# VIRGINIA WILD TURKEY MANAGEMENT PLAN

2025-2034


2025

VIRGINIA DEPARTMENT OF WILDLIFE RESOURCES

## Executive Summary

Wild turkeys, once pushed to the brink of extinction, represent one of North America's landmark conservation success stories. Today's healthy wild turkey populations provide many benefits for hunters, outdoor recreationists, and the general public, but may also foster concerns for crop damage, vehicle collisions, or conflicts within residential neighborhoods. Concerns over turkey populations have risen over the past several years which provides some uncertainty and challenges for future management. With varied public values and opinions about wild turkeys (even among hunters), turkey management continues to provide challenges for the Virginia Department of Wildlife Resources (VDWR) in their mission to *Conserve, Connect, and Protect.* Optimum turkey populations will balance positive demands (e.g., hunting, viewing) with negative demands (e.g., agricultural damage, other conflicts).

Embodying the interests of all citizens, the first Virginia Wild Turkey Management Plan (2013-2022) was developed using a stakeholder involvement process to reflect the values of a diverse public about what should be accomplished with turkey management in Virginia. A similar approach was undertaken for this revision of the turkey management plan. Public stakeholders interested in turkeys made value choices about turkey management, while wildlife professionals focused on technical and biological aspects. While considering technical background information from VDWR staff from throughout Virginia, a citizen Stakeholder Advisory Committee (SAC) met three times to develop the goals and objectives found in the Virginia Wild Turkey Management Plan. The SAC, initially comprised of 18 individuals from key stakeholder groups, represented various turkey-related interests from across the state, including private landowners, public land managers, sporting interests (e.g., fall hunters, spring hunters), non-governmental organizations, recreational interests, and agricultural producers.

The Turkey Technical Committee, involving VDWR staff with technical expertise in turkey management, provided scientific and technical information. In addition to providing technical feedback to the SAC, the Turkey Technical Committee also focused on identifying the objectives and potential strategies to achieve the goals drafted by the SAC.

The Virginia Wild Turkey Management Plan contains four sections: History, Demand, Accomplishments of the Previous Plan, and the Values, Goals, Objectives, and Strategies. The technical portion (History and Demand Sections) describes wild turkey management history, life history and biology, and status (supply and demand) in Virginia. The accomplishments of the previous plan section provide an assessment of VDWR's progress towards meeting goals and objectives outlined in the previous management plan. The Virginia Wild Turkey Management Plan includes an overarching mission statement for managing turkeys and four goal areas that address populations, habitat, recreation, and human-turkey conflict. Specific objectives were developed to help guide the attainment of each goal. Potential strategies suggest ways that each objective might be achieved.

Turkey Plan Mission Statement:

*Sustainably manage wild turkey populations as a wild, free-roaming public trust resource in a manner that serves the needs and interests of the citizens of the Commonwealth.*

*Manage wild turkey populations, turkey habitat, turkey-related recreation, and human-turkey conflicts, using biologically sound, applied science-based approaches that:*

- *are ethical;*
- *are flexible, innovative, and cost effective;*
- *are proactive;*
- *are publicly accepted (i.e. informed acceptance);*
- *have impacts at relevant scales (local, region, state);*
- *are accountable and transparent;*
- *are collaborative with other agencies, partners, and the public; and,*
- *are holistic, considering consequences on other species and stakeholders.*

The specific goals address:

Populations: *Manage turkey populations at levels adaptable to changing landscapes that balance the varied needs and expectations of stakeholders statewide and locally. The use of regulated hunting and active habitat management should be the primary population management tools while acknowledging that other management tools may be employed depending upon localized objectives or limiting factors.*

Habitat: *Manage turkey habitat compatible with turkey population, recreation, and conflict goals while working across diverse public and private land ownerships and ecosystems. Habitat conservation actions should consist of practices that benefit multiple species with an emphasis on areas of special significance to the life history of turkeys (e.g., nesting or brood rearing habitat) while also considering potential impacts of other landscape changes (e.g., land use or climate impacts).*

Recreation: *Provide and promote various forms of wild turkey-related recreation to optimize quality opportunities (i.e. safe, responsible, ethical, lawful, and accessible). Preserve the heritage and tradition of hunting turkeys (fall and spring), and provide opportunities to observe turkeys, for both management and recreational benefits. Turkey related recreational opportunities should not prevent the attainment of population objectives.*

Conflict: *Prevent and reduce human-wild turkey conflicts (e.g., agricultural, residential, recreational, airport) while:*

- *promoting shared responsibility (personal, community, agency)*
- *fostering practices that keep turkeys wild*
- *prioritizing use of nonlethal methods to resolve conflicts,*
- *using regulated hunting as the preferred method when lethal alternatives are required to manage conflicts,*
- *attaining turkey population, habitat, and recreation goals.*

This second Wild Turkey Management Plan intends to build off the success of the first plan, guiding management direction and providing clarity to management strategies that VDWR and partners should employ to achieve lasting success for turkey management. The Plan

identifies generally what, when, and how turkey projects are implemented and will provide guidance to the VDWR Board of Directors, VDWR administrators and staff, and the public on turkey program priorities, management activities, hunting regulations, and annual budgeting for the next 10 years. It is important to emphasize that (1) the Plan is strategic rather than operational, and (2) turkey management is the shared responsibility of DWR, other agencies, partners, and the public.

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# INTRODUCTION

As a symbol of nature's bounty from the first Thanksgiving, wild turkeys are widely recognized by people throughout North America. After wild turkeys were pushed to the brink of extinction in the early 1900s, the restoration of this cultural icon represents one of North America's landmark wildlife management success stories. Today's healthy wild turkey populations provide many benefits for hunters, outdoor recreationists, and the general public. However, abundant populations can also foster concerns about crop damage or neighborhood nuisances. With the varied public values and opinions about wild turkeys (even among hunters), turkey management has created complex and unique challenges for the Virginia Department of Wildlife Resources (VDWR).

The VDWR, under the direction of a Governor-appointed Board of Directors, is charged specifically by the General Assembly with the management of the state's wildlife resources. The Code of Virginia expresses many legal mandates for the Board and VDWR, prominent among which are management of wildlife species (§29.1-103), public education (§29.1-109), law enforcement (§29.1-109), and regulations (§29.1-501). To help clarify and interpret the role of VDWR in managing wildlife in Virginia, the Board of Directors has adopted the following Agency mission statement:

- **Conserve** and manage wildlife populations and habitat for the benefit of present and future generations.
- **Connect** people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities.
- **Protect** people and property by promoting safe outdoor experiences and managing human-wildlife conflicts.

To accomplish the mission of the VDWR, the Board of Wildlife Resources provided further guidance in goals (see Mission, Goals, Objectives, and Strategies section of this plan).

## What is the Virginia Wild Turkey Management Plan?

The Virginia Wild Turkey Management Plan *is a strategic plan* that is only intended to provide overall directions, goals, and objectives for the wild turkey program (e.g., to increase turkey populations in a specific county). As such, *it is not an operational plan* where the specific details of potential strategies to carry out objectives are exactly described (e.g., establishing the specific hunting season dates).

The Virginia Wild Turkey Management Plan describes the history of wild turkeys and their management in Virginia, the current status of wild turkeys (supply and demand), and future management directions. The plan establishes a framework through 2034 for what needs to be done for turkey management and how it should be done. By clarifying management goals and objectives of the VDWR relating to turkeys, this plan will help Board members, VDWR administrators, VDWR staff, and the public to effectively address wild turkey management issues. As the basis for guiding turkey management activities, decisions, and projects, the plan also informs the General Assembly and the public of what the VDWR intends to accomplish.

## How the Plan was Developed

Because VDWR's mission is to serve the people of the Commonwealth, the process used to develop this plan incorporated both public values (e.g., economic, sociological, and political) and biological considerations. During the planning process, public stakeholders focused on the public values regarding wild turkeys, whereas wildlife management professionals focused on the technical aspects of wild turkey management.

VDWR's first statewide plan was developed in 2013 to fulfill its mandate to manage wild turkeys in Virginia. The 10-year plan represented the turkey-related interests of all citizens, not just select groups of people. Diverse stakeholders representing public landowners, sporting interests, non-consumptive interests, and agricultural producers contributed toward this end. To identify important issues in wild turkey management, a series of nine focus group meetings were conducted throughout Virginia to begin the planning process. The issues identified by focus group participants provided a starting point for Stakeholder Advisory Committee (SAC) discussions. The SAC, initially composed of 13 representatives from key stakeholder groups, was tasked with developing draft goals that reflect public values to guide wild turkey management. A Wild Turkey Technical Committee (Technical Committee), composed of VDWR (then VDGIF) biologists with expertise on wild turkey management, was formed to provide scientific information and technical feedback to the SAC. The Department of Fish and Wildlife Conservation in the College of Natural Resources and Environment at Virginia Tech provided the overall guidance and administrative support for the planning approach and processes. To broaden input and to ensure that the work of the SAC accurately reflected the values of the Commonwealth's citizens, the public was provided an opportunity to provide input during six public meetings and online review of the draft plan. The final draft of the Virginia Wild Turkey Management Plan was presented to the VDGIF Board of Directors for their review and endorsement at the January 28, 2014, Board Meeting.

The process used to revise the current plan (2025-2034) was similar to the initial planning effort, but without focus groups, public input meetings, or consultation with an external facilitator. However, this revision incorporated additional input from turkey hunters on the front end with a survey in the fall of 2023 conducted by DWR's human dimensions team. As before, a Stakeholder Advisory Committee (SAC; Appendix A) and Technical Committee (TC; Appendix B) were important contributors, along with the DWR wild turkey program consisting of the Forest Game Bird Biologist, the Deer-Bear-Turkey Biologist, and Forest Wildlife Program Manager. The SAC, representing a cross section of wild turkey-related interests (e.g., different types of hunters, agricultural producers, conservation organizations, tribal interests, and other natural resources management agencies), was responsible for identifying the goals and prioritizing the outcomes for turkey management. The Technical Committee, composed of DWR staff with technical expertise in turkey management, drafted objectives and strategies based on values identified by the SAC. The VDWR Board of Wildlife Resources endorsed the 2025-34 Plan on X X, 2025

## Plan Format

The Virginia Wild Turkey Management Plan includes sections relating to the life history of wild turkeys, the wild turkey program history in Virginia, Virginia's wild turkey program status (supply and demand), and accomplishments of the 2013 plan. Within the context of the VDWR mission statement, the four program goals focus on wild turkey populations, turkey habitat, turkey-related recreation, and human-turkey conflicts. Specific objectives have been established to help guide the attainment of these goals, with potential strategies clarifying how each objective might be achieved.

**Interim Changes to the Plan**

The Virginia Wild Turkey Management Plan is designed to provide guidance and priorities to help manage Virginia's turkey program through 2034. A plan life of 10 years was chosen for several reasons: goals should remain relatively constant over that time, a mechanism exists for interim changes in objectives and strategies, and limitations in staff and resources preclude more frequent revisions. However, a plan should be a dynamic and flexible tool that remains responsive to changing social, environmental, technical, and administrative conditions. To keep the plan relevant and responsive to the programmatic goal directions provided by the public, specific objectives and strategies may be added, deleted, or amended by VDWR as new circumstances demand. As adaptive changes in management approaches (i.e., objectives) are necessary, VDWR will submit interim updates to the SAC for review before implementing changes; updated objectives will be provided as addenda to the Plan on the VDWR website.

**Acknowledgements**

The meaningful involvement of stakeholders (some of whom participated in the development of the original turkey plan) from throughout the Commonwealth was crucial to the successful representation of the turkey related interests and public values of all Virginians. The commitment of time and dedication provided by the Stakeholder Advisory Committee (Appendix A) not only made a substantial difference in the quality of the final plan, but also enriched the process throughout; we greatly appreciate their effort and dedication.

Appreciation is extended for the work of the Technical Committee (Appendix B) for reviewing and updating technical information and for providing their expertise along the way. Technical research and writing for the revised plan primarily were provided by Mike Dye and Katie Martin of VDWR. Appreciation is also extended to Rene Valdez and Mallory Gyovai White (VDWR human dimensions team) for developing and conducting a survey of turkey hunters during 2023. Scott Klopfer of Virginia Tech's Conservation Management Institute dedicated significant time and expertise to updating the turkey habitat suitability model.

Last but not least, we would like to extend our gratitude to all the individuals, whether public or agency staff, who took the time to respond to the 2023 turkey hunter survey and/or review the draft plan and provide constructive input in 2025.

# HISTORY

## LIFE HISTORY OF WILD TURKEYS

Two species of turkeys occur in North America. The wild turkey (*Meleagris gallopavo*) can be found in 49 states, 6 Canadian provinces, and Mexico. The ocellated turkey (*M. ocellata*) is limited to Belize, Guatemala, and Mexico. Five subspecies of the wild turkey, each with distinct biological characteristics and unique management requirements, are widely distributed across the continent (Fig. 1). The most common subspecies, and the subspecies found in Virginia, is the eastern wild turkey *(M. g. silvestris*). Although population approximations are very speculative, the population of wild turkeys in the United States and Canada has been estimated to be approximately 5 million birds.

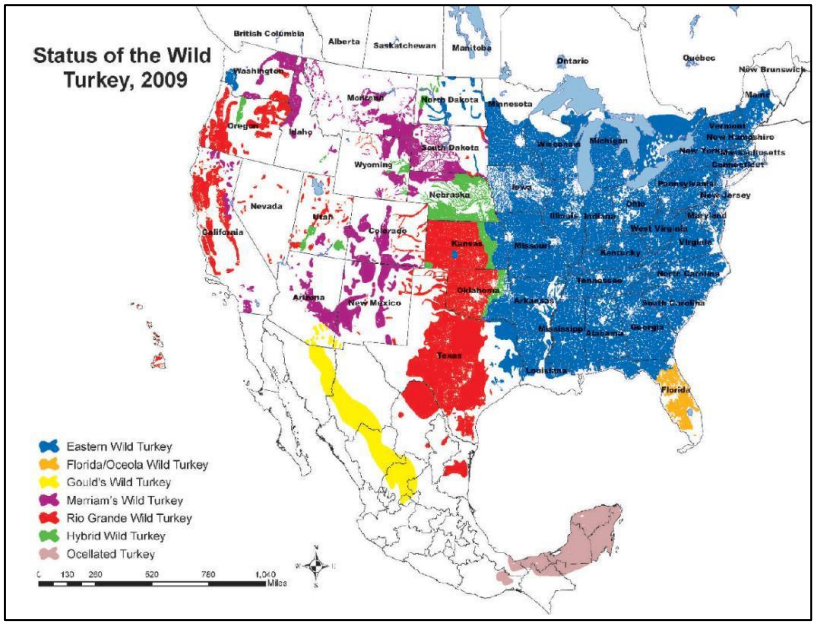


Figure 1. Distribution range of the wild turkey by species and subspecies (from Tapley et al. 2012).

### Physical Characteristics

Both sexes have iridescent feathers showing varying colors of red, green, copper, bronze, and gold. Age and sex can be distinguished by the coloration, shape, and contour of certain feathers. Compared to the chestnut-brown color of female (hen) breast feather tips, male (gobbler) breast feathers are typically black tipped which results in a darker appearance of gobblers compared to hens. Although uncommon, other variations in feather color may result in turkeys that appear black, red, or white. Males generally lack feathers on the head, while females have feathers that extend up to the back of the head. Especially during the mating season, skin on the heads of gobblers can be quite colorful with variable shades of whites, reds, and blues.

A prominent difference between male and female wild turkeys is the presence of a beard in gobblers. The beard is a group of bristles (modified feathers) that originate from the center of

the breast and grow throughout the bird's life. Beards generally begin to protrude from between the breast feathers at 6-7 months of age and are permanently attached, unlike feathers that are periodically replaced. While the beard can grow 3-5 inches per year, the total length may be limited by wear and breakage from dragging on the ground and from ice or snow damage. Gobbler beards in the first year are generally less than 6 inches in length, while two-year-old birds typically have beards that are 8-11 inches in length. The record beard length of an eastern wild turkey in Virginia is over 16 inches. Infrequently, turkeys may also have multiple beards; the highest number of beards reported to the VDWR has been 7 beards. A small proportion (5-10%) of adult females also possesses beards, but they are typically shorter (6-8 inches) and have fewer bristles than gobblers.

Unlike hens, gobblers possess spurs, which are used for fighting. The spur is located on the lower leg just above the foot and is made up of a bony core layered with keratin scales. As birds age, additional keratin scales are added contributing to the length of the spur. Historically, spur length was commonly used to assign ages in adult gobblers; however, more recent research suggests that individual variation in spur growth may cause this to be an inaccurate measure of age. Taken as a general rule of thumb, birds with spurs less than ½ inches by the spring are juveniles (i.e. born the previous spring). Birds with spurs between ½ and ¾ of an inch are commonly classified as two-year-old birds; gobblers with spurs longer than ¾ of an inch are typically three or more years old. Spurs over 2 inches are uncommon for the eastern subspecies. Infrequently, gobblers can have 2 spurs on each leg and even hens may rarely possess spurs.

Poults (young turkeys) weigh just a few ounces at hatching but gain weight quickly. Females generally weigh 4 to 7 pounds in their first year and typically weigh 8 to 11 pounds as adults. Adult males are heavier, weighing 17 to 21 pounds on average. Gould's and Rio Grande subspecies are typically the heaviest subspecies, with the Florida subspecies weighing the least. The current weight record for Virginia wild turkeys is 27.3 pounds.

Wild turkeys have a keen sense of vision, and they can easily detect movements and likely distinguish colors. With eyes on the sides of their head, wild turkeys have monocular vision that provides a wide field of view but little depth perception. To compensate for their lack of depth perception, turkeys frequently move their heads. Turkeys also have a remarkable ability to hear and locate sounds. Turkeys have a relatively poor sense of taste and smell.

Although wild turkeys typically prefer to walk rather than fly when feeding or traveling, they are capable of rapidly rising and flying short distances when disturbed. They can also travel longer distances in the air when the topography allows them to glide down-slope. Turkeys are estimated to run up to 12 miles per hour and fly up to 50 miles per hour.

**Food Habits**

Most of a wild turkey's life is spent in search of food. The quantity and availability of food affects condition, behavior, survival, hunting mortality rates, movements, reproduction, and population size. As evidenced by their wide distribution, a very flexible diet has helped the wild turkey adapt to many different habitats. Wild turkeys are opportunistic and omnivorous (eating both plant and animal matter) feeders with a diverse diet that generally reflects available foods. They have been documented to feed on more than 350 different plant species and 87 different insect species. Important plant foods include acorns, grasses, sedge leaves, roots, tubers, stems,

buds, and leaves. Other important foods include wild grapes, beechnuts, dogwood berries, and sumac fruits. Acorns are an especially important food for wild turkeys and, when available, are preferred over most other natural foods; smaller acorns are preferred over larger varieties.

Poults (< 2 months of age) subsist on a diet of insects that provide high protein and energy needed for rapid growth of feathers. Important insect groups include beetles, grasshoppers, and leafhoppers. The percentage of insects in the diet of young turkeys declines through the summer as their diet changes to more herbaceous leaves, berries, and fruits. Turkeys also will use agricultural areas, row crops, and openings to obtain food.

Especially at the higher elevations of western Virginia, deep snows can limit the availability of wintertime foods. Wild turkeys have the ability to scratch through 12 inches of snow, but snow depths above 4 inches can limit their access to food. Unless snow-covered areas become ice-packed, snow depths less than 4 inches have little impact on turkey feeding. When snow conditions are not favorable, turkeys will move into areas with pines, cedars, or other cover for shelter and foods. As spring approaches, spring seeps are an important source of early-emerging herbaceous plants. Even during years with mast failures and deep snows, turkeys are able to survive because of their flexible diet, fat reserves, and thermal protection provided by their feathers. Although they may lose up to 40% of their body weight, wild turkeys can still survive 2 weeks without food.

**Flocking Behavior**

Wild turkeys are social and live in flocks which are usually segregated by family units, age, and sex. During the summer, turkey flocks are usually composed of brood flocks (i.e., groups of hens and their young poults), made up from several different broods and hens (often unrelated hens), flocks of unsuccessful hens, and flocks of gobblers. During late fall, young males will leave the brood flocks to form their own juvenile male flock. Some birds in these flocks remain together for life. As a result, many flocks of adult wild turkeys are composed of same-sex siblings that were raised together in brood flocks.

The social organization within a flock, called a pecking order, is a linear hierarchy of dominance. The top-ranked bird, or alpha bird, is dominant over all others and the lowest-ranked, or omega bird, is submissive to all others. Within-flock pecking orders are determined by behavioral displays and fighting among individuals. Fighting for dominance begins in brood flocks during late summer and progresses into autumn. Once determined, the pecking order is stable and changes only with the death or serious injury of a flock member. Not only do pecking orders occur within flocks, but they also exist between flocks. The pecking order between flocks is usually determined simply by flock size, with smaller flocks yielding to larger ones. Males and females also have separate social orders. During early autumn there can be spectacular displays of fighting when several brood flocks come together.

**Home Range and Movements**

Home range is defined as the area occupied by an animal over a given period of time. All the life history requirements to reproduce and survive must be provided within a turkey's home range. Reflecting the dynamic nature of turkey habitat use, home range size and shifts in location can be highly variable due to habitat quality, food availability, sex, age, hunting pressure, season,

and reproductive status. On an annual basis, individual home range sizes may range from 3 to 13 square miles. With diverse habitats, turkey home range sizes in Virginia also vary widely. Research in the Shenandoah Valley showed home ranges that varied from 2.6 $mi^2$ to 13.2 $mi^2$ while turkeys at Fort Eustis in Newport News exhibited home range sizes of about 3 $mi^2$. Male turkeys usually have larger home ranges than female turkeys. Because turkeys seasonally move to other habitats, the home range used on an annual basis is larger than the home range being used within a specific season.

Marked by significant movements to explore new habitats during the fall and spring, juvenile turkeys typically have larger home range sizes than adults. In a West Virginia study of 315 hen turkeys from 1989-93, the annual home range size of adult hen turkeys (7.0 $mi^2$) was smaller than the home range for juvenile hens (20.4 $mi^2$). In general, home range size also tends to be larger during fall and winter than during spring and summer. However, during years with abundant acorn crops, the fall and winter home range sizes may be small because of the ease with which food can be found. Likewise, birds that are artificially fed by people have very small home ranges compared to turkeys foraging on natural foods. When acorns are scarce, turkey home range size increases. The greatest long-distance movement observed during Virginia turkey research was an adult female that travelled more than 50 air miles during a fall season with a mast failure.

The home range sizes of hens vary by age and reproductive status. In West Virginia, spring home range sizes of adult hens without broods (3.4 $mi^2$) were smaller than hens with broods (5.3 $mi^2$). In contrast, spring home range sizes of juvenile hens without broods were larger than those with broods. Seasonal shifts in home range are common, especially between winter and spring seasons, and between juvenile and adult turkeys. Winter-to-spring shifts in locations were smaller for adult females (1.2 miles) than for juvenile females (2.9 miles). On average, adult hens shifted successive spring home ranges by 0.5 miles, while juvenile shifts were 2.2 miles. Because 45% of adults and 62% of juvenile birds made substantial shifts in spring home range location between years, most hens do not use the same nesting location annually. However, some hens will return to the same general nesting location between years.

**Habitat Requirements**

The habitat required to support wild turkey populations within their home range must meet all the food, cover, space, and water needs throughout the year for all ages and sexes. The best turkey habitats offer a mosaic of forest patches with a diversity of options for feeding, reproducing, and surviving. In general, ideal habitats are made up of many different forest age classes interspersed with openings and/or open or agricultural lands that comprise 10-50% of the area. Turkeys often take advantage of farming operations where they feed on waste corn, grains, and insects attracted to agricultural crops.

A variety of different ages of timber will provide a diversity of foods and other habitat needs for wild turkeys. Timber rotation ages between 80-120 years create timber stands with an

assortment of ages. Timber rotation refers to the number of years it takes to grow a tree to maturity. With a rotation age of 100 years, an average of 1% of the forest area would be regenerated each year by harvesting the oldest trees. A timber rotation of 100 years results in 10% of the area being less than 10 years old and 50% would be greater than 50 years old. Older-aged timber stands, particularly those that have trees producing hard mast like acorns, provide important foods for energy and protein that contribute to over-winter survival and condition. Although only briefly available, younger-aged stands (1-5 years old) provide good brood habitat for cover and insects. Young timber stands also provide a variety of soft mast-producing shrubs plants, such as blackberry, that are particularly important during years of mast failures. Substantial hard mast production does not occur until timber stands reach 50 years old. Although a necessary stage of sound forest management, timber stands between 20-50 years of age are of lesser value to wild turkeys.

Especially in northern hardwoods and high elevations in western Virginia, conifer cover (e.g., pines, cedars) provides an important roosting habitat for wintering birds. Turkeys frequently use these areas to provide thermal protection and some fruits and seeds. Spring seeps are another important habitat type when snow covers the ground. Spring seeps are places where ground water comes to the surface. At a constant temperature of about 50-60 degrees Fahrenheit, ground water in seeps melt away snow which provides feeding areas rich in insects and herbaceous vegetation.

Of particular importance are the habitats that provide adequate nesting and brood-rearing opportunities. Wild turkey hens can nest in almost any forest stand, but nest sites are generally selected in early successional habitats with dense herbaceous and shrub cover at ground level. Hens may select nest sites in recently cut forest stands, old fields, or pastures. Individual nests are typically protected by some over-head cover of branches, limbs, or vines. A recent study in Tennessee (Johnson et al. 2022) documented that Nest-site selection was positively associated with the amount of early succession and shrubland available in pre-nesting home ranges and positively associated with visual obstruction (0–50 cm above-ground) and percent vegetation cover above the nest but negatively associated with distance from trails or roads. Johnson and others (2022) found that the single best predictor of daily nest survival was the percent vegetative cover above the nest.

Brood survival depends on habitats that provide cover and insects. Herbaceous vegetation at ground level supports the insect populations necessary for growth and survival of young turkeys while also providing cover from predation. Hens with broods seek openings (e.g., forest clearings, fields, pastures, rights-of-ways, log landings, skid trails, forest savannas) with abundant herbaceous plants and insects often spending the majority of their day foraging (up to 89%, Chamberlain et al. 2020). Forest savannas are areas with sparse tree canopies that provide an herbaceous layer of plants rich in insect production. The overhead cover available in forest savannas provides some added protection for broods from avian predators. Good interspersion of open areas with other habitats enables hens to quickly travel from nest sites to brood habitats; minimizing travel distances among brood habitats helps minimize poult mortality. Chamberlain et al. (2020) found that daily brood survival was negatively associated with the distance traveled from the nesting location to the brood rearing ranges (survival decreased as distance traveled increased), further indicating the need for interspersion of suitable habitats.

Except in areas with very little available water or during unusually dry summers, water does not appear to be an important limiting factor for turkeys. Turkeys usually are able to meet

their need for water from moisture obtained from dew and by eating green leaves, soft mast, and insects.

**Reproduction and Brood Survival**

Wild turkey population levels depend on reproductive success. Total reproduction is influenced by a combination of factors that include nesting and renesting rates, nest and hen success, clutch size, fertility rates, hatching success, and poult or hen survival.

Wild turkeys generally breed from late March through mid-April, with the timing driven primarily driven by photoperiod. Renesting efforts may extend into May. Although juvenile gobblers are sexually mature and capable of breeding, adult males do most of the breeding. Because sperm can remain viable in female reproductive tracts for several weeks, eggs may be fertilized for up to 4 weeks after copulation. During the early stages of egg laying, hens may lay an egg every 2-3 days. As egg laying progresses, hens generally lay an egg per day until a full clutch of 10-12 eggs is reached. Hens cover their nest after laying an egg until they begin incubation. Once a full clutch is completed, incubation begins and normally lasts 28 days until hatching occurs. High fertility rates (90-98%) for eastern wild turkeys result in most eggs hatching after 28 days. Peak hatching date in Virginia is about May 5, but may range from late April until mid-May.

The percentage of birds that nest is a critical factor in reproductive success. Nesting rates in western Virginia have been estimated to be about 80% for adult female and 50% for juvenile females. In other areas, nesting rates may be higher and approach 100%. Hen condition (i.e., body mass and fat stores) in the spring may be affected by inclement weather and food availability during the fall and winter, and in turn may influence nesting rate, clutch size, hatching rate, brood survival, and overall reproductive success.

On average, approximately half of the hens that attempt to nest will successfully hatch a brood. But on an annual basis, hen success may vary widely and range from 33% to 82%. Nest predation is a common reason for failure, with crows and raccoons being common nest predators. Hens disrupted during egg-laying or incubation may abandon the nest. Hens are less likely to abandon the nest if disturbed later in incubation than if they were disturbed early in the nesting period. Hens that abandon their nest may re-nest. However, re-nest rates are low and the number of eggs in second clutches are typically lower (6-8 eggs) than found in first clutches.

Due to inclement weather and predation, poult mortality rate during the first 4-weeks is a critical factor affecting recruitment. Poult mortality rates may average about 50% but annually can range widely from 21% to 88%. Poults less than 1 week of age are usually able to withstand weather extremes because they still have significant yolk sacs available for energy and the entire brood is able to find shelter underneath the brooding hen. Older poults that have exhausted their yolk sacs and are too large (e.g., quail size) to all fit under the brooding hen have higher mortality rates, especially when cold and wet conditions persist for over 12 hours. Normal weather conditions during May and June (i.e., not too dry or too wet) are considered to be best for good brood survival.

Especially during the first 2 weeks when poults are unable to fly, predation is also an important factor affecting poult survival. Although they readily seek cover when threatened by

predators, flightless poults can be easy prey. Females with young broods typically try to distract predators by mimicking a broken wing. Poults are typically able to fly at 8-12 days of age and often start roosting off the ground in shrubs at that point. Typically roosting in trees is possible by 2-3 weeks of age.

Ultimately, production rates represent the outcome of all the aspects of nesting and brood survival. While production rates vary greatly from year to year, an average of about 1.5 poults (that live to 4 weeks of age) are produced by each hen turkey. Production also varies depending on the age of the hen with adult hens being more productive than juveniles. Research in Virginia found juvenile hens produced 0.5 poults/hen, 2-year-old birds produced 1.4 poults/hen, and adults (3+ years old) produced 2.6 poults/hen.

**Mortality**

During a study from 1989-1994, the annual mortality rate of hen turkeys in western Virginia averaged 52% (or a survival rate of 48%) but varied widely among years from a high of 66% mortality to a low of 34%.

Annual mortality of juvenile hens was higher (56%) than adults (48%). Another Virginia study found annual hen mortality rates were 65%. The leading cause of hen mortality in Virginia has been predation (53% of all mortalities) (Fig. 2). Legal hunting harvests only accounted for 12% of all deaths and were exceeded by poaching losses (18%) and other losses (17%) such as accidents, diseases, or crippling injuries (natural and human-caused).

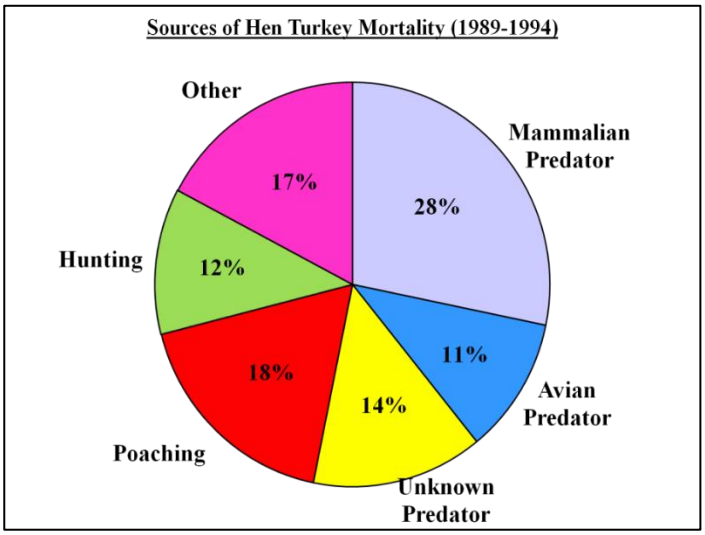


Figure 2. Sources of mortality for hen turkeys in Virginia and West Virginia from 1989-1994 (n=549 deaths).

In western Virginia and West Virginia, mammalian predators (primarily bobcats) generally take more turkeys than avian predators (primarily great-horned owls). Predation also tends to increase during spring dispersal as juveniles move into unfamiliar habitats outside their home range.

Legal harvest rates of female turkeys during the fall seasons in Virginia averaged 12% during the 5- year study but annually ranged from 3% to 20%. Acorn mast production also

affects fall harvest rates. Lean mast years result in increased harvest rates as turkeys spend additional time searching for available foods, making them more vulnerable to hunters. Mortality of hens has been found to be one of the largest factors in population growth (Norman et.al. 2001, Londe et al. 2023).

Illegal harvests (either intentional or accidental) also can be a major mortality factor for hens. The annual rate of illegal hen harvest in the Virginia study averaged at least 5% during the fall hunting seasons and 6% during the spring gobbler season. In fact, illegal harvest levels can exceed legal harvest rates in Virginia and may be an important factor affecting population levels. Similar illegal harvest rates also were found by studies in Florida, Missouri, and Kentucky. In the Virginia study, the majority of the spring illegal hen mortality took place during the first 2 weeks of the spring gobbler season, suggesting that the timing of spring gobbler hunting may contribute to illegal harvest. However, not all Virginia studies have shown such high illegal harvests of hens. Research on large private land holdings in the Tidewater region showed no illegal kills. Because more hens are active during the egg-laying period before the onset of peak incubation, earlier spring hunting seasons may expose more non-incubating hens to potential illegal harvests than occurs later in the nesting season.

Like hens, gobbler annual mortality rates also vary. There have been several research projects in Virginia looking at harvest rates in gobblers in both eastern and western portions of Virginia. These studies have estimated annual mortality of adult gobblers to range from 46% to 69%. The findings of the two study area mortality rates were fairly similar. Most of the annual mortality for adult gobblers was concentrated in the spring gobbler season when the hunting mortality rate was 25%. In contrast, juvenile male (jake) mortality rates were only 5% during the spring hunting season. Mortality of adult and juvenile males was comparable during the other seasons of the year. Known illegal kills accounted for 5% of the fall male mortalities, but the potential illegal fall mortality rate might have approached 9%. Most poaching losses of male birds took place following the fall turkey season.

Mortality of adult birds due to starvation is uncommon in Virginia. However, extended periods of packed snow and ice can affect survival rates by making limited food supplies unavailable.

**Diseases**

Mortality from diseases and parasites can also occur, but typically these effects are localized and pose little large-scale threat to turkey populations or humans. A variety of pathogens have been reported in wild turkeys, including avian pox virus, lymphoproliferative disease virus (LPDV), reticuloedotheliosis virus (REV), avian cholera (*Pasturella multocida*), *Mycoplasma* sp., sarcocystosis (*Sarcocystis* sp.), toxoplasmosis (*Toxoplasma gondii*), blackhead disease (*Histomonas meleagridis*), *Haemoproteus meleagridis*, *Leucocytozoon smithi*, and tracheal worms (*Syngamus trachea*). Fortunately, two of the most commonly diagnosed diseases, avian pox virus and blackhead disease, do not pose a risk to public health. A third disease, LPDV, is a pathogen that was diagnosed for the first time in wild North American turkeys in 2009 and is not believed to pose a threat to humans.

Avian pox is a highly contagious condition that typically affects wild turkeys during warmer months. While many infected turkeys do not show any visible signs of disease, clinically affected birds display lesions consisting of nodules that eventually scab over. The nodules are

usually restricted to the unfeathered portions of the head and legs or in the mouth. Affected turkeys may develop vision impairment and breathing problems due to obstructions from nodules, significant weight loss, and/or weakness. Blood- feeding insects, especially mosquitoes, are the main mode of avian pox virus transmission. Avian pox formerly posed a significant problem when diseased pen-reared turkeys were released for population restoration (see section on "Restocking Efforts"). This disease is generally widespread throughout Virgina but typically results in localized or minor mortality events. Large-scale mortality events are rare.

Blackhead disease, caused by a protozoan parasite *Histomonas meleagridis*, often induces non- descript clinical signs in affected birds, including listlessness, droopy wings, and ruffled feathers. Infected turkeys usually have lesions in the gastrointestinal tract and the liver. Earthworms play a role in parasite transmission by storing eggs from parasites after ingestion of droppings from infected birds. Uninfected birds may be exposed to the parasite after eating earthworms harboring the parasites. Turkeys are particularly susceptible to *H. meleagridis*, and severe disease and high mortality may be observed. Infection rates among wild turkeys are unknown, but mortality rate usually exceeds 75 percent among infected birds. Unfortunately, many of these outbreaks are under reported and may go unnoticed on the landscape. Although the infections can create significant localized effects, it is generally not thought to cause significant population level impacts.

Lymphoproliferative disease virus (LPDV) and reticuloendotheliosis virus (REV) are both forms of viral tumorigenic viral diseases. LPDV had previously only been known to occur in domestic turkeys in the United Kingdom and Middle East, but the first North American case was diagnosed in 2009. Harvested wild turkeys have been recently diagnosed from Virginia and many other states (i.e., Arkansas, Georgia, Maine, Missouri, New Jersey, North Carolina, Pennsylvania, and West Virginia). Recent surveys indicate that LPDV is geographically widespread, but likely accounts for a small percentage of disease-related mortality in wild turkeys. Similarly, REV has been detected in the blood of healthy appearing wild turkeys across a wide geographic area. There remains a great deal of uncertainty with these diseases in wild populations. Although clinical impacts seem to be minor, there remains a potential for subclinical effects of the disease affecting survival, reproduction, recruitment or other population vital rates. Additional research is ongoing in neighboring states that should close some knowledge gaps on the disease impacts of wild populations.

Research shows that the majority of domestic poultry diseases are spread from farm to farm via contaminated humans, poultry equipment, and farm vehicles. Humans, equipment, or vehicles that come into direct contact with diseased wild turkeys do have the potential to transmit infectious agents to domestic poultry. With opportunities for direct contact with wild turkeys, operations with compromised biosecurity practices (i.e., poor traffic control, isolation, or sanitation) or free-ranging domestic poultry (including both backyard flocks and large commercial flocks) have the potential to be exposed to diseases carried by wild birds. While direct contact with contaminated feces, uric acid droppings, nasal discharge, or saliva from sick wild birds may result in disease transmission to domestic poultry, airborne transmission of infectious agents over large distances is not considered to be a significant mode of disease transmission.

Supplemental feeding of turkeys and other wildlife may lead to aflatoxin exposure. Aflatoxins are poisons produced by fungi in spoiled grains and have been linked to wild turkey mortality. Aflatoxins may be found in contaminated corn and other small grains that are often

used to feed wildlife. Aflatoxin levels are closely monitored in grains intended for livestock, but when levels are too high for safe use by domestic animals, these grains are often sold as "wildlife corn". One study showed that over 50% of corn samples from North Carolina and South Carolina contained aflatoxins. Turkeys that feed on grains with toxic amounts of aflatoxin may exhibit weight loss, reduced liver function, decreased reproduction, and suppression of the immune system. A recent study in Mississippi found that aflatoxins were present at lethal levels in sampled corn piles during the spring and summer months starting 3 days after placement and by 8 days after placement, 100% of sampled piles contained lethal levels of aflatoxins (Huang et al. 2022).

In addition to potential aflatoxin exposure, supplemental feeding of turkeys also congregates birds and may increase the transmission of other diseases among birds. Debilitated birds are more likely to feed from a convenient source, such as a feed pile, rather than find food on their own. Consequently, artificial feeding sites may expose healthy turkeys to infectious agents either through direct contact with other birds or indirectly via contamination of the feed from infected feces, saliva, nasal discharge, or urates. In addition to the disease concerns, feeding-related concentration of turkeys may also increase predation and poaching losses.

**Population Dynamics**

The combined effects of reproduction and mortality on population size and growth determine the dynamics of a wild turkey population. With the wide variation that sometimes occurs in reproduction (e.g., nesting success, poult mortality) and survival (e.g., predation rates, hunting harvests), wild turkey populations may also experience large year-to-year changes (± 50%).

When turkey population densities are low, weather is favorable, and resources are abundant, un-hunted wild turkey populations can maximize population growth because reproduction and survival are both optimal. Under such favorable circumstances, turkey population size could double every 1-2 years. The maximum population growth for turkeys has been observed to be about 68% per year (after reintroductions in Iowa). Actual growth rates are highly variable and are usually much less than the maximum because population growth is influenced by a variety of factors such as available food, weather conditions, habitat quality, number of females, population size, predation, and hunting harvests.

Turkey populations cannot grow indefinitely. Similar to deer population dynamics, increasing turkey densities also inhibit recruitment and slow population growth rates. Turkey population growth and density will become limited as habitat resources (e.g., food supplies, brood habitat, nesting sites) become limiting. Eventually the biological carrying capacity (BCC), which is the maximum number of turkeys an area can support over an extended period, will be reached. The BCC for wild turkeys is unknown for Virginia and other areas in North America, but turkey populations have been documented to reach densities as high as 32 turkeys/mi$^2$ in Alabama, 25 (or more) birds/mi$^2$ in New York, and 20 turkeys/mi$^2$ in Iowa.

Population modeling for Virginia wild turkeys has found that population growth rates were most strongly influenced by the fall hunting mortality of hens (at the level occurring in the 1989-1994 study in western Virginia) than by reproductive factors. Research in Virginia has

shown that fall hunting mortality on hens during long hunting seasons, that also overlapped deer season, can be an additive loss to the population (that is, hunting losses add to the existing natural mortality). Because this additive mortality results in reduced survival and population growth, regulating the fall harvest of hens has been the primary option for managing turkey population levels. However, at current harvest levels, the fall harvest is not believed to be having as significant of an impact on population trajectories.

While managing the harvest of hens is the most effective population management tool to influence turkey population levels (like regulating the harvest of does to manage deer populations), harvest losses (both legal and illegal) are still only a relatively small component of the overall turkey mortality (Fig. 2). Unlike other big game species, where legal hunting is the primary form of mortality (e.g., bear, deer), the combined influence of many other sources of mortality (e.g., predation, weather, poaching) and reproduction may overwhelm the anticipated impact that changes in hunting seasons might have on turkey population levels. Additionally, hunting mortality can vary from year to year due to weather factors, mast abundance, and influence of other hunting seasons. With all the background variation that occurs in both reproduction and mortality, yearly changes in turkey populations can be very unpredictable. As a result, the annual impact of population management strategies cannot be precisely predicted. Population modeling suggests fall harvest hen mortality rates of 10% or less still permit long-term population growth, while populations would generally stabilize at a maximum fall hunting mortality rate of 15%. Gobbler hunting mortality in both the spring and fall is generally considered to have minimal population impact.

## PROGRAM HISTORY OF WILD TURKEYS

The history of the wild turkey in Virginia and across the United States is a story of abuse to the brink of extinction, followed by restoration, and management. By the end of the 19th century, turkey populations had been extirpated (i.e., eliminated) throughout most of Virginia and only survived in the most inaccessible areas. As one of the landmark wildlife management success stories, wild turkey populations have been reestablished in record numbers across the continent, even beyond their historic range.

### Pre-colonial / Colonial Period

As an abundant and easy prey, Native Americans commonly used wild turkeys for food, clothing, blankets, tools, weapons, and ceremonies. The Spanish Conquistador, Cortés, may have been the first European to give accounts of the wild turkey in 1519, in Mexico. Probably originally domesticated by the Aztecs, Cortés sent Mexican turkeys back to Spain, where they quickly spread across Europe and to the British Isles. Various strains of these domesticated Mexican birds were shipped to Jamestown, Virginia for the early colonists around 1607; additional turkeys were delivered to Boston in 1629. These early birds from Mexico (via England) became the original source of today's commercial turkey industry.

The first description of wild turkeys in the mid-Atlantic region came from the Roanoke Island Colony of North Carolina about 1585. There were no credible estimates of wild turkey populations in Virginia when Jamestown was settled in 1607, but many journals noted that wild

turkeys were very abundant. Many reports and landmark names reflect the abundance of turkeys in Virginia into the 1700s. Despite being hunted and trapped year-round in the early 1700s, wild turkeys continued to survive the early pressures of habitat changes and market hunting. There is no doubt that the wild turkey played an important role for early settlers as a source of food and income from game markets.

**Population Declines**

As human populations expanded and cities grew throughout the country and in Virginia, habitat destruction, combined with increasing demand for wild turkeys and other wild game, began to take a toll on turkey and other wildlife populations. Much of the demand for popular foods like wild turkey was met by professional market hunters. These commercial hunters were very effective with stories of hundreds of wild turkey carcasses being shipped on trains destined for large cities. In 1872, wild turkeys sold for $1 each.

Agricultural practices during the late 1800s and early 1900s further reduced habitat for turkeys. These practices involved extensive deforestation, burning, grazing, and cultivation. The lowest point for turkey populations likely occurred during the period 1890-1920. By 1916, turkey populations in Virginia had been extirpated from 2/3 of the state. By 1941, there was serious doubt that the wild turkey would remain a game species in Virginia and throughout the United States.

**Population Recovery**

The agricultural practices of the late 1800s and early 1900s reduced soil fertility and limited productivity. Once productivity declined, many farmlands were abandoned, and farmers migrated to cities for industrial jobs. These reverting farmlands enabled all wildlife, including wild turkeys, to reoccupy newly forested habitats.

Congressional approval of the Weeks Act in 1911 made it possible to purchase and protect deforested land in Virginia and begin forest restoration on what later became national forest lands. The first land purchase in Virginia occurred during 1911 and contained 13,450 acres in the Mt. Rogers area. Established in 1916, the Natural Bridge National Forest became Virginia's first national forest. Subsequent purchases and name changes have resulted in the current 1.7 million acres of the George Washington and Jefferson National Forests in Virginia, assuring large, forested areas for turkey habitat. In 1938, the Virginia Game Commission and the U.S. Forest Service executed a formal agreement (the oldest of its kind in the United States) to fund additional wildlife habitat and management work on national forests within the state. The creation of the 200,000-acre Shenandoah National Park in 1936 also provided additional protection for wild turkeys and their habitat. In the 1930s, the Civilian Conservation Corps (CCC) provided funds and manpower to create and manage brood range on these public lands.

Concurrent with improving habitats, early efforts to reverse the population decline of wild turkeys included the creation of laws to protect turkeys. In order to limit market hunting, hunting methods and sales restrictions were established in 1912. The growing conservation ethic and awareness for the welfare of wild turkeys and other wildlife also led the General Assembly to pass the "Robin Bill" in 1912, which prohibited the sale of wild turkeys and other

wildlife.

Even though there were laws in place to limit the methods and numbers of turkeys that could be taken, enforcement was ineffective. The lack of enforcement to halt market hunting spurred the creation of the Department of Game in 1916. The Department of Game hired game wardens to protect the wildlife species of Virginia. From 1916 to 1929, the Department of Game added regulations and enforcement for game protection. The Pittman-Robertson Act in 1938 provided significant additional financial support for wildlife management and research programs in Virginia and throughout the country. With the added funding for the Department of Game, came renewed efforts for game management activities. Not only was considerable attention given to the wild turkey, elk were reintroduced, deer populations were restored, and predators were controlled.

**Restocking Efforts**

To speed the recovery of wild turkeys, the Commission of Game and Inland Fisheries began an exhaustive program to restock turkeys across Virginia in 1929. The restocking effort was started by purchasing 150 birds at a cost of $5.00 each. Initially, the practice of releasing game-farm birds was considered a success and birds continued to be purchased at market prices.

An intensive program to raise and release pen-reared wild turkeys was initiated with the hopes of reestablishing new populations. After disappointments with the progress of releasing game-farm birds, a graduate student, Wayne Bailey, was charged in 1933 to investigate different release methods for successfully establishing birds. In 1935, the Virginia Cooperative Wildlife Research Unit at Virginia Tech was created with a principal charge to support this artificial propagation program and Henry Mosby was chosen to lead the restoration program. Both Wayne Bailey and Dr. Mosby went on to become early pioneers and renowned biologists for wild turkey management in North America.

Despite diligent efforts to produce “genuine” wild turkeys at 7 different game farms around the state, the release of 21,865 pen-reared birds between 1929 and 1960 (Fig. 3) had virtually no success at reestablishing populations. These pen-raised birds failed to reproduce and survive because they never learned survival skills as young turkeys raised by a wild hen, they were impacted by diseases common to confined conditions and lacked the genetic quality of wild turkeys. Most of the game-farm releases occurred between 1948 and 1960, with the most birds (2,809) being released in 1952.

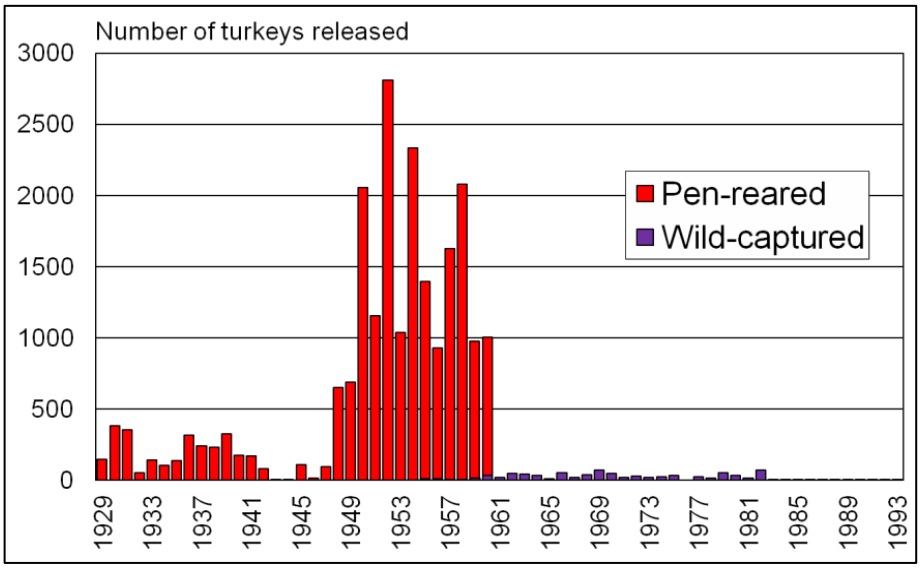


Figure 3. Turkeys released in Virginia for population restoration (1929-1993).

Although game farm operations could produce thousands of birds with the hope of accelerating the pace of restoration, biologists began to suspect that trapping and releasing free ranging wild turkeys would be a more effective approach for successfully establishing new populations. The problem of capturing large numbers of wild turkeys was solved in 1951 in South Carolina when turkeys were first trapped by using a cannon net technique that was originally developed for capturing waterfowl.

In 1955, the Virginia Game Commission began its own trap-and-transfer release program. In the coming years, the trap-and-release program was so successful that the Commission's pen-rearing operations were closed after 1960. During the period 1955-1993, and primarily from the Gathright WMA, the Game Department trapped and released 917 wild turkeys. These wild-trapped birds were released in 22 different counties, primarily in southwest Virginia, the Northern Neck, and the Eastern Shore. The restoration of the wild turkey in Virginia was completed in 1993 with the release of two Gathright WMA birds in Accomack County on the Eastern Shore (Fig. 4). Although overshadowed by the great volume of pen-reared turkeys that were released prior to 1960 (Fig. 3), the trap and transfer program represented a significant effort that produced one of the Commission's greatest conservation achievements. Through the combined benefits of hunting regulation controls, reforestation, public land purchases, effective law enforcement, restocking, and management-based research, turkey populations grew and expanded their range in Virginia (Fig. 5 - 6). Today, turkeys are distributed across every county in the state.

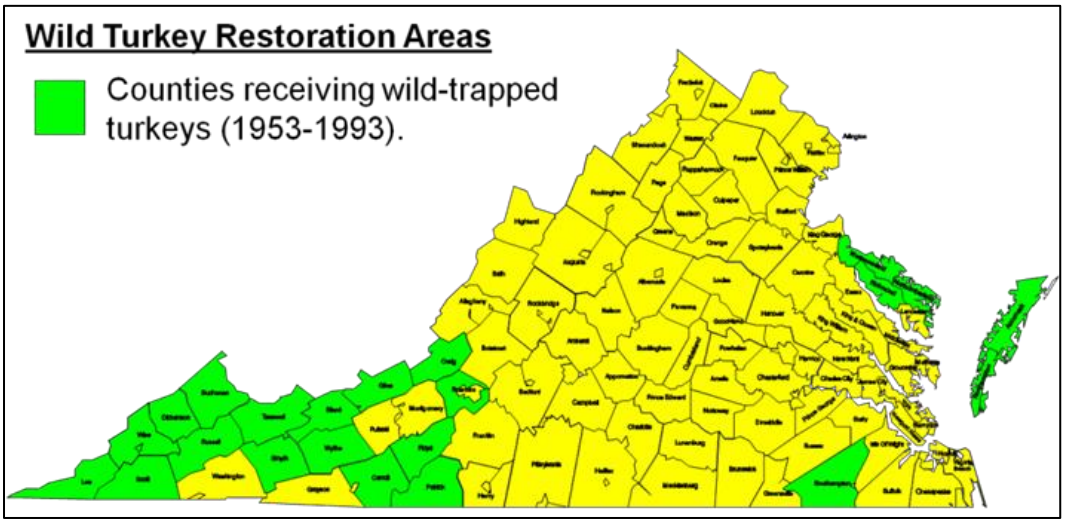


Figure 4. Virginia counties receiving 917 wild-trapped turkeys for population restoration (1955-1993).

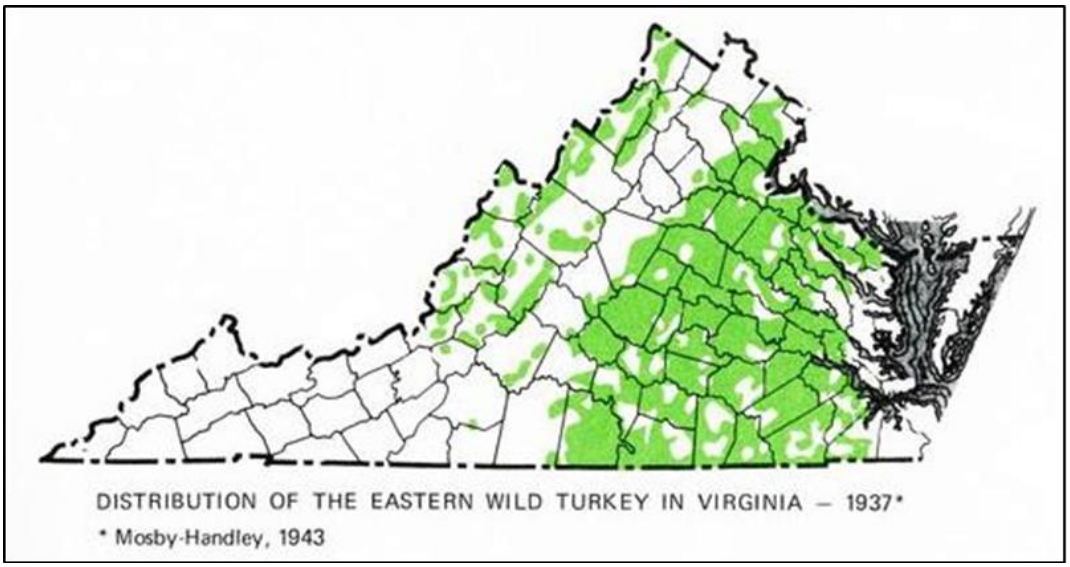


Figure 5. Distribution of wild turkeys in Virginia in 1937.

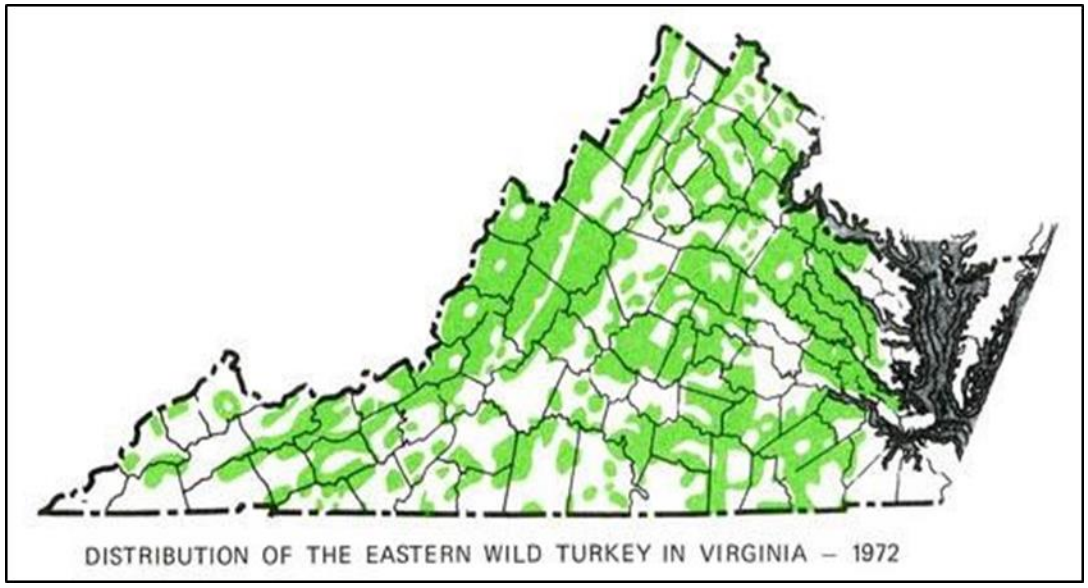


Figure 6. Distribution of wild turkeys in Virginia in 1972.

**Hunting Regulation Changes**

The first regulation restricting wild turkey hunting came in 1885, when the General Assembly set seasons for areas east and west of the Blue Ridge Mountains (EBR, WBR respectively). The season east of the Blue Ridge Mountains was from October 1 through January 15. In counties west of the Blue Ridge the fall turkey season was longer, from September 15 through mid-February. These earlier fall/winter seasons likely helped to establish fall hunting as the traditional time of year to hunt wild turkeys in Virginia. This law also prohibited the buying and selling of wild turkeys. In 1904, the General Assembly further restricted the shooting of wild turkeys at night and the capture of wild turkeys with traps or nets. The legislature made it illegal to bait wild turkeys in 1922.

Fall Hunting Seasons

***1940s -1971***.

Between the 1940s and 1971, fall hunting season dates in Virginia were highly variable, with counties sometimes exhibiting large annual changes in turkey season structure (liberal, conservative, closed). As one of the more extreme examples of county variations, Hanover County had fall turkey seasons that changed from November 19 – January 15, to closed, to December 15 – January 15, and back to closed during the 4-year period of 1962 through 1965. In general, season closures were most prevalent in southwestern Virginia with the longer seasons (up to almost 9 weeks long) in the southern Piedmont and northern mountain counties. Unless otherwise closed, seasons prior to 1958 tended to be longer in counties EBR, than in counties WBR. After 1962 the opposite was more normal, with a tendency for longer seasons WBR than EBR. Prior to 1972, the earliest opening date was November 1 and the latest closing date was January 20.

***1972-1988***.

*1972*: The regular long hunting season dates were standardized to a 7-week season (approximately) in all counties EBR and WBR. The standard fall turkey season ran from the

second Monday in November through December 31. As necessary, some counties remained closed or only had 2-week seasons during this period.
*1981*: The fall hunting season was extended to an 8-week season by opening one week earlier; the new standard season dates became the first Monday in November through December 31.
*1987*: The fall hunting season was extended to nearly a 9-week season by closing about one week later. The new standard season dates became the first Monday in November through the first Saturday in January.

***1989-2010***.

This period is characterized by many changes to create more fall turkey hunting opportunity in previously closed counties or counties with conservative seasons (primarily in eastern Virginia). Due to the increase in deer hunting opportunities (e.g., longer seasons, muzzleloader seasons) and associated impacts on turkey mortality, many changes were also made in the most liberal areas to shorten fall turkey seasons and minimize overlap with deer hunting. The net result was a reduction in fall turkey season length from about 9 weeks to 6 weeks in many counties. Some key changes included:

*1989*: In 11 Shenandoah Valley counties, the 9-week season was shortened by one week when turkey season was closed during the opening week of the firearms deer season. This resulted in a split turkey season: two weeks before the opening of firearms deer season, closed for the opening week of firearms deer hunting, and then resuming in the second week of the firearms deer season.
*1991*: The shortened split turkey season was expanded to 45 counties.
*1995*: Multiple changes included:

- The shortened split turkey season was expanded to 71 counties, all the remaining counties with a long season.
- The early 2-week split in the season was moved to start one week earlier.
- The second season also started later during the first or second week of December.

*1999*: Turkey hunting was permitted on Thanksgiving Day in counties with a fall season.
*2003*: The 3-week fall seasons structure were replaced by 4-week seasons.
*2006*: Opening day for turkey hunting was changed from Mondays to Saturdays. Season lengths were unchanged.
*2008*: The season was split between EBR and WBR. The starting and ending dates of the second segment of the EBR season were shifted 1 week earlier. There was no net change in season length.
*2008*: Accomack County, Northampton County, and the City of Suffolk were opened to fall hunting. With the exception of the heavily populated cities around Norfolk and Virginia Beach, all of Virginia had fall turkey hunting for the first time since the early part of the 1900s.

***2011-2023***.

Hunting season changes were made to help stimulate population growth and provide additional fall turkey hunting opportunities:
*2011*: Reducing the open fall season to two weeks, the December portion of the fall turkey was eliminated in 11 northern mountain counties WBR.
*2011*: Two additional weeks of late January turkey hunting (after the deer seasons) were added in counties with a standard 6-week fall season, creating an 8-week season.

*2019*: The first segment of fall turkey season was moved 2 weeks earlier to reduce the overlap with muzzleloader season. The day before Thanksgiving was added to accommodate hunter desires. A new 6-week season structure was added in 25 counties to assist in meeting population objectives.
*2021*: Fall archery season was extended to occur concurrent with deer and bear archery season.

*Legal turkeys*. In general, since 1951, it has been legal to harvest turkeys of either sex during fall hunting seasons, but with the following exceptions:
East of the Blue Ridge
*1968-78*: Bearded birds / Gobblers only
*1979-82*: Only one hen was permitted
West of the Blue Ridge
*1971, 1976-82*: Only one hen was permitted
*1971-74*: Bearded birds / Gobblers only in southwestern counties

Spring Hunting Seasons

Spring hunting for bearded turkeys started in Virginia during 1961 as an experimental 6-day season (April 24-29) on three public hunting areas (Gathright WMA, Fort A.P. Hill, and Camp Pickett) and resulted in the harvest of 34 gobblers (24 at Camp Pickett, 5 at Fort A.P. Hill, and 5 at Gathright WMA). During 1962, the experimental 6-day season (April 23-28) was expanded to include four entire counties with predominately private ownerships (Amelia, Chesterfield, Nottoway, and Powhatan) and additional public areas (Gathright WMA, Goshen WMA, Little North Mountain WMA, Fort A.P. Hill, Camp Pickett, Camp Peary, Ft. Eustis, Naval Weapons Station, and Cheatham Annex); 129 birds were killed, including one bearded hen. The 6-day spring season was again expanded in 1963 to include 43 counties. Through the 1960s and 1970s, spring hunting continued to be opened in a growing number of counties. The first statewide spring turkey season occurred in 1977, with Lee County included as the last county to be opened for spring gobbler hunting.

*Spring season length*.
Season lengths gradually increased through the 1960s, 1970s, and 1980s. Season length changes for spring gobbler hunting in Virginia include:
*1961*: First 6-day spring season.
*1965*: Season length extended to 7 hunting days, including 2 Saturdays.
*1966*: Season length extended to 12 hunting days, still including 2 Saturdays.
*1967*: Season length extended to 13 hunting days, including 3 Saturdays.
*1968*: Season length extended to 18 hunting days, still including 3 Saturdays.
*1969*: Season length extended to 19 hunting days, including 4 Saturdays.
*1973*: Season length extended to 25 hunting days, including 5 Saturdays.
*1988*: Season length extended to 31 hunting days, including 6 Saturdays.
*2004*: Season length extended to 32 hunting days, including 7 Saturdays with youth season inclusion.
*2014*: Season length extended to 38 hunting days including 7 Saturdays with Sunday hunting expansion.

*Spring season timing*.

Spring gobbler seasons in Virginia have traditionally been set to open around the time of peak incubation because nesting hens may be less vulnerable to illegal kills as they spend more time on the nest. Some milestones for spring gobbler season opening dates in Virginia include:

*1961-1972*: Opening dates varied between April 17 and April 29.

*1973-1989*: Opening dates were either the second Saturday in April (12 years) or the third Saturday in April (5 years) and varied between April 8 and April 17.

*1990-1999*: Opening dates occurred on the Saturday closest to April 15 and varied between April 12 and April 18.

*2000-Present*: Opening dates occurred on the second Saturday in April and varied between April 8 and April 14.

*Spring hunting hours*.

Beginning at one-half hour before sunrise, morning-only hunting has been designed to help minimize nest disturbance and potential poaching of hens. Changing closing times for spring gobbler hunting hours in Virginia include:

*1961*: Hunting hours for the first experimental season ended at 12:00 noon.

*1962*: Hunting hours were shortened to end at 10:00 a.m.

*1970*: Hunting hours were extended until 11:00 a.m.

*1990*: Hunting hours for spring gobbler hunting were extended until 12:00 noon.

*2003*: Hunting hours during the last 12 days of the season were extended from 12:00 noon until sunset.

*2021*: Hunting hours during the last 20 days of the season were extended from 12:00 noon until sunset.

Bag Limits

*1940s*: The general state law in 1940 was 2 birds per day and 4 per season, with the exception of 2 birds per day and 2 birds per season in most northern counties WBR.

*1951-1987*: The bag limit was generally 1 per day, 2 per year with the following exceptions:

- 1971-74: 3 birds per year statewide, all of which may be taken in the spring gobbler season
- 1975: 3 birds per year EBR, all of which may be taken in the spring gobbler season

*1987-1999*: Beginning with the 1987-88 hunting seasons, the statewide bag limit was 1 per day, 3 per year, no more than 2 of which could be taken in the fall or spring.

*1999-Present*: Beginning with the 1999-2000 hunting seasons, the statewide bag limit remained 1 per day, 3 per year, but no more than 2 of which may be taken in the fall which means all 3 could be taken in the spring.

Youth Hunting Days

*2004*: Youth spring gobbler day established on the first Saturday in April for hunters 15 years old and younger.

*2008*: Youth fall turkey hunting day established on the third Saturday in October for hunters 15 years old and younger.

*2009*: Hunting hours for the youth spring gobbler day were extended from 12:00 to sunset.

*2014*: Apprentice license hunters were added to create a Youth and Apprentice Hunting Season.

*2019*: Youth and Apprentice fall hunting weekend was moved to the second Saturday in October.

**Population Monitoring Programs**

No simple methods exist for estimating key wild turkey population characteristics (e.g., recruitment rates, mortality rates, population growth rates, density) at a scale useful for management. The best estimates of these parameters can only be obtained through expensive and site-specific research. To assess wild turkey population status over large areas, Virginia has used a combination of indices derived from harvest, observations of age and sex structure, and hunter surveys.

Hunting harvest data are a principal source of information for monitoring turkey population status in Virginia. Turkey harvest information has been collected since 1927. From 1927-1950, turkey harvest numbers were estimated by county game wardens. Beginning in 1951, mandatory checking of turkeys was required at official big game check stations. Through the years, as many as 1,500 check stations across the state have provided annual harvest information on black bears, white-tailed deer, and wild turkey. In contrast to many states that estimate their annual turkey harvest, Virginia turkey harvest figures represent an actual known minimum count.

Beginning in 2005, successful spring gobbler hunters had the option to check turkeys through a new telephone checking system (1-866-GOT-GAME) or at a traditional check station. In 2010, spring-harvested turkeys could not be checked at check stations; instead, they were required to be checked electronically (via telephone or internet). For the 2011-12 hunting season, fall turkey hunters were provided the option to also use the electronic checking system. Beginning in 2021 all turkey harvests were moved to the electronic reporting system with the closure of all physical check stations for all big game species in Virginia.

While harvest data from the big game checking system are a major source of population-related information, other programs provide important supplementary data:

*Fall-feather collections*.

Between 1958 and 2010, 53 years of turkey productivity information had been collected at big game check stations from fall-harvested birds. Feather samples from birds provided valuable recruitment information from the sex and age composition of the fall harvest. These collections were discontinued in 2011 due to hunter use of electronic checking and declining fall harvests (with associated feather samples).

*Brood surveys*.

With the decrease of the fall-feather collections to monitor productivity, a new system for reporting turkey broods was implemented in 2007. VDWR staff provides observations of turkey broods, hens, and gobblers they see while driving their normal day to day duties in July and August. Additional surveys are completed by volunteers associated with the Master Naturalist Chapters as well as members of the NWTF chapters.

*Spring gobbler hunter survey*.

The VDWR conducts an annual survey of spring gobbler hunters to monitor harvest age ratios, gobbling chronology, hen observations, and spring hunter satisfactions. Hunters in across the state annually provide information on some 3,500 hunts and 12,000 hours of hunting.

*Bowhunter survey*.

Archery hunters (primarily deer hunters) provide observations on many wildlife species during their fall hunting trips. Among many questions about the wildlife they see, hunters are asked to provide observations of wild turkeys. Thousands of hours of observations are collected annually that provide population indices on turkeys and many other wildlife species.

*Hunter surveys*.

A periodic mail survey of a sample of hunters provides information on effort, harvest, and opinions related to all game species. Fall and spring turkey hunters are well represented in the 2% sample of residence license holders.

*Turkey gobbling surveys*.

Each spring VDWR and US Forest Service staff conduct approximately 50 surveys (10-mile route) and count the number of turkeys gobbling (and grouse drumming). The survey routes are run twice each year, once during the week before the spring gobbler season and once during the first week of the spring gobbler season.

**Important Wild Turkey Research in Virginia**

Contributing to the wealth of knowledge about wild turkeys in the Commonwealth, Virginia has been fortunate to have many important research studies conducted on wild turkeys within the state. Results of these studies have been published in the scientific literature and have made significant contributions to the knowledge of wild turkey management throughout the United States. These studies have resulted from collaborative efforts among the Virginia Department of Wildlife Resources, Department of Fish and Wildlife Conservation at Virginia Tech, the Virginia Cooperative Fish and Wildlife Research Unit, U.S. Forest Service, West Virginia Division of Natural Resources, National Wild Turkey Federation, Department of Statistics at North Carolina State University, and Department of Fishery and Wildlife Biology at Colorado State University. Some of the key Virginia studies have been:

1935-41: As one of the seminal early studies ever conducted on wild turkeys, this study investigated almost every aspect of turkey biology, management, and restoration. Results are summarized in a landmark book, The Wild Turkey in Virginia: Its Status, Life History, and Management, by Mosby and Handley (1943).

1983-1985: A study was conducted to evaluate wild turkey responses to the conversion of mature forests to short rotation, even-aged pine stands in the Piedmont Region of Virginia.

1985-1987: A study of road impacts on turkey survival and habitat use was conducted on George Washington National Forest.

1989-1991: A study was conducted on the economics of spring turkey hunting in Virginia.

1989-1994: This was a 5-year study of the survival and reproductive ecology of wild turkey hens in western Virginia and West Virginia. The primary goals were to determine the impact of fall hunting on turkey populations, understand reproductive ecology, and model population dynamics. With 1,032 radio-tagged females over the 5-year study, this research

was the largest study of wild turkeys ever conducted.

1989-1996: A banding study of 473 gobblers was cooperatively conducted in Virginia and West Virginia to determine gobbler survival rates.

1995: A study of 92 radioed hens explored age-related nesting success and habitat use.

2000: A study of the reproductive ecology of wild turkeys in the Tidewater region was conducted to determine the timing of incubation, predation, and illegal kill of 31 radio-marked hens.

2000-2002: New insights about acorn use by wild turkeys resulted in a chapter called "Turkeys, Acorns, and Oaks" in the book, Oak Forest Ecosystems: Ecology and Management for Wildlife.

2003: Evaluated the relationship between long-term (1973-2002) recruitment, turkey harvest, and acorn production.

2004: Effects of environmental parameters on turkey recruitment were studied.

2003- 2006: Combining results of past research and other studies, wild turkey population models were developed to evaluate density-dependent population growth and the associated harvest yields for management (both spring and fall).

2004- 2006: A cooperative study with the West Virginia Division of Natural Resources was conducted to investigate differences in gobbler survival by age, year, location, and hunting season structure.

**Other Management Programs**

National Wild Turkey Federation Super Fund programs. The Virginia State Chapter of the National Wild Turkey Federation (NWTF) has over 7,500 members in about 46 local chapters throughout Virginia. In partnership with the VDWR, the State NWTF Hunting Heritage Super Fund is used for wild turkey projects that support habitat management, education, research, and other conservation projects within Virginia. Since 1985, over $5.6 million has been raised and spent by Virginia chapters on wild turkey conservation projects within Virginia.

## SELECTED BIBLIOGRAPHY FOR WILD TURKEY HISTORY


Alpizar-Jara, R., E. N. Brooks, K. H. Pollock, D. E. Steffen, J. C. Pack, and G. W. Norman. 2001. An eastern wild turkey population dynamics model for Virginia and West Virginia. Journal of Wildlife Management 65:415-424.

Chamberlain, M. J., B. S. Cohen, N. W. Bakner, B. A. Collier. 2020. Behavior and movement of wild turkey broods. Journal of Wildlife Management, 84(6): 1139-1152.

Cobb, D. T., D. H. Ley, and P. D. Doeer. 1992. Isolation of *Mycoplasma gallopavonis* from free-ranging wild turkeys in coastal North Carolina seropositive and culture-negative for *Mycoplasma gallisepticum*. Journal of Wildlife Diseases 28:105-109.

Coggin, J., and C. Peery. 1975. A review of the wild turkey in Virginia. Virginia Commission of Game and Inland Fisheries. Richmond, Virginia, USA.

Davidson, W. R. (ed). 2006. Field manual of wildlife diseases in the southeastern United States. Third Edition. Southeastern Cooperative Wildlife Disease Study, Athens, Georgia, USA.

Davidson, W. R., V. F. Nettles, C. E. Couvillion, and E. W. Howerth. 1985. Diseases diagnosed in wild turkeys (*Meleagris gallopavo*) of the southeastern United States. Journal of Wildlife Diseases 21:386-390.

Davidson, W. R., V. F. Nettles, C. E. Couvillion, and H. W. Yoder, Jr. 1982. Infectious sinusitis in wild turkeys. Avian Diseases 26:402-405.

Fischer, J. R., A. V. Jain, D. A. Shipes, and J. S. Osborne. 1995. Aflatoxin contamination of corn used as bait for deer in the southeastern United States. Journal of Wildlife Diseases 31(4):570-572.

Forrester, D. J. 1991. The ecology and epizootiology of avian pox and malaria in wild turkeys. Bulletin of the Society for Vector Ecology 16:127-148.

Godfrey, C. L., and G. W. Norman. 1999. Effect of habitat and movement on wild turkey poult survival. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 53:330-339.

Gwynn, J. V., and C. H. Shaffer. 1962. Tom turkey test number two. Virginia Wildlife 23(9):8-9, 20.

Huang, M. J., S. Demarais, B. K. Strickland, W. C. Brookshire. 2022. Identifying aflatoxin exposure risk from supplemental feeding of deer. Journal of Wildlife Diseases 58(2): 384-388.

Healy, W. M., and S. M. Powell. 2000. Wild turkey harvest management: biology, strategies, and techniques. U.S. Fish and Wildlife Service Biological Technical Publication BTP – R5001 –1999, Shepherdstown, West Virginia, USA.

Hopkins, B. A., J. K. Skelles, G. E. Houghten, D.Slagle, and K. Gardner. 1990. A survey of infectious diseases in wild turkeys (*Meleagridis gallopavo silvestris*) from Arkansas.

Journal of Wildlife Diseases 26:468-472.

Johansen, P. R. 1981. Invertebrate biomass of various aged Loblolly pine plantations and upland hardwood stands in the central Piedmont of Virginia. MS Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

Johnson, V. M., C. A. Harper, R. D. Applegate, R. W. Gerhold, D. A. Buehler. 2022. Nest-site selection and survival of wild turkeys in Tennessee. Journal of the Southeastern Association of Fish and Wildlife Agencies 9:134-143.

Lafon, N. W., G. W. Norman, D. E. Steffen, J. C. Jeffreys, and R. D. Fell. 2001. Forest clearings management: insects and vegetation for wild turkey broods. Proceedings of the Southeastern Association of Fish and Wildlife Agencies 55:547-559.

Little, T. W., J. M. Keinzler, and G. A. Hanson. 1990. Effects of fall either-sex hunting on survival in an Iowa wild turkey population. Proceedings of the National Wild Turkey Symposium 6:119-125.

Little, T. W., and K. L. Varland. 1981. Reproduction and dispersal of transplanted wild turkeys in Iowa. Journal of Wildlife Management 45(2): 419-427.

Londe, D. W., A. K. Moeller, P. M. Lukacs, S. D. Fuhlendorf, C. A. Davis, R. D. Elmore, M. C. Chitwood. 2023. Review of range-wide vital rates quantifies eastern wild turkey population trajectory. Ecology and Evolution 13:e9830.

Luttrell, M. P., T. H. Eleazer, and S. H. Kleven. 1992. *Mycoplasma gallopavonis* in eastern wild turkeys. Journal of Wildlife Diseases 28:288-291.

McDoughal, L. A. 1990. Wild turkey-road interactions on a Virginia National Forest. MS Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

McGhee, J. D., and J. M. Berkson. 2007. Estimation of a non-linear density-dependence parameter for wild turkey. Journal of Wildlife Management: 71:706-712.

McGhee, J. D., and J. M. Berkson. 2012. Eastern wild turkey harvest strategies for a stochastic density- dependent system. Proceedings of the Tenth National Wild Turkey Symposium 10:133-142.

McGhee, J. D., J. Berkson, D. E. Steffen, and G. W. Norman. 2006. Density-dependent harvest modeling for the eastern wild turkey. Journal of Wildlife Management 72:196-202.

Mosby, H. S., and C. O. Handley. 1943. The wild turkey in Virginia: its status, life history, and management. Virginia Division of Game, Commission of Game and Inland Fisheries. Pittman- Robertson Project Report. Richmond, Virginia, USA.

Norman, G. W., M. M. Conner, J. C. Pack, and G. C. White. 2004. Effects of fall hunting on survival of male wild turkeys in Virginia and West Virginia. Journal of Wildlife

Management 68:393-404.

Norman, G. W., T. M. Fearer, P. K. Devers. 2004. Factors affecting wild turkey recruitment in western Virginia. Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 58:248-262.

Norman, G. W., J. C. Pack, D. E. Steffen, and C. I. Taylor. 2006. Fall illegal kill of female wild turkeys in Virginia and West Virginia. Proceedings of the National Wild Turkey Symposium 9:67-73.

Norman, G. W., J. C. Pack, C. I. Taylor, D. E. Steffen, and K. H. Pollock. 2001. Reproduction of eastern wild turkeys in Virginia and West Virginia. Journal of Wildlife Management 65:1-9.

Norman, G. W., and D. E. Steffen. 2003. Effects of recruitment, oak mast, and fall-season format on wild turkey harvest rates in Virginia. Wildlife Society Bulletin 31:553-559.

Norman, G. W., P. D. West, and A. M. Cowan. 2001. Survival and reproduction of eastern wild turkeys in Tidewater Virginia. Northeast Wildlife 55:31-38.

Pack, J. C., G. W. Norman, C. I. Taylor, D. E. Steffen, D. A. Swanson, K. H. Pollock, and R. Alpizar-Jara. 1999. Effects of fall hunting on wild turkey populations in Virginia and West Virginia. Journal of Wildlife Management 63: 964-975.

Paisley, R. N., R. G. Wright, and J. F. Kubisiak. 1996. Survival of wild turkey gobblers in southwestern
Wisconsin. Proceedings of the National Wild Turkey Symposium 7:39-44.

Porter, W. F., G. C. Nelson, and K. Mattson. 1983. Effects of winter conditions on reproduction in a northern wild turkey population. Journal of Wildlife Management 47:281-290.

Quist, C. F., J. P. Dubey, M. P. Luttrell, and W. R, Davidson. 1995. Toxoplasmosis in wild turkeys: a case report and serologic survey. Journal of Wildlife Diseases 31:255-258.

Reeves, J. H. 1960. The history and development of wildlife conservation in Virginia: a critical review.
Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

Roberts, S. D., J. M. Coffey, and W. F. Porter. 1995. Survival and reproduction of female wild turkeys in New York. Journal of Wildlife Management 59:437-447.

Shaffer, C. H. 1961. Tom turkey tests. Virginia Wildlife 22(8):4-5, 12.

Shaffer, C. H. 1967. Hunting the king in the spring. Virginia Wildlife 28(4):6-7.

Seiss, R. S., P. S. Phalen, and G. A. Hurst. 1990. Wild turkey nesting habitat and success rates. Proceedings of the National Wild Turkey Symposium 6:18-24.

Speake, D. W., W. J. Fleming, G. A. Wright, and W J. Hamrick. 1975. Habitat use and seasonal movements of wild turkeys in the Southeast. Proceedings National Wild Turkey Symposium 3:122-129.

Steffen, D. E., N. W. Lafon, and G. W. Norman. 2002. Turkeys and oaks. Pages 241-255 *in* W. J. McShea and W. M. Healy, editors. Oak forest ecosystems: ecology and management for wildlife. Johns Hopkins University Press, Baltimore, Maryland, USA.

Steffen, D. E., and G. W. Norman. 1995. Dynamics between spring and fall harvests of wild turkeys in Virginia. Proceedings of the National Wild Turkey Symposium 7:231-237.

Suchy, W. J., G. A. Hanson, and T. W. Little. 1990. Evaluation of a population model as a management tool in Iowa. Proceedings of the National Wild Turkey Symposium 6: 196-204.

Swanson, D. A., J. C. Pack, C. I. Taylor, D. E. Samuel, and P. W. Brown. 1995. Selective timber harvesting and wild turkey reproduction in West Virginia. Proceedings of the National Wild Turkey Symposium. 7:81-88.

Tapley, J. L., M.A. Hatfield, R. K. Abernethy, and J.E. Kennamer. 2012. Status and distribution of the wild turkey in 2009. Proceedings of the National Wild Turkey Symposium. 10:19-30.

Vangilder, L. D. 1992. Population dynamics. Pages 144-164 *in* J.G. Dickson ed., The wild turkey biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Vangilder, L. D., and E. W. Kurzejeski. 1995. Population ecology of the eastern wild turkey in northern Missouri. Wildlife Monographs 130.

Wright, G. A., and L. D. Vangilder. 2001. Survival of eastern wild turkey males in Western Kentucky. Proceedings of the National Wild Turkey Symposium 8:187-194.

## WILD TURKEY PROGRAM SUPPLY AND DEMAND

### SUPPLY

### Wild Turkey Habitat Supply

Habitat Components

There are six ecoregions (Middle Atlantic Coastal Plain, Southern Appalachian Piedmont, Blue Ridge Mountains, Northern Ridge and Valley, and Northern Cumberland Mountains, and Southern Cumberland Mountains) representing 2 major landscape units (Atlantic Coastal Plain and Appalachian Highlands) in Virginia (Fig. 7). These different landscapes create a diversity of habitat types and forest communities. Northern hardwoods or oak/hickory/pine forest types characterize mountainous areas. Oak/hickory forests are the typical climax forests in the Piedmont. Coastal Plain habitats include coastal marshes along with pine, pine/oak, and bottomland/hardwood forests.

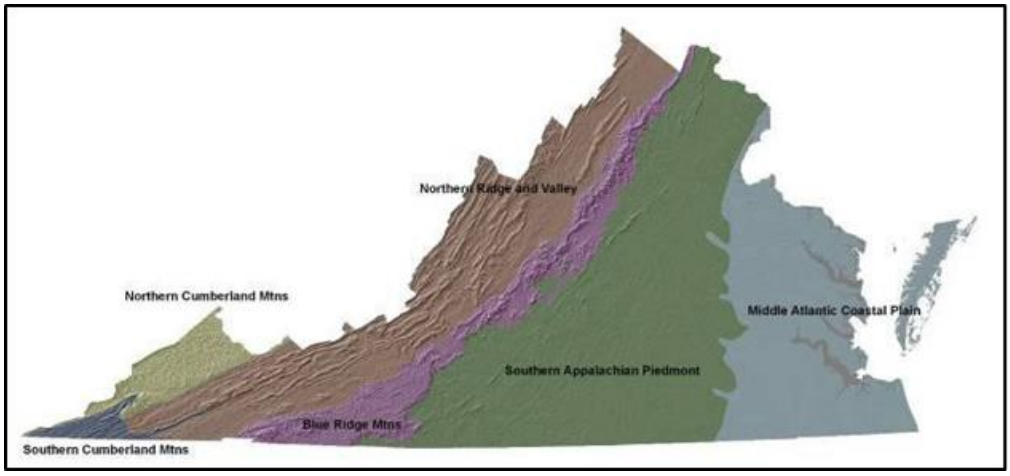


Figure 7. Virginia's ecoregions.

Turkey habitat quality depends on the fertility of the underlying soils. Soils along narrow ridges and steep slopes in the Cumberland Mountains and Ridge and Valley provinces are usually shallow and low in fertility. Valley soils, derived from shale and limestone, are relatively fertile. Blue Ridge soils tend to be deeper and more fertile than Ridge and Valley and Cumberland Mountain soils. Piedmont soils are characterized by sandy loam soils with red clay subsoil. They are generally acidic and low in organic material, phosphorus, and nitrogen. Coastal Plain soils are typically sandy and low in fertility.

Forests (16.1 million acres) represent 62% of Virginia’s land area (Fig. 8). Agricultural lands constitute 32% (8.2 million acres) of the Commonwealth (Fig. 9). Wetlands (Fig. 9) and urban areas primarily represent the balance of land covers in Virginia.

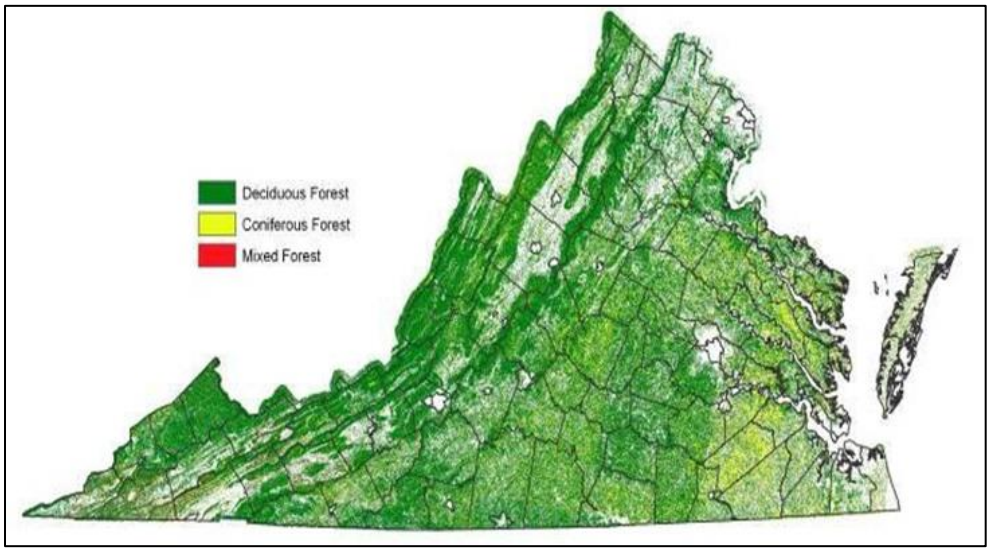

Figure 8. Land cover of Virginia: Forested areas by type.

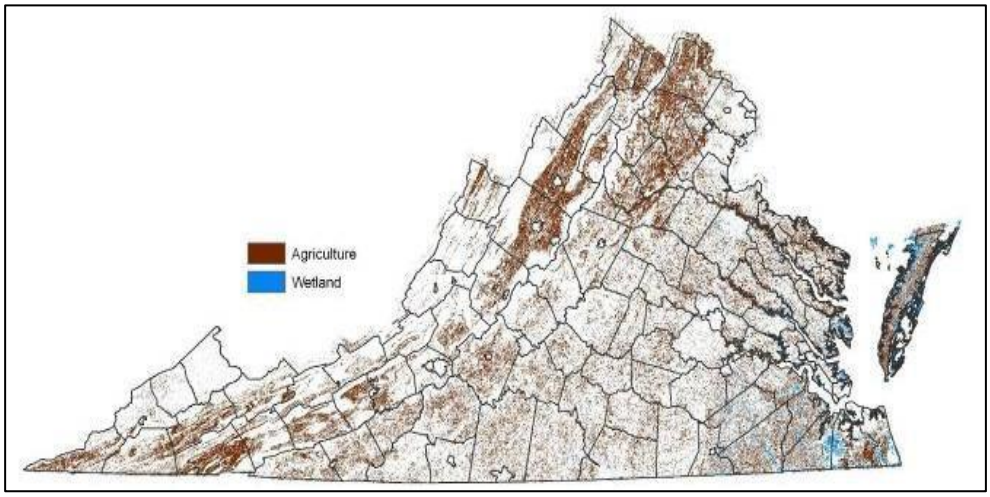

Figure 9. Land cover of Virginia: Agriculture and wetlands.

Changes in diversity of dominant tree species within a stand and interspersion of different stands may also have positive or negative impacts on future turkey populations in some areas. In 1940, hardwood forests made up only 57% of forestland across the state compared to 80% in 2023; softwoods (e.g., pines, cedars) made up 43% and 20% of forested lands in 1940 and 2023, respectively. Decreased timber harvesting during the last 20 years on national forest lands and other public lands west of the Blue Ridge has reduced forest habitat diversity on public lands in western Virginia. In eastern Virginia, habitat quality for turkeys is generally high as active forest management through timber harvesting and prescribed burning are more common. Conversions of eastern Virginia forests from hardwood to pine monocultures (predominantly loblolly) and the potential impacts on turkey habitat quality should be monitored, although currently the improved early successional habitats may offset the loss of hard mast producing species in this area. Continued declines in hard mast

production (primarily white and red oak acorns) and lack of sufficient oak regeneration in climax forests will likely negatively affect wild turkeys into the future.

Despite reversions from other land uses to forestlands through the 20th century, there have been more recent net losses of forested acres statewide. Between 2011 and 2021, over 193 $mi^2$ of forested land have been lost to land-use changes; the majority (55%) for urban development. This equates to over 1,153 $mi^2$ of forest land lost over the past 25 years (National Land Cover Database 2021).

The distribution (Fig. 10) and growth (Fig. 11) of human populations in Virginia plays a major role influencing habitat and land use changes. Primary population centers include areas around Richmond, Norfolk, and northern Virginia (Fig. 10). Growing at a rate of 1.4% each year since 1960, the estimated population in Virginia now exceeds 8 million people. However, the rapidly growing human population is not uniform across the state (Fig. 11). While tremendous growth has been concentrated in urban and suburban areas, some rural areas in the southern Piedmont and in the western mountains have experienced population decline. Development and population expansion of suburban areas typically results in fragmentation of farms and large parcels of land, which generally translates to losses in turkey habitat.

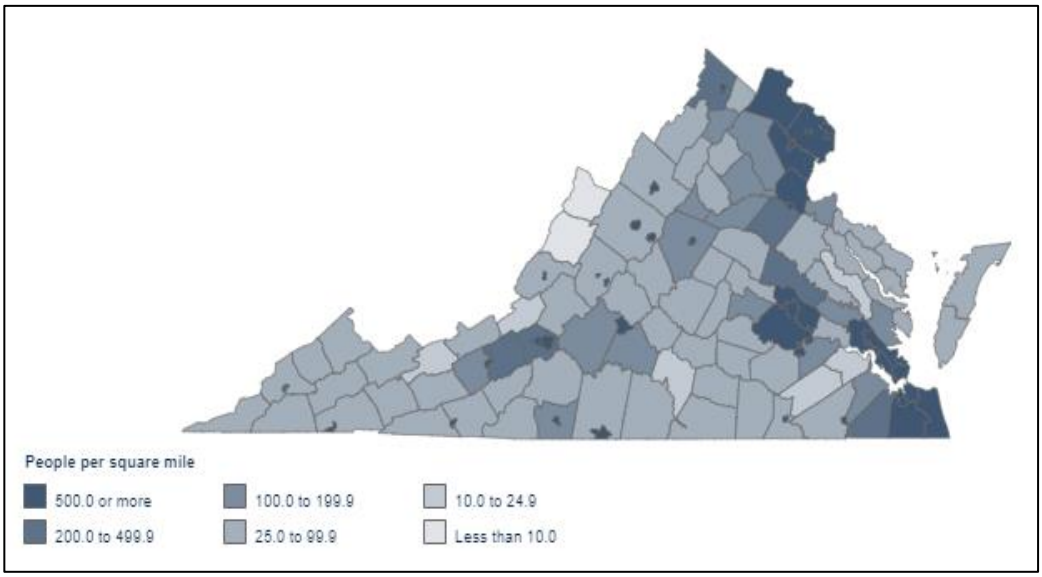


Figure 10: Human population density of Virginia by people per square mile (2020 Census Data).

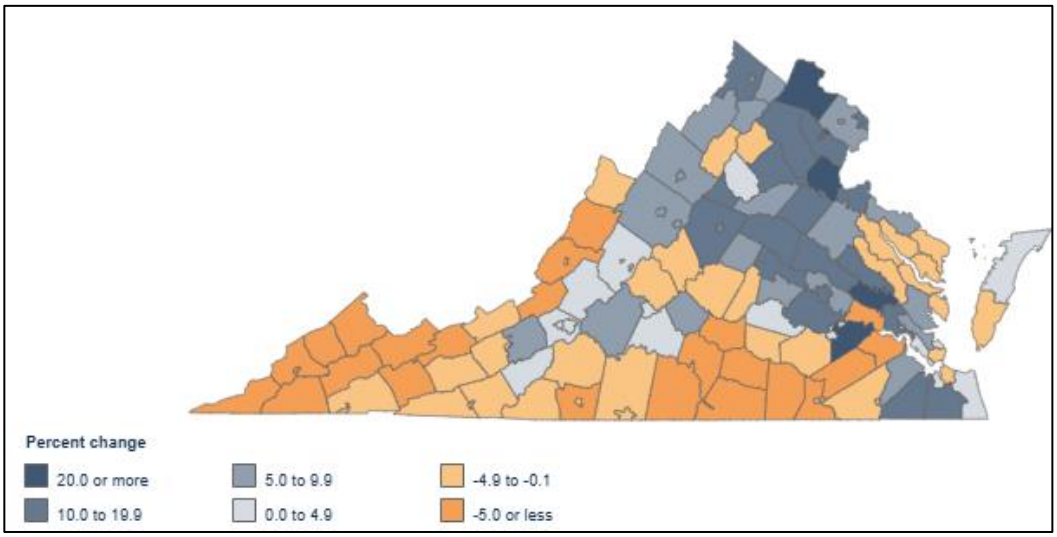


Figure 11: Percent of human population change, from 2010 to 2020 (2020 Census Data).

Habitat Suitability

With extensive forested areas and a variety of habitat types in all ecoregions, most of Virginia can be considered potential turkey habitat. Only a few areas in Virginia with landscapes composed of very extensive open lands often associated with large agricultural fields (Fig. 9) or high human density from urbanization (Fig. 10) would be considered entirely unsuitable for turkeys. Wild turkeys have shown surprising adaptability, even in moderate development, to survive in a variety of conditions.

In order to establish a more accurate landscape-perspective of turkey habitat, a habitat suitability index (HSI) model was developed based on the forest, open land, and edge composition to provide a relative measure of turkey habitat quality in Virginia (Morris 2014). While this HSI model functioned admirably for management through 2022, staff recognized the need to revisit the HSI model and incorporate some minor changes to the current model along with corrections to account for recent landscape changes. The Conservation Management Institute at Virginia Tech was brought in to revamp this model in 2023. The newly revised model incorporated more up-to-date imagery, as well as methodology to match the newer technologies available for habitat mapping (Fig. 12). Additionally, the new version of the model incorporated a 1,500-meter grid system that allows a better measure of the habitat distribution across a county.

Optimal turkey habitat can be characterized by an appropriate mixing of diverse forests, interspersed with openings and agriculture. Less diversity of land cover and land use will generally be associated with lower quality turkey habitats. Cover types, from the most recent National Land Cover Database (2021), to include in the model were guided by turkey life history needs. For suitable turkey habitats, the HSI index could potentially range between 0 for the poorest turkey habitats and 1 for the best habitats.

The average county HSI value was 0.598 across all Virginia counties and ranged from a county high of 0.773 (Pittsylvania) to a low of 0.337 (Virginia Beach) (Appendix C). The

HSI model indicates that the better turkey habitats in Virginia are generally found in the southern Piedmont counties (Region 2), while the poorer turkey habitats occur in the mountainous areas of western Virginia (primarily western Region 4) and the highly urbanized areas (Fig. 13). The southern Piedmont is generally characterized by a high diversity of farmlands and forested stands that offer better turkey habitat than is found in the more continuous forest cover with little interspersion of openings in the western counties.

While the HSI is a valuable tool, it is a coarse scale management evaluation and as such may not adequately describe all turkey habitat that is available. Examples of the coarse level can be found in lands that are in managed forests. These areas provide many of the necessary habitat requirements due to varied forest structure, but because of the overall classification of the overstory stand, the score may not adequately represent the value to turkeys. As such, the model may in some cases under-represent the true habitat value. Similarly, lands that are open (and ranked highly by the model) may not be available to turkeys due to invasive pasture grasses or other thick vegetation, in these cases over-representing the habitat value. This model was developed as a tool to look at larger landscape level quality and as such may have limited utility for fine scale management.

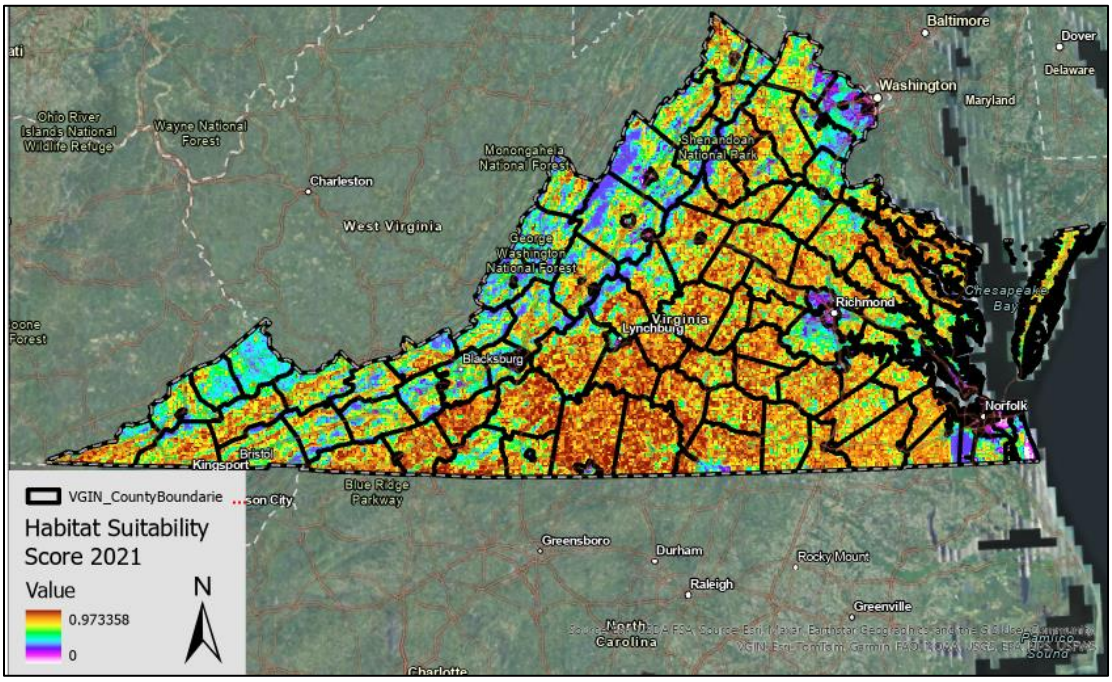


Figure 12. Habitat suitability for turkeys in Virginia (Virginia DWR 2024).

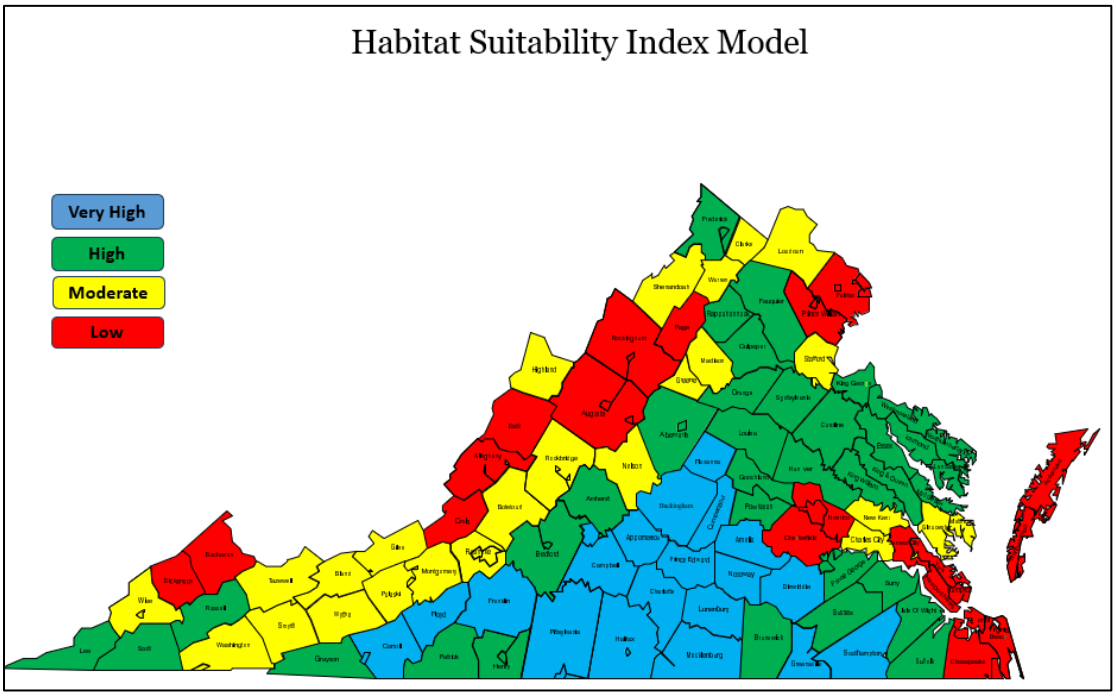


Figure 13. Habitat Suitability for wild turkey in Virginia arranged by mean county suitability cluster analysis.

Public Land Habitats

Private ownerships represent most (88%) of the suitable habitat for turkeys across Virginia, with 12% of the suitable habitats in public ownership. On a statewide basis, the largest public landowner is the U.S. Forest Service (USFS) with 2,569 $mi^2$ of suitable turkey habitat on National Forest lands; the USFS contains 65% of all public land that is suitable for turkeys in Virginia. The next largest public land ownerships include the U.S. National Park Service (NPS) (437 $mi^2$, 11% of all public land), U.S. Department of Defense (DOD) (418 $mi^2$, 11% of all public land), Virginia Department of Wildlife Resources (VDWR) (275 $mi^2$, 7% of all public land), U.S. Fish & Wildlife Service (USFWS) (159 $mi^2$, 4% of all public land), and other Virginia state lands (STATE) (105 $mi^2$, 3% of all public land).

The George Washington and Jefferson National Forests, whose ownership is restricted to the western part of Virginia, are an especially important resource for turkey-related recreation and habitat west of the Blue Ridge Mountains. On average, National Forest lands represent 20% of the total huntable habitat in the 30 counties that contain USFS properties and 93% of the public land open to hunting west of the Blue Ridge. Three counties have more than half of the suitable turkey habitat contained on public land: Craig (57%), Alleghany (52%), and Bath County (52%). National Forest lands account for over 84% of all suitable public land and over 90% of the huntable land west of the Blue Ridge.

Because of the importance of public land in western Virginia (and USFS properties in particular), habitat quality on public lands has become a source of controversy for citizens interested in the management of turkey and other wildlife species. Most publicly owned properties in western Virginia, including USFS and VDWR lands, are found on slopes and ridge

tops with poorer soils than the more fertile privately-owned valley lands. Therefore, public lands will almost always contain lower quality habitat than neighboring private lands.

Over the past decades, the vegetative characteristics on public lands have shifted towards increased coverage of closed canopy, older age forests that are of less value to turkey. While these closed canopy forests provide adequate roosting habitat and produce hard mast, they often exclude more beneficial shrubs and herbaceous plants through shading in the understory. The long-term changes in habitat conditions have likely had multiple causes, including changes in land management practices (e.g., reduced timber cutting, fire suppression), reduced staff working directly on lands for wildlife habitat management, forest maturation, and even deer herbivory, in some areas.

Wild turkeys thrive in areas with an abundance of diverse habitat types, those that are especially important are areas of early successional vegetative communities that are needed for nesting and brood rearing cover. Timber harvests and other forest disturbance (e.g., insect damage, fire) are often the main sources of this diversity on public lands. Timber harvests (e.g., clearcuts, shelterwood cuts, selection cuts, thinnings, salvage cuts) on National Forest lands have declined substantially since the peak five-year period (1985-89) when 5,983 acres (0.33%) were harvested annually. Even including other timber stand improvements (e.g., pre-commercial thinnings, removal of cull trees), only 9,946 acres (0.55%) were treated annually during peak years. Since this peak of activity in the 1980s, forest management activity has decreased substantially. Timber harvests on DWR lands have similarly declined over the past several decades, resulting in lower diversity of habitats on the WMAs, particularly in areas west of the Blue Ridge.

The use of prescribed fire has increased significantly on National Forest lands. Both prescribed and wildfires increase the abundance and diversity of succulent plants, improves insect abundance and increases production of soft mast. Longer-term habitat benefits may also be provided by fires that thin the canopy, allowing sunlight to reach the forest floor and stimulating more sustainable ground-level herbaceous cover (useful for brooding, nesting, and foraging). Recent research by The Nature Conservancy on National Forest lands in Virginia showed that 24% of burned areas resulted in open gaps in the forest canopy. The ultimate long-term success of prescribed fire for improving habitat quality will depend on many factors including site quality, stand condition, and fire intensity. From pre-European settlement in the 1700s through the 1930s when aggressive fire suppression began, wildfires were much more frequent and extensive. In some years, wildfires may continue to have significant impacts (e.g., 2012, 2024).

While it might seem obvious that declining habitat quality (and turkey abundance) on public land has been a direct result of the significant decreases in the peak timber harvest since the late 1980s, timber harvests on National Forest lands have never been an intensive management activity at the landscape level. Even at the peak during 1985-89, annual timber harvests still represented only an average of 0.33% of the landscape (i.e., a timber rotation of about 300 years). The timber rotation period is the time between establishing a stand of trees and when that stand is harvested. The best timber rotations for turkey management will depend on a variety of factors, but an optimal rotation period to benefit turkey habitat will typically be 125 years or shorter. As important as timber management is, it is unlikely that the historically low intensity of timber harvests on National Forests have ever produced large landscape benefits for turkey.

Even without active management of forests, natural disturbances such as wind, ice storms, disease, pests, fire, etc. will produce dispersed canopy gaps where some minimal level of forest diversity will be produced. However, the habitat potential for turkey will remain below the level that could be achieved with active forest management. Further, without management to improve habitat diversity on National Forests and State WMAs, it is unlikely that turkey populations can be sustained at levels to meet public demands for viewing and hunting.

## Wild Turkey Population Supply

### Population Densities

As with most wildlife species, no economically practical methods exist to accurately estimate actual turkey populations in Virginia. Previous research has shown that spring gobbler harvests and success by hunters are the best indices of turkey population trends and abundance. The primary sources of information about spring harvests and hunter success come from mandatory harvest reporting and periodic hunter surveys. Data from additional surveys of bow hunters and spring gobbler hunters are also used to monitor turkey population abundance.

While harvest data and hunter surveys are currently still the most common tools for measuring population trends in wild turkeys, questions of spatial and temporal variation in harvest pressure, hunting activity, and hunter behaviors are leading to the development of integrated population models and use of population reconstruction by some states. Continued research into these methods and comparisons to harvest trend indices will be necessary as declines in hunter numbers and changes in land use continue across Virginia. Additionally, datasets such as E-bird (Cornell Lab of Ornithology), breeding bird surveys (US Geological Survey), and other citizen science applications currently show confounding trends when compared to traditional harvest indices. Use of these novel datasets in conjunction with more traditional harvest methodologies will likely be needed in the future to fully understand wild turkey population dynamics and trends in a changing landscape (Chamberlain et al. 2022).

The number of spring gobblers killed per square mile of available habitat is used as a relative index to turkey population density. In order to account for annual fluctuations in harvest, the three-year average index is used. Available habitat for turkeys is defined as all areas except for locations considered barren land, herbaceous wetlands, and areas under human development as defined by the National Land Cover Database (NLCD). The 2021 NLCD dataset was used for the estimation of available habitat as it was the most recent dataset available at the time of publication. The Statewide 3-year average harvest index from 2022-2024 was 0.58 spring gobblers killed/ $mi^2$ of available habitat. By contrast, during the 2011 and 2012 spring hunting seasons, the statewide population density index was 0.44 spring gobblers killed/ $mi^2$ of suitable habitat. By region (Fig. 14, Table 1), the highest turkey densities occur in Tidewater (Region 1, 0.85 gobblers/$mi^2$), followed by the South Piedmont (Region 2, 0.55 gobblers/$mi^2$), Southwest Mountains (Region 3, 0.55 gobblers/$mi^2$), the North Mountain region (Region 4, 0.48 gobblers/$mi^2$), and the North Piedmont (Region 5, 0.47 gobblers/$mi^2$). Densities also vary among counties within regions (Fig. 15, Appendix C).

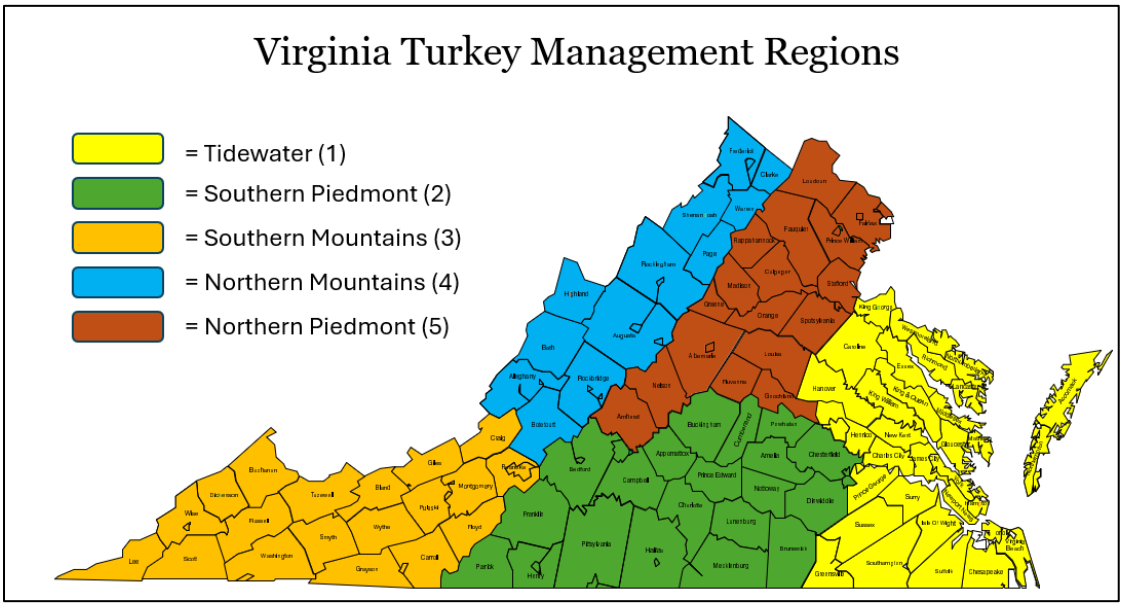


Figure 14. Virginia turkey management regions

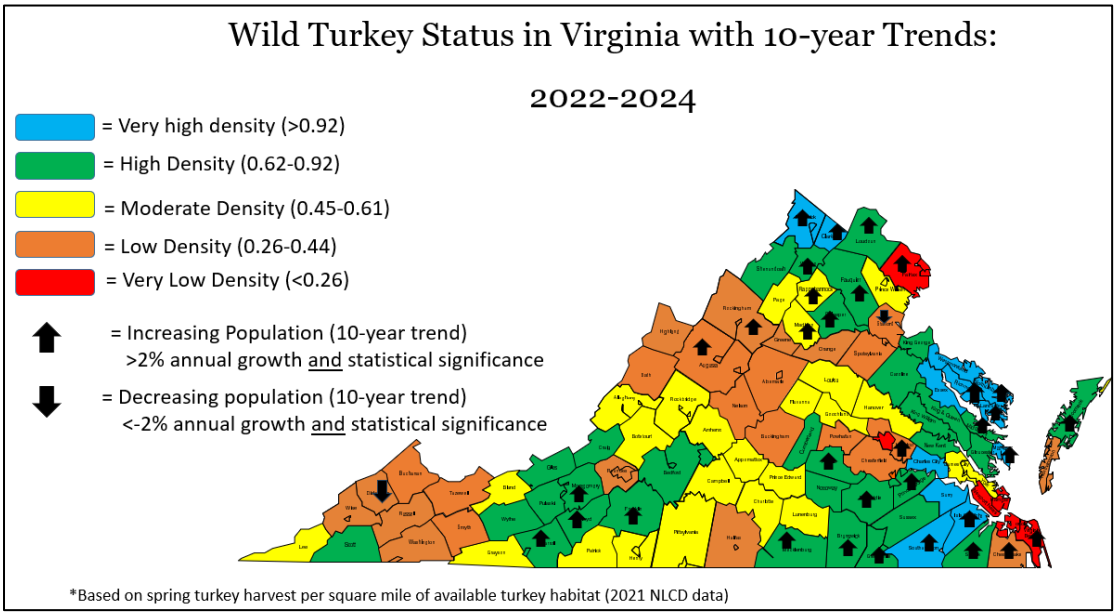


Figure 15. Relative densities of wild turkeys in Virginia based on the three-year average harvest of gobblers during spring hunting seasons from 2022-2024 per square mile of available habitat and 10-year regression of harvest data to determine long term population growth trajectories.

## Population Trends

Population trends are evaluated by estimating the annual rate of change in spring gobbler harvest over time (Appendix C). In addition to evaluations of the relative density discussed in the previous section, longer-term trends are evaluated using a linear regression analysis over a ten-year period. This allows tracking trends of the population over time that may be difficult to see due to the somewhat irregular harvest patterns of wild turkeys. These trends are monitored at the state and county levels annually.

Historically, the state-wide population index of spring gobbler harvest showed steady and rapid growth from 1961 through about 2002, with an average growth rate of 10% annually (Fig. 16). The population growth stabilized in the early 2000s at a harvest level around 15,000. Since 2014, the statewide population index indicates the population may be increasing slightly, although the trend is not statistically significant (annual rate of change = 2.52%, p = 0.053). While the population appears to be increasing slightly, these patterns are not uniform across the state. Population trends vary greatly across the state as productivity (often driven by weather and harvest patterns) differs across various regions (Fig. 15). The regional or localized population changes are often the source of frustration of hunters who see changes in local areas that may not show up at the county, region, or the state level. These changes in local populations may contribute to the perception that populations are out of balance or may be insufficient for meeting constituent needs.

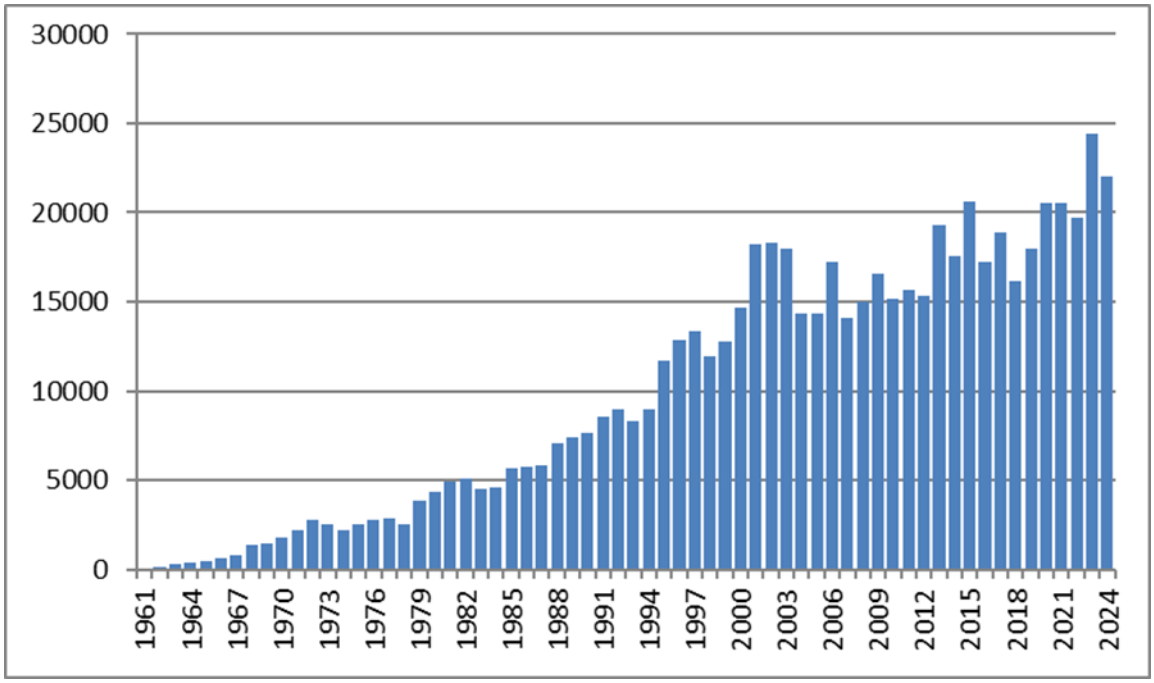


Figure 16. Virginia spring gobbler harvest as reported through mandatory check-in, 1961-2024.

Hunter survey data also provide several meaningful metrics for comparison of population growth. DWR Human Dimensions program staff conduct biennial surveys of a segment of the hunting license holders to gain insight into the attitudes and perceptions of hunters. The survey also serves to establish hunting effort and success data. One of the most

useful datapoints for monitoring trends over time is the average daily success rate. The results from the 2023-2024 Hunter Survey indicate that, on average, Virginia's spring turkey hunters harvest 0.065 gobblers per day of hunting, or said another way, it takes the average hunter approximately 15 days of hunting to harvest a gobbler. The average daily harvest has declined very slightly over the last two decades, but the trend is not statistically significant. During the mid-1980s, when populations were much lower, it took an average of 40 days of hunting to kill a gobbler when hunter success was about 0.025 gobblers killed per day. The daily success increased through the 1990s to about 0.04 gobblers per day (25 days to harvest a gobbler) as populations increased. During the early 2000s, the average daily success peaked at 0.075 (or 13 days to harvest a gobbler) in the 2004 season (Fig. 16). The 2023-24 Hunter Survey indicates that 35% of hunters were successful in the spring 2024 season, the highest hunter success rate reported on a hunter survey. Hunter success rates during the mid-1990s ranged from 22-25% depending on the year. Success rates have averaged 28% since 2012 (Fig. 18).

Hunter perceptions of turkey populations often differ from harvest or other survey data. The 2023-2024 Hunter Survey found that 45% of respondents felt turkey population in their area had declined or had declined dramatically, opposed to only 14% who felt the populations had increased or increased dramatically. The majority of respondents (55%) also indicated that they felt turkey populations in their area were too small, opposed to 37% who felt populations were just right, and only 3% who felt there were too many turkeys. A similar question was posed to turkey hunters in the 2023 Turkey Hunter Survey. Thirty-five percent of turkey hunters indicated that populations had declined or declined dramatically, while 23% indicated that populations had increased. This disparity between survey results collected within a 12-month period indicates varied opinions on the severity of potential declines but does outline the general trend of a perceived general decline in populations. There may be multiple factors influencing these responses, including considerable discussion of turkey declines in the Southeastern US, and decreases in poult productivity. This discrepancy between hunter attitudes and harvest or observation-based data suggests that the hunter attitudes and preferences may not track with harvest trends. This can increase the challenge of setting season or population objectives, as hunter attitudes may differ from harvest-based metrics or even observation data.

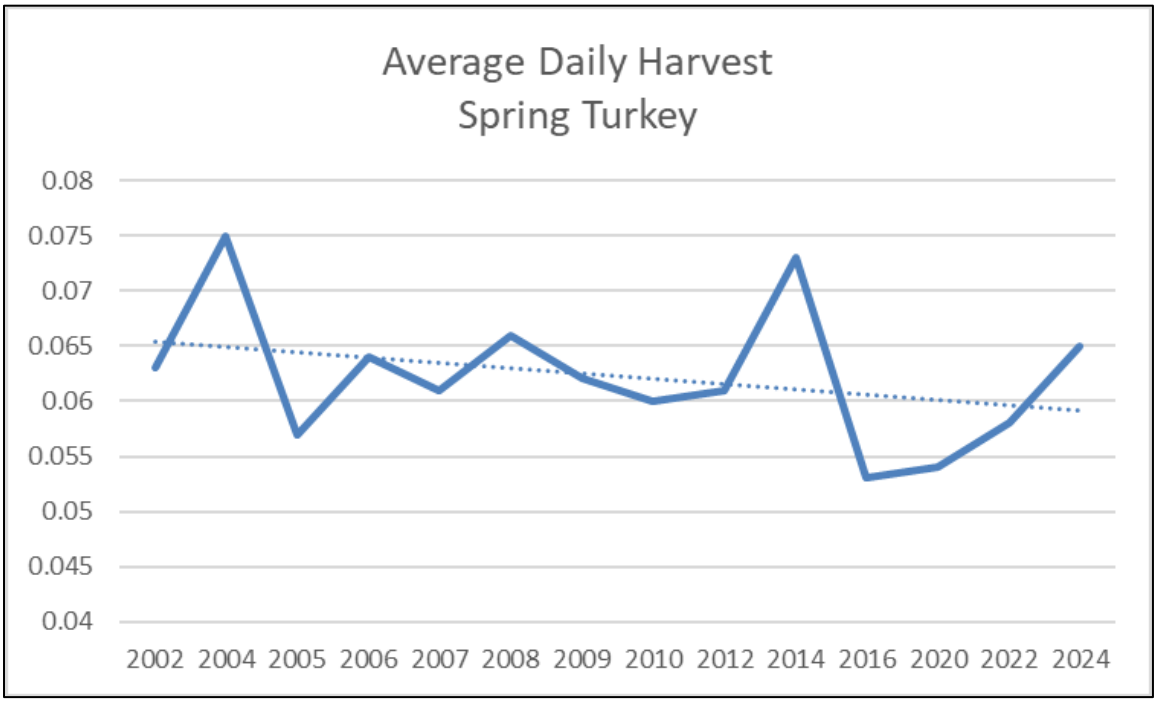


Figure 17. The average daily harvest of spring turkey hunters as reported in the biennial Hunter Survey between 2002 and 2024.

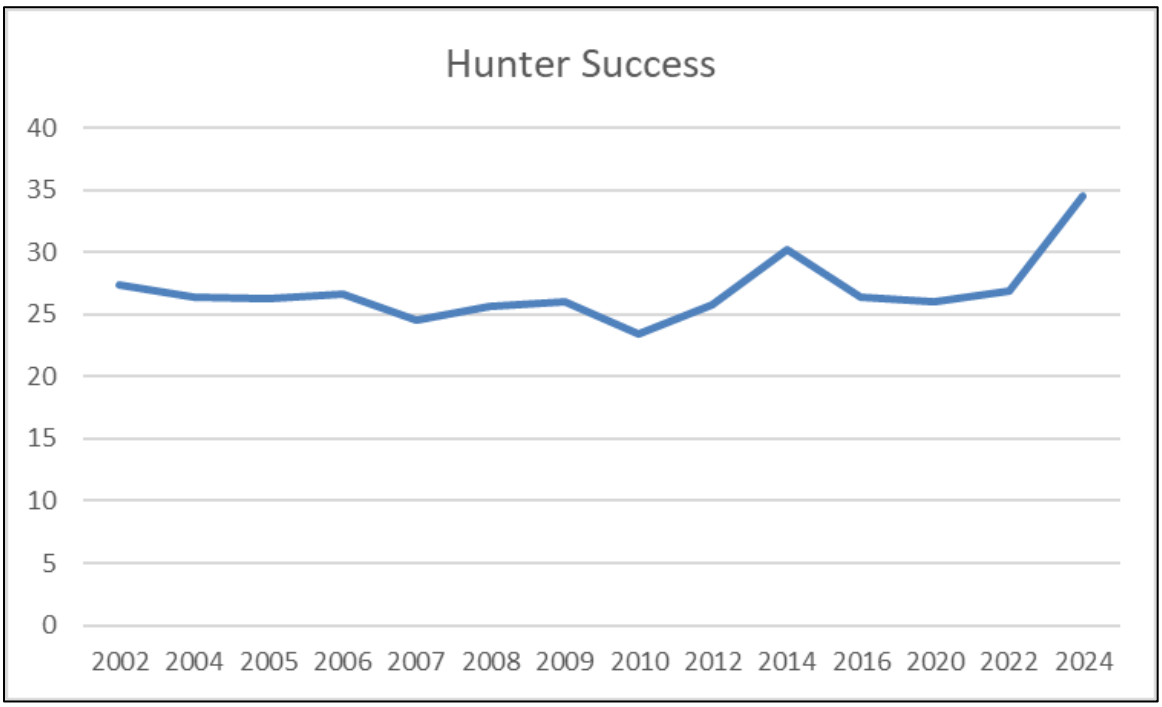


Figure 18. The spring turkey hunter success rate as reported in the biennial Hunter Survey between 2002 and 2024.

Although the statewide turkey population growth rate has stabilized, population trends are variable by region and by county (Appendix C). Generally, turkey populations are increasing in the Tidewater (Region 1) and in the North Mountain Region (Region 4). Populations have stabilized in the South Piedmont (Region 2), North Piedmont (Region 5), and Southwest Mountain (Region 3) portions of the state (Table 1). Within regions, county-level trends also are variable (Fig. 15, Appendix C). While only two counties are currently showing a statistically significant downward trend, several others do indicate a downward trend that has not yet reached the statistically significant threshold (Appendix C).

Table 1. Ten-year population trend data for turkey management regions with a three-year average density.

| Region | 10 Year Trend | | | 2022-2024 Average |
|---|---|---|---|---|
| | % Annual Change | P-Value | R-Square | Kill/Mi$^2$ Available Turkey Habitat |
| Region 1 (Tidewater) | 4.58 | 0.002 | 0.71 | 0.846 |
| Region 2 (S. Piedmont) | 1.21 | 0.393 | 0.09 | 0.547 |
| Region 3 (SW Mountains) | 0.74 | 0.445 | 0.08 | 0.546 |
| Region 4 (N Mountains) | 4.41 | 0.027 | 0.48 | 0.482 |
| Region 5 (N Piedmont) | 2.8 | 0.147 | 0.24 | 0.473 |
| Statewide | 2.52 | 0.053 | 0.39 | 0.583 |

Annual bowhunter surveys also provide additional information regarding turkey populations. During fall archery hunting seasons, bowhunters are recruited to report observations of animals they see while afield hunting. Although these hunters are primarily hunting deer, they observe a diverse number of species largely due to the sedentary hunting style most bowhunters employ. The statewide turkey observations provide an index to gauge the turkey population trajectory over time. The statewide observations per 100 hours of hunting has remained stable at both the 10 (2013-2022) and 20 year (2002-2022) periods (Fig. 19).

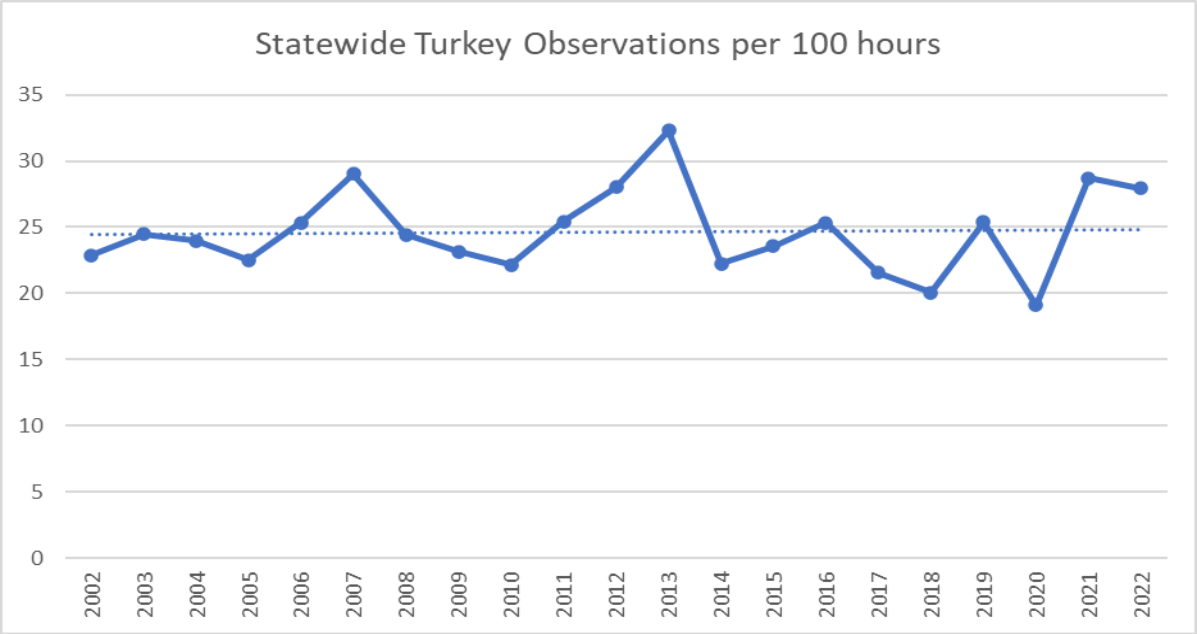


Figure 19. Statewide observations of turkeys from the Bowhunter Survey per 100 hours of observation.

While harvest and hunter-based surveys remain the core methods for ascertaining population status, the concern over declining hunting license sales creates the need for metrics outside of traditional hunting methodologies. Additional trend information can be obtained from other surveys that have not historically been utilized for game species management, such as the breeding bird survey and E-bird reports. The breeding bird survey has been run annually by the United States Geological Survey since 1966. The survey uses defined routes where trained observers identify any birds that are observed or heard along their survey routes. The breeding bird survey trend for Virginia shows a stable trend over the last 10 years (Fig. 20). This trend appears to be similar to our statewide harvest estimates, providing increased confidence in the utility of harvest as a predictor of population status. E-bird, however, is a newer data collection tool where birders can report observations to a central repository which can then be analyzed for trend information. The E-bird option is still in its infancy but may provide significant options for following trend data moving into the future. Current E-bird data show variable trends in portions of the state but may be heavily influenced by birding observations.

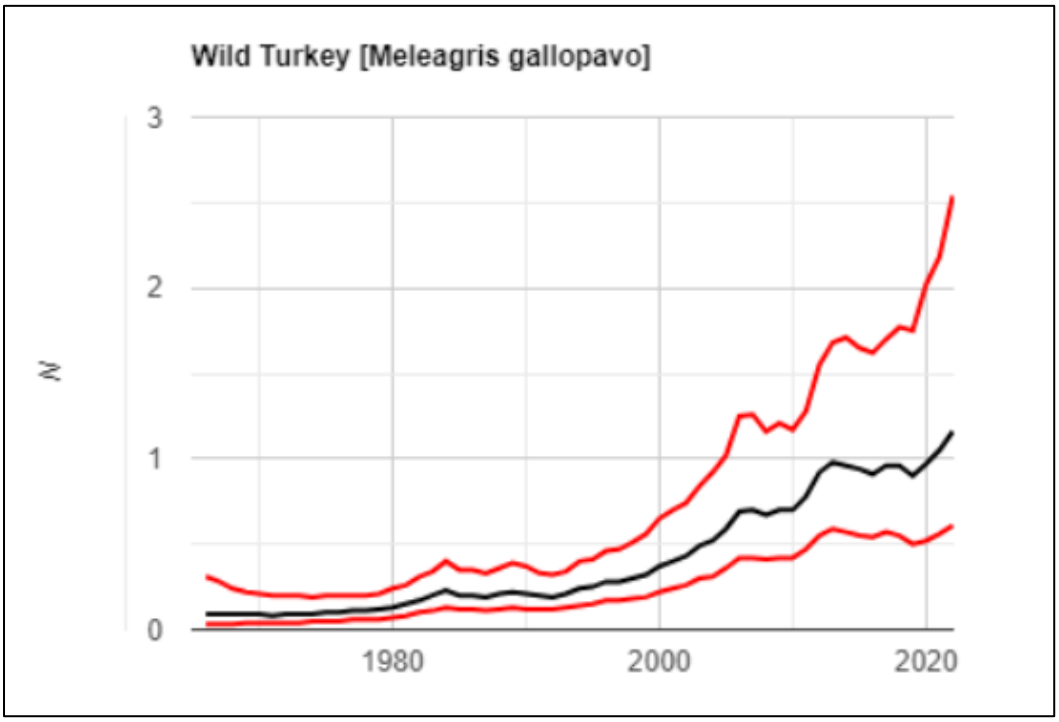


Figure 20. Breeding bird survey data from 1966 to 2022 for wild turkey.

Public Land Population Trends

Turkey population status on Virginia's public lands can be challenging to monitor with precision. There are many factors that can influence public land populations, including habitat quality (see section on Public Land Habitat), hunting pressure, disturbance during nesting or brood rearing season, among other factors. All of these may factor into effectiveness of specific methods for tracking populations over time.

As with turkey population status for the remainder of the state, hunter harvest trends provide the most reliable index to population size on public lands. Public land harvests in Virginia tend to be dominated by harvests on the George Washington and Jefferson National Forests as these lands encompass 92% of the public hunting land west of the Blue Ridge and approximately 73% of the total public hunting land in Virginia. In general, harvests on the National Forest have followed the statewide trends with relatively stable harvests over the past decade (2014-2024) in the spring, and declining harvests in the fall (Fig. 21). However, National Forest lands have experienced harvest declines overall since the mid-1990s in both fall and spring harvests. While habitat quality has often been implicated as a driving factor in that decline, hunting pressure may also play a pivotal role.

Because hunting pressure and effort can greatly influence harvest rates, it is important to understand hunter trends in relation to harvest. Tracking the number of hunters using the National Forest can be difficult as there are no specific license or stamps required to turkey hunt on public lands. The National Forest Stamp is required of all users who hunt or fish on the National Forest so using trends in Stamp sales provides some indication to hunting pressure (but does not identify specific turkey hunters). National Forest Stamp sales have experienced a general decline over the past 30 years, but specifically the Stamp sales declined significantly

(4.1% annually) through the period from 2002-2012. This decline in the early 2000s, resulted in a decrease of approximately 35,000 users on the National Forest. It is unclear how many of those users would have been turkey hunters so the overall impact cannot be directly tied to hunter effort. However, overall turkey harvests (spring and fall seasons combined) on the National Forest declined at almost 7% annually during this same period of time. Harvests have stabilized since 2012 on National Forest lands; however, the harvests have not returned to levels observed in the late 1990s or early 2000s (Fig. 21). Similarly, Stamp sales seem to have stabilized over the past decade, but total Stamp sales have decreased by almost 71,000 since 1994.

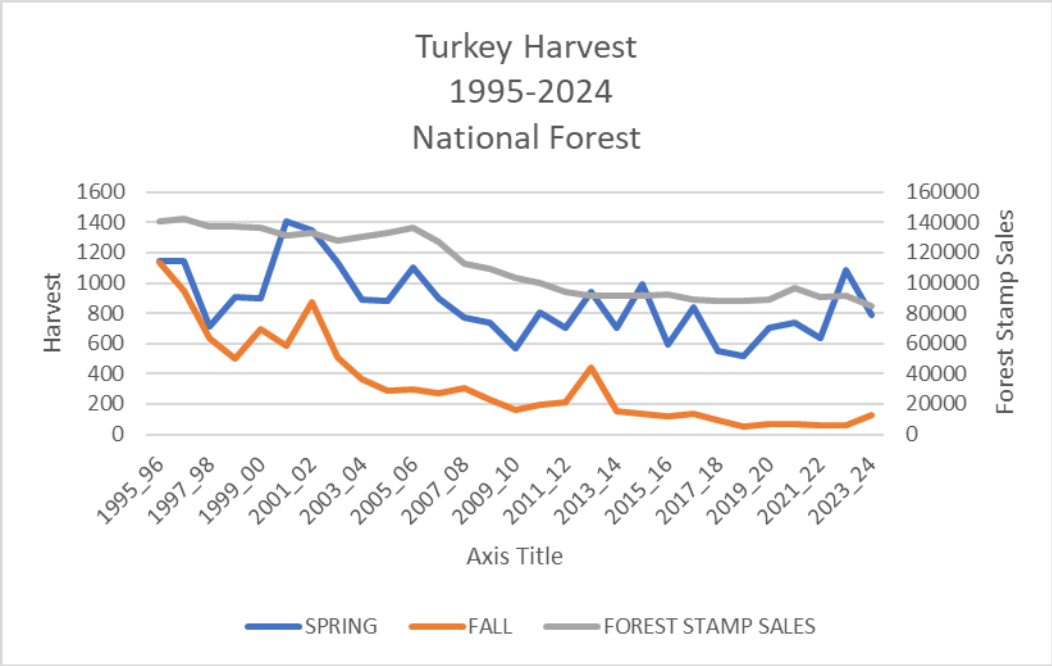


Figure 21. Spring and fall turkey harvest on the George Washington and Jefferson National Forests in Virginia from 1995-2024.

While these potential changes in hunter effort likely affect harvests, the population index (spring harvest/mi$^2$ of available habitat) can provide some meaningful insight into populations on the National Forest. The three-year average (2022-2024) spring turkey harvest per square mile of available habitat on National Forest lands is 0.28, considerably lower than the private land statewide average of 0.61 turkeys/mi$^2$ of available habitat. Populations on the National Forest are generally considered to be below the desired population levels, and as such are often the subject of frustration from public land turkey hunters.

Other federal lands that allow harvest of turkeys in Virginia are predominately made up of military installations (e.g., Marine Corps Base Quantico, Fort Walker) and US Army Corp of Engineers (e.g., Kerr Reservoir, Philpott Reservoir) lands. Of these lands, military installations make up the majority of the remaining federal land harvests in Virginia (excluding National Forest lands). Due to security concerns, most military installations have traditionally monitored harvests and hunting effort to a much finer detail than other public lands. These military installations generally provide good mosaics of turkey habitat and often have robust turkey populations. The average population density index of these lands over the past three years (2002-2024) is 0.47 turkeys/mi$^2$ of available habitat, slightly below the statewide private land

average (0.61 turkeys/mi$^2$ of available habitat). The population index on these lands have remained stable over the past several decades.

State lands make up the remainder of the public land turkey harvest. For this section, WMAs operated by the VDWR and State Forests operated by the Virginia Department of Forestry are grouped together as they often follow similar trends and are grouped in the harvest reporting system. These lands tend to be managed more specifically for wildlife and timber resources, so they often have higher amounts of early and young successional forests and open lands, which are ideal for turkeys. These lands however are often smaller parcels and can be heavily hunted, often resulting in higher-than-average hunting pressure. However, estimating hunting pressure on these lands is difficult. Generally, the fall harvest has declined on state lands similar to trends statewide; however, the spring turkey harvest has remained fairly stable over the past couple of decades (Fig 22). The population index for state lands averaged 0.77 turkeys/mi$^2$ of available turkey habitat, exceeding the population index for private and federal lands. While the habitat may provide some improvements over other lands, the increased hunting pressure on WMA and State Forest lands is likely the main reason this index is slightly higher.

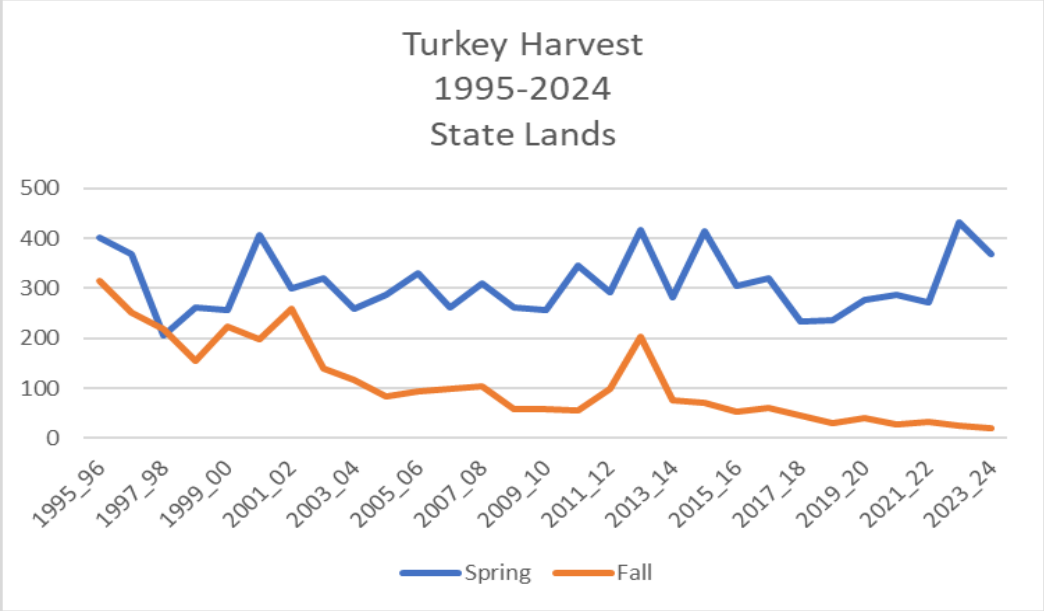


Figure 22. Spring and fall turkey harvest on state lands (WMAs and State Forests) in Virginia from 1995-2024.

Productivity

From 1958 until 2010 turkey productivity (defined as the number of poults per adult hen) was primarily measured utilizing fall feather collections from hunter harvested birds (Fig. 23). At its peak, productivity averaged 3.5-4 poults per hen (1978; hereafter: pph) but fell to an average of 2 pph statewide by 2010. Due to shifting trends in turkey harvests between the fall and spring seasons (decline in fall season harvests versus significant increases in spring season harvests) using fall feather collections has become a less accurate index of productivity. Beginning in 2007, a summer turkey brood survey was initiated to measure productivity based

on turkey sightings categorized by age and sex (Fig. 24). Methods used in this survey were created and standardized across the Southeast in 2014 (SE Wild Turkey Working Group) and adopted by most southeastern states by 2017. During the 2018 NWTF technical committee meeting the standardized survey methods was adopted nationwide to be used throughout the range of the wild turkey (NWTF 2019).

While productivity can vary significantly from year to year based on a variety of factors (e.g., weather, fall mast crops) the long-term statewide average of 2.6 pph was maintained from 2007 until 2020 (Fig 24). By 2023 the long-term statewide average fell to 2.4 pph. The annual index has fluctuated significantly over the past 10 years, from a survey low of 1.6 pph in 2018 to 2.7 pph in 2021. The index has declined 1.3% annually over the past 10 years although the trend is not statistically significant ($R^2$= 0.046, p = 0.581). Generally, ratios of above 2 pph indicates populations are stable or increasing, while pph ratios below 2 suggest that populations may be declining. However, these benchmarks may not hold true as populations have expanded in many areas and the influence of productivity on population status likely varies with hen survival (when hen survival is high, productivity is less influential in population regulation and when hen survival is low, productivity is more influential in population regulation). Reasons for this decline in productivity are unknown although habitat and weather patterns likely play important roles. Turkey populations in Virginia may also be exhibiting some measure of density dependence in certain regions wherein population growth rates slow as the overall population size increases.

Because the brood survey is largely conducted by staff as they are conducting their normal business, there is concern that as workloads, staffing, and responsibilities shift the opportunity to observe turkeys may be diminished. For example, as counties become more urbanized, staff may be spending less time working in rural areas where they are likely to encounter turkeys. This shift may appear in the survey results as a decrease in observations but may be related to changing work obligations in place of shifts in productivity. Additionally, the survey is currently only generating a long-term average of 141 observations per year, below the 200 observations that are needed to draw significant statistical inferences. The number of observations has improved over the last 5 years as staff have worked to enhance survey participation. Staff are currently working to expand the survey to include a public facing survey in an effort to increase sample size and reduce variability in data. While shifting to public-facing surveys has its own set of challenges, the increased sample size has the potential to drastically improve the long-term utility of the survey.

Not unlike what has happened in Virginia, turkey populations in many states (particularly in the southeastern US) have experienced largely unexplained decreases in recruitment, often associated with overall population declines. While the overall supply of turkeys has been restored to record levels, new challenges exist to better understand and manage turkeys in the face of changes and future uncertainties. On-going research in the region is significantly reducing the knowledge gaps for the species and is leading to improvements in management strategies.

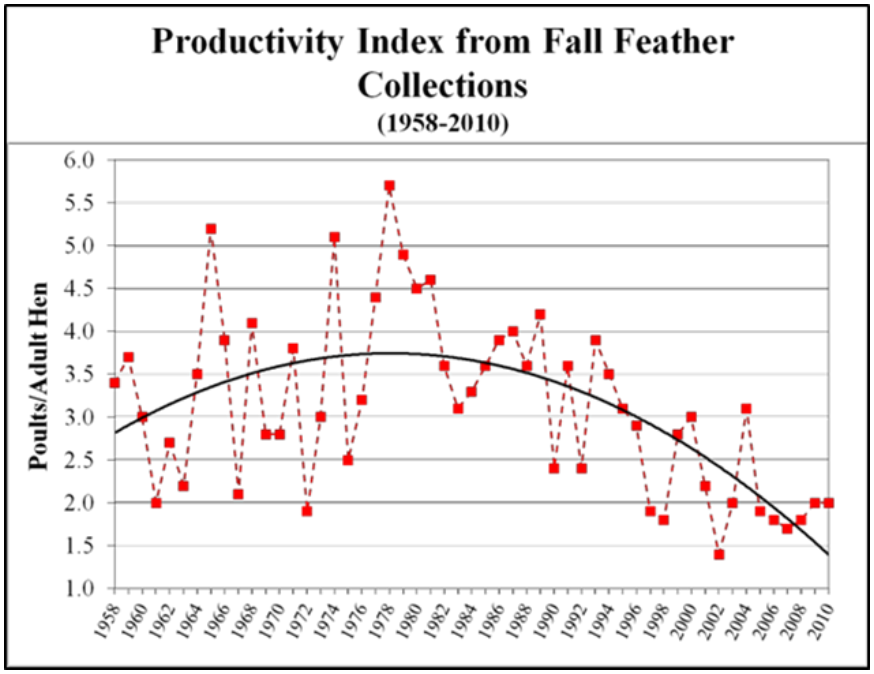


Figure 23: Productivity and fall recruitment indices (poults per adult in the harvest) from feather collections of fall-harvested turkeys (1958-2010).

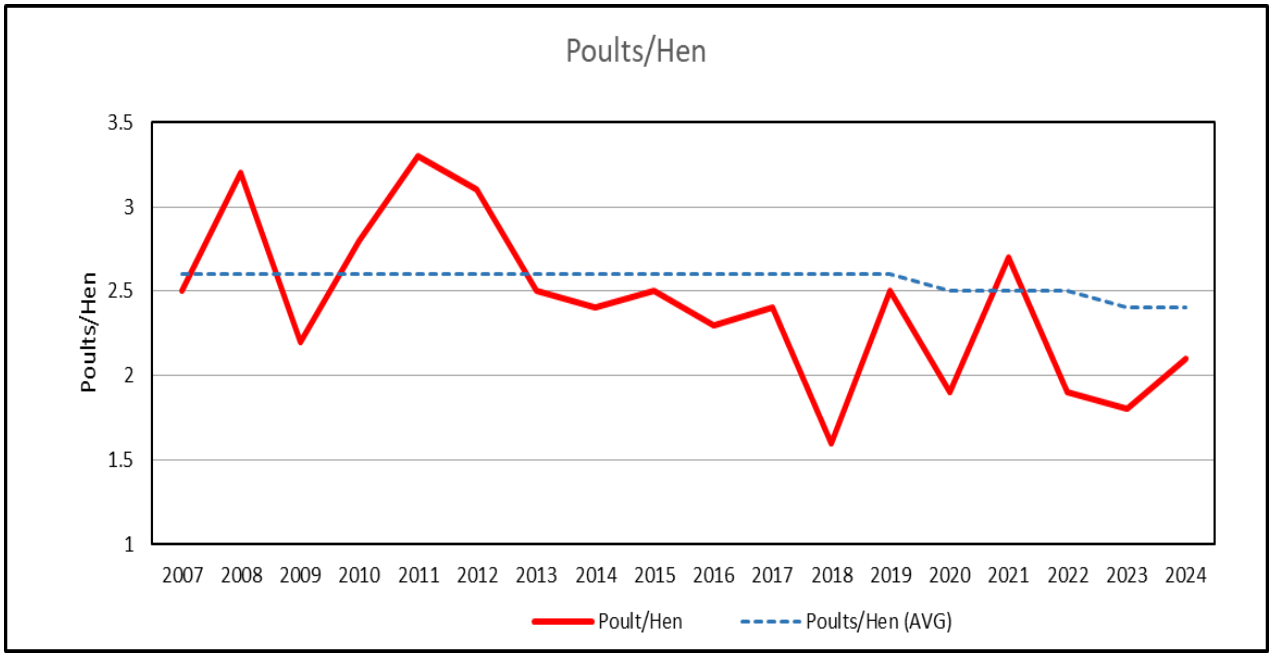


Figure 24: Turkey productivity index (poults/hen) estimated through annual brood survey, 2007-2024.

Predation

One of the most discussed aspects of turkey population management, especially among Virginia's hunters, is the concern around turkey predator populations. In the 1989 - 1994 study of hen turkeys in Virginia, predation was cited as the highest source of mortality with 52% of all mortalities being attributed to predation (only 12% to legal hunting). In that study, mammals (primarily bobcats) were the main source of mortality, accounting for 28% of all mortalities. There has been considerable concern among the hunting community that predator populations have increased dramatically and are now creating management concerns for turkey populations. Hunter perception of increased predator populations often fuel these concerns.

The Virginia Bowhunter Survey provides general population data for a multitude of species. The survey participants are asked to report all wildlife species they see or encounter while hunting during the archery season. These observations provide an index to the general population and are most useful for tracking trends over time. The most common species of concern to Virginia's turkey hunters are generally raccoon, coyote, bobcat, and fox as these species are often implicated in nest predation or are active predators of adult turkeys. Since 2002 when the survey began, except for coyote, all major mammalian predator observations have remained stable or have decreased slightly (Fig. 25). These data suggest that except for coyote populations, the predator context within Virginia has remained relatively static over the past decade.

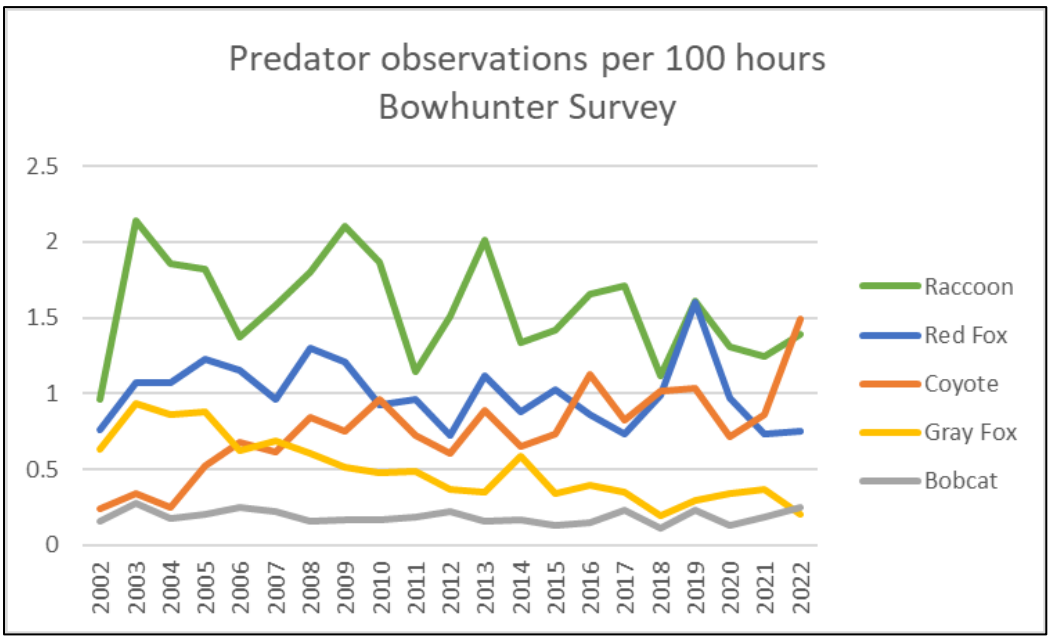


Figure 25. Observations of most common predators of wild turkeys per 100 hours of observation in the Virginia Bowhunter Survey from 2002-2022.

**DEMAND**

## Turkey Hunting Demands

Turkey hunting is an extremely popular form of hunting in Virginia and second only to white-tailed deer hunting. During the 2021-2022 hunting seasons (fall and spring seasons combined), 39% of all hunters were turkey hunters, compared to 82% that were deer hunters and 20% that were squirrel hunters. An estimated 73,079 hunters spent 554,198 hunter-days turkey hunting during the 2021-2022 hunting seasons.

Hunters generally pursue turkeys using four different approaches: (1) gobbler-only hunting during the spring and/or either-sex hunting during the fall that includes (2) hunters who specifically pursue turkeys without the use of dogs, (3) hunters who specifically pursue turkeys with the use of dogs, or (4) hunters who take turkeys while pursuing other species. When asked about how important different forms of hunting were to them, 2021-2022 hunters felt that deer hunting was most important, with spring turkey hunting and fall turkey hunting rating second and third most important, respectively. Bear hunting was fourth most important to hunters.

### Fall Turkey Hunting Demands.

*Fall hunting effort and harvest*.

In 1938, fall turkey hunting was the most popular form of hunting in Virginia, followed by grouse and bear hunting. By 2021-2022, the interest in fall turkey hunting had fallen behind deer, spring turkey, and coyote (in decreasing order).

During the 2021-2022 fall hunting seasons, 15% of hunters were fall turkey hunters. This represents a significant decrease from the number of fall turkey hunters in 2011, when 22% of all hunters were fall turkey hunters. An estimated 28,931 hunters spent 135,356 hunter-days turkey hunting during fall 2021-2022. Because fall turkey hunting opportunities overlap with many other hunting seasons in Virginia, it is often difficult to distinguish among the different types of fall turkey hunter (i.e., those who target turkeys without dogs, target turkeys with dogs, or take the opportunity to kill a turkey while hunting other species). In a 2023 survey of turkey hunters, 19% of hunters indicated they hunted specifically for turkey, 33% hunted turkey while primarily hunting other species (opportunistic hunters), and 19% indicated that they hunted other species while specifically hunting turkeys.

About 4% of all fall hunters used dogs to hunt turkeys in a 2023 survey of turkey hunters and would probably be classified as serious or avid fall hunters. Fall hunting turkeys with dogs has a long history in Virginia and early turkey dog breeding efforts can be traced to Virginia hunters. In the 2023 survey of turkey hunters, 17% of the respondents indicated that the opportunity to hunt with dogs was “Important” or “Very Important”.

Based on the 2023 survey of turkey hunters, most fall hunters (71%) used a shotgun to hunt fall turkeys. Less commonly used weapons by fall hunters were rifles (27%), archery equipment (bows and crossbows combined, 45%), and muzzleloaders (21%; hunters could select multiple weapons).

Despite increasing turkey populations, the number of fall turkey hunters (Fig. 26) and hunter-days of effort (Fig. 27) have been declining since the early 1990s. Separating the fall turkey season from the deer firearms season between 1989 and 1995 decreased the

opportunistic harvest of turkeys and may also have contributed to the initial decline of fall turkey hunters. Concurrent with the declining hunter interest has been a decline in the harvests of fall turkeys, even after reaching a record high kill of 16,861 birds in 1990 (Fig. 28).

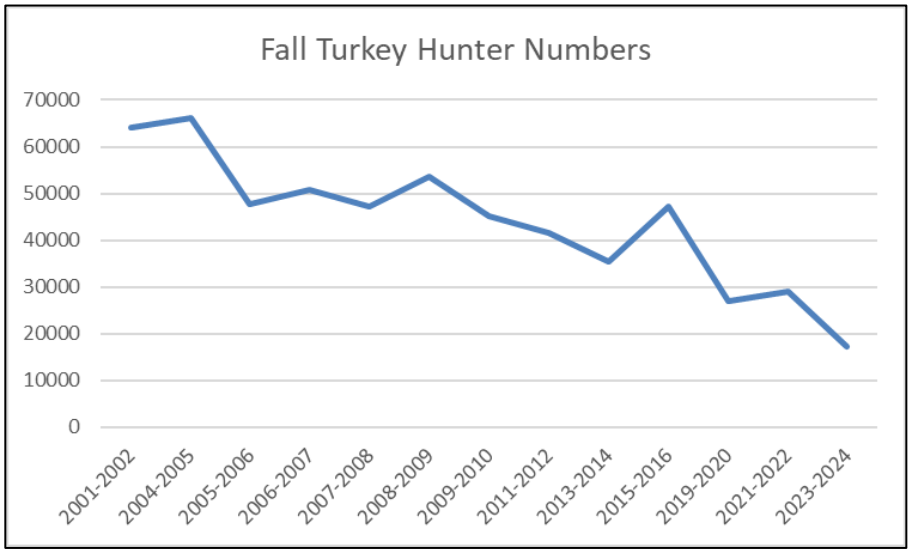


Figure 26. Estimated number of fall turkey hunters in Virginia from hunter surveys, 2001-2024.

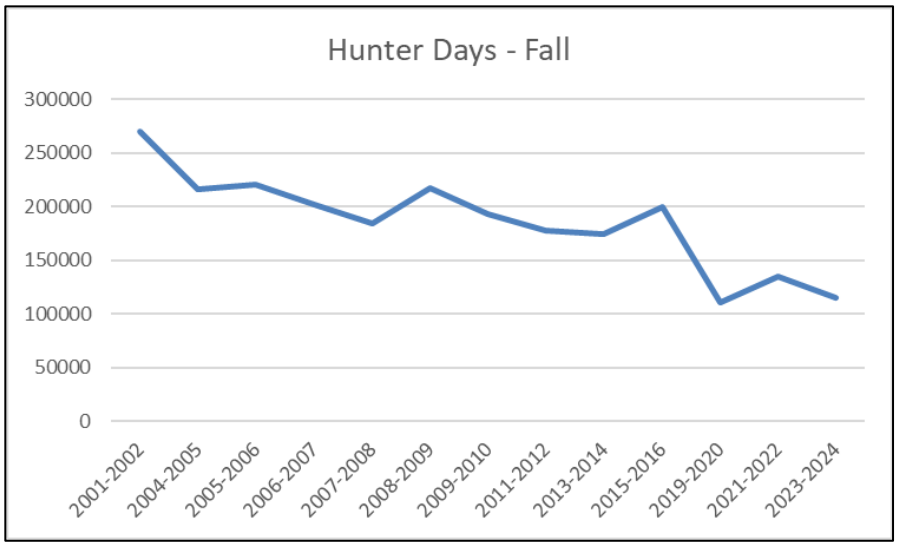


Figure 27. Estimated number of hunter-days spent fall turkey hunting in Virginia from hunter surveys, 2001-2024.

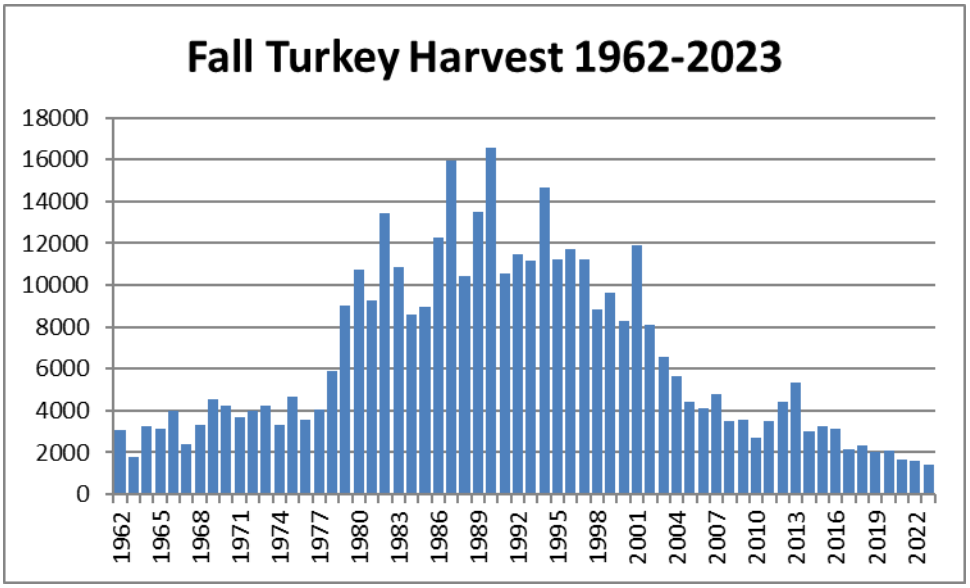


Figure 28. Virginia fall turkey harvest as reported through mandatory check-in system, 1962-2023.

A 2023 survey of spring turkey hunters that did not hunt fall turkeys showed that decreasing interest in fall turkey hunting was related to preference for spring hunting and an increased interest in hunting other species in the fall (likely deer). Many spring turkey hunters appear unwilling to utilize their turkey tags during the fall season, preferring to use the tags during the spring turkey season. In addition to a preference for spring hunting, the increased interest in deer hunting over the past 2 decades has also affected the traditional fall season participation.

The fall hunting season harvest has traditionally made up the bulk of the overall annual turkey harvest (Fig. 29). As hunter preferences and competing interests have shifted, so has the distribution of the annual turkey harvest. Prior to the 1995 hunting season, most of the harvest occurred during fall hunting seasons. Since 1995, the spring season has made up the majority of the overall turkey harvest. Although the total turkey harvest has remained fairly stable over the last several decades, the proportion of the annual turkey harvest occurring during the fall season has decreased.

*Fall hunting satisfactions.*

Hunter satisfactions are often assumed to be highest when harvest and/or the number of days spent hunting are maximized. However, recreational satisfaction is more complex and includes many other elements of the hunting experience that extend beyond success and effort. As an aggregate measure of the multiple components of satisfactions, a hunter satisfaction index has monitored the quality of fall turkey hunting experiences since 1993. Periodic hunter surveys have posed the question, "*overall, how do you rate the quality of your [current year] fall turkey season?*", with responses on a 7-point scale where 1= poor, 4=adequate, and 7= excellent. Average hunter satisfaction with fall hunting quality have declined since 1993 when quality was nearly adequate (3.93) to a low (3.39) after the 2009 fall season. One of the objectives of the 2014 Virginia Turkey Management Plan for the Turkey-Related Recreation

goal was to improve the fall turkey hunter satisfaction rating. Fall turkey hunters in 2021, indicated a satisfaction rating of 3.5 but this is within the standard error of the survey results indicating no statistically significant change in the satisfaction rating.

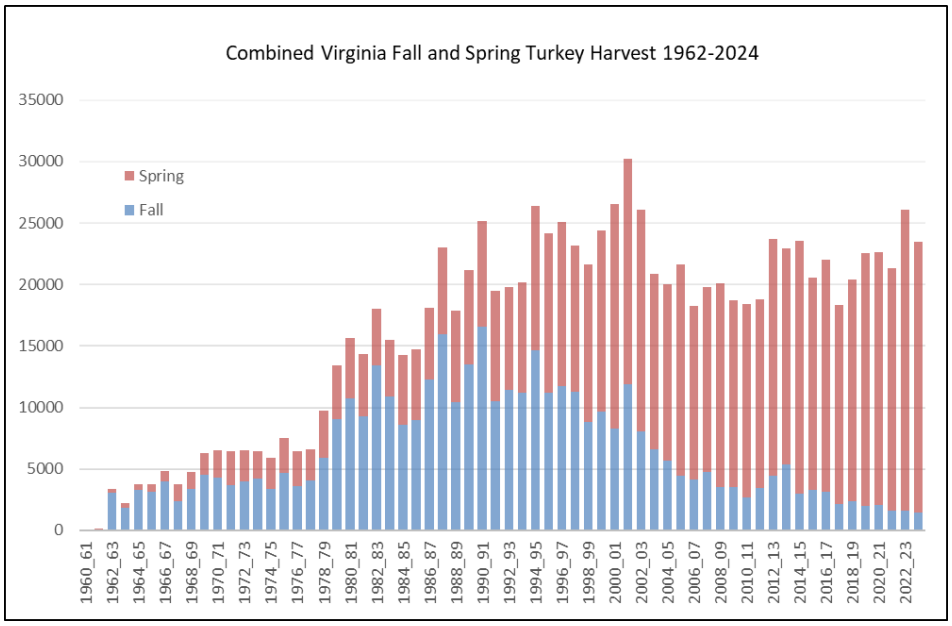


Figure 29. Fall and spring turkey hunting harvests through mandatory check-in system by license year, 1961-2024.

## Spring Turkey Hunting Demands

*Spring hunting effort and harvest.*

During the 2022 spring gobbler hunting season, 34% of all licensed hunters participated as spring turkey hunters. An estimated 62,747 hunters spent 418,846 hunter-days turkey hunting during spring 2022. Most turkeys were harvested with shotguns (93%). Rifles accounted for 6% of the harvest with the balance from bows, pistols, and muzzleloaders. Based on a 2023 survey of turkey hunters, most hunters (96%) used a shotgun to hunt spring gobblers. Less common weapons used by spring hunters were archery equipment (14%, vertical and crossbow combined), rifles (7%), muzzleloaders (1%), and other (1%) [hunters could select multiple options].

Contrary to perception of many turkey hunters, the numbers of spring turkey hunters (Fig. 30) and effort (hunter days, Fig. 31) have remained relatively stable since the early 1990s. Trends in either hunter numbers or effort are not statistically significant when looking at the longer term or during the previous turkey plan period (2013-2022). Due in part to licensing structure, it is difficult to track trends of hunters participating in various turkey seasons. Spring harvest totals increased significantly through the early 1980s and into the early 2000s when harvests stabilized (Fig. 16). Over the last decade, harvests appear to be increasing slightly, although the increase in harvests are not statistically significant (Table 1).

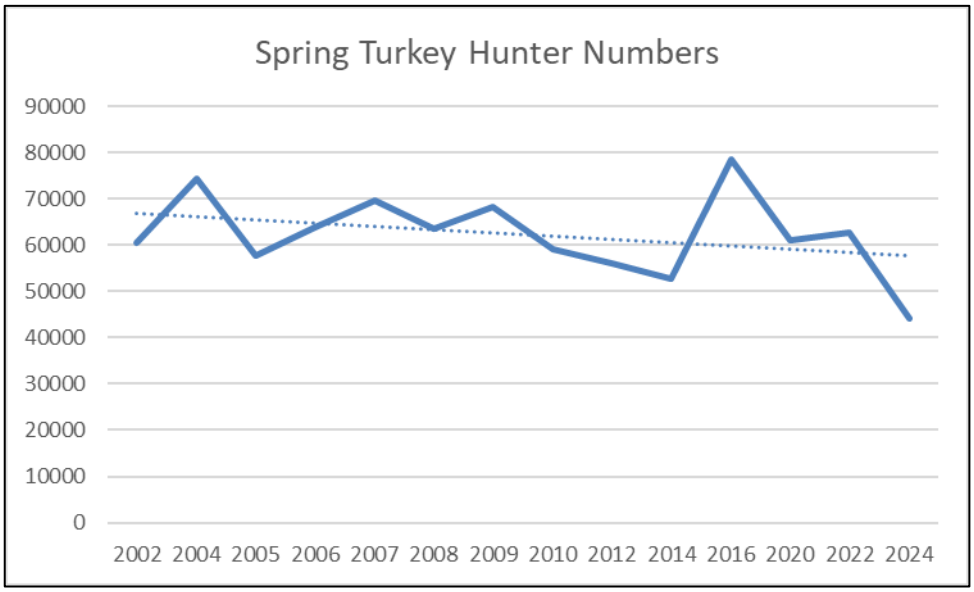


Figure 30. Estimated number of spring turkey hunters in Virginia from hunter surveys, 2002-2024.

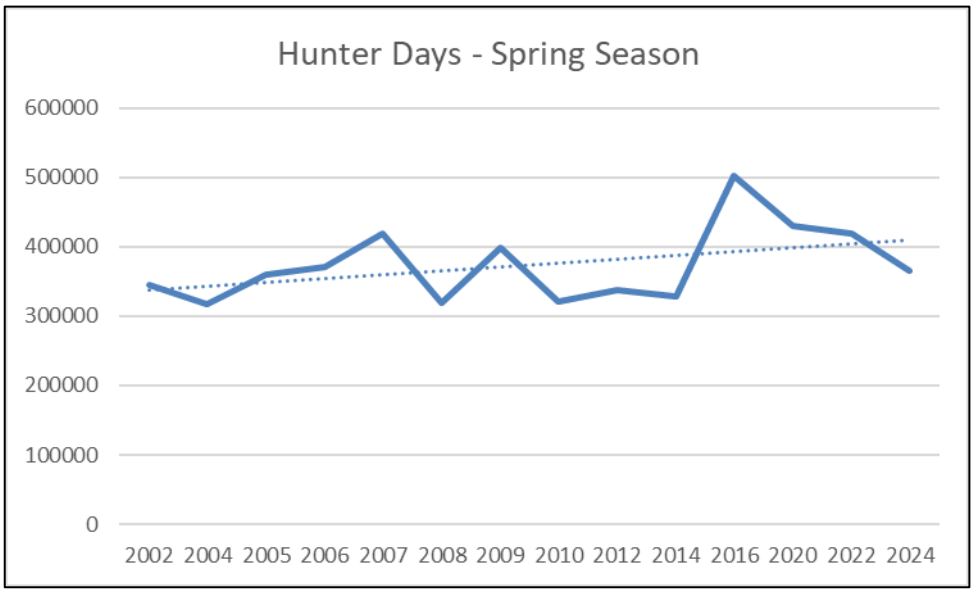


Figure 31. Number of hunter-days spent spring turkey hunting in Virginia from hunter surveys, 2002-2024.

Beginning in 2003, all-day spring gobbler hunting was permitted during the last 2 weeks of the season. The regulation was amended in 2021 to extend all day hunting to the last three weeks of the hunting season. Based on survey responses from 2023 spring gobbler hunters, the majority of the hunting effort occurs in the morning the first two weeks of the season (53%), followed by mornings during the last three weeks (30%), and only approximately 12% of the hunting hours occur during the afternoons of the final three weeks of the season. In the 2023 survey, hunters were asked about the acceptability of expanding all day

turkey hunting to the full season. The survey respondents were very evenly split with 24% in favor of expanding the all-day segment and 23% opposed to expanding the all-day segment of the season. Forty-five percent of the survey participants also reported that they were extremely or somewhat unlikely to hunt in the afternoons if the opportunity was provided. Comparatively, 44% of respondents said they were somewhat or extremely likely to participate. During the 2024 spring turkey season, 92% of the harvested turkeys were reported as being harvested in the morning with only 7% being harvested in the afternoon. However, the afternoon harvests may account for as much as 25-30% of the weekly harvest total during the final three weeks of the season.

*Spring hunting satisfactions*.

As measured for fall hunting, an aggregate index of hunter satisfactions has monitored the quality of spring gobbler hunting experiences since 1995. Periodic hunter surveys have posed the question, "*overall, how do you rate the quality of your [current year] spring turkey season?*", with responses on a 7-point scale where 1= poor, 4=adequate, and 7= excellent. The most recent hunter survey (2022) indicated that hunters reported an adequate rating to the 2022 season. The 2014 Virginia Turkey Management Plan Turkey-related recreation goal called to improve spring hunter satisfaction. The 2011 hunter satisfaction rating of 3.95 was not statistically different than the 2022 rating, indicating the satisfaction had remained stable.

To determine factors that influence hunter satisfaction, turkey hunters were asked in a 2023 survey to indicate how important various factors were to their satisfaction. The highest-ranking factors were spending time outdoors, feeling safe while hunting, followed by spending time hunting with friends and family and hearing turkeys (tied). Calling or working turkeys, seeing turkeys or other wildlife were in the second tier of quality factors. Harvesting a turkey ranked much lower.

Hunters often suggest other alternatives for the timing of the spring gobbler season. When posed with the question about spring gobbler season timing, the majority of 2011 turkey hunters (70%) felt the season was timed just right; 24% felt it was too late, and 6% thought it was too early. In the 2023 survey, delaying the opening of the spring season was consistently the lowest scoring of options provided to improve turkey populations among survey participants. Participants were also more likely to suggest factors related to turkey reproduction should be factored into decision making over opportunities for hunters.

Recent regulation changes in neighboring states have resulted in calls to evaluate the bag limit of turkeys in Virginia. While excessive harvest of males has been shown to alter reproductive success, there is currently little evidence that populations in Virginia are being negatively affected by current harvest rates. Since there does not appear to be a population factor in this situation, hunter attitudes and preference may suggest the current bag limit of three birds is adequate. In the 2023 survey, 75% of survey respondents indicated that they were satisfied with the current bag limit while only 16% indicated support for lowering the bag limit. Of those desiring a reduced bag limit, the majority indicated the highest level of support for a two-bird annual limit.

Hunting Safety Concerns

Hunting safety is a concern associated with all hunting, but especially for turkey hunters, who typically wear camouflage and mimic the sounds of wild turkeys. Over the 57-year period from 1967-2023, a total of 204 spring turkey hunting incidents, including 24 fatalities, have been documented in Virginia. Almost all spring turkey hunting incidents in Virginia have involved a victim other than the shooter, with only 5% of the total being self-inflicted. With many overlapping hunting seasons during the fall, hunters often share hunting areas with hunters of other species and pursue multiple species at the same time. As a result, it is difficult to accurately determine hunting incidents specifically associated with turkey hunting during the fall.

The average annual rate of spring turkey hunting incidents has changed significantly since spring seasons were initiated in the 1960s (Fig. 32). As the popularity of spring turkey hunting increased between the 1960s and the 1980s, so did the annual rate of spring hunting incidents. The spring turkey hunting incident rate peaked during the mid-1990s with an average of 6.4 incidents every year. Since then, the incident rate has significantly decreased to an average of approximately 2 incidents per year. With stable hunter numbers since the mid-1990s (Fig. 30), the decrease in spring hunting incidents is undoubtedly related to the 1988 initiation of mandatory hunter education requirements for all new Virginia hunters and other prominent safety-awareness programs from the VDWR and sportsmen groups (e.g., NWTF).

When hunting incidents were at their peak, spring turkey hunters after the 1996 season ranked feeling safe as the second most important factor for a satisfying turkey season. More recent surveys such as the 2023 survey of turkey hunters indicates that feeling safe remains one of the highest ranked factors for a satisfying season. In the 2023 survey, feeling safe ranked the second most important factor, just behind being outdoors. Feeling safe while hunting clearly remains a core element of hunter satisfaction.

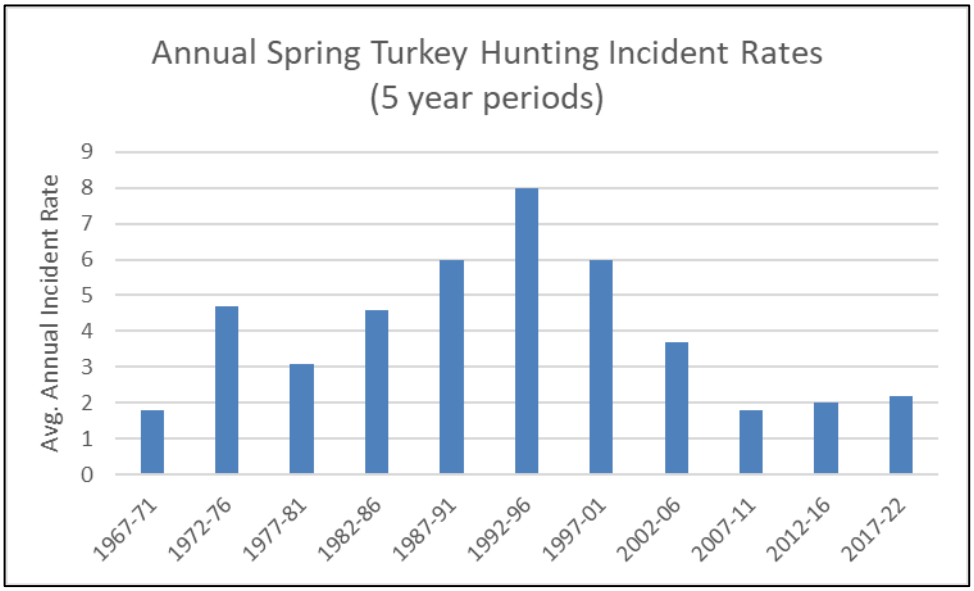


Figure 32. Trend in the rate of spring turkey hunting incidents in Virginia, 1968-2022.

*Rifle-related safety issues*.

Perceived as a safety issue by some hunters (especially for spring hunting), hunters often raise safety concerns about the use of rifles for turkey hunting. During the period from 2013 to 2023, 10% (n=2) of spring turkey hunting incidents involved rifles and only 7% (n=14) of the cumulative spring turkey hunting incidences since 1967 have involved a rifle. Presumably for safety considerations, many eastern Virginia counties have passed local ordinances that restrict the use of rifles for hunting (Fig. 33). Most of the county ordinances prohibit rifles for general hunting, although several including Caroline and Sussex specifically limit rifle use for turkey hunting. Restrictions in most counties impose limits such as "no rifles for big game", "no rifles for hunting", a maximum size of .22 caliber for rifles, or a maximum of .22 caliber rimfire. Several counties also allow the use of rifles larger than .22 caliber from an elevated stand.

In the 2023 survey of turkey hunters, 27% of fall turkey hunters reported hunting turkeys with rifles as opposed to only 7% of hunters using rifles in the spring season. Questions about the use of rifles were posed to turkey hunters after the 2011-12 hunting seasons. Most turkey hunters (57%) supported the use of rifles for turkey hunting during the fall, with 29% opposing rifle use and 15% having no opinion. However, opinions about rifle use for spring gobbler hunting were mixed, with identical support for prohibiting rifles (43%) and allowing rifles (43%); 14% of the hunters had no opinion.

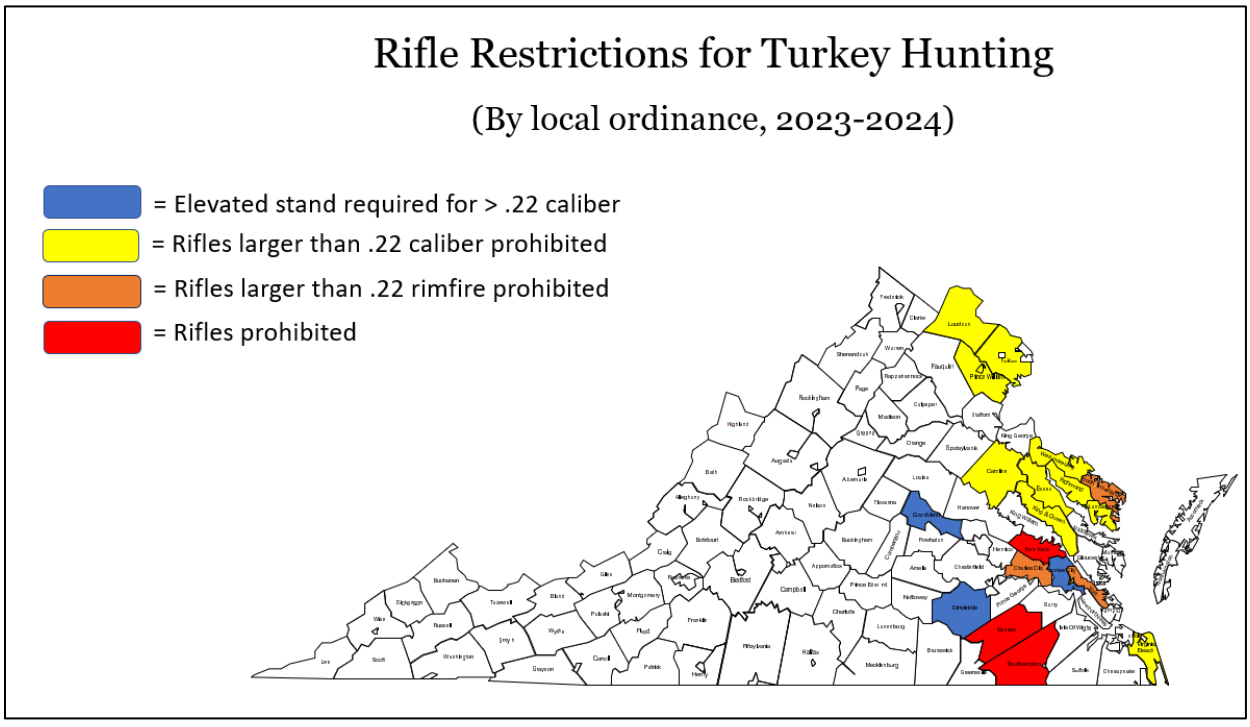


Figure 33. Counties with local firearms ordinances that restrict the use of rifles for turkey hunting during the 2023-2024 hunting seasons.

**Wild Turkey Damage Demands**

Agricultural Damage

During the first writing of the wild turkey management plan in Virginia (2012), growing populations and visibility of wild turkeys led to increased concerns about agricultural crop damage caused by turkeys. These concerns about turkey impacts on agriculture motivated crop depredation studies in many states including California, Connecticut, Illinois, Iowa, New York, Ohio, Pennsylvania, Virginia, and Wisconsin, as well as a national survey about turkey-related damage.

Turkey damage has been confirmed in many different agricultural crops including corn, wheat, grapes, soybeans, oats, tobacco, rye, ginseng, strawberries, tomatoes, apples, gardens, peanuts, ornamentals, barley, alfalfa, blueberries, and milo. Corn (silage, standing, and spring plantings) is the crop most often reported to be damaged by wild turkeys. Most confirmed reports and specific studies of turkey damage conclude that the losses are minimal for most producers. Because of their high visibility due to population numbers, body size, flocking behaviors, daytime activity, and habitat preferences, wild turkeys may often be disproportionately credited with crop damage. Specific studies of damage attributed to turkeys in crops (e.g., corn, soybeans, alfalfa, oats) have shown the primary cause to be from other wildlife, principally deer and raccoons. In only a few instances (especially in silage corn, grapes, ginseng, apples, and wheat) has crop damage by turkeys been considered to be moderate or heavy.

During the early 2000s (2002-2005), the National Wild Turkey Federation (NWTF) led a large-scale study on grape depredation in vineyards across multiple states (California, New York, Connecticut, and Virginia). Using motion sensing cameras at these sites, NWTF was able to document 1,933 animals (representing 8 species) across the 15 vineyards. While turkeys were the most common species observed (43% of observations), they accounted for a consistently low percentage of damage (average 4%, range 2-6%). Raccoons (34%) and white-tailed deer (21%) made up the highest percentages of observed damage across all sites. Since this time, little additional research has occurred specifically to vineyard damage and wild turkeys. In Virginia, complaints from vineyard owners have been minimal. While damage to specialty crops (e.g., grapes) can be more financially significant than perceived damage to traditional agricultural crops, these specialty operations are often small enough to successfully utilize damage mitigation and prevention techniques successfully. In Virginia, fencing vineyards to prevent deer and bear damage may be helping with reducing damage by wild turkeys as well.

Data from the USDA-Wildlife Services (USDA-WS) Conflict Helpline in Virginia show that turkey agricultural damage complaints make up a very small percentage of their annual call volume. From fiscal years 2019 through 2023 there were a total of 277 calls regarding wild turkeys. Of those calls, agricultural damage complaints made up 3.4% of the turkey call volume. Damage most often cited in these reports was to landscaping, gardens, or turf/sod rather than traditional agricultural crops such as corn, soybeans, or vineyard grapes.

Other Turkey-human Conflicts

With the increased wild turkey and human populations and the turkey's adaptability to many environments, increased conflicts with people in urban/suburban areas are not surprising. Wild turkey- vehicle collisions become more of a concern with expanding turkey

populations and increased volume of traffic. Although road-killed turkeys and associated accidents are difficult to document, the number of incidences seems to be increasing.

Wild turkeys, and turkey-associated complaints, are now commonly observed in more suburban and exurban (i.e., semi-rural lands just beyond the suburbs) areas around cities and towns. Complaints include damage to landscape plantings, turkey droppings, aggressive birds around people, scratching motor vehicles, and roosting on roof tops. Adult male birds typically are the source of the aggressive interactions, which more frequently occur in spring during the breeding season.

USDA-WS conflict helpline data from FY19-FY23 shows a range from 9 calls for perceived nuisance situations (FY22) to a high of 22 nuisance/urban conflict calls (FY21), with an average of 14.8 nuisance/conflict calls per year. The majority of these conflict calls were in relation to vehicle damage or turkeys acting aggressively (e.g., following, chasing, physical contact with a person). In response to an increased number of urban wild turkey conflict calls since the 2012 plan, an internal guidance document (Turkey Conflict Mitigation) was developed by the DWR Turkey Technical Committee in 2019.

The occurrence of turkeys at airports can be a major issue for public safety. Per §29.1-529 of the Code of Virginia, being a hazard to aircraft is the only reason a "kill permit" can ever be issued for wild turkeys. From FY19-FY23, USDA-WS was contracted for turkey removals due to airplane hazards at Dulles International Airport, Naval Air Station Oceana, Naval Auxiliary Landing Field Fentress, and Richmond International Airport. In total, 134 turkeys were removed from all reported airfields during that time period, with the majority of removals occurring at Dulles. Additionally, USDA-WS has staff located on Reagan National, Felker Army Airfield, Langley Air Force Base, Naval Station Norfolk, and Wallops Flight Facility for turkey hazing and potential removal as needed due to aircraft hazards.

**Turkey Watching Demands**

Non-hunting wildlife recreation (e.g., wildlife viewing) has increased significantly over the last several decades. Although the extent of turkey-specific wildlife watching is unknown, viewing activities (e.g., observing, feeding, photographing) of all wildlife are important to Virginians. Over 35 % of Virginians reported watching wildlife in a 2016 survey, contributing to over 251 million days spent viewing wildlife. In 2021, DWR finalized the Virginia Wildlife Watching Plan to guide strategies for better incorporating wildlife watchers into the management of our resources. The Wildlife Viewing Plan incorporates 4 main goals:

- Connect diverse segments of the public to wildlife and wildlife viewing in Virginia
- Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth
- Promote wildlife and habitat conservation through wildlife viewing
- Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing.

**Turkey Population Demands**

Wild turkey populations at the national and regional level are receiving considerable attention, and declines in populations are being noted in several surrounding states. The most significant declines appear to be in the southeastern states, with declines in productivity creating the largest concern for many states. While there are significant concerns on the national and regional scale in terms of turkey productivity, the populations in Virginia appear to be relatively stable (see population section) although there are areas of concern. Of note in Virginia is the lower-than-average productivity over the past 5-8 years as determined through annual brood surveys. This lower productivity is concerning, although harvests have remained high. The discrepancy between productivity estimates and harvest have created concerns from many hunters that we may be overharvesting populations.

The 2023-2024 Hunter Survey found that 45% of respondents felt turkey population in their area had declined or had declined dramatically, opposed to only 14% who felt the populations had increased or increased dramatically. The majority of respondents (55%) also indicated that they felt turkey populations in their area were too small, opposed to 37% who felt populations were just right, and only 3% who felt there were too many turkeys. A similar question was posed to turkey hunters in the 2023 Turkey Hunter Survey. Thirty-five percent of turkey hunters indicated that populations had declined or declined dramatically, while 23% indicated that populations had increased. While harvest data continues to show stable or increasing trends, it is clear that Virginia's turkey hunters are expressing concerning trends in turkey abundance.

In general, conflict concerns have been minimal indicating that cultural carrying capacity (CCC) has not been met at any broad scales to this point. While there are local and typically isolated issues with agricultural damage or urban situations, solutions for these isolated incidents are typically achievable with current population levels.

## Cultural Carrying Capacity

The joint impact of all the demands for wild turkeys (both negative and positive demands) results in the CCC. Sometimes called the wildlife stakeholder acceptance capacity, the cultural carrying capacity is the maximum number of turkeys in an area that is acceptable to the human population. The CCC is a function of the human tolerance of turkeys and the benefits derived from turkeys by all citizens. It is different for each constituency, location, and point in time. The actual CCC is subjective and involves a combination of social, economic, political, and biological perspectives. For example, a farmer experiencing crop damage from turkeys may have exceeded their tolerance and desire fewer turkeys. On the other hand, a wildlife enthusiast hoping to see lots of wild turkeys will likely want higher turkey populations. The CCC is ultimately a balancing act that involves trade-offs among the variety of public demands.

Somewhat unique to managing turkey populations for a CCC balance, will be harvest trade-offs between spring gobbler hunters and fall either-sex hunters. Based on modeling work at Virginia Tech (Fig. 34), spring gobbler harvests will be maximized at higher population sizes that approach the biological carrying capacity (BCC). However, because fall either-sex harvests are an additive form of mortality that control population levels, the highest turkey populations (and highest spring gobbler kills) will require minimal fall hunting opportunity and harvest. On the other hand, sustained fall harvests would be maximized at a

much lower population level (in theory, at 40% of BCC) where spring gobbler harvests would also be lower. While neither spring nor fall harvests would be at a maximum, the combined total harvest would be maximized at a population level of about 55% of BCC. Among other public considerations for desired turkey population size, these fall hunting and spring hunting trade-offs will need to be resolved.

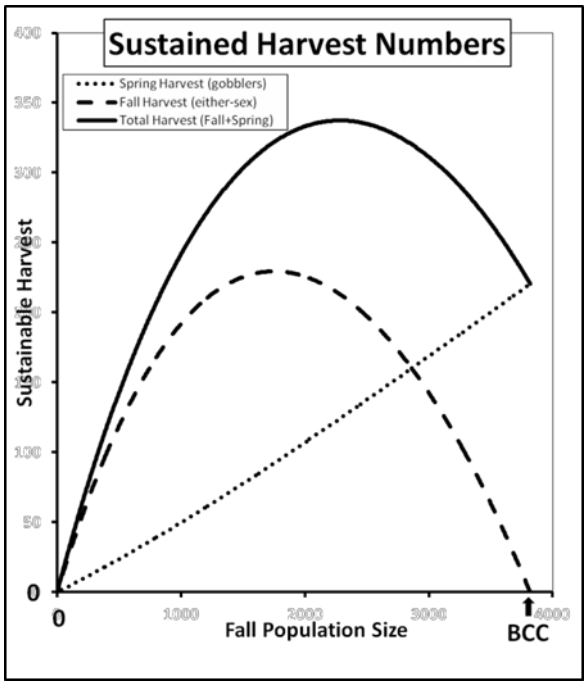


Figure 34. Sustained spring, fall, and total harvest relationships at different population levels. Adapted from McGhee et al. (2008).

## SELECTED BIBLIOGRAPHY FOR WILD TURKEY SUPPLY AND DEMAND


Coates, R. W., M. J. Delwiche, W. P. Gorenzel, and T. P. Salmon. 2010. Evaluation of damage by vertebrate pests in California vineyards and control of wild turkeys by bioacoustics. Human–Wildlife Interactions 4(1):130-144.

Chamberlain, M.J., M. Hatfield, and B.A. Collier. 2022. Status and distribution of wild turkeys in the United States in 2019. Wildlife Society Bulletin 46:e1287.

Coggin, J., and C. Peery. 1975. A review of the wild turkey in Virginia. Virginia Commission of Game and Inland Fisheries. Richmond, Virginia. USA.

Craven, S. R. 1989. Farmer attitudes toward wild turkeys in southwestern Wisconsin. Proceedings of theEastern Wildlife Damage Control Conference 4:113-119.

Decker, D. J., and K.G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. Wildlife Society Bulletin 16:53-57.

Gabrey, S. W., P. A. Vohs, and D. H. Jackson. 1993. Perceived and real crop damage by wild turkeys in northeastern Iowa. Wildlife Society Bulletin 21:39-45.

Greene, C. D., C. K. Nielsen, A. Woolf, K. S. Delahunt, and J. R. Nawrot. 2010. Wild turkeys cause little damage to row crops in Illinois. Transactions of the Illinois State Academy of Science 103:145-152.

Groepper, S. R., S. E. Hygnstrom, B. Houck, and S. M. Vantassel. 2013. Real and perceived damage by wild turkeys: a literature review. Journal of Integrated Pest Management 4(1):1-5.

Howell, J. 2012. Virginia survey of hunter harvest, effort, and attitudes 2011-2012. Department of Game and Inland Fisheries. Richmond, Virginia, USA. (In Press)

Jagnow, C. P., and D. E. Steffen. 2005. Virginia survey of hunter harvest, effort and attitudes 2004-2005. Wildlife Resource Bulletin 05-7. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Jagnow, C. P., D. E. Steffen, and J. Howell. 2007. Virginia survey of hunter harvest, effort and attitudes 2005-2006. Wildlife Resource Bulletin 07-5. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Jagnow, C. P., J. Howell, and D. E. Steffen. 2008. Virginia survey of hunter harvest, effort and attitudes 2006-2007. Wildlife Resource Bulletin 08-2. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Jagnow, C. P., J. Howell, and D. E. Steffen. 2008. Virginia survey of hunter harvest, effort and attitudes 2007-2008. Wildlife Resource Bulletin 08-6. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Jagnow, C. P., J. Howell, and D.E. Steffen. 2009. Virginia survey of hunter harvest, effort, and attitudes 2008-2009. Wildlife Resource Bulletin No.09-3. Department of Game and Inland Fisheries. Richmond, Virginia, USA.

Jagnow, C. P., J. Howell, and D.E. Steffen. 2010. Virginia survey of hunter harvest, effort, and attitudes 2009-2010. Department of Game and Inland Fisheries. Richmond, Virginia, USA.

Jagnow, C. P., and C. L. Godfrey. 2010. 2010 deer, bear, and turkey hunter survey. Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Koele, B., D. Hirchert, and N. Balgooyen. 2013. Wildlife damage abatement and claims program 2012. Summary Report. Wisconsin Department of Natural Resources, Madison, Wisconsin, USA.

Mathis, R., and T. Hughes. 2005. Do wild turkeys eat wine grapes? Practical Winery and Vineyard. September/October:40-44.

McGhee, J. D., J. Berkson, D. E. Steffen, and G. W. Norman. 2008. Density-dependent harvest modeling for the eastern wild turkey. Journal of Wildlife Management 72(1):196-203.

Miller, J. E., B. C. Tefft, R. E. Eriksen, and M. Gregonis. 2000. Turkey damage survey: a wildlife success story becoming another wildlife damage problem. Proceedings of the Wildlife Damage Management Conference 9:24-32.

Morris, H. N. 2014. Management planning and habitat modeling for wild turkeys (*Meleagris gallopavo silvestris*) in Virginia. MS Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

Rodgers, E. B. D., B. A. Wright, D. Cavin, and D. E. Steffen. 2003. Virginia Survey of hunter harvest, effort and attitudes 2001-2002. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Tefft, B. C., M. A. Gregonis, and R. E. Eriksen. 2005. Assessment of crop depredation by wild turkeys in the United States and Ontario, Canada. Wildlife Society Bulletin 33:590-595.

U.S. Department of Agriculture. 2009. 2007 census of agriculture: United States summary and state data. National Agricultural Statistics Service, Volume 1, Part 51.

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2013. 2011 National survey of fishing, hunting, and wildlife-associated recreation - Virginia. FHW/11-VA.

U.S. Fish & Wildlife Service. 2010. Turkey Hunting in 2006: An Analysis of Hunter Demographics, Trends, and Economic Impacts. Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Report 2006-7.

Valdez, R. X., M. Gyovai-White. 2023. Results of the 2023 Virginia Turkey Hunter Survey. Department of Wildlife Resources, Henrico, Virginia.

Virginia Department of Forestry. 2009. State of the forest: annual report on Virginia's forests. Virginia Department of Forestry. Charlottesville, Virginia, USA.

Virginia Department of Game and Inland Fisheries. 2005. Virginia's comprehensive wildlife conservation strategy. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A. 1995. Virginia survey of hunter harvest, effort and attitudes 1993-94. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., and M. R. McFarland. 1996. Virginia survey of hunter harvest, effort and attitudes 1994- 1995. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., and N. D. Emerald. 1997. Virginia survey of hunter harvest, effort and attitudes 1995-1996. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., N. D. Emerald, K. Pitches, and D. E. Steffen. 1998. Virginia survey of hunter harvest, effort and attitudes 1996-1997. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., N. D. Emerald, C. Cox, and D. E. Steffen. 1999. Virginia survey of hunter harvest, effort and attitudes 1997-1998. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., N. D. Emerald, C. Cox, M. Thomas, and D. E. Steffen. 2000. Virginia survey of hunter harvest, effort and attitudes 1998-1999. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

Wright, B. A., N. D. Emerald, S. P. Mott, and D. E. Steffen. 2001. Virginia survey of hunter harvest, effort and attitudes 1999-2000. Virginia Department of Game and Inland Fisheries, Richmond, Virginia, USA.

**Progress in meeting 2014 Turkey Management Plan Objectives**

| Objective: | Objective met: | Explanation: |
|---|---|---|
| **Goal : Turkey Populations** | | |
| To meet and maintain turkey population objectives at cultural carrying capacity in each county management unit through 12/31/2022. | Partial | Populations are meeting or exceeding objectives in 57 management units, failing to meet objectives in 40 management units. However, in 14 of the 40 failing management units, population trends are increasing but are not statistically significant. Most failures are in Management units with "Increase" objective (Appendix C). |
| To determine factors that may be limiting the attainment of turkey population objectives through 12/31/2022. | Partial | Low population and underperforming areas have been identified and potential issues have been evaluated. Emerging issues such as disease, habitat, and other factors have been evaluated. Specific research into limiting factors has not been conducted due to Agency wide research priorities and budgetary limitations. |
| To biennially assess and update turkey population CCC objectives in each county management unit through 12/31/2022. | Yes | Population objectives have been assessed through the biennial regulation setting process. CCC has not been modified or exceeded for any management unit to this point. |
| To annually assess and update turkey population status in each county management unit through 12/31/2022 | Yes | |
| To develop and/or continue site specific population management programs within county management units through 12/31/2022 | Partial | Developed BMP guidance document, Private land Biologists.<br>TPOP or supplemental harvest opportunities was not determined to be necessary following discussions with the internal Turkey Committee. |
| To validate and test sustained yield population models for turkeys and to determine practical methods for identifying maximum sustained yield for fall and spring harvests by 12/31/2020. | No | Other research needs took priority. |
| **Goal: Turkey Related Recreation** | | |

| | | |
|---|---|---|
| To update knowledge of turkey hunter satisfactions and constraints to hunting participation in Virginia by 1/1/2016. | Partial | Biennial hunter surveys and 2023 turkey hunter survey (although outside of period). Spring Gobbler survey data. |
| To improve fall and spring turkey hunter satisfactions, as measured by the 2011 hunter survey, by 12/31/2022. | No<br>Stable trend | Turkey hunting quality was not addressed in the 2011 hunter survey. The 2009-10 survey indicated a mean quality of 3.4 for fall 2009 and 3.95 for Spring 2010. The 2021-22 hunter survey indicated a mean satisfaction of 3.5 for fall 2021 and 3.9 for spring 2022. Both fall and spring measures fall within the standard error for each respective survey so no conclusive change can be detected. |
| To determine non-hunting turkey recreation demands, desires, and satisfactions by 1/1/2017. | No | Low ranking objectives and not addressed due to low ranking although opportunities exist within DWR Viewing Plan to expand non hunting recreation. |
| Establish programs to meet demands and satisfactions for non-hunting recreational opportunities through 2022. | No | Low ranking objective and not addressed due to low ranking. Opportunities exist within DWR Viewing Plan. |
| **Goal: Hunting Tradition** | | |
| To have at least 55,000 fall hunters (i.e., a 30% growth from 2011) and 55,000 spring gobbler hunters (i.e., maintaining 2012 levels) annually participating in turkey hunting by 12/31/2022. | Partial | Based on the 2021-22 Hunter survey, spring hunter numbers are 67,000, fall hunter numbers have continued to drop and are below 28,000. |
| To determine limiting factors for participation in fall turkey hunting and make programmatic recommendations to preserve fall turkey hunting traditions and participation by 1/1/2018. | yes | Season adjustments in 2019 to move fall season out of muzzleloader, January season (2011), day before Thanksgiving added. Surveys indicate opportunities are not limiting factor, hunter choice seems to drive participation. |
| **Goal: Allocation of Fall harvest** | | |
| To manage turkey harvests during the peak deer hunting periods (during the first 2 weeks of early muzzleloading deer season and during the first 2 weeks of general firearms deer season) to be approximately 50% (between 40-60%) of the total annual | No | Current season allocation provides only 2 days within the peak of deer hunting season, as a result of season changes designed to increase interest/participation in traditional fall hunting. |

| | | |
|---|---|---|
| fall turkey harvest through the 2022-23 hunting seasons, while also providing quality turkey hunting opportunity prior to these peak deer hunting periods. | | |
| To refine appropriate allocation of fall turkey hunting opportunities and harvests by 1/1/2015. | No | See above |
| **Goal: Safety** | | |
| Compared to the 10-year period (2003-12) when 25 spring hunting incidents occurred, reduce turkey hunting-related incidents by 25% (by 6 incidents) for the period 2013- 2022. | No | During the period from 2013-2023 there were 21 spring hunting incidents reported. This represents a 16% reduction in the number of spring hunting incidents |
| To annually inform hunters and the general public about open turkey hunting seasons and associated safety considerations through 12/31/2022. | Yes | Hunter education produced a fanning/reaping video. Open hunting seasons were posted at kiosks and in the annual hunting digest. Hunter education updated class curriculum to include gobbler calls, blaze tree straps, fanning/reaping. |
| To develop and implement a system to annually monitor safety incidents related to fall turkey hunting by 12/31/2015. | Partial | Incident reporting forms provide the option to categorize incident types, although the officers may or may not include species hunted. |
| **Goal: Ethics and Compliance with Law** | | |
| To describe ethical principles for turkey hunting by 1/1/2016. | Yes | Regulatory discussions of issues including fanning, and daily bag limit were evaluated. The Hunter education curriculum for turkey hunting included ethics module. |
| To implement strategies that ensure compliance with these standards by 1/1/2018. | Yes | Law enforcement staffs were actively engaged in turkey enforcement and conducted trainings specific to turkey poaching. Technical committee evaluated regulations such as daily bag expansion and others that would have ethical considerations. Staff cooperated with partners (Jakes events), and the hunter education curriculum updated. |
| **Goal: Human-Wild Turkey Problems** | | |
| To quantify and assess agricultural and other negative turkey impacts by 1/1/2018. | Partial | Helpline data was evaluated for patterns and trends, however there were few calls or complaints, so efforts were redirected to species with higher damage potential. |

| | | |
|---|---|---|
| To develop and implement cost-effective response policies/guidelines for managing wild turkey problems by 1/1/2015. | Partial | Staff developed a BMP document to provide guidance to handling conflict situations, provided education and technical assistance to landowners, and shared to helpline, extension, etc. |

## MISSION, GOALS, OBJECTIVES, AND STRATEGIES

This section of the plan outlines and describes the goals for wild turkey management in Virginia through 2034. At the highest level, these turkey management goals align with the mission and goals of the Virginia Department of Wildlife Resources (DWR), which are to:

- **Conserve** and manage wildlife populations and habitat for the benefit of present and future generations.
    - DWR Goal 1: Conserve sustainable and diverse native wildlife populations and ecosystems.
    - DWR Goal 2: Manage wildlife populations and habitats to meet the balanced needs among diverse human communities.

- **Connect** people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities.
    - DWR Goal 3: Recruit, retain, and re-engage people who enjoy wildlife and boating activities.
    - DWR Goal 4: Promote people's awareness and appreciation of their role in wildlife conservation.

- **Protect** people and property by promoting safe outdoor experiences and managing human-wildlife conflicts.
    - DWR Goal 5: Minimize wildlife-related conflicts while balancing conservation goals and human benefits.
    - DWR Goal 6: Promote public safety for all people enjoying Virginia's wildlife and waterways.

The Stakeholder Advisory Committee (SAC, Appendix A) worked with DWR staff to revise goals from the 2013-2022 Wild Turkey Management Plan related to turkey populations, habitat, turkey-related recreation, and human-turkey conflicts. These goals reflect the values of a diverse public and are broad statements of principles and ideals about what should be accomplished with turkey management in Virginia. The goals articulate desired outcomes as well as important process guidance from the public on preferred approaches to achieve these stated outcomes. Simultaneously, overarching values and principles were identified as a mission for turkey management, which describes why and how turkeys should be managed in Virginia.

Based on these goals, the DWR Technical Committee (TC, Appendix B), in consultation with the SAC, developed specific objectives to help guide the successful attainment of each goal. Objectives are the technical expression of the public vision, expressed as goals. Some objectives used in this plan are intended to be quantifiable and/or have milestones for achievement; however, the entire set of objectives ultimately functions as a guide for achieving goals.

Potential strategies, which clarify how each objective should be met, were developed by TC and reviewed by SAC. While this is not an operational plan detailing all specific steps or actions to achieve objectives, these strategies represent some approaches, techniques, and programs that will be considered to accomplish objectives. As with objectives, decisions about what strategies to use are largely the technical realm of wildlife professionals, but still with input and considerations about what techniques are most acceptable to the public.

The broad mission and goal statements are much less likely to need amending before the next major plan revision than objectives and strategies. While goals should remain relatively constant over time, specific objectives and strategies will need flexibility to respond to changing social, environmental, technical, and administrative conditions. Objectives and/or strategies may be added, deleted, or amended by DWR as new information or circumstances demand. DWR staff will submit any interim updates to the SAC for review. Updated objectives will be provided as addenda to the Plan on the agency website.

**Turkey Plan Mission**

***Sustainably manage wild turkey populations as a wild, free-roaming public trust resource in a manner that serves the needs and interests of the citizens of the Commonwealth.***

***Manage wild turkey populations, turkey habitat, turkey-related recreation, and human-turkey conflicts, using biologically sound, applied science-based approaches that:***

- ***are ethical;***
- ***are flexible, innovative, and cost effective;***
- ***are proactive;***
- ***are publicly accepted (i.e., informed acceptance);***
- ***have impacts at relevant scales (local, region, state);***
- ***are accountable and transparent;***
- ***are collaborative with other agencies, partners, and the public; and,***
- ***are holistic, considering consequences on other species and stakeholders.***

These overarching values and principles establish, at the most basic level, why and how wild turkeys should be managed in Virginia. DWR has a legislative mandate (§29.1-103) to manage turkeys and other native wildlife in Virginia as a public trust for all citizens. Successful turkey management depends not only on the best scientific information and techniques, but also the support and engagement of a diverse public. Turkey management is the shared responsibility of DWR, other agencies, partners, and the public.

Seven (7) fundamental outcomes were identified within the four goals that follow (Appendix F). By the completion of this revision process, the SAC and the TC will have weighted these outcomes, which will help direct limited turkey program resources toward the most important areas of work.

**Goal 1: Population**

***Manage turkey populations at levels adaptable to changing landscapes that balance the varied needs and expectations of stakeholders statewide and locally. The use of regulated hunting and active habitat management should be the primary population management tools while acknowledging that other management tools may be employed depending upon localized objectives or limiting factors.***

This goal primarily addresses the tenet of the agency mission to "conserve and manage wildlife populations and habitat for the benefit of present and future generations." The need to balance the human needs associated with turkey populations is recognized in this goal and DWR Goal 2, as noted above; therefore, both the "connect" (e.g., recreation; DWR Goal 3) and

"protect" (e.g., human-wildlife conflicts; DWR Goal 5) tenets of the agency mission are implicated in this goal, as well.

The "varied needs and expectations of stakeholders" is often considered in terms of cultural carrying capacity (CCC). CCC is the maximum number of turkeys in an area that is acceptable to the human population. Because different turkey population sizes have different implications for sustained yields, recreation, animal health, and conflicts, the desirable CCC population level for turkeys may not occur at the biological carrying capacity (BCC); BCC is the maximum number of turkeys that a habitat can sustain over time.

Unlike deer and bear, there are relatively few areas in Virginia where CCC is exceeded for turkeys (e.g., certain urban areas or specific properties). Therefore, the desired turkey population for most management units will either be at BCC or at the level that provides nearly maximum sustainable turkey harvest. In either case, strategies to minimize negative impacts on specific private properties within the larger management units will be necessary.

By manipulating factors that limit the attainment of desired turkey population levels, management to attain populations should be done on a local/regional basis. While lawful hunting and habitat management should be the primary population management tools, other factors such as illegal mortality, predation, or diseases may also require management. For the purposes of this plan, hunting refers to the legal pursuit and/or taking of wild animals under fair chase conditions for recreational and/or management purposes.

**Objective 1***: To meet and maintain turkey population objectives in each management unit (Figure 35)*

Turkey management to achieve desired population levels should be done over the smallest landscape area that is practical. In Virginia, counties and major cities (e.g., Chesapeake, Suffolk, and Virginia Beach) are the basic management units for monitoring wild turkey harvest and population trends. From a practical perspective, population objectives are generally set to increase, stabilize, or decrease the existing turkey population levels to meet the varied needs of stakeholders in changing landscapes.

As an aid for determining the size of the current turkey population in relation to the desired population level, the disparity between relative population density and the relative quality of suitable habitat in each county (Appendix C, Fig. 13) was considered. In general, all county management units with relatively low or very low turkey population densities were assumed to have underachieving population levels and had corresponding objectives to increase population abundance. County management units with moderate population densities in the highest quality habitats also had objectives to increase population levels. In addition, the objectives in counties with greater than 50% of their land area in National Forests is to increase populations due to the demand for turkeys in those areas.

Although the remaining counties had objectives to stabilize the turkey population, population increases would also be acceptable unless CCC was obviously being exceeded ("stabilize+" in Fig. 35). Although no management units were considered to have surpassed CCC, there were several management units in highly urbanized areas (e.g., Fairfax, Virginia Beach) where concerns for increased conflict suggested increasing the

population may not be desirable. These management units have objectives of stabilize+ despite low or very low population densities. No county management unit was considered to have surpassed CCC, as such there were no objectives to decrease population levels at the county level.

Attainment of the population objectives likely will not be uniform across entire counties. Local site-specific needs for unique management concerns (e.g., damage issues near abundant vineyards, public lands popular for hunting or other recreation) might also result in locally different population objectives and management approaches compared to the rest of the county management unit. However, attainment of the county-wide objective will be based on population monitoring indices from across the entire county.

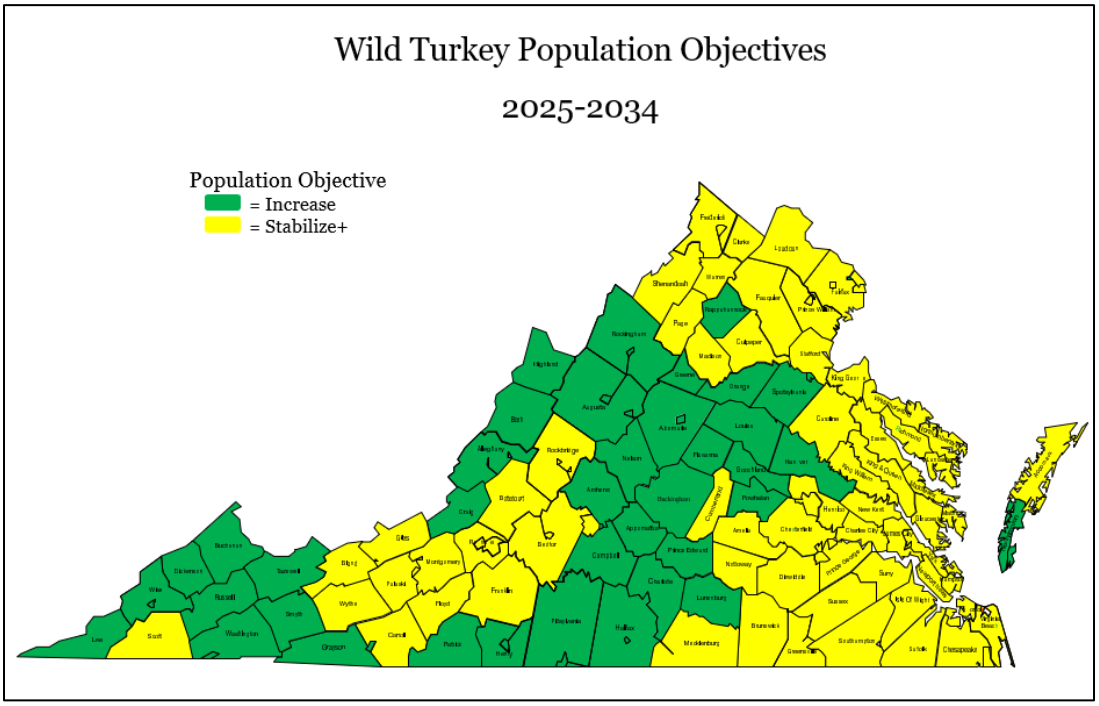


Figure 35. Wild turkey population objectives by county management unit, 2025-2034.

Potential Strategies:

- Control hunting mortality through bag limits, season structure (e.g., timing, length), hunting methods, and sex composition of fall harvest
- Manage illegal mortality through targeted enforcement, education, or other deterrent programs.
- Manage all National Forest and Department (DWR) owned and managed lands with an objective to increase turkey populations regardless of the county management objective.

**Objective 2.** ***Manage factors that may be limiting the attainment of turkey population objectives.***

Attaining population objectives depends on the proper identification of the factors that may be limiting current population management. Potential limiting factors for turkey population management may be associated with human-related mortality (e.g., legal

hunting, poaching), natural mortality factors, recruitment rates, habitat abundance and quality, and environmental influences. Describing, evaluating, and prioritizing these specific factors will be essential for designing management strategies to address population objectives. With the wide range of habitats, land use, and human values found across Virginia, these limiting factors for population management will also vary from area to area.

Potential Strategies:

- Identify limiting factors for the attainment of population objectives (e.g., disease, pesticides, predation, nesting disturbance, productivity and recruitment, habitat quality and quantity, legal and illegal hunting mortality, climate impacts)
- Identify management units with unique population management issues (e.g., low populations, marginal habitats, higher hunting pressure or harvests)
- Evaluate habitat or land use impacts on turkey populations with an emphasis on regional differences
- Monitor current and emerging issues within the state, region and national scope of turkey management and evaluate the implications for Virginia's populations
- Provide effective communication and education as appropriate on factors limiting turkey populations
- Provide technical assistance for management activities (e.g., active habitat management, reducing disease or predation risks) that mitigate or otherwise improve limiting factors for population growth at scales that are appropriate for the issue

**Objective 3.** ***To biennially assess, and update as necessary, turkey population objectives in each county management unit***

A challenge for implementing population objectives is balancing the dynamic changes that may occur over time in both turkey populations and social demands. As turkey populations, land use, human populations, and public values change, so will the public demands associated with wild turkeys. Because these factors may be constantly changing over time within any county management area, population objectives need to be periodically revisited to ensure that management programs respond accordingly.

Potential Strategies:

- Develop and evaluate methodology that incorporates habitat suitability (quantity and quality), public input methods (e.g., public surveys) and harvest metrics to establish management unit objectives
- Consider future changes in conditions (land use, habitat, human population density) that impact turkey populations and public perceptions of turkey populations
- Continue to investigate the use of maximum sustained yield (MSY) as an appropriate basis for population objectives.

**Objective 4.** ***To annually assess and update turkey population status in each management unit***

In order to monitor progress toward meeting population objectives, an annual assessment of population status is necessary. Unfortunately, no economically practical

methods exist to accurately estimate turkey population size across all county management units in Virginia. Currently, spring gobbler harvests in relation to available habitat and success by hunters are the best indices of turkey population trends and abundance. Data from additional surveys of bow hunters and spring gobbler hunters (as well as other surveys) are also used to validate the population indications from harvest results. Annual monitoring of recruitment (e.g., via brood surveys) and other environmental variables such as weather and mast conditions also help explain the variations observed in population trend data.

Potential strategies:

- Monitor and evaluate harvest and hunting effort data (especially spring harvest) as an index of population status
- Evaluate and monitor the availability of the landscape available to hunting specifically as it pertains to the harvest index
- Evaluate effectiveness of other population data to provide multiple indices of population parameters (e.g., brood surveys, recruitment, mortality, gobbler call counts) and monitor indices that accurately reflect population impacts or changes
- Monitor environmental parameters that impact populations and interpretation of population monitoring indices (e.g., mast conditions, weather, predators)
- Evaluate effectiveness of management-based indices of relative population size and habitat quality (i.e., Habitat Suitability Index).
- Evaluate climate vulnerability for turkey populations (e.g., nesting and gobbling chronology, disease impacts)

**Objective 5.** ***To develop and/or continue site-specific population management programs within management units.***

Even when a county-wide population objective is met, attainment will likely not be met uniformly in all areas of the county management unit. Site-specific management needs for unique concerns (e.g., damage issues around vineyards) might also result in locally different population objectives and management programs. County-wide hunting seasons are purposefully designed at a relatively large scale to be as simple and uniform as possible among counties. Because habitats, turkey densities, hunting pressure, turkey issues, and public demands vary within counties, broader population management approaches may sometimes be too conservative or too liberal at specific sites within county management units. Unique management needs in local areas may require alternative site-specific management approaches. Site-specific management might be needed in urban areas, wildlife refuges, parks and other public lands, planned communities, airports, or agricultural areas.

Potential strategies:

- Provide technical assistance to communities, landowners, and agricultural producers to mitigate potential population issues that arise.
- Develop non-lethal management actions that can be employed in special circumstances where hunting may not be a feasible alternative
- Provide localized opportunities for supplemental harvest or removal of turkeys when

there is a need to control conflicts or human interactions (i.e. kill permits, targeted property-level hunting programs, etc.)
- Evaluate alternatives to hunting in scenarios where hunting may not be a feasible alternative for lethal removal.

**Objective 6.** ***To investigate and evaluate alternative population monitoring methodologies (approaches) for turkeys***

Given limitations with current methods of turkey population assessment (e.g., relationships between hunter effort, harvest selectivity, available habitat, and turkey population size), turkey managers and researchers must continue to improve monitoring methodologies that are more sensitive to changes in wild turkey populations.

Potential Strategies:
- Evaluate the effectiveness of non-harvest related metrics (e.g., eBird, iNaturalist, breeding bird survey) to track population changes over time.
- Improve monitoring methodologies or technologies that can better detect changes in population (e.g., automated recording unit surveys)

**Goal 2: Habitat**

***Manage turkey habitat compatible with turkey population, recreation, and conflict goals while working across diverse public and private lands and ecosystems. Habitat conservation actions should benefit multiple species with an emphasis on areas of special significance to the life history of turkeys (e.g., nesting or brood rearing habitat) while also considering potential impacts of other landscape changes (e.g., land use or climate impacts).***

This goal primarily addresses the "conserve" tenet in the agency mission statement. The availability of suitable turkey habitat is key to managing turkeys to meet specific population and recreational goals while also minimizing human-turkey conflicts. Habitat management activities that affect habitat diversity, forest succession, land use, and habitat connectivity will have significant implications for meeting turkey population management objectives. Habitat management practices that promote a diversity of habitat types, with particular emphasis on habitats needed for nesting and brood rearing, will likely benefit turkey populations. When feasible, the use of native plant communities or natural regeneration will be preferred over intensive planting of non-native species. The lack of active habitat management, particularly across large public landscapes, and the ensuing lack of habitat diversity and productivity will continue to be a detriment to turkey populations. Education and outreach on the benefits of active forest management, particularly on lands consisting of even-aged climax forest (composed of species such as American beech, tulip poplar, sugar maple) are necessary to achieve habitat and thus population goals for turkeys.

Increasing urbanization and human population growth across portions of Virginia will have direct impacts to turkey habitat and thus turkey population and recreational goals. The human population in Virginia grew by nearly 7.4% from the 2010 to 2020 census, an addition of more than 600,000 people. While much of this growth is centered along the Interstate 95 corridor (from Loudoun County south to Virginia Beach), pockets of growth also occur along the

Interstate 81 corridor, particularly the Roanoke/Montgomery County area and from Rockingham County east to Charlottesville (US Census, 2020). Portions of these areas have had turkey population concerns since the past turkey management plan. Increasing human development and the loss of turkey habitat along with a continued lack of active habitat management will only continue to exacerbate turkey population issues in these areas. Habitat fragmentation will likely become an increasingly important issue for turkey habitat management through the duration of this turkey plan.

**Objective 1.** ***To update and evaluate the turkey habitat status in each management unit every five years***

As Virginia's landscape continues to evolve it will be critical to evaluate land use patterns and changes in relation to turkey habitat suitability throughout the lifespan of the plan. Factors such as urbanization, particularly around northern Virginia and Interstate 95 corridor along with land use changes (development, solar farms, data centers, forest succession) will impact habitat suitability for wild turkeys possibly leading to localized population impacts or changes in cultural carrying capacity (urban conflict situations). The habitat suitability model is used in conjunction with current population densities (e.g., using spring gobbler harvest indices) to set turkey population objectives. Thus, changes to habitat suitability can have a potential positive or negative impacts on population objectives and the ability to meet those objectives.

Potential Strategies:

- Incorporate the most recent landscape inventory and forest inventory data to enhance and update the habitat suitability index model.

**Objective 2.** ***To identify management units where habitat is a limiting factor for achieving turkey population and recreation goals***

As depicted in Figure (12), habitat suitability varies across Virginia, with areas of "good" habitat depicted by the red or orange coloration while areas of less suitable habitat are depicted as blue to purple. These differences can be seen regionally and locally within a management unit. Regionally, the area west of the Blue Ridge Mountains of Virginia are predominantly categorized by mature hardwood forests in a late successional (climax) stage. Interspersion of successional stages is limited in these areas where the predominant land ownership is public land (USFS, VDWR). Evaluating county level land ownership, forest successional stages, current and potential habitat management practices, and the feasibility of habitat manipulations will all be critical for understanding habitat variables limiting turkey population and recreational goals.

Potential Strategies:

- Identify differences in populations and habitat in public and private landownership
- Determine impacts of habitat changes (e.g., land use patterns, aging forests, changes in agricultural production) on turkey populations

**Objective 3**. ***Promote appropriate turkey habitat management especially in management units where habitat is a limiting factor for achieving turkey population,***

***recreation, and conflict goals.***

Activities which intentionally (forest management) or unintentionally (development) alter turkey habitat will have implications on meeting turkey population, recreation, and conflict goals. Virginia is comprised of primarily private land (90% of land area), thus habitat manipulation by private landowners can have profound impacts on turkeys as well as other wildlife species. Working with conservation organizations such as NRCS and local Soil and Water Conservation Districts will be highly beneficial in promoting and encouraging private land habitat management. In western Virginia public land ownership is more prominent, thus making partnerships and education about the importance of public land management a critical piece for improving areas with limited turkey habitat suitability currently. Working with partners (federal and state agencies, NGOs such as the National Wild Turkey Federation and The Nature Conservancy) will be necessary to achieve landscape scale habitat changes, particularly over the long term.

Potential Strategies:

- Promote partnerships with state and federal partners, NGOs and private landowners to cooperatively manage habitat at landscape scales and to educate and provide technical assistance to landowners in efforts to achieve population objectives
- Support efforts to enhance active management of landscapes on public lands with an emphasis on DWR lands to serve as an example for habitat management.
- Educate land managers (i.e., DWR staff, other public land managers, partners, and private landowners) about specific turkey habitat needs (e.g., nesting, brood, escape), vegetative communities (e.g., early successional plant communities) that facilitate those needs, and management techniques to develop the appropriate habitats to meet population and recreation objectives and associated values for other wildlife
- Identify and discourage land management practices that may inhibit the attainment of population objectives (e.g., mowing or other disturbance during nesting or brood rearing).
- Promote habitat practices that provide long-term benefits to a diversity of wildlife species emphasizing natural plant communities rather than more artificial management.

**Objective 4.** ***Increase stakeholder awareness, support, and tolerance for turkey habitat management including the need for management and method used***

Education is a critical component of habitat management. Utilizing multiple avenues to provide scientific information on habitat practices to a general audience will continue to be both a challenge and an opportunity within this goal area. Misinformation about habitat management practices tends to spread quickly and garner intolerance for many types of habitat manipulations. Proactive messaging across multiple user groups of the outdoors (e.g., hunters, recreationists, ecologically-minded citizens) as to the benefits of managed disturbances (e.g., timber harvests, prescribed burning, invasive species removals) to both turkeys and other wildlife species should be emphasized whenever possible. Partnerships for to provide habitat education through various modalities will continue to be important and will likely be strengthened as changes to Virginia's

landscape continue.

Potential Strategies:

- Promote the value of active habitat management (including forest management) on public and private lands to achieve population objectives
- Education to promote wild turkey habitat management through publications, social media, workshops and other media.
- Collaborate with other agencies, schools, NGOs and other entities to educate on the importance of habitat management activities
- Educate the public about the relationship between habitat quality and turkey densities
- Enhance the public appreciation of habitats (e.g., diverse forests, early successional communities) that benefit turkeys and other wildlife.
- Increase awareness of recreational user impacts on habitat and disturbance

**Goal 3: Recreation**

***Provide and promote various forms of wild turkey-related recreation to optimize quality opportunities (i.e., safe, responsible, ethical, lawful, and accessible). Preserve the heritage and tradition of hunting turkeys (fall and spring), and provide opportunities to observe turkeys, for both management and recreational benefits. Turkey related recreational opportunities should not prevent the attainment of population objectives.***

This goal primarily addresses the "connect" tenet of the agency mission (DWR Goals 3 and 4), but also implicated in this goal are the "conserve" (e.g., manage populations; DWR Goal 2) and "protect" (e.g., promote safe outdoor experiences; DWR Goal 6) tenets of the agency mission.

Wild turkeys provide valuable recreational opportunities for a diverse suite of users across the Commonwealth including hikers, hunters, wildlife watchers, photographers, and the general public. Regulated hunting through the allocation of season lengths, season timing, and hunting methods (fall or spring), is the preferred management tool for meeting population objectives. Regulated hunting can provide recreational benefits while also attaining population objectives of increase or stabilize depending on the parameters placed on the hunting seasons (i.e. timing, overlap with deer seasons, season structure) and/or methods. The array of turkey hunting opportunities in Virginia through spring and fall seasons (including archery, firearms, and traditional turkey-dog hunting), provide distinct experiences and satisfactions for the recreational users. Virginia's hunters consistently rate turkey hunting importance as very high, second only to deer hunting.

Based on a 2016 survey, approximately 35% of Virginia's population viewed wildlife, equating to nearly 2.1 million wildlife viewers in the state and equating to nearly $32 billion dollars in wildlife viewing expenditures. Wild turkeys continue to rank highly as a species valued for viewing opportunities in Virginia. While the number of licensed hunters in Virginia has declined over the past thirty years, wildlife viewing has seen a slight increase in participation. In 2021, DWR completed its first Virginia Wildlife Viewing Plan outlining four key goal areas to continue to engage and support wildlife viewing across the Commonwealth.

Non-hunting recreational opportunities to enjoy wild turkey in their natural habitat should be available to all Virginia citizens.

**Objective 1.** ***Monitor turkey hunter satisfactions and constraints to hunting participation in Virginia to maintain fall and spring turkey hunter satisfactions at the adequate level, as measured by the biennial hunter survey.***

Individuals hunt for many reasons, which provide a distinct set of satisfactions (e.g., for meat, to be with friends or family, observing wildlife, being close to nature, working with dogs, testing their skills, for the challenge), but specific information on turkey hunter satisfactions needs to be continually monitored and updated. Understanding hunter satisfactions and intrinsic motivations for turkey hunting will allow recreational opportunities to be tailored to better meet these satisfactions. Understanding constraints to participation in turkey hunting (e.g., free time, cost, access) will also be beneficial in evaluating hunter effort and developing recreational programs that maximize hunter satisfactions while minimizing constraints and still meeting programmatic goals.

Average satisfaction ratings for fall and spring hunting have remained relatively stable over the previous plan period. The most recent hunter survey (2022-2023 season) indicated that spring turkey hunter satisfactions had dropped just below the adequate level at a rating of 3.8 (on a 7-point scale) although ratings have remained fairly stable over the past decade, with a slight dip since 2022. Fall hunting satisfactions have also remained fairly stable at 3.4 (on a 7-point scale), although below the desired (adequate) level. Identifying and managing for factors that enhance satisfactions can improve the overall hunting experience, leading to an enhanced value of turkey hunting recreation.

Potential Strategies:

- Conduct hunter surveys at regular intervals to gauge effort and satisfaction of both resident and non-resident hunters
- Determine the relative importance of desirable attributes for quality spring and fall turkey hunting experiences (e.g., bag limits, seasons, access, disturbance, harvest)
- Determine constraints to turkey hunter participation and enjoyment (e.g., access, interference, overlap with deer seasons)
- Focus efforts to increase hunter satisfaction in areas where it is currently inadequate (e.g., Northern Mountains)
- Develop or improve methodology to regularly monitor turkey hunter trends in participation, effort, and success for both resident and non-resident hunters.

**Objective 2.** ***To determine non-hunting turkey recreation demands, desires, and satisfactions, and inform the public about non-hunting recreational opportunities.***

Non-hunting recreational demands for turkey are poorly understood. While the demand to view wild turkeys is high among some members of the public, satisfactory

approaches to developing these viewing opportunities are unknown. Improved understanding of non-hunting recreational desires for wild turkeys and how these opportunities can be used to tailor education and outreach programs while preventing unnatural situations is needed.

Potential Strategies:

- Survey Virginia citizens regarding non-hunting recreational satisfactions and demands (e.g., wildlife viewing, photography)
- Evaluate the constraints to participating in non-hunting recreation
- Prioritize programs based on demands expressed by Virginia citizens in the DWR Wildlife Viewing Plan
- Ensure that turkey viewing opportunities do not facilitate human-turkey conflicts and promotes more natural activities (e.g., discourages supplemental feeding).
- Develop best management practices for wildlife viewing and hunting on public lands
- Continue educational programs on turkey biology and management geared towards non-hunting recreationists
- Facilitate and promote viewing opportunities in accessible locations

**Objective 3.** ***Maintain turkey hunting quality by preserving diverse types of hunting opportunities (fall and spring)***

Hunting quality is driven by multiple factors, including the type of opportunity or experience the individual hunter is looking to achieve. Traditionally, Virginia turkey hunters have enjoyed diverse hunting opportunities (e.g., spring, fall, opportunistic, archery), perhaps a greater diversity of opportunity than most other states. While some hunters participate in multiple seasons or styles of hunting (multi-season hunters) other are more selective, preferring a specific season, weapon, or type of experience (spring or fall only, passive-opportunistic, or turkey-dog hunting). Maintaining diverse opportunities and exploring options to maximize or create new opportunities may improve or increase participation and subsequently improve the value of turkey hunting satisfaction for a greater number of hunters. However, these diverse opportunities also create potential conflicts of how the opportunities or harvests are allocated among user groups.

Allocation of hunting opportunities and harvest is an ongoing issue that impacts multiple constituent groups. There are diverse (and sometimes conflicting) interests, values, and satisfactions associated with different hunting methods or seasons. Continual evaluation of current harvest season structures with diverse public input is necessary to optimize hunter satisfactions while limiting conflict between hunters of varying methods. A diverse mix of recreational hunting opportunities that provide an equitable allocation among user groups and participants based on their unique harvest rates, efficiency, and methodology will continually be adapted based on hunter desires and meeting population objectives

Potential Strategies:

- Identify recreational demands for all types of turkey hunting through hunter surveys and other sources
- Manage the allocation of recreational opportunities among users (e.g., weapon, method, season timing, land type) in a manner that limits user conflicts to the extent feasible
- Develop and enhance recruitment, retention and reactivation programs for all types of hunters (e.g., youth, women, weapons, season, timing, dogs)
- Evaluate various approaches to increase participation (quota hunts, etc.) and promote access to lands not traditionally open to public hunting

**Objective 4.** ***Provide for appropriate turkey hunting allocation between traditional fall turkey hunters and opportunistic fall hunters***

Fall hunting seasons provide a diversity of recreational hunting opportunities and experiences. However, because the traditional either-sex harvest of the current fall season structure, the potential to affect population trajectories has been identified as a potential management concern. Providing maximum opportunity during fall seasons may come with trade-offs in population growth, while inversely, ensuring population growth may necessitate decreased opportunity. During periods of overlap with deer hunting seasons, opportunistic take may be maximized; however, these harvests may push the limits of population objectives and may require shortened seasons to achieve or maintain objectives. Finding and maintaining an appropriate balance of these trade-offs within fall hunting user groups, while meeting population objectives, can lead to decreased tension between user groups and subsequently increased recreational value. Developing and implementing a decision matrix that incorporates a suite of data from diverse user groups, population data, and other metrics will allow improved allocations in season structure and harvest.

Potential Strategies:

- Utilize hunter survey data, stakeholder meetings, and regulatory processes to determine the ideal allocation of harvest
- Manage hunting season opportunities (i.e. season timing and length, bag limits, hen harvest, weapon, overlap with other hunting opportunities) to balance allocation and population objectives
- Develop a transparent and defensible matrix for setting fall harvest seasons that incorporate population index, population objectives, hunter preferences and other factors to determine ideal season structure

**Objective 5.** ***Annually monitor and minimize turkey hunting incidents in both the spring and fall hunting seasons***

Hunter safety is a concern for all hunting and is often cited as a significant concern for turkey hunters. The incident rates for turkey hunters have decreased over the previous decades and through the life of the preceding plan (Figure 32). Building upon

those successes is vital to ensure that recreational user safety remains at the forefront of management decisions. Not only will a safe hunting experience increase the recreational value to hunters, but also a safe image of hunting will also alleviate many safety concerns of other outdoor or recreational users during open turkey hunting seasons.

Potential Strategies:

- Promote mandatory hunter education to emphasize the importance of safety
- Evaluate effectiveness of online or in-person hunting education programs (workshops, traditional hunter-ed courses)
- Cooperate with other agencies and organizations to deliver consistent hunter safety information
- Evaluate emerging hunting techniques that may affect hunting safety (e.g., fanning or reaping)
- Implement laws and hunting regulations that reduce hunting incidents or fatalities
- Annually inform hunters and the general public about open hunting seasons and associated safety considerations
- Promote the safety record of turkey hunting

**Objective 6.** ***Promote turkey hunting methods that are sportsmanlike and ethical***

The future of turkey hunting may be affected significantly by public perception of turkey hunters and turkey hunting activities. Therefore, guidelines, regulations, and education pertaining to turkey hunting should address sportsmanlike and ethical behaviors and methods.

Potential Strategies:

- Based on surveys or other methods, describe and define turkey hunting activities that are not considered sportsmanlike or ethical.
- Develop and implement educational programs, regulations, guidelines, and recognition programs in conjunction with partner agencies and organizations to encourage hunter ethics.
- Manage illegal activities to promote sportsmanlike and ethical behavior through law enforcement, incentives, and other deterrence strategies.
- Enact regulations to address hunting activities that are not considered fair, sportsmanlike, and ethical.
- Maintain prohibition on the use of bait to hunt turkey.
- Encourage the responsible utilization of harvested turkeys (meat, feathers, etc.)
- Maintain the image of turkey hunters as important and influential conservationists

**Goal 4: Conflict**

***Prevent and reduce human-wild turkey conflicts (e.g., agricultural, residential, recreational, airport) while:***

- ***promoting shared responsibility (personal, community, agency)***
- ***fostering practices that keep turkeys wild***
- ***prioritizing use of nonlethal methods to resolve conflicts,***
- ***using regulated hunting as the preferred method when lethal alternatives are required to manage conflicts,***
- ***attaining turkey population, habitat, and recreation goals.***

This goal primarily addresses the tenet in the agency mission to "protect people and property by promoting safe outdoor experiences and managing human-wildlife conflicts (DWR Goal 5 and 6). The "conserve" (e.g., manage populations and coexistence; DWR Goal 2) and "connect" (e.g., appreciation for the species; DWR Goal 4) tenets of the agency mission are also implicated in this goal area.

Turkey management goals are not limited to achieving population objectives or providing recreation for Virginia's citizens. Although generally much less of a concern than other wildlife species (e.g., bear, deer), wild turkeys may still create problems for agricultural crops, people in residential areas, vehicle collisions, and airport safety risks. With rural and urban environments in close proximity to turkeys and turkey habitats, wild turkey conflicts can occur almost anywhere in Virginia.

Citizens, communities, local governments, VDWR, and other state and federal agencies share responsibility in managing human-turkey conflicts. While VDWR has primary responsibility for managing turkey populations, the decisions and actions of landowners, local governments, and all citizens directly influence the type of interactions people have with turkeys and the effectiveness of programs to prevent or mitigate human-turkey conflicts. Community leaders can minimize potential negative human-turkey interactions by proactively making policy decisions such as enacting wildlife feeding ordinances, which limit habituation and food conditioning.

Education and outreach are critical components of the human-turkey conflict goal area. Effective public information campaigns and consistent messaging across all jurisdictions and by all stakeholders are necessary to both foster coexistence with wild turkeys and provide factual conflict prevention strategies. Collaborative efforts between VDWR and impacted stakeholders (e.g., agricultural producers, residential neighborhoods, airports) are also vital to further the science in conflict prevention and mitigation strategies.

**Objective 1.** ***Monitor and assess agricultural, residential, recreational, and airport wild turkey conflicts***

Knowledge of turkey related conflicts, particularly agricultural and residential, are currently limited in scope and severity. Reliable estimates of turkey damage to agricultural crops in Virginia is currently non-existent, with limited reports involving sod/turf farms, commercial row crops (e.g., soybeans, peanuts), and vineyards. As human populations continue to increase, urban turkey conflict situations may also become more apparent on the landscape. Reports of aggressive turkeys around homes, parks, or businesses do occur, but the overall extent of these situations is often not fully known.

Potential Strategies:

- Utilize the wildlife conflict helpline to gather data on damage complaints
- Evaluate metrics related to agricultural damage caused by turkeys (vineyard damage, potential domestic poultry impacts, etc.).
- Evaluate metrics related to residential or urban conflicts (e.g., damage, harassment).

**Objective 2.** ***To implement and review best management practices (for the public and agency) that utilize both non-lethal and lethal options for managing turkey conflicts***

Standardized, but flexible, wildlife conflict response guidelines are necessary to clarify public and agency responsibilities for human-turkey conflicts. Options for managing conflict situations are often poorly understood by the public, thus education will be a key component of guidance documents. In addition to support from VDWR, citizens, communities, local governments, and other agencies share the responsibility for managing conflicts associated with turkeys. Non-lethal conflict mitigation strategies are primarily favored by the general public and are encouraged as a first step before using lethal control. VDWR currently has a turkey best management practices guidance document for dealing with turkey conflicts (Appendix D). Ongoing training and review are critical elements of response guidelines.

Potential Strategies:

- Maintain and revise (when necessary) cost-effective response policies/guidelines to address human-turkey conflicts.
- Allow flexibility in policies/guidelines to allow affected individuals, landowners, and municipalities a range of choices in resolving conflict situations.
- Communicate and educate the public, municipalities, and state agencies about these policies/guidelines.
- Policies/guidelines and regulations should identify and correct citizen actions that encourage turkey conflicts (e.g., intentional feeding that habituates turkeys to people).

**Objective 3.** ***To develop policies and protocols for alternative approaches to managing site specific turkey conflicts when hunting is ineffective, unacceptable, or not feasible***

When lethal removal is warranted due to human-turkey conflicts, regulated hunting will be the preferred option. To provide consistency and simplicity, turkey hunting regulations are uniformly established on a county level. While this is generally sufficient to meet population objectives, it may be ineffective to address localized issues or unique situations, such as highly urbanized areas or extensive agricultural damage associated with large refuges or un-hunted landscapes. Thus, site specific management options that utilize non-lethal and lethal tools outside of regulated hunting are critical. Education and outreach will be necessary to ensure success of unique management approaches and to mitigate public concerns.

Potential Strategies:

- Evaluate the feasibility and desirability of special options that might be utilized for site-specific concerns (e.g., nuisance wildlife control operators, hazing, etc.).

**Objective 4.** ***Maintain and expand prohibitions on feeding wildlife especially as they pertain to disease and human habituation***

The negative effects of feeding wildlife and thus congregating animals at a single location include disease transmission risks, negative effects on native habitats from unnaturally high densities of animals, habituation and/or food conditioning of fed animals, and increased human-wildlife conflicts. While feed may be placed out for one species, it is often hard to prevent any number of other wildlife species from accessing this open food source, often leading to intermingling of species that is not seen in more natural settings. This can increase the risk of disease transmission both within the same species as well as across various species. In areas where wildlife diseases are prevalent or disease management units are designated (e.g., chronic wasting disease management areas for deer, sarcoptic mange endemic counties for bear), the feeding of all wildlife should be prohibited or at a minimum strongly discouraged year-round.

Potential Strategies:

- Develop and maintain regulations that prohibit feeding all wildlife, with particular emphasis in areas where wildlife diseases have been identified or are at increased risk.

**Objective 5.** ***Increase stakeholder support for turkey conflict management methods and tolerance for turkey related conflicts.***

Successful turkey management depends not only on the best scientific information and techniques, but also the support and engagement of a diverse citizenry. Public attitudes and perceptions can greatly influence the success or failure of turkey conflict management options. Preventing and reducing human-turkey conflicts is a shared responsibility of the public and VDWR. Education and outreach are the primary tools for reducing negative human turkey interactions by increasing the understanding of turkey behavior, increasing tolerance for turkeys, and providing techniques and resources for prevention and mitigation of conflict situations. Continuing to provide regulated recreational hunting opportunities to meet population objectives is also an important tool in reducing negative human-turkey conflicts over time.

Potential Strategies:

- Advocate public outreach and education messages to change attitudes and behaviors in support of turkey conflict management.
- Collaborate with other agencies, non-governmental organizations, schools, private entities and individuals, etc. (e.g., agribusiness, insurance companies, VA Dept. of Agriculture and Consumer Services)
- Target audiences to increase public awareness about turkey conflict issues and solutions.
- Develop educational materials for agricultural producers and the public regarding turkey damage abatement programs and techniques.
- Educate public about human and animal health relating to turkey in coordination with Virginia Department of Health and other appropriate agencies.

Appendix A. Stakeholder Advisory Committee

| Name | Interest/Organization | DWR Region |
|---|---|---|
| David Eustis | Fall turkey hunter | Region 4 |
| Bridges Comer | Fall turkey dog hunter | Region 3 |
| Earl Seachrist | Multi season hunter | Region 4 |
| Austin Bradley | Spring turkey hunter - Public | Region 3 |
| Jon Joyner | NWTF | Region 1 |
| Jason Lupardus* | Turkeys for Tomorrow | Kentucky |
| Isaac Weintz | Back Country Hunters and Anglers | Region 4 |
| Morgan Wilson | General Conservation (Hollins University) | Region 2 |
| Adrienne Frank | Master Naturalist | Region 1 |
| Nolan Nicely | Appalachian Habitat Association | Region 4 |
| John Taylor | SW Virginia Sportsmen | Region 3 |
| Chad Forehand | USDA-WS, Urban | Region 1 |
| Tom Olexa | Dept of Navy | Region 1 |
| David Demarest | National Park Service | Region 4 |
| Danny Wright | US Forest Service | Region 4 |
| Randy Kyner | VA Dept of Forestry | Region 2 |
| Jake Tabor | Virginia Farm Bureau | Region 1 |
| David Cearley | Virginia Vineyards Association | Region 4 |
| Nathan Osborne | Private Landowner | Region 3 |
| Powhatan Owen** | Chickahominy Tribal Member | Region 1 |

* Local Chapter representative unavailable

**Unable to attend meetings

Appendix B. Virginia Department of Wildlife Turkey Technical Committee

| Name | Agency Position | Region |
|---|---|---|
| Kat Black | District Biologist | Region 3 |
| Ali Davis | District Biologist | Region 2 |
| Mike Dye | Forest Gamebird Biologist | Statewide |
| Todd Englemeyer | District Biologist | Region 1 |
| Joe Ferdinandsen | District Biologist | Region 4 |
| David Garst | District Biologist | Region 1 |
| Jordan Greene | District Biologist | Region 4 |
| Mitchell Kern | District Biologist | Region 2 |
| Neil Kester | Conservation Police Officer | Region 4 |
| Matt Kline | Regional Lands and Access Manager | Region 4 |
| Nelson Lafon | Forest Wildlife Program Manager | Statewide |
| Alexandra Lombard | Wildlife Disease Biologist | Statewide |
| Katie Martin | Deer/Bear/Turkey Biologist | Statewide |
| Cathrine McCarty | District Biologist | Region 4 |
| Jason Miller | Hunter Education Coordinator | Region 4 |
| David Norris | Regional Wildlife Manager | Region 1 |
| Sarah Peltier | District Biologist | Region 2 |
| Lisa Stukowski | Regional Wildlife Manager | Region 3 |
| Josh Thomas | Conservation Police Manager - Lieutenant | Region 1 |
| Seth Thompson | District Biologist | Region 4 |

Appendix C. Turkey Population trends, relative density and habitat quality for wild turkeys in Virginia

| County | Habitat Quality | | | 2022-2024 Average Density | | Population Growth | | |
|---|---|---|---|---|---|---|---|---|
| | Available Habitat [1] | HSI Mean Quality [2] | Relative Habitat Quality [3] | Spring harvest [4] (kill/mi$^2$) | Density [5] | Annual Rate of Change (%) [6] | Statistically Significant | Trend [7] |
| Accomack | 320.09 | 0.48 | Low | 0.75 | High | 11 | yes | Increasing |
| Albemarle | 711.22 | 0.65 | High | 0.34 | Low | 1.8 | no | Stable |
| Alleghany | 443.61 | 0.43 | Low | 0.48 | Moderate | 0.7 | no | Stable |
| Amelia | 355.67 | 0.71 | Very High | 0.63 | High | 4.6 | yes | Increasing |
| Amherst | 471.19 | 0.61 | High | 0.55 | Moderate | 0.2 | no | Stable |
| Appomattox | 332.35 | 0.75 | Very High | 0.46 | Moderate | -2.6 | no | Stable |
| Augusta | 958.45 | 0.47 | Low | 0.38 | Low | 6 | yes | Increasing |
| Bath | 528.51 | 0.46 | Low | 0.31 | Low | -2.4 | no | Stable |
| Bedford | 753.77 | 0.67 | High | 0.82 | High | 1.6 | no | Stable |
| Bland | 356.80 | 0.54 | Moderate | 0.56 | Moderate | 1.5 | no | Stable |
| Botetourt | 536.10 | 0.54 | Moderate | 0.58 | Moderate | -0.5 | no | Stable |
| Brunswick | 562.46 | 0.68 | High | 0.65 | High | 10 | yes | Increasing |
| Buchanan | 495.65 | 0.43 | Low | 0.36 | Low | -2.9 | no | Stable |
| Buckingham | 577.28 | 0.71 | Very High | 0.43 | Low | 0.3 | no | Stable |
| Campbell | 496.51 | 0.76 | Very High | 0.56 | Moderate | -1.2 | no | Stable |
| Caroline | 523.15 | 0.63 | High | 0.66 | High | 2.9 | no | Stable |
| Carroll | 472.70 | 0.72 | Very High | 0.86 | High | 4.3 | yes | Increasing |
| Charles City | 175.27 | 0.59 | Moderate | 0.99 | Very High | 4.1 | yes | Increasing |
| Charlotte | 470.47 | 0.75 | Very High | 0.57 | Moderate | -1.2 | no | Stable |
| Chesapeake | 309.91 | 0.39 | Low | 0.38 | Low | 18.5 | yes | Increasing |
| Chesterfield | 388.12 | 0.49 | Low | 0.28 | Low | -0.3 | no | Stable |
| Newport News | 45.20 | 0.28 | Low | 0.10 | Very Low | 4.8 | no | stable |
| Clarke | 175.06 | 0.51 | Moderate | 1.08 | Very High | 7.6 | yes | Increasing |
| Craig | 328.21 | 0.49 | Low | 0.70 | High | 1.4 | no | Stable |
| Culpeper | 373.68 | 0.64 | High | 0.63 | High | 7.5 | yes | Increasing |
| Cumberland | 296.06 | 0.71 | Very High | 0.70 | High | 0.8 | no | Stable |

| County | Habitat Quality | | | 2022-2024 Average Density | | Population Growth | | |
|---|---|---|---|---|---|---|---|---|
| | Available Habitat [1] | HSI Mean Quality [2] | Relative Habitat Quality [3] | Spring harvest [4] (kill/mi$^2$) | Density [5] | Annual Rate of Change (%) [6] | Statistically Significant | Trend [7] |
| Dickenson | 327.48 | 0.49 | Low | 0.39 | Low | -4.5 | yes | Decreasing |
| Dinwiddie | 496.35 | 0.70 | Very High | 0.62 | High | 5.6 | yes | Increasing |
| Essex | 248.32 | 0.69 | High | 0.92 | Very High | 2.3 | no | Stable |
| Fairfax | 330.21 | 0.35 | Low | 0.05 | Very Low | 4 | no | stable |
| Fauquier | 641.79 | 0.64 | High | 0.74 | High | 6.4 | yes | Increasing |
| Floyd | 379.33 | 0.74 | Very High | 0.75 | High | 3.9 | yes | Increasing |
| Fluvanna | 285.53 | 0.71 | Very High | 0.51 | Moderate | -0.9 | no | Stable |
| Franklin | 687.45 | 0.70 | Very High | 0.83 | High | 3.9 | yes | Increasing |
| Frederick | 401.24 | 0.60 | High | 1.02 | Very High | 9.2 | yes | Increasing |
| Giles | 354.97 | 0.56 | Moderate | 0.85 | High | 2.3 | no | Stable |
| Gloucester | 202.86 | 0.58 | Moderate | 0.81 | High | 3.8 | no | Increasing |
| Goochland | 277.79 | 0.68 | Very High | 0.56 | Moderate | -2.7 | no | Stable |
| Grayson | 440.65 | 0.68 | High | 0.58 | Moderate | -0.6 | yes | Stable |
| Greene | 154.72 | 0.59 | Moderate | 0.38 | Low | 6 | no | Stable |
| Greensville | 288.56 | 0.70 | Very High | 0.70 | High | 7.4 | yes | Increasing |
| Halifax | 811.80 | 0.76 | Very High | 0.43 | Low | -1.6 | no | Stable |
| Hanover | 454.29 | 0.67 | High | 0.49 | Moderate | 3.7 | no | Stable |
| Henrico | 200.94 | 0.45 | Low | 0.38 | Low | 4.8 | yes | increasing |
| Henry | 376.32 | 0.66 | High | 0.59 | Moderate | -0.2 | no | Stable |
| Highland | 415.07 | 0.52 | Moderate | 0.29 | Low | 2.4 | no | Stable |
| Isle of Wight | 301.29 | 0.69 | High | 1.41 | Very High | 4.8 | yes | Increasing |
| James City | 126.02 | 0.48 | Low | 0.53 | Moderate | 0.5 | no | Stable |
| King and Queen | 307.68 | 0.67 | High | 0.85 | High | 3.4 | no | Stable |
| King George | 172.32 | 0.60 | High | 0.68 | High | -0.2 | no | Stable |
| King William | 262.33 | 0.65 | High | 0.77 | High | -1.1 | no | Stable |
| Lancaster | 127.53 | 0.61 | High | 1.60 | Very High | 5.5 | yes | Increasing |
| Lee | 430.97 | 0.62 | High | 0.54 | Moderate | 0.8 | no | Stable |

| County | Habitat Quality | | | 2022-2024 Average Density | | Population Growth | | |
|---|---|---|---|---|---|---|---|---|
| | Available Habitat [1] | HSI Mean Quality [2] | Relative Habitat Quality [3] | Spring harvest [4] (kill/mi$^2$) | Density [5] | Annual Rate of Change (%) [6] | Statistically Significant | Trend [7] |
| Loudoun | 469.42 | 0.55 | Moderate | 0.90 | High | 5.8 | yes | Increasing |
| Louisa | 492.39 | 0.69 | High | 0.57 | Moderate | 2.3 | no | Stable |
| Lunenburg | 428.72 | 0.72 | Very High | 0.58 | Moderate | 2.3 | no | Stable |
| Madison | 320.39 | 0.60 | High | 0.46 | Moderate | 6.1 | yes | Increasing |
| Mathews | 76.47 | 0.53 | Moderate | 0.93 | Very High | 9.4 | yes | Increasing |
| Mecklenburg | 612.96 | 0.70 | Very High | 0.63 | High | 5.5 | Yes | Increasing |
| Middlesex | 125.97 | 0.65 | High | 0.69 | High | 4.4 | yes | Increasing |
| Montgomery | 372.47 | 0.55 | Moderate | 0.69 | High | 3.1 | yes | Increasing |
| Nelson | 469.51 | 0.58 | Moderate | 0.36 | Low | 0.7 | no | Stable |
| New Kent | 198.89 | 0.58 | Moderate | 0.78 | High | 3.4 | no | Stable |
| Northampton | 143.20 | 0.43 | Low | 0.43 | Low | -3.1 | no | Stable |
| Northumberland | 183.73 | 0.64 | High | 1.71 | Very High | 6.6 | yes | Increasing |
| Nottoway | 306.99 | 0.72 | Very High | 0.73 | High | 3.7 | no | Stable |
| Orange | 338.40 | 0.68 | High | 0.42 | Low | 1.96 | no | Stable |
| Page | 307.78 | 0.50 | Low | 0.51 | Moderate | 4.3 | no | Stable |
| Patrick | 481.22 | 0.65 | High | 0.56 | Moderate | 2.5 | no | Stable |
| Pittsylvania | 963.63 | 0.77 | Very High | 0.52 | Moderate | 0.04 | yes | Stable |
| Powhatan | 256.53 | 0.69 | High | 0.40 | Low | -3.5 | no | Stable |
| Prince Edward | 346.30 | 0.71 | Very High | 0.49 | Moderate | -3.7 | no | Stable |
| Prince George | 255.43 | 0.65 | High | 0.87 | High | 4.9 | yes | Increasing |
| Prince William | 297.11 | 0.46 | Low | 0.49 | Moderate | 1.4 | no | Stable |
| Pulaski | 313.80 | 0.51 | Moderate | 0.75 | High | 1.8 | no | Stable |
| Rappahannock | 266.36 | 0.62 | High | 0.61 | Moderate | 4.1 | yes | Increasing |
| Richmond | 183.64 | 0.67 | High | 1.53 | Very High | 3.2 | yes | Increasing |
| Roanoke | 239.50 | 0.50 | Moderate | 0.44 | Low | 0.97 | no | Stable |
| Rockbridge | 593.65 | 0.55 | Moderate | 0.58 | Moderate | 0.9 | no | Stable |
| Rockingham | 840.20 | 0.44 | Low | 0.28 | Low | 7.8 | yes | Increasing |

| County | Habitat Quality | | | 2022-2024 Average Density | | Population Growth | | |
|---|---|---|---|---|---|---|---|---|
| | Available Habitat [1] | HSI Mean Quality [2] | Relative Habitat Quality [3] | Spring harvest [4] (kill/mi$^2$) | Density [5] | Annual Rate of Change (%) [6] | Statistically Significant | Trend [7] |
| Russell | 467.84 | 0.64 | High | 0.39 | Low | -1.2 | no | Stable |
| Scott | 534.09 | 0.63 | High | 0.66 | High | -1.1 | no | Stable |
| Shenandoah | 504.13 | 0.54 | Moderate | 0.78 | High | 5.4 | no | Stable |
| Smyth | 447.42 | 0.56 | Moderate | 0.38 | Low | -1.8 | no | Stable |
| Southampton | 589.16 | 0.71 | Very High | 1.06 | Very High | 7.4 | yes | Increasing |
| Spotsylvania | 390.67 | 0.61 | High | 0.27 | Low | 1.4 | no | Stable |
| Stafford | 254.95 | 0.53 | Moderate | 0.27 | Low | -6.7 | yes | Decreasing |
| Suffolk | 376.69 | 0.60 | High | 0.88 | High | 6.98 | yes | Increasing |
| Surry | 271.85 | 0.66 | High | 1.28 | Very High | 3 | yes | increasing |
| Sussex | 482.15 | 0.67 | High | 0.84 | High | 4.6 | yes | increasing |
| Tazewell | 508.05 | 0.56 | Moderate | 0.27 | Low | -3.6 | no | Stable |
| Virginia Beach | 185.97 | 0.34 | Low | 0.15 | Very Low | 24.3 | yes | Increasing |
| Warren | 210.70 | 0.58 | Moderate | 0.77 | High | 6.9 | yes | Increasing |
| Washington | 553.07 | 0.58 | Moderate | 0.44 | Low | -1 | no | Stable |
| Westmoreland | 221.79 | 0.66 | High | 1.37 | Very High | 0.3 | no | Stable |
| Wise | 383.62 | 0.53 | Moderate | 0.42 | Low | -2.5 | no | stable |
| Wythe | 456.34 | 0.55 | Moderate | 0.71 | High | 0.18 | no | Stable |
| York | 92.54 | 0.44 | Low | 0.49 | Moderate | 7.8 | no | Stable |

[1] Available habitat is the total land area in each county minus locations classified as barren, herbaceous wetlands, or under human development based on the 2021 National Land Cover Database.

[2] Average habitat suitability index (HSI) from suitable habitat only.

[3] Based on cluster analysis, relative habitat quality status (HSI) range from very low to very high where:

- Very high > 0.7
- High = 0.6 – 0.69
- Moderate = 0.5 – 0.59
- Low < 0.55

[4] Spring gobbler kill/mi$^2$ of suitable habitat is the index of relative density based on the 3-year average from the 2022 - 2024 spring harvests.

[5] Based on cluster analysis, relative density (gobbler kill/mi$^2$) status range from very low to very high where:

- Very high > 0.92
- High = 0.62 – 0.92

- Moderate = 0.45 – 0.61
- Low = 0.26 – 0.44
- Very Low < 0.26

[6] Based on the 10-year (2015-2024) exponential regression, $N_{10} = N_0 * \lambda^{10}$ ; where $N_{10}$ = spring gobbler kill in 2024, $N_0$ = spring gobbler kill in 2015, and $\lambda$ = finite population rate of change. The average annual growth rate (R) is, $R = 100*(\lambda-1)$.

[7] Trends that were either not significant ($P > 0.1$) or had annual growth between -2.0% and 2.0% were considered stable. Counties with significant trends ($P < 0.1$) and rates that exceeded 2.0% growth were considered increasing. Decreasing counties had significant growth rates less than -2.0%.

Appendix D. Best Management Practices for managing turkey conflicts

**Guidelines for Aggressive and Conflict Wild Turkey Situations**

Prepared by: DWR Forest Game Bird Committee, Fall 2020

Wild turkey populations in Virginia are at or near record levels in most counties. With these populations comes the possibility for negative turkey: human interactions, turkey damage to personal property, and crop depredation. Negative interactions can stem from flocks congregating on public recreation areas (golf courses, parks, recreation fields) and the resulting refuse they leave behind to more serious aggressive behavior towards youth and/or adults. Landowners have reported turkey depredation to crops, most commonly to grapes in the fall and corn seedlings in spring. Increases in vineyards in Virginia may lead to more complaints in the future.

This document is intended to inform Virginia Department of Wildlife Resources staff on the Best Management Practices that are recognized to address conflict situations and aggressive turkey behaviors.

**Note about legal hunting**: For many of the situations listed below, legal hunting of wild turkey during the fall and/or spring seasons may help alleviate turkey populations that have reached levels that can lead to conflict situations. While hunting may not be an immediate option to remediate a conflict situation (due to time of year), it should be discussed with complainants as one option for long term turkey population management.

**Best Management Practices (BMPs)**

**<u>BMPs for Homes, Gardens, and Businesses</u>**

1) Check for foods that may be attracting turkeys to the area. Likely attractants include birdfeeders or other wildlife feeders, freshly sown lawn seed, and domestic fowl feed (cracked corn, scratch, etc).
2) Check for reflective surfaces that birds may be "seeing their reflection" in (vehicle mirrors, vehicle hubcaps, porch or sunroom windows or doors, etc). Cover these areas or apply taping (if possible) to distort or block their image.
    - Vehicles: For turkeys perching on vehicles apply a cover over the vehicle if possible (paying close attention to cover all shiny surfaces).
        i. Activate a car alarm when the bird approaches the vehicle to scare it off.
        ii. Move your vehicle to a different area of the parking lot if possible to minimize interaction.
        iii. Utilize aversive conditioning methods outlined below.
3) Remove all food attractants for a minimum of 2 weeks.
4) Practice aversive conditioning on turkeys after food sources have been removed to discourage continued presence:

- Utilize motion-activated sprinklers around decks, flowerbeds, or other areas.
- Utilize visual detractors that can scare turkeys:
    i. Mylar tape: Attach 2-3' piece to a stake driven into the ground at a 45-60 degree angle so that it moves frequently with even a slight breeze. These should be spaced around the area to be protected such that a turkey(s) will encounter them regardless of their approach to the area.
    ii. Spinning rods: 12" long rods that spin while suspended
    iii. Pinwheels
    iv. Owl and coyote decoys
    v. Balloons (predator eyes)
- Visual detractors work best when moved around the area to be protected frequently so that the turkeys do not become accustomed to them. Their efficacy can be improved when paired with other negative stimuli such as loud noises or the motion activated sprinklers.
- Utilize noise makers such as air cannons, radios, air horns, or other devices that can either be set to go off at spaced intervals on a timer or motion activated.
    i. Always alert nearby property owners before utilizing noise makers that may impact adjoining property owners.

**BMPs for Public Recreation Areas: Golf Courses, Ballfields**

1. Conflict specialist dogs or well-trained herding dogs (border collies, Australian shepherds, etc.) can be used to chase turkeys off public recreation areas under the guidance of a dog handler.
    - Multiple attempts will likely be needed before the turkeys are deterred from the area.
2. No feeding of wildlife (duck ponds for example) should be implemented on these public areas to limit additional food attractants for wild turkeys.
3. Consider Mylar tape and other visual deterrents (see BMPS for Homes, Gardens, and Businesses)

**BMPS for Agriculture**

1. Vineyards:
    - Fencing is the best long-term deterrent to prevent agricultural damage from turkeys (as well as other wildlife species).
    - Guard dogs can be utilized as a deterrent. Breeds such as border collies, some hounds, or flushing bird dogs are generally best.

- Visual detractors as mentioned in the BMPs for homes, gardens, and businesses (Mylar tape, spinning rods, pinwheels, and predator decoys) can all be used around vineyards to detract turkeys.

2. Field Crops (Corn or others)
    - While damage by wild turkeys can occur to field crops, reported damage should be investigated first by a biologist or CPO to determine that turkeys are the actual culprit. Reports of turkeys in a crop field doesn't automatically equal crop damage, often they are only "bugging" within these fields and not damaging the actual crop.

- Visual detractors positioned intermittently around the field perimeter may work as a deterrent when combined with additional methods outlined below.
- Auditory devices such as air cannons, air horns, radios, or others may deter turkeys from field crops when fired at random intervals when turkeys are present.
- Often the vulnerable stage of crop development overlaps with the spring gobbler hunting season. Allowing licensed hunter's access to hunt the property with emphasis around any damage areas may help reduce turkey numbers and ensuing crop damage.

**BMPS for Aggressive Turkeys**

1) Wild turkeys can become aggressive around people at any time of year but increased prevalence in this type of behavior are noted during the spring breeding season. Male birds (gobblers) are most likely to display aggressive behavior towards a person.
    a. Aggressive Behavior may include:
        i. Lack of fear around people
        ii. Approaching, following, jumping on, or wing flapping at or near a person
        iii. Posturing towards a person
2) People that are being threatened by aggressive birds need to stand their ground every time turkeys appear. The following are some recommendations for devices to utilize to help scare the bird away:
    a. Umbrella. Open and close briskly to create "popping" noises
    b. Loud whistle
    c. Marine air horn
    d. Starter or blank pistol
    e. Broom. Wave broom and yell
    f. Water (water hose, strong water gun, or several buckets of water). Douse bird with water if able to get close enough safely.

g. Leashed dog (obviously one that is not afraid of turkeys), barking will help.