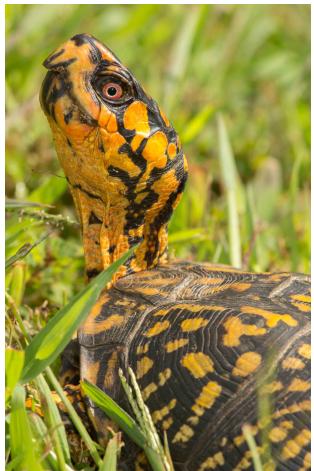




Albemarle County Biodiversity Action Plan – Executive Summary June 2018



Albemarle County Biodiversity Action Plan

Executive Summary

The Importance of Biodiversity

As a contraction for the term “biological diversity,” biodiversity has been defined as “the diversity of life in all its forms, and at all levels of organization” (Hunter 1996). While there are numerous ways to think about how life and all organisms are organized, the most common ways of viewing biodiversity include species diversity, genetic diversity, and ecosystem diversity. Biodiversity is sometimes described as the totality of genes, species, and ecosystems of a region.

Biodiversity is important to human populations for many reasons, not the least of which is the fact that we consume products of natural systems (e.g., wood products from forests). More broadly, we depend on the services that ecosystems, and the living things found in them, provide. Ecosystem services refer to the many benefits that humans receive, at no direct economic cost, from natural environments and functioning ecosystems. Some critical ecosystem services include purification of air and water, pollination of crops and natural vegetation, generation and renewal of soil and fertility, and mitigation of floods and droughts. Healthy, functioning ecosystems also contribute greatly to the quality of life of many Albemarle County residents.

Humans threaten these ecosystem services and biodiversity in a number of ways—through the destruction and alteration of habitat, the introduction of non-native invasive species that negatively impact ecosystems, pollution of the environment, alteration of the earth’s climate, and overexploitation of our natural resources. Through conservation efforts such as those recommended by this plan, we can help protect and conserve the diversity of life in Albemarle County.

County Commitments to Biodiversity

The Biodiversity Action Plan (BAP) was created in response to Albemarle County’s current Comprehensive Plan, approved in June 2015, which calls for “an Action Plan for Biodiversity to protect significant areas of biological importance in the County” (from Strategy 4a in the Natural Resources Chapter). Discussion of Strategy 4a further states that when completed, the “action plan should be presented to the Board of Supervisors for adoption into the Comprehensive Plan.”

Formal recognition and commitment to protecting biological resources began in 1999, when Albemarle County adopted a new Natural Resources and Cultural Assets chapter in its Comprehensive Plan. The new chapter called for conducting a biological resources inventory, appointing a standing biodiversity committee, and developing an action plan.

In 2002, the county created the Biodiversity Work Group (BWG). The BWG developed a report in 2004 with an assessment of Albemarle’s biodiversity resources as well as recommendations for conservation goals and strategies. The BWG, created as a temporary body, was dissolved after producing the report.

In 2005, the Board of Supervisors appointed a permanent body, the Natural Heritage Committee (NHC), composed of local naturalists, educators, scientists, and other residents concerned with biodiversity conservation. The NHC is an advisory committee created to assist county staff and elected officials in applying biodiversity information in making land use decisions and supporting biodiversity education.

The BAP was developed by county staff in consultation with and under advisement of the NHC. It is an outgrowth and extension of the 2004 BWG report. The BAP is intended to help significantly increase efforts to conserve biodiversity in Albemarle County. Much of the material in the BAP, including goals and recommendations, reinforces numerous objectives and strategies in the Comprehensive Plan.

The State of Biodiversity in Albemarle

Given its complex topography and geology, Albemarle hosts many distinct types of forest and other vegetative communities. Fires set by Native Americans and caused by lightning are believed to have shaped the composition of forests that greeted the first European settlers.

Over the past three centuries, Albemarle County's landscape was subjected to many human disturbances that affect biodiversity. Essentially, all county forests were timbered at some point in time. Forest fires were suppressed, impacting which species comprise the forests and the physical characteristics of the forests. Large areas of land were cleared for agriculture. Many streams are silted and some are dammed. Many wetlands were drained or otherwise lost (Tiner 1984), while many others were heavily impacted by human activities.

In recent decades, in concert with a growing population, the county has experienced rapid urbanization, rapid suburbanization, and construction of many new homes in rural areas. These changing conditions have placed additional stresses on county biodiversity. The new stresses are varied and include fragmentation of rural forests by new houses and related amenities, fertilizer runoff from lawns, more roads, parking lots, and other impervious surfaces, and increased activities in rural and undeveloped areas of the county.

With so many changes and disturbances in the Albemarle landscape over time, many species present at the start of European colonization are no longer present. Populations of many other species are continuing to decline.

Landscape Analysis

Land cover and other data were used to analyze the current landscape and biodiversity resources in Albemarle County. A landscape-level analysis is necessary for comprehensive and effective conservation planning. The analysis is a broad-brush look at the county. It is not intended for fine scale or parcel level use. However, the information lays the groundwork for evaluation of projects and efforts that involve parcel level analysis and work.

Scientists have extensively studied how the spatial qualities of habitat areas affect the value of that habitat for biodiversity (e.g. Forman and Godron 1986). Four spatial characteristics are used in the BAP

to describe and assess forested habitat across Albemarle County: 1) edge and interior habitat, 2) size of habitat areas, 3) shape of habitat areas, and 4) connectivity among areas of habitat.

The concept of edge habitat and interior habitat is crucial to understanding and assessing habitat quality. Figure 1 illustrates how interior forest and edge habitat were identified and used in the BAP. Interior forest is of great value for the long-term conservation of biodiversity in much of central Virginia and eastern North America. Many species that have evolved in forest-dominated landscapes require the habitat conditions that occur only in the interior areas of forest.

The size of a habitat area is generally considered the single most important factor in determining its conservation value. The shape of habitat areas and the degree to which they are connected or accessible to each other are also key characteristics.

Connectivity of habitat across the landscape is critical for the long-term viability of many wildlife populations. Connectivity not only allows for plant dispersal and the movement of individual animals, which is necessary for maintaining populations, but can also allow for the geographic range of species to shift over time in response to climate change and other changing conditions. Functioning linkages or connections among habitat within the landscape can, in effect, increase the total area of habitat by making disconnected areas accessible to one another. Figure 2 illustrates the concept of connectivity among areas of habitat.

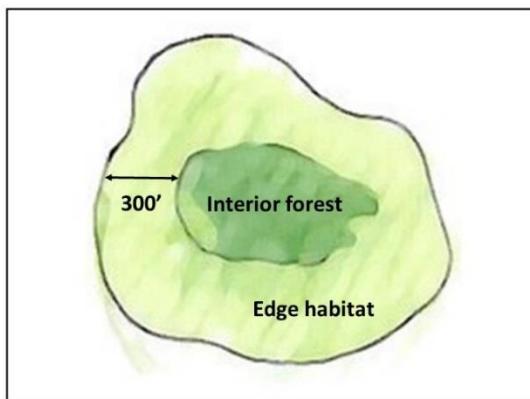


FIGURE 1. A FOREST BLOCK WITH EDGE HABITAT, 300' IN WIDTH, SURROUNDING THE FOREST INTERIOR HABITAT. ADAPTED FROM MMILLERICELAND.WORDPRESS.COM.

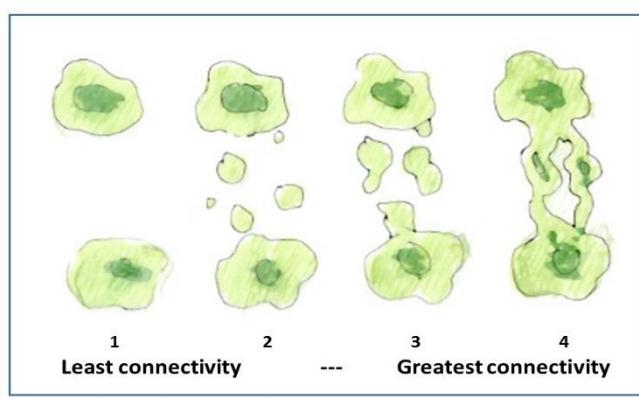


FIGURE 2. FOUR EXAMPLES OF DIFFERING LEVELS OF CONNECTIVITY BETWEEN HABITAT AREAS. ADAPTED FROM MMILLERICELAND.WORDPRESS.COM.

A variety of data were used in assessing the Albemarle landscape and identifying areas important for conserving biodiversity. In 2017, the Green Infrastructure Center completed a community planning project for Albemarle County that identified 1) all forested areas that contain 10 or more acres of interior forest (Figure 1), and 2) in consultation with the NHC, a set of physical landscape characteristics to describe the county (Albemarle County 2017). Other important datasets included 1) Important Sites for biodiversity in the county, identified by the NHC, 2) locations of plants, animals, and natural communities that are rare or uncommon at the state level, provided by Virginia Department of

Conservation and Recreation-Division of Natural Heritage, and 3) regional data from The Nature Conservancy identifying sites that are likely to be resilient to climate change (Anderson et al. 2016).

Using the spatial qualities and data described, large forest blocks (containing 100 acres or more of interior habitat) and Important Sites were assessed for their biological value and resilience to climate change. The two factors were combined to determine the overall conservation value of each forest block and Important Site, with biological value accounting for 90% of the composite value. See Figure 3 (Map 2 of the BAP).

In analyzing areas where large forest blocks with the greatest conservation value are located, in combination with locations of high priority Important Sites, three areas of the county stand out as having significant conservation value. These areas of Albemarle County should be the focus of conservation efforts during the next five years and are shown in Figure 4 (Map 4 of the BAP). They are 1) Northwestern Albemarle - the northwestern portion of the county east of the Blue Ridge Mountains, 2) Southern Albemarle Mountains - the area surrounding the high priority Important Site of the same name, and 3) the Rivanna River corridor.

Issues of Concern

Conserving biodiversity requires considering a number of factors when developing strategies and taking concrete actions. Most county biological resources occur in the rural areas. Given current and past uses of the land, the value of rural land as habitat is highly variable. Rural areas need to continue supporting a range of land uses. However, sufficient areas of viable habitat are necessary to sustain biodiversity. The areas should not be heavily disturbed (i.e., highly impacted by human activity) and they should represent a cross section of physical landscape conditions.

Land Use and Land Management. Some land uses in the county's rural areas degrade and sometimes destroy patches of habitat. For example, approximately 45,000 unused residential development rights are estimated to exist in rural areas (Albemarle County Comprehensive Plan, Chapter 7, p. 18). On average, from 1994-2013, 203 new residences were built each year in county rural areas (Albemarle County Comprehensive Plan, Chapter 7, Figure 7). Continued residential development is likely to negatively impact biodiversity, though some of the impact could be mitigated through education and conservation measures.

Agriculture requires pastures and open fields, and these support vegetation very different from native land cover. Commercial forestry can manage forests in ways that maintain most of the biological value of forest habitats. However, some management strategies (e.g. pine plantations) provide minimal value as habitat. A range of management options exists for some rural tracts of land. There are many examples of good land management practices (e.g. establishing pastures with native warm season grasses, creating wide forested stream buffers that exclude livestock) that allow land in agricultural or forestal production to benefit biodiversity. Private landowners can be a vital partner in conserving biodiversity and other natural resources.

Public lands and the ways they are managed also play an important role in protecting important open space and wildlife habitat. County parks and other public lands contribute significantly to conserving biodiversity and other natural resources in Albemarle County.

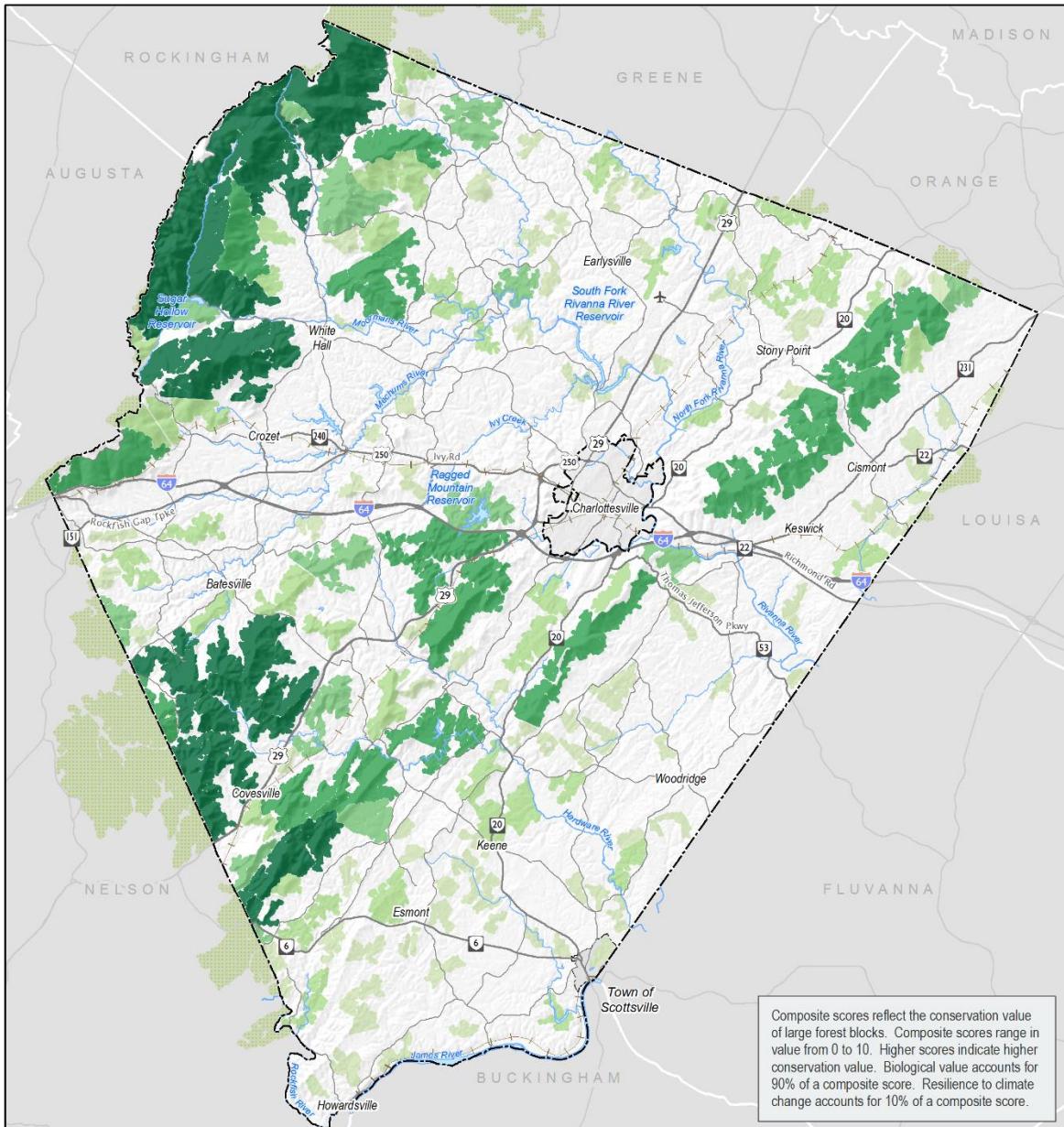


Figure 3: Ranking the Conservation Value of Large Forest Blocks

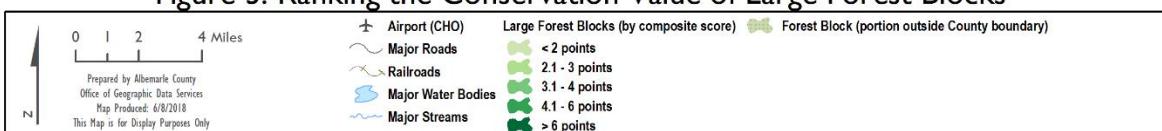


Figure 3 corresponds to Map 2 of the BAP report. It illustrates the composite scores of large forest blocks (blocks containing 100 or more acres of interior forest). Forest blocks were identified using 2009 land cover data.

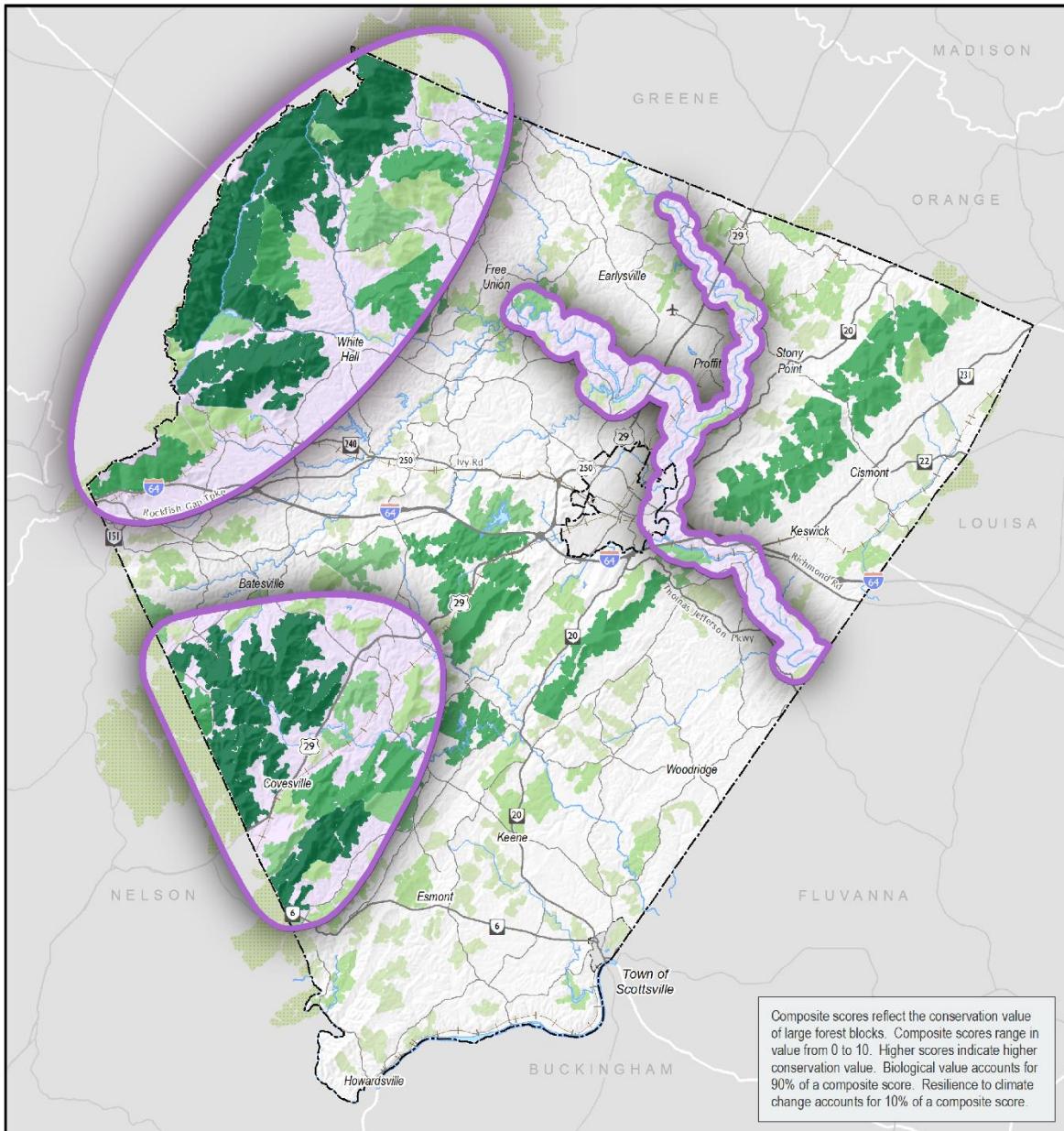


Figure 4: Conservation Focus Areas

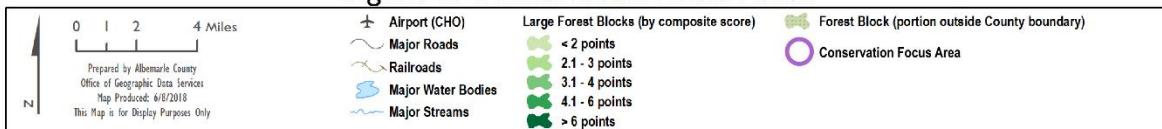


Figure 4 corresponds to Map 4 of the BAP report. It depicts the three areas in Albemarle County that should be a focus of conservation activity and attention.

Habitat Fragmentation. Habitat fragmentation is the breakup of large habitat patches into smaller patches. Figure 5, taken from the current Comprehensive Plan, illustrates the concept and some effects. Roads, agriculture, commercial forestry, residences, and commercial developments all have contributed to the fragmentation of Albemarle County habitats. Aquatic habitat is commonly fragmented by dams, small or inadequate culverts, and other barriers that prevent the movement of water and aquatic organisms.

The negative impacts of habitat fragmentation on biodiversity have long been known and extensively studied (Harris 1984, Saunders et al. 1991). The consequences are varied and often include severing habitat connections between local populations of wildlife species.

Invasive Species. In recent years, the presence of non-native invasive species has emerged as a grave threat to biodiversity, both locally and globally. An invasive species is an exotic species (a species living outside its native range) that causes harm to native plants, animals, or natural communities. Humans have often transported invasive species to new locations, both intentionally and unintentionally. Much attention is paid to invasive plants, but non-native insects, fungi, and vertebrates have also caused great harm.

Invasive species may 1) reduce or eliminate native species through competition, 2) prey on native species, 3) introduce infectious diseases to native species, 4) in combination with dense deer populations, disturb forest succession, 5) harm agricultural and forestal industries, and 6) cause human health issues. The reduction or elimination of certain native species can in turn affect other native species (e.g. the loss of host plants for butterflies or moths).

Climate Change. Like invasive species, climate change is a local and global threat to biodiversity that, to date, has increased in severity over time. The release of “greenhouse gases” into the atmosphere through human activities is causing rapid global climate change (Intergovernmental Panel on Climate Change 2014). Many scientific organizations have modeled climate changes for the remainder of the twenty-first century. Climate change projections commonly include 1) systematic temperature increases, 2) more variable precipitation, 3) more extreme storms, and 4) regional variations in changes. However, many uncertainties exist in climate change projections.

Parcel Subdivisions. Subdivision of land parcels into smaller parcels is conceptually distinct from habitat fragmentation and has been referred to as “parcelization” (Downing 2016). However, parcelization often leads to habitat fragmentation.

Where natural features such as steep forested mountains or streams occur, land is often subdivided into strips as narrow as 100 feet wide to maximize development rights (Figure 6). This creates “bar coded” parcels that are generally usable only for residential purposes and complicates land management activities. Once land is subdivided, it is very unlikely it will be reconstituted into a large parcel again.

Conserving Biodiversity

Protecting open spaces and healthy landscapes, and the ecosystem services they provide, should be key goals in county efforts to conserve biodiversity. These goals will facilitate long-term conservation and adaptation to ever changing conditions. It is recognized that protecting the diverse underlying geological conditions present in the landscape is important to conserving biodiversity (Hjort et al. 2015).

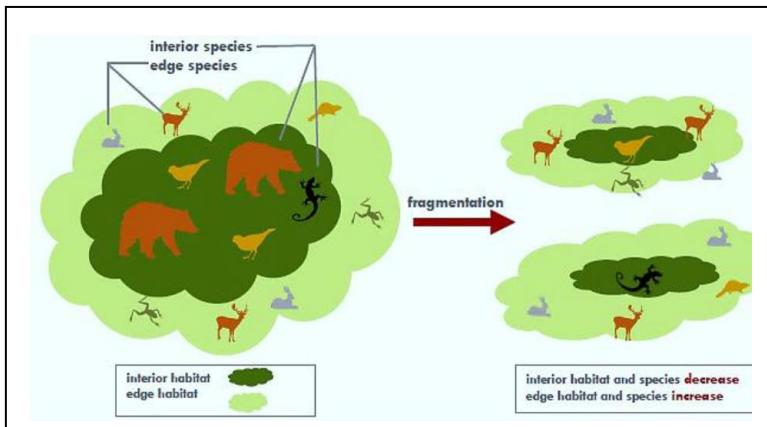


FIGURE 5. FOREST FRAGMENTATION RESULTS IN LESS INTERIOR HABITAT AND MORE EDGE HABITAT. THE TOTAL AMOUNT OF HABITAT IS OFTEN REDUCED. (FROM FIGURE 4, CHAPTER 4 OF COMPREHENSIVE PLAN, SOURCE: LINFIELD COLLEGE, DEPT. OF SUSTAINABILITY, LINFIELD, OR).



FIGURE 6. "BAR-CODED" PARCELS.

In analyzing the current landscape and existing biodiversity of Albemarle County, five types of ecosystems were identified that merit special attention. The ecosystems are 1) forests, 2) outcrops, bluffs, and other xeric habitats, 3) relict piedmont prairies, meadows, and grasslands, 4) rivers, streams, and riparian areas, and 5) wetlands.

Identifying, conserving, and restoring (when applicable) examples of these ecosystems is critical for conserving county-wide biodiversity. Virtually all areas of the county contribute to biodiversity. Developed areas often contain small but valuable habitat patches and are home to native flora and fauna. Conservation and restoration opportunities are present. The Rivanna River and adjacent areas, flowing through both developed and rural portions of the county, is an outstanding example of resources and opportunity.

Education and Information

Citizens value the beauty of our natural landscape, and the county has formalized this shared value in the Comprehensive Plan. We have a variety of diverse species and landscapes, and though most residents understand this, many lack the expertise to fully appreciate and protect it. A well-designed and comprehensive education program is needed to develop good citizen stewards and informed government leaders. There is a need for a public education program that contributes to both understanding and positive action in support of biodiversity. Such a program will facilitate working with private landowners to conserve biodiversity and other natural resources. Defining and discussing the importance of biodiversity should take place from a local perspective, focusing on native flora, fauna, and communities of the Piedmont region of central Virginia.

The state of biodiversity in Albemarle County is continually evolving. Indicators of change are important in monitoring and assessing the current state, for tracking changes through time, and for effective

conservation planning. This action plan, including the goals and recommendations that follow, should be reviewed and updated on a regular basis to account for changing conditions and to incorporate new knowledge and data. This plan is intended to cover a five year period and should be reviewed and updated as needed in 2023.

Priority Goals and Recommendations

The BAP contains 21 goals and more than 90 specific recommendations designed to help conserve biological diversity in Albemarle County. The most important goals and recommendations from the plan have been identified and consolidated. They are presented here in a condensed and streamlined format and divided into two categories: 1) Land Management and Conservation, and 2) Education and Information. Recommendations are further divided into two year and five year timeframes.

A Note about Recommendations

Characters in square brackets after each recommendation indicate the parties potentially or likely involved in implementing the action. Codes are: "N": County natural resources staff, Natural Heritage Committee members, and volunteers; "C": other County staff or decision-makers; "\$": staff funded by grant or other outside sources; "P": partner organizations; "R": general county residents.

Land Management and Conservation

GOAL 1: Recognize the importance of the three conservation focus areas identified in the action plan (Figure 4, Map 4 of the BAP). Prioritize conservation of the land and natural resources within them.

GOAL 2: Identify, restore, and protect areas with the five key ecosystems identified in the action plan: 1) forests, 2) outcrops, bluffs, and other xeric habitats, 3) relict piedmont prairies, meadows, and grasslands, 4) rivers, streams, and riparian areas, and 5) wetlands.

GOAL 3: Minimize and reduce habitat fragmentation county-wide. Maintain existing habitat connectivity and establish connectivity where possible and appropriate.

GOAL 4: Increase the amount and quality of stream buffers in the county to improve aquatic ecosystem health, water quality, and riparian habitat quality.

GOAL 5: Promote management of county-owned lands that conserves and enhances biodiversity and other natural resources.

RECOMMENDATIONS for the NEXT TWO YEARS:

- Use existing tools (e.g. conservation easements) to protect lands in the three conservation focus areas (Figure 4) and lands that can serve as habitat corridors or connections among important habitat areas. [N,C,P]
- Revise ACE and PRFA easement-acceptance criteria to reflect biodiversity values and conservation needs. Incorporate data from the BAP and the Natural Heritage Committee in assessing biodiversity values. [N,C]
- Take steps to conserve and protect the high priority Important Sites (identified in Appendix C of the BAP). [N,C,P]

RECOMMENDATIONS for the NEXT FIVE YEARS:

- Strengthen the county's ACE and PRFA conservation easement programs. [N,C,]
- Develop strategies to conserve and protect lands in the three conservation focus areas, other areas containing conservation targets, and lands that can serve as habitat corridors or connections among important habitat areas. [N,C,P]
- Investigate the possibility of a Transfer of Development Rights (TDR) program to help protect important geographic areas and conservation targets. Give special consideration to the three conservation focus areas. [N,C]
- Develop incentives for preserving and restoring urban streams. [N,C]
- Revise stream buffer regulations and develop tools and incentives for landowners that will increase the amount and improve the quality of stream buffers throughout the county. [N,C,P,R]
- Develop and implement management strategies in county parks that conserve and enhance biodiversity. [N,C]

Education and Information

GOAL 6: Educate the public on the importance of biodiversity and ways to protect it.

GOAL 7: Manage non-native invasive species to reduce their impacts and limit their spread.

GOAL 8: Promote the use of locally native plants.

GOAL 9: Develop indicators and monitor data that reflect the state of biodiversity in Albemarle County.

RECOMMENDATIONS for the NEXT TWO YEARS:

- Promote and provide information about the control of invasive species. [N,C,P]
- Promote and provide information about the use of locally native plants for gardening and landscaping. [N,C,P]
- Contact the landowners of Important Sites in Albemarle County to educate and inform them of the biodiversity resources on and near their property. Develop relationships and encourage conservation of the land. [N]

RECOMMENDATIONS for the NEXT FIVE YEARS:

- Monitor data and develop indicators of conditions that: [N,C,P]
 - Reflect the state of biodiversity in the county, either directly or indirectly.
 - Indicate the amount of land and landscape areas that are protected.
 - Indicate threats to biodiversity.
- Review and/or develop list(s) of approved plants for the different types of projects that require county approval (e.g., site plans, stormwater management facilities, stream buffers). The lists should emphasize the use of locally native plants. [C]
- Develop strategies to control invasive species in and near biologically important areas and on county-owned properties. [N,C,P,R]
- Educate the public generally about climate change. Develop information pertinent to Albemarle County. [N,C,P]

References

Albemarle County. 2017. "Protecting Green Infrastructure in Albemarle County, VA." Grant report submitted to Virginia Department of Forestry, Charlottesville, VA.

Albemarle County. 2015. *Albemarle County Comprehensive Plan*. Albemarle County.

Albemarle County. 1999. *Albemarle County Comprehensive Plan 1996-2016. Natural Resources and Cultural Assets*. Albemarle County.

Albemarle County Biodiversity Work Group. 2004. *Albemarle County Biodiversity: A Report on its History, Current Conditions and Threats, with Strategies for Future Protection*. Albemarle County.

Anderson, M.G., M. Clark Barnett, C. Ferree, A. Olivero Sheldon, and J. Prince. 2016. *Resilient Sites for Terrestrial Conservation in Eastern North America*. The Nature Conservancy, Eastern Conservation Science.

Downing, A. 2016. "The Fragmented Forest." *Virginia Forest Landowner Update*. Accessed September 1, 2017.
https://forestupdate.frec.vt.edu/content/dam/forestupdate_frec_vt_edu/newsletter/archives/2016/30_4/Downing.pdf.

Forman, R.T.T., and M. Godron. 1986. *Landscape Ecology*. New York, NY: John Wiley & Sons.

Harris, L.D. 1984. *The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity*. Chicago, IL: University of Chicago Press.

Hjort, J., J.E. Gordon, M. Gray, and M.L. Hunter Jr. 2015. "Why geodiversity matters in valuing nature's stage." *Conservation Biology* 3: 630-639.

Hunter, M.L. 1996. *Fundamentals of Conservation Biology*. Cambridge: Blackwell Science.

Intergovernmental Panel on Climate Change. 2014. "Synthesis Report Summary for Policymakers." Accessed August 28, 2017. http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. "Biological Consequences of Ecosystem Fragmentation: A Review." *Conservation Biology* 5 (1): 18-32.

Tiner, R.W. 1984. "Wetlands of the United States: Current Status and Recent Trends." U.S. Fish and Wildlife Service Report, Washington, DC, 59.

Cover page design and photographs by Emily Luebke. From left to right,

Top row: curlyheads (*Clematis ochroleuca*), eastern tiger swallowtail (*Papilio glaucus*) on wild azalea (*Rhododendron peryclinoides*), blue curls (*Trichostema dichotomum*)

Second row: eastern box turtle (*Terrapene carolina carolina*), fire pink (*Silene virginica*), song sparrow (*Melospiza melodia*), spring beauty (*Claytonia virginica*)

Third row: Halloween pennant (*Celithemis eponina*), spotted salamander (*Ambystoma maculatum*), juniper hairstreak (*Callophrys gryneus*) on golden ragwort (*Packera aurea*)