

Human Dimensions of the Frederick City Watershed

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Executive Summary

The Frederick City Watershed is a multi-use property with the primary function of providing clean water for The City of Frederick, but also provides many opportunities for recreation. Our research focused on analyzing the historical and current human dimensions of the Frederick City Watershed to inform management decisions.

To better understand the makeup of recreational user groups and their impact on the watershed, both interviews and surveys were conducted. Interviews with Frederick City Watershed stakeholders provided historical context related to land use activities, forest cover, wetland modification, native species distribution, and management decisions. The surveys of recreational users imparted a better understanding of use and perceptions of the Frederick City Watershed.

From the surveys and interviews, eight main topics of interest were identified for further discussion: user group demographics, environmental concerns, trail signage, trail conditions, garbage and illegal dumping, invasive species, forest purpose, and safety. Public perception on each of these topics is expanded through quantitative survey data and user comments within the report.

We recommend creating a Recreation Management Plan for the Frederick City Watershed geared toward the multi-user group community. Besides the watershed's primary function as a source of high quality water, survey responses and user comments can be used to pinpoint the areas of greatest concern to the majority of users and help narrow the focus of the Recreation Management Plan to the most pressing issues facing the Frederick City Watershed.

Question

The Frederick City Watershed has been the site of various forms of human activity. The *Forest Stewardship Plan for Frederick City Watershed*, which was prepared by the City's Department of Public Works with assistance from the Maryland Department of Natural Resources (DNR) and the United States Forest Service, contains valuable historical information about the site (Eriksson and Pannill, 2005). Historical watershed impacts have included clear cuts, pasturing, food extraction, fire suppression, and charcoal production. Recent human uses of this area are recreational activities such as hunting, biking, fishing, and hiking. Although these uses contain certain value for local inhabitants, the primary function of the watershed is to provide a source of high quality water for Frederick City residents. Recreational activity can cause soil compaction, erosion of hillsides, loss of forest cover, and changes in species composition, which can have detrimental effects upon a reservoir (Cole, 1993).

Therefore, this report focuses on the historic and current use of the Frederick City Watershed. Who has historically used the Frederick City Watershed, how are people using it today, and how do current users perceive the condition of the watershed and their own impacts upon that condition?

Methods

To better understand user impacts and perceptions, we pursued a literature review of the area's history, a user group survey, and stakeholder interviews.

The literature review of the watershed's natural history that gives a historical overview is detailed in Appendix 1.

The 17-question user group survey, entitled "Frederick Municipal Forest/Watershed User Survey," covered topics ranging from how often patrons visit the Frederick City Watershed, their primary reason for visiting, and any improvements they'd like to see implemented in the future. The survey was designed so that even those who had never visited the watershed could complete the first page, with those who had previously visited continuing on with the survey to describe their thoughts and experiences.

During survey development, members of our group attended the Ad Hoc Watershed Committee meeting on October 9, 2014 where a preliminary draft survey was shared with stakeholders. We held an open period for comments and suggestions for one week, after which the survey was finalized. An online version of the survey was made available through the website surveymonkey.com, and a link was distributed to Ad Hoc Committee members as well as user group members in attendance, who distributed the survey link to their respective groups. Our team members also traveled to a local Frederick farmer's market to reach an audience who may not have been aware of the online survey.

Stakeholders were interviewed by phone and asked to address their individual areas of expertise as well as any changes they've seen in land use over time. These anecdotes helped us analyze our survey results more effectively and put the responses in the context of those actively involved with the management of the Frederick City Watershed. The interviews were conducted with: Dan Feller, DNR; Melissa Nash, DNR; Adam Miller, DNR; Clyde Hicks, Owner of *The Trail House* and long-time watershed visitor; Justin Collins, naturalist; Ryan Delaney, IMBA.

Survey Results

The Frederick City Watershed User Group Survey was filled out by 869 respondents. Of those, 29 percent were Frederick City residents and 71 percent live outside of the Frederick City area; 77 percent were male and 23 percent were female, and 48 percent were between the ages 36-50. A majority of the respondents, 95 percent, have visited the Frederick City Watershed; 34 percent have been visiting for 0-5 years and 66 percent for 6+ years; 19.4 percent visit at least once a week. A number of common topics and trends from our results are presented below.

User Groups

*"It is one of the **best mountain biking locations** in the United States." (Q12, Response 49)*

*"**Excellent family destination**--something for all." (Q12, Response 57)*

*"It offers **large training areas for our team** to train for K9 Search and Rescue and we can leave the dogs search off leash like they need to do." (Q12, Response 49)*

The Frederick City Watershed is host to multiple user groups with diverse interests. The majority of survey respondents identified their primary interests as mountain bike riding (73%) and hiking (53%). Additional common interests include: running, camping, road bike riding and family outing. Many visitors come to the Frederick City Watershed at least once a month (47%). This continuous interest highlights the importance of the forest for the City of Frederick residents and outside visitors.

*"There is a **shortage of quality mountain bike trails** all across the DMV region, and the relative concerns are low for that activity. Local groups volunteer a lot of time to maintaining trails to prevent environmental damage." (Q16, Response 34)*

*"I think the **conflicts between hikers and bikers** can be resolved with intelligent trail design." (Q16, Response 80)*

*"Whether people with guns are illegally poaching or not, the effect is the same when you're trying to take the family and kids out to learn about and appreciate nature. It seems like its getting **harder and harder these days to go out and not see hunters with guns.**" (Q16, Response 82)*

Conflict among user groups came up frequently within the survey. The majority of respondents suggested interventions such as proper signage, clear rules, and well designed trails that could help alleviate conflict among user groups. As use of the area continues to increase, visitors are looking to the City of Frederick or the Department of Natural Resources to provide structure to uphold the primary functions of the forest for sustainable use.

Groups that self-identified themselves in the survey include (Q2):

- The Baltimore Bicycling Club
- Mid-Atlantic Off Road Enthusiasts (MORE)
- Adobo Watershed Ride
- Old Line Velo
- Potomac Velo Club (PVC)
- Frederick Steeplechaser's Running Club
- Catoctin 50K Trail Run
- Potomac Appalachian Trail Club (PATC)
- Hood College Photography
- Girl Scouts of Frederick County, MD
- Western MD K-9 Search and Rescue Inc.
- Frederick Bird Club
- Maryland Native Plant Society
- Trout Unlimited
- Northeast Mid-Atlantic Downhill/Freeride Mountain Biking Association
- Single Speed Outlaw Bike Team
- Frederick Camera Clique
- Shed Heads
- The Bicycle Escape
- Bike Doctor Frederick
- Joe's Bike Shop Racing Team
- Frederick Bird Club
- Wicked Wash Racing Team

Environmental Concerns

*"There is a fine line of **loving a place to death.**"*

--Dan Feller, DNR

*"**Maintaining the health of the forest and streams is most important**, because that adds to my recreational experience (mountain biking and hiking)." (Q16, Response 116)*

Environmental concerns in the watershed fell into multiple categories. The survey used environmental concerns—erosion, stream health, and forest health—to gauge opinions on the conditions of the Frederick City Watershed that may or may not be directly attributed to human disturbance. Of the respondents, 54 percent were concerned with erosion, 69 percent with stream health and 69 percent with forest health. These environmental concerns will be discussed throughout the results section as they relate to other topics.

Signage Concerns

*“Identify and maintain a set of sustainable trails for mountain bikers, hikers, equestrians, etc. **Produce a map** that accurately shows the legal trails in the watershed and areas to avoid...**Place better signage** at the trailhead parking lots: maps to let people know which trails are legal, rules of use, and notifications of hunting seasons to help users avoid conflict with hunters.” (Q17, Response 16)*

*“I would like to see **better trail signage/blazing** and perhaps a trailhead area with a map of the available trails.” (Q17, Response 68)*

*“Personally, I would be most interested in a **sanctioned, marked, and mapped network of official trails** beyond the Catoctin (Blue) Trail, open to mountain bikers, hikers, and runners.” (Q17, Response 141)*

When asked to rate their level of concern on a number of issues, 50 percent of survey participants listed trail signage as something they were “concerned” or “strongly concerned” about. In written comments, participants noted many concerns regarding the lack of signage and trail maps available at the Frederick City Watershed, including the fear of getting lost, lack of signage for potential hazards, lack of signage for prohibited activities or allowed activities (including hunting, biking and other forms of recreation).

Trail Conditions

*“I moved to Frederick because of the **world renowned trails** at the Frederick municipal forests. My wife and I both work at Fort Detrick and live a mile from the Watershed. I hope the town of Frederick can recognize what amazing potential exists for this area to become a major destination for trail enthusiasts.” (Q18, Response 33)*

When asked about why users visit the watershed about 92 percent of respondents either agreed or strongly agreed with the statement that they visit because the Frederick City Watershed “offers a unique trail experience in the DC/Baltimore area” (Q12). In fact, this unique trail experience was found to be the most compelling reason for visiting the Frederick City Watershed, out of all the reasons listed in the survey question. Because many of the survey responders are attracted to the Frederick City Watershed for the trails, it follows that trail conditions and potential overuse are concerns that were mentioned throughout the written comments.

*“Some of the trails are well constructed and sustainable, while others are poorly...constructed and not good for the health of the watershed... It is **important that a good, sustainable trail system be maintained** for mountain bikers, hikers, equestrians etc.” (Q16, Response 12)*

As evident in the above response, this user believes that trail conditions are an issue in the Frederick City Watershed. Although some trails are well constructed and maintained, others are seen as quite the opposite. Within the written comments of question 16, 25 comments specifically referred to the poor quality and overuse of Frederick City Watershed trails. In

contrast, 7 comments referred to Frederick City Watershed trails being in good shape. Due to the variability of response present within the data, it is evident that users view the trail system differently. This could be due to varying methods of trail use or differing views of what makes a quality trail. Presented below are some user comments that exhibit the dissonance in perception of trail quality.

These comments reflect users who are not as concerned about the effect of trails:

*“The mountain bike trails may be in rough shape, but I think in the grand scheme of things it is **unlikely they affect water quality** in a measurable way.” (Q16, Response 73)*

*“I **don't see signs of overuse or erosion**. The old eroded trails are being corrected in an environmentally responsible way.” (Q16, Response 125)*

While these comments reflect users who are concerned about the effects of trails:

*“**Too many trails created by users** throughout the property put increased stress on other aspects of use (water quality, hunting, timber, etc). Many trails go straight downhill, causing **severe erosion**.” (Q16, Response 177)*

*“On the topic of Trail over use and unsanctioned trails being created I think that the issue is more with **trails being built without knowledge** on how to create trails with proper drainage to prevent erosion issues.” (Q16, Response 100)*

Erosion from trails was often cited as a problem that affected stream health as well as trail safety (hikers and bikers sliding, as well as inability of plants to remain firmly rooted). Though some saw erosion as a natural product of gravel road systems on sloping roads, others felt that improperly designed trails constructed by mountain bikers were the main culprit. DNR employees concur that slope near streambeds needs to be addressed in order to stall the rate of sediment deposit.

Interestingly, question 15 showed that 70 percent of responders are not concerned by trail overuse. So, although many written comments expressed concerns about trails, a large number of users still feel that trails are not being overused.

One final note about the Frederick City Watershed trail system is that many users don't know which trails are sanctioned. Close to 48 percent of survey responders either didn't know that sanctioned trails existed in the watershed or were unsure if they have used unsanctioned trails. Also, even though some users recognize the difference between sanctioned and unsanctioned trails, they don't see unofficial trails as being necessarily 'bad' and they don't see the official trails as being necessarily 'good.'

*“Unsanctioned Trail Creation is very vague. There are **some trails that are not built very well and could lead to erosion, while others are built and are extremely sustainable**. Many of these trails are built better (sustainable) than the sanctioned trails. These trails are also more aesthetically appealing as*

they are narrow with limited erosion. They appear to be a more natural part of the environment instead of some of the sanctioned paths that appear to just cut through the landscape.” (Q16, Response 119)

*“As a trail professional, the erosion issues, specifically with old, poorly designed trails, are of great concern to me. **Many of the trail maintenance attempts have failed**, and many sections really need re-routing. Much of the worst issues are on the blue (sanctioned) trail, while many unsanctioned trails were designed and constructed in a much better way.” (Q12, Response 173)*

However, some users support the prevention of new unsanctioned trails being built.

*“I am in favor of strongly **prohibiting new unsanctioned trail building** if it will protect the forest and MTB usage.” (Q16, Response 135)*

*“**Unsanctioned trails are bad** because they're usually badly designed and **create erosion**. This seems to be a Mtn biker issue.” (Q16, Response 78)*

In summary, the survey captured a wide variance in how user groups view the current trail network in the Frederick City Watershed. Written comments ranged from high levels of concern to very little concern. It is evident that user groups are cognizant of and care about the quality, use rate, and creation of trails in the Frederick City Watershed.

Garbage and Illegal Dumping

*“It sickens me that **people dump trash** at the Shed.” (Q16, Response 83)*

*“I don't know a lot about most of these issues, but the **trash situation was awful** when I helped with the cleanup earlier this year. I tend to run on the Catoclin trail area, which is clean, but apparently there are places that people go and drink and dump their bottles, or their drywall, or their tires, or their refrigerators... ugh.” (Q16, Response 93)*

Survey responders are exceptionally concerned about the presence of garbage and illegal dumping in the Frederick City Watershed. About 74 percent of users were either concerned or strongly concerned with this issue according to survey question 15. This level of concern is not surprising given that 93 percent of users either agree or strongly agree that they visit the Frederick City Watershed for an experience with nature (Q12). From the survey comments, it was clear that users are not just generally appalled by the presence of trash, but are worried about its effect upon watershed ecosystems.

*“The amount of trash that is dumped in the watershed is atrocious, to the **detriment of the environment** in the surrounding area.” (Q16, Response 99)*

*“**Concern for streams** is directly related to the garbage dumping and partying that occurs so frequently at parking areas next to streams and ponds.” (Q16, Response 112)*

Users also listed various reasons why they believe illegal dumping has become such a problem and some possible solutions.

*“There is a lot of dumping once **bulk trash pick up was canceled.**” (Q16, Response 94)*

*“One of the **biggest problems is the dumping of trash** (large item trash such as TV's furniture etc) which could be stopped if the authorities monitored the area or closed the area to vehicle traffic.” (Q16, Response 169)*

*“Frederick County **should provide residents a free public facility** for dumping garbage and bulk items. If the facility is convenient, it might dissuade the illegal dumping in the forest.” (Q16, Response 120)*

One encouraging find was that users are not just concerned about trash, but are actively taking steps to alleviate the problem.

*“**I regularly pickup small trash** when hiking and cycling in the forest. Not much in the trails but on the edges and occasionally have found dumped garbage and reported it.” (Q16, Response 152)*

*“Any time I come across small trash like beer cans or cigarette packs, I **pick them up and carry them out with me.**” (Q16, Response 11)*

Invasive Species

*“Many areas are **overrun by invasive plant species** and too much deer browsing. Large areas have no young trees and masses of barberry. I'm not a hunter, but support culling the deer herd to protect the health of the forest for water quality and overall wildlife/plant diversity and health.” (Q16, Response 71)*

As discussed in our history of the Frederick City Watershed, invasive species are prevalent throughout the area. The survey results showed a range of opinions about the invasive species threat. According to question 15, 31 percent of respondents are not concerned about invasives and 49 percent are either concerned or strongly concerned. There were not many written comments from the survey that explicitly mentioned invasives. However, the received comments showed contrasting perceptions.

*“Way too many **off road bike users** are causing serious fragmentation of forest habitat, and are creating sources of erosion and **new invasive species introductions.**” (Q16, Response 172)*

*“**Many areas are overrun** by invasive plant species” (Q16, Response 17)*

*“Any concern about invasives is a national concern, not specific to the Watershed. **I am not aware of any current invasive problem.**” (Q16, Response 36)*

Forest Purpose

*"I think the largest threat to the watershed is the logging. The areas that look the **least healthy** are where trees have been **cleared out**." (Q16, Response 18)*

*"Whoever sanctioned the tree cutting near red gate 1 did not appear to consider **presence of sensitive species**. I saw no evidence of efforts to evaluate area before clear cutting. I am concerned about cutting taking place along the trail between the towers (south of red gate 1); again, there are sensitive species of orchids and butterflies in this area." (Q16, Response 69)*

A majority of users noted their concern for the health of the Frederick City Forest within the survey in question 15, where 48 percent of respondents rated their level of concern regarding Forest Health as "concerned," while 21 percent of respondents responded with "strongly concerned." Comments left by users link their concern regarding timber harvest to increased erosion and run-off, presence of clear cutting near potentially sensitive species, and generally unhealthy, unattractive looking landscapes.

*"It is my belief that the substantial logging operations in the area have compromised the forest's ability to deal with rainwater and moisture. The **excessive run off and wash-out** of the roads has been exacerbated of late, and the most obvious recent change was the logging." (Q17, Response 77)*

*"Why are trails blamed for **erosion**, when the roads are a disaster? Just look at what happened to Delauter over this past winter. Stop the timber harvesting now, if you really care about the **water supply**." (Q17, Response 197)*

Two main natural resources are obtained from the Frederick City Watershed: water taken from the reservoir and timber extracted from the forest. Interestingly, in question 13, these functions are rated as both the most and least important, respectively. Maintaining the watershed as a source of high quality water was ranked by 46 percent of respondents as the most important function of the Frederick City Watershed, while 86 percent of respondents ranked resource extraction of timber as the least important function. Many user comments, such as the one above, indicate that it is believed that the main source of erosion and run-off is timber harvesting, perhaps putting these two functions in conflict with one another in Frederick City Watershed.

*"The watershed has endured forest fires, complete timber extraction, gypsy moth destruction and many other natural and man-made events that have had big impacts on the forest. Yet at this time, the forest health is in some of the **best condition of history since modern humans** have been visiting. Maintaining this as a recreation destination for hunting, fishing, biking, hiking, and horseback riding will insure that those who love the forest will continue to care for it and see it maintained." (Q16, Response 65)*

In question 15, mentioned above, a majority of users were concerned about Forest Health, while in question 14, which asks users to rate the state of the Frederick Municipal Forest and Watershed, a majority of respondents selected "Good" (42 percent) or "Excellent" (28 percent). These appear to be conflicting results, which could have been due to the structure or wording of

our survey and/or differing conceptions of forest health. Quite a few comments, like the one above, maintain that compared to the recent past the overall forest health is in good shape.

*"I don't begrudge reasonably respectful land use to anybody. It's a lot of land; people are going to likely use it one way or the other. Giving them sustainable pathways to enjoy the land is key to keeping them from engaging in unsanctioned use... Understand too that authorized timbering can also **contribute to the health of the forest**, though it has to be carefully thought through and monitored, and sanctions applied to those who violate the rules." (Q17, Response 57)*

A vast majority of the comments that mentioned timber harvest displayed a negative opinion of the practice. Only a few comments recognized that timber harvest could be beneficial to an ecosystem. Representatives from DNR explain that harvesting matured stands, which will soon dieback and become a fire hazard, as well as the harvesting of overcrowded stands, which helps trees grow better, is helpful to the ecosystem as a whole. While other DNR representatives have noted there is visible line where invasive species start that correlates with where clear-cutting has taken place. Overall, while DNR representatives stated that they have received some complaints about harvesting, there have been relatively few compared to what was expected when the timber harvest began three years ago. Many complaints came from private landowners who were concerned about the proximity of the harvest to their backyards, the speed of log trucks on watershed roads and comments categorized as "external complaints." However, survey results and comments indicate that perhaps there is a discrepancy between public opinion of timber harvest and how DNR perceived public opinion of timber harvests.

*"If timber harvesting is going to continue, the practice need to improve, the **condition the land is left in is unacceptable.**" (Q18, Response 41)*

*"I hike and mountain bike the watershed. In addition, my property is bordered by the watershed. I see the illegal dumping all the time... Timber harvesting is my next issue. It seems that it's all about money for the city. **They say it promotes forest health but what I see is heavily rutted ground and few decent trees left.** The Watershed lost a substantial number of its oaks to gypsy moth infestation twenty or so years ago. Let's give the oaks a chance to come back instead of trying to make a small amount of money for the city." (Q16, Response 33)*

Safety

*"I've heard about the placement of **razorblades at trailheads**. Everyone just needs to be cautious. Pictures/warnings on signs in parking areas might be a good idea." (Q17, Response 178)*

*"The **booby traps** are very scary and dangerous for all users." (Q16, Response 58)*

*"It is **EXTREMELY** alarming that someone is **strategically placing booby traps** in biking and hiking trails! These traps are made of hand-made razor blades and other sharp items intended to harm bikers, hikers and their pets. This person or persons **MUST** be stopped before someone is seriously injured!!!" (Q16, Response 87)*

Our survey showed that many patrons were concerned about the trails being sabotaged with things like nails and razor blades, presumably to discourage the mountain biking in the area. Of the 188 written comments on a question regarding issues of concern, 15 percent specifically expressed concern over safety, with the majority of these comments mentioning fears of booby traps on trails. Written comments listed razor blades, nail boards, and other sharp objects hidden on trails as well as fishing wire strung up at neck height as examples of these traps that have been set to discourage trail use from certain user groups. Concerns over traps were expressed in almost every question that allowed for supplemental user comments.

*"[There are] **no adequate signs** as to when hunting is going on so that hikers, bikers and trail training is not interfering with hunting as well as to protect other forest users safety." (Q16, Response 32)*

*"I'm a bit concerned about the mix of uses of the watershed, for example **hunting in the same areas that folks are hiking, mtn. biking, etc.**" (Q16, Response 184)*

According to our survey results, 64 percent of respondents were concerned or strongly concerned about illegal hunting activities. User comments also show a concern over the potential for accidents resulting from hunting at the same time as other interest groups are using the Frederick City Watershed. While less than 10 percent of our survey respondents listed hunting as one of their primary reasons for visiting the Frederick City Watershed, accidents may still occur if patrons are unaware of the rules and regulations for hunting activity.

*"I think the Watershed has some fantastic trails, but unfortunately the locals don't give off a warm feeling about being there. I've encountered **booby traps on the trail systems** and have gotten foul looks from hunters in the area, even riding on the main fire trail in bright colors. I've **felt pretty uncomfortable several times** by some of the locals to the area." (Q17, Response 15)*

As evidenced by the comment above, these safety issues can make the Frederick City Watershed atmosphere uncomfortable and slightly hostile to users. While the majority of survey participants (70 percent) rated the state of the Frederick City Watershed as being either "excellent" or "good," an increasingly hostile environment could negatively impact the area's reputation and drive users to recreate elsewhere.

Recommendations for the Frederick City Watershed

The overall recommendation is a City of Frederick Recreation Management Plan or a modified version of the Forest Management Plan that is geared toward the community. It would establish and maintain effective, long-term management of the Frederick Watershed. The plan would define the policies and procedures used by City staff in the management and care of the forest to uphold the primary objective: to maintain and improve the watershed as a source of high quality water. It should contain at least these essential elements: a statement of purposes and goals; a description of the forest's location, boundaries, management areas (including both narratives and maps); and volunteer opportunities. Visitors want to engage with forest managers to gain a better understanding of the forest services and to help maintain forest structure.

We recommend **volunteer programs** that involve diverse user groups and focus on cleaning up garbage, removing non-native species, developing educational materials and maintaining trails. This would contribute to the Frederick City Watershed's overarching goal of conserving and enhancing wildlife populations and their respective habitats while providing public recreational use of the State's wildlife resources. To improve communication with user groups, we also recommend **creating a website** with capacity for feedback that offers relevant watershed information such as trail information, off limits areas, safety tips, and hunting season information.

We also recommend **adding signs that are educational along sanctioned trails.** This would alert users to the benefits of an intact ecosystem, and provide information about species and ecosystem services that the surrounding forest provides. It is an indirect way of communicating why it is important to follow the rules established by forest managers.

The willingness of the survey participants to provide feedback for the forest management speaks to their enthusiasm for and dedication to the area. Above all, it was clear that the users value the Frederick City Watershed immensely and their input should be considered as Frederick City develops future management plans.

"[I] love the watershed. It's a complete gem...so unlike any other place to hike/run/bike in the state." (Q17, Response 128)

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Appendix

1. Historical Overview
2. Survey
3. Survey Results
4. One page project summary for the Ad Hoc Watershed Committee

Appendix 1: Historical Overview

Human Use

The Frederick City Watershed has supported consistent human dependence despite inconsistent ecological stability throughout history. Beginning around ten thousand years ago, the Native Americans who inhabited the area used fire as a tool for managing the vegetation. This tool promoted habitat for certain game species (e.g. grass-feeding buffalo), in turn facilitating hunting. When Europeans arrived in the 1500s, the native flora and fauna were subjected to new pressures. When trees in the area began to regenerate, the mountainous landscape was deemed too inaccessible and not arable enough to farm (Pannill et al., 2005). Shortly after the American Revolution, the local residents used the forests for fuel, timber and to make fencing for livestock. Fires were deliberately set to improve pasturage. It also encouraged considerable blueberry production.

From 1776 through 1903, oak was used to make charcoal for iron production at Catoctin Furnace. The growing population created a demand for wood products to build farmhouses, barns and commercial buildings for Frederick County and for the City of Frederick. Through the clear-cutting of white pine for lumber and the American Chestnut for timbers and rails, the demand was met. Intentional fires in the undergrowth ensured the continued propagation of blueberries and huckleberries for personal use and for sale. Just before the turn of the 20th century, the first dam and filter building were built on Fishing Creek Watershed. In 1918, the Chestnut blight (*Cryphonectria parasitica*), a devastating fungal disease, became a catalyst for change. The death of the dominant tree species contributed to and made apparent the lack of commercially valuable forest stands in Frederick County. For about 30 years, deciduous trees regenerated on steep slopes and wet areas of abandoned farmland (O'Philips 2004).

The City of Frederick constructed and dedicated the present dam and reservoir in the Frederick City Watershed by 1925. Throughout this time, the State of Maryland was quickly acquiring forest land at a rate that was outpaced only by the public's desire for a new commodity: outdoor recreation. By the early 1940s, the forestry department, originally spearheaded by Fred W. Besley, had become the Department of State Forests and Parks. Consequently, public forestlands were developed with recreation in mind (Maryland Forestry and Parks Centennial 2006). Between 1933-1938 the Civilian Conservation Corps *Camp S-57, Company #2302* operated in the Frederick City Watershed. They built over eleven miles of roads, seventy-five miles of fire trails, and planted many acres of White and Scotch Pine trees for use by the City of Frederick in supplying lumber for bridge planks, excavation shoring, fencing, park benches,

picnic tables and picnic shelters. Forest fire preparedness, forestry, and conservation projects were always at the forefront of Maryland Forest Service's and C.C.C.'s efforts.

In 1979, the Frederick City Watershed became a Cooperative Wildlife Management Area and a year later, the first formal management plan was prepared. This plan included recommendations of timber harvests, improvement cuttings, thinnings, and other methods to balance, "species composition and age class distribution" (Pannill et al., 2005). Though the primary objective for the watershed is water quality, its larger mission is "to conserve and enhance wildlife populations and their respective habitats as well as to provide public recreational use of the State's wildlife resources" (Wildlife and Heritage Service).

The role of humans in the Frederick City Watershed is complex. They have shaped the terrain, accidentally introducing invasive species and destroying 95 percent of the original forest (Feller, 2014). But hunters also ensure that the white-tailed deer population is stable and the City's dependence on clean water means that erosion is monitored. As a nationally recognized mountain biking destination, a haven for foragers, an educational resource for families, and a retreat from city life, the watershed is a valuable recreational resource.

Flora and Fauna

The watershed provides habitat for a variety of game and nongame species of fish and wildlife. Most of the habitat in the watershed is forest, with about 16 acres of fields that are maintained as permanent openings for wildlife. Most of the wildlife species found here are typical of forests in the general area, including birds such as turkeys, ruffed grouse, and numerous species of raptors and songbirds; mammals such as white-tailed deer, gray fox, bobcat, raccoon, opossum and gray squirrel; and reptiles such as the timber rattlesnake and the copperhead snake. White-tailed deer are common in the watershed, though relatively heavy hunting pressure keeps the population stable. The streams in the watershed are home to a variety of fish and other aquatic organisms. Trout are found in both forks of Fishing Creek above the reservoir, along with bass and bluegill (Bates et al., 2005).

The Frederick City Watershed is also home to a number of invasive species. Historically, invasive insects, diseases, and plants have been problematic for the watershed. Serious invasive alien species found in the watershed include Japanese Stiltgrass (*Microstegium vimineum*), Mile-a-Minute (*Polygonum perfoliatum*), Multiflora Rose (*Rosa multiflora*), Japanese Barberry (*Berberis thunbergii*) and Tree of Heaven (*Ailanthus altissima*).

The gypsy moth (*Lymantria dispar*), an introduced pest that feeds primarily on oak leaves during its caterpillar stage, had a severe impact on the watershed forest composition. Appearing in the Frederick City Watershed with unexpected severity in the early to mid 1980s, it killed many of the oak trees on the property. Since the forest was comprised of mostly oak, it was particularly susceptible to this invasion. However, in recent years the gypsy moth population has decreased dramatically due to several diseases. Another invasive species with a great impact on the watershed forest composition was the chestnut blight that nearly wiped out the American chestnut (Pannill et al., 2005).

Appendix 2: Survey

Frederick Municipal Forest / Watershed User Survey



1. When visiting a forest or park, what is your primary activity?
(Choose up to three)

- | | | |
|----------------------------------|--|---|
| <input type="checkbox"/> Hiking | <input type="checkbox"/> Camping | <input type="checkbox"/> Road Bike Riding |
| <input type="checkbox"/> Hunting | <input type="checkbox"/> Horseback Riding | <input type="checkbox"/> Bird Watching |
| <input type="checkbox"/> Fishing | <input type="checkbox"/> Mountain Biking | <input type="checkbox"/> Family Outing |
| <input type="checkbox"/> Running | <input type="checkbox"/> Other (please specify): _____ | |

2. If your primary activity is a group event, what is the name of the group or club?

3. I am a Frederick City Resident.

- Yes No

4. If no, what state and county do you live in?

5. Age

- Under 18 18-24 25-35 36-50 51-64 65+

6. Gender

- Male Female

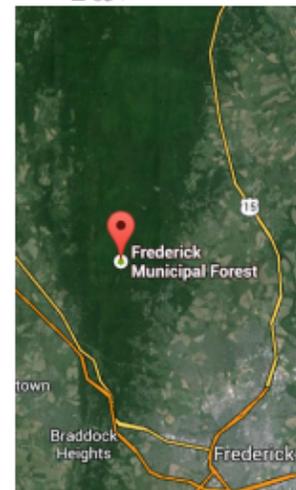
7. Have you visited forest or parks in Frederick County, MD?

- Yes No

8. Have you ever visited the Frederick Municipal Forest /
Watershed? (Shown on the map)

- Yes No

The following questions are specific to the
Frederick Municipal Forest / Watershed.
Proceed only if you have visited.



9. How many years have you been coming to the Frederick Municipal Forest / Watershed?

- 0-5 years 6-10 years 11-20 years 21 or more years



10. How many times a year do you visit?

- At least once a week At least once a month At least once a year

11. Do you venture outside of sanctioned trails? (Check all that apply)

- Yes No Not sure Did not know sanctioned trails exist

12. Rate the current state of the Frederick Municipal Forest / Watershed

- Excellent Good Minor problems Serious problems Not sure

13. On a 1-5 scale, order the importance of the following functions of the Frederick Municipal Forest / Watershed: (1 = most important)

- ___ Maintain natural habitat for wildlife
 ___ Maintain the watershed as a source of high quality water
 ___ Resource extraction (timber)
 ___ Recreation
 ___ Aesthetics (natural beauty)

14. I choose to visit the Frederick Municipal Forest / Watershed because:

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
It offers a great area to hunt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It offers a great area to fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is not crowded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It offers a unique trail experience in the DC/Baltimore area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It offers quality spots that allow me to be one with nature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):					



15. Within the Frederick Municipal Forest / Watershed, do you think any of the following are issues of concern?

	Undecided	Not Concerned	Concerned	Strongly Concerned
Garbage/illegal dumping of trash	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trail overuse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Invasive species	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illegal hunting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trail signage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illegal timber harvest	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stream health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forest health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unmanaged fires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Partying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unsanctioned trail creation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):				

16. Specific comments related to your issues of concern:

17. Please share any ideas you believe Frederick City Forest Management should focus on to improve your overall experience:

18. Other comments:

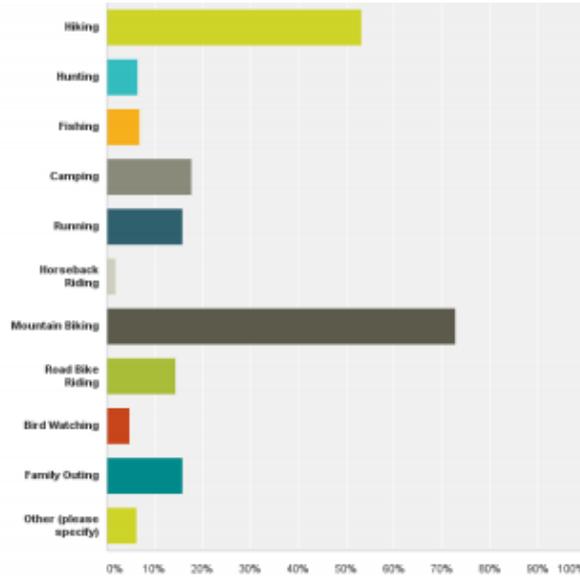
Thank you for your participation!

Please send questions or comments regarding this survey to ashtonj@umd.edu

Appendix 3: Survey Results

Q1: When visiting a forest or park, what is your primary activity? (Choose up to three)

Answered: 869 Skipped: 0



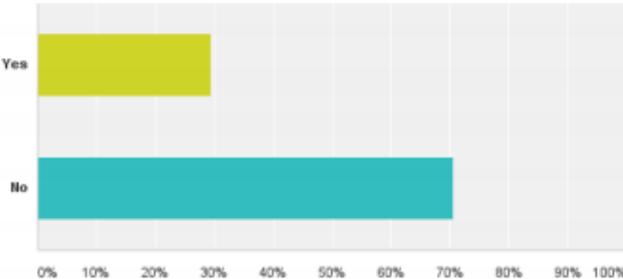
Q1: When visiting a forest or park, what is your primary activity? (Choose up to three)

Answered: 869 Skipped: 0

Answer Choices	Responses	Count
Hiking	53.28%	463
Hunting	6.56%	57
Fishing	6.79%	59
Camping	17.72%	154
Running	15.77%	137
Horseback Riding	1.84%	16
Mountain Biking	72.96%	634
Road Bike Riding	14.38%	125
Bird Watching	4.72%	41
Family Outing	15.77%	137
Other (please specify)	6.21%	54
Total Respondents: 869		

Q3: I am a Frederick City resident

Answered: 869 Skipped: 0



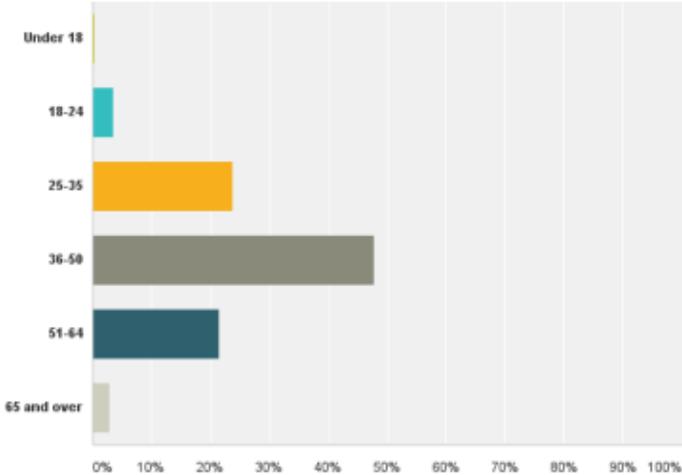
Q3: I am a Frederick City resident

Answered: 869 Skipped: 0

Answer Choices	Responses
Yes	29.34% 255
No	70.66% 614
Total	869

Q5: Age

Answered: 869 Skipped: 0



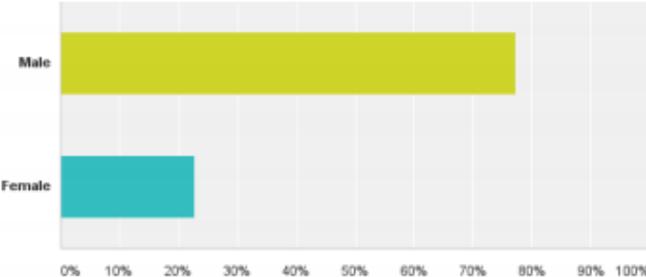
Q5: Age

Answered: 869 Skipped: 0

Answer Choices	Responses
Under 18	0.46% 4
18-24	3.45% 30
25-35	23.82% 207
36-50	47.76% 415
51-64	21.52% 187
65 and over	2.99% 26
Total	869

Q6: Gender

Answered: 869 Skipped: 0



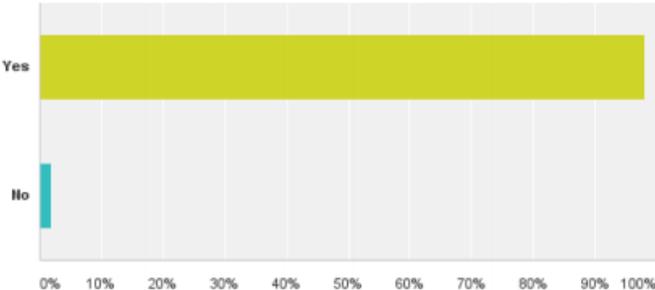
Q6: Gender

Answered: 869 Skipped: 0

Answer Choices	Responses	
Male	77.33%	672
Female	22.67%	197
Total		869

Q7: Have you visited forests or parks in Frederick County, Maryland?

Answered: 861 Skipped: 8



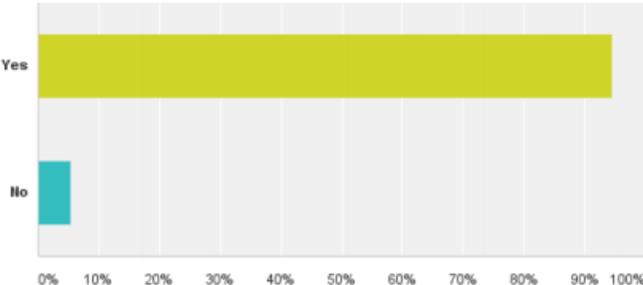
Q7: Have you visited forests or parks in Frederick County, Maryland?

Answered: 861 Skipped: 8

Answer Choices	Responses
Yes	98.14% 845
No	1.86% 16
Total	861

Q8: Have you visited the Frederick Municipal Forest / Watershed?

Answered: 869 Skipped: 0



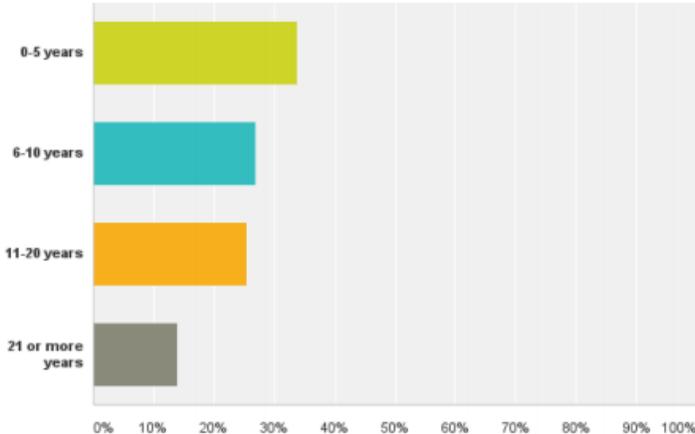
Q8: Have you visited the Frederick Municipal Forest / Watershed?

Answered: 869 Skipped: 0

Answer Choices	Responses
Yes	94.59% 822
No	5.41% 47
Total	869

Q9: How many years have you been coming to the Frederick Municipal Forest / Watershed?

Answered: 745 Skipped: 124



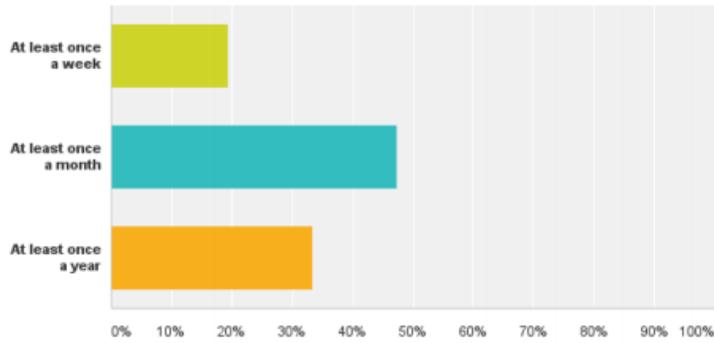
Q9: How many years have you been coming to the Frederick Municipal Forest / Watershed?

Answered: 745 Skipped: 124

Answer Choices	Responses	Count
0-5 years	33.83%	252
6-10 years	26.85%	200
11-20 years	25.37%	189
21 or more years	13.96%	104
Total		745

Q10: How many times a year do you visit?

Answered: 744 Skipped: 125



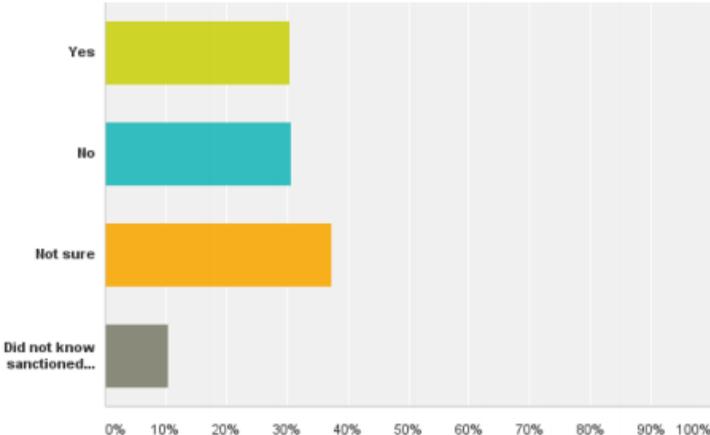
Q10: How many times a year do you visit?

Answered: 744 Skipped: 125

Answer Choices	Responses	
At least once a week	19.35%	144
At least once a month	47.31%	352
At least once a year	33.33%	248
Total		744

Q11: Do you venture outside of sanctioned trails? (Check all that apply)

Answered: 741 Skipped: 128



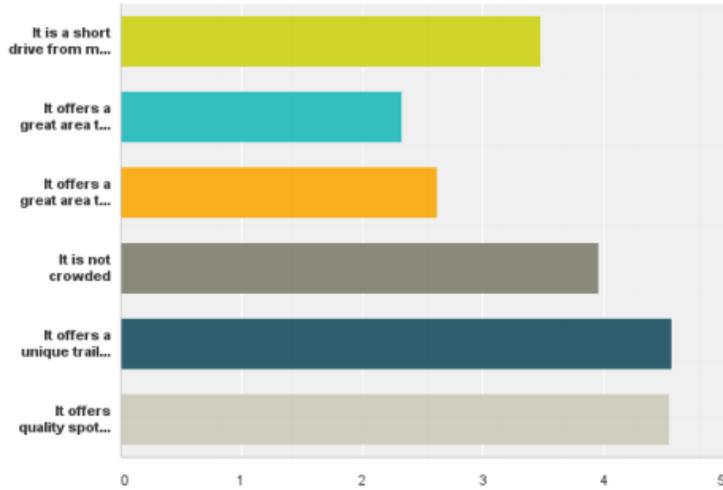
Q11: Do you venture outside of sanctioned trails? (Check all that apply)

Answered: 741 Skipped: 128

Answer Choices	Responses
Yes	30.50% 226
No	30.63% 227
Not sure	37.38% 277
Did not know sanctioned trails exist	10.53% 78
Total Respondents: 741	

Q12: I choose to visit the Frederick Municipal Forest / Watershed because:

Answered: 748 Skipped: 121



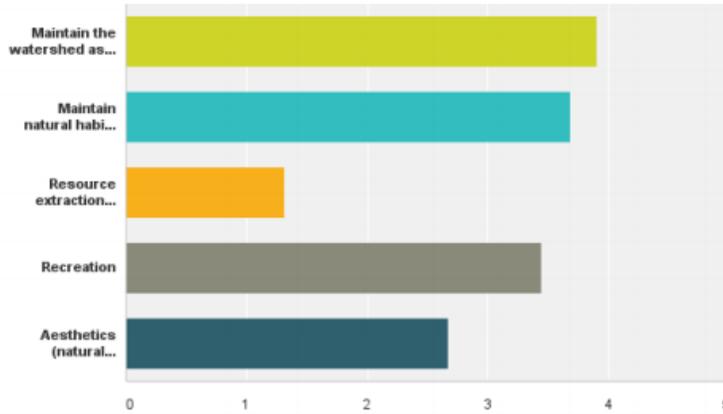
Q12: I choose to visit the Frederick Municipal Forest / Watershed because:

Answered: 748 Skipped: 121

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree	Total	Average Rating
It is a short drive from my home	7.31% 53	18.21% 132	19.59% 142	29.10% 211	25.79% 187	725	3.48
It offers a great area to hunt	34.05% 237	11.21% 78	45.55% 317	6.10% 43	3.02% 21	696	2.33
It offers a great area to fish	23.34% 162	9.94% 69	51.59% 358	11.67% 81	3.46% 24	694	2.62
It is not crowded	1.63% 12	3.54% 26	17.71% 130	51.23% 376	25.89% 190	734	3.96
It offers a unique trail experience in the DC/Baltimore area	1.77% 13	0.82% 6	5.44% 40	23.27% 171	68.71% 505	735	4.56
It offers quality spots that allow me to be one with nature	1.09% 8	0.14% 1	5.56% 41	29.85% 220	63.36% 467	737	4.54

Q13: On a 1-5 scale, order the importance of the following functions of the Frederick Municipal Forest / Watershed: (1 = most important)

Answered: 737 Skipped: 132



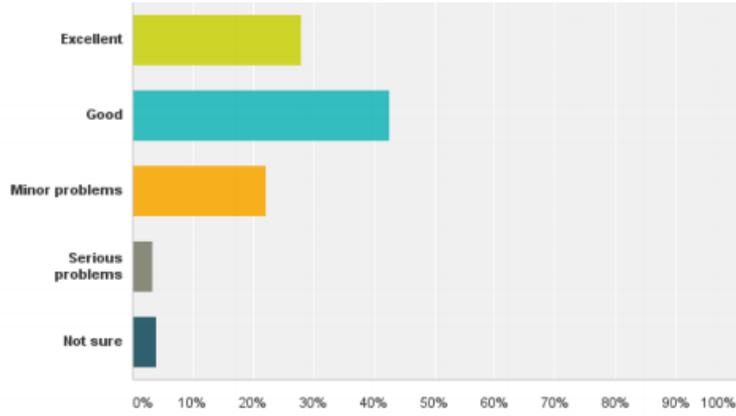
Q13: On a 1-5 scale, order the importance of the following functions of the Frederick Municipal Forest / Watershed: (1 = most important)

Answered: 737 Skipped: 132

	1	2	3	4	5	Total	Average Ranking
Maintain the watershed as a source of high quality water	45.45% 335	19.27% 142	16.42% 121	17.10% 126	1.76% 13	737	3.90
Maintain natural habitat for wildlife	18.75% 138	43.89% 323	25.82% 190	9.78% 72	1.77% 13	736	3.68
Resource extraction (timber)	4.22% 31	1.77% 13	1.77% 13	6.26% 46	85.99% 632	735	1.32
Recreation	25.99% 191	20.14% 148	29.80% 219	20.41% 150	3.67% 27	735	3.44
Aesthetics (natural beauty)	5.71% 42	15.08% 111	26.36% 194	46.47% 342	6.39% 47	736	2.67

Q14: Rate the state of the Frederick Municipal Forest / Watershed:

Answered: 739 Skipped: 130



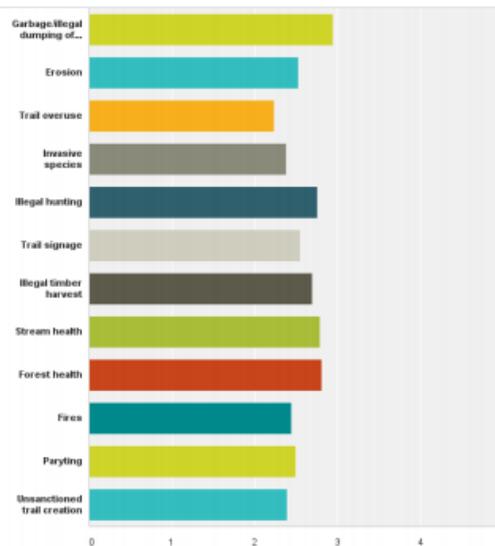
Q14: Rate the state of the Frederick Municipal Forest / Watershed:

Answered: 739 Skipped: 130

Answer Choices	Responses
Excellent	28.01% 207
Good	42.49% 314
Minor problems	22.06% 163
Serious problems	3.38% 25
Not sure	4.06% 30
Total	739

Q15: Within the Frederick Municipal Forest / Watershed, do you think any of the following are issues of concern?

Answered: 737 Skipped: 132



Q15: Within the Frederick Municipal Forest / Watershed, do you think any of the following are issues of concern?

Answered: 737 Skipped: 132

	Undecided	Not concerned	Concerned	Strongly concerned	Total	Average Rating
Garbage/illegal dumping of trash	9.66% 71	16.85% 118	44.49% 327	29.80% 219	735	2.94
Erosion	8.88% 65	36.89% 270	46.72% 342	7.51% 55	732	2.53
Trail overuse	5.59% 40	70.81% 509	20.22% 147	4.26% 31	727	2.23
Invasive species	19.95% 146	31.15% 228	38.62% 280	9.29% 68	732	2.38
Illegal hunting	15.62% 114	20.55% 150	35.89% 262	27.95% 204	730	2.76
Trail signage	5.91% 43	44.15% 321	38.51% 280	11.42% 83	727	2.55
Illegal timber harvest	16.14% 118	24.90% 182	32.97% 241	25.99% 190	731	2.69
Stream health	11.22% 82	19.70% 144	48.15% 352	20.93% 153	731	2.79
Forest health	9.54% 70	21.12% 155	48.89% 353	21.25% 156	734	2.81
Fires	12.24% 89	43.85% 313	33.43% 243	11.28% 82	727	2.44
Poaching	12.65% 91	40.55% 294	32.55% 238	14.34% 104	725	2.49
Unsanctioned trail creation	13.29% 97	46.88% 340	28.36% 207	11.78% 86	730	2.39

Appendix 4: Project Summary for the Ad Hoc Watershed Committee



University of Maryland + Frederick City

The University of Maryland's Partnership for Action Learning in Sustainability (PALS) is working with the City of Frederick on sustainable growth initiatives for the 2014-2015 academic year. Coursework customized by PALS faculty targets the goals and projects articulated by Frederick, engaging students directly with the community on real projects. The win-win partnership created through PALS provides students the opportunity to stretch their critical and creative thinking muscles and allows Maryland communities unparalleled access to UMD's expertise and energy.

PALS + Conservation Biology

Our team is one of three teams in the Conservation Biology course researching how global change has impacted and will impact the area.

Frederick Municipal Forest User Survey

Frederick owns and manages a large, 3000 ha forest lot, which surrounds a reservoir and important eastern brook trout habitat. Our team is researching the historical changes to the forest, both ecologically and perceived by recreational users. We plan to draw upon the wealth of historical forest literature provided online to summarize how the forest has changed over time. In addition, we will use a survey to gather input about usage history in the forest, as well as perceived forest and stream health from visitors. Finally, we will overlay the literature analysis of how the forest has changed with visitor perception data in a report.

For any questions regarding the survey please contact Ashton Harp at ashtonj@umd.edu. We are accepting survey suggestions and revisions until Monday, October 13. We will open the online survey on Tuesday, October 14. We are also seeking input on upcoming events or meetings to conduct in-person interviews.