear to more imperiled species such as the Dismal Swamp southeastern shrew, canebrake rattlesnake, and Wayne's black-throated green warbler. Habitat restoration and enhancement efforts are ongoing.

The Big Woods WMA includes over 2,200 acres of pine forest in stands of different ages. In addition to providing habitat for white-tailed deer, wild turkeys, and northern bobwhite, this WMA has been identified as one of the best opportunities in Virginia to restore a functional pine savannah habitat. Ongoing efforts to restore long-leaf pine ecosystems will facilitate efforts to recover the federally listed red-cockaded woodpecker and other pine savannah obligates identified within Virginia's Wildlife Action Plan. Noteworthy is the continued need for more burning of the understory. These fire-dependant ecosystems, and their fire-adapted constituent species of plants and animals, are declining in part due to the lack of periodic burning on the landscape. The Big Woods WMA is a recent acquisition, and habitat restoration efforts are beginning.

The DGIF manages two WMAs within the Coastal Plain portion of the Rappahannock River drainage: Land's End and Pettigrew. Land's End WMA provides a variety of open, forest, and wetland habitats and was purchased to support goose migrations. Land's End also provides habitats for bald eagles, white-tailed deer, wild turkeys, and carpenter frogs. The Pettigrew WMA is largely forested, but also includes wetlands and small amounts of cultivated habitats.

Pettigrew WMA supports deer, turkey and a variety of SGCN, such as spotted turtles. Habitat restoration and enhancement efforts are ongoing.

The Mattaponi WMA, another recent acquisition, is located in the York River watershed and is comprised of 2500 acres. The Mattaponi is largely forested, but contains a substantial open wetland and forested wetland component. Forests are dominated by loblolly pine, and wildlife present include deer, turkey, bear, quail and songbirds. Habitat enhancement efforts are beginning and will focus on pine forest and wetlands management.

Finally, the DGIF manages four WMAs with the Coastal Plain portion of the James River watershed: Chickahominy, Game Farm Marsh, Hog Island, and Ragged Island. The majority of these areas provide wetland habitats for waterfowl, yellow-crowned night-herons, rails, bald eagles and a wide variety of reptiles and amphibians. In addition to wetland habitats, Chickahominy and Ragged Island WMAs also provide upland habitats which support deer, turkey, quail, other small game species and numerous songbirds. Habitat restoration and enhancement efforts are ongoing.

Piedmont WMAs

Virginia's Piedmont extends from the Blue Ridge escarpment in the west to the Fall Line in the east. The Piedmont includes almost 40% of Virginia's land mass and most regional residents live in the urban and suburban areas along Interstates 66, 95 and 64. The Piedmont has the second highest human population density of all the physiographic regions. The DGIF manages more than 35,000 acres on 14 WMAs in the Piedmont.

The Amelia, Powhatan, Horsepen, Featherfin, and Briery Creek WMAs occur in the central Piedmont south of the James River, while the James River and Hardware River WMAs, also in the central Piedmont, are located on the north side of the James. Each of these WMAs is predominately forested, but also features a variety of wetland and open habitats. This combination of habitats accommodate an assortment of species, including deer, turkey, quail, beaver, brown creeper, winter wren, Rafinesque's big eared bat, eastern spadefoot toad, and eastern hog-nosed snake. Habitat restoration and enhancement efforts are ongoing.

Weston, Merrimac Farms, and C.F. Phelps WMAs occur in the Rappahannock and Potomac drainages. These WMAs are closest to the urban and suburban areas around Washington, D.C., and along Interstate 95. All are predominately forested, but also contain riparian, wetland, and early successional habitats. This combination of habitats accommodates many species, including deer, turkey, quail, bald eagle, spotted turtle, and northern saw-whet owl. Habitat restoration and enhancement efforts are ongoing. Merrimac Farms WMA is a recent acquisition and, in addition to maintaining the existing forested habitats, staff will apply practices that will enhance early successional habitats.

The Fairystone Farm, Turkeycock Mountain, Dick Cross, and White Oak Mountain WMAs are located in the Roanoke River drainage in Virginia's southern Piedmont. Each area supports forest, riparian, early successional, and wetland habitats. This combination of habitats accommodates an assortment of species, including deer, turkey, quail, northern harrier, spirit supercoil, eastern box turtles, and barn owls. Efforts to improve forest conditions and to enhance early successional habitats are ongoing on these WMAs.

Mountain WMAs (Blue Ridge and Ridge & Valley)

The Blue Ridge is a mountain range that extends across Virginia from southwest to northeast and separates the Piedmont from the Ridge and Valley region. The Blue Ridge physiographic province contains approximately 11% of Virginia's land mass and is home to less than 5% of Virginia's human population. The Ridge and Valley region consists of parallel southwest to northeast lines of mountains and valleys in western Virginia that extend from the Blue Ridge in the east well into West Virginia. The Ridge and Valley region covers approximately 24% of Virginia's landmass and is home to almost 12% of Virginians. The DGIF manages approximately 127,000 acres on 14 WMAs within these two regions.

Nine WMAs occur within the Ridge and Valley physiographic region: Highland, Goshen, Little North Mountain, Gathright, Short Hills, Havens, Clinch Mountain, Hidden Valley and Big Survey. These WMAs feature rugged ridges and slopes that primarily support hardwood forest

habitats that are important for popular game species, including deer, bear, turkey, ruffed grouse and squirrels, as well as an assortment of other native wildlife, including golden-winged warblers, timber rattlesnakes, fisher, Appalachian cottontails, and Indiana bats. These areas also provide important habitats for various birds during spring and fall migrations. Habitat restoration and enhancement efforts are ongoing. Short Hills WMA was purchased in 2010, and future habitat management efforts will focus on maintaining and enhancing hardwood forests along this ridge.

In the Blue Ridge physiographic region, Thompson, Rapidan, Stewarts Creek and Crooked Creek WMAs provide opportunities to manage riparian habitats and forested coves that are highly productive. These habitats support a variety of species including deer, turkey, American woodcock, ruffed grouse, mountain chorus frogs, and least weasels. Healthy aquatic habitats on these areas provide habitats for native trout species and promote the conservation of imperiled species like the green floater, the Cumberland bean pearlymussel, and the Appalachian hellbender. Habitat restoration and enhancement efforts are ongoing.

Recreational use on WMAs in Virginia

WMAs provide wildlife-related recreational opportunities including hunting, fishing, wildlife watching, and trapping. Recreational activities that are not related to wildlife are also popular on Virginia's WMAs, including hiking, horseback riding and mountain biking, as well as other activities. Due to unrestricted access to Virginia's WMA recreational programs, little is known about stakeholders and users who engage in activities that are not related to wildlife nor require a hunting, fishing or trapping license.

In 2008, the DGIF initiated an effort to learn more about WMA users and the activities in which they are engaged. During a field survey conducted on 10 WMAs from September 2009 to September 2010, surveyors interviewed more than 4,500 WMA users across the Commonwealth and asked them about their activities, frequency of WMA use, satisfaction with their visits, and opinions about habitat management practices and potential imposition of access fees. The 10 WMAs included in the study were: Chickahominy, Cavalier, Amelia, Dick Cross, Clinch

Mountain, Big Survey, Goshen, Little North Mountain, G. R. Thompson and C. F. Phelps. Surveys were distributed throughout the year and conducted on weekdays and weekends, with special hunting season opening days or target days surveyed in addition to randomly chosen sampling days. Responses indicated that approximately 65% of WMA users participated in consumptive activities on the day they were contacted (i.e. 45% hunting, 18% fishing, <1% trapping). Among hunters, deer hunting was most often indicated activity (60% of hunters), with dove (20%), turkey (9%), squirrel (7%), and bear (3%) hunting also significantly represented. In general, most visitors reported that they were satisfied following their visit to the WMA. Satisfaction ratings ranged from 4.5 to 6.2 on a 7-point scale (where 1 = very dissatisfied and 7 = very satisfied).

Frequently reported non-consumptive activities on WMAs included using the shooting range (11%), hiking or walking for purposes other than hunting, fishing, or wildlife watching (11%), wildlife watching or scouting (6%), camping (4%), boating (2%), and horseback riding (1%). Other relatively minor, but significant ,uses at some WMAs included wildflower viewing, photography, sightseeing, dog walking, and scenic driving. Some WMAs have a seasonal or specific use component unique to the area, such as the Thompson WMA near Front Royal. Each spring, visitors travel to the Thompson to view a unique wildflower plant community. The average satisfaction rating at Thompson on the wildflower viewing target day was 6.6 on a 7-point scale (where 1=very dissatisfied and 7= very satisfied).

Recreational use varied among the 10 WMAs examined and likely varies throughout the state based on WMA location, regional influences, and resources available. In general, WMAs within a short drive from the Richmond and Northern Virginia areas were visited more consistently through the year, while other WMAs were visited more often during hunting seasons. The survey also indicated that many WMAs also experience a seasonal change in use based on accessibility of the area and site-specific availability of resources, such as lakes and streams for year-round fishing, or trails to view wildflowers in the spring. Access is limited on some WMAs due to seasonal road closures, while on other WMAs, lakes and streams are accessible for fishing and sightseeing throughout the year.

Six of Virginia's WMAs have shooting range facilities available for public use, three of which were included in the study. The majority of participants in the WMA range user survey in 2009 and 2010 were hunting and/or fishing license holders (74%); however, a minority consisted of non-license holders (26%). The majority of the visitors to the range reported they were sighting-in for hunting season; however, over half of the participants also noted they were shooting recreationally during their visits. Several shooting ranges, particularly those within driving distance of urban centers, receive a high volume of use throughout the range season (September 1 through March 31).

The Amelia, Dick Cross, Chickahominy and Phelps WMAs are utilized by hunting dog field trial groups for competitions and events during the field trial season (September-March). Events can last up to a week or longer, with some trial participants electing to camp on the WMA during the event. Field trial participants use courses developed on these four WMA to allow hunting dogs (commonly bird-hunting dogs) to display their hunting abilities in competition. Participants follow the dogs on foot and on horseback for portions of the competition. Many field trial groups reported organizing at least one field trial on a WMA annually, with many reporting multiple events each season. Field trials constitute a large component of use on the WMAs where they occur, and many field trial groups are involved in the upkeep and maintenance of the course and/or facilities on the WMA.

Recreational users were asked their opinions regarding management practices used on WMAs to maintain and enhance wildlife habitats. In general, visitors were supportive of habitat enhancement techniques involving forest management and timber harvesting intended to create openings and promote growth of desired species of vegetation (supported by 73% of respondents) and prescribed burning to reduce fuel loading and promote growth of desired species of vegetation (supported by 76% of respondents). Visitors were very supportive of the use of machinery to manage vegetation (supported by 87% of respondents) and planting crops for wildlife food and habitat (supported by 92% of respondents) on WMAs. Participants were less supportive of the use of herbicides to manage vegetation on WMAs (supported by 34% and opposed by 46% of respondents).

Current Management Practices Employed

Land management practices employed on Virginia's WMAs are designed to enhance habitats and encourage optimum levels of diverse, native wildlife populations. Virginia's wildlife species need a variety of habitats to meet their yearly requirements for food, cover, water and space and these requirements vary by wildlife species. Gray squirrels need predominantly mature hardwood forest with cavity trees, while optimal deer habitat is a mix of 50% brushy cover (e.g., cutover timber land, abandoned fields, dense thickets), 25% mature hardwood forest and 25% open field habitat. Turkeys prefer habitat with more mature hardwoods and pines, but still need brushy areas for nesting and escape cover and open fields for insect foraging and brood rearing. Ruffed grouse require about 70% early-successional hardwood forests, 20% mature forest, and 5% open herbaceous clearings. Bobwhite quail prefer herbaceous plant cover (70%) with some hedgerows and recently harvested timberland (30%). All of these combinations benefit a variety of other wildlife. Large forested tracts provide habitat for wood thrush, other forest interior birds, and a variety of salamanders. Recent clearcuts provide benefits for yellow-breasted chats, indigo buntings, and a variety of other early successional habitat dependent species. A variety of habitat management practices are utilized by wildlife managers to create the habitat or vegetative conditions required by wildlife species found on WMAs.

Several habitat management techniques are used to manipulate vegetation on WMAs to create and maintain habitat conditions for a variety of wildlife species. These techniques are science-based and have been proven to produce desired habitat responses. Many of these practices are applicable statewide, although some are more useful in specific habitats or forest types.

A variety of land management practices regularly utilized by the DGIF are discussed in Chapter 3 of this report. However, it is important to recognize that special circumstances or extreme events may require implementation of special management techniques. Storms or extreme weather events (e.g., tornadoes hurricanes, ice storms, flooding) or severe infestations of non-native or invasive pests (e.g., Hemlock wooly adelgid) and invasive plants (e.g., kudzu) may require a site-specific management plan to address issues caused by these events. Other rare or unique habitat types (e.g., limestone cedar glades, pine savannah, high elevation grasslands/balds, Atlantic white cedar) may require non-traditional or passive management to

protect the area or limit the impact on unique habitats. Because certain wildlife species depend on these habitats, it is important to manage and preserve their unique features in perpetuity.

Like any other landowner, the DGIF is obligated to procure appropriate permits and approvals before disturbing soils to create wildlife habitat or conducting work on structures. The DGIF cooperates with other state and federal agencies to ensure compliance with regulations and permitting processes. Wetland permits, historic resources reviews, county and state building permits, soil and nutrient management plans and forest management best management practices are incorporated into WMA management plans. Individual project leaders and land managers are responsible for determining which permits or reviews may be needed and securing these permits or reviews from the appropriate agency or entity.

Chapter 3: Land Management Practices on WMAs

A wide variety of management practices are available for use on WMAs and are applied to appropriate sites. Although specific practices may be applied on small or site-specific scale, part of the management process involves consideration of the impacts of management applications on surrounding landscapes. Managers assess long-term outcomes and implications of each application under the conditions present. In many cases, the short-term outcome may not be the ultimate goal as there is often a lag between application and achievement of the desired habitat results. For example, clearcutting is conducted to regenerate shade-intolerant tree groups such as oaks and hickories that produce hard masts. Results are not immediate, but clearcuts create conditions conducive to encouraging growth of mast-producing species and achieving the goal of creating a forest with a strong oak/hickory component for the future.

This Technical Report outlines wildlife habitat management practices available for use on Virginia's WMAs, serves as a supplement to the WMA study final report, and functions as a reference and guide for DGIF staff in the future.

Virginia's WMAs are divided into compartments to facilitate forest management. Each compartment is evaluated on a 10-year schedule, and appropriate forest management

prescriptions are made. Uplands, wetlands, and forest clearings are reviewed yearly for application of habitat enhancements.

The specific habitat management techniques used to create and maintain wildlife habitat on the WMAs are defined in this chapter. Each practice is described using the following format:

- 1) **Definition** – what it is, description of the tool/implement or the specifics of the technique;
- 2) **Application** – how is it used, description of conditions under which it would be used;
- 3) **Management Goal or Desired Outcome** – why it is used, description of the end-product;
- 4) **Implications** – the advantages and/or disadvantages associated with this technique; and,
- 5) **Alternatives** – a list of other techniques that may create similar outcomes.

Section 1: Mechanical Techniques

Bulldozing/Excavating

Definition – Bulldozing and excavating is the use of a bulldozer, front-end loader, track-hoe or similar earth-moving equipment to move dirt, soil, debris and other material.

Application – These techniques are used to create and renovate wildlife clearings in forested and open land habitats, install fire lines, restore wetlands and construct and maintain roads. Bulldozing is used to remove trees and other woody vegetation to create forest openings, which are maintained in native forbs and grasses to provide habitat for wildlife. Fire lines established during bulldozing are used to contain prescribed fire to meet habitat objectives. Excavators are used to restore and create wetlands by constructing dikes and for to install water control structures. Roads and trails are constructed and maintained with bulldozers and other heavy equipment. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of this application is to maintain and enhance a variety of habitats and infrastructure on WMAs.

Implications – The operation of heavy equipment is relatively expensive and can also cause soil displacement if Best Management Practices (BMPs) are not implemented.

Alternatives – Heavy equipment replace shovels, picks and other hand tools. Concerns for wildlife that are unable to quickly disperse from work areas can be mitigated with awareness of species presence and implementation of time-of-year restrictions.

Disking

Definition – Disking is cultivating the upper layer of soil with a disk or harrow so that the sod layer is broken up to expose bare soil. Farm tractors pulling implements are commonly used. Types of implements include disk harrows, chisel-point harrows, spring-tooth harrow and chain harrows.

Application – This technique is commonly used in fields and forest clearings to reseed or establish new herbaceous vegetation. Disking is used to break up sod cover, prepare seedbeds and create fire breaks for prescribed burning. When used as a firebreak, disked lines may be left as bare soil, but often are seeded to wheat or rye as a green line. Disking to create early successional habitat should be timed to minimize the effect on wintering birds. Allowing vegetation to stand through the bulk of the winter months provides critical songbird winter cover. Fields are often managed by disking on a three-year rotation; this practice is applicable statewide.

Management Goal or Desired Outcome – The desired habitat goal for disking is to create and maintain an early successional grass/forb plant community

Implications – Disking is relatively inexpensive and can result in enhanced growth of native forbs and grasses that are not dense, a condition preferred by quail and many other bird species.

Alternatives – Similar habitat conditions can be created by lightly plowing. However, this approach often leaves the ground surface rough, and disking is required to smooth the surface. Prescribed fire can be used for similar effects in fallow field management. It should be noted that mowing is NOT a substitute for disking where bare ground or open structure is desired.

Drum Chopping

Definition – Drum chopping is the use of a heavy vehicle (bulldozer) to pull a large metal cylinder (drum) with longitudinal cutting blades to displace and cut woody stems. The drum is usually filled with water for additional weight.

Application – This technique is most often used in old fields or forest clearings where woody vegetation has grown too large to bush hog. Drum chopping is used to maintain early successional habitat by controlling the invasion of woody vegetation. The cutting blades of drum choppers break down woody vegetation and expose bare soil. Drum chopped areas are usually burned in the year subsequent to chopping and this practice is applicable statewide.

Management Goal or Desired Outcome – The goal of drum chopping is to maintain and enhance early successional habitats.

Implications – Drum chopping is a relatively expensive practice, requiring the use of heavy bulldozer and special transportation equipment for hauling. Drum chopping is not practical in areas with large stumps, debris, stems over six inches in diameter, or on steep slopes, extremely wet areas or areas with large rocks. Drum chopping can result in good growth of native forbs and grasses that are not dense, a condition preferred by quail and many other bird species; however, woody debris still remains in the chopped area, making it inaccessible to farm equipment. With this practice, environmental concerns are minimal since soil disturbance is limited, and the remaining woody debris reduces erosion. The residual woody debris improves cover for a variety of invertebrates and small vertebrate species. Use of drum chopping in early successional habitat should be timed to minimize the effect on wintering birds. Allowing vegetation to stand through the bulk of the winter months provides critical winter cover to songbirds.

Alternatives – Recovering early successional habitats in brushy fields or cutovers often requires bulldozing, mulching or drum chopping. Prescribed fire compliments the use of these mechanical methods and can often be used alone to achieve similar results.

Mowing or Bush Hogging

Definition – Mowing or bush hogging refers to the use of a farm tractor equipped with a large rotary mower or a side-mounted sickle bar mower to cut herbaceous and woody vegetation in fields and forest clearings and along roads and trails to keep these areas in early successional grass/forb habitats.

Application – Mowing is used to maintain herbaceous vegetation in fields and forest openings by cutting the herbaceous and woody vegetation. Cutting stimulates the herbaceous vegetation and prevents woody vegetation from growing and overtaking the field, thereby losing the benefits provided by the early successional herbaceous habitat. To avoid damage to nests and young wildlife, time-of-year restrictions should be implemented, avoiding nesting and brood-rearing seasons and allowing re-growth for winter food and cover. Mowing can also be used to keep woody vegetation from encroaching into roadways. Maintaining herbaceous cover along roads/trails creates linear habitats beneficial to many wildlife species for insect foraging, grazing, and nesting. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of this application is to maintain and enhance early successional habitats, road edges and associated habitats.

Implications – Mowing is labor intensive, but less expensive than other mechanical means often used to set back succession. Mowing slows the natural process of conversion of openings to shrubby cover and then to forested habitat as natural succession occurs. Mowing creates thatch and reduces bare ground.

Alternatives – Alternatives to mowing include application of herbicides to kill invading woody vegetation and use of prescribed burning to stimulate herbaceous cover and kill woody vegetation.

Mulching (Hydro-Axe)

Definition – Mulching is a land clearing practice in which woody vegetation is reduced to chips by a rotary cutterhead mounted on a Bobcat or large rubber-tired loader.

Application – This technique is used in old fields or forest clearings where woody vegetation has grown too large to bush hog. The cutterhead lightly disturbs the surface of the soil, mixing the chips with topsoil. This action stimulates the establishment of native forbs and grasses that provide food and cover for wildlife favoring early successional habitats. Mulching can also be used in cutover areas to maintain early successional habitat and is applicable statewide.

Management Goal or Desired Outcome – Mulching is used to create early successional habitat in areas that have become overgrown with woody vegetation.

Implications – Mulching is a relatively expensive practice and is not practical in rocky terrain, wet areas, or on woody stems over six inches in diameter. Mulching does not kill woody vegetation, and stump sprouting will occur. Mulching results in good re-growth of native forbs and grasses that are not dense, a condition preferred by quail and other ground-nesting bird species. The woody chips and debris decompose within a few years, adding nutrients to the soil. Depending on terrain, mulched areas can be disked and planted. Environmental concerns are minimal since soil disturbance is limited, and the remaining woody debris reduces chances of erosion.

Alternatives – Returning brushy fields or cutovers to early successional habitat usually requires bulldozing or drum chopping where mulching was not practical. Prescribed fire compliments the use of these mechanical methods and can often be used alone to achieve similar results.

Road Construction

Definition – Roads are developed on WMAs by excavating and removing obstacles (e.g., rocks, debris, vegetation, and soil) on a predetermined path. Construction and maintenance are conducted by the DGIF, hired contractors, timber buyers and cooperators. Bulldozers, motor graders and excavators are the primary equipment used to shape side-slope and road surfaces.

Roads are built from earthen materials located on-site and capped with either a natural or gravel-hardened surface.

Application – WMA roads are used for travel throughout WMAs from public roads. WMA roads provide access for habitat management, wildfire suppression, recreational access, research studies, back country emergencies, and patrol. WMA roads may be continuously open, seasonally opened, or continuously closed to public vehicular traffic. WMA users utilize roads for hunting, angling, hiking, bicycling, horseback riding and wildlife watching. The strategic placement of gravel, water-bars, broad-based dips, surface out-sloping, ditches and culverts are considered and implemented during construction to control surface water drainage on roads and trails to prevent erosion. Roads developed exclusively for timber harvests are usually closed afterwards and their natural surface stabilized, employing a combination of BMP and agricultural techniques to prevent erosion. This practice is applicable statewide.

Management Goal or Desired Outcome – The development and maintenance of a permanent and properly constructed road system provides safe, long-term use and produces minimal negative environmental impact.

Implications – Road construction is relatively expensive and planning is imperative to site roads with minimal impact to landscapes and wildlife resources. Use of BMPs reduces environmental impact and costs. Road construction can impact aesthetics, water quality, wetlands, flood plains, wildlife populations, habitats, unique geographical characteristics and historical and cultural features.

Alternatives – For public vehicular and management access, there are no practical alternatives to roads. Helicopter extraction of high value forest products is viable in limited high –value locations, restricted by proximity to highways, railroads, streams and power-lines.

Section 2: Agricultural Techniques

Managing forest clearings and openings

Definition – Creating forest clearings and openings involves use of heavy equipment (bulldozer, front-end loader, etc.) to remove trees or other woody vegetation to create a grassy or herbaceous clearing. Once the site is cleared, a seedbed is prepared using a farm tractor and implements, then soil amendments (lime and fertilizer) are added, and the clearing is seeded to the desired wildlife mixture.

Application – Creating a forest clearing or opening enhances growth of native grasses and forbs in forested and cutover sites, diversifying forested landscapes with interspersed early successional habitats. Successful locations are relatively flat and not too rocky, and linear clearings (brood strips) are favored along roadsides or trails where grade and soils allow. Clearings are managed to provide permanent cover of native grasses and forbs, but are sometimes managed for annual plants, typically corn or small grains. Slope is a critical consideration when creating new openings so that annual maintenance is possible using farm tractors. This practice is applicable statewide.

Management Goal or Desired Outcome – Forest clearings provide important insect foraging areas for turkeys, ruffed grouse and songbirds as well as important habitats for butterflies and grazing and feeding sites for deer, bear, and rabbits. These openings also provide nesting and escape cover and critical fawning cover for deer.

Implications – Clearings are relatively expensive to create. Heavy and farming equipment is required to clear, seed, and maintain openings. Openings provide critical early successional habitat for many wildlife species and hunters frequently visit clearings to hunt deer, bear, turkeys, grouse and quail. Annual mowing, periodic use of herbicides or application of prescribed burning to control invasion of woody vegetation is desirable to maintain an open condition. Management also includes application of soil enhancements to maintain productivity of native forbs and grasses or corn, small grains or clovers.

Alternatives – To maintain habitat diversity in forested landscapes, there are few alternatives to creating and managing openings and clearings. Logging decks and roads maintained in native

forbs and grasses also contribute to habitat diversity. Benefits provided by these openings are often temporary and are prone to invasion by woody vegetation if not maintained by mowing or use of herbicides. Utility right-of-way corridors can also be maintained as clearings.

Fallow Field Management

Definition – Fallow fields are sites that have previously been used for agricultural production but are currently uncultivated. Fallow fields are characterized by inactivity. “Fallowing” is the practice of allowing a field, or portions of it, to rest, growing only early successional native cover or vegetation.

Application – Fallow field management is applicable on any open fields where nesting, brood rearing, and feeding cover is desired without the application of direct management or cultivation. Fallowing is applicable statewide.

Management Goal or Desired Outcome –The desired outcome is an area in various stages of early-successional habitats dominated by native forbs and grasses high in seed and insect production.

Implications – Fallowing is less expensive than planting, fertilizing and managing crops for habitat enhancements. Habitat benefits are initially similar to those provided by managed fields but over time will decline. Managers should examine fallow fields annually for non-native, invasive plant species. .

Alternatives – A viable alternative is the use of rotational planting, actively managing a sub-section of the field or opening each year, leaving a portion of the area fallow. Costs are reduced by using inexpensive crops like millet and minimizing soil enhancements. This rotation cycle is often used with clover or other legumes to restore nitrogen to fallow fields, ultimately making the soil more productive for plantings in future years and creating forage for deer and many bird species in the process.

Field Borders (Cut Back Edge and Feathered Edge)

Definition – Field borders are the perimeter of crop, hay, pasture, or old fields and forest clearings. Managed field borders provide transitional herbaceous cover between forest and open land. Two management techniques are employed to create the desired stage of transitional cover: a *edge cutting* reduces the density of existing woody cover, and *edge feathering* provides some transitional herbaceous cover in the field. A combination of these techniques is used to provide a wider field border cover zone.

Application – The practice of creating a cut back edge is accomplished using chainsaws, weed eaters, mulchers and herbicides to reduce woody cover along the edges of fields. Cut back edges can be feathered by removing 75% of the trees in the first one-third the distance from the field or clearing edge, then 50% of the trees in the next one-third, and finally removing 25% of the trees in the last one-third. Edge feathering is also accomplished by allowing native vegetation to encroach into a field, with desired vegetation subsequently managed using a variety of techniques. Edge feathering is further encouraged by felling some perimeter trees into the field and allowing vegetative cover to develop. The results create a “stair-step” appearance as mature woodlands transition to tall shrubs, to lower growing shrubs and brier thickets, then into a mixed grassy and herbaceous zone, yielding eventually to crop, pasture or hay fields. These plants provide forage and cover for a variety of wildlife species, especially in winter months. These practices are applicable statewide.

Management Goal or Desired Outcome – The goal is to create a mixed shrubby, herbaceous and grassy transition zone between wooded areas and fields.

Implications – Creating cut-back edge can be labor- and time-intensive, as well as relatively expensive. Subsequent management is often required to control undesirable invasive vegetation. Allowing native cover to grow into a field often creates a rough or unkempt appearance and can allow non-native invasives to take hold.

Alternatives – The alternative to these techniques is to create a field border by planting desirable vegetation.

Field Borders (Planted Edge)

Definition – Planted field borders are zones around the edges of crop, pasture or hay fields that are planted with desirable vegetation to create a transitional cover zone between wooded areas and fields.

Application – Combinations of native forbs and grasses are used to plant a border of transitional cover into a crop, hay or pasture field. This result is achieved by using a combination of herbicide application and disking to prepare the planting zone. Native forbs and grasses can be planted by broadcast seeding or by using a seed drill to plant in rows. Shrubs can be planted by seed, but they are usually planted as seedlings (12” to 24” high) by hand using planting bars. Shrubs are also planted using a tree planting machine pulled by a tractor. Planted field borders create a “stair-step” effect or *soft edge*, as planted taller shrubs, transition to lower growing shrubs, down to grassy and herbaceous vegetation and eventually to the managed field. These planted field borders provide excellent forage and cover for a variety of wildlife species, especially in winter months. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of establishing planted field borders is to provide transitional habitat zone consisting of native forbs and grasses between wooded areas and fields.

Implications –Planting of field borders can be expensive and labor intensive. In addition, undesirable plants may invade the planted borders creating management problems.

Alternatives – Perhaps the best option for creating field borders is to allow native vegetation to encroach into the field and subsequently managing it by using low cost tools such as rotational disking, prescribed fire and selective herbicide application.

Hedgerow Establishment

Definition – Hedgerows consist of a mixture of shrubs, vines and thicket cover interspersed with native forbs and grasses. Hedgerows occur between open fields. Hedgerows were often planted to compartmentalize fields into smaller sections and reduce wind erosion. Hedgerow

management is used to create new, or renovate old hedgerows to enhance early-successional habitat benefits.

Application – Hedgerow establishment is used to create early-successional habitat between crop, hay, pasture or old fields. Woody plants comprising a thicket usually make up the core and are bordered on both sides by lower growing mixed native forbs and grasses. Hedgerows can be created by allowing native plants to develop or by planting. Hedgerows provide cover, food and connective corridors for wildlife to travel through and are valuable for a variety of songbirds and small mammals for both denning and territorial displays. Hedgerow development is applicable statewide.

Management Goal or Desired Outcome – The desired outcome is a transitional habitat and travel corridor between open fields.

Implications – Hedgerow establishment may encourage non-desirable vegetation to invade, requiring selective cutting, herbicide application, disking or prescribed burning for maintenance and control.

Alternatives – Hedgerows can be developed without the shrubby component and managed by rotational disking or burning and function more like filter strips, still providing transitional cover and corridors.

Planting and Food Plots

Definition – Food plots are cultivated and planted sites that may be small (1/4 acre) to large (10 acres or more). Commonly planted foods include clover, millets, sunflower, wheat, oats, corn, soybeans and lespedezas. Food plots cultured to attract deer and turkey have become popular in recent years and are often planted in winter wheat, small grains and clovers, combined with orchard grass or chicory.

Application – Food plots are prepared to develop a smooth, clean seed bed and are planted in crops attractive to wildlife. Soil amendments such as lime and fertilizer are often applied to correct soil pH, ensure good plant growth and enhance nutrition and palatability. To improve attractiveness, food plots cultured in annual and perennial forages are dispersed and managed to maintain foraging areas throughout the year. Cultured food plots often benefit a wide variety of songbirds, small mammals, and butterflies. Food plots are applicable statewide.

Management Goal or Desired Outcome – The desired outcome is a productive stand of planted forage that will provide attractive feeding areas for target species such as deer, turkey, quail, rabbits or doves.

Implications – Food plots are relatively expensive due to the cost of soil preparation. Plots cultured in annual forages do, however, provide high quality forages and reduce winter stress periods for game and nongame species.

Alternatives – Fallow fields, use of prescribed burning and practices that enhance growth of native forbs and grasses are alternatives to cultivated food plots.

Planting (Native Warm Season Grasses)

Definition – Native warm season grasses (NWSG) are defined as those that formerly occurred naturally in low abundance in portions of Virginia with growing seasons during the warmer months of the year. NWSGs are well adapted to drought conditions and include switchgrass, broomsedge, bluestem, little bluestem, big bluestem, indiangrass, and gama grass. These grasses grow in clumps or bunches, a characteristic beneficial to ground-nesting birds and other small animals. Bunch grasses enable movement by turkey and quail chicks while providing overhead cover and protection from avian predators. These grasses also provide fine, quick-drying fuels that burn well, supporting the use of prescribed burning to maintain early successional grassland habitats.

Application – NWSGs provide overhead cover with bare ground underneath, promoting safe foraging and movement by early-succession small animal species. For wildlife habitat and

population management purposes, pure stands of NWSG are not desirable. Rather, 30% to 50% NWSGs well interspersed with native forbs and grasses will enhance brood rearing, nesting, feeding and loafing cover for bobwhite quail, field sparrows, blue grosbeaks, rabbits, pollinating insects, butterflies and dragonflies. NWSG plant communities and habitats are dependent on rotational prescribed burning or mowing. This practice is applicable statewide.

Management Goal or Desired Outcome – The desired outcome is habitat beneficial to ground nesting birds and for escape and fawning cover.

Implications – NWSGs are relatively expensive to plant and difficult to establish without aggressive efforts to exclude sod grasses. NWSG communities can become too thick to produce the desired habitat enhancement effect if not managed with fire.

Alternatives – Removal of undesirable vegetation such as fescue or Bermuda grass through selective herbicide application, followed by prescribed fire and rotational disking will produce a diverse plant community consisting of native forbs and grasses with no planting required.

Planting (Cool Season Grasses)

Definition – Cool season grasses (CSG) are defined as those that grow vigorously during the cooler months of the year – early spring and fall months. CSGs include orchard grass, timothy, bluegrass, ryegrass, and grains such as oats, winter wheat, winter rye, and triticale.

Application –New fields or forest clearings are often seeded in a mixture of grasses that will provide food and cover for wildlife while stabilizing the soil and controlling erosion. CSGs are often used in conjunction with clovers to produce this effect. CSGs are also commonly used to stabilize disturbed soils on log decks, skid trails and truck landings as well as in linear food plots and brood strips. Site diversity is often enhanced by establishing cool season forbs such as clovers (many types and varieties), chicory, rape, Austrian winter pea and birdsfoot trefoil. CSG habitats provide beneficial forage, insect production and hiding or escape cover if managed at a density that does not restrict movement. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of planting CSGs is to enhance nesting, feeding and rearing cover for wildlife as well as stabilize soil in disturbed areas.

Implications – Establishing stands of CSGs is less expensive than establishing NWSGs. Farm tractors and implements are required for establishment, and management includes annual mowing to stimulate growth and control of woody vegetation and aggressive non-native grasses. Optimal stands of CSGs require applications of lime and fertilizer every 2 to 3 years, and clovers generally require re-seeding every 5 years.

Alternatives – An alternative is to allow openings and fields to revegetate naturally. Prescribed burning can be used to enhance habitats in forest landscapes if the forest canopy allows sunlight to stimulate native forbs and grasses.

Planting (Trees and Shrubs)

Definition – Planting trees and shrubs is defined as planting seedlings in a defined area to establish a specific woody or shrubby vegetative cover.

Application – Tree and shrub planting is used in old fields, openings, field edges, under thinned forest stands (under plantings) and in clearcuts where a specific cover type or enhanced diversity of tree and shrub species is desired. On forest sites, planting is usually accomplished using hand tools, inserting seedlings into openings made with tree-planting bars. In more open fields, mechanical tree planters are more efficient and less costly than hand-planting. This process is applicable statewide.

Management Goal or Desired Outcome – Tree and shrub planting enhances habitats by establishing a cover that also produces fruits and nuts. Planting tree seedlings also accelerates the process of forest regeneration towards tree species more desirable for wildlife and for hard and soft mast production. Planting trees and shrubs can also establish evergreen covers, providing critical thermal cover for winter, and can be used to restore rare or unique forest communities (e.g., Atlantic white cedar) or to create field borders and hedge-rows providing cover and fruit-bearing shrubs and trees.

Implications – Planting trees and shrubs is relatively labor-intensive and expensive. Site preparation and maintenance with herbicide and/or prescribed burning are required to reduce competition and promote planting success. Tree shelters and ground-cover mats are sometimes used to reduce browsing and competition, but such processes are expensive and prone to failure.

Alternatives – The prime alternative to planting trees and shrubs is to allow the area to regenerate naturally from existing tree seeds and sprouts. Tree species composition and competition is often managed through prescribed burning, herbicide applications, disking, drum chopping, and mulching. Rare species forest components usually require planting.

Herbaceous Seeding

Definition – Seeding is the application of soil culture and seeds by manual and mechanical means to establish or change herbaceous cover.

Application – Native forb and grass seeds are planted in a prepared seedbed. Seeding is employed when establishing clearings and food plots and for erosion and sedimentation control at excavated sites. Lime and fertilizer are often used to amend soil nutrients and ensure successful production. On Virginia's WMAs, fertilizer use is outlined in a site-specific Nutrient Management Plan approved by the Virginia Department of Conservation and Recreation (DCR). Mulch is often used on highly erodible sites to encourage seed germination, add soil surface stability and replenish lost organic matter.

Management Goal or Desired Outcome – Seeding is used to establish a forb and grass cover to promote soil stability, protect water quality, and enhance wildlife habitat.

Implications – Seeding with forbs and grasses beneficial to wildlife enhances control of plant species composition and speeds establishment of vegetative cover. This practice reduces stream sedimentation by incorporating BMPs during establishment. Soil stabilization in areas prone to erosion will improve stream and water quality conditions.

Alternatives – One option is to allow surrounding vegetation to invade unoccupied sites to establish ground cover and stabilize soils. Over time, natural plant communities will invade exposed soil but may not prevent substantial soil erosion prior to establishment.

Section 3: Forest Management Techniques

Silviculture Methods

Definition – Silviculture refers to the art and science of controlling the establishment, growth, composition, and health of a forest to meet stated objectives on a sustainable basis.

Application – Common silviculture includes even-aged and unevenaged management applications. Treatments are used to enhance growth, quality, vigor, and composition of the forest and include establishment, regeneration and final harvest. Treatments include thinning, timber stand improvement (TSI), crop-tree release, salvage cuts and final harvests. Forests are commonly managed as stands that are identifiably homogeneous receiving like silvicultural treatments. Silvicultural treatments are planned based on management objectives and sustainable application and these factors are used to determine an annual allowable harvest. All common silvicultural practices are applicable statewide.

Management Goal or Desired Outcome: Silvicultural practices are applied to optimize and enhance habitats.

Implications: Appropriate application of silvicultural practices reduces adverse affects on residual forest conditions.

Alternatives: Harvesting practices that remove the biggest and best trees are not sound intermediate treatments and are commonly referred to as “high-grading.” Such practices reduce the genetic diversity of the forest, limit forest quality, and reduce future forest value. Selective and diameter-limit cuts often result in high-grading.

Passive Management

Definition – Forest management without silvicultural applications. Natural processes are the dominate treatment.

Application – Passive forest management is often utilized in inoperable areas, to maintain sensitive ecological features, or where management resources are not available.

Management Goal or Desired Outcome – The desired outcome is habitat enhancements in areas where silvicultural applications are undesirable or impractical. Benefits accrue to wildlife species dependent on mature or intact forests.

Implications – Passive forest management reduces forest diversity and can adversely affect forest health. No application of management operations may also result in loss of early successional habitats and timber value.

Alternatives – Application of active forest management treatments including commercial and non-commercial harvests.

Clearcutting

Definition – Clearcutting is a silvicultural practice that removes all trees within a defined area.

Application – In hardwood and mixed-pine hardwood stands, clearcutting is applied to maintain a strong oak component in the residual stand post-harvest. In pine stands clearcutting is commonly applied to harvest mature stands, remove undesirable species, and to prepare the site for planting. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of clearcutting in hardwoods is to enhance habitats by maintaining a strong mast-producing component in forest stands. Oak, cherry and other desirable species are shade-intolerant and require full sunlight for survival. The goal of clearcutting in pine stands is to enhance habitats.

Clearcutting provides early successional habitats, often featuring a flush of herbaceous growth for several years after harvesting. This condition enhances growth of palatable browse, cover, insects, seeds and soft mast.

Implications – Clearcutting is controversial, but is a useful and important technique for regenerating shade-intolerant hardwood trees and improving habitats. Forest stands with strong mast-producing components are important for many wildlife species and clearcutting is a viable and sound technique for regenerating these desired forest stand compositions.

In pine stands, clearcutting as a technique is less controversial. Clearcutting in pines is used to harvest the desired forest product, renew the stand's habitat condition and to prepare the site for planting the next forest stand.

Alternatives –Alternatives to clearcutting include shelterwood harvesting and intermediate treatments to enhance habitats. However, these techniques may not produce canopy openings as large as clearcuts and the regeneration response of oak and hickory may be reduced.

Shelterwood

Definition – Shelterwood harvesting is a silvicultural practice that implies removal of most trees within a defined area while retaining temporarily some of the larger, more vigorous trees (25% to 50%) as a seed source, to provide shelter for sensitive seedlings, and to regenerate an even-aged forest stand.

Application – Shelterwood harvesting is applied primarily to regenerate even-aged hardwood stands. This technique is useful on sites where advanced regeneration is lacking or absent. Habitat features such as den trees and mast producing trees can be left within a shelterwood to meet wildlife habitat objectives other than regeneration. Completing application of this technique, the residual overstory is usually removed after sufficient desirable regeneration is established. Use of prescribed fire often enhances desired species establishment. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of shelterwood harvesting is to enhance habitats by encouraging regeneration of desirable forest tree species. This technique establishes early successional habitats. Similar to clearcuts, forests on shelterwood sites exhibit a flush of herbaceous growth for several years after treatment but also continue to provide crops of hard mast.

Implications – Shelterwood harvests are less controversial than clearcuts. Shelterwood harvests create habitat conditions similar to a clearcut while continuing to provide hard mast crops while the residual overstory remains in place. Shelterwood harvests are a useful technique for managing even-aged hardwood stands.

Alternatives – To achieve a similar result, alternative techniques include clearcutting and certain intermediate treatments. Intermediate treatments such as early and continued periodic thinnings can create similar forest regeneration responses and desired habitat conditions in forest stands.

Seed Tree Management

Definition – Seed tree regeneration is a technique applied to forest stands comprised of trees that produce light seeds easily dispersed by wind. Healthy, stable trees with favorable characteristics remain standing to “seed” the site, while all other trees are removed.

Application –Seed trees should be evenly distributed over the harvested site. The residual overstory density is substantially less than that of a shelterwood harvest, generally 8 or more trees per acre retained. This practice is applicable statewide, but is most commonly used in the Piedmont and Coastal Plain regions of Virginia, in pine stands. Generally, the residual overstory is not removed and the newly regenerated stand is of poorer quality than that of comparable planted stands.

Management Goal or Desired Outcome – The goal of this practice is to enhance habitats and to regenerate forest stands comprised of tree species with light seed, easily dispersed by wind. Habitat enhancements include escape, loafing and winter thermal cover.

Implications – Application of this technique establishes new forest stands with little or no regeneration costs, but usually the regenerated stand is of poorer quality. Also, compliance with Virginia’s seed tree law requires retaining 8 trees/acre in loblolly pine and white pine stands unless an alternate reforestation technique is applied.

Alternatives – An alternative to using seed tree regeneration is to plant tree seedlings or to engage in passive management.

Single Tree Selection

Definition – Single tree selection harvesting is an uneven-age silvicultural practice that implies selecting individual trees for harvest. Individual trees are selected from all size classes to maintain a self-sustaining forest of three or more age classes. Single tree selective cutting is not “selective cutting” often referring to removing trees in the same size class which results in high-grading or diameter-limit cutting.

Application – This practice is commonly used to regenerate shade-tolerant species such as American beech, black gum, flowering dogwood, red maple, and sugar maple. Over time, single tree selection will transform an even-aged forest composed primarily of shade intolerant species to one dominated by shade tolerant species. Single tree selection requires high management costs to implement correctly and is not used frequently. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of this practice is to enhance habitats by maintaining a continuous forest cover. Single tree selection harvesting and management produces stands containing at least three age classes from sawtimber to pole-sized trees to saplings.

Implications – This practice is not suitable for shade-intolerant species because of the challenge of establishing regeneration under shade where browsing intensity can frustrate seedling recruitment. Great care must be taken not to damage the residual trees left in the stand. This

practice is not widely used because of the potential for residual tree damage, the high management costs associated with inventory, and the potential for abusive practices such as high-grading.

Alternatives – An alternative would be to use the group selection practice, which is easier and cheaper to implement.

Group Selection

Definition – Group selection is an uneven-aged silvicultural regeneration method characterized by harvesting small groups of trees resulting in openings approximately equal to twice the height of the surrounding trees. Smaller openings favor shade tolerant trees while larger openings favor shade intolerant species. Many harvest openings are generally less than 2 acres in size.

Application – Group selection is similar to clearcutting, modified to favor shade tolerant species and uneven-aged stands. Trees of intermediate tolerance can be maintained in the center of these harvest units. Group selection requires a good road system and frequent entry to remove timber (every 5 years or so). After a few harvest cycles a landscape patchwork of openings and regeneration areas of different sizes and ages is created that is uneven-aged. This practice is applicable statewide.

Management Goal or Desired Outcome –The goal of this technique is to enhance habitats by creating stands with small clumps of relatively dense regeneration, saplings and pole-sized trees interspersed with stands of relatively mature trees.

Implications – Effective implementation requires considerable inventory and management effort to develop and maintain the uneven-aged structure over time. While the dense regeneration units provide cover and food for many wildlife species they are often too small to meet the year round habitat needs of many wildlife species.

Alternatives –Single tree selection may be an alternative to group selection, however, cost is much higher and implementation is more difficult for single tree selection. Single tree selection would not provide for regeneration of shade intolerant species.

Salvage

Definition – Salvage harvest is an intermediate silvicultural practice that implies harvesting dead, dying, or damaged trees.

Application – Salvage harvest is used to harvest trees and stands of timber that have been affected by natural disaster, disease or insect damage. This practice is applicable statewide.

Management Goal or Desired Outcome – Salvage harvests are applied to prevent the spread of insects such as southern pine beetle, disease and to utilize damaged trees.

Implications – Salvage cuts are often used to preserve forest health by preventing the spread of forest diseases and insect pests, as well as reducing fuel loads in forest stands impacted by hurricanes, tornadoes and ice storms. Salvage harvest revenues can offset other regeneration costs.

Alternatives – An alternative is passive management, allowing the area to regenerate naturally, accepting whatever impacts may occur. The tangles and large volume of coarse woody debris can provide valuable habitat to a variety of wildlife.

Crop Tree Release

Definition – Crop tree release (CTR) is an intermediate silvicultural practice intended to improve quality, composition and vigor of trees by reducing surrounding competition.

Application – Crop trees are selected based on species, condition and form according to management objectives. The practice is to select crop trees and then use herbicides, mechanical girdling or felling to reduce competition. This practice is applicable statewide.

Management Goal or Desired Outcome – The goal of the crop tree release method is to enhance the growth of selected crop trees, to control species composition of the future stand and promotes herbaceous growth in the understory. Habitat conditions resulting from this method depend on species composition and the amount of competition removed. Generally, there is an initial flush of herbaceous ground cover that over time is shaded out as the remaining trees expand their crowns into the adjacent space. This ground cover provides habitat for many early successional wildlife species. However, since this practice is done in a young forest stand, increased hard mast production should not be expected until the stand matures.

Implications – Crop tree release increases the growth and vigor of the crop trees which results in bigger crowns, more mast production in the future, and a higher value tree. This practice is labor intensive with little initial economic reward in the short-term.

Alternatives – An alternative would be to allow the stand to develop naturally or use conventional timber stand improvement and thinning practices.

Den Tree and Snag Retention

Definition – Management of den trees and snags implies retaining live trees with cavities and dead standing trees within a timber harvest site.

Application – This practice is applied to hardwood, mixed pine hardwood and pine stands to provide nesting and escape habitats for birds and small mammals. Not all forest stands will have cavity trees but where present it is beneficial to retain a few for cavity-dependent wildlife species. This practice is applicable statewide.

Management Goal or Desired Outcome – Den trees and snags are retained at the time of timber harvest to enhance habitats for cavity-dependant wildlife. Live-tree cavities often

develop due to a broken branch or top, or at the site of insect or environmental damage. These cavities provide critical shelter for many wildlife species like owls, raccoons, squirrels, song birds, woodpeckers, wood ducks, and black bears. Retaining four or more cavity trees or snags per acre is beneficial.

Implications – Retaining cavity trees and snags has few adverse implications. Generally, the commercial value of three trees is low and such trees are often avoided by timber operators. It may not be appropriate to retain such trees in areas high in human traffic. Trees infested with tree disease or harmful insects should be removed.

Alternatives – An alternative would be to build and erect nest boxes for cavity-dependent wildlife species.

Timber Stand Improvement and Thinning

Definition – Timber Stand Improvement (TSI) is an intermediate silvicultural treatment that implies thinning or partial removal of selected trees to reduce stand density and release the residual stand. TSI accelerates the natural process of plant succession that is usually driven by competition for sunlight, water and nutrients. Trees chosen for retention are selected based on quality or species. Multiple applications may occur over the life of the forest stand.

Application – TSI and thinning operations are applied commercially and pre-commercially. Pre-commercially, selected trees are usually removed by saw or application of herbicides. Such treatments improve the quality of the timber in the residual stand, enhancing habitats and timber values. The scale, scope and characteristics of TSI and thinning operations are determined by habitat goals and desired understory vegetation growth response. This practice is applicable statewide.

Management Goal or Desired Outcome – TSI and thinning are applied to reduce resource competition among trees within a forest stand to enhance the vigor, growth, and mast production of residual trees and to enhance habitats by stimulating understory plants. In hardwood and mixed-pine hardwoods, mast producing species such as hickory, black gum, black cherry, red

and white oaks, beech and uncommon food producers are retained as well as cavity trees and snags. Soft-mast producers are retained in the understory.

Implications – Use of thinnings and TSI offer opportunities to enhance forest habitats while promoting forest health. The scale with which commercial thinning can be applied may be limited by topography and relative value and the residual stand should be well-protected from felling and skidding damage. The temporary loss of support from neighboring trees increases the possibility of wind throw during high wind or ice storm events.

Alternatives – Alternative treatments to thinning and TSI include allowing natural succession to occur. Without these intermediate treatments, tree growth in pine stands will usually stagnate and the stand will become more susceptible to insect and disease damage. In hardwood and mixed-pine hardwood stands, competition will result in natural mortality and reduced vigor and growth, which leads to changes in composition from oak and hickory to maple, beech and black gum.

Section 4: Aquatic and Wetland Management Techniques

Dike & Dam Maintenance

Definition – Dike and dam maintenance is the use of equipment to remove woody vegetation, repair damage and prevent the growth of undesirable vegetation.

Application – This practice is applicable on all pond/lake dams and dikes created for wetland restorations or enhancements. This practice is applicable statewide.

Management Goal or Desired Outcome – The desired goal is to enhance wildlife habitats by maintaining functional dikes and dams and retaining wetlands.

Implications – The root systems of woody vegetation, animal burrows and water damage can create paths for water flow through the dam, creating the possibility of a breach of the structure. Regular maintenance can forestall these issues and reduce repair and replacement costs. The

Department of Conservation and Recreation (DCR) regulates dams and dykes in Virginia, enforcing dam safety laws developed by the Virginia Soil and Water Conservation Board.

Alternatives – There are no realistic alternatives to applying reasonable and routine maintenance to dams and dykes in compliance with rules and regulations.

Impoundment Management

Definition – Impoundments (ponds, small lakes, and reservoirs) on WMAs are designed to provide angling opportunities for warmwater fish species such as largemouth bass, smallmouth bass, chain pickerel, sunfish, channel catfish, black crappie, rock bass, northern pike, and walleye. Eight WMA impoundments, totaling 1414 acres, range from farm ponds to the 845-acre Briery Creek Lake.

Application – Fishing is the intended primary activity on WMA impoundments. Smaller boats and canoes are allowed for that purpose, and gas-powered motors are restricted to a few of the larger lakes. General recreational boating is prohibited

Management Goal or Desired Outcome – WMA impoundments are designed to provide angling opportunities and are managed as warmwater fisheries. Activities include aquatic weed control, fertilization and habitat structure enhancements. Developing new impoundments on WMAs is limited by landscape, legal restrictions, environmental considerations and costs.

Implications – As access to Virginia's waterways becomes more restrictive, impoundments on public lands become more valuable for recreational angling. Costs for mowing, inspections and legal compliances are important considerations. High visitation rates often lead to littering, vandalism, trespass and other misuses, resulting in increased management costs.

Alternatives – Streams and rivers offer most reasonable alternative to angling opportunities on WMA impoundments

Developing Shallow Water Impoundments

Definition – The use of heavy equipment (bulldozers, excavators, paddle pans) to build dikes, earthen plugs, and install water control structures for the purpose of impounding or holding water, creating wildlife habitat and recreational use.

Application – Creation of shallow water impoundments is applicable on wetland sites that have been previously ditched and drained for other management purposes. This practice is applicable statewide.

Management Goal or Desired Outcome – The creation of wetland habitat less than 2 feet in depth for varied species of wildlife.

Implications – Shallow water impoundments are valuable wetland habitat for many species of wildlife, both wetland dependent and upland species. The proper placement of dikes and plugs will allow the site to be managed for wetland vegetation or planted crops utilized as food sources for wildlife. Wetlands also provide resting, loafing, and escape cover for a variety of wildlife. In addition to the habitat benefits, wetlands also have many other values such as storm water retention, groundwater recharge, nutrient uptake, and buffering capabilities.

Alternatives – Alternatives include not completing the restoration and allowing the habitat to remain as is or changing the habitat to an alternative upland habitat.

Managing Shallow Water Impoundments

Definition – The use of tractors to manipulate soils, vegetation, and water levels in wetland impoundments.

Application – For use on managed impoundments statewide.

Management Goal or Desired Outcome – Manipulating soils, vegetation, and water levels can impact the types of vegetation growing in a shallow water impoundment. Early successional, high volume seed producing plant species provide valuable wintering habitat for a variety of waterfowl and wetland wildlife dependent species (moist soil management). Some crops are also planted in shallow water impoundments and then flooded to provide food sources. Some impoundments are managed for spring and fall staging habitats, concentrating on providing invertebrate food resources.

Implications – Providing high quality managed impoundments results in increased food resources available for waterfowl, shorebirds, wading birds, amphibians, and numerous other species of wildlife. These resources can be in the form of moist soil management, planted crops, submerged aquatic vegetation, and other vegetation types. Shorebirds can benefit from the presence of minimally vegetated shallow/exposed mudflats. Water level manipulations should take into account the life cycle of water dependent species such as amphibians.

Alternatives – Unmanaged wetland impoundments can quickly become vegetated by perennial species which do not produce the volume of seed resources. Use by wetland species decline, and the sites are susceptible to invasion by exotic invasive species.

Stream and River Restoration

Definition –Stream and river restoration on WMAs is conducted to stabilize channels or to enhance habitats for specific aquatic species. Associated riparian lands are also considered part of any stream or river restoration effort as these lands are critical to the health of streams and rivers and provide productive habitat for terrestrial wildlife.

Application – Streams and rivers on WMAs are used for a variety of recreational activities including fishing, canoeing/kayaking, wildlife observation, waterfowl hunting, trapping and camping.

Management Goal or Desired Outcome – The goal for managing WMA streams and rivers is to enhance habitats by stabilizing hydrological conditions and conserving riparian corridors that

provide shade, buffers and bank protection as well as improving habitat for species of conservation and recreational importance.

Implications – WMA streams and rivers are used extensively by visitors, often causing resource damage. Incompatible uses such as stream-side camping and swimming are common and popular, often negating habitat and aquatic population management efforts

Alternatives – Streams and rivers are dynamic systems reaching stability without active management given adequate time. Active management accelerates the process and improves water quality and habitats.

Section 5: Other Management Techniques

Herbicide Use (Control Woody Vegetation, Phragmites Control, Roadside Maintenance)

Definition – Application of herbicides controls undesirable vegetation to promote desirable habitat enhancements.

Application – Herbicides can be applied to control undesirable vegetation and to create conditions favorable for desired vegetation and conditions. Herbicides can be used to reduce woody vegetation, control undesirable grasses, facilitate plant community restoration and prepare sites for planting or prescribed fire. The application of herbicides to control vegetation is applicable statewide.

Management Goal or Desired Outcome – Herbicides are used to manipulate vegetation and enhance habitats by promoting beneficial plant communities and habitat conditions. Regular use of herbicides can reduce the need for mowing or other mechanical applications to manipulate vegetation.

Implications – Use of herbicides is often confused with the use of insecticides, which are generally considered more toxic to humans and therefore less desirable. Modern herbicides are safe and effective, can be expensive to purchase but are generally inexpensive in effect due to the reduced use of machinery and staff. Unintended application to desired vegetation cannot be reversed and often must be applied more than once to achieve the desired effect. A pesticide applicators license is required by the Virginia Department of Agriculture and Consumer Services (VDACS) to purchase and apply herbicides.

Alternatives – Prescribed fire applied during the growing season, repeated rotational disking or plowing, and row cultivation in planted crops can reduce the need for herbicides.

Nest Structure Management

Definition – Nest box management involves the installation of nest boxes and structures to encourage wildlife nesting and to enhance nesting success.

Application – Nest boxes and structures provide a critical habitat component in areas where cavity trees and snags are lacking or absent. This practice is applicable statewide.

Management Goal or Desired Outcome –The desired outcome is to enhance wildlife populations by providing additional nesting opportunities. Squirrels, bluebirds, bats, owls, purple martins, wood ducks, osprey and Canada geese commonly use artificial nest structures.

Implications – Nest structures require maintenance and proper construction to prevent excessive predation. Poorly constructed or maintained structures can become “breeding sinks”, attracting breeding activity but offering little chance of success. Nest structures facilitate wildlife study, providing access for researchers with relatively minimal disturbance wildlife

Alternatives – Improved management of cavity trees and snags is an alternative to nest structure management.

Prescribed Fire

Definition – Prescribed fire is the use of intentionally set and controlled to achieve desired habitat and wildlife management results.

Application – Prescribed fire is used to control and manipulate vegetation to create and enhance habitat conditions. Prescribed fire is used to enhance understory vegetation in forests, to maintain or change successional stages in open fields and to manage native grasses and forbs. This practice is applicable statewide.

Management Goal or Desired Outcome – A desired outcome is to enhance habitat conditions by controlling woody vegetation and encouraging native grasses and forbs. Prescribed fire is also applied to reduce competition and promote the regeneration of hardwoods, especially those that are shade-intolerant. Repeated applications of prescribed fire produces a diverse mixture of native grasses and forbs, providing food and cover for ground-nesting birds, deer, reptiles and small mammals.

Implications – Prescribed fire is cost-effective vegetative management application. Preparation is important to reduce the risk of escape and unintended damage and smoke dispersal affecting residential areas, highways or livestock. Prescribed burning in early successional habitats is timed to minimize adverse effects on wintering birds.

Alternatives – Use of rotational disking, mulching and herbicides can achieve similar results, but at a higher cost. Prescribed fire predominately replaces the historical natural occurrence of periodic wildfire and is applied in fire adapted ecosystems.

Trail Management

Definition – Trails on Virginia's WMAs are paths through woods and fields that allow easier access for travel areas of WMAs that are not immediately adjacent to roads.

Application – Trails are used for foot travel to remote areas from parking areas, interior access roads or public highways adjacent to WMAs. Many WMA trails are interior roads that are closed to public vehicular access but are used by staff vehicles for administrative purposes.

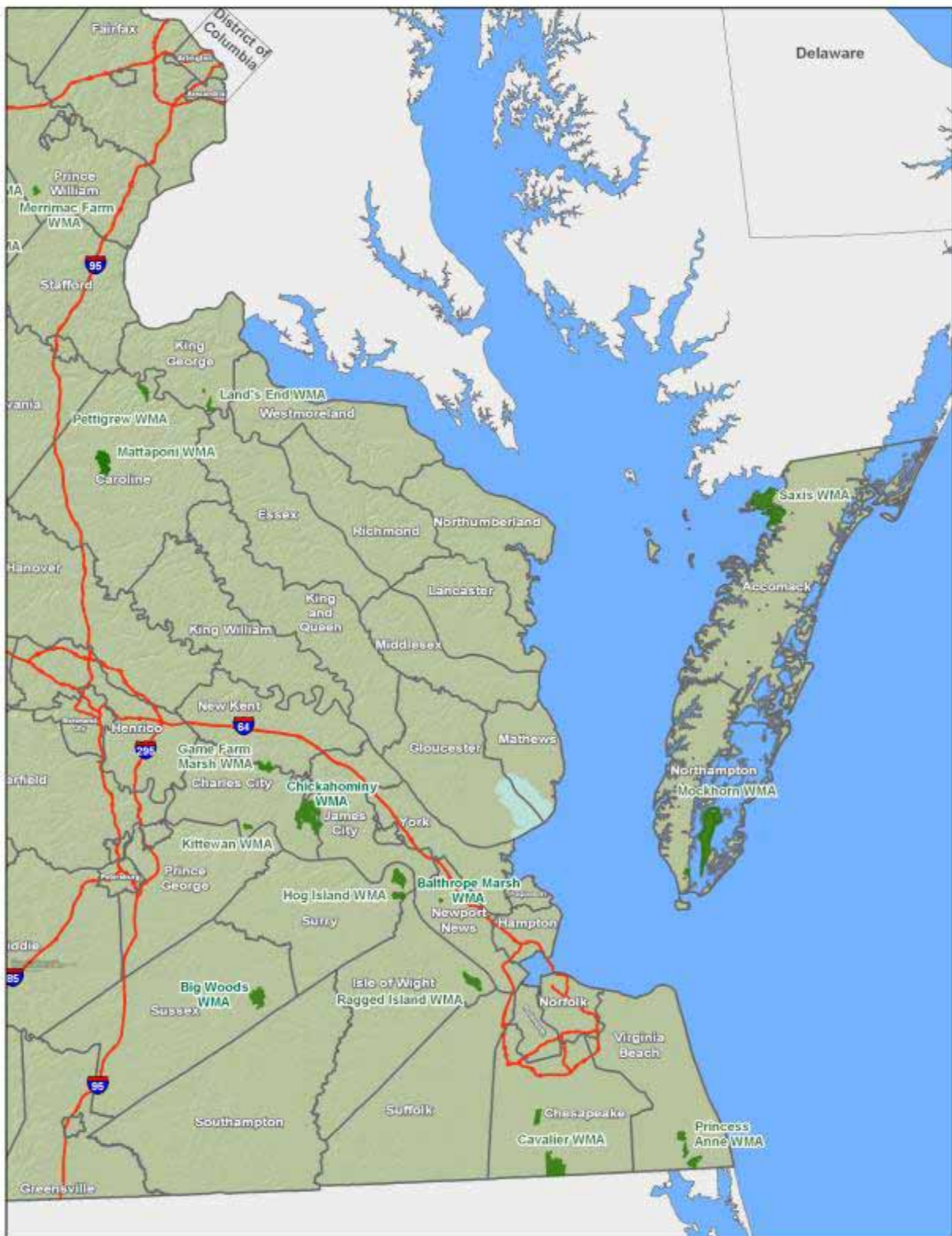
These trails are commonly used by horseback riders and bicyclists. Smaller foot trails on WMAs are generally developed by visitor use rather than by staff and are open for foot travel only. Horseback riders and bicycles are prohibited from using these off-road trails. Only the administrative roads are marked and maintained by WMA staff. Trail management is applicable statewide.

Management Goal or Desired Outcome – The goal for trail management is to facilitate foot access to areas of WMAs that are not served by roads open to public vehicular access.

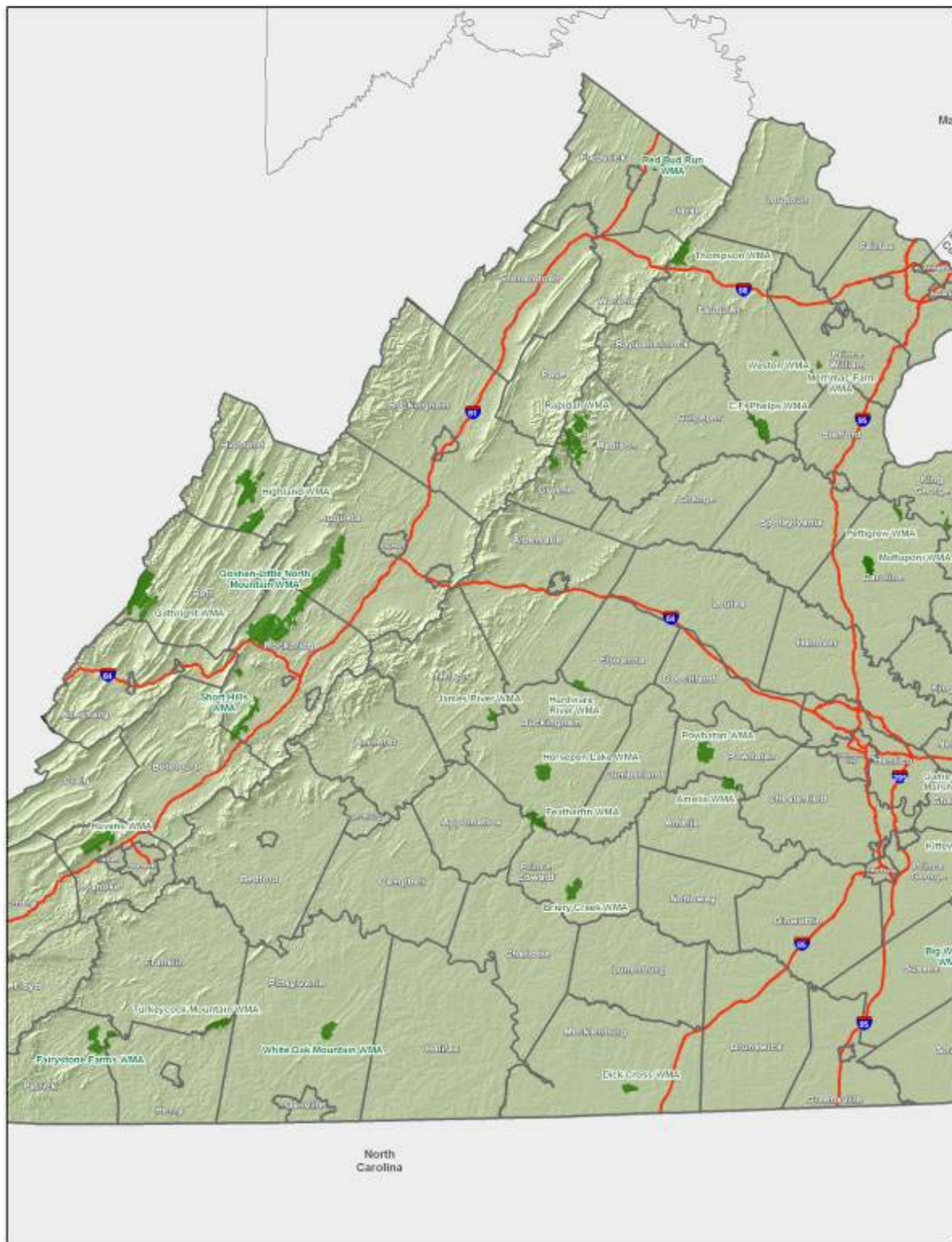
Implications – Trail management as a part of the routine upkeep of administrative roads is relatively inexpensive and an effective means of providing access to WMAs. Smaller off-road trails can adversely impact habitats and wildlife populations if users traverse sensitive areas or disregard seasonal wildlife needs for solitude

Alternatives –Trail management on WMAs is accomplished as a part of necessary administrative road maintenance, and there is, therefore, no alternative.

Appendix FA. Map of wildlife management areas (WMAs) in coastal Virginia.



Appendix FB. Map of wildlife management areas (WMAs) in central Virginia.



Appendix FC. Map of wildlife management areas (WMAs) in southwestern Virginia.

