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Analyzing a collaborative approach to forest management planning on the Evitts Creek Water Company Property in Bedford County, Pennsylvania

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ABSTRACT

Forest management planning is critical for the sustainability of natural systems on a site. Managing public ground is a complicated process, and usually involves many stakeholders with a variety of opinions. One such public property is the Evitts Creek Water Company (ECWC) property, owned by the city of Cumberland, Maryland. The primary objective for the ECWC property is to provide clean drinking water for the city and surrounding area, but achieving this goal and planning for the future should be a careful process. In order to sustainably manage the ECWC property, a small focus group containing members of a variety of agencies was formed to create a sustainable forest management plan. This case study examined the effectiveness of using a collaborative effort to create a sustainable forest management plan for the property. The group consisted of partners from the Pennsylvania Department of Conservation and Natural Resources (DCNR), Maryland Department of Natural Resources (DNR), The Nature Conservancy, The City of Cumberland, Allegany College of Maryland, and the Western Pennsylvania Conservancy. Personal experience of a member of the ECWC focus group showed that the barriers for success on this project were a lack of committed group members and unclear expectations for those involved. Additionally, strict but realistic deadlines would have contributed to the successful completion of the plan. Forest certification through the Forest Stewardship Council was a driving factor for deadlines, and its benefit makes the additional planning worthwhile because becoming certified will allow the ECWC property to be recognized for its sustainable forest management. Investigating management on other public lands led to a set of recommendations for increasing collaboration, justifying certification, and improving the planning process on the ECWC property. These recommendations will be shared with the ECWC planning group in order to improve future planning efforts.

INTRODUCTION

Background and Property Description

The Evitts Creek Water Company (ECWC) is a 3,600 acre (+/-) forested parcel located in Bedford County, Pennsylvania. The property surrounds two reservoirs, Lake Gordon (north) and Lake Koon (south) that were created in the early 1900's (Figure 1). The property is critical to the wellbeing of the Cumberland, Maryland area as a quality water source for the city.

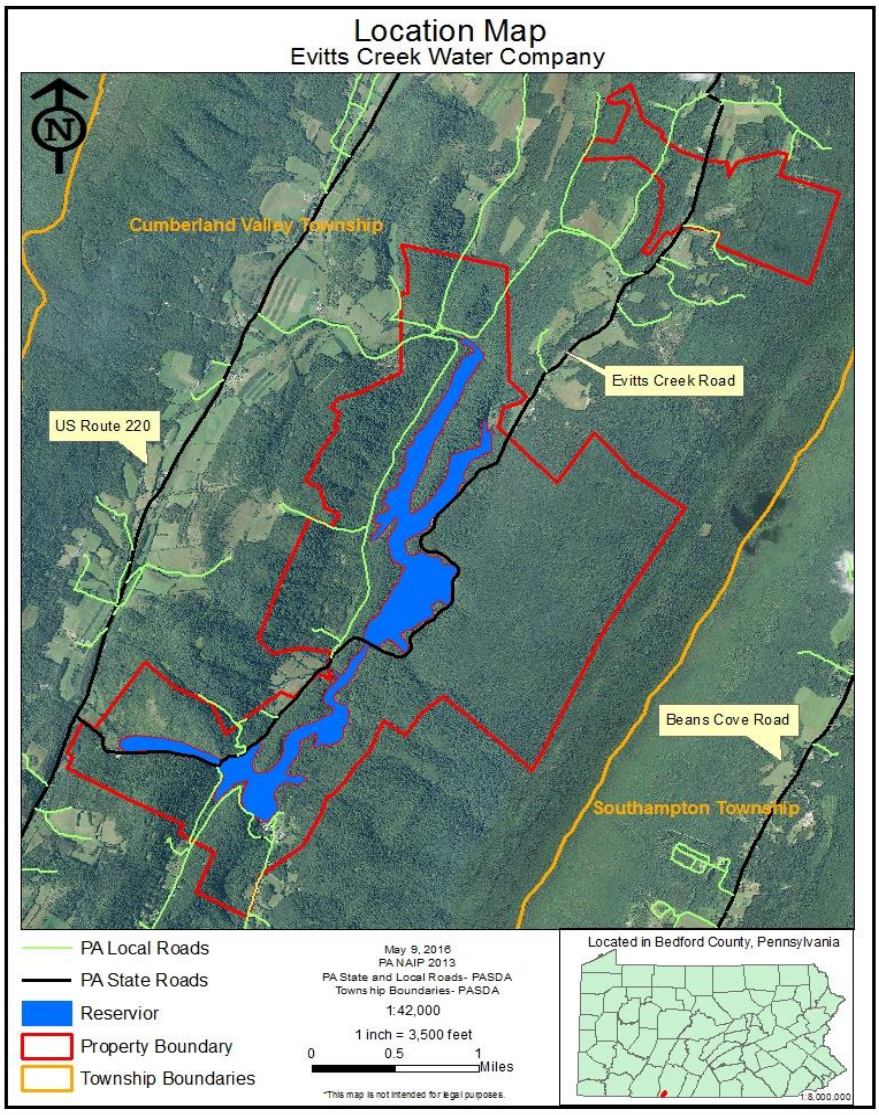

Figure 1. Map of ECWC Location

The water supply from the ECWC for Cumberland is unique because it is the only water system in the state of Maryland where the source is located entirely out of the state. The tract is located in Bedford County, PA but is owned by the city of Cumberland, Maryland. The tract functions as

"public" land in that it is available for use by the general public, particularly for recreational purposes such as fishing and hiking (Eriksson 2016).

The development of a management plan on the ECWC property involved the numerous users as well as professionals to guide the process. In early 2015, stakeholder meetings were held by the city of Cumberland Environmental Planner to receive public input on the management of the ECWC property. From these meetings a committee was formed that was composed of a variety of partners including: The Nature Conservancy, Maryland Department of Natural Resources, Pennsylvania Department of Conservation and Natural Resources, Allegany College of Maryland Forestry, and the City of Cumberland. Each partner added unique ideas to the management planning process, all of which focused on the sustained use of the property.

In order to manage the ECWC property in a sustainable manner a plan was developed that considered the long-term health of the forest surrounding the two reservoirs. Responsible management actions were determined through the use of modern technology, data collection, and scientific reasoning.

Forest Management Planning

Forest management plans are a common tool in guiding the management of public and private forest lands. There are a variety of formats for forest management plans, but generally they include objectives, maps, a description of the forest, information about soils, and management recommendations (Pennsylvania Forestry Association 2016). It is common for consulting foresters, service foresters, or Department of Natural Resources personnel to write management plans for private forest landowners. Forest management plans may recommend timber harvests, wildlife management practices, or simply monitoring the property for the duration of the plan

(typically 15 years). A forest management plan is not a strict set of rules for the landowner to follow, but is rather a "road map" or working guide to direct the landowner in creating the healthy and sustainable property they desire (PA Forestry Association 2016). It is relatively common in Maryland for a DNR forester to visit a landowner, discuss his objectives, and then develop an individualized plan for the property (A. Miller, personal communication, April, 2016).

Many public lands have forest management plans as well, but these typically include different information than those for private land. Generally, forest management plans for public grounds are created with multiple-use objectives in mind, and consider a variety of stakeholders in the planning. According to the MD DNR website, foresters for state forests work with stakeholders and other agency personnel to identify areas in need of management and make "sustainable forest management decisions" (MD DNR 2016).

Figure 2. Timber harvesting and sawmill on ECWC property in early 1900s. (Eriksson 2016).

Although the forest on the ECWC property was "managed" since the late 1700's, the property has been managed under a forest management plan only since 2000 (Eriksson 2016). Prior to that, forests on the ECWC property had been harvested intensively to supply the wood to a

growing population in the area (Figure 2) (Eriksson 2016). Much of the early management on the property was not sustainable or environmentally sound, consisting of expansive timber harvests with little regard for the future forest (Eriksson 2016). Creation of the 2000 management plan by a consulting forester began with a complete inventory of the property which allowed more appropriate forest management planning. The primary objective of the 2000 ECWC forest management plan was to promote a "viable, uneven-aged forested watershed that supplies a continuous flow of filtered water for the city of Cumberland…" It has been proven that tree species, leaf size, and tree flexibility (sapling size) greatly impact the travel of water through a forest system by altering patterns of interception and evaporation (Edwards et al. 2015). Specifically, saplings contribute more water to the system than mature trees because of their flexibility, allowing water to pass through leaf cover to the ground (Edwards et al. 2015). Likewise, trees with downward facing branches have lower precipitation interception losses because of their ability to "shed" precipitation (Edwards et al. 2015). Managing for an uneven-aged forest can promote a variety of vegetative age, species, and size classes across the landscape and increase available water. The secondary objective of the plan was to provide "periodic income from forest thinnings and enhancement of fish and wildlife habitat." Additionally, the plan noted species of special concern that were known to be present on the property and recommendations to preserve or enhance them (Harper 2000). Species of concern from the 2000 plan included Tooth-cup (*Rotala ramosior)*, Bog bluegrass (*Poa paludigena*), and box huckleberry (*Gaylussacia Brachycera*) (Harper 2000). The standard 15-year management cycle of the original plan ended in 2015, and preparation for the creation of a new "collaborative" plan began. Enactment of a collaborative approach to management was a new

venture for several individuals involved with the project and may have been improved with some guidelines.

Collaboration

In recent years, collaborative management on public lands has gained popularity in natural resource management. According to Wondolleck and Yaffee (2000), collaboration is a powerful way to get people involved with resource management. They claim, "Collaboration in resource management can help provide fertile ground for the development of a heightened sense of citizen involvement and responsibility, and it can help rebuild a sense of trust in government institutions and each other" (Wondolleck and Yaffee 2000 p.8). Engaging communities can often foster support and understanding of a proposed project. Community-based collaborative forest management is the process where decisions on a particular public land are derived from the local community, rather than policy makers from afar (Wilson and Crawford 2008). According to Wilson and Crawford (2008), collaborative forest management increases public participation and can lead to more educated management decisions, and can potentially eliminate political gridlock that results from natural resource practices. In collaborative management, the community involved should be fairly represented and it can be expected that improved knowledge of forest management activities will be achieved. Wilson and Crawford (2008) studied a collaborative management project on the San Juan National Forest and determined that regardless of the composition of the focus group, people involved with a collaborative forest management project left with new knowledge of forest management. Additionally, people involved discovered new ways to engage in forest issues and relationships were formed (Wilson and Crawford 2008).

Engaging communities in collaborative resource management can be problematic and labor-intensive, but usually proves to be very beneficial. Some policy makers worry that too much community involvement will cause them to lose "power" but studies have shown that the opposite is often true (Wondolleck and Yaffee 2000). Wondolleck and Yaffee (2000) claim that decentralized, consensual decision making is currently the most effective method to achieve management goals rather than "top-down" management. Sisk et al. (2006) presented a study that aimed to use a participatory approach to restore Ponderosa pine (*Pinus ponderosa)* ecosystems in the American Southwest. In order to achieve their goals, they used extensive public outreach and education to develop a working-group for the project. A variety of stakeholders were invited to participate in the collaborative project where they were informed about resources in the area through the use of spatial data, a website, and in meetings. Sisk et al. (2006) initiated extensive outreach efforts in order to include as many people as were interested in their restoration project. Their efforts in creating a collaborative restoration process led to well-informed citizens who supported their land management objectives.

Shindler and Neburka (1997) interviewed a variety of participants from collaborative groups to determine positive attributes that were present in most collaborative situations. Each of the groups was working toward a different goal, but all were related to forest planning. Shindler and Neburka outline attributes of successful collaborative projects in their article, "Public Participation in Forest Planning: Eight Attributes of Success" (1997). Shindler and Neburka's "attributes of success" include:

1. Groups whose members are selected for their understanding of the issues and willingness to commit to a group process are more effective.

2. Meetings are much more productive if structured to promote full group interaction, rather than simple information sharing and feedback.
3. A group whose purpose is defined and whose end product is identified at the outset is inherently more successful.
4. Groups in which the decision maker has a regular presence believe their contributions are taken more seriously by the agency.
5. Working with current and reliable information adds considerably to a credible process.
6. The "care and feeding" of participants is important.
7. The experience of getting to know "the other side" is beneficial to outcomes.
8. Willingness to filter out "noise" from national interest groups can help participants stay focused on their common goals.

In addition to eight clear "guidelines", Shindler and Neburka (1997) mention that "basic organizational skills, attention to detail, commitment to constituents, and good leadership" are also critical factors in successful collaborative efforts.

A variety of collaborative processes can be used to achieve forest management goals, but it can be anticipated that with a proper collaborative approach, less conflict will arise from natural resource management. Following some guidelines for successful collaboration could have improved the planning process on the ECWC property.

OBJECTIVES

The primary objective of this case study was to examine the collaborative approach that was used to create a new forest management plan on the Evitts Creek Water Company Property. This paper outlines the methods used to create the plan and examines their strengths and weaknesses.

Additionally, this paper analyzes the potential benefits and negative aspects associated with forest certification on the ECWC property and makes recommendations to improve future sustainable management on the property.

ECOLOGICAL FACTORS

Geology and Soils

The ECWC property is located in Pennsylvania's ridge and valley province that is characterized by long ridges with valleys running between (Knight 1998). The property contains varied geology with most of the rock being from Cambrian to Pennsylvanian in age. The major ridges on the property contain quartzite and sandstone making them resistant to erosion, while limestone valleys lie between the ridges. One unique geologic feature on this property is

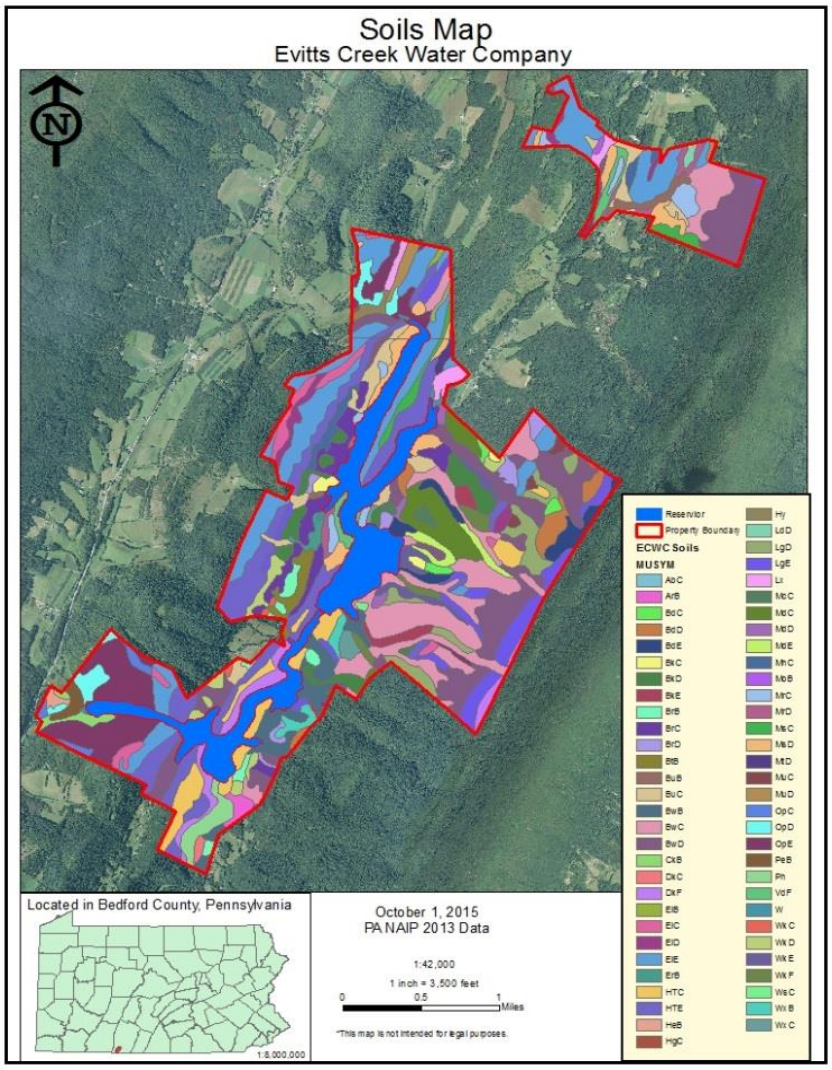

Figure 3. Map of soils by type on the Evitts Creek Water Company Property

Figure 4. View of Lake Gordon on ECWC property, 2015 (Eriksson 2016)

the shale barrens located on several ridges (Tyndall 2015). The unique geology provided by these areas allows the ecosystems to support a variety of unique flora and fauna including some endemic species (Tyndall 2015).

Several important mineral resources are present on the ECWC property. Historically, limestone was extracted from the property and used for concrete, aggregate, and lime throughout the area (Knight, 1998). Coal was only mined in a small portion of Bedford County and the ECWC property was not impacted by its extraction (Knight, 1998).

Soils play a critical role in vegetative composition and productivity on a site, and the ECWC property holds over 60 different soil types from 35 soil series (Figure 3) (Soil Survey Staff, 2016). Most notable soils series classes on the ridges are Dystrochrepts, Laidig, and Buchanan, while Opequon, Hagerstown, Murrill, and Morrison soils are prevalent in the valleys and on low ridges (Knight, 1998). Generally, most of the soils on the property are conducive to growing forests and are well-drained (Soil Survey Staff, 2016). Erosion potential, drainage, and texture of soils are other important considerations for land management (Soil Survey Staff, 2016). The web soil survey indicates that the ECWC property has slight to moderate erosion potential. This rating is based on "the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface" (Soil Survey Staff, 2016). Roads and trails can be a major source of erosion and sedimentation in water sources (Figure 6 shows roads on the property). Fortunately, the ECWC property has a well-developed primary road system where most of the

roads are paved. Soils on the property show slight to moderate erosion potential from roads and trails (Soil Survey Staff, 2016). Forest roads or old logging roads are grassy and most are gated to prevent unauthorized traffic.

Climate

The climate in Bedford County, Pennsylvania is similar to much of the mid-Atlantic region. Winters on the ECWC property are known to be cold and snowy with average snowfall at 31 inches, while summers are hot and humid (Knight 1998). Rainfall is around 40 inches per year (Knight 1998). The daytime temperature can range from an average of 30 degrees in the winter months to about 85 degrees in the summer (Knight 1998).

Watershed

A watershed can be defined as the area in which all incoming precipitation drains to the same common location which is typically a body of water (Edwards et al. 2015). The ECWC property is part of a larger watershed, but management of the lakes is focused on the property which directly surrounds them. Lake Gordon and Lake Koon are supplied primarily by Evitts Creek and secondarily by Growden Run. The watershed above the intake at Lake Koon and Lake Gordon encompasses approximately 50.8 square miles of land in Bedford County, PA. The watershed is primarily forested, but is also

Figure 5. Typical hardwood stand with open understory on ECWC property, 2015 (Eriksson 2016).

composed of about 18-35% agricultural use (MDE 2002). This property drains into the Potomac River Basin which is part of the larger Chesapeake Bay Watershed (Knight 1998). Average runoff is roughly 18 inches per year (Knight 1998). It is important to understand the ECWC's role in the larger ecosystem and the function of its forested land in protecting water and filtering runoff. The property is part of the 499 square-mile North Branch of the Potomac Watershed that contains lands in Maryland, Pennsylvania, and West Virginia. This is a tributary of the Chesapeake Bay Watershed that is home to roughly 18 million people (Chesapeake Bay Program 2012). According to the US Forest Service, forested watersheds play a critical role in regulating runoff, minimizing floods, reducing erosion, and filtering sediment and contaminants from waterways (USFS 2007). The ECWC property is a significant forested acreage that helps provide clean water to areas far downstream.

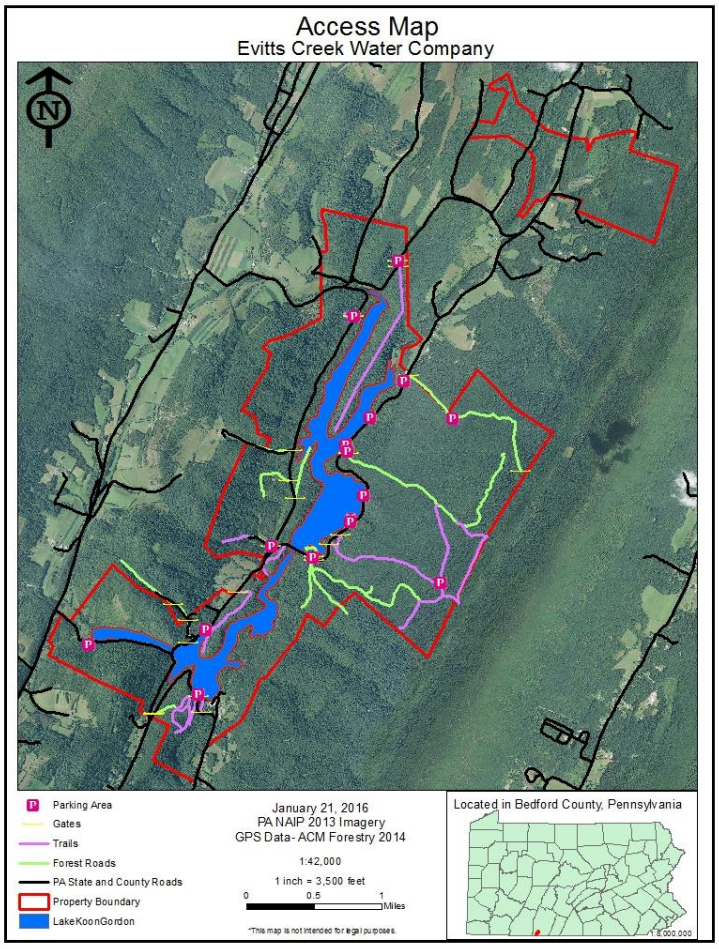

Figure 6 . Map of roads on ECWC property

Prior to entering ownership of the city of Cumberland, the ECWC property was used for farming and forest products. The area contained prime farmland for dairy and beef cows as well as

poultry, hogs, and sheep (Knight 1998). Other products from the property included fruit, grain, lumber and pulpwood (Knight 1998). The ECWC property was purchased in parcels from 1910-1930 and the impoundments to create Lake Gordon and Lake Koon were created (Eriksson 2016). Periodic timber harvests have occurred in recent years to maintain forest health.

Forests and Water

Availability of clean drinking water is a critical issue in some parts of the world. A variety of factors are currently threatening water supply worldwide including invasive species, intense wildland fire, increasing population and development, and climate change (Furniss et al. 2010). Forests are critical for maintaining a supply of clean water on Earth and play an

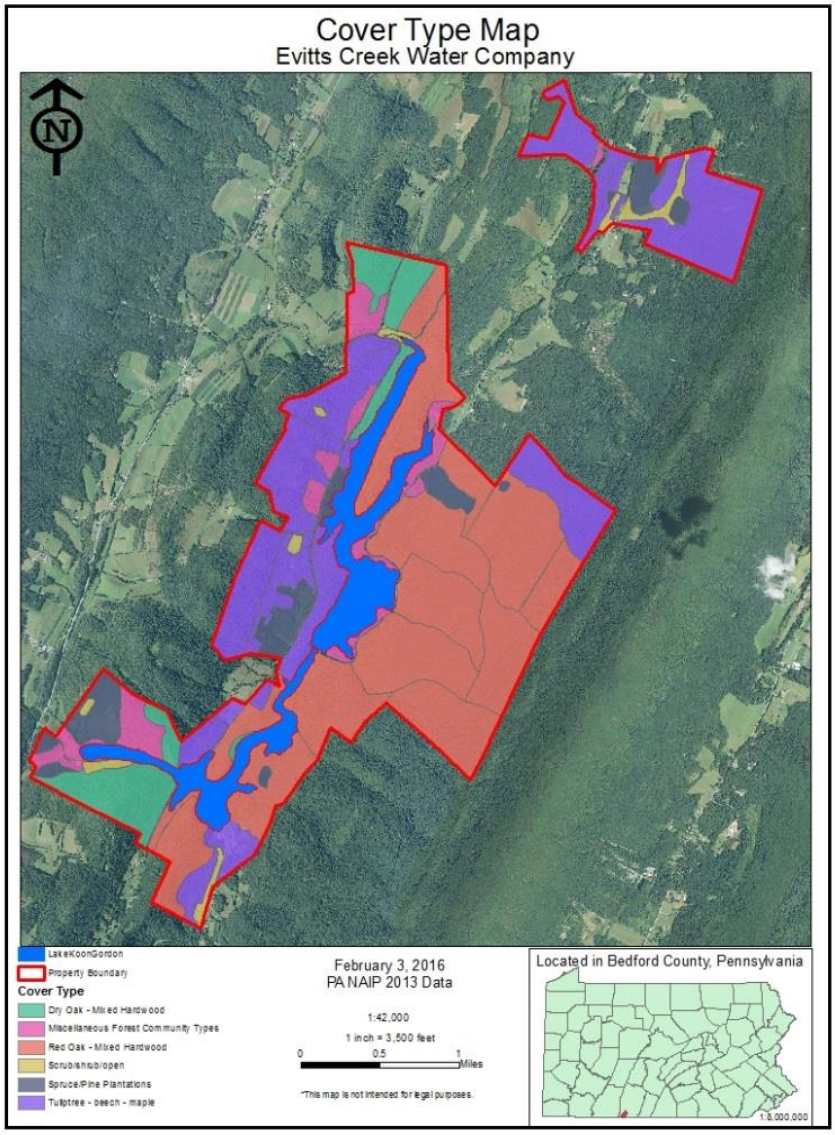

Figure 7. Map of ECWC stands by cover type.

important role providing this resource in the future. Forested watersheds provide many benefits including the reduction of runoff, stabilization of stream banks, shading and cooling of water, nutrient cycling, and filtration of pollutants from the water (Furniss et al. 2010). Gifford Pinchot, America's first forester wrote in his 1905 "Primer on Forestry" that "A forest, large or small, may render its service in many ways. It may reach its highest usefulness by standing as a safeguard against floods, winds, snow slides." (Furniss et al.2010). This statement from over 100 years ago reveals the interconnectedness of trees and water, and promotes the necessity for forest management in maintaining water quality. Water is one of the most precious resources on Earth and providing a clean, consistent supply for people everywhere is a valiant goal of natural resource managers.

Clean water can be a subjective term, but the City of Cumberland set parameters for achieving what it considers to be clean, quality water. A few of the regulated parameters include: maximum turbidity, total coliform bacteria, barium, chloramines, chlorine, fluoride, copper, lead, and others. Water pH, hardness, and sodium are also monitored but are unregulated parameters (MDE 2002). Specific levels of water quality parameters are followed as set by the Environmental Protection Agency. All of the required water quality parameters are outlined in the ECWC Source Water Assessment.

Potential impacts to the quality of the water supply were listed in the Source Water Assessment report from 2002 which included agricultural runoff, highway runoff from route 220, high sedimentation rates, and others. Most of the area surrounding the ECWC property is deciduous forest with some farmland. Maintaining forest throughout the property and on a broader landscape scale is important in supplying clean water, as forests filter runoff and help prevent

erosion. Truly managing for clean water might require the involvement of landowners upstream and throughout the far-reaching watershed.

Forest Resources

The ECWC property is located in the Oak-Chestnut Association of the Eastern deciduous forest (Vankat, 1979). Historically forests in this association were composed of oak species (*Quercus spp*) and American chestnut (*Castanea dentata*). Unfortunately, the advent of the chestnut blight (*Chryphonectria parisitca*) in the early 1900's eliminated American chestnut as a dominant species. Common tree and shrub species on the ECWC property and surrounding area in this forest type include red oak (*Quercus rubra*), chestnut oak (*Quercus montana*), pitch pine (*Pinus rigida*), and azaleas and rhododendrons (*Rhododendron spp.*)

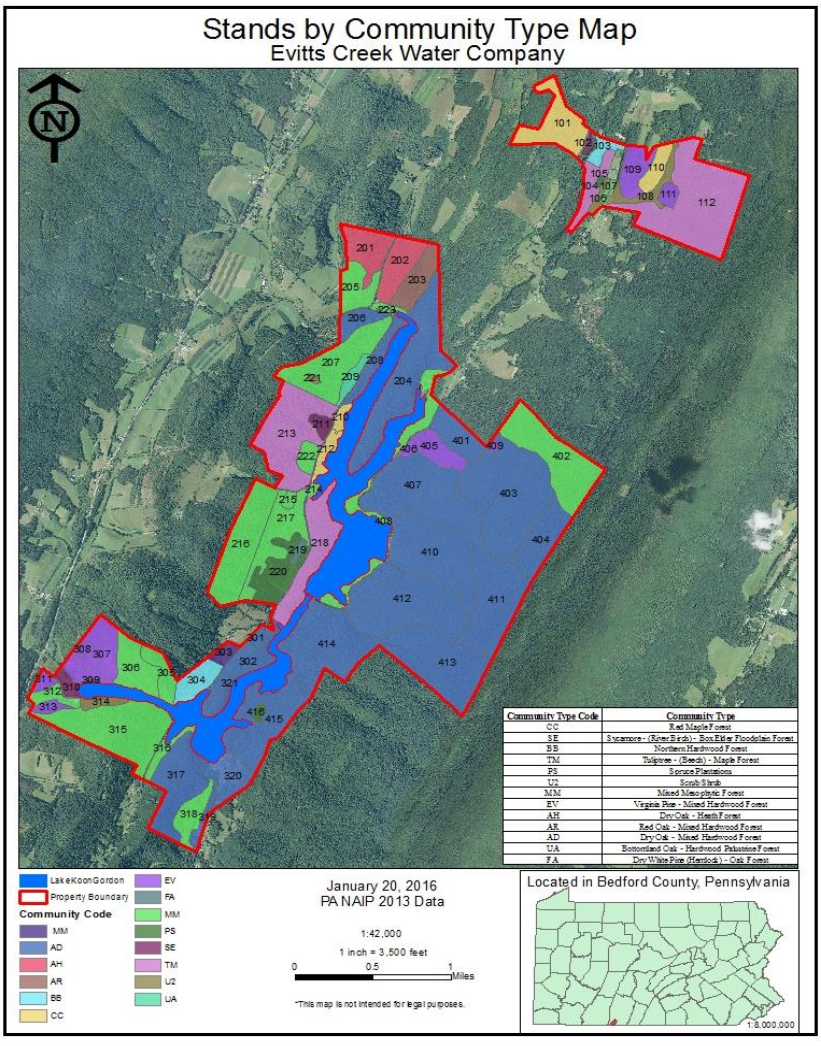

Figure 8. Map of ECWC stands by community type.

(Vankat 1979). This area is also known as the "Appalachian oak" forest type.

The ECWC property was classified into six primary forest cover types (Figure 7) and fourteen different forest community types (Figure 8). The most common community type on the property include mixed mesophytic, typified by a high level of biodiversity and well-drained sites (Vankat 1979). Analysis of forest inventory data on the property indicates a relatively even-aged forest with stands of pole-timber size and above (see "Stands by age class" in appendix). This forest stand structure indicates a lack of timber harvesting in recent years, as there are few young forest stands present. Stands are typical of the eastern deciduous forest, with some exhibiting open understory (Figure 5). Invasive species are present on the site including Japanese barberry (*Berberis thunbergii*), mile-a-minute (*Persicaria perfoliata*), Japanese stiltgrass (*Microstegium vimineum*), and multiflora rose (*Rosa multiflora*).

Wildlife

The most predominant mammal on the property is the white-tailed deer (*Odocoileus virginianus*). Overpopulation of white-tailed deer can negatively impact forest structure and disrupt other ecosystem functions (Bressette et al. 2012). Other major wildlife includes black bear (*Ursus americanus*), squirrels (*Sciurus carolinensis*), rabbits (*Sylvilagus floridanus*), bobcat (*Lynx rufus*), wild turkey (*Meleagris gallopavo)*, a variety of game birds, and numerous songbirds. Abundant amphibians and reptiles can be found on the site as well- in fact during data collection in summer 2015, multiple turtle species were documented (Figure 8).

Figure 9. Eastern Box Turtle (*Terrapene carolina carolina*) identified in ECWC stand 405 (left), and Wood Turtle (*Glyptemys insculpta*) located in stand 319 (right) in summer, 2015 during data collection (Eriksson 2016).

According to the Bedford County natural heritage inventory (CNHI), several rare or endangered plant and insect species have been known to exist on the ECWC property including common shooting star (*Dodecatheon meadia*) (Figure 10), Northern metalmark (*Calephelis borealis*), Henry's elfin (*Callophrys henrici*), and the silvery checkerspot (*Chlosyne nycteis*).

Fire

Fire has historically played an important role in the development of eastern hardwood forests. Many plants and animals of this region have evolved to tolerate and thrive with the presence of periodic wildfires. Frequent, small, low-intensity fires historically burned in many areas reducing fuel build-up on the surface and in the understory, as well as encouraging the regeneration of any fire-dependent species **(**Brose et al. 2001). Today, however, most fires in Pennsylvania are extinguished quickly after they are detected and have been for the last century or so. The act of extinguishing all fires should not be considered "sustainable" management, as fire was historically a part of the ecosystem. Frequent, light fires would have minimal impact on

water quality, but hot, destructive fires could burn as a result of fuel build-up and lead to erosion and water quality issues. Fire is sometimes re-introduced into ecosystems through the use of prescribed burning, but is relatively uncommon. The ECWC property has not experienced a significant fire in recent history (Eriksson 2016).

Figure 10. Common Shooting Star on ECWC property, 2015 (Eriksson 2016).

Prescribed burning is recommended in forest management on the property to enhance the growth of some desirable species (e.g. oaks) and to maintain certain fire-dependent systems like the yellow oak- redbud woodland (CNHI data 2015). Introducing fire into the ecosystem should be planned carefully to adhere to the primary management objective of water quality.

SOCIAL FACTORS

Stakeholders

There are a variety of stakeholders and agencies involved with the management of the ECWC property (Table 1). Perhaps the most important stakeholder involved with the property is the city of Cumberland which provides one "natural resource engineer" to manage the property in addition to other job duties. The fact that there is not one individual dedicated to management of the property creates prioritization issues for tasks on the property. The Pennsylvania Department of Conservation and Natural Resources owns land adjacent to the property and the property is

located in Pennsylvania, making them an obvious interested party. Allegany College of Maryland has been a long-time user of the property for student laboratory exercises. The Western Pennsylvania Conservancy has monitored the property in recent years for sensitive, threatened, or endangered species. Additionally, The Nature Conservancy and Maryland Department of Natural Resources Forest Service have become involved with the property while assisting in writing the most recent forest management plan. The one stakeholder group that could be most "involved" with the property is adjacent landowners. These people see the property every day and rightfully share concern about its management and well-being. Any management on the property should suit their needs and concerns. Despite the fact that the ECWC property is not technically "public" land, the public and others are very absorbed in its management.

Table 1. List of stakeholders involved with the Evitts Creek Water Company property
Stakeholders
Evitts Creek Steering Committee (this includes landowner, township, and recreational interests as well as the Soil Conservation Districts)
Allegany County Forestry Board (wildlife management and forestry expertise to supplement our team's expertise)
FSU Ethnobotany Program (expertise in non-timber forest products)
Allegany College of Maryland
Maryland Department of Natural Resources
Pennsylvania Department of Conservation and Natural Resources
Western Pennsylvania Conservancy
The City of Cumberland, Maryland
The Nature Conservancy
Recreational users
Adjoining landowners (private and public)

Recreation

Perhaps the most attractive recreational activity on the ECWC property is fishing. Common fish species in Lake Koon and Lake Gordon include: Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*Micropterus dolomieu*), Pumpkinseed (*Lepomis gibbosus*), Bluegill (*Lepomis macrochirus*) , Crappie (*Pomoxis spp*.), Walleye (*Sander vitreus*), and others. Fisherman can gain access to the reservoir from several boat launches or fish from docks or banks. Hunting is

another popular recreational activity and is permitted throughout the property. Hunting is allowed and managed under Pennsylvania State game laws. Hiking on old logging roads is another common use. Students from the Allegany College of Maryland forestry department use the property as an outdoor laboratory for classes in forest measurements, forest insects and diseases, as well as others. Photographers can also routinely be seen using the ECWC property for nature photography as well as portraiture. The recreational opportunities provided by the ECWC property are an asset to the greater Cumberland area.

Economics

The total value of the ECWC property is difficult to quantify but should be based on the ecosystem services it provides. Timber value is obvious, though it has not been quantified in recent years and basing the value of the property solely on timber would not be an accurate representation. When timber sales do occur, however, they provide work for individuals in the local economy. The recreational value of the property is difficult to quantify, as is the value of the clean water and air the forest provides. Regardless, it is quite obvious that the ECWC property is an economic asset to the area.

There are many benefits and challenges in managing a public resource. The Evitts Creek Water Company property presents a unique situation in that it is not located in within the city to which it provides water. Many city residents have no idea where their water comes from or the importance of managing the forest resource to maintain clean water. The ECWC property is a public resource and the land it encompasses provides a variety of assets for many different stakeholders. Managing the forest is critical for maintaining a healthy water supply, but it may not correspond with the ideas of recreational users of the property. Understanding stakeholders

and the social aspects of the ECWC property are critical parts of creating a sustainable forest management plan.

CREATING THE ECWC MANAGEMENT PLAN

Background

Upon the expiration of the original (2000) ECWC management plan, it was decided by the city of Cumberland that a "collaborative" plan would be created in order to better manage the asset. A small "focus group" was created to work on the plan which initially consisted of representatives from The Nature Conservancy (two individuals), MD DNR (one individual), Allegany College of Maryland (one individual), and the City of Cumberland (one individual). As time progressed, the group membership fluctuated as members joined and left. The following text and Table 2 outlines the progression of creating a "collaborative" management plan on the ECWC property.

Figure 11. Field crew with collaborators collecting data on ECWC property, 2015 (Eriksson, 2016).

Developing the Plan

Following the organization of the focus group in April 2015, data collection was initiated by the Maryland DNR forest service. Two technicians were hired for a six-month time period to complete data collection on the ECWC property. Data collection protocols were determined

based on US Forest Service Forest Inventory Analysis (FIA) data collection. The data collection was completed in October, 2015 and data was entered into Two-dog software for analysis (Figure 11).

Table 2. Rough timeline of planning process on ECWC property from spring 2015 to April, 2016. Items in red indicate that they were not completed on time or at all.

Date	Action
Spring 2015	Early planning and stakeholder meetings held to generate comments/interest
Spring 2015	Small "focus group" formed
September 2015	Marie joined focus group to discuss mapping needs
September 2015	GIS data obtained
October 2015	Data Collection Completed
October 2015	Early Map review
October 2015	Portions of plan complete (fire, introduction)
November 2015	PA Natural heritage Data obtained
November 20, 2015	Group meeting, technical issues
December 31, 2015	Maps to be completed, KEA Scorecard to be completed
January 13, 2016	Group Meeting, New DNR forester joined group, one left
January 27, 2016	All components of plan due
February 5, 2016	First draft to group for review
February 19, 2016	Presentation to Mayor and City Council (cancelled)
February 24, 2016	Second draft to be reviewed by group
March 9, 2016	Final draft of plan complete
April 2016	Public comment period
April 1, 2016	Decision to hand project to new MD DNR Watershed forester, join The Nature Conservancy FSC certificate in 2017

The group agreed that The Nature Conservancy's Key Ecological Assessment (KEA) tool would be a practical way to display forest inventory data to the public (Figure 12). The Nature Conservancy developed the Key Ecological Assessment scorecard as a "robust but quick and concise diagnostic scorecard that can characterize and rate ecological and economic forest health" (TNC 2009). The report card contains information on several different aspects of forest health and can be applied on a small or large scale. Examples of variables involved include stocking, species diversity, species evenness, and regeneration. The scorecard uses a rating system to assign each variable a color that indicates a rating of poor, fair, good, or very good. The color rating system allows the viewer to take a glance at the scorecard and obtain a fair estimate of overall forest health. It also allows the land manager to easily target specific areas that need attention (ranked "poor"). The table provides a quick view for anyone who is interested

in the current forest conditions and the color rating system provides a visual representation that could aid land managers in defending their management decisions with landowners. In regards to managing with specific attention to clean water (the primary objective for the ECWC property), the KEA scorecard did not provide any significant indicators. Species diversity and forest composition could be analyzed in streamside areas to determine overall health of these zones. A healthy and productive riparian zone should aid in providing clean water. The KEA scorecard provides land managers with a quick picture of overall forest health. TNC has used the KEA scorecard for managing other properties as well but it is not widely used. One reason for the restricted use of the KEA scorecard is the labor-intensive process of gathering the data to populate the table. A group member from Allegany College of Maryland was assigned the task of populating the KEA scorecard.

The KEA scorecard for the ECWC property reveals that most of the stands on the property are fully to overstocked. Additionally, there seems to be a sufficient amount of acceptable growing stock (AGS) and regeneration throughout the property. A few areas of concern might be stand diversity, where numerous stands were rated "fair", and conifer cover. Most of the stands on the property rated "poor" for conifer cover, indicating that conifers composed 0-3% of the basal area in the stand. The scorecard proves a useful guide for management and gives a "big picture" idea of where initial management may be needed.

Forest Health & Condition Report

Evitts Creek Tract

3,800 acres; Beford County, PA

Allegheny Front - Key Ecological Attribute set and indicator ratings

Steve Resh, Allegany College

Inventory Data Collected by Megan McKewen and Seth Clapper

**Condition values were derived from 519 sample points established within the forested portions of the property

Mgmt. Unit*	COMPOSITION				STRUCTURE		REGENERATION		
	Stocking (%)		Tree Species		Conifer Cover (% BA)	snags>/= 10" dbh	all stems (regen)	% desirable (regen)	Deer Browse Impact Rating
	TOTAL	AGS	Diversity	Evenness					
201	102	83	10	0.79	1	2	5714	95	2
202	97	85	12	0.78	2	4	12250	87	2
203	83	69	13	0.85	0	4	3400	82	2
204	103	87	16	0.86	6	2	12409	85	2
218	120	95	18	0.87	10	3	23667	89	3
415	108	90	22	0.86	11	0	16952	88	3
405	130	104	9	0.62	63	13	37600	87	3
320	85	77	5	0.69	0	5	9123	100	3
312	55	30	5	0.84	0	5	2667	100	2
310	0	0	0	0.00	0	0	26000	100	3
214	78	72	4	0.73	0	0	5000	100	3
401	120	98	14	0.87	18	1	24250	98	3
406	55	45	3	0.55	33	22	10000	0	4
211	87	41	5	0.91	0	17	1000	100	2
210	41	30	5	0.86	0	0	4000	100	2
209	45	20	2	0.93	0	0	1000	100	2
205	39	30	5	0.75	0	0	6333	100	2
216	106	88	17	0.66	0	4	6722	98	3
217	99	66	12	0.88	9	15	5333	86	2
302	120	82	13	0.88	17	1	9333	92	3
306	120	65	8	0.91	0	5	7250	86	2
307	93	30	9	0.75	13	3	19000	78	2
315	113	72	19	0.62	4	6	5625	89	2
402	118	97	17	0.83	2	7	19313	97	3
403	117	89	17	0.79	3	3	22912	88	3
404	86	79	13	0.83	1	3	22143	83	3
407	125	102	19	0.87	3	6	32036	98	3
410	114	94	15	0.82	0	5	25130	93	3
411	109	93	16	0.85	0	3	19684	98	3
412	118	87	21	0.79	2	5	23767	97	3
413	92	82	16	0.85	0	2	21667	80	2
414	88	76	19	0.86	15	2	34044	82	2
317	112	72	16	0.84	3	5	14636	89	3
318	68	49	7	0.82	9	4	4667	100	2
101	90	61	7	0.57	2	7	7857	60	2
104	88	85	8	0.72	3	0	2667	100	2
112	101	79	19	0.83	3	5	27158	86	3
301	120	30	3	0.67	0	34	8000	100	2
314	89	78	20	0.80	0	0	5500	96	3
213	98	82	17	0.79	0	7	10211	96	2
219	72	66	1	0.00	100	0	3000	100	3
208	105	98	6	0.79	0	10	34000	97	3
220	89	65	5	0.49	83	2	3857	85	2
304	100	68	9	0.75	0	5	3250	100	2
416	111	83	5	0.79	42	0	4000	100	2
107	130	115	4	0.88	0	0	4000	100	2
110	81	61	4	0.30	0	0	19750	33	3
109	91	67	7	0.71	28	3	14000	77	2
103	100	96	8	0.74	21	0	3000	100	2
111	50	43	3	0.52	91	0	24000	96	2
206	99	92	10	0.85	0	30	3000	83	2
207	88	72	17	0.83	0	2	6000	97	2

RATING	Stocking (%)		Tree Species		Conifer Cover (% BA)	snags>/= 10" dbh	all stems (regen)	% desirable (regen)
	TOTAL	AGS	Diversity	Evenness				
POOR	< 44	<40	</=3	0 to 0.6	0 to 3	0 to 2	0-10k	<25
FAIR	45 to 58	41 to 53	4-8	0.61to 0.7	4 to 8	3 to 5	10,001-15k	26 to 54
GOOD	59 to 79	54 to 69	9-12	0.71 to 0.8	9 to 16	6 to 8	15,001-50k	55 to 74
V. GOOD	80+	70+	>12	0.81+	17+	9+	>50k	>75

RATING	Deer Browse Impact Rating
5	V. High Impact
4	High Impact
3	Moderate Impact
2	Low Impact
1	No Impact

Figure 12. Key Ecological Attribute Report Card for ECWC property. Produced by Steve Resh, Allegany College of Maryland, Fall 2015 (Eriksson, 2016).

In September, 2015, I was recruited to assist on the ECWC project for map production. Initially, I was given an example management plan from The Nature Conservancy and asked to recreate the same nine maps for the ECWC property. Obtaining spatial data for some aspects of the project presented great challenges and often resulted in unmet deadlines. One particularly difficult data set to obtain was the Pennsylvania natural heritage data that showed rare, threatened, and endangered species. Of the original maps that were requested many were combined and additional maps were added.

It may not have been apparent to the focus group how useful the maps and spatial data could be in making management decisions and recommendations. A study by Sisk et al. (2006) discusses the use of spatial data sets to achieve landscape-level ecosystem management in the American Southwest. Through an aggressive public outreach campaign the authors inform stakeholders about current ecological conditions and educate them on proposed management actions. Through the use of easy-to-read spatial data and maps, stakeholders were able to collaboratively decide on management actions for the area (Sisk 2006). Sharing spatial data through the use of Geographic Information Systems (GIS) could have been extremely useful in supporting management decisions on the ECWC property.

From October to December, minimal text was written for the management plan. During this time period, the MD DNR attempted to hire a new watershed forester whose primary duty was to assist with writing the ECWC plan. Unfortunately the new hire did not work out and no assistance was available from the MD DNR. In January, the MD DNR brought a new employee into the focus group for a limited time to assist with forest management decisions. One formal meeting of the entire focus group was held in January at which a proposed deadline for a draft plan was set. One major issue that arose from the January meeting was the question of who

would compile the plan into a product. This issue was hardly resolved and was delegated to a representative from The Nature Conservancy, the MD DNR forester, and the city of Cumberland engineer.

In late February, 2016 a draft plan was sent to the focus group for comment. The group was given a week to review the document and submit comments so that a second draft could be formed. Few members of the focus group fully submitted comments on the draft plan. An attempt was made by the three "editors" to incorporate the comments in the ECWC plan and create a second draft, but the draft was never completed. The project was put on hold when The Nature Conservancy representative realized that deadlines were not being met and that it was highly unlikely that the plan would be complete for the 2016 SFI certification.

As of April, 2016, the task of completing the ECWC management plan has been delegated solely to a MD DNR watershed forester. This new hire is expected to develop similar management plans across the region.

Method of Analysis

There are a variety of different methods to analyze the success of a collaborative process, most of which could be linked to the objective of the collaborative process in general (Conley and Moote 2003). In order to analyze the overall success of the planning process for the ECWC property, I compared it to Shindler and Neburka's (1997) attributes for success and created a few other "attributes for success" based on other studies. I used shortcomings in the planning process to make a clear set of recommendations for use in future collaborative forest management planning efforts. The following items are the "checklist" items used to analyze the ECWC collaborative process.

1. Members of the collaborative group were well educated on the subject matter and were committed to seeing the project through to completion (Shindler and Neburka 1997).

Members of the ECWC group were all well-educated on the subject matter. Most were natural resource professionals, though some lacked the technical forestry knowledge needed to create a forest management plan. There was a respectable variety of technical expertise including watershed foresters, service/consulting foresters, an urban forester, forestry professors, natural heritage specialists, and others.

Unfortunately, the second half of this item was not fulfilled and many group members were not prepared to see the project through to completion. Changing work schedules and duties as well as staff changes facilitated the lack of commitment for some members.

2. Meetings were used to make decisions and progress the plan instead of just relaying information and obtaining feedback from group members (Shindler and Neburka 1997).

This criterion was partially met, and sometimes meetings were used to come to agreement on pressing issues. More commonly than not, however, meetings were used to update group members and delegate additional tasks. Using face-to-face meeting time for these matters was a misuse of what could have been valuable discussion time.

3. The desired product of the group's effort was clear, as were the expectations of group members (Shindler and Neburka 1997). A final (realistic) deadline was set.

Upon beginning the ECWC plan, the final product seemed to be clear- a forest management plan. Unfortunately, the format and components of the plan were not determined at an early stage which made delegating tasks and compiling the final product difficult. Because of the variety of agencies involved, there were numerous ideas for what the plan *should* look like. SFI certification added another element of confusion, as it requires components in management plans that are beyond the typical information provided in a forest management plan. SFI certification was driving deadlines that seemed attainable, but changing work duties and seasons as well as uncertainty about final product format led to an unfinished plan. Overall, the lack of a "vision" for a final product led to an incomplete project and unmet deadlines.

4. The primary decision maker was present and receptive to suggestions from the group (Shindler and Neburka 1997).

This checkpoint indicates an underlying question of who was the primary decision maker on this project. There was a group leader (The Nature Conservancy), but there was also the primary forester for the City of Cumberland who is ultimately responsible for the management of the land. These uncertainties arose when compilation of plan elements occurred and no solid decisions could be made.

5. The best information possible was available throughout the planning process to promote credibility and accuracy (Shindler and Neburka 1997).

The ECWC project did make use of the individuals involved to provide the best information possible on this project. When an uncertainty arose, a group member usually reached out to other agency personnel for advice. One particular instance was in the case of examination for tribal

lands, where the Nature Conservancy identified a source for the information and provided a report.

6. Group members were well "cared for", made comfortable, and recognized for their contributions (Shindler and Neburka 1997).

This item is extremely subjective and depends on individual members and their opinions. Personal experience leads me to say that group members on this project were fairly well cared for and were usually commended for a job well done. Often, group members would be notified when a piece of the plan was completed and compliments were exchanged. Recognition was given for jobs well done and helped encourage other group members to keep working toward the goal.

7. Group members formed working relationships that helped appease concerns and broaden perspectives (Shindler and Neburka 1997).

Despite common interests and knowledge, there were still some disagreements on land management among the focus group on the ECWC project. Conflicts about riparian buffer width were appeased with explanations from three different agencies. Timber harvesting guidelines were discussed thoroughly among the group. Information sharing in order to educate all individuals and get them to support an idea was successful when necessary.

8. Focus of the project was kept on the project level without excessive attention to other entities/agencies that could be affected (Shindler and Neburka 1997).

This checklist item was not successfully completed. For much of the project instead of focusing on the actual plan objective of clean water, extensive effort was placed on creating a plan to suit

SFI standards. Additional maps and research was needed to fulfill standards for certification. Some group members were so focused on appeasing SFI that they lost sight of the real reason for the plan and the people who might be impacted by its creation.

9. Technology was used to educate and update all parties involved with the process (Sisk 2006).

Technology was under-utilized to keep the public informed on throughout the planning process. In his study, Sisk (2006) explain the use of technology to not only educate the collaborative group, but also to inform interested stakeholders about the land management goals. No effort was made to use technology to educate the public on the ECWC project which leads to the last checklist item.

10. The public and stakeholders were involved early and throughout the planning process (Sisk 2006).

This collaborative project considered stakeholders but did not involve them in the collaborative process. The ECWC property was managed to suit stakeholder needs, but they were as assumed by the focus group. No public representative was present at meetings, nor was a draft plan available for public review. This shortcoming is major, considering the fact that land management on the property will directly impact adjoining property owners, recreational users, and others in the surrounding community.

Discussion

Perhaps the most limiting factor in the creation of the ECWC management plan was the commitment and availability of the focus group. An endeavor that started out as a small group containing several professionals from different agencies became a much larger group with some "excess" individuals that may have hindered efficacy at meetings. Collaboration is important, but too many people each with his own ideas can result in gridlock. Several times at meetings conversation shifted to arguments about personal opinions or practices that were not relevant to the ECWC property. Aside from occasional excessive people, the focus group also faced issues with commitment of members outside of meetings. Several group members actively participated in meetings but were not willing to collaborate with smaller groups outside of meetings to accomplish a task. Unless a task was specifically assigned to someone, it rarely got completed. The staffing changes within the MD DNR that occurred amidst the plan writing were detrimental to the momentum of writing the plan. In this case it seems that the most beneficial aspect of collaboration, gleaning knowledge from many, became a major hindrance.

The ECWC management planning group did not meet any final product deadlines and is still incomplete at this time. One obvious organizational issue is that there was no standard template for the ECWC management plan. It was never agreed upon that the group would adopt the format of a Maryland DNR Forest Stewardship Plan or one from The Nature Conservancy. Instead, all of the information was combined into a massive document that had no formal outline or order. In my opinion, this led to an excessive amount of time for plan compilation because the group was trying to "re-invent the wheel". This holds true for map production as well. Many maps were created that were not used, and many additional maps were requested that were not

needed. Excess work for no foreseeable benefit can be degrading to the morale of the individuals in the group.

One stated objective of the MD DNR was to use the ECWC management plan as a template for landscape-level watershed management. Currently, the plan is being "edited" by the MD DNR's new hire, a forester whose primary duty is to complete the ECWC plan and others across the region.

Forest Certification

Many properties owned by The Nature Conservancy are certified under the Sustainable Forestry Initiative (SFI) certification (D. Keech, Personal Communication, January 13, 2016). It was a goal of the new ECWC focus group to gain certification for the property under The Nature Conservancy's SFI certificate.

The Sustainable Forestry Initiative (SFI) is "an independent, nonprofit organization dedicated to promoting sustainable forest management" (SFI 2016). This group aims to certify forests based on standards that include measures to protect water quality, biodiversity, wildlife habitat, species at risk, and Forests with Exceptional Conservation Value (SFI 2016). Each standard has certain "performance measures" and "indicators" to determine whether a forest is being managed suitably. For example, under the water quality standard, one performance measure is that the forest will meet or exceed best management practices and the indicators include monitoring, implementation of BMP's, and conforming to BMP's. In order to become certified, forest landowners must adhere to 13 Principles, 15 Objectives, 37 Performance Measures and 101 Indicators, and undergo an independent audit by a certification body (SFI 2016). Obtaining forest certification is desirable because it encourages responsible forestry, promotes science and

research, protects culturally and ecologically significant lands, and engages communities in forest management. Typically, forests that are certified produce wood fiber that is of higher value to some mills than non-certified forests. This certification is widely accepted and SFI provides a stable supply of wood products to consumers while ensuring sustainable forest management.

Forest certification has been extensively studied to analyze its benefit and its effectiveness in promoting sustainably managed forests. It is believed by some that forest certification merely supports those who were already practicing good forestry and incurs additional restrictions on their good work (Moore et al. 2012). Conversely, some believe that certification is too lenient and that it "imposes excessive costs on already marginal forest management operations" (Moore et al. 2012). In an extensive survey by Moore et al., it was determined that forest certification (regardless of certification body) was viewed as beneficial. It was determined that many groups that were surveyed had to make changes to their forest management style and public outreach, but the changes were not a hindrance (Moore et al. 2012).

Obtaining forest certification through SFI on the ECWC property could prove to be very beneficial. The process by which they plan to do become certified, under the Nature Conservancy's certificate, is cost-effective. Sustainable forest management planning was already occurring on the property, which makes the certification process slightly simpler. Some limitations or challenges that arose as a result of working toward certification were an extensive amount of work related to designating "Forests with Exceptional Conservation Value". This is fairly objective and was not considered prior to data collection. Historic knowledge of the property combined with accurate field data would simplify the process of designating particular areas of interest to the certification body.

Overall, the certification process seems very straightforward and could prove extremely beneficial to the ECWC property economically and through preservation of ecological resources.

CONCLUSIONS

A collaborative approach seems to be a preferable method for managing public lands to suit the needs of stakeholders and agencies involved. By working cooperatively, stakeholders can better understand different interests in the property and land managers should gain support. Public education can be a very powerful tool in achieving land management objectives. A transparent collaborative approach to land management could create a strong support system for land managers and a foundation in scientific forest management with minimal political and social barriers.

The ECWC planning process began with good intentions that, unfortunately, were not carried through. Conflicting interests, lack of commitment by group members, and personnel changes caused the plant to lose momentum before a final product could be created. Allowing the plan to be completed by an "outside party" as it is now seems to defeat the purpose of collaborative management. Additionally, the process was not a true collaboration among all stakeholders, but rather a select few professionals. Following a successful collaborative process such as that of Wilson and Crawford (2008) on the San Juan National forest may have been more useful to the ECWC focus group. Analysis of the planning process indicated that the public was not involved with the development of the plan, which could have led to a lack of accountability for those involved with its creation.

Looking forward, forest certification is still a primary objective for the ECWC property. The Nature Conservancy intends to enroll the property under its SFI certificate in 2017.

Overall, a sustainable forest management plan will be created for the ECWC property. Whether or not the plan is "collaborative" is subjective. The following recommendations are suggestions for improving the collaborative planning process on the ECWC property or any other small public land.

RECOMMENDATIONS

1. Develop a consistent and committed focus group of people who plan to stay with the project through completion
2. Determine clear expectations of group members
3. Involve the public early and provide updates often
4. Make use of technology available to update public
5. Determine the intended audience of the plan (public? certification body?)
6. Develop a standard outline, timeline, and map set for creating a management plan

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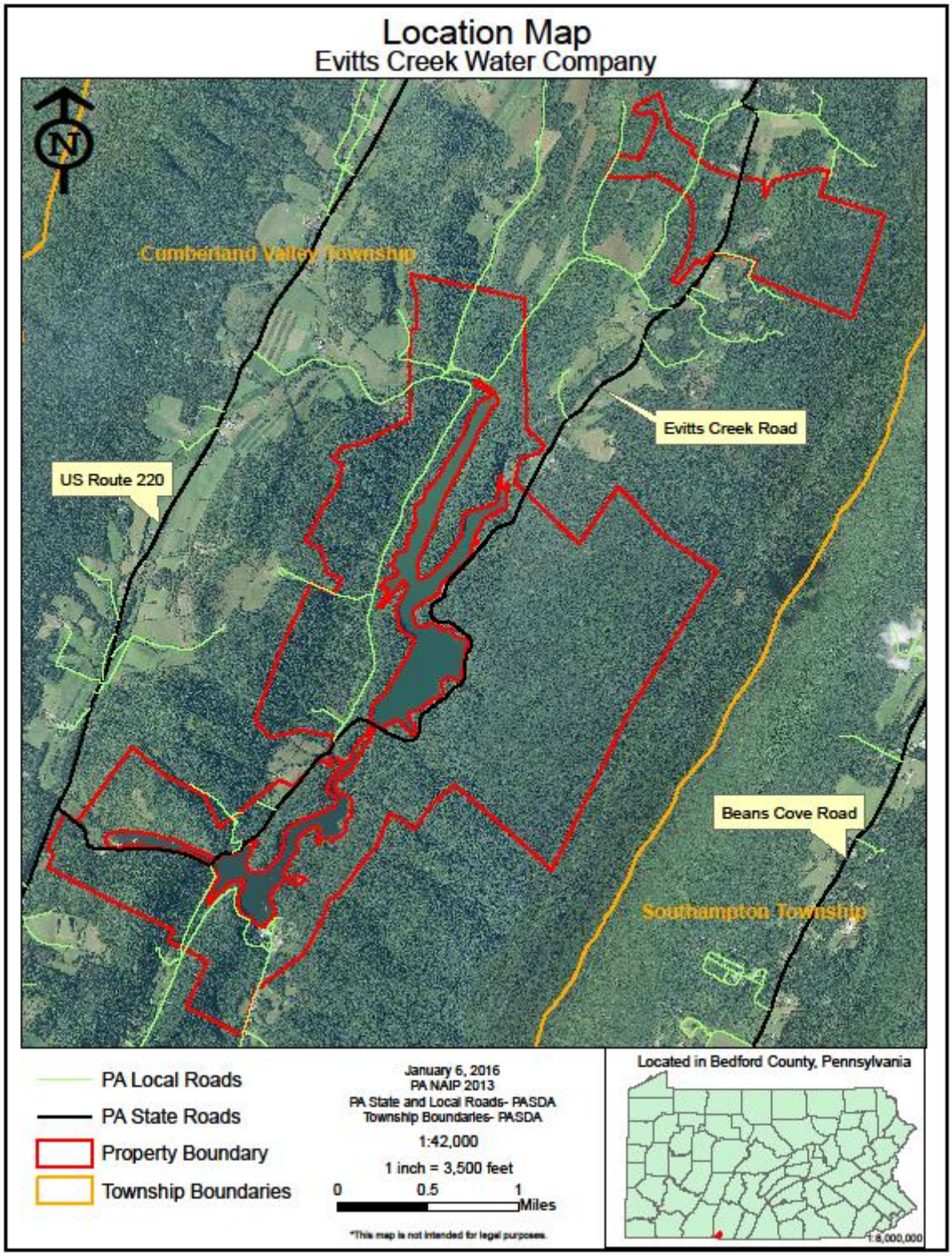
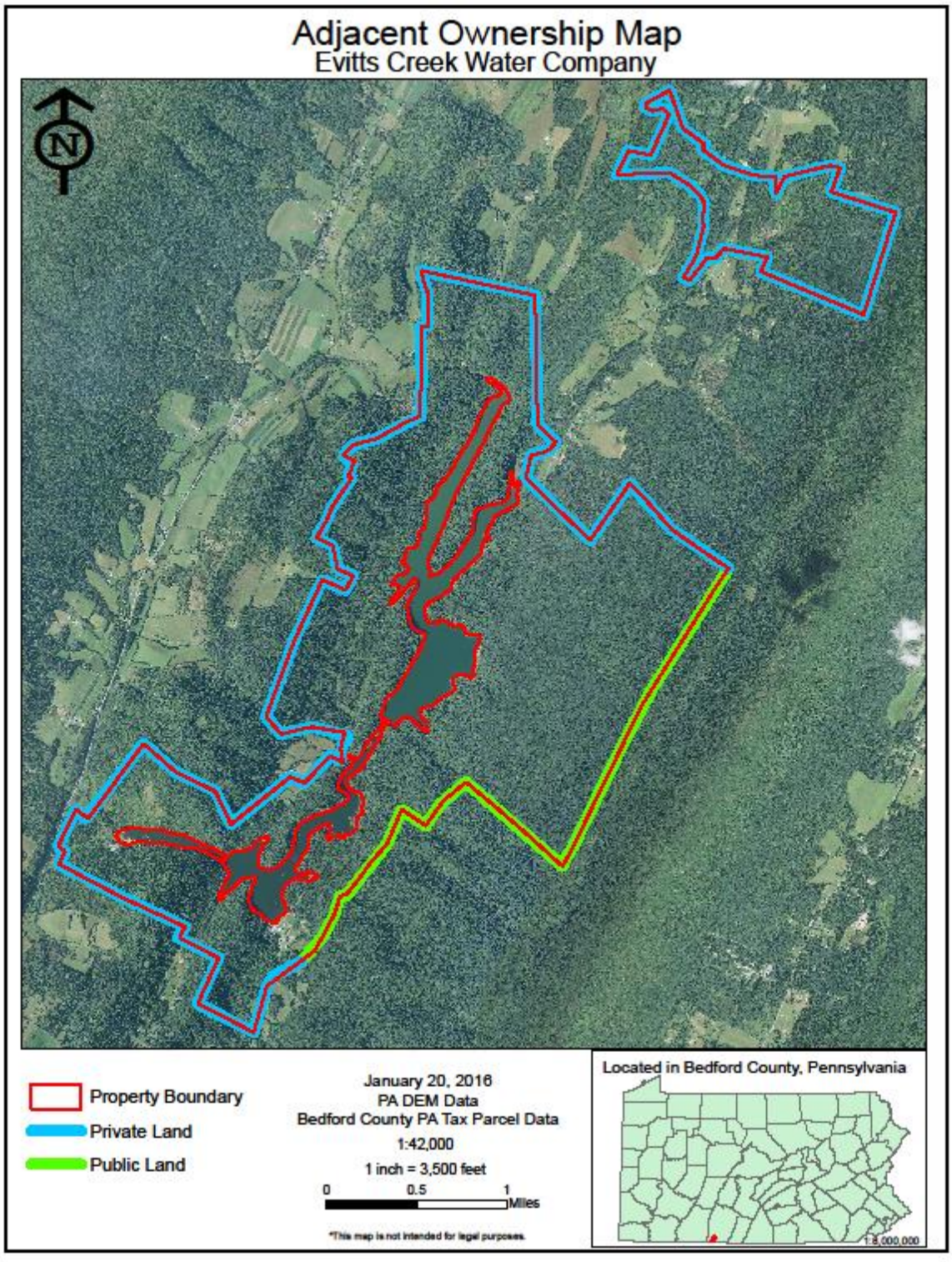
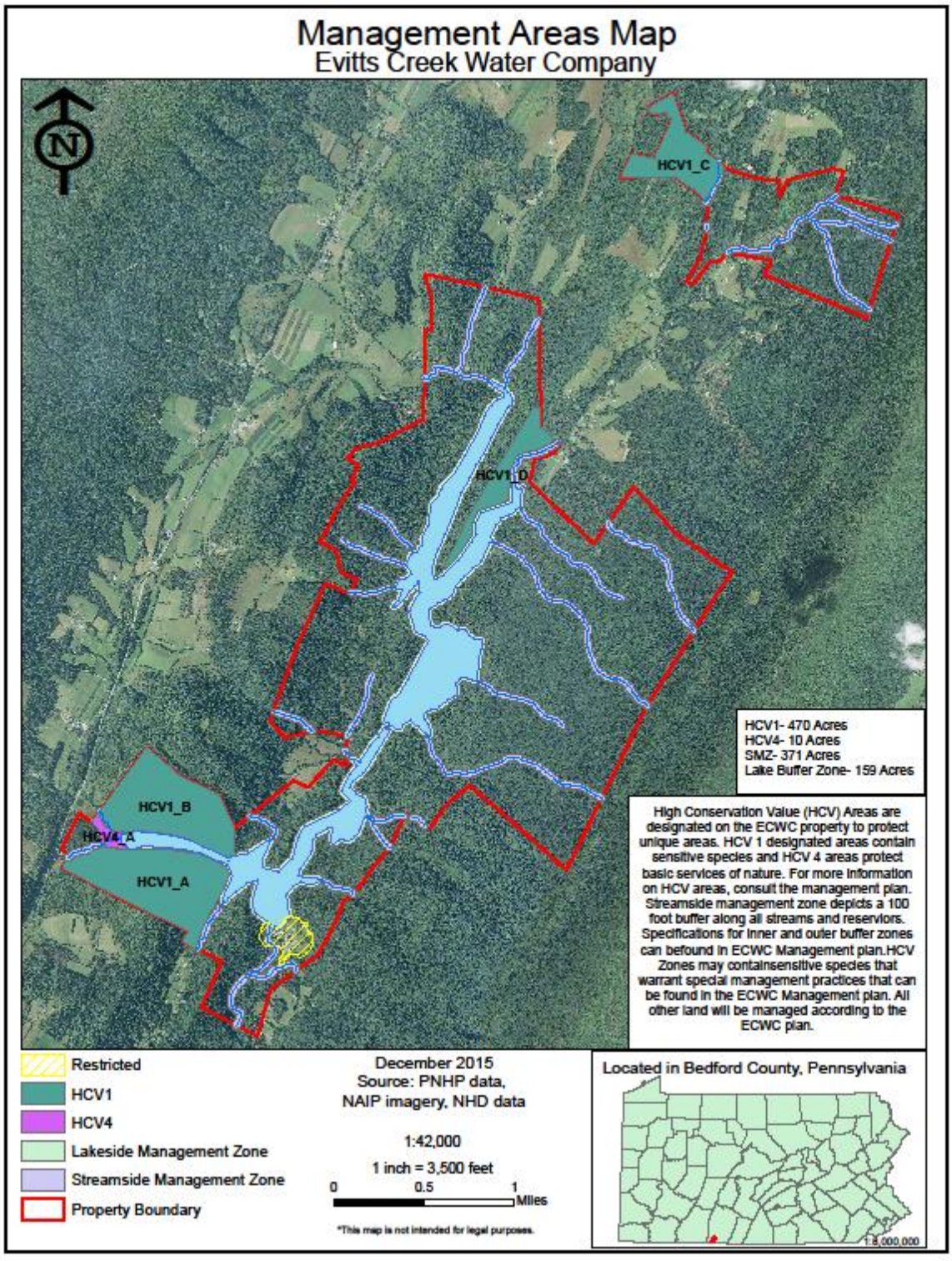
APPENDIX

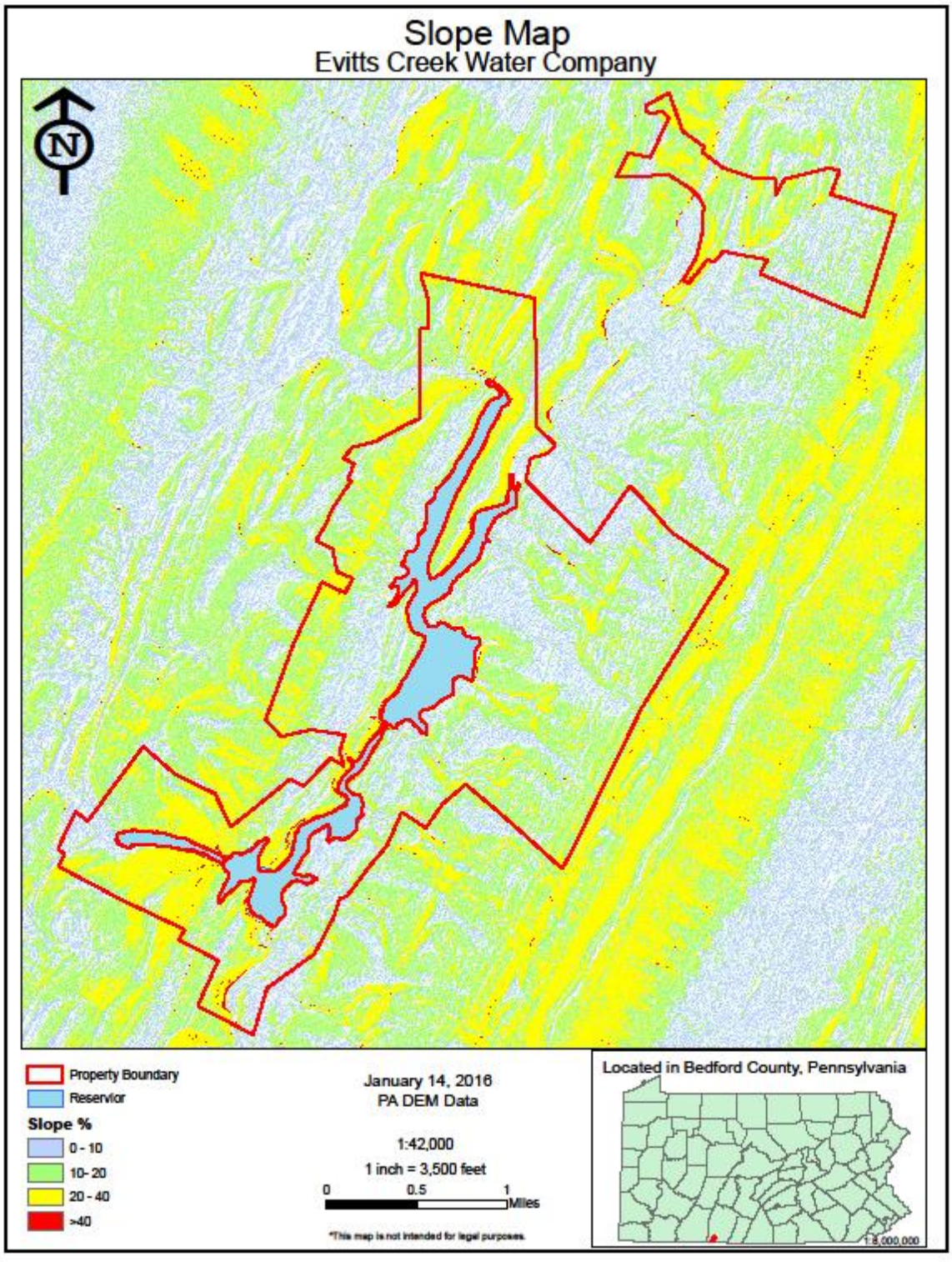
Appendix 1. Evitts Creek Water Company Map Set

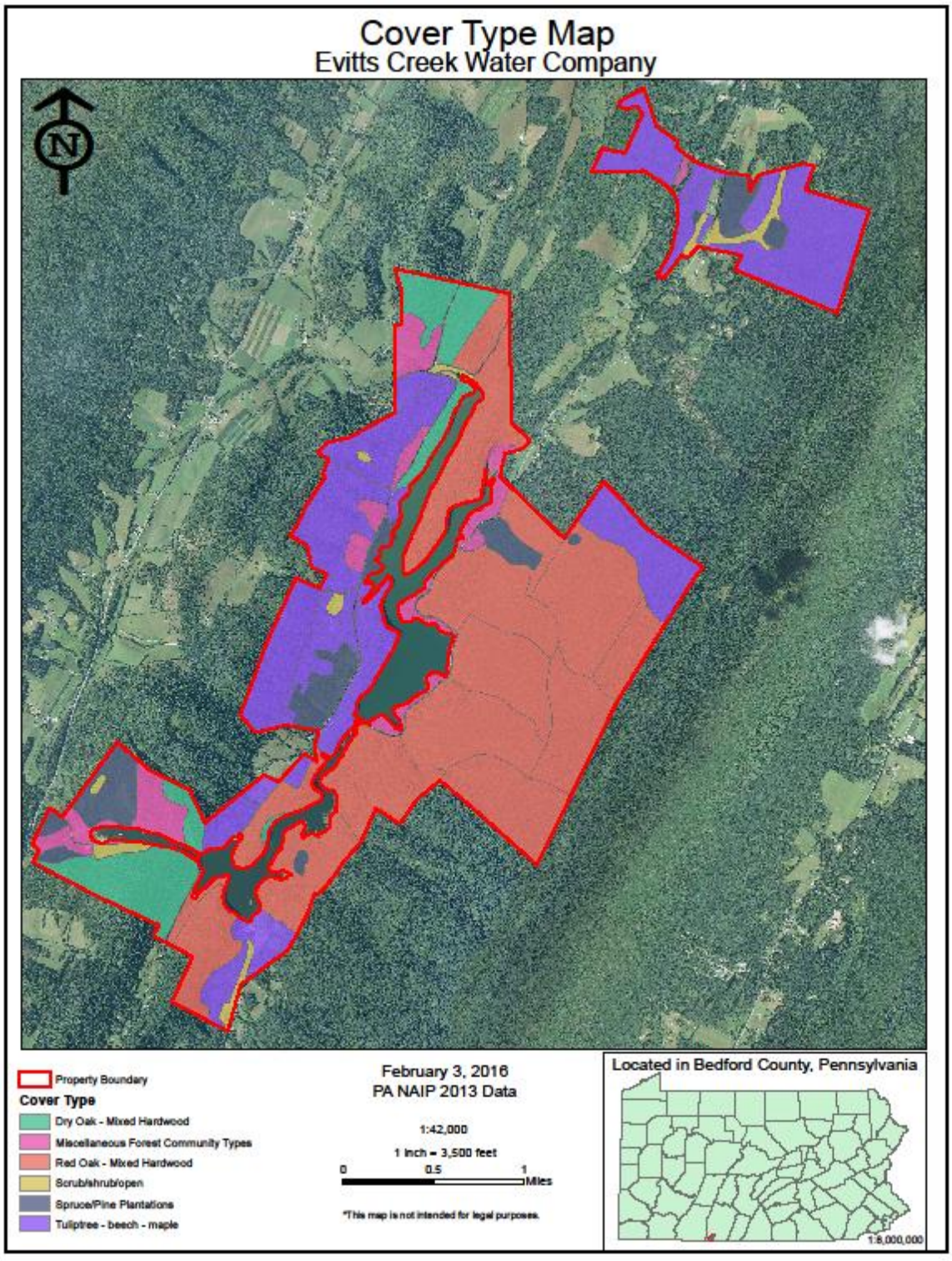
*Maps are not to scale

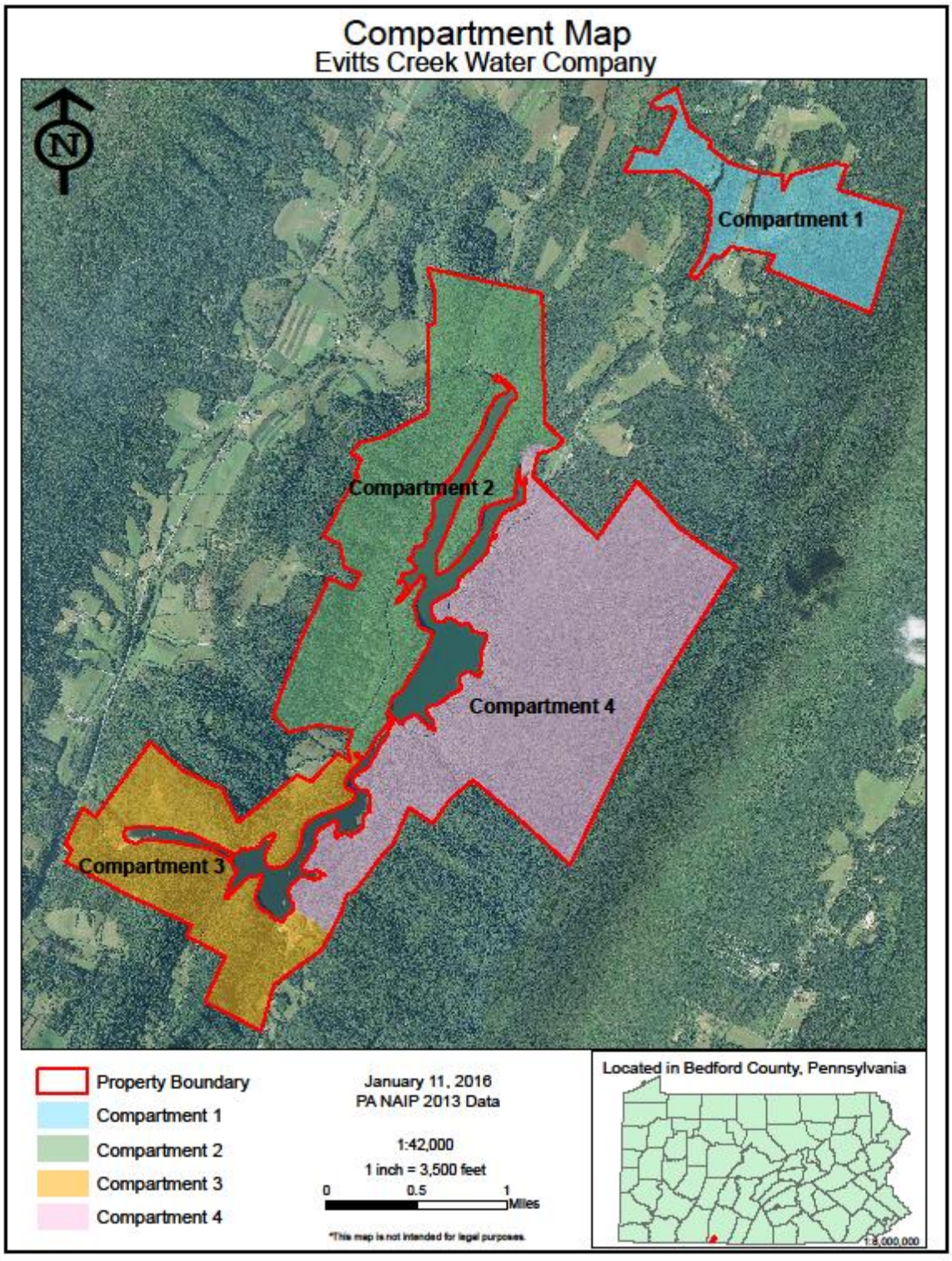


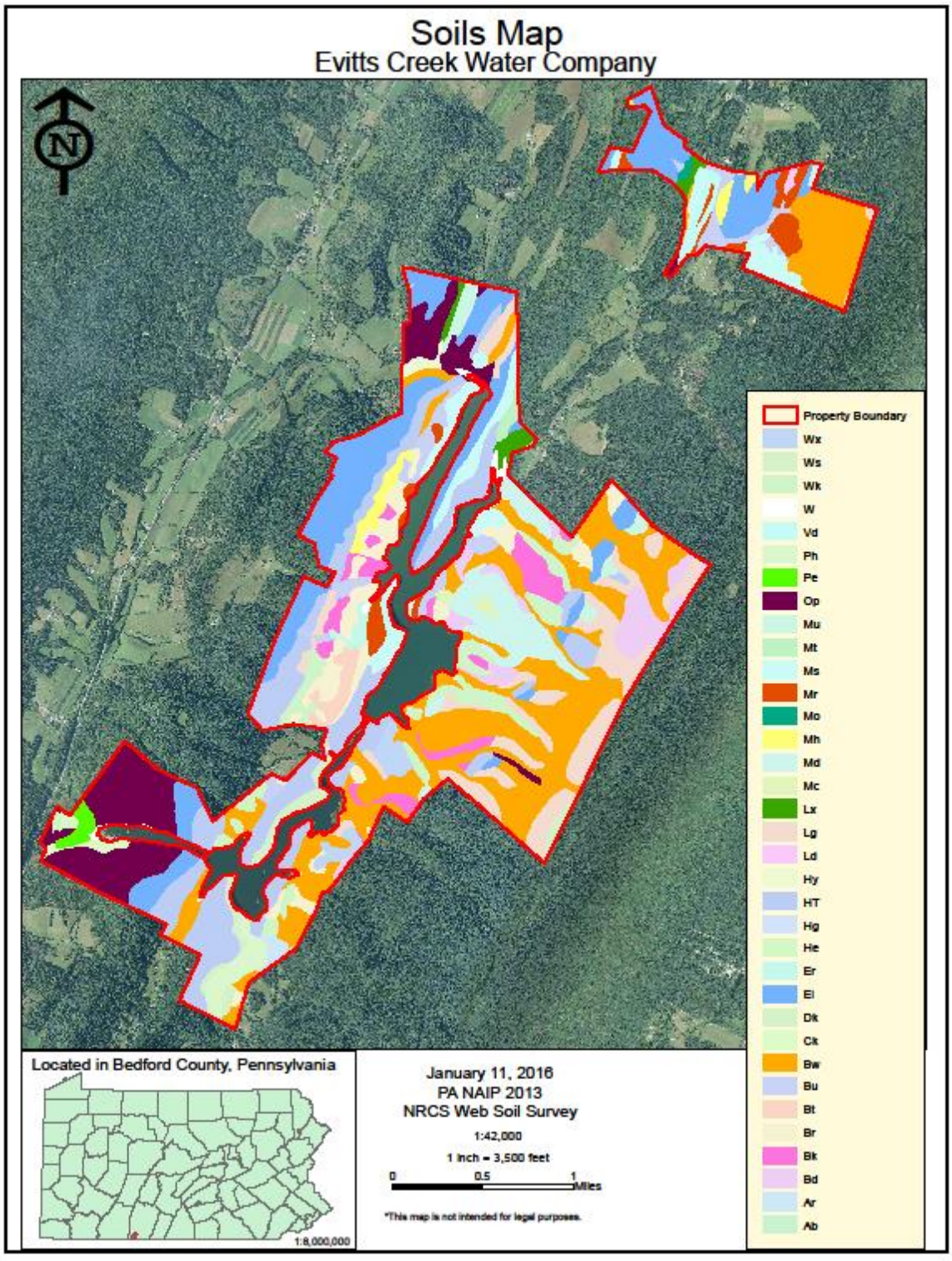

Adjacent Ownership Map
Evitts Creek Water Company
N
Property Boundary
Private Land
Public Land
January 20, 2016
PA DEM Data
Bedford County PA Tax Parcel Data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania

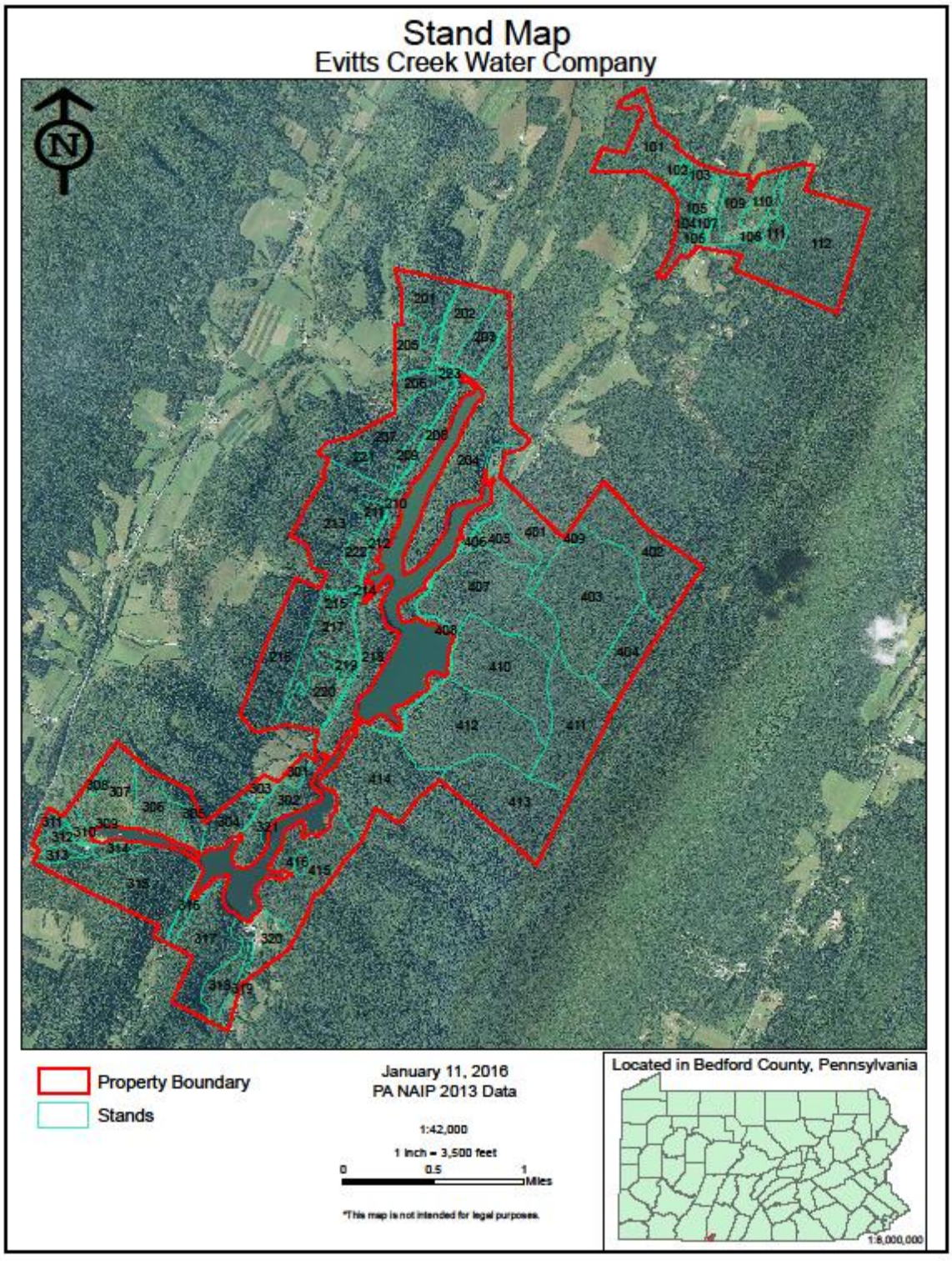

Management Areas Map
Evitts Creek Water Company
N
HCV1_C
HCV1_D
HCV1_B
HCV4_A
HCV1_A
HCV1- 470 Acres
HCV4- 10 Acres
SMZ- 371 Acres
Lake Buffer Zone- 159 Acres
High Conservation Value (HCV) Areas are designated on the ECWC property to protect unique areas. HCV 1 designated areas contain sensitive species and HCV 4 areas protect basic services of nature. For more information on HCV areas, consult the management plan. Streamside management zone depicts a 100 foot buffer along all streams and reservlors. Specifications for inner and outer buffer zones can befound in ECWC Management plan.HCV Zones may containsensitive species that warrant special management practices that can be found in the ECWC Management plan. All other land will be managed according to the ECWC plan.
Restricted
HCV1
HCV4
Lakeside Management Zone
Streamside Management Zone
Property Boundary
December 2015
Source: PNHP data,
NAIP imagery, NHD data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania

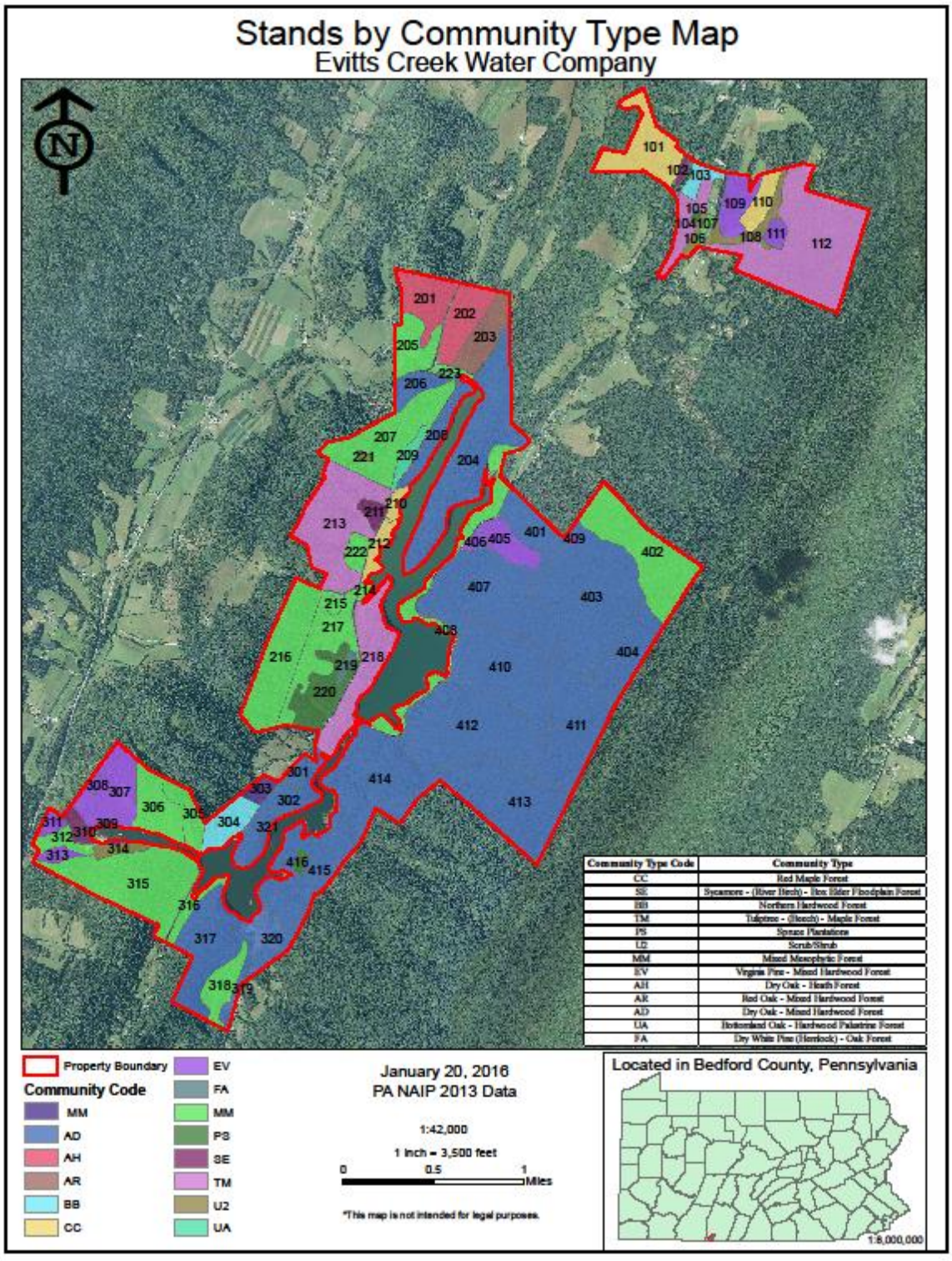

Slope Map
Evitts Creek Water Company
N
Property Boundary
Reservior
Slope %
0 - 10
10- 20
20 - 40
>40
January 14, 2016
PA DEM Data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania

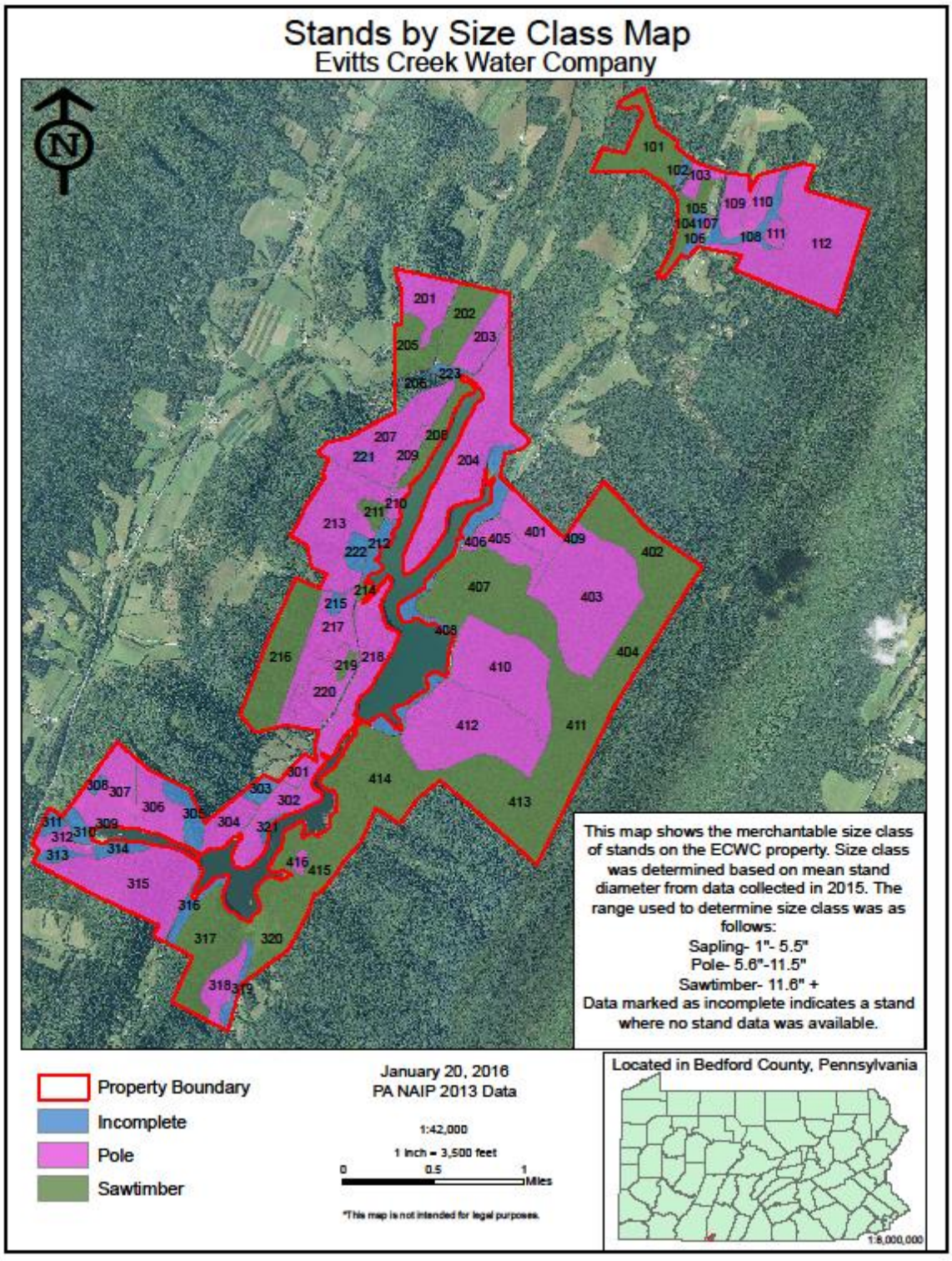

Cover Type Map
Evitts Creek Water Company
N
Property Boundary
Cover Type
Dry Oak - Mixed Hardwood
Miscellaneous Forest Community Types
Red Oak - Mixed Hardwood
Scrub/shrub/open
Spruce/Pine Plantations
Tuliptree - beech - maple
February 3, 2016
PA NAIP 2013 Data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania
1:8,000,000


Compartment Map
Evitts Creek Water Company
N
Compartment 1
Compartment 2
Compartment 4
Compartment 3
Property Boundary
Compartment 1
Compartment 2
Compartment 3
Compartment 4
January 11, 2016
PA NAIP 2013 Data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania


Soils Map
Evitts Creek Water Company
N
Property Boundary
Wx
Ws
Wk
W
Vd
Ph
Pe
Op
Mu
Mt
Ms
Mr
Mo
Mh
Md
Mc
Lx
Lg
Ld
Hy
HT
Hg
He
Er
El
Dk
Ck
Bw
Bu
Bt
Br
Bk
Bd
Ar
Ab
Located in Bedford County, Pennsylvania
1:8,000,000
January 11, 2016
PA NAIP 2013
NRCS Web Soil Survey
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.


Stand Map
Evitts Creek Water Company
N
Property Boundary
Stands
January 11, 2016
PA NAIP 2013 Data
1:42,000
1 Inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania
1:8,000,000

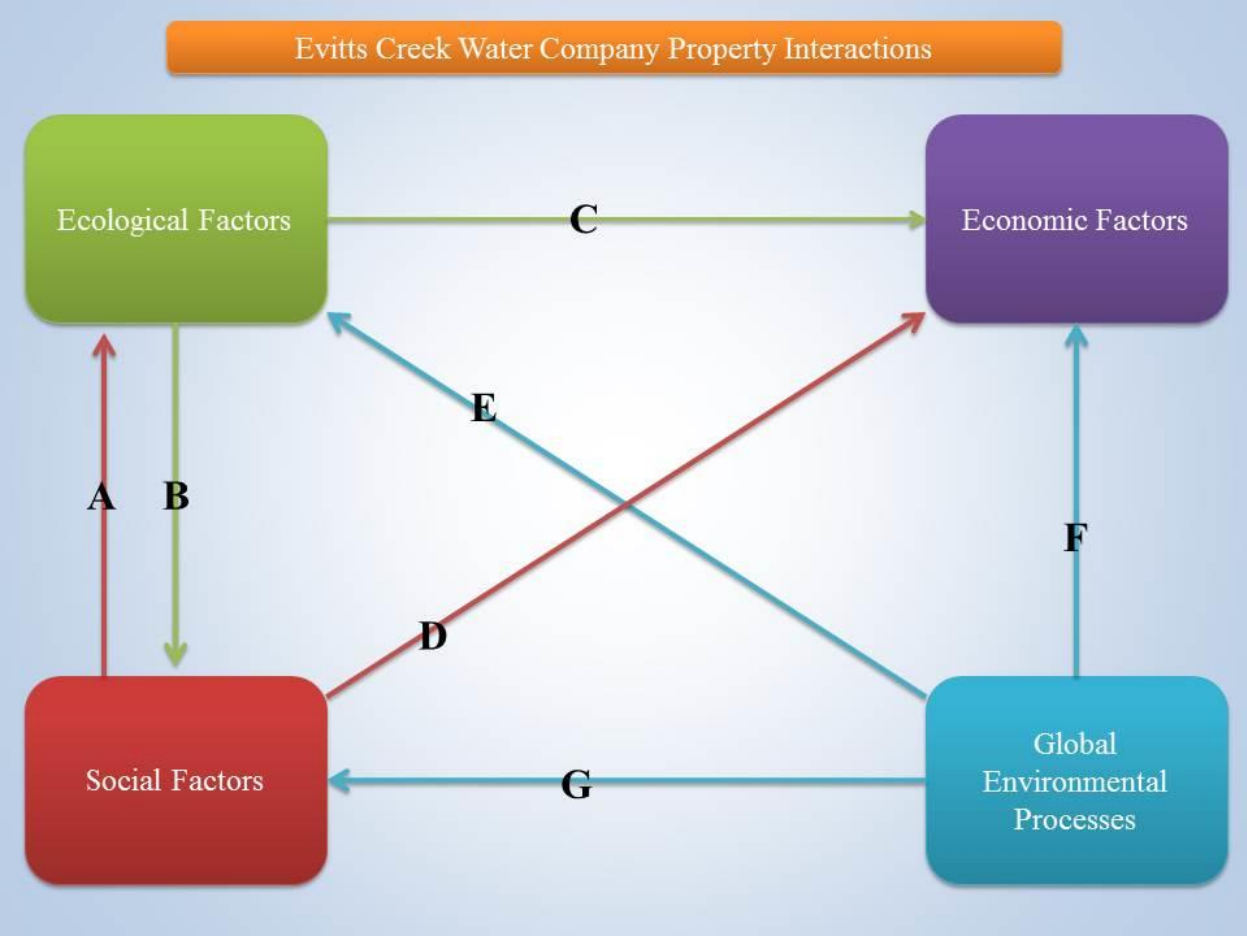

Stands by Community Type Map
Evitts Creek Water Company
N
Community Type Code
Community Type
CC
Red Maple Forest
SE
Sycamore - (River Birch) - Box Elder Floodplain Forest
BB
Northern Hardwood Forest
TM
Tulipitree - (Beech) - Maple Forest
PS
Spruce Plantations
U2
Scrub/Shrub
MM
Mixed Mesophytic Forest
EV
Virginia Pine - Mixed Hardwood Forest
AH
Dry Oak - Heath Forest
AR
Red Oak - Mixed Hardwood Forest
AD
Dry Oak - Mixed Hardwood Forest
UA
Bottomland Oak - Hardwood Palustrine Forest
FA
Dry White Pine (Hemlock) - Oak Forest
Property Boundary
Community Code
MM
AD
AH
AR
BB
CC
EV
FA
MM
PS
SE
TM
U2
UA
January 20, 2016
PA NAIP 2013 Data
1:42,000
1 inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania
1:8,000,000


Stands by Size Class Map
Evitts Creek Water Company
N
This map shows the merchantable size class of stands on the ECWC property. Size class was determined based on mean stand diameter from data collected in 2015. The range used to determine size class was as follows:
Sapling- 1"- 5.5"
Pole- 5.6"-11.5"
Sawtimber- 11.6" +
Data marked as incomplete indicates a stand where no stand data was available.
Property Boundary
Incomplete
Pole
Sawtimber
January 20, 2016
PA NAIP 2013 Data
1:42,000
1 Inch = 3,500 feet
0
0.5
1
Miles
*This map is not intended for legal purposes.
Located in Bedford County, Pennsylvania
1:8,000,000

Appendix 4. Sustainaibility Matrix

Management/Sustainability Issue	Potential Resolution
Limited Timber harvesting on Property is not supporting optimal forest health	Develop a forest management plan that is accessible to the public so that they can support and understand management objectives.
Multiple agencies are working toward writing the management plan, all with different ideas	Limit the number of individuals involved in the planning process. Incorporate valid ideas where possible.
The land is home to many sensitive species of plants and some animals	Develop special management zones to protect sensitive species
The more special management zones that are created, the less land can be actively managed	Carefully select management zones or deal with sensitive species on a case-by case basis
There is no "presence" of land management or "law enforcement" on the ECWC, so encouraging recreation could damage the landscape	Hire an employee to manage the property
The ECWC is located in PA, but is owned by the City of Cumberland in MD- who should manage?	The property should be maintained based on rules to manage lands in MD and by the City of Cumberland
Water quality is a primary concern	Pay special attention to waterways in management, also consider the surrounding landscape- can waterways be protected there?
The City of Cumberland must find a way to sustainably manage the ECWC property while generating revenue for the city when possible and providing clean water	The City is in the right track by creating a forest management plan, but it needs to make sure to actually enact the best management practices recommended by professionals.

Appendix 5. Diagram of Interactions


Evitts Creek Water Company Property Interactions
Ecological Factors
Economic Factors
Social Factors
Global Environmental Processes
A
B
C
D
E
F
G

Interaction Explanations

- **Ecological Factors**: This includes forest, water, wildlife, Sensitive Species
- **Social Factors:** Includes City of Cumberland, The Nature Conservancy, Allegany College of Maryland, Maryland DNR Forest Service, Pennsylvania DCNR, Stakeholders, Increasing technology
- **Economic Factors:** Timber value, cost to maintain and own property, supporting the local economy
- **Global Environmental Factors:** Climate change, air quality concerns, Environmentalist movement, Carbon Sequestration

Interaction Explanations

- Path A: Stakeholders have varied opinions on ecological processes, they may not respect certain sensitive species, could damage biodiversity from over-use, different opinions on how to manage certain features
- Path B: Ecological factors are what attract people to the site, current or historic conditions form public opinion about property
- Path C:Ecology dictates management and harvest which impacts economics, ecological factors contribute to property value
- Path D: Public opinion can dictate management (timber harvest), local economy will be affected by management, local economy may dictate ability to manage property (employees available)
- Path E: Changing global conditions will alter property and vegetative composition
- Path F: Current state of global processes may impact what management is allowed on property (preservation vs. conservation)
- Path G: Global processes as presented by media can influence public ideas/opinions