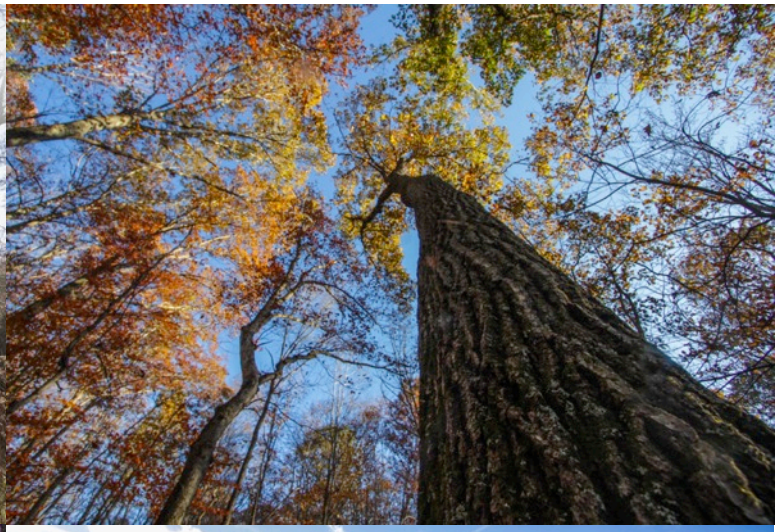
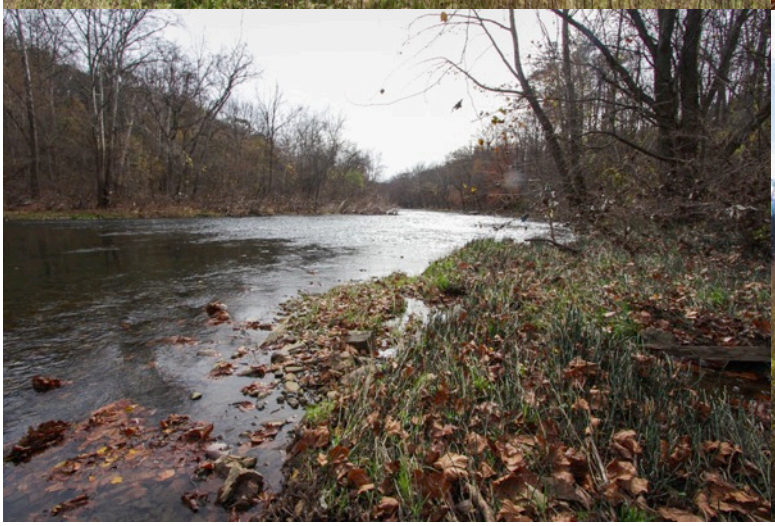
Roanoke Explore Park

Landscape Inventory and Special Places Project


Prepared for

Roanoke County Parks, Recreation and Tourism

WRT

Prepared by

Michael Gaige

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Executive Summary

Rarely does such a combination of high quality forests, a large river, rugged terrain, and a legacy of settlement and history come together as a large recreation space near an urban area. Explore Park lies at these crossroads with dozens of excellent to outstanding features scattered among its undulating terrain. Here nature showcases a litany of remarkable features and boasts room enough for groups to come and learn, and solitude seekers to get lost.

I had the pleasure of walking all 1100 acres at Explore Park in November 2015. I wandered the land in a systematic way to cover the place as finely as I was able. My wanderings took me through rich forests, rocky ravines, and small streams and springs. I marked the park's exotic plant infestations, dozens of dumps sites from when the park was a working landscape, as well as its ancient trees, rich coves, and quiet spots.

Geographically, Explore Park lies in a remarkable location. It sits nestled along a main river, the Roanoke, splitting the Blue Ridge into its northern and southern sections. To the east is Virginia's Piedmont, and farther still the pine-dominated coastal plain. To the west is the ridge and valley. Because of this regional physiographic diversity, Explore Park pulls from each in unique and diverse ways.

I mapped the Park's natural and anthropogenic communities. With high quality cove forests, oak forests, and pine-dominated ridges, the Park's topography shapes and drives forest composition and diversity. Former settled areas and old agricultural fields are now tree-covered in a mix of early successional forests that tell the story of settlement, and departure. The park has challenges with exotic plants especially in these old settlement areas. These infestations are mapped and described. Considering the size of the property, however, the overall level of infestation should be considered mild. This is good news.

The park contains a few dozen ancient trees. These range from the presettlement oaks mainly in the 250-year range, to many similarly aged American beech trees, and a couple ancient tulip poplar of unknown age. The most impressive is a single black gum confidently aged at 500-650 years. A single wave of cutting around ~1900 took the best and left the rest. Today these charismatic old trees will inspire generations for a century or more until the younger trees attain ancient status.

The cultural landscape is equally rich. With eight former settlement areas, there is no shortage of living history. Unlike the Historic Building Area, Explore Park's cultural landscape presents the real, unedited, legacy of the property's history from settlement to abandonment. A stone cellar hole, buildings hidden among successional forests, dozens of clearance cairns, and more dot the landscape as an 1100-acre museum of greater Roanoke history.

All together I located and described 363 points on the ground that document the variability, richness, and challenges of Explore Park's landscape. With the number of sites identified, it was impractical to list and map everything in this report. The complete list is documented in the separate *Explore Park Field Inventory* spreadsheet (Excel file). The sites are categorized, described, and their GPS coordinates provided. About half have photographs included. The points are labeled on a map that can be found in this report. (All my map files are available to Roanoke County and WRT.)

I boiled down the abovementioned forests, and historic features, and more into a listing of the best special places. The top sites are explained and interpreted more thoroughly in the report than in the *Field Inventory* document. These also include a number of sites that don't necessarily have historic, educational, or ecological significance, but are scenic, hidden, and/or quiet spots for the adventurous and solitude seekers alike. Don't trample these special places with infrastructure; give the park user a simple path so they can get in and get out safely, leave their cars and gadgets behind, and find the joys and rewards of discovery that I had. Make them feel like explorers.

I used the process of *reading the landscape* as the primary means for uncovering the stories and special places of Explore Park. A goal for the park's education and interpretation programming could be to teach reading the landscape. The process gets people to look for the clues and cues that generate a deeper understanding of local geology, ecology, and history. Residents of Roanoke, guests from the Blue Ridge Parkway, and others will find this a rich and rewarding process. The story of Explore Park will come alive through careful observation. This document lays a foundation for reading the landscape.

Ultimately, this project attempts to document deep knowledge of what is on the land. Undoubtedly I missed things, and decades from now I believe this document will be successful if it is viewed only as a good starting point. But what is presented here should serve as a springboard for knowing the land, getting park users to the best places, and helping them understand the unique and exciting place that is Explore Park.

Sincerely,

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Introduction

> palimpsest: *n.* an object made or worked upon for one purpose and later reused for another.

Mountain, granite, river, oak, fern: a few ingredients that make a landscape. Each has a different story. At Explore Park, the story of rock begins nearly a billion years ago. The story of mountains reaches 30,000 feet. For oak the story begins in Asia. Each has a story of change in a complex, ever-moving landscape.

Axe, cairn, fence, path, mill: humans weave additional layers of story onto the landscape. Complexity increases; the stories become more interconnected. On the landscape, intersecting lines create opportunity as one story is laid on top of another.

To make a place special, it's important to understand where the place has come from. To know your land means to uncover its best places and also to learn the stories of its rocks, oaks, fences, and old paths. Every place is special, but some places' stories are never revealed. So they remain uncelebrated.

As Explore Park's master plan unfolds it is critical to understand and document the stories and sites, the unique natural and cultural features that the park offers. These places will shape people's experiences, and ultimately define Explore Park in the minds and emotions of its users.

In their Strategic Planning Report for Explore Park, Dan Jones and Scott Martin of 21st Century Parks wrote:

"*Quality requires a knowledge of the special places found on its landscape: the pockets of trees, the rock layers and the stories they tell, the quiet spots that you want your planners to keep quiet—accessible only to those who truly want to find them—and other places where you want to bring the many to experience a special view, or the hum or the river, or the sliver of blue in the sky from a rocky gorge. A site like this must be accessed, in special ways, and that is only possible with a deep knowledge of what is there, on land and in the water, and through the seasons.*

This project is a special places inventory, but to understand the special places, one needs to learn the entire landscape such that the best places can rise to the top. **This document, then, has two goals**: to share the special spots on the ground that make Explore Park unique; and to bring the entire landscape forward with context and detail.

The special sites and features will feed directly into the planning process, shaping where people go and how they experience the landscape. Too often, a trail, or a site is randomly placed, laid out on a map from afar, while a few feet away something remarkable remains undiscovered.

The sites and the context will facilitate high quality, unique, place-based education and interpretation for engaging park users in a deeper way. The special places allow one to find the best places on the ground that tell the story of Explore Park. This sort of detail-oriented interpretation fulfills people in a way that broad-stroke generic educational programs cannot.

Approach

This project is primarily an effort in groundtruthing to document Explore Park's special places and natural assets for its Master Plan process and beyond. In November 2015, I walked 81 miles around Explore Park over nine days. During fall, leaf-off conditions, I could see 200 to 400 feet through the forest. With GPS tracking I was able to walk a meandering route that kept me, on average, 250 feet from my previous lines allowing me to see into every acre. I waked almost all of Explore Park's existing trails, many property boundaries, and into its core. It's a beautiful place.

Along this transect I marked, noted, and photographed anything worthy of documentation: old trees, historic land use, changes in natural communities, exotic plant infestations, and more. All my notes were transferred into a spreadsheet, which has been provided and accompanies this report. The spreadsheet, herein called the *Explore Park Field Inventory Spreadsheet*, describes what I found at every point. Some points are insignificant. Other points mark noteworthy features. *This report is essentially an expansion, explanation, and interpretation of the field data*.

A few areas of Explore Park I did not visit: I kept distant from the inholding in North Bedford as requested by Roanoke County Parks. I did not visit the small outparcel on Hardy Road in Bedford. Because they required crossing railroad tracks or the river, I did not visit the two small outparcels located between the tracks and the Roanoke River (though I could see into them from the other side). I also did not groundtruth the western third of the small northwest outparcel. The property was internally posted (heavily) and I decided to leave that conversation to the county. A map of my transect route and the 363 points I marked is found in Appendix A.

Limitations

A few limitations to the project are worth noting. Seasonality is a limiting factor. The survey work occurred in early November 2015, and therefore was not in the growing season. Leaves were down and plants were dormant. It is worth doing a botanical survey in the spring to capture that diversity. Planning a four-season park that uses the best features found throughout the year is the goal. Additionally, my biases lie in the forest. I do not know agricultural weeds well, or meadow plants. Nonetheless, this project is not a botanical study nor is it a general environmental inventory.

Maps were made on Google Earth using property boundaries provided by WRT. WRT has excellent capabilities with GIS mapmaking and access to GIS data and they have

created a number of maps depicting general environmental conditions. The maps herein are intended to document groundtruthed field information. All map files are available to WRT and Roanoke County.

How to use this document

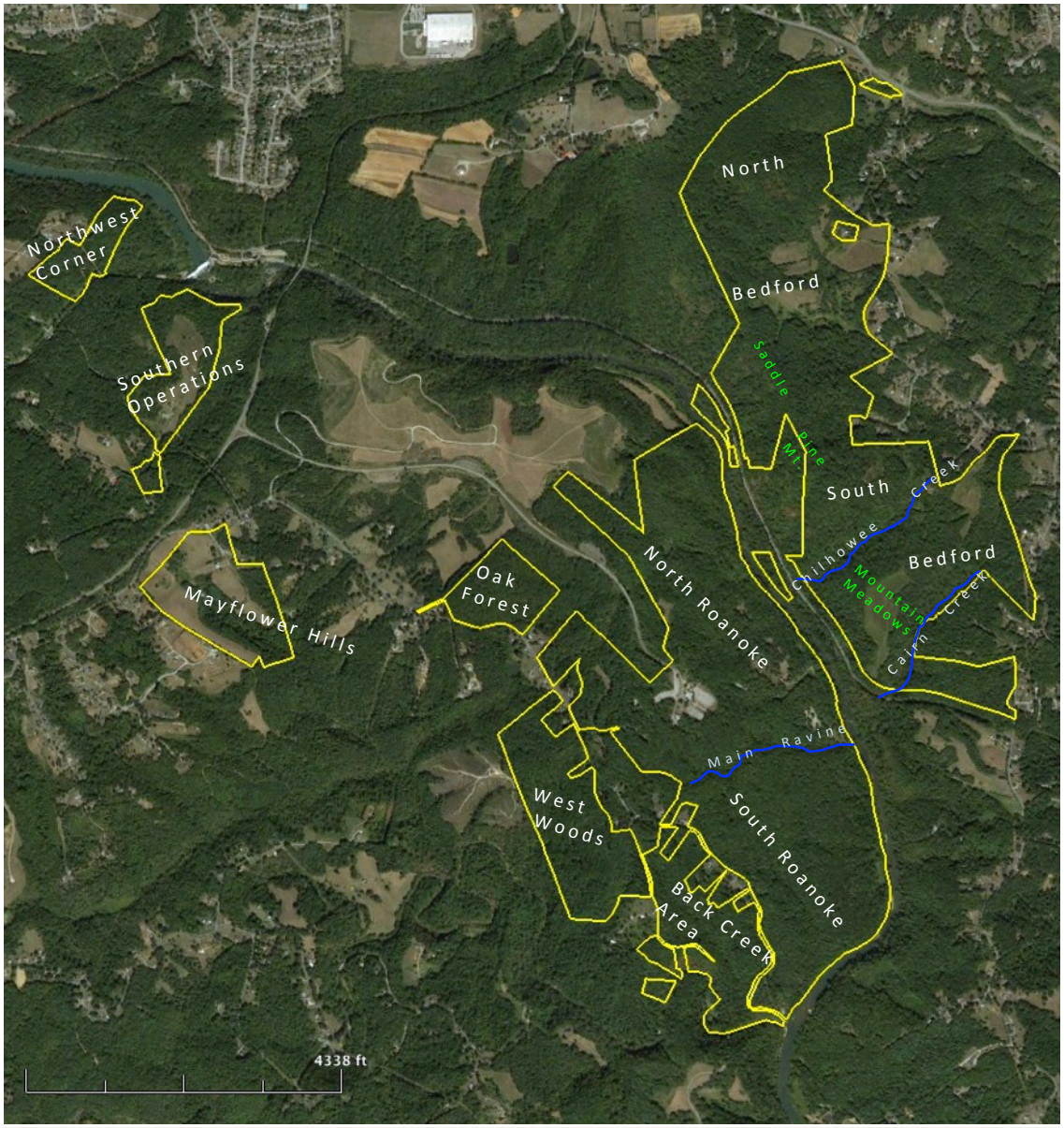
This report is an expansion and interpretation of the *Explore Park Field Inventory* spreadsheet that accompanies it. The spreadsheet itself is a reorganization of my field notes. All 363 points I documented during the survey are explained, and categorized. About a third have photographs attached all the GPS coordinates are provided.

What you will find here begins with background context for understanding the details found on the ground. Explore Park holds a unique position on a gap of the Blue Ridge; there is no other place in the state of Virginia with such proximity to so many physiographic regions. The region's geologic history is explained as this related to what the park user will encounter on the ground.

You will find a complete description and map of Explore Park's Natural Communities as I identified them. Ten community types, driven by the park's topography, substrate, and its particular disturbance history – especially the past 100 years of intense anthropogenic disturbance – are mapped and described. The exotic plants are described in frequency and spatial extent. Old growth trees, an impressive number of them in truth, are mapped and the methods for recognizing them explained. The Cultural Landscape is documented in context as a land use history description, and is presented in maps for the places on the ground where one can experience history.

When using this document, it will be useful to refer to the *Field Inventory* spreadsheet and the maps. It was not practical to describe all the sites and features, so I strongly suggest referring to that document and the mapping files. The maps in this document were created based on the 363 GPS points I marked and the 81-miles I walked. Full extent maps are provided in the main body, and detailed maps occur in the appendices. All the Google Earth .kmz files are available to Roanoke County and WRT and these can be used in Arc GIS. In addition, my photos can be made available by request.

Explore Park has remarkable rock outcrops, ravines, and unique ecological communities. The human stories embedded in the land – from the hundred-year-old coppiced trees of the logging days, and the old pasture with rusting barbed wire, were shaped by people working the land decades or centuries ago. It's important that their story remains. And of course, there is the Roanoke River, its quiet pools and churning rapids meandering though the Blue Ridge. This document illuminates the riches of this unique palimpsest that is Explore Park, with a regard for all of its history, and an eye on its future.



Explore Park location terms used in this document:
To ease description of general areas in Explore Park, these names were created for various broad areas. These names are used in the text of this report. *Mayflower* and *Southern Operations* were provided by Roanoke County Parks. Some additional names like "the church" and "historic building area" are also used but these should be self explanatory. *Chilhowee Creek* is named for the geological layer that occurs there. *Cairn Creek* is named for the abundance of historic clearance cairns in that ravine. *Pine Mt*. is listed on USGS maps (no pines there), and *Mountain Meadow* is named for its views.

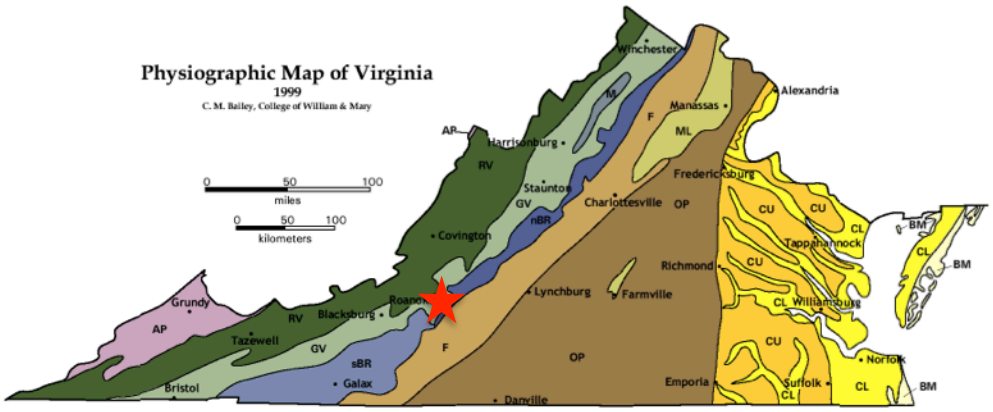
Location Terms Used in This Document

Landscape Context

To understand Explore Park, first zoom out to view eastern North America in its entirety. Explore Park lies in the forests and farmlands of the Central Appalachians. It occurs in a low gap of the Blue Ridge – a narrow spine of land bounding the eastern edge of a broad mountain landscape. Keep the landscape in context – where are you?

Physiographic Regions

Because it lies in a low gap in the Blue Ridge, the influence of adjacent regions is more pronounced. While it would take more systematic study to tease out the nuance in Explore Park's location relative to regional diversity, the fact that it lies in this position suggests a richer ecological potential. While physiographic regions describe broad topographically related areas, specific ecosystems and community types tend to follow those patterns. The map below shows Explore Park's location; no other spot in Virginia has the proximity to five physiographic regions (North Blue Ridge; South Blue Ridge; Piedmont Foothills; Great Valley; Ridge and Valley).



The human, or cultural landscape lies untidily on top of this. It may seem simple, but the Blue Ridge is forested because the slopes and soils do not lend themselves to good agriculture. Instead, agriculture and urban areas occur in the valleys, which often have richer soils from softer rocks (soft rocks allow the creation of valleys). This document pulls these concepts down to the 1100 acres of Explore Park.

Geologic Background

The geologic foundation shapes and drives all other landscape conditions. Ecosystems and community types are driven by geology. And the ways humans create habitat from the landscape with agriculture, forest, and urban areas, is a result of geology. The particular geology of Explore Park and Roanoke could fill volumes. This brief description

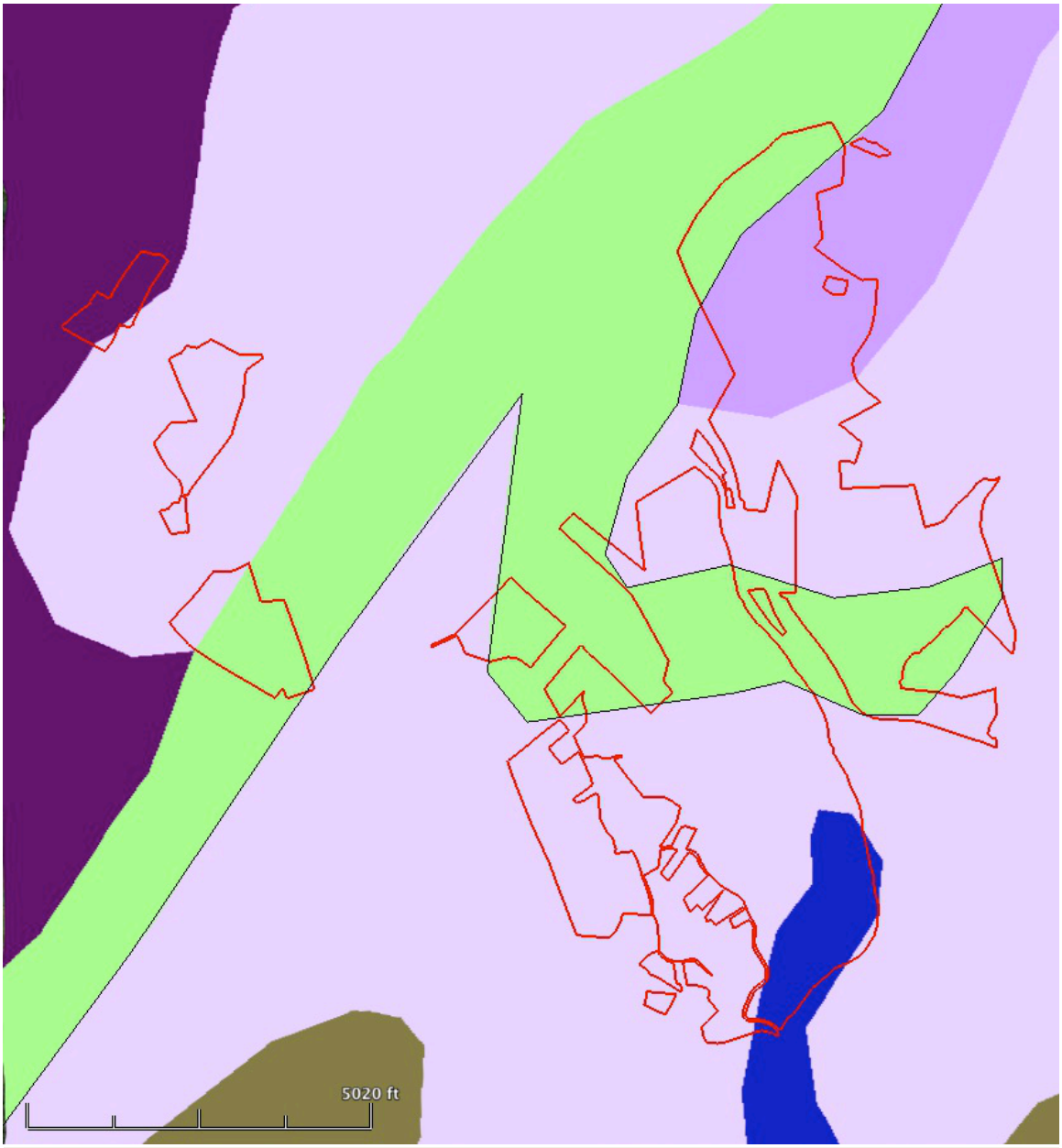
is intended to provide background context for everything that follows, and provide interpretive value for the geological features found in Explore Park.

There are two critical background topics to review before any understanding of geology can occur. First, geologists describe three basic rock types: igneous, sedimentary, and metamorphic. Igneous rocks began as molten lava beneath the surface of the earth. Igneous rocks may cool above the surface as a volcano (extrusive igneous rocks), or they may cool and harden deep below the surface (intrusive igneous rocks). Granite is an intrusive igneous rock a form of which is common in Explore Park. Sedimentary rocks are composed of eroded material, deposited and later coalesced into rock. Sandstone (derived from deposited sand) and limestone (from deposited marine shells) are sedimentary rocks. Metamorphic rocks may have begun as Igneous or sedimentary rocks, but then deep below the surface the forces of heat and pressure alter the rock enough that it recrystallizes. Metamorphic rocks may be "cooked" or squished multiple times and/or to varying degrees. Explore Park contains old, hard, metamorphic rocks.

The second background process needed to understand geology is plate tectonics. The theory posits that the Earth's surface is broken up into a system of plates and these shallow lithic rafts float on a molten mantle. Slowly, through convection processes, the plates move around, coalescing, subducting, scraping, and bumping into one another. This process gives rise to volcanoes, mountains, earthquakes, and even the continents and oceans themselves. Plate tectonics is the driver that creates and erodes rocks and thus forms sedimentary, igneous, and metamorphic rocks. Plate tectonics is the primary factor creating the Blue Ridge.

With a very basic geological background behind us, we can look at the specific events that created Explore Park. Explore Park's features that have large geologic controls are the Blue Ridge, and the Roanoke River. The shaping of these two features have driven everything else. In discussing the geology of Explore Park, we are really discussing the geology of the Blue Ridge.

Explore Park's four rock types are mapped on the following page (generalized map with USGS data layers). All four types are found throughout the northern Blue Ridge and are considered Blue Ridge Basement Rocks. Three of the four types are very old (> 1 billion years) metamorphic rocks. They were originally granitic or other similar rock, but were recrystallized under heat and pressure during continental collisions. These are old, very hard rocks, and have resisted the erosive forces that have removed the tall mountains above them. The fourth rock type, called the Chilhowee Group, is much younger, at 500 million years old. It contains a mix of rock types including conglomerate rocks. Conglomerate rocks are a sedimentary rock composed of sands and gravels pressed together. There must have been considerable erosion from an ancestral mountain range to build the conglomerate layer.



Charnockite Granitic Gneiss: Slightly metamorphic rock of Proterozoic / Grenville age (~1 billion years). Occurs throughout the northern Blue Ridge.

Chilhowee Group: Composed especially of metamorphic Quartzite (originally of sandstone) and sedimentary Conglomerate (large grain material cemented together) of Cambrian age (500 million years). Forms much of the western Blue Ridge in its northern section.

Layered Gneiss and Granulite: Highly metamorphic Blue Ridge basement rock of middle Proterozoic age (1 – 1.5 billion years). Occurs throughout the northern Blue Ridge.

Layered Granulite: Highly metamorphic rock of middle Proterozoic age (1 – 1.5 billion years). Occurs throughout the northern Blue Ridge.

Geological Map of Explore Park

Source: USGS

The geologic story begins over a billion years ago when the largely granitic rocks formed as molten material deep beneath the surface. They cooled into granite or similar rock types. The Grenville Mountain Building event about 1 billion years ago created heat and pressure needed to cause the extensive metamorphism seen in Explore Park rocks. The rocks recrystallized into something still resembling granite, but with a different crystal structure. Mountains rose from uplift, and erosion concurrently tore them down. The Blue Ridge is one of the few places where Grenville Rocks are exposed.

Between the Grenville event and the next event, the region experienced mostly erosion. Chilhowee sediments were deposited 500 million years ago and originated as sediments from the Grenville Mountains. The layer contains sedimentary rocks and metamorphic sedimentary rocks throughout the northern Blue Ridge.

A mountain building event at 400 million years ago contributed further to metamorphose the Blue Ridge basement rocks. Large landmasses collided and created intense heat and pressure below ground. The pressure caused recrystallization of the granitic rocks deep below the surface. On the surface, erosion and deposition of sediments occurred. Those sediments became rocks of the Valley and Ridge province.

A final mountain building event 300 million years ago uplifted the Appalachians as North America and Africa collided. This caused additional pressure on the basement rocks further recrystallizing the old granites into highly metamorphic rocks. More erosion and subsequent deposition followed; as mountains rise, they also come down. The last 200 million years or so has been a quiet period of erosion as North America and Africa split apart.

What's left are the very hard "roots" of the old mountains. The Appalachians once reached heights of the Himalaya. Today only those hard, erosion resistant metamorphic basement rocks remain. The soft limestone rocks are found in the valleys where the rock has largely been removed.

Today in Explore Park we find rocky outcrops of these old bedrock layers scattered throughout the landscape. It is hard to tell them apart, especially without getting a fresh sample by breaking the rock open. As you'd expect a one-billion year old

rock to be, they are difficult to crack open. So geology in Explore Park maybe less about study and rock identification than it is about learning the story of landscape development and appreciating the age of the rocks and the process. Of course, it is the rocks that lead to the soils, the topography, and the park. Geology drives everything.

The Roanoke River creates an additional layer of intrigue especially in the way it cuts through a mountain range. The river may predate the mountains and cut through them as they have uplifted for 300 million years. This story bears out in the New River, which ironically, is one of the oldest (or *the* oldest) rivers in the world. Alternatively, the Roanoke River may have captured, or pirated another river. In this scenario the mountains would have divided two rivers, and the eastern river eroded through the mountains and captured a different river on the west side.

Nonetheless, however the Roanoke River was formed, perhaps the most interesting geological find in Explore Park includes an area of about 5 acres in South Roanoke (see map in Introduction) contains a stranded gravel deposit. This is a deposit from an earlier period in the Roanoke's history when it was about 200 feet higher than it is now. The gravels, today identified on the trails as round river stones up to 10 inches in diameter, are easily identified. This interesting find tells a compelling story of environmental change. The gravels are "a few million years old" and were deposited during a period of greater precipitation and also when the river was less incised and higher up. See the Special Places site number 5 for more detail and a map of this site.

River cobbles high on the ridge in the Roanoke South section. The cobbles extend over a 5-10 acre area and are a stranded gravel deposit from a few million years ago when the Roanoke River was much higher. See the Special Places section for more details.

The Eastern Deciduous Forest

The forest of eastern North America is the continent's unsung treasure. It is vast, it is diverse, and it is beautiful. So often our eastern forest remains unseen, standing only as backdrop. We find excitement in the grandeur of the West, or exotic locations abroad. But the eastern forest is one of the world's remarkable natural areas.

Stepping back about 75 million years we arrive in a world where the precursor to our eastern forest dominated the entire northern hemisphere. Today fossils of oaks, maples, and other eastern trees are found in Alaska and Siberia. From there the forest spread east and west into Asia, Europe, and North America. Many plant groups we find today grew and radiated during that time. The world was warm, diverse, and wild.

At about 35 million years ago, planetary events began cooling the Earth. Cooling initiated at the poles and pushed toward the equator. Subsequently, warm-loving forests that once occupied the far north were constricted to the mid latitudes. The forest zone that once spanned around the world was cut into three areas: Europe, East Asia, and the mid-latitudes of North America. As the Rocky Mountains and other ranges of western North America rose, the west dried out, and the moisture dependent Eastern Deciduous Forest settled into its current location.

The most recent 2-million years has brought still more instability to the eastern forest. As glacial pulses have waxed and waned in northern North America, the periods of cold climate pushed the deciduous forest farther south, confining it to the Gulf Coast, south Florida, and the mountains of Mexico. As climate warmed, the forest spread back north. Just 15,000 years ago, a blip of time geologically speaking, spruce forest and woodlands dominated Virginia much as it dominates central Canada today. As climate warmed, oaks, hickory, tulip tree, hemlock and others have spread to colonize the eastern quadrant of the continent.

Adding to this forest history are waves of two different cultures. The period of American Indian dominance lasted from 13,000 years ago to approximately 400 years ago. Native groups managed the land through agriculture, hunting, and burning, the later of which had lasting effects on today's landscape in the dominance of oak and hickory. We are finding today that without burning, our oak and hickory forests are shifting to red maple and other mesic species.

European dominance began roughly 300 years ago. Euro-Americans, in much less time, have exuded far greater effects. Forests have been extensively cleared, plowed, and soil eroded. Exotic species have been released, forever altering the original native flora and ecological processes. Large animals were extirpated. Explore Park contains all of these stories, clearly written down in its ancient oaks, young tulip trees, clearance cairns, and the Roanoke River.

The forests of eastern Asia still contain remarkable similarities to eastern North America with species of *Liriodendron* (tulip tree), *Acer* (maple), and *Magnolia* among many, many more. Though the forests of eastern Asia are slightly more diverse in most plant taxa, others including salamanders, fish, crayfish, and freshwater mussels have their global center of diversity and distribution in the Eastern Deciduous Forest. Our eastern forest is much more in tact than that of eastern Asia.

Compared to western North America the east finds its superlatives in its diversity. Today, the 2.2 million acre Yosemite National Park in California contains 37 species of native trees. The celebrated temperate rain forests of Olympic National Park contains 25 species of trees. At Explore Park's 1100 acres, you can find over 50 species of trees. (Great Smoky Mountains National Park is the most diverse with 109 species.) The bottom line is, once people know what's here, they get excited.

Explore Park could share this remarkable story of change, diversity, affinity, and culture. The diverse forests and cultural landscapes of the park lend themselves to telling a story that captures the processes of the eastern forest.

A diverse cove forest from the area around the White Trail.

Vegetation Inventory

Explore Park's vegetation was sampled in November 2015 by walking an 80-mile non-linear transect throughout the property and noting vegetation change with regard to topography and land use history (see Appendix A for survey track). This was not a quantitative inventory, but a systematic examination to characterize substrate conditions, successional status, diversity, and user experience. The map below shows the community types by color; community types are described following the map.

Natural Communities

Explore Park contains an array of community types. A plant community, as described by the Virginia Department of Conservation and Recreation, is "an assemblage of co-existing, interacting species, considered together with the physical environment and associated ecological processes, that usually recurs on the landscape" (DCR 2015). In ecology, *natural communities* descriptions are typically restricted to sites with minimal anthropogenic disturbance. Some areas of Explore Park had a single wave of logging about 100 years ago and satisfy this requirement. But much of the park has been subject to more intense disturbance from agricultural activity. The entire spectrum of communities, from the relatively pristine to the substantially disturbed, are considered here because, for at least the next 30 to 50 years, this suite of species will dominate Explore Park. It will take centuries for succession to play out to a degree such that the landscape can be considered natural or minimally disturbed once again.

The array of community types found on a landscape is determined by three factors: topography, substrate, and disturbance. Topography includes the steepness of the slope and the aspect the slope faces (cardinal direction). Steep south-facing slopes are warmer and drier and thus favor plants suited to those environments. Cool, moist, north-facing slopes harbor species preferring those factors.

Substrate includes the texture, moisture, and chemistry of the soil. Explore Park's geology contains old granitic rocks and the soils thus tend to be acidic. Typically, acidic soils are less species rich than higher-nutrient, alkaline soils. Moisture is often determined by slope (flat vs. steep) and the ability of a soil to drain.

Disturbance is the overarching factor affecting Explore Park's community types and the eastern deciduous forest more broadly. Disturbance from past human activities include grazing, logging, clearing, fire, road and trail building, forest pathogen outbreaks, etc. As is described in detail in the Land Use History section, portions of Explore Park were used for these activities for decades until about the 1960s on most sites. The land was abandoned and vegetation reclaimed through the process of succession. *Succession* is

the semi-predictable progression of ecological change over time following a disturbance.

For this inventory I gathered information on existing vegetation at most of the 363 points listed in the *Explore Park Field Inventory*. I noted general species composition and structure for woody plants (November field season so few herbaceous plants present). Refer to that document for details on specific locations. I condensed the vegetation data into a map showing the current communities as 10 types. Refer to the maps below, descriptions, and photographs of the 10 community types as reference for any location in the park. The boundaries of the community polygons are approximate, but also reasonably accurate considering this was not a quantitative study nor the sole purpose of the field work.

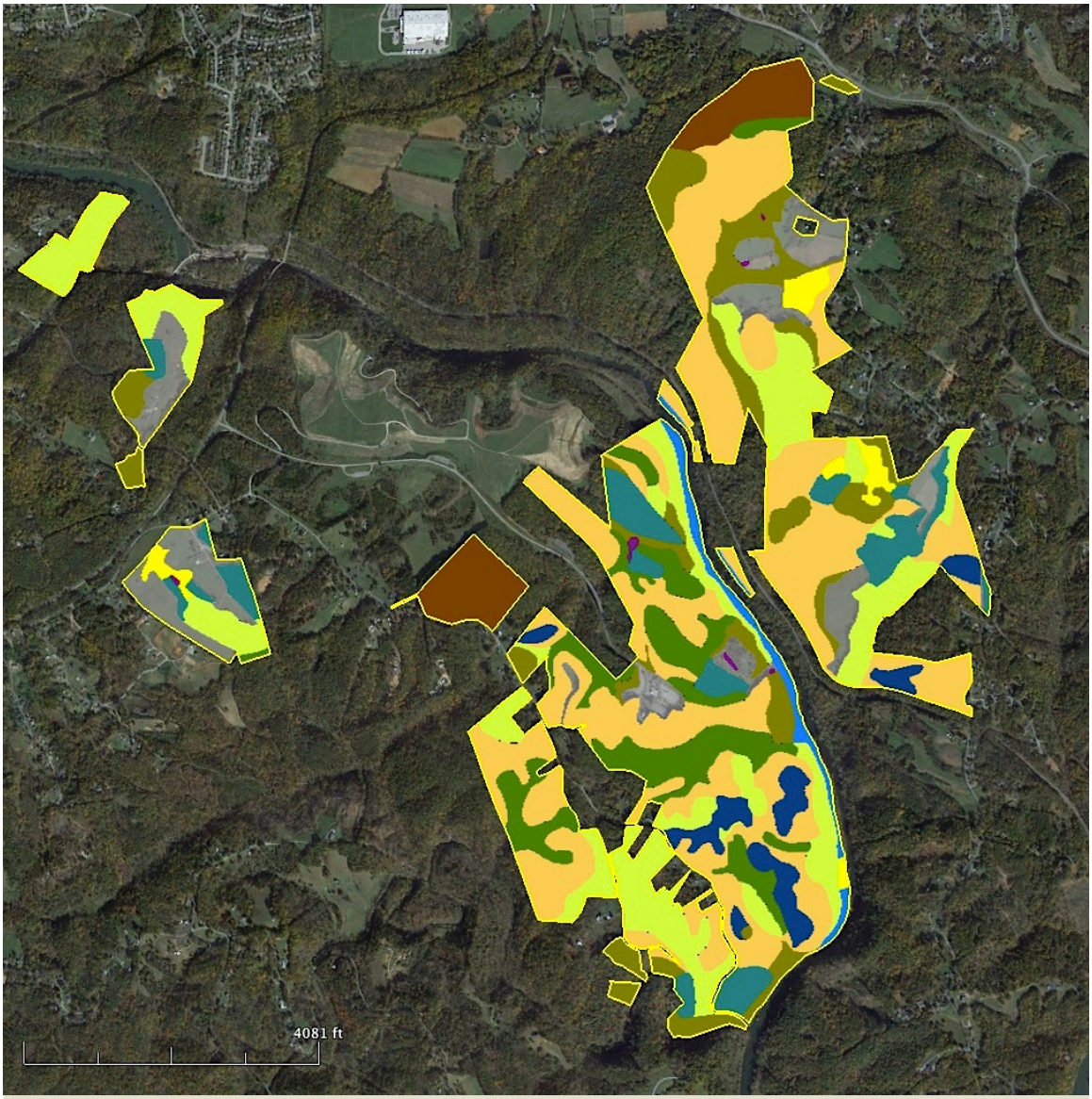
A few general comments and patterns regarding the distribution of vegetative community types in Explore Park:

- Substantial human disturbance is generally concentrated in: the three outlying west parcels; the floodplain and toe-slope of the Roanoke River; and the flat areas on the Bedford side of the river. These areas tend to have younger, disturbance-driven vegetation.

- The natural communities tend to follow a typical ecological pattern of more mesic, and diverse cove forests in the ravines, drier oak-dominated forests in the mid-elevations, and in some areas, drier pine-dominated ridges along the crests.

- Older, less disturbed forests have been more resistant to, and contain fewer exotic plants than the younger, recently disturbed area. By limiting additional development in those mature forests, an onslaught of new exotic plants can be prevented.

These communities tell the unique story of Explore Park. When we view a landscape through both an ecological lens, and also a lens of land use history, we find the two lenses inseparable. Whereas a purely Natural Communities approach, as is typical from Virginia DCR and most ecological study, is somewhat limiting and ignorant, the 10 communities described here embrace the land use history of Explore Park and describe the current conditions on the ground. This will help guide and support planning, management, and education.



- Cove Forest
- Oak-Dominated Forest
- Pine Dominated Successional Woods
- Roanoke River Floodplain Floodway
- Oak Forest
- Dry Pine Ridge
- Mixed Species Successional Woods
- Pond / Wetland
- Old Field
- Tulip Poplar-Dominated Successional Woods

Key to Explore Park Communities

More detailed natural community maps can be found in Appendix B.
White/grey areas indicate mowed, built, or other non-applicable area.

Cove Forest

Cove Forests in Explore Park occur in the deeper ravines and drainages. The cooler, moister, and more mesic conditions in these troughs allow for a diverse suite of plants to develop. The coves likely have the greatest diversity of native plants in Explore Park (though it is unclear which cove has the highest diversity— a question worth pursuing).

Typical species include: American beech (many old growth); tulip-tree; red oak, white oak, chestnut oak (occasionally old growth), red maple, bitternut hickory, pignut hickory, eastern hemlock (small and dying), cucumber magnolia, and black birch. Understory trees include sourwood, musclewood, and flowering dogwood. Christmas fern is common on the slopes, while maidenhair fern (*Adiantum pedatum*), a species typically associated with richer soils, is occasionally found in the ravine bottoms. A botanical survey in spring during the floral bloom is suggested when herbaceous species are present.

Virginia DCR describes Acidic Cove Forests as a close approximation to this community in Explore Park. However, a number of species found in the coves of Explore Park such as bitternut hickory, black walnut, pawpaw, and maidenhair fern are listed in DCR's description for Basic Cove Forest. The communities of Explore Park could be slightly richer than their granitic foundation suggests. A spring flora survey would aid in determining the degree of soil acidity or richness the park contains. Nonetheless, these are beautiful, intact forests with disturbance history limited largely to a single logging wave ~100 years ago.

Cove forest occurs predominantly in the main portion of Explore Park, with a small piece at the southern end of Mayflower, and a beautiful area in the West Woods (draining into Back Creek). It is likely that the two large drainages in South Bedford once contained cove forest composition, but these were moderately disturbed during the agricultural era so now contain a different suite of species. In time, and with proper management, they could once again be diverse cove forests.

Oak-Dominated Forest

Oak-Dominated Forests in Explore Park occur mainly in the mid-elevations, drier ridges, south-facing slopes, and old wooded-pasture lands. These environments are warmer and drier than the coves or floodplains, and oaks, among other species, tend to favor them. In general, disturbance in the oak-dominated forests has been limited to the logging from ~100 years ago, forest grazing, and fire.

As the name suggests, these sites are dominated by species of oak including northern red oak, white oak, chestnut oak, scarlet oak, and occasionally southern red oak and post oak. Other species include tulip-tree, red maple, American beech, white pine, shortleaf pine, Virginia Pine, pignut hickory, and sourwood. The understory often contains mountain laurel, though only in a few places is the species dense. Drier-sited grasses and herbs are expected and should be surveyed for in spring. Rattlesnake plantain (*Goodyera pubescens*) was commonly seen among fallen leaves. The plant is common in acidic oak forests. The forests are generally open and provide nice views into the ravines.

Virginia DCR lists several community types with oak dominance. Acidic Oak-Hickory Forests, Montane Mixed Oak and Oak Hickory Forests, and Eastern White Pine – Hardwood Forests all have similarities with the former being perhaps the most similar. Because of the disturbance history at Explore Park the best fit is difficult to pin down. A spring botanical survey would provide additional information. See the Oak Forest description below for a comparison with that community.

This is one of the dominant cover types in Explore Park. Though Oak-Dominated Forest is absent from the three western outparcels, it is the dominant vegetation in the core of Explore Park and the Bedford side of the river. American chestnut would have favored these communities and likely the loss of chestnut led to the rise in oak. Woodland grazing occurred over much of the Oak-Dominated Forest during the 1900s. As livestock grazes through a forest, the result is typically a forest containing a canopy of large trees (often oaks) with an open, clear understory. When grazing is abandoned, the understory begins filling in with small trees and shrubs. Many Oak-Dominated Forests in Explore Park, are in this stage, especially on the Bedford side.

Oak Forest

Oak Forests occur in two large areas of Explore Park: the northern reach of Bedford North and the larger disjunct parcel northwest of the Visitor's Center. The difference between the Oak Forest and Oak Dominated Forest is that the former has a higher proportion of oak of multiple species, largely to the exclusion of other deciduous trees. Oak Forest also has the presence of heaths and pine. These communities occur on drier sites, with acidic soils, and fire has likely played a role.

Oak Forests could more accurately be described as Oak – Pine – Heath communities. The dominant oak is Chestnut oak, which is the driest-sited and most fire adapted of Explore Park's oaks and at times makes up 50% of trees. White oak, scarlet oak, and red oaks are also found and at times are abundant. Shortleaf pine, white pine, and Virginia pine are also common in decreasing order. Heaths include mountain laurel as a scattered shrub or in small patches, and low bush blueberry, which is much less common. There are few other shrubs. Other species include red maple, hickory, or American beech, but these are generally subordinate and restricted to the understory. On some ridge crests, pines may take dominance.

The Oak – Pine – Heath complex is a classic community association throughout North America occurring especially on granitic soils, as is found here. Virginia DCR describes Oak / Heath Forests, and Pine – Oak / Heath Woodlands, with the later being a more specialized community structure not found in Explore Park. Nonetheless, the park's Oak Forests represent a drier community type specific to its location and disturbance history.

Though this community type is represented in only two locations in Explore Park, it spreads over large areas. Oak – Heath Forests would likely have contained a substantial component of American chestnut prior to its demise by the blight. This pattern is documented in Shenandoah National Park. The Oak Forests are fire-adapted communities and would benefit from prescribed fire as a management tool (as would most of Explore Park). In fact, the community is being disrupted without fire; they are undergoing "mesophication" where shade tolerant trees such as red maple are invading the understory and will, in time, become dominant (See Nowacki and Abrams 2008). This is occurring in Explore Park's Oak Forests and Oak Dominated Forests. The community is relatively clear of exotic species and no significant logging has occurred in 80 or more years.

Dry Pine Ridge

Dry Pine Ridges occur in several areas in the south of Explore Park. The ridges are sub-xeric, warm, and pines favor such an environment. These are probably successional relics originating from the logging days; I cored pines at 115 years old so pines had to be present on the site before the logging took place. Nonetheless, they don't contain the hallmarks of a successional pine community (see below) including the ruderal suite of species typical of old fields and post agricultural lands. These could be just a pine-dominated variant of the Oak Forest, but they are described here separately because in Explore Park at least, they form a unique community and landscape pattern.

The Dry Pine Ridges, as their name suggests, are dominated by pine. Eastern white pine, shortleaf pine, Virginia pine occur in varying mixtures with Shortleaf as the dominant. These communities are also the only locations for pitch pine in Explore Park. Pitch pine is a very dry-sited, fire-adapted species the presence of which indicates xeric conditions. Pitch pine makes up only a small percentage of pines here. Other trees include oaks, beech, and red maple, which like in the oak forest, is invading these shady pine forests. Shrubs are scant and herbaceous plants should be surveyed in the spring.

Globally, pines are often found on dry sites and ridges. Virginia DCR does not have a community type for what is described here as a Dry Pine Ridge, probably a result of this being successional in part. Nonetheless, the pattern found in Explore Park should be acknowledged and incorporated into thoughtful management. Perhaps with careful thinning, the western-most site of this community type could be pushed to something more like a Pine – Oak Woodland or a Piedmont Acidic Woodland as described by DCR. This could also open some additional views from the ridges to enhance the user experience. Proceed cautiously, though; use a scalpel, not a machete.

The use of fire in these sites should also be considered as a land management tool. Like the oak forests, these sites, too, are becoming more mesic with an invasion of red maple, among other hardwoods. These are unique communities with a very different feel from the rest of Explore Park and that feeling should be incorporated into trail planning and landscape management. Additionally, the small Dry Pine Ridge area in the southwest could be a good place for an observation tower (see Special Places 19).

Pine – Dominated Successional Woods

Pine, in general, is a sun-loving species. Many pine species colonize old fields and other open lands. In Explore Park, some successional stands are colonized by, and dominated by, pines. It appears that the Pine – Dominated Successional Woods in Explore Park, occur on south-facing or otherwise warmer/drier sites than the tulip-tree successional stands (see below). Not all south-facing successional stands are pines, but almost all pine – dominated successional stands in Explore Park are on south or west facing slopes. This is expected, as pines prefer sunnier, drier, early successional sites whereas the cooler, moister successional sites are dominated by other species, especially tulip-tree.

The Pine – Dominated Successional sites are composed primarily of Virginia pine and shortleaf pine. White pine dominates in the Mayflower stands, but these appear planted. Other trees include oaks, young beech, some tulip-tree, and red maple among other early successional species. Greenbriers are common, as are exotics, especially Japanese honeysuckle. The pine stands in the Bedford Mountain Meadows are probably the densest. Trees in most stands range from 60 to 110 years old. See the land use history section for more details.

As an early successional community, Successional Pine Forests do not have an equivalent community type in the Virginia DCR natural communities descriptions. We would expect succession continues the community will develop into one of their described low elevation dry or dry-mesic forests or woodlands. Considering the environmental conditions of these sites – south facing slopes on acidic soils, we'd expect some type of oak-dominated community. However, with the proliferation of exotic species, forest pathogens, and a warming climate, prediction and categorization looking out 100 years out is challenging.

Eliminating exotic species will be the primary management concern with these sites in the near term. The stands could be thinned to allow understory oaks or other hardwoods to prosper. Additional underrepresented species could be planted. But these Pine – Dominated Successional stands tell an important story about the history of Explore Park and the settlements that occur there. That history should be shared and cared for and not eliminated.

Tulip Poplar-Dominated Successional Woods

Forests dominated by Successional Tulip-tree communities are found throughout Explore Park generally on east and north-facing slopes and adjacent to settlement areas. These communities are more mesic compared to successional pine sites. They're disturbance driven communities; most were previously cleared pasture, though areas along the Roanoke River have been repeatedly logged as well as pastured. Tulip poplar is an early successional, sun-loving tree that commonly colonizes old fields and clear cuts. It also stump-sprouts prolifically and coppiced trees are common.

Tulip-tree is the dominant species on these sites. Trees are typically 15 to 20 inches in diameter and many are large and coppiced. The history of the site, whether it was cleared, or was woodland pasture, or repeatedly logged, will determine what other species are found there. In old pasture-woodland, mature oaks, black walnut, or other open grown trees may be present. In previously open lands, black cherry, black locust, ash, or elm may be common. Shortleaf, white, or Virginia pines may also be common. Successional oaks may occur in the understory as well as American beech. The shrub layer is dominated by thickets of sassafras or spicebush (the species are closely related and I could not distinguish them in the field without leaves, though spicebush should be restricted to the riverside sites). Musclewood, sourwood, greenbrier, are common. Exotic plants are a problem in these communities.

As an early successional community, this Tulip-tree Dominated community has no described equivalent by Virginia DCR. However, because it is such a common assemblage in Explore Park it would be naïve to ignore its prevalence. As the process of succession unfolds, the Tulip-tree Successional Woods should trend towards Acidic Cove Forests or Mesic Mixed Hardwood Forest. Historically, some of these communities maybe have been Eastern Hemlock – Hardwood Forests, though hemlock has been reduced to an inconsequential component after logging and the exotic pathogen hemlock wooly adelgid, which is killing hemlock trees.

The primary management concern in these communities is the control of exotic plants. Japanese honeysuckle, multiflora rose, garlic mustard, Japanese stiltgrass, and oriental bittersweet are common. These communities are among the most infested sites in Explore Park. The planting of underrepresented trees and shrubs could also be done, but plantings should be species unpalatable or toxic to deer.

Mixed Species Successional Woods

Mixed Species Successional Woods are those younger forests that are not dominated by any particular species. It's a catch-all category for successional woods that do not fit in other categories. These are disturbance driven communities and most occur on flatter sites in and around old settlements, however, a few occur on slopes. Most of these sites were cleared entirely at one point and the presence of these communities means the site was formerly agricultural.

Community composition is a mix of deciduous trees and pines. Common tree species include: ash, elm, black cherry, black locust, black walnut, tulip-tree, oaks, sycamore, red maple, and shortleaf and Virginia pines. Understory shrubs include greenbrier vines, sassafras, wild grape vines and a host of exotics. Coralberry is an abundant native shrub common in these communities. It indicates old pastures and fields. Because they are young (typically 30 to 50 years) these communities are prone to infestation by exotics.

Because Virginia DCR does not account for early successional communities in their natural communities descriptions, no described equivalent exists. The potential natural vegetation therefore is determined by environmental conditions (topography and substrate). We'd have to look at Explore Park's Mixed Successional Communities site by site to determine the potential community type. Most sites in Explore Park would fall into an oak-dominated community type, or a floodplain community for those areas.

Early successional communities, though ephemeral, have important value. They have wildlife value for birds and some mammals as well as a variety of invertebrates. They also have human experience value both from the feel they create and also from the interpretive and educational opportunities they present; they tell us people have worked this land. And that story will remain for generations. However, it may be necessary to manage for mixed successional communities decades from now if they are considered a valued community type and desired on the landscape. In the near term, however, managing for native species by eliminating exotics will be important.

Roanoke River Floodplain and Floodway

The Roanoke River Floodplain and Floodway comprises a variety of assemblages along the gravel bars and several levels of river terraces. Species in these communities tend to sort themselves out along intersecting gradients that include relative elevation above stream level, flood duration, soil drainage, and fertility. Proximity to floodwaters, and duration and depth of inundation, drive which species occur close to the river and which occur higher up and father away. Complicating these topographic and hydrologic factors is land use history; almost the entire floodplain of the Roanoke River in Explore Park was cleared for agriculture. Except for a non-continuous narrow strip of trees along the river bank, by 1949 the floodplain was cleared. By around 1970 it was all in a process of being reclaimed. So we approach the floodplain expecting less than 50 years of growth.

The floodplain includes the main terrace with the river walk trail. Though disturbed, this is a diverse area. Tulip-tree is dominant in most areas. These early successional trees sprouted after abandonment in the 1960s. Other common trees include sycamore, box elder, musclewood, ash, black walnut and bitternut hickory. Uncommon trees include Osage orange, flowering dogwood, hackberry, and rarely, sugar maple (the only sugar maples found in Explore Park). Common understory plants include greenbrier vines, pawpaw, and dense thickets of spicebush (could be sassafras but habitat suggests spicebush). *Equisetum* horsetails are common. Exotics are common with Japanese honeysuckle, multiflora rose, garlic mustard, stiltgrass, and oriental bittersweet.

The floodway includes the bank, low terraces, and gravel bars. It is inhabited by fewer species tolerant of inundation by floodwaters, and also the physical abuse that rushing, debris-laden waters brings. Dominant species include American sycamore, box elder, ash, and catalpa. Other common species include Osage orange and elm. Shrubs generally do not occur as they are ripped out by floodwaters.

As noted above, factors controlling species occurrence on these sites are complex with soil, subjectivity to flooding, and prior land use. Virginia DCR describes two similar communities: Piedmont / Mountain Floodplain Forest and Piedmont / Mountain Small Stream Alluvial Forest. The early successional nature of Explore Park's community and the heavy dominance of tulip-tree as a post agricultural species, makes classification a challenge. But the size of the river would classify it in the former. Nonetheless, it will take centuries for the area to reach anything approaching maturity. In the mean time, the towering tulip-trees will become all the more impressive.

Managing for exotic species and trying to overcome the problem of stream trash will be ongoing challenges. These bottomland sites were used for agriculture because of their deep, fertile soils, replenished each year by flooding. They are as productive for agriculture as they are for forest communities. Prior to clearing, the herbaceous community would have been quite rich. But it is unlikely that much has survived the sterilization period of agriculture. Nevertheless, a flora survey should be done in spring.

Old Field

Old Fields contain the youngest successional community types in Explore Park. They are disturbance driven communities that occur around old settlements and agricultural lands. They range from 10 to 50 years since abandonment and occur on flatter or gently sloping lands. Note that Old Fields do not include meadows or hay fields that are still in production or experience regular mowing. The Mountain Meadows, for example, are not considered Old Fields. Four sites are identified as Old Fields in Explore Park: in Mayflower; in the Roanoke River Floodplain; around the old homestead in Bedford South; and the abandoned farm in Bedford North.

Species composition on Explore Park's Old Field communities is diverse. In Mayflower, the Old Field site occurs around the farm pond and includes the paddock area with a large mulberry tree, black walnut, black locust, and elm, as well as tulip-tree and a host of ruderal weeds and a dense stand of bamboo. The compartments in South Bedford include the Raspberry Meadows and the area immediately around the old homestead. Composition there includes elm, ash, red cedar, box elder, and exotics such as autumn olive. Herbaceous and other plants are typical ruderals and agricultural weeds. The area in Bedford North contains red cedar, and dense patches of Japanese honeysuckle, multiflora rose, among other exotic and native shrubs.

As noted previously, Virginia DCR doesn't categorize early successional environments. The potential natural vegetation for these sites should include one of the previously mentioned community types.
However, with the perniciousness of exotic plants and their proliferation on recently abandoned lands, it is highly unlikely that these communities will attain a community type described by DCR. If the land is properly managed and stewarded, however, it is possible to facilitate native ecosystems. But left to their own accord, they will remain marginal indefinitely.

Old fields composed of native vegetation are important habitats for wildlife. The openness is critical to invertebrates such as butterflies, bees, and other pollinators. Those species will be more diverse in Old Fields than elsewhere in the forested areas of Explore Park. Birds, too, are drawn to these environments (as are birders in search of them). Old fields can be important components of a diverse natural area network within a park. But because they are ephemeral, it will be up to land managers to determine how, when, and where these open communities will occur and be maintained, and preventing exotic species from dominating.

Wetland / Pond

Explore Park contains 6 ponds/wetlands. There is a forest pond and a field pond in Bedford North, a wetland in the historic building area, and a pond at the bottom the grist mill run, Palmer's Pond/wetland in the north, and the farm pond at Mayflower. People constructed all of the ponds since the 1950s. There was a second pond below Palmer's, but this has been gone since the 1970s or 80s. Portions of the dam remain. It is likely a pond occurred in the Homestead area of Bedford South, but no trace was found. The wetland in the historic building area may have been an agricultural pond at one time, or it may have been a wetland spring since presettlement times. Settlers built ponds for agricultural purposes or water storage.

Aquatic survey was not a goal of this inventory. Therefore, the composition of these sites is surficial and cursory. The margins of the 5 ponds contain abundant cattails. Palmer's Pond contains smooth alder, and multiflora rose. The dam of Palmer's pond is compromised and the pond is significantly smaller than it was 20 years ago. The gristmill pond contains emerging sycamore and willow, among others. The Field Pond in Bedford North is lined by ash trees, and contains other emergent vegetation, and typical old-field vegetation around the edges. The Forest Pond is lined mainly by tulip-tree and coralberry. The pond at Mayflower contains a concrete dam, is lined by cattails and bamboo and below the dam is Explore Park's only large outbreak of Japanese knotweed.

Virginia DCR does not classify human built farm ponds. Prior to being dammed, the ponds would have been forested like the surrounding landscape, perhaps with a spring or seep. Today these ponds are an asset to the park. For wildlife, especially aquatic and semiaquatic reptiles and amphibians, as well as birds and invertebrates. Ponds are undoubtedly focal areas for animals. They are also focal areas for people, and park users will flock to them to look for birds and to sit and relax. Consider keeping one or two ponds low or no development to preserve wildness for wildlife.

The management of the ponds should include preserving the integrity of the dams (keeping trees off of them), controlling exotic species on the margins, and controlling algae and duckweed in the pond. Consider making the forest pond in Bedford North fishless (by killing any now present) making this a wildlife pond where amphibians can thrive without fish predation pressure. Many amphibians breed in the forest thereby making this pond ideally suited for such wildlife focused management.

Exotic Species

Exotic plants are those that are not native to a region. They've been brought in as ornamental plants, culinary plants, or hitched here inadvertently. *Invasive* plants are those that spread and take over a site rapidly. *Exotic invasive* plants outcompete native vegetation reducing diversity and often changing soil chemistry. Like a cancer of the land, they spread unchecked by ecological feedbacks. Exotic invasive plants are widely recognized as being the greatest threat to forests and biodiversity after habitat fragmentation and land use change. Because they reproduce annually, the cost to eradicate exotic plants increases exponentially. The greatest environmental investment that can be made in Explore Park is the elimination of exotic invasive plants.

The following maps and table documents exotic invasive plants found Explore Park and their relative abundance. This is a partial list of species I observed in November 2015. Other species undoubtedly occur. However, several of these woody species such as Tree of Heaven and Multiflora Rose are particularly egregious. Every year the cost goes up.

Bare in mind this was not a quantitative systematic study; it was a subjective observational assessment taken during a multi-parameter groundtruthing of Explore Park. A few red areas on the Roanoke River terraces may be somewhat biased since they contained impenetrable thickets of native and exotic vegetation on disturbed lands. Additionally, the Bedford lands were also difficult to assess. There is a lot of heterogeneity on that side of the park as a result of settlement and agricultural history. Those areas hold a broad spectrum of disturbance history from complete clearing and abandonment (worst exotics), to woodland grazing and partial clearing (moderate levels). But in the end, prioritizing areas of exotic removal based on increasing ecological integrity, protecting weed-free areas, and containment of the worst infestations, will need to be done.

This list is limited to the forest areas and successional sites. Additional invasive weeds observed in the meadows include: Lespedeza (common in meadows of Bedford), Chinese silver grass (one population near the Saddle), and bamboo species (one stand on the new parcel by the White Trail and another population east of the pond at Mayflower). The table below lists species I observed and their relative abundances in the forests of Explore Park.

Information for this table and these maps was taken during fieldwork in November 2015. Specific information on species occurrences can be found in the *Field Inventory* Spreadsheet.

Exotic plant species and relative occurrence at Explore Park:

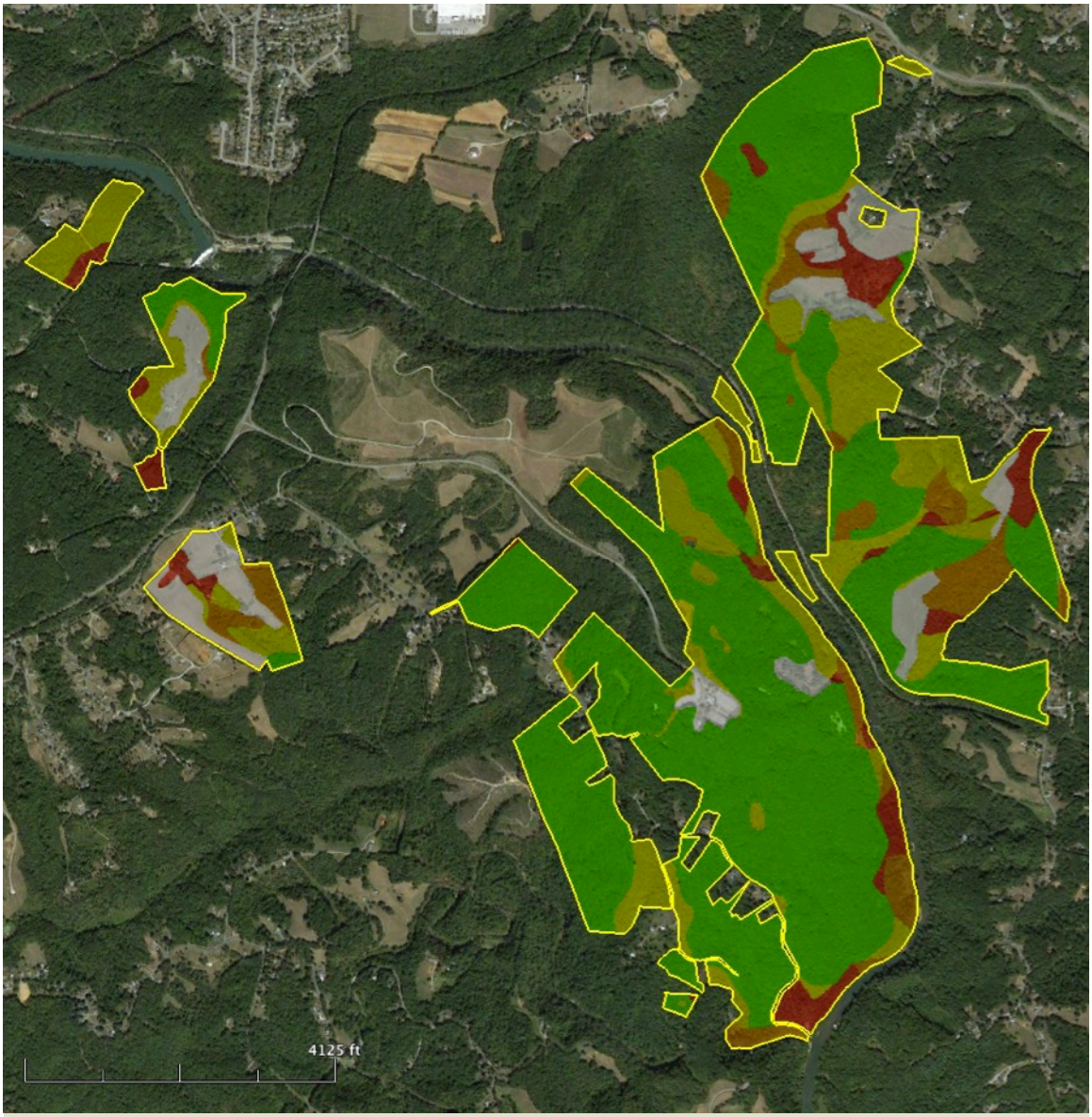
Common Name	Species	Occurrence in Explore Park
Norway Maple (*Tree*)	*Acer platanoides*	**Rare**. Only a few trees seen in disturbed areas on low slopes near Roanoke River and Back Creek. Low threat.
Tree of heaven (*Tree*)	*Ailanthus altisima*	**Occasional**. Stands occur along edges of old fields, old habitations, and disturbed areas. Some remarkably large individuals occur in Explore Park. The species can colonize large areas and can be difficult to eliminate. Serious threat.
Mimosa (*Tree*)	*Albizia julibrissin*	**Rare**. Only a few individuals seen along Roanoke River. Moderate threat.
Garlic Mustard (*Herbaceous*)	*Alliaria petiolata*	**Uncommon**. Small patches seen in the disturbed forest areas around old farm sites. The species has the ability to colonize high quality forests. Serious threat.
Japanese barberry (*Shrub*)	*Berberis thunbergii*	**Uncommon**. The species was nowhere abundant and occurred in disturbed areas around old farms and pastures.
Oriental Bittersweet (*Vine*)	*Celastrus orbiculatus*	**Common** in disturbed areas of old agricultural sites, and along edges of quality forests. The species poses a significant threat.
Autumn Olive (*Shrub*)	*Elaeagnus umbellata*	**Uncommon**. Found along edges of open meadows and old fields. Moderate threat.
Burning Bush (*Shrub*)	*Euonymus alatus*	**Rare**. Only a few plants seen.
Winter Creeper (*Vine*)	*Euonymus fortunei*	**Rare**. Only one population seen at the Saddle.
Japanese Knotweed (*Herbaceous*)	*Fallopia japonica*	**Rare**. Populations seen off property and densely beow Mayflower pond. The species has the ability to colonize large areas quickly. Work to eliminate. Serious threat.
Chinese Privet (*Shrub*)	*Ligustrum* spp.	**Uncommon**. Only a few plants seen along Roanoke River terraces.
Japanese Honeysuckle (*Vine*)	*Lonicera japonica*	**Abundant**. The species is the most common exotic plant in Explore Park. It occurs mainly along edges and in disturbed old pasture and agricultural areas, however, it was also seen in high quality forests and forest edges.
Shrub Honeysuckle (*Shrub*)	Lonicera spp.	**Rare**. Only a few populations were seen mainly along the Roanoke River, especially at the high use area near the parking lot.
Japanese Siltgrass (*Herbaceous*)	*Microstegium vimineum*	**Common**. The species occurs in dense patches in formerly disturbed areas and also as discrete localized outbreaks in high quality forests. It has the ability to overtake high quality forests. Serious threat to Explore Park.
Princess Tree (*Tree*)	*Paulownia tomentosa*	**Uncommon**. The species occurs as discrete individuals in disturbed forests. It is aggressive and fast growing in disturbed sites.
Callery/ Bradford Pear (*Tree*)	*Pyrus calleryana*	**Rare**. Only one population seen below the forest pond in Bedford. The species has the ability to infest large areas.
Multiflora Rose (*Shrub*)	*Rosa multiflora*	**Common**. The species is found in a number of populations, and where found it occurs in dense patches and thickets. It is common along the Roanoke River and in old pastures. It spreads vigorously and is difficult to eliminate.

Forest Pathogens
In addition to exotic plants, Explore Park is faced with two exotic forest pathogens: the hemlock woolly adelgid, and emerald ash borer, both exotic species from eastern Asia. The adelgid is present in Explore Park (first found in Virginia in 1951) and it affects hemlock trees and kills them. Most or all of the Park's hemlocks are infected and most are dying. Hemlock is not an abundant species in Explore Park; however, its loss is significant due to its unique ecological role.

The **emerald ash borer**, according to the USDA, is in Roanoke. The insect kills all species of ash trees within ~5 years of its arrival. Ash is common in disturbed successional stands in Explore Park. The genus (probably two species present) makes up a significant component of the trees in those areas. Individual trees can be treated and saved, but treating a forest, at this time, is impractical. There is no value in removing the trees either. Treating individual trees determined to warrant saving could be considered. This will change the nature of Explore Park's forests.

In less than 100 years, four species of tree will have been extirpated from Explore Park by exotic pathogens: American Chestnut, Eastern Hemlock, White Ash, Green Ash. Which will be next? (This could be an educational theme for Explore Park to embrace.)

Exotic Species Maps
The map below shows the distribution of exotic vegetation in Explore Park. The map is not species specific but paints a general picture of distribution and abundance. The table above describes abundance/occurrence by species. Having said that, **the main species of concern with the highest level of threat** are: *Ailanthus*, Japanese Honeysuckle, Princess Tree, Japanese Stiltgrass, Multiflora Rose, and Oriental Bittersweet.



Level of infestation by exotic plants in Explore Park.

Clear of exotics, or discrete patches of Stilt grass (not practical to note all of these).

Low-level infestation: Scattered individuals, isolated patches of a single species.

Moderate: Multiple species, dense patches, or uniformly scattered and reproducing.

Heavy infestation: Multiple dense patches, impenetrable tickets, multiple species.

Areas are built-up or mowed.

Considering historic settlement and land use in Explore Park, a pattern emerges of exotic plants tending to follow old settlements and land use disturbances like clearing and pasture. The Bedford area lowlands are particularly infested, as is the floodplain of the Roanoke River and Rutrough Point. These areas contained settlement and agricultural land uses in historic times (see cultural landscape maps). The areas that have always been forested, even though they were logged ~100 years ago, held their integrity and exotic plants did not seed in. In time, however, they can.

Exotics should be prioritized for elimination based on the aggressiveness of the species, the proximity to high quality exotic free areas, eliminating seed sources, and in corridors where wildlife travel (and spread the plants).

Priority areas for eradication of exotics should include:

- The Saddle corridor
- Chilhowee Creek
- Cairn Creek
- Rutrough Point settlement area
- Isolated outbreaks in the main park
- Rest of Roanoke River corridor beginning on slopes and upland terraces
- Isolated outbreaks in the far north of Bedford

Elimination of exotic plants is difficult, but important. Left alone, each year the cost increases. But because so much of Explore Park is exotic free, it makes clearing out the trouble spots all the more important. With a sustained effort, Explore Park could be exotic free in 5 years.

Old Growth Trees

The concept of "old growth" is fraught with debate and ambiguity. (See Hilbert and Wiensczyk (2007) for a review of definitions.) Explore Park does not contain old growth forests, but it does contain old growth, or "ancient" trees. For many of our eastern trees, we impose human timespans on them and misunderstand their potential. For example, a white oak can live to over 500 years. We rarely let them live that long and often consider a 100-year old tree "old." Trees at 100-years, which are commonplace in Explore Park, are really adolescent or middle-age trees at best.

For the purposes of this inventory, I defined old growth trees as those with external characteristics that typically develop at 200 years of age. An article by Pederson (2010) describes the features associated with old trees in the eastern forest. I look for the following:

- *Size*: larger trees are often older, but size is species and site dependent and can be misleading. Very old trees are often smaller and slow growing.
- *Bark Characteristics*: Like human skin, tree bark ages somewhat predictably over time and age can be interpreted based on those characteristics. Plates, furrows, rugosity, and exfoliation, among other features characterize old trees.
- *Canopy Branches*: Old trees develop twisted canopy branches and often take a "celery top" appearance with short, crooked, fat limbs.

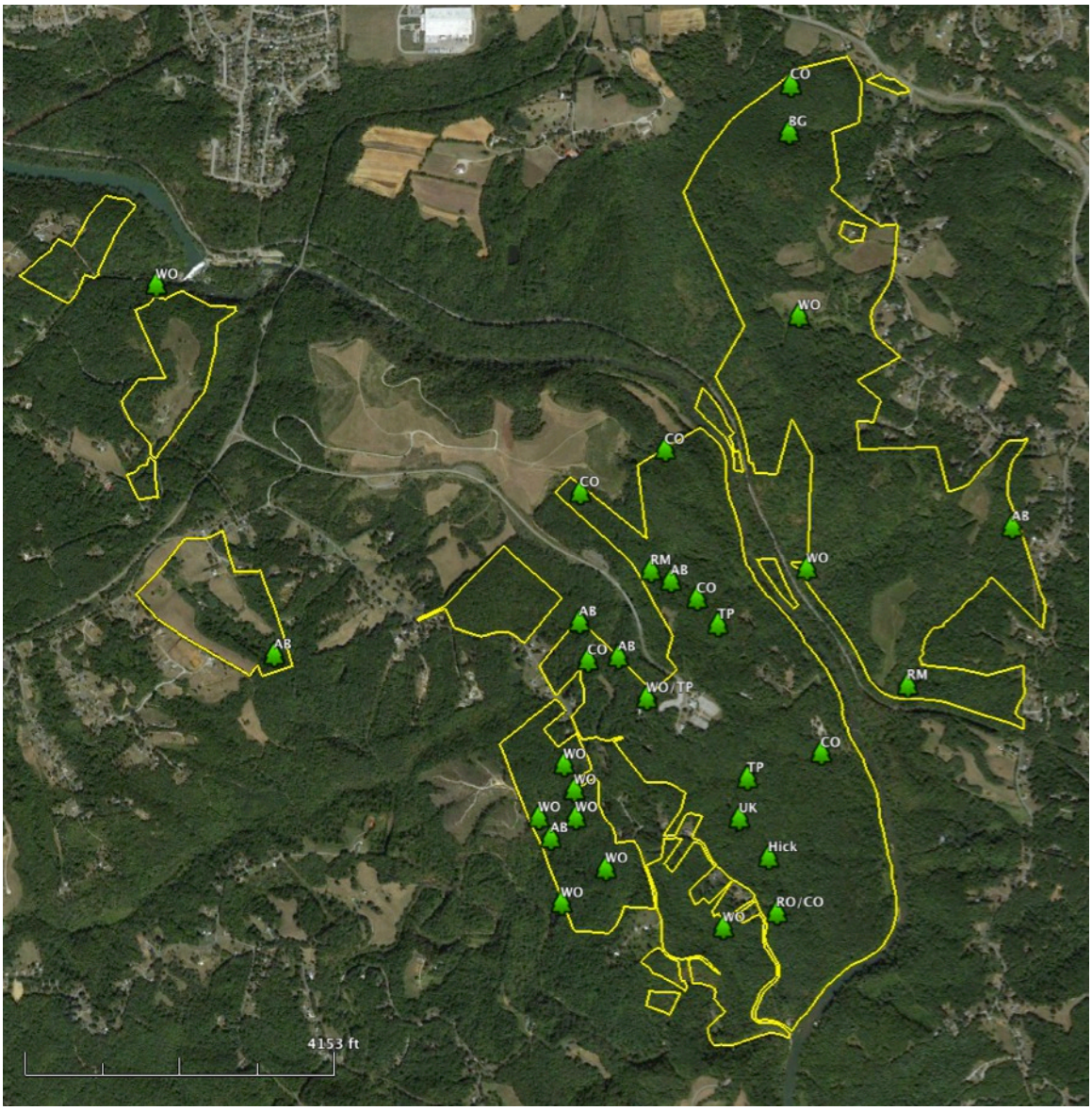
Ancient chestnut oak with exfoliating bark. The tree is likely ~300+ years.

Explore Park does not contain old growth forests. The forests have all been disturbed, though many areas had only a single cutting in the late 1800s or early 1900s and the forests today are high quality. During that wave of cutting, trees were left behind either because they were unreachable, were an undesired species, had poor form, etc. Those trees have aged 100 years since that cutting.

Explore Park contains at least 40 ancient trees, with probably a dozen or two more waiting to be discovered. The table below lists the species of old growth trees I found in Explore Park with age estimates and other notes. The black gum, estimated at 500 to 600+ years could be a significant find for Virginia. Some trees should be shared with the public via trails or other resources, but making them too much of a draw could lead to vandalism (carving names on beech trees) or root compaction.

Species	Approximate Age	Occurrence and Notes
White Oak	200 – 350 years	More than 10 ancient white oaks occur in Explore Park. The greatest concentration is in the West Woods, which also has the oldest. White oaks to 250 years were cored and confirmed, though based on bark characteristics, older trees occur.
American Beech	150 – 300 years	Beech may be the most common old growth tree in Explore Park. The species was of little value to pioneers and timber cutters. Beech to 280 years was cored and confirmed. The species maximum is 300-350.
Black Gum	~600 years	Only one black gum was found and was cored. The tree was hollow and produced only a 4.25-inch core from a 25.5-inch diameter tree (8.5 inches missing). The core had to be treated chemically for rings to show. The count revealed ~205 rings and if the growth was consistent over the life of the tree, it would be over 600 years. The tree may be as young as 500 years. The oldest black gum tree is in New Hampshire and is 695 years.
Red Maple	~200 years	Only two ancient red maples were found in Explore Park. The species is not long lived and maybe less than 200 years.
Chestnut Oak	150 to ~300 years	Several were cored and confirmed to 225 years. A few elder trees were not cored and are expected to be nearer to 300 years. The species has been documented at 430 years.
Red Oak	~200	A fallen and cut red oak in a group of three ancient trees was counted at 185 years. The others should be equally as old.
Tulip Poplar	200 – 400 years	I am less familiar with aging ancient tulip trees, however, the two in Explore Park look the same in characteristics as documented multi-century trees in the Smokey Mts. The trees were not cored and are hollow.
Cucumber Magnolia	100 to 300	Two old trees were found, but not noted as old growth. I am unfamiliar with the species, but it does live to over 400 years. They could be 200 years or more.

Old growth black gum from North Bedford. Based on a partial core, age is interpolated to be 500-600+ years. The species often attains those ages in New England. Note the rugose and exfoliating bark. The bark ridges are several inches thick.



Locations of old growth trees in Explore Park: Trees were identified by external characteristics and 9 trees were cored to reveal more precise ages. Four sites contain multiple trees. Key to species listed above: AB: American beech; WO: white oak; RO: red oak; CO: chestnut oak; TP: tulip poplar; Hick: Hickory; BG: black gum; RM: red maple; UK: Unknown. See the *ExP Field Inventory spreadsheet* for details.

American Beech tree cored and confirmed at ~280 years old.

Cultural Landscape Inventory

Explore Park, of course, contains it Historic Building Area, but the cultural landscape of the park neither begins nor ends there. The park contains living history in eight settlement areas, in forests with clear signs of woodland grazing, timber cutting, and in trees that pre-date that exploitation. Explore Park showcases impressive stonework from a cellar hole, short sections of stone wall, and dozens or perhaps 100 clearance cairns.

The cultural landscape of a place can be defined as the human-created features or legacies found on that landscape. An urban area is overwhelmingly a cultural landscape. While in a wilderness area obvious signs of a cultural landscape are largely lacking. In rural areas, such as Explore Park, human and natural landscapes mesh in a way that makes it difficult to tease out what is entirely natural and what is human created.

The cultural landscape of Explore Park is driven largely by 100 to 200 years of human habitation. Although we don't see much evidence of American Indian occupation, the predominance of oak in the forests of Explore Park is likely a legacy or their land management. Indigenous use of fire to manage and maintain the landscape contributed or even created the oak-dominated forest types we see in the Central Appalachians. It would be inaccurate and irresponsible to ignore their role in shaping this landscape. But beyond the oak forests we find little observational evidence of indigenous habitation like we find with European–American settlement occurring over the last ~150 years.

Presettlement Forest

Ecologists refer to the forest environment prior to European-American settlement as the *Presettlement Forest*. It's worth noting briefly what that may have looked like so that we can keep land use history in context.

In an article by Brown (2000), he described in broad terms the presettlement forest of Virginia. Brown notes a savannah type landscape occurring in the Shenandoah Valley, and the western piedmont. He notes this community type probably occurred discontinuously down the western valleys. It is likely that the Roanoke basin had a savannah type landscape maintained by American Indian burning and bison activity (Brown 2000). Because Explore Park occurs on a major river we expect use by indigenous Americans as a travel corridor at the least, and more sedentary activity at most. Either activity would have included burning.

Burning would favor certain species to the exclusion of other species. Oaks, hickory, pines, and other dry-sited species are favored by fire. Beech, maple, and other cool-sited species or those with thin bark (subject to heat kill) would be selected out. Such trees would be confined to the cooler, moister coves. And this is what we see in Explore Park. The old growth beech trees occur only in the lowest ravines, while oak dominates

the mid-slopes, and pine and oak on the ridges. American chestnut, of course, is absent today; it would likely have contributed a significant proportion of the presettlement forest. In sum, the composition of the presettlement forest would have been similar to today's forest, with the addition of chestnut, and probably more hemlock in the coves, although species would have occurred in slightly different proportions. On hilly terrain, centered on the Roanoke Gorge, the landscape would probably have been closed canopy forest, with sparse understory (from burning). Nearby the Roanoke valley could have been more open with more abundant animals and humans alike.

Land Use History

It is unclear (to me) when European-American settlement of what is now Explore Park began. Roanoke in general developed relatively late (late 1800s). There is no indication of extensive settlement in Explore Park prior to the late 1800s. One stone cellar hole (point 265) at the homestead site along Chilhowee Creek (South Bedford) suggests early settlement. This is probably the oldest human feature in the park but I do not have an accurate way to date the feature. The history of this homestead site, and the others in Explore Park, should be researched. Historical documents probably exist that could provide insight into Explore Park's history. However, we approach history here looking only at features on the ground. (A segment of stone lined trail along the Roanoke River at point 137 may be older.)

Settlement and Agriculture

As noted, it appears the earliest settlement feature is the stone cellar hole in the Bedford homestead along Chilhowee Creek. No other cellar hole was found in the park.

Stone Cellar hole in Bedford South homestead.

The cellar suggests people were preserving food below ground and thus living a year-round settlement perhaps in a subsistence manner. The cellar hole has yucca growing around it, as most settlement sites in Explore Park do. It is an impressive site that should have proper preservation and interpretation. See the Special Places.

As shown in the map below, there are eight settlement areas in Explore Park (yellow areas). These areas were identified as core areas of settlement by the presence of buildings, extensive cleared lands, ponds or some combination of these. As noted, it's unclear when these farms began, but according to the successional growths of pine, and tulip poplar, some were on the wane by the 1930s. By the 1960s almost all agricultural fields in the core of Explore Park (except the

western outparcels) had been abandoned. I cored and dated successional trees to these periods and the dates were confirmed through aerial photographs from 1949 and 1962. Ponds were built in the 1950s, 1960s and the one in Mayflower was the newest being built in the 1970s or 1980s or later.

Some areas were cleared for row crops, mainly along the Roanoke River floodplain terraces and hills slopes were cleared for pasture. Most of North and South Bedford were pastured, but a lot of this remained forest or woodland. It was common in early agriculture, to let cattle graze in the forest. Small trees and shrubs would be eaten, trampled, or girdled, and the forest opened, leaving large canopy trees, and clear understory. That particular forest structure is apparent today in the Bedford woods.

Clearance Cairns (stone heaps) in old pasture at South Bedford.

One of the most interesting legacies from this activity are the clearance cairns. These stone heaps occur on the edges of old pastures and grazed woodlands. Rocks on the ground prevent grass from growing so they were heaped up out of the way, typically placed on large unmovable stones. Clearance cairns are found all over the world especially in northern Europe. A great concentration of them occurs in Cairn Creek in Bedford South. A trail should definitely weave in and among them there. Another spot with impressive cairns is at point 289.

Additional stonework around the homestead site in Bedford South is found along the narrow creek below the site. A stone wall lines the stream which may have held a sluice, but its function is unclear. Stone heaps and clearance cairns dot the slopes, and stone was used to terrace a path down to the stream from the wooden house nearby. Short stone wall sections occur on the Roanoke River floodplain. Their original purpose is unclear. See the Special Places section for more details on these sites.

Timber Cutting

The general lack of evidence for timber cutting throughout Explore Park was rather surprising. Typically, one would find stumps, old tops of trees, and coppiced trees showing previous longing. In Explore Park, stumps are rare occurring only in a few locations in the Southern Operations property, a few in the West Woods, and scattered around Bedford. Stumps of white oak, one of the dominant trees in Explore Park and also one of the most valuable, often last 50 years on mesic sites and can last over 100 years on dry sites. The lack of stumps suggests no significant cutting has occurred in 50 years or more in the oak-dominated forest covering much of Explore Park.

A coppiced tree from Explore Park. You can see the stump of the original tree in the foreground, and the paired sprouts rising from it. Note the other coppiced tree in the background.

Coppiced trees, those trees with multiple trunks forming as resprouts after cutting or fire, are common to occasional in Explore Park. In the park oaks and tulip trees are the common coppiced species. I cored a number of coppiced oaks as this can provide an accurate date of cutting (if the core is full and penetrates the center of the tree). These cores ranged from 90 to 110 years suggesting a wave of cutting in the late 1800s and early 1900s. This corresponds with information I received from Rupert Cutler about a wave of cutting occurring around this time after the railroads were built and the timber could get to market. It appears, over the always-forested parts of explore Park, this was the only wave of logging to have occurred. Old growth trees remain, and without coppiced trees showing any more recent logging, nor stumps, there is no evidence to suggest additional widespread cutting. Ecologically, a single wave of logging is a fairly minor disturbance.

In the successional tulip tree stands however, especially in Cairn Creek in South Bedford, and along the low slopes by the Roanoke River floodplain, cutting occurred more recently. I did not core these coppiced tulip trees because their rings are difficult to decipher. Based on their size, it appears cutting happened as recently as 30 to 40 years ago, with some large coppiced tulip trees having been cut 50 to 60 years ago (1950s?).

I met a neighbor named “Jay” in Bedford South who told me the previous owner of the Bedford lands logged frequently and operated a small sawmill on the site. The engine of the sawmill is still on site (point 253 along the main path down to the Mountain Meadows; see Field Inventory). I was surprised to hear this since there was only a small amount of logging evidence in those forests. Most of it, found mainly in the woods around the Mountain Meadows, looked like it was logged ~40 years ago (1970s). Jay did not say when the sawmill operated. Nonetheless, it doesn’t look like it was heavy cutting. (Jay said the previous owner is still around and is on a “legacy list” of people with permission to access the park.)

Throughout Explore Park, there are lots of old farm trails and roads. A map of “unmarked trails” is in Appendix E. Many of these should be reused as hiking trails, especially the one in Chilhowee Creek where a gentle grade runs parallel to the scenic creek bottom. Other grades worth reusing are listed in the caption for that map. A look at old aerial photographs show there was a major road-building period in the 1950s. It’s

strange since the road and trail building should have occurred with logging or other activity, but there is no evidence to suggest any widespread logging in the 1950s or 60s with the exception of the tulip poplar on the low slopes by the Roanoke River. The ponds at the North Roanoke farm were built during the 1950s and perhaps it was just a guy with a bulldozer with too much time on his hands. Some of the old trails are impressively steep and should not be reused because of erosion concerns.

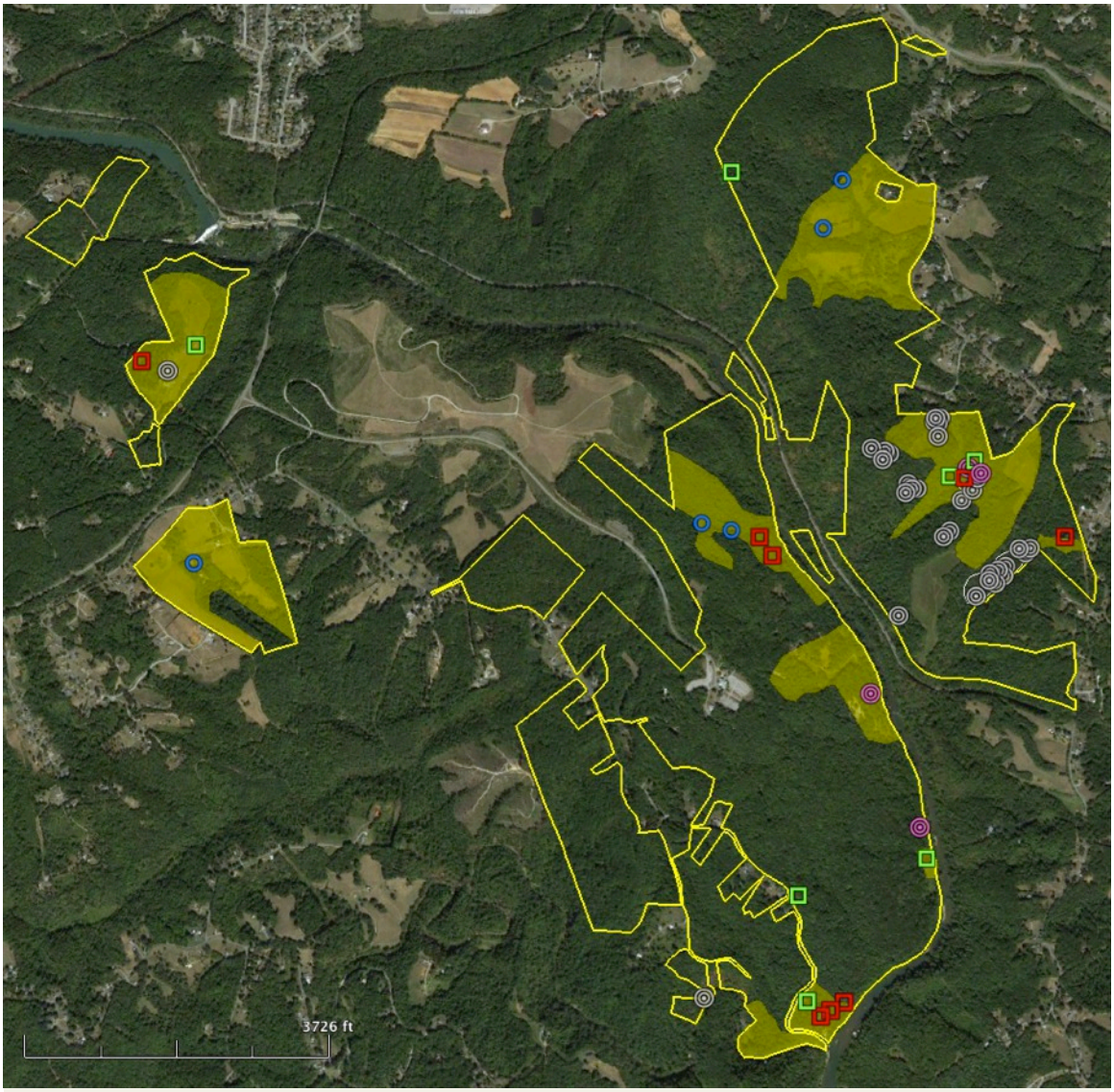
As noted, abandonment occurred in the 1950s, 60s, and 70s over the core areas of Explore Park. Successional pine, successional tulip poplar, and the mixed successional forests all emerged. In the pasture woodlands, young oaks, beech, and more recently red maple initiated. Exotic invasive plants would have emerged during the last 30 to 40 years also, perhaps more recently for some species. Many forest areas would benefit from the use of prescribed fire to clean out the understory and encourage oak regeneration.

Historic Fire

Basal scars from the ~1980 fire on Pine Mountain in Bedford South. Fire burns the litter accumulated on the uphill side of the tree and kills the wood on that side. Eventually it hollows making a basal scar. You can see scars on three trees in this image.

I found widespread evidence of fire in Explore Park; these are shown on the map that follows. The primary indication for fire are basal scars on the uphill sides of trees for older fires, charred stumps and downed wood for some fires, and for recent fires black charring on the trees themselves. The most recent fire occurred in 2015 (or maybe 2014) in the narrow panhandle area of Roanoke North. It appears the fire started on NPS lands, and burned through the narrow strip of Explore Park. Only a few acres of Explore Park burned. This is an excellent site for people interested in fire ecology.

The largest fire occurred on the Bedford side both in Bedford North and South in the 1970s or 1980s. Basal scars, coppiced trees, and charring all were found frequently over a broad area. It is likely this started at the train tracks, as they were often a source of ignition for forest fires. Other fires in the Roanoke Cove forests are shown through basal scars and coppiced beech trees. I dated one of these fires to 70 years ago through coring (point 346). The fire would have occurred in the 1940s. Undoubtedly, fires occurred in other decades. What is unclear is how the fires started, and whether they were intentionally set as some form of woodland management (like the Native Americans did) or whether they were unintentional and undesired. Nonetheless, they've had a significant effect shaping the natural and cultural landscape.



Settlement Areas: Yellow polygons show the core cleared areas of historic settlements.

Farm Ponds: Blue circles show ponds; ponds were built during 1950s to 1970s.

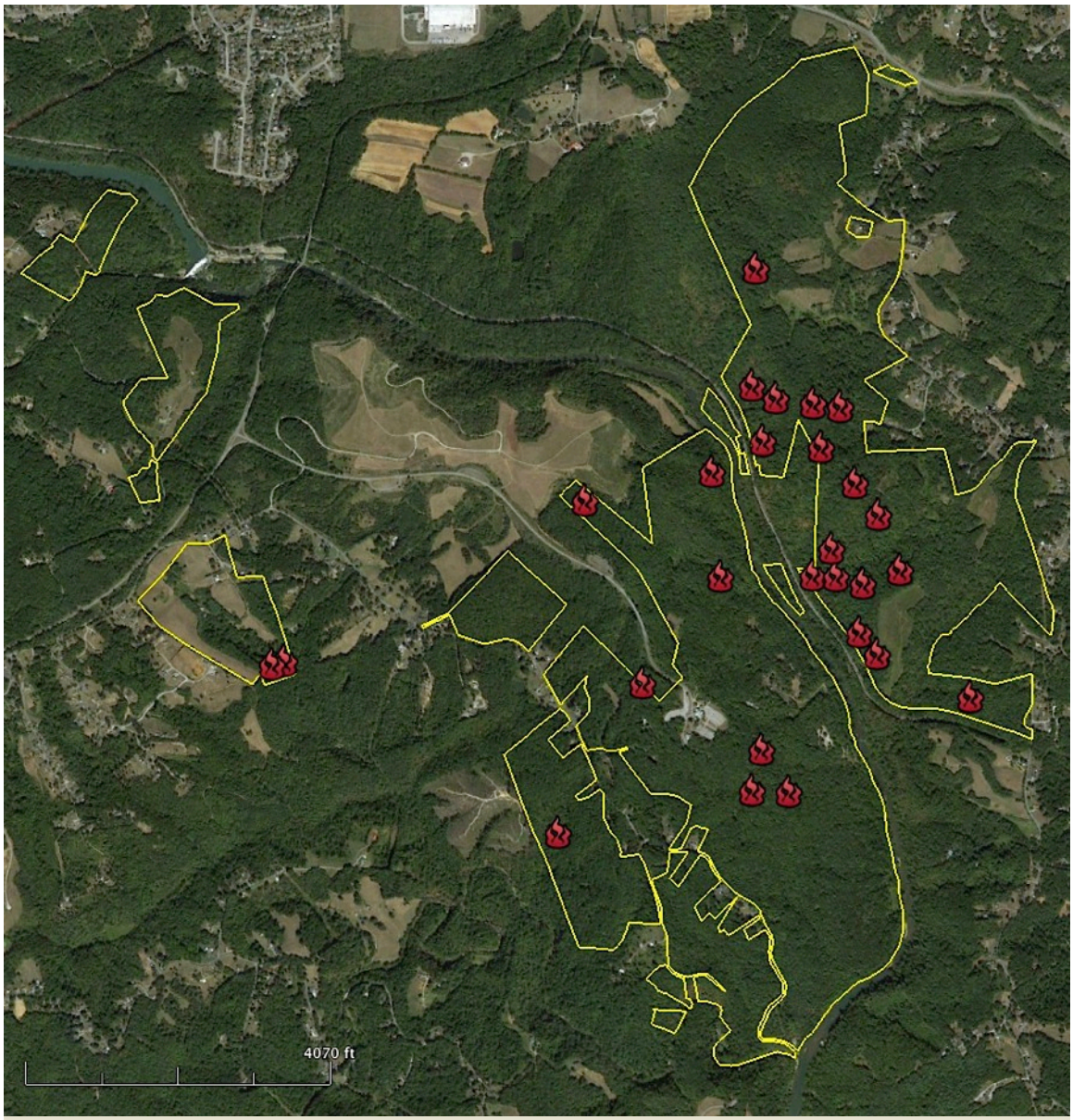
Extant Unmarked Buildings: Historic structures not indicated on WRT/ExP maps

Historic Building Sites: Sites where building no longer remains but traces of it exist.

Clearance Cairns: Stone heaps piled up during pasture clearing. Areas with multiple icons may contain a couple or a dozen cairns.

Stone Wall: Two short segments of wall occur in the Roanoke River floodplain and a longer segment occurs at the Chilhowee Homestead in Bedford.

Cultural Landscape of Explore Park



Locations showing evidence of historic fire in Explore Park:
These locations show historic forest fires in Explore Park identified by basal scars, coppiced trees, and/or charring. The Bedford fire was a single large fire covering the western portion of the Bedford section. It occurred 30-40 years ago (~1980); however, the steep slope along the river had a second previous fire 50 to 100 years ago. The fires in West Woods, Mayflower, and most of Roanoke North and South occurred 50 to 100 years ago. Most of these were identified from basal scarring on old beech trees. These fires could have occurred after the single wave of logging around 1900. An even older fire is evidenced on an old growth tulip tree. The fire in the narrow panhandle in North Roanoke occurred in 2015 (or 2014). It is the only recent fire.

Historic Fires in Explore Park

Special Places

Many of Explore Park's special places have been introduced and described earlier in this document. For example, the ecological communities show where the various forest types are. The old growth section describes those special trees. And the cultural landscape and land use history section describes those sites.

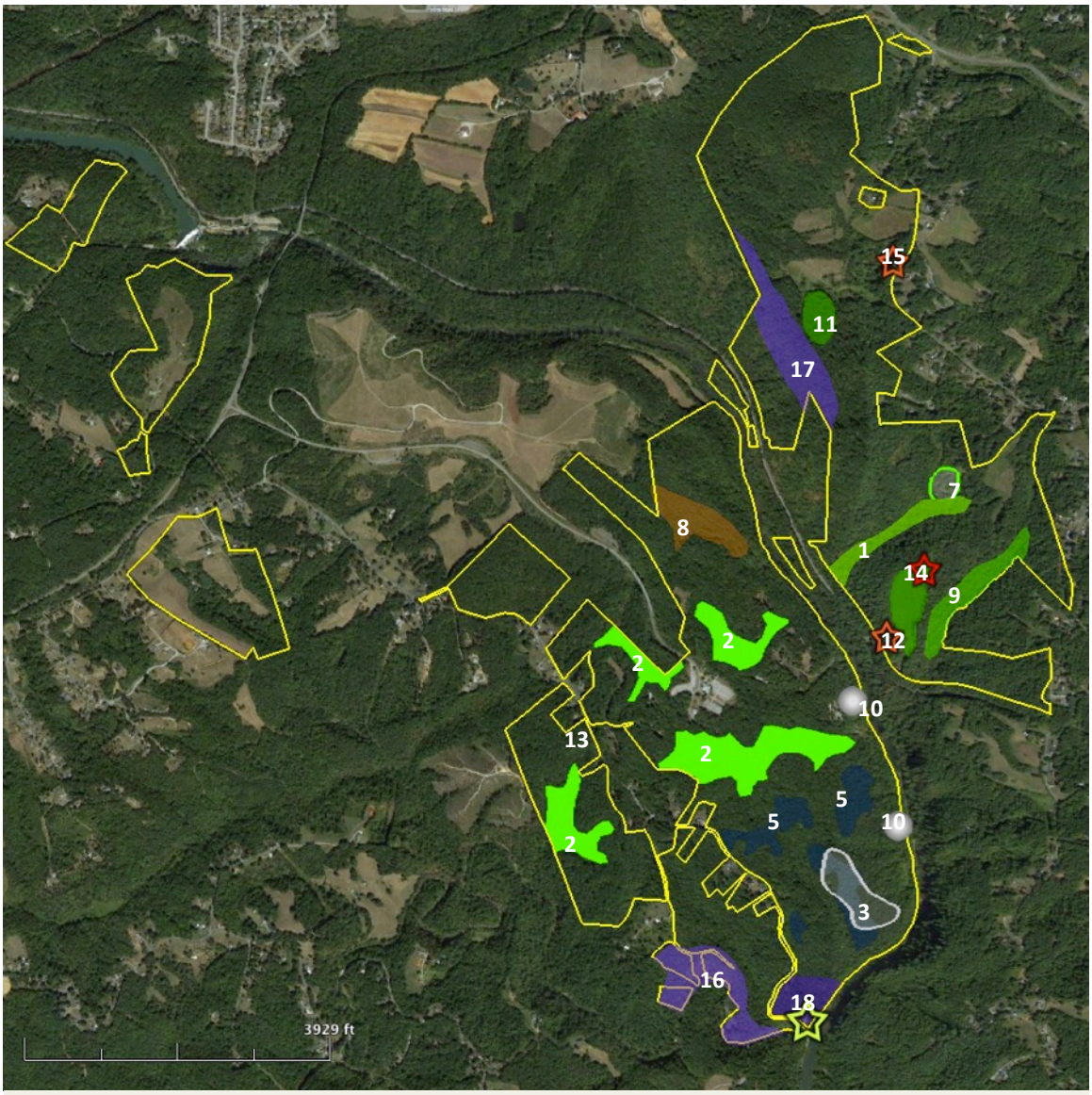
What follows is a listing and description of the best special places. These are the features you'll want to highlight, bring people to (unless noted otherwise), and possibly use as defining features of Explore Park. The first group includes Natural Features such as Chilhowee Creek Ravine, and Cove Forests. The second group includes features from the Cultural Landscape such as the Bedford Homestead and the stone walls. And the third group includes those spaces that are special not necessarily for their ecological, historical, or interpretive value, but just because they are scenic, quiet, or beautiful.

Some of these sites are very particular points on the ground, such as a stone wall, or a particular tree. Others are broader areas, of forest, of cultural landscape, or a stream bottom. It will be important in these areas to preserve what is there now by not over-developing or adding too much infrastructure.

Please also refer to the Special Places list created by Tara Poelzing. Her list takes in different sites than mine. Hers also contains a rare plant list, which is important and not incorporated into this report. Rare plants were not visible during my survey and also not the purpose of this inventory.

This group of special places is relative to the entire park and also my perspective (and biases). For example, in these 19 sites, none are listed from the Mayflower property. However, an entire day could be spent at Mayflower looking at successional forests, coppiced trees, and a pond. Mayflower even contains a small slice of cove forest, with a couple old growth beech trees. But because the other cove forests in the main park are so much larger and somewhat nicer, the Mayflower forest is not listed here. Every spot in Explore Park tells a story. Though this list tries to share the best sites, refer to the *Field Inventory* and the map of all 363 points to find special places that occur in any area of Explore Park.

A map follows with numbered features corresponding to numbered descriptions below.



Numbers refer to order listed in the pages to follow. 1) Chilhowee Creek Ravine; 2) Cove Forest; 3) Ancient Roanoke River Deposit; 4) Old Growth (not mapped); 5) Pine Ridges; 6) Rock outcrops (not mapped); 7) Bedford Homestead and Cellar Hole; 8)North Roanoke Farm; 9) Cairn Creek; 10) Roanoke Floodplain Stone Walls; 11) Woodland Pasture; 12) ~1980 Fire; 13) Coppiced Woods; 14) Mountain Meadows; 15) Bedford Basin Viewpoint; 16) Back Creek Area; 17) The Saddle; 18) Rutrough Point Confluence and Farm; 19) other places (not mapped); 20) Roanoke River (not mapped).

Top Special Places at Explore Park

1. Chilhowee Creek Ravine

Field Inventory Points: 270-275

This ravine in South Bedford is the most rugged, rocky, scenic ravine in Explore Park. For ease of description in this document, I called it Chilhowee Creek after the Chilhowee Group geologic layer that occurs here. On one geologic map, the rock type cuts right through the ravine. On another map, the rock type occurs slightly north of the ravine. The USGS does not name this creek.

Chilhowee Creek Ravine in green, with unmarked trail segments in brown.

The south slope contains Oak Dominated Forest and a number of rocky outcrops. Barbed wire can be found, indicating grazing above the creek and low slopes. Basal scars and charred wood, from the ~1980 fire, can be found throughout the southern slope and occasionally on the northern slope. The northern slope was partially pastured and contains stands of tulip poplar and other mixed successional woods. There are patches of dense exotics.

But it is the stream bottom that is most impressive. Large boulders and tall rocky outcrops line the stream. A few rolling waterfalls and small plunges add to the soundscape. The stream is the largest tributary in Explore Park (except for Back Creek). It's unclear weather it flows consistently year round, or if it at times it dries up. The culvert at the bottom going under the rail tracks is undersized and sediment deposits and show it plugs up, and then cut back down.

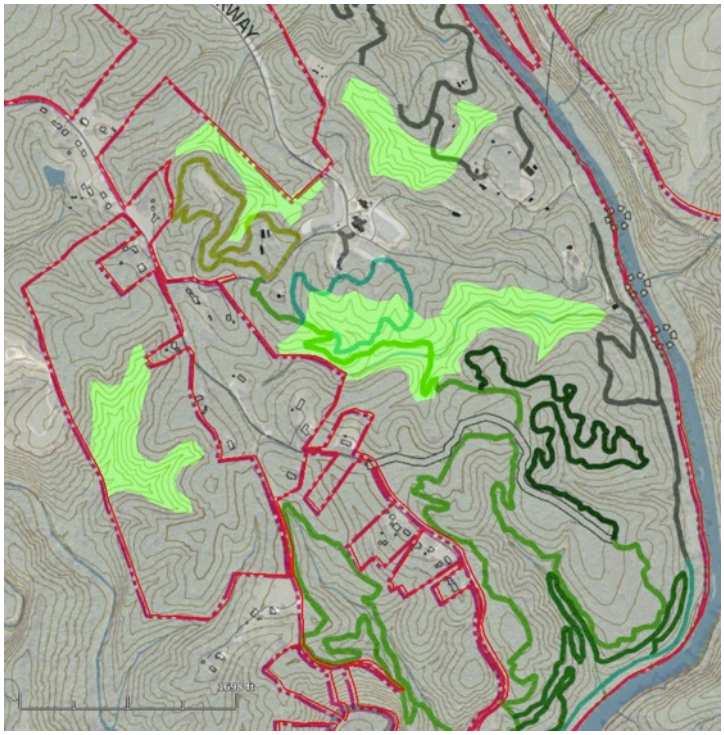
A nice farm trail is cut on

the slope north of the stream. The trail ultimately comes from the homestead also described in the Special Places. The path could be repurposed to hold an excellent trail on gentle grade. The trail right now is 0.4 miles long and is shown on the map. From the terminus above the tracks it could continue in one of several directions.

2. Cove Forests

Field Inventory Points: 113-118; 27-28a; 342-344; 204; 206; 361-363; 48-53; 71

The Cove Forests are described in detail in the Natural Communities section. They're listed here because the forests are, at times, of such good quality and beauty that they rank as one of the best features in Explore Park.



Cove Forest sites shown in green on a topographic and trail map. Other cove forests occur; see the Natural Communities section for maps and descriptions.

The Cove Forests are the richest and most diverse forests in Explore Park. Especially the coves mapped here in the West Woods, the Main Ravine, and the cove below the church, the old trees and diverse stands offer much scenic and ecological value to Explore Park. Old growth beech trees are common, old growth chestnut oaks are occasional, and exotic plants are almost nonexistent. Maidenhair fern was seen in several areas indicating rich soils. Cucumber magnolia was found a few times. A spring botanical assessment should be done to document ephemeral forest plants.

The Main Ravine already has a nice trail in the cove forest with scenic crossing points at stone outcrops. A trail down the lower section of that ravine could compliment. If the west woods were to have trails, be aware that trails near the old growth beech trees will desecrate the trees with carvings. Keep any trails away from those trees.

3. Ancient Roanoke River Deposit

Field Inventory Points: 212-216

This is the most interesting geological feature I found in Explore Park. It captures a fascinating, yet not completely understood, story of landscape development dating back several million years. The features occur in Roanoke South, on the broad pine-dominated ridge. The map here shows the minimal extent of the feature – it may extend beyond these bounds.

The 5-10 acre area contains river gravels consisting of small stones up to cobbles at 10 inches in diameter. The stones occur in the woods, but are most apparent where they have been exposed by the bike trail. Photos are below showing various sized stones.

Because the stones are rounded, we know they have been worked by river water. We call such stones *fluvial*. That they are left here we call it a *deposit*. And because these stones occur far away from the river, in this case up to 1500 feet horizontally and 210 feet vertically away from the existing Roanoke River, we call them *stranded*. Thus we have a *stranded fluvial deposit*. Had I been in a glacial landscape, I would not have thought twice about these stones. But in unglaciated Virginia, seeing river stones high above the Roanoke struck me as interesting. They had to date from a time when the river was at this higher level.

I contacted Dr. Philip Prince at Virginia Tech who is a researcher in geomorphology and ancient river dynamics. Dr. Prince kindly replied via email:

> "You have found deposits that relate to a pre-incision period of the Roanoke's history, but the driving force of the incision is unclear. Age of these deposits is entirely unconstrained... incision rates in our area are typically measured at ~20-100 m/million yr. Simple arithmetic thus puts your gravels at "a few million years old," although more and more folks suggest they might be Plio-pleistocene in age or even younger due to the likelihood of strong climate control. Indeed, large debris flows were frequent and numerous in this area from the late Tertiary (??) to Pleistocene, and would have worked to "flood" river systems with tremendous amounts of sediment.

Basically, a few million years ago, the Roanoke River was higher on the landscape than it is today. The river has incised since then, cutting into the hard basement rocks of the Blue Ridge. The reasons for the incision are unclear. Dr. Prince speculated two possibilities: that incision of the river downstream would cause more rapid incision of the Roanoke in the upstream sections. Or, uplift of the entire region relative to sea level would cause the stream to incise more quickly. Regardless, the different environmental conditions during the Pleistocene, including likely greater precipitation and different vegetation (less forest) would create different flows in the river.

Most people will not notice the stones in this area. Most people will not know the significance of landscape history that these cobbles showcase. It may be Explore Park's responsibility to interpret this site either through direct education, interpretive signage, or some other creative way for people to have their minds opened to the dynamic landscape of Roanoke County.

4. Old Growth Trees

Field Inventory Points: at large; see Field Inventory or Old Growth section in the Vegetation Inventory

I find a lot of old growth trees in my work. People are always surprised and excited to learn they have trees over 200 years on their property. Most people assume that 1) all trees were cut in the early days of American history; and 2) eastern trees don't live that long. Neither are true.

An old growth tulip tree in Roanoke North. The tree is hollow as most ancient tulip trees are. The age is not known but estimated at 300 years. A second ancient tulip tree occurs in Explore Park.

Pockets of old growth trees and forest typically occur in remote mountain areas, on steep slopes, and in swamps. But many ancient trees remain in settled areas. Settlers did not sweep through the landscape and chop every tree. They worked the land as their needs demanded, grazing as many animals as they could, cutting trees as they needed to or as markets demanded. Consequently, trees remained, especially on a landowner's steep slopes and remote areas, and trees of poor form or undesirable species.

Old growth has been described more thoroughly in the vegetation inventory section of this document. That summary contains a map of all ancient trees found by species and also a table of species found an notes on their ages. I found over 40 trees from 7 species in Explore Park with most in the cove forests and oak dominated forests. As noted, the most significant tree found is a black gum in North Bedford. The tree has exfoliating bark and canopy branches suggesting great age. I cored the 25.5 inch diameter tree and pulled a core 4.25 inches long containing ~200 rings (years). This missing 8 inches of core (the tree is hollow) should contain an additional 300 to 400 rings giving an age of 500 to 600 years. Black gum in New Hampshire has been documented to 695 years, and growing. The species is the longest-lived deciduous tree in North America.

It might be best not to broadcast the uniqueness of this tree too broadly. It is a sensitive site. I suggest not coring the tree again either, as the hollow trunk is full of water. The

loss of that water would eliminate the anoxic environment in the trunk and encourage rot.

The old growth beech trees (cored and confirmed to 280 years), while relatively common in Explore Park, are vulnerable to people carving names in the bark. The two ancient tulip poplars, in Roanoke North and South, might be the best trees to bring trails to. The trees are hollow, but healthy, and can tolerate visitation. They are impressive in size, unlike most of the beech trees or oaks. See the old growth section for additional detail. Let Explore Park's ancient trees be an identifying feature of the park's history and ecology.

The 4.25 inch core from the ancient Black Gum in Explore Park. The core yielded ~200 rings. The purple color is from a mixture of phloroglucinol and hydrochloric acid used to make the rings more distinct.

5. Pine Ridges

Field Inventory Points: numerous, see map for locations.

The pine ridges are interesting because they showcase the rapid transition from deciduous forest, and cove forest, to drier pine dominated ridges. The change is driven by topography and the dry conditions created on ridges compared to slopes and coves. Ecologically, these ridges are not especially rare or uncommon, however, they create a much different feel, sound, and smell than the deciduous woods and are therefore listed as a special place.

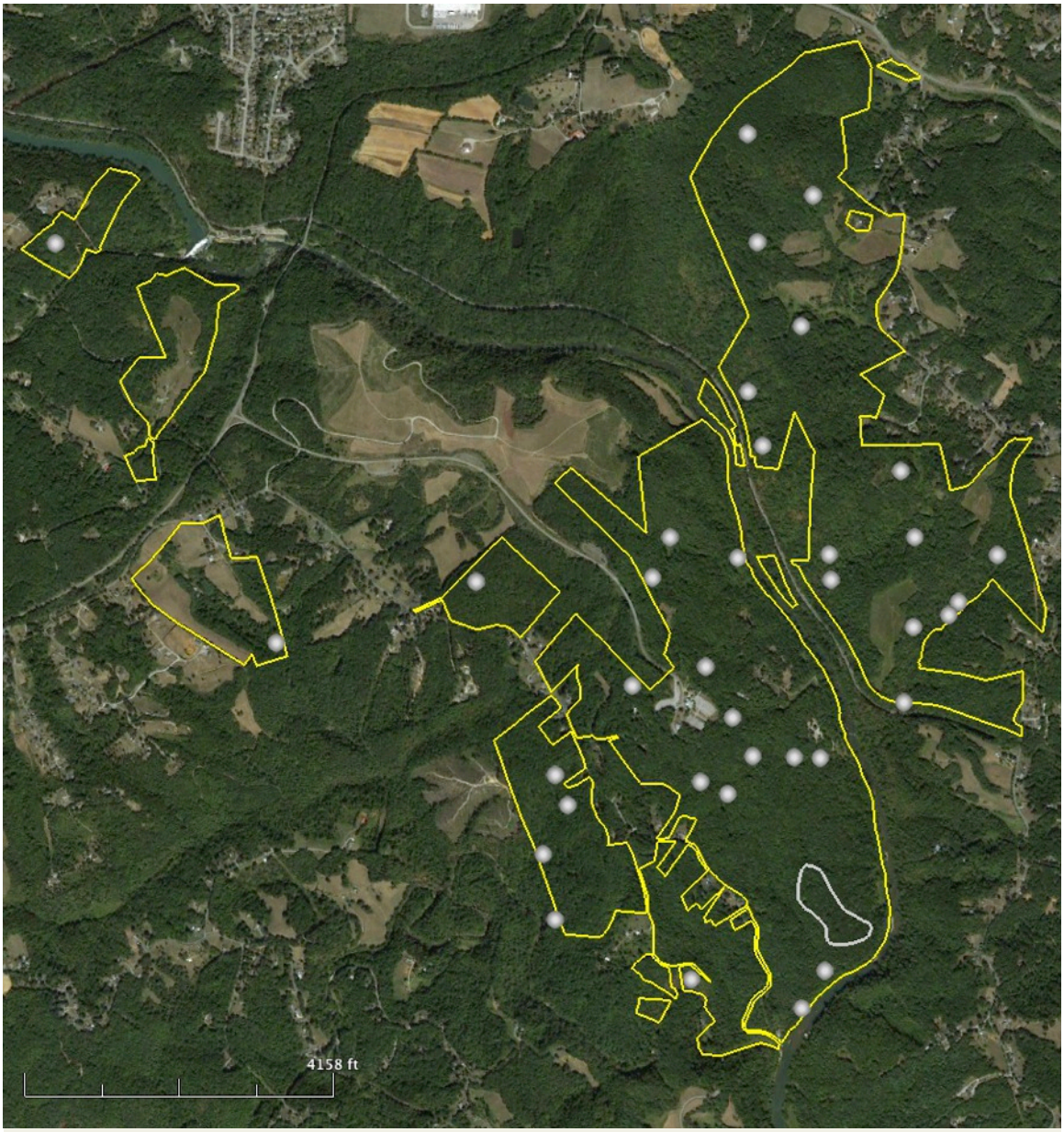
The Pine Dominated Ridges are described in detail in the Natural Communities Inventory. Of note, are the older stands and the one group with pitch pine. Pitch pine is a dry-site, fire dependent species the presence of which indicates those conditions.

The long Pine Ridge in the South Roanoke section that contains an old road (the road went to settlement at river's edge) is the most significant dry pine ridge. The ridge currently contains nice trail alignments that capture the sites. Other trails in pines capture those areas. In general, the pine ridges have a lot of access and can tolerate it.

Pitch pine in Explore Park seen here with epicormic buds (needles). The tree has buds hidden below the bark that sprout prolifically after fires.

6. Rocky Outcrops

Field Inventory Points: At large; see *Field Inventory*, Geology column.



Locations of Rock Outcrops and Boulders in Explore Park: This map shows the locations identified in the *Field Inventory* having rocky outcrops. Refer to the *Field Inventory* for details on each in the Geological Features column. It is likely that areas with clusters of outcrops have several more, so this data should be a guide only. The drawn oval in South Roanoke shows the area with abundant river cobbles from the Ancient Roanoke. These site are listed because rock outcrops add considerable scenic value to trails and the park experience.

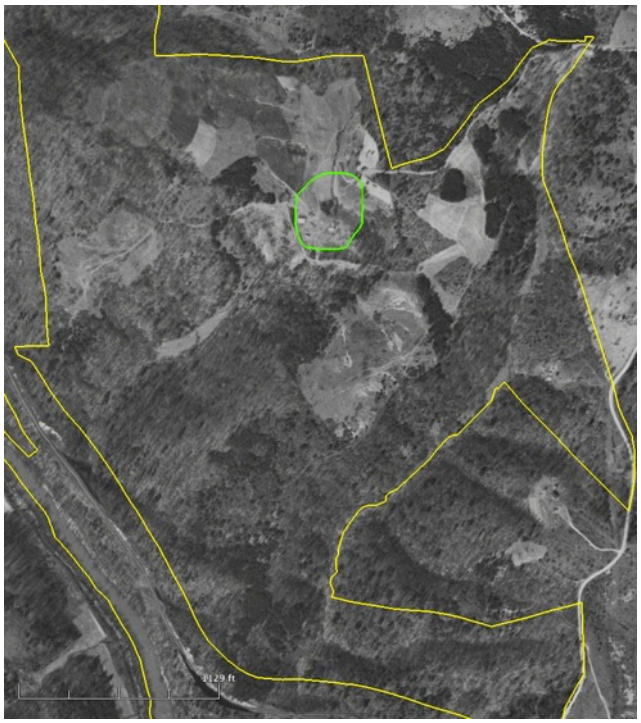
Rock Outcrops and Features

7. South Bedford Homestead and Cellar Hole

Field Inventory Points: 265-268; 276

The South Bedford Homestead is the best and most involved old settlement site in Explore Park. The features in this site include:

- A stone cellar hole with yucca (see photo)
- A clapboard house with stone fireplace (see photo)
- Stone walls, clearance cairns, and other stone work possibly for a sluice on Chilhowee Creek
- Vegetation and trees showcasing land use history



The South Bedford Homestead *ca*. 1949. The structures are not visible; see Appendix D for close up. Note the amount of clearing to the west up the slopes of Pine Mt.

The cellar hole occurs in the north of the site. A red cedar emerges from the edge and yucca surrounds the north edge. It is not clear what structure was here. The cellar suggests the inhabitants were storing root vegetables as this was typically the purpose for a labor-intensive cellar. I don't recall seeing a chimney (it would have been collapsed). In New England, the lack of a chimney suggests the house was built after the 1830s as this is when wood stoves came into prevalence and large stone chimneys were no longer necessary. I don't know if this holds true in Virginia.

Across the stream is the second house. It is wood clapboard and missing doors and is in poor condition. I did not note if it had a cellar (I don't think so), but it does have a large fireplace. I did not explore the inside.

The ravine, which occurs between the two house sites, is narrow and deep. The stream has a series of plunges. The edges of the stream have dry stacked

stone wall for about 140 feet. Edges around the house contain clearance cairns and stonework along built up edges of the trails that go to the creek.

Section of overgrown stone wall along Chilhowee Creek near the homesteads. The purpose of the wall is unclear, but could have been a fence for keeping animals, or could have held a sluice. An expert in such things should be retained.

The site should be interpreted by someone with a background in early Virginia settlements. Historical research could be done to find out who lived here, when, for how long, and what they did. Much of the last question is clear from the landscape, but there is much to learn from this site that could be shared with park users about their living history. This site could have very high quality interpretation once some of these historical questions have answers.

In the short term, the stonework could have the trees and vegetation removed. Trees growing and falling on stone work will ruin it.

As a recreational space it will be important not only to interpret it, but also to prevent it from trampling and abuse. It will also be a delicate area for park planning as modern infrastructure will alter the character of the site. The area could be used as a hub – as a launching point for adventures into Chilhowee Creek Ravine, up to Pine Mt and the Saddle, and into the Mountain Meadows. For generations this homestead served people in such a way.

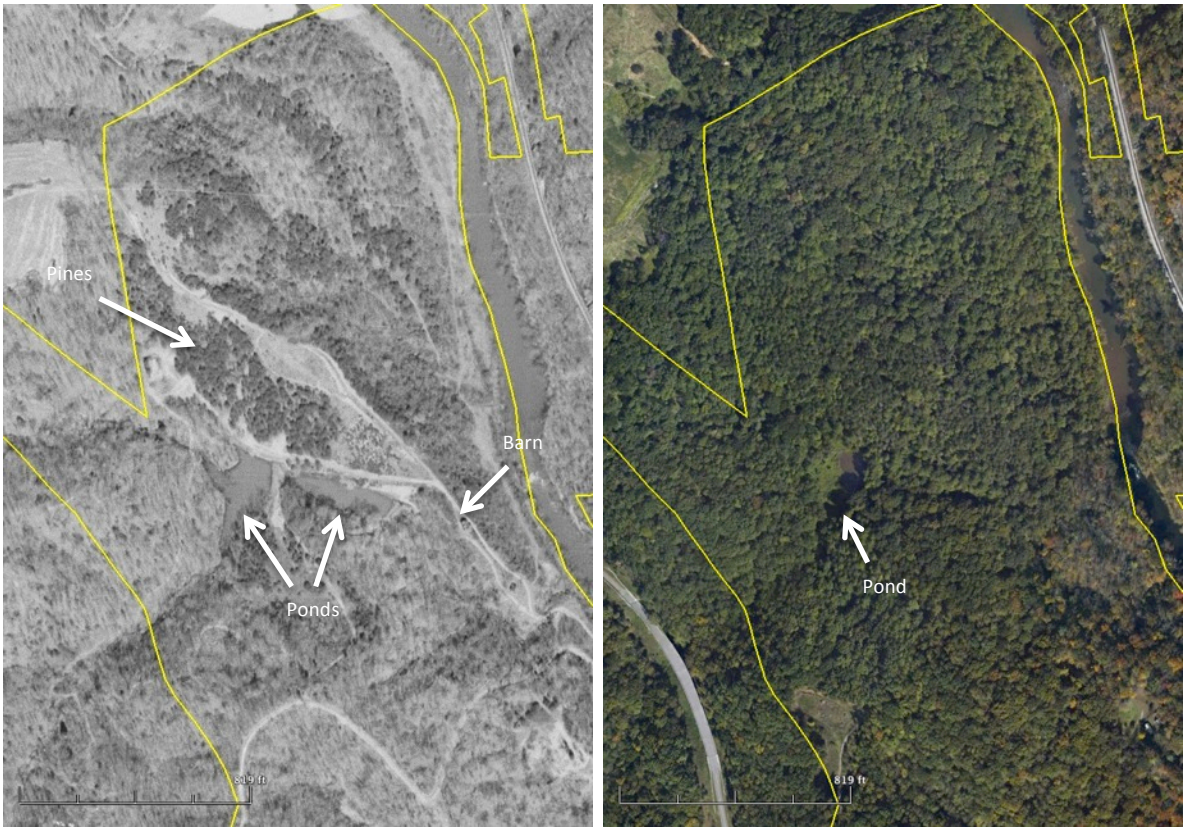
The Cellar Hole at South Bedford Homestead.

8. North Roanoke Farm

Field Inventory Points: 87-93; 111

The North Roanoke Farm contains a number of land use legacies that together make this an excellent site for land use history interpretation. The site is broad and encompassing. The main features of the site include:

- Successional pine old field dating to 1930/40s
- Standing barn
- A pond/wetland (reduced size) and the remains of a dam from a second pond
- A Post Oak legacy tree
- Old farm roads



The North Roanoke Farm *ca.* 1962 (left) and 2012 (right). Notice the two ponds in 1962 and the shrunken size of the pond today. Also note the successional pine field. A detail of the historical image is in Appendix D.

Like the Bedford Homestead, it is unclear who farmed this, when and for how long. However, some fields were abandoned in the 1930s and the remainder was largely discontinued by the 1970s. It must have reached peak clearing in the 1920s as no trees are older than this in the former cleared areas. The ponds were not built until the 1950s, and the east pond had breached by the 1980s. The west pond, today called Palmer

Pond, is increasingly looking more like a wetland than a pond as its dam has breached. Succession continues and nature reclaims the land.

It appears the farm was a part of a larger holding occurring to the north. I did not find a farm house site. It appears the residence might have been north, off Explore Park property.

A small barn stands in the woods (see photo) and the remains of a second structure occurs in the thickets down slope from the barn. The barn lies on the ridge surrounded by black cherry trees. A farm road leads up the ridge where it passes a large old post oak that formerly grew in the pastures. It is now surrounded by successional pine (shortleaf and Virginia). There is a maze of old farm roads around here. It appears the owner had a bulldozer and a lot of time on his hands.

The pond is a lovely, quiet spot that should be accessible. The pond is much smaller than it was in 1962 or anytime since. The dam has breached and the level is quite low. Marginal vegetation has taken root around the edges. The edges will succeed to forest without management. The pond is undoubtedly a wildlife hot spot in Explore Park. Despite its history, it should be treated as a sensitive site.

9. Cairn Creek

Field Inventory Points: 239-244

Cairn Creek is the other large drainage on the Bedford side of Explore Park (the first being Chilhowee Creek). It is unnamed on USGS maps. I refer to it here as Cairn Creek because the area shown in green on the map contains dozens of clearance cairns from the agricultural days. The creek has additional virtues in being steep, deep, and scenic. These are described below.

Explore Park owns only the north side of the stream over much of the ravine. The two panhandle areas on the south side contain oak forest and mountain laurel with pines. The lowest portion of the creek contains nice forest, rocks, and it is very deep and steep.

The main section, shown on the map in green, is steep, rocky, and contains the clearance cairns. The vegetation indicates old pasture or pasture woodland. Tulip poplar is dominant as a successional tree and there are dense patches of exotics. But there are also some large musclewood trees, post oaks, and other trees that stood as open pasture trees decades or 100 years ago.

The most interesting feature, however, are the cairns. Clearance cairns are stone heaps and piles of stone, often placed on a large unmovable stone, to rid a field of rocks. In this case, the slope was (still is) very rocky and whoever was farming the area was increasing the quality of the pasture by clearing the stones. Once in piles the stones are sometimes hauled away for use as building material or something else. Clearance cairns are found all over the would in mountain landscaped where animal grazing meets rocky terrain. They are particularly common in northern Europe and

The lower reach of Cairn Creek is deep, steep, and scenic.

Scotland where poorer people were working small parcels. Perhaps the settler of this property in Explore Park was of Scottish or northern European descent.

In addition to the cairns, the entire slope is rocky with large boulders and bedrock outcrops. It is weedy but also scenic. Weaving a trail through this area among the rocks and cairns is strongly encouraged. There are other clearance cairns in Explore Park, but the concentration of them here sets this area apart.

One of many clearance cairns on the steep, rocky north slope in Cairn Creek.

10. Roanoke River Walls

Field Inventory Points: 137; 223

The two grey dots show the locations of stone walls. Point 137 is north and 223 is south.

Though Explore Park contains a number of historic settlement areas, and many slopes contain abundant rock, there are few stone walls. This description describes two walls along the Roanoke Floodplain. These are the only stone walls found Explore Park outside the Bedford Homestead (see above).

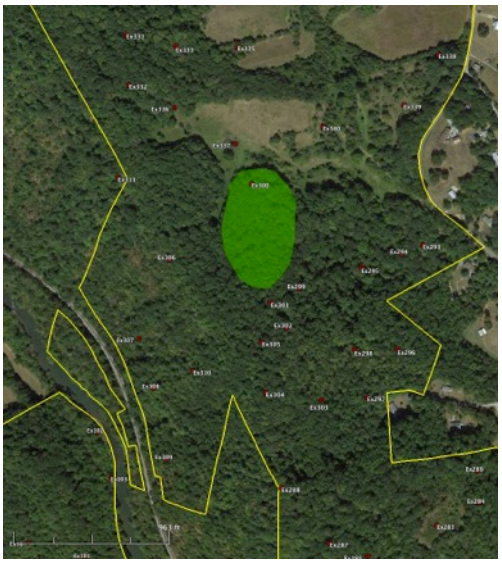
The two walls are short sections amounting to 15 feet (point 137) and 60 feet (point 223). Typically stone walls are built as fences for keeping animals in or out of an area. But when barbed wire was introduced and popularized in the 1880s the need for stone fences diminished. Because this area was settled so late, and because the wall sections are so short, it is unlikely that these walls served as fences.

Though the walls do not show up on historical aerial photographs, the GPS points occur on the edges of crop fields. Typically when stones are moved from a farm field they are dumped, not stacked. These walls are stacked, so considering the labor invested, it seems they had a purpose. Perhaps the builder had a lot of time on their hands and appreciated a good wall.

Regardless of the purpose, it is worth sharing these walls. Slightly south of the wall at point 137 are the remains of an old road or path. It is stone lined. The origin or age of this original road should be determined. It could originally have been Native American.

11. Bedford Woodland Pasture

Field Inventory Points: 300; additional sites at 338, 293.



One of the myths of settlement history is that forests were cleared to make pasture. Certainly that was true, but most domestic animals were sent to the forests to graze. Over time, the animals would clear out the understory and only the larger canopy trees were left. As these died, or animals girdled them, or the farmer cut them, the land was ever so slowly cleared and opened. But woodland grazing was exceptionally common.

The structure of these areas – big trees, open understory – is often described as a “park” or “park-like” and many open forest regions were named as such by early settlers (Oak Park, Manassas Park, etc.). Much of this was a result of Native American burning which creates this structure. The park-like notion originates in England where royal deer parks, for exclusive use of royal hunting parties, had that open structure. As England became more democratic, and pressure for public space in industrial areas increased, the old royal parks because more and more public. And the notion of a “park” as having that forest structure was sealed.

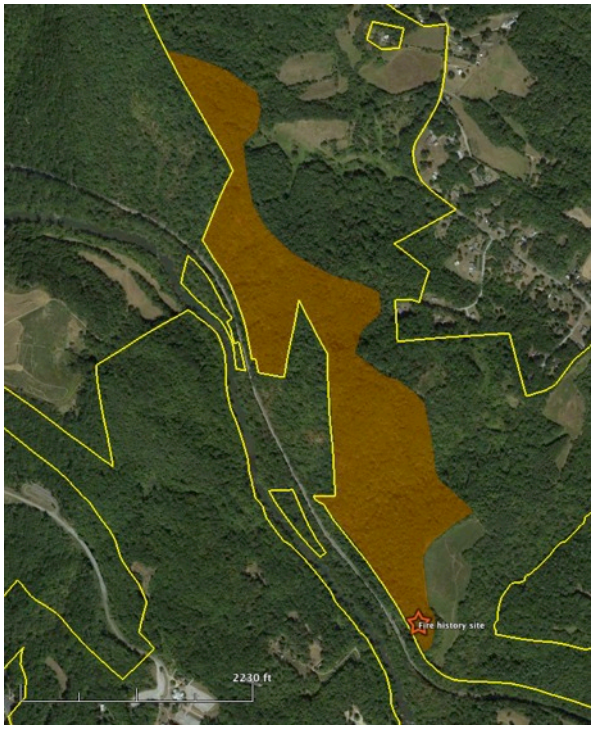
At Explore Park, this small area was recently grazed and is therefore more open. But much of Explore Park historically was like this. I identified old woodland pasture as having occurred in most of the Bedford Forests, and some other areas. They can be identified today by looking at the sizing and spacing of trees, and at their canopy branches (they reach out). Oaks will be common. The understory looks young and there is a large gap in ages of trees from the canopy (150 to 200 years) to the understory (40 years or less).

Woodland Pasture is a landscape aesthetic that many people enjoy. The woodland will need to be managed or it will grow up into a dense understory. Fire is a good tool for managing woodlands. Trails are encouraged.

12. Bedford Fire

Field Inventory Points: numerous in 260s, 270s, 280s, 300s, 310s; see *Field Inventory* Forest Features column

In the cultural landscape section, I discussed the role of fire in shaping the landscape at Explore Park. The section includes a map showing all the locations I found evidence of fire, from old fires ~100 years ago, to a recent fire in 2015. This piece describes a single site in South Bedford because it is excellent as an educational site for interpreting fire and a landscape shaping disturbance. However, there are many sites in Explore Park for teaching about this fundamental landscape process.



The site described here is in the bottom marked with a star. The orange polygon is the minimum extent of the fire in the 1980s. The neighbor in the north (Hammond) may know when the exact year.

The site and its coordinates is listed in *Field Inventory* spreadsheet (site 258 and 259). Upon entering the site the following features come into view:

- Basal scars on all the larger trees and some smaller trees
- Charred wood on the ground
- Stumps without charring
- Dense stands of small diameter trees (mostly tulip tree)

Basal scars on large trees caused by ~1980 fire. Young growth surrounding it emerged after the fire.

Basal scars (see photo below) form as fire burns the fuel pocket formed on the uphill side of the tree. The bark is initially charred, but underneath, the sap boils and kills that portion of the tree. In time, rot ensues, and the basal scar develops. After a few years, there will be no charring on the tree.

Charred wood can be found on the ground. Rub it with a finger and if your finger turns black it is char; if not it is a fungus and not fire related. Charred wood will persist in the forest for decades.

The stumps on this site are from oak trees that had to be cut after the fire. If the stumps were present before the fire, we would see charring on the stumps, and we don't see that. It is possible that these oaks were killed by the fire and then salvage logged shortly thereafter. Logging activity can also cause basal scars on other trees from skidding the logs, but we know the scars are from fire because they are all on the uphill sides and because of the charred wood.

The last feature is the dense stands of young trees. These are mostly tulip polar and other early successional trees. It is hard to know exactly if these young trees came in immediately after the fire, or after the logging. We could look for coppiced trees, but we wouldn't necessarily know if the small coppice was caused by the fire or the logging. By coring a coppiced tree we could get the age of one of the two events. By coring the dense young growth trees we could get an age on those and we'd know the fire had to occur before that time.

I was unable to get a good core from this site. But I estimate the fire occurred in the early 1980s (or late 1970s) based on the growth of the young trees and the conditions of the basal scars. I think one could pin down the exact years of all the events. Or there may be some local knowledge of when the fire occurred. More than one fire has occurred but this one appears to be consistent in the orange are a mapped above.

There is also a clearance cairn at this site probably with stones taken from the open meadow adjacent. The spacing of the large trees suggests it was woodland pasture before or at the time of the fire.

This is a great site for interpreting evidence of fire. However, there are many fire sites in Explore Park. Refer to the fire description in the Land Use History section and map, and also the *Field Inventory* spreadsheet for more details.

One of several oak stumps at the fire site. Because the stump has no charring on it, we know the cutting of the tree happened after the fire. Also not the large tree with basal scar in the background. And also the young growth mixed in.

13. Coppiced Woods

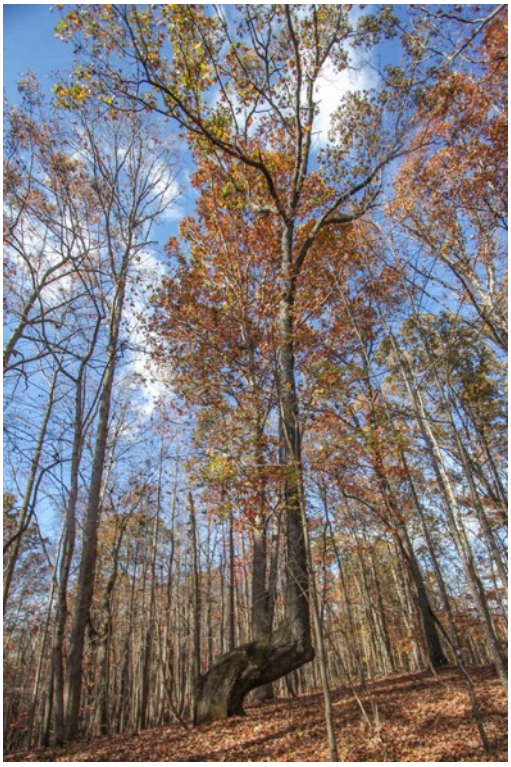
Field Inventory Points: 47

As noted in the land use history section, it appears a single wave of widespread logging went through the Roanoke side of Explore Park about 100 years ago. Evidence for this comes from coppiced trees. The lack of evidence, in the form of stumps and younger coppiced trees that do not occur indicates a lack of widespread cutting more recently. Smaller cuts occurred, such as around the edges of the Mountain Meadows (~1980) and also at the top of the Forester's Trail (mid-1990s), but no widespread logging events occurred.

Coppicing is a tree's adaptation to disturbance. Fire, windfall, and browsing by animals are the main disturbing agents over evolutionary time. Most eastern deciduous trees have small, hidden epicormic buds below the bark surface and these can sprout if the tree is injured or if a shaded tree is exposed to sun. With one exception, conifers (pines) in eastern forests do not coppice. The exception is pitch pine, which is a very dry sited, fire-adapted species that can resprout after cutting or fire. (See the photo of pitch pine above in this section.)

On the edge of the West Woods very near Rutrough Road is a site with a number of coppiced trees. This is the best site with easiest access for observing that wave of logging 100 years ago. Several white oaks and pignut hickories have two trunks showing disturbance. I cored 4 of these trees and got ages of ~100 years indicating the age of the cutting. (The site also contains metal debris and other dumped junk).

The site also has what looks like a "pointer



The red oak “pointer” tree.

tree.” It is a red oak (could be black or scarlet oak) with a side that is bent at horizontal and “pointing” to the east. Native Americans often made such trees to point at and guide people to significant places. But I think this pointer tree was collateral damage from the logging event. It must have been trampled, or a cut tree fell on it, bending it over. A side branch shot skyward, and the previous top eventually died back to the stubby pointer. By coring the shoot, once could accurately date the time when it was bent over.

Lots of other coppiced oaks and hickories occur in the West Woods and elsewhere in the main part of Explore Park. Most of these date to the same wave of cutting. The coppiced tulip trees, however, mainly found on the slopes along the Roanoke River, are from a later cutting. I was unable to pin down exactly when that was.

Better examples of coppiced trees from the Oak Forest. These chestnut oaks were cut around the same time ~100 years ago.

14. Mountain Meadows

Field Inventory Points: 255, 256

Here lies the best view in the park: From the Bedford meadows south to the Blue Ridge and beyond. Accompanying the view, there is a small bit of history and geography.

In Bedford South there is an upper field (mostly without views) and a lower field with the awesome views. In between is a flat area with dense Virginia pines. The pines are 60 years old initiating in the 1950s. A debris pile at the east end of the pines is all that remains of a sawmill. A neighbor informed me of this.

According to old aerial photos, in the early 1960s what are open fields today was young woods. The meadows were reopened in the late 1960s and the field shape has been in place for the last 50 years. The meadows have gone through various stages of land use.

Nonetheless, today it is the view that counts here. Almost due south, about 3 miles away is Lynville Mountain, with Chestnut Level and Panther Knob. Slightly to the west and much more distant at 13 miles appears to be Cahas Mountain. The best views are at the top of the meadow as you exit the pines. At that point there are a number of sawtooth oaks planted along the edge. The trees are exotic, from east Asia, but do not seem to be reproducing. They are planted for wildlife. Ailanthus occurs on the edges.

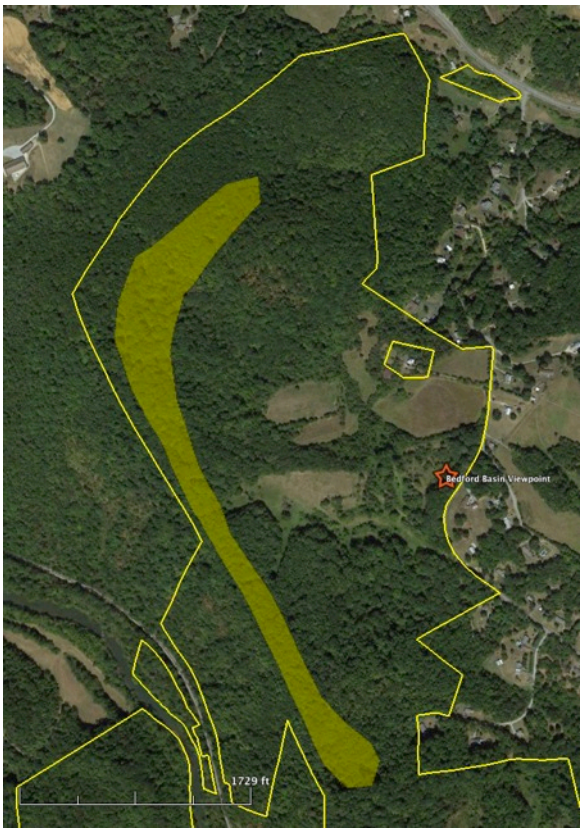
This is a very special place that people are going to love spending time in.

The view from lower down in the fields changes. More depth is added from the trees, but some of the distance is lost.

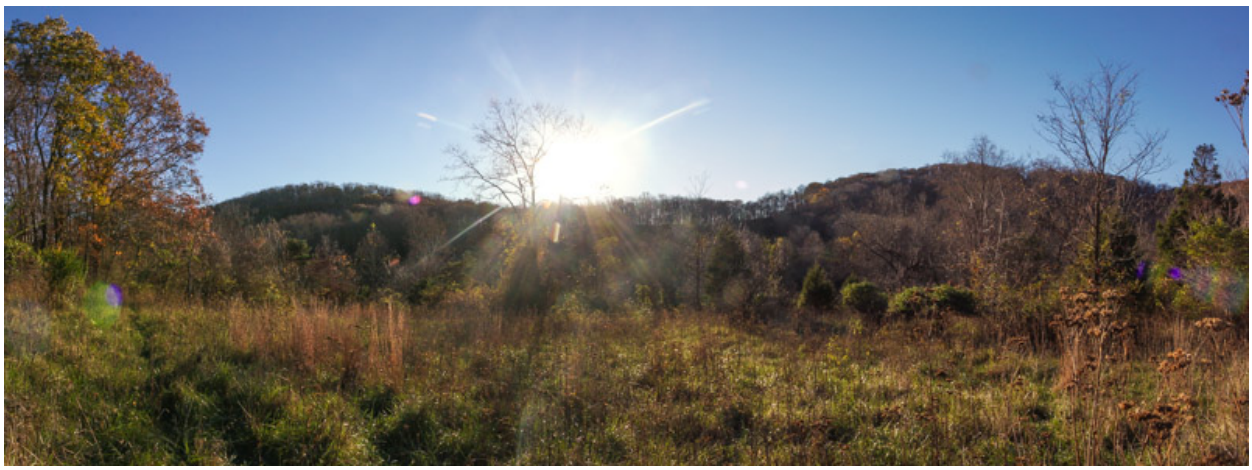
15. North Bedford Basin

Field Inventory Points: 339

This site occurs in North Bedford in the weedy pasture east of the farm compound. Currently the site provides nice partial views of the hills surrounding the North Bedford settlement areas. The views run from Pine Mountain in the south, to the Saddle in the west, the Explore Park high point in the northwest, to unnamed (Oak) hill in the north. This could be a good place to build a building with nice views, or some other amenity for which a broad panorama was desired. There is little vegetation in the immediate area to worry about, but some nice cedars occur.



View of the Bedford Basin. Red star shows the view site while the yellow polygon shows the ridge crest captured in the view.



Panorama View at the Bedford Bowl. The hill at left is Pine Mountain. The Saddle occurs below the sun and the Explore Park High Point occurs at right. There is one more hill farther right and not shown here.

16. Back Creek Area

Field Inventory Points: 160-173

The Back Creek area in the southern reach of the park is a scenic place with some interesting features and also some obvious challenges. On the positive side are its steep slopes, views above the park's only mid-sized stream, rocky out crops, and more. It's challenges lies in the fragmented ownership, steep slopes, and exotic plants.

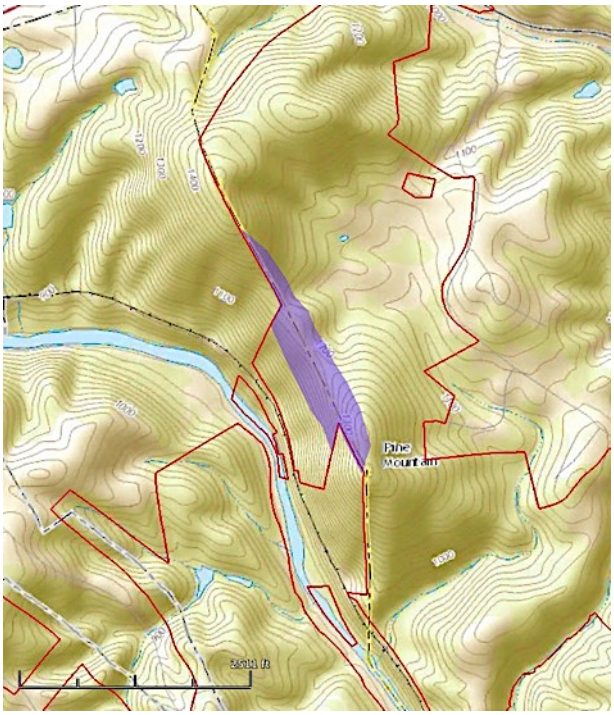
The existing trail that traverses the top of the ridge is nice and catches a few small views of the creek. It could be possible to weave a hike only trail down closer to the stream to catch some of the rock features and Back Creek. Fishermen might appreciate such a trail too if there is good access.

The area surprised me in the level of exotics and disturbance it had. Typically, very steep slopes are the least disturbed. It is however, the only place in the park to find Rhododendron and the slope does contain a couple very large shortleaf pines.

Looking downstream at Back Creek. The photo was shot the day after an inch of rain so the stream is high. Note the vines: bittersweet and Japanese honeysuckle. Back Creek is a cool area that people will like to explore. Fragmented property is the main challenge.

17. The Saddle

Field Inventory Points: 304-311



The Saddle area – that low ridge between the high points of Pine Mountain and the Park High Point – is a spot with enormous potential. It's also delicate because seen from the Roanoke side of the river, the ridge is scenic unbroken backdrop. But standing on the Saddle, the south to west views, made more dramatic by the very steep slope below, beckon for visitor interaction.

The Saddle area itself – the flat, low ridge – is an old disturbed pasture or pasture woodland. It is nice with mixed successional trees including black cherry and others, but in general it is ecologically commonplace. The steep slope below is more interesting. It's dominated by oak, hickory, and a host of other trees. Evidence of the ~1980 fire is abundant with basal scars on most mature trees. Charring on downed wood is common. And it is being invaded by native red maple, a common phenomenon in dry eastern forests. It would benefit from another fire. The slope is also rocky with some excellent outcrops and nice quiet places to sit and watch the river below.

The Saddle can easily be accessed by an old farm grade coming from the east. It is gentle and could be repurposed to an ADA grade (I think..?). From the Saddle area, faint old trails head up to the high points to the north and south.

One idea would be to build a skywalk structure, taking advantage of the steep slope below. Other similar structures include the Stegastein Viewpoint in Aurland, Norway, the Kinzua Skywalk in Pennsylvania, or the Canopy Tree Walk at Bernhiem Forest, Kentucky. A structure at the Saddle could be simpler and less dramatic than these examples. But the point is the site lends itself to such a feature, except for how such a structure would affect the view of the ridgeline from the Roanoke side.

If not a structure, by clearing just a few trees, a view can be opened, a grassy meadow maintained, benches installed, and people will flock to the site for sunset.

View from The Saddle. Notice the weedy, early successional nature of the forest. But also notice the view potential beyond. The slope drops off quite steeply beyond the foreground.

18. Rutrough Point

Field Inventory Points: 181-187

Rutrough Point is formed by the confluence of Back Creek with the Roanoke River in the southern reach of Explore Park. It has road access and Roanoke Parks is aware if its value and interest. I see its value as 1) scenic; 2) educational; 3) historic.

Rutrough Point shown with the star. The purple area is the extent of the historic area that reached peak clearing around 1930 and is today successional pine and exotics.

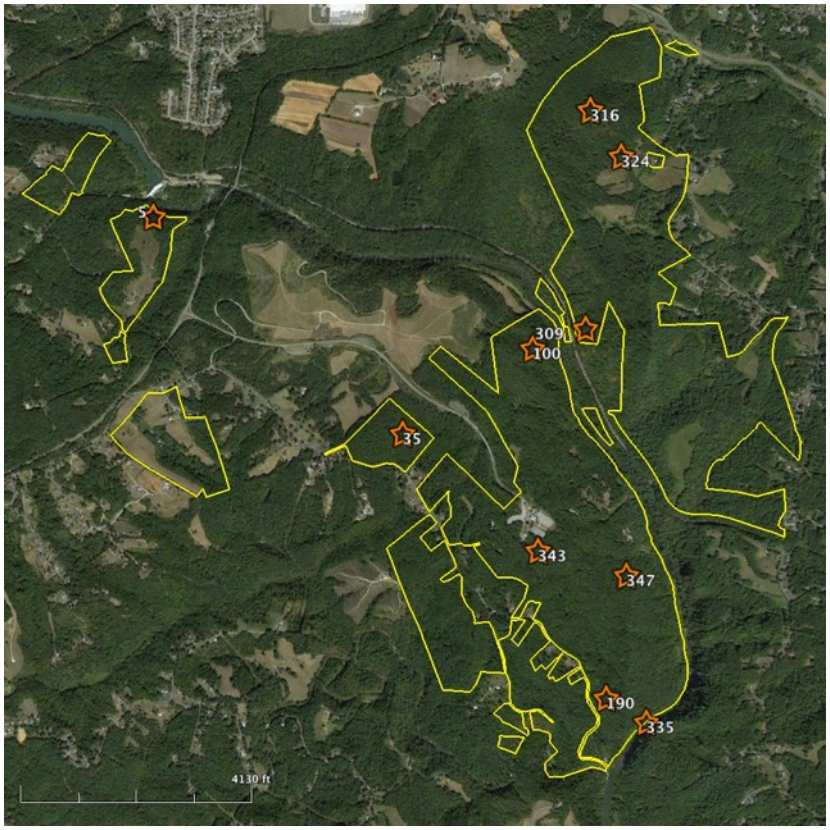
The scenic value is obvious. The educational value lies in the confluence of the two streams, and the landscape changes since settlement. Learners interested in water quality could sample the two streams and compare differences. Fishermen already take advantage of the site.

The historic value, which is also educational, lies beyond the house that stands in the parking lot. Several other structures can be found in the woods behind it (6…?) and most are falling down, or nearly so. The ecological conditions in the successional old field area is poor. It is overrun by exotics, successional pines, and other weeds. It does have a few legacy trees from the pasture era. The farm probably reached peak clearing in the 1930s. By the 1940s pines were invading, and slowly covered more and more area until the site was forested by the 1980s. This can be seen today as one gets farther away from the house, the trees get older and older (though never very old).

Even if all the structures are razed, and the vegetation is flattened, the story of farming and settlement activity should be uncovered and shared.

19. Quiet, Scenic, and Falling Waters

This list contains a number of smaller sites that are very spot specific and don't require a larger write up. Each is listed and described by its GPS point number so you can easily reference it in the *Field Inventory*. A short description is provided here. Photos for some sites occur in the *Field Inventory*.



5. Sounds of the Niagara Dam: The area is one of the few places in Explore Park where one can listen to falling water. The sound-scape is an important piece of every landscape.

35. Chestnut Oaks: The Forest is heavily dominated by chestnut oak. Up to 50% of trees are chestnut oak.

100. Large Oak Ridge: A short length of ridge with large oaks. The ridge would be a nice place for a trail.

190. Tower Site: The site could be an excellent place for an observation tower. It is a hill summit that was bulldozed flat in the early 1960s with a farm road approaching from Rutrough Road. An old home site on Rutrough provides parking space and a relaxing spot with large oaks. A tower here would have excellent views south, down the Roanoke River and north over the Explore Park Forest.

309. River View Bluff: A large rock outcrop low on the steep slope provides a nice place for sitting with limited views of the river. Cutting a few trees would expand the summer views. The place feels remote because of the effort to get there, and the ruggedness of the landscape.

316. Oak Hill: The site is a hill summit with excellent mature oak forest. The spot is scenic, quiet, and undisturbed. Other hill sites, on Pine Mt. and the High Point were previously disturbed and could be better for a tower or other feature.

324. Forest Pond: This farm pond is hidden in the forest. It makes for a peaceful, quiet place.

343. Old Chestnut planting: I believe this is the American Chestnut planting site. It looks like irrigation is in place and the site was partially cleared in the 1990s. This could be a good place to try to reestablish blight resistant chestnut trees. The American Chestnut Foundation has come a long way in 20 years.

347. Mountain Laurel: Slope has dense mountain laurel. Dense patches aren't common in Explore Park.

20. Roanoke River

Field Inventory Points: 95-96; 102-105; 124-125; 136, 139; 353-359; 227

The Roanoke River is the heart and the centerpiece of Explore Park. People want to be near the river. I saw more people walking the river trail than all the other trails combined. In the south, they want to fish and sit by the calmer water. In the north they are looking at rapids and the scenic steeps of the gorge.

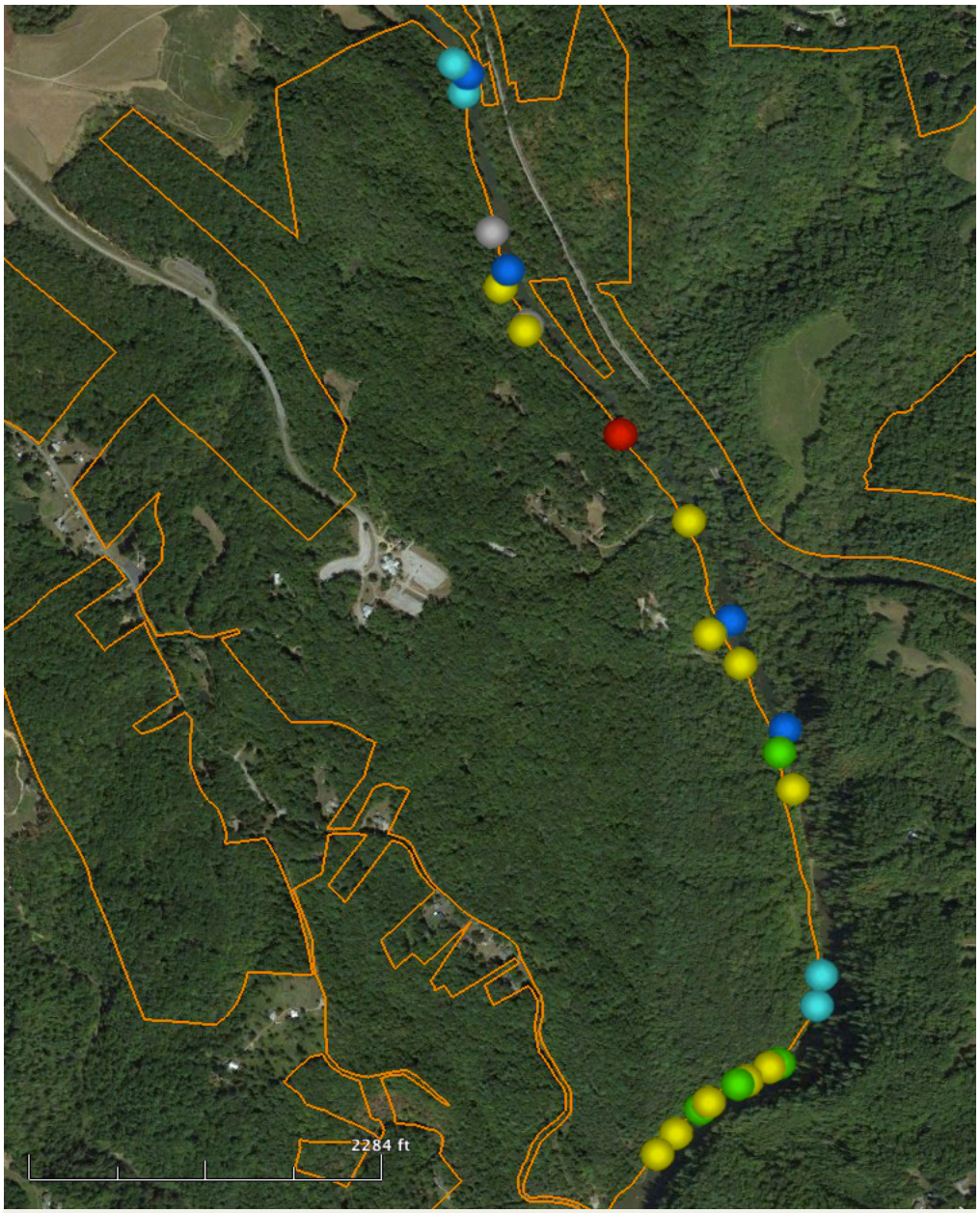
The entire river is a special place and this map marks the locations where people access the river, or the scenic spots where the planning team should bring them. Refer to the points listed above in the *Field Inventory* for descriptors of each point. Opportunities abound from low terraces that allow no-bank river access, to spots with waterfall sounds, to others with boulders that kids can climb on in near shore.

There are a couple dozen informal access points especially in the south. People park at Rutrough Point and find small access areas to fish, or sit by the river. If you can do one thing to improve access to the places where people want to go, then figure out a structure that allows people to get on or below the bank of the River. They're doing it already, but in truth, current access spots are limiting to people who can handle them.

A few notes:

- Access to the river can be had at places where the river naturally creates them. These include: large gravel bars; deltas formed by small tributary streams; low terraces. A lot of opportunity exists to access the river.
- Boulders along the stream make for good focal points and places for kids to mess around. Several of these occur in the center and north.
- People like to sit by rapids.
- Keep in mind that these features change position over time.

Access to the river is provided here by the delta of a small tributary stream (shown). This site has easy access down to the water and a small beach. Other tributaries provide more limited access.



Yellow: Access spot. In the south these are human-made informal spots along narrow beaches and clefts in the bank. In the north, these are on low terraces that connect and can be walked, and along deltas made by tributary streams.

Scenic spots because of sounds of falling water across the river, or rocky outcrops.

Locations define the beginning and end of large gravel bars. These are educational sites, places where a large group (students) can access the river together.

Rapids and Riffles.

Appears to be canoe landing; location is poor.

Access from tributary delta.

Roanoke River Places

An informal trail in the south with an access point at the clump of grass at river level. A dozen or more of these informal access points exist in the southern reach of the river where the bank is often steep. Engineering access into this section would accommodate these users.

Excellent access is proved here by a gravel bar at a tributary delta. These are educational places in stream behavior as much as they are access sites. The vegetation seen here would be trampled if the spot was made easily available to people. I suggest targeting sites well that will hold up to traffic. The larger gravel bars (one north and one south) are indestructible. The smaller ones are more sensitive.

This site, directly below the Grist Mill, has a number of boulders at the mouth of a tributary. Access is good and people can get on the boulders for fishing, sitting, or play.

Special Management Concerns: *The Not-So-Special Places*

In addition to noting and documenting the outstanding places and high quality areas of Explore Park, it is also worth noting and documenting the trouble spots. These features should be addressed for Explore Park to live up to Clean, Safe, Fun, and Beautiful. In this survey, I noted dump and debris sites, possible encroachment issues, hunting stands, and other concerns. These are described in detail in the *Explore Park Field Inventory* spreadsheet in the column on the right, Special Management Concerns.

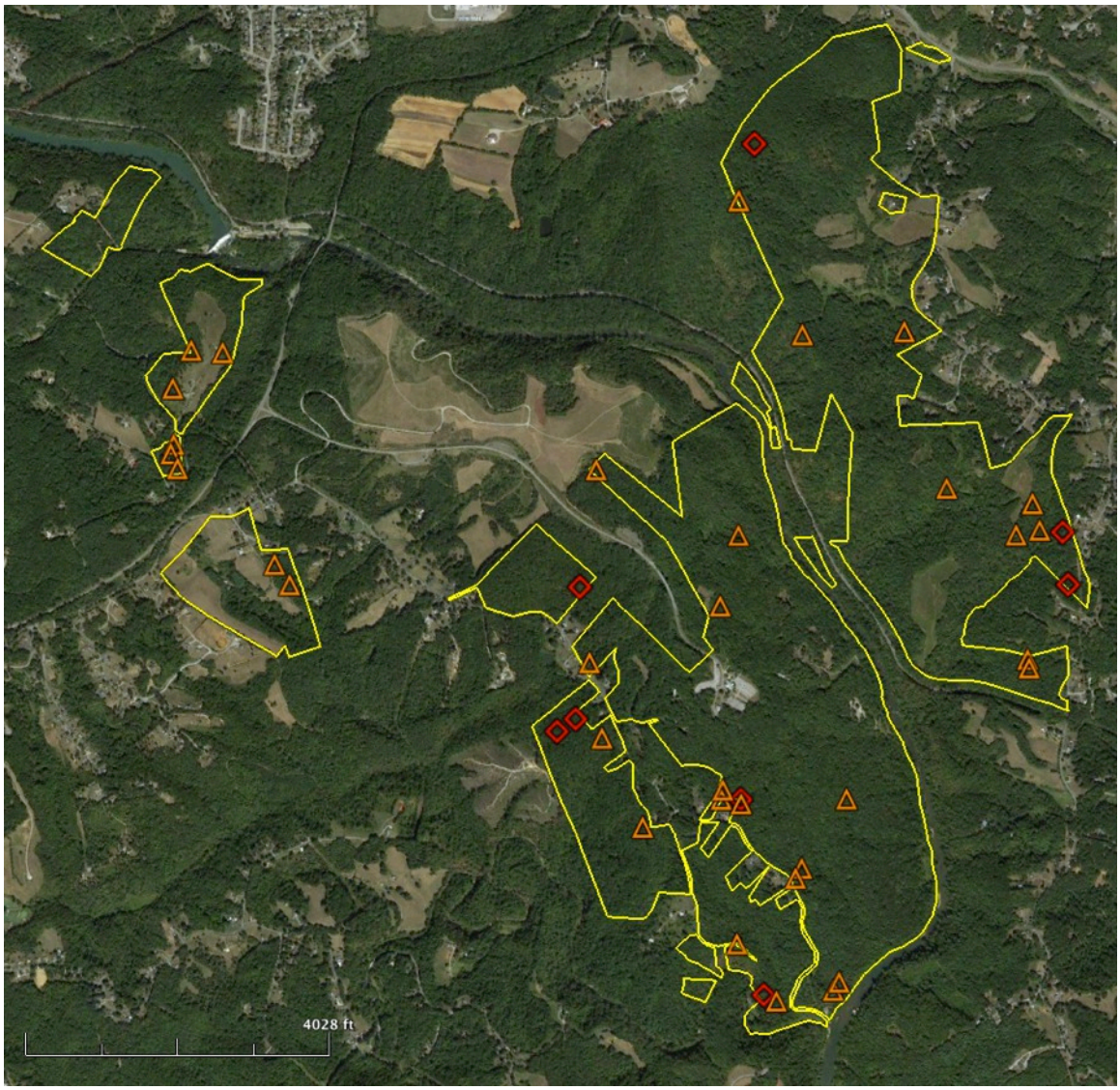
An overarching concern is the marking of property boundaries. I found survey pins and markers only along the NPS boundaries and one additional corner pin. Boundaries and property lines are difficult to locate in forest areas.

The most common management concern is dumping and debris. The 33 locations found are shown in the map below. Most of these are old, occurring in the farm days, and contain metal debris, barrels, tires, glass, or similar junk. GPS coordinates and brief descriptions are given in the spreadsheet. With this information, volunteers could begin cleaning them up. I suggest quantifying the amount of debris removed as this makes for good P.R. (e.g. "*15,000lbs of metal recycled and 100 tires removed from Explore Park!*").

I found 8 hunting stands that, while close to property lines, all appear to be on park property. Several more occur only slightly off property. One elaborate stand (pictured) was well within park boundaries. The hunting stand locations are shown in the map below and GPS coordinates are given in the *Field Inventory* spreadsheet. While the deer population is overpopulated and an argument could be made for introducing a deer program, unmanaged hunting is dangerous in a park setting.

Many examples of encroachment were found along the edges of Explore Park in all areas. A simple look at property boundaries on satellite imagery shows encroachment into county lands. The examples I found in the field are listed in the special management concerns in the *Field Inventory* spreadsheet and are not mapped here.

An unmarked cabin in South Bedford. A number of old structures or structural remains were found. These are listed in the Field Inventory Spreadsheet.



Special Management Concerns in Explore Park (partial list): Orange triangles show dumping and debris sites; Red diamonds show hunting stands observed in November 2015. See the Explore Park Field Inventory spreadsheet for GPS coordinates and additional special management concerns.

Summary of Recommendations

Recommendations or ecological, educational, and recreational aspects of this inventory have been sprinkled throughout the document. Refer to those areas for specifics. Below is a list of the main points and recommendations for using the information in this report.

- Do a spring botanical survey employing the Roanoke Wildflower Society. It could be expanded to a Bio-Blitz to inventory additional life forms.
- Use the priority list and map in the exotic plants section to determine a path forward for addressing this invasive plants in Explore Park.
- Use the points listed for the Roanoke River Special Places to identify the best user interfaces for accessing and protecting the river.
- Using the special places as a guide, consider the educational themes for Explore Park. Primary themes could be: The Eastern Forest; Natural Communities; Processes of the Roanoke River (includes the ancient fluvial deposit); Reading the Landscape (historical sense)
- Consider making an Explore Park Field Guide that can be print or on the web to engage people in the best sites and broad themes from the landscape.
- Identify old growth trees to which the public should access I recommend the tulip trees, and also being cautious of the oldest oaks, the beech trees (carving is a concern), and the black gum. Don't core the ancient black gum. It is water logged and the loss of the water by coring could threaten its longevity.
- Revive the relationship that must have existed with The American Chestnut Foundation; identify sites for blight resistant chestnut trees. Consider reusing the old site near the tavern.
- Forest pathogens as an educational theme.
- Determine the best way to interpret the historical features in the park, especially on the Bedford side. The Bedford Homestead is an excellent site.
- Consider repurposing some of the old farm trails, though keeping in mind it is often better to build new. Old trails do not always lend themselves to quality experiences.
- Consider a trail on the farm road along Chilhowee Creek. It's a very scenic area.
- Using the Natural Communities section as a guide, consider natural areas management and ways to improve them.
- Consider opening small views at some overlooks and trail spots. Survey the trails during leave off to identify the best places. Be gentle – the last thing people want is a clear cut. Make the openings look natural.
- Seriously consider the use of prescribed fire as a management tool.
- Prepare for the loss of ash trees within 5 -10 years. Ash is not abundant in the mature forests, but is common in the mixed successional woods.
- Consider making the Forest Pond in North Bedford fishless (if it has any). Shock them all to kill them. The pond would be an excellent breeding pool for amphibians, which thrive without fish predation.
- Visit the unmarked buildings identified in this report and determine their future.
- Manage vegetation on and around stonewalls and other stone work. Trees and other vegetation destroy stonework.
- Begin eliminating dump and debris sites and hunting stands. Work with adjacent land owners on encroachment issues.
- Get staff on the ground as much as possible (with this document) to explore, learn, document, interpret and understand the landscape. Knowledgeable staff, both for natural areas management and interpretation, will make Explore Park shine in the minds of the users.
- Send me any questions or comments.

Resources for further Reading

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