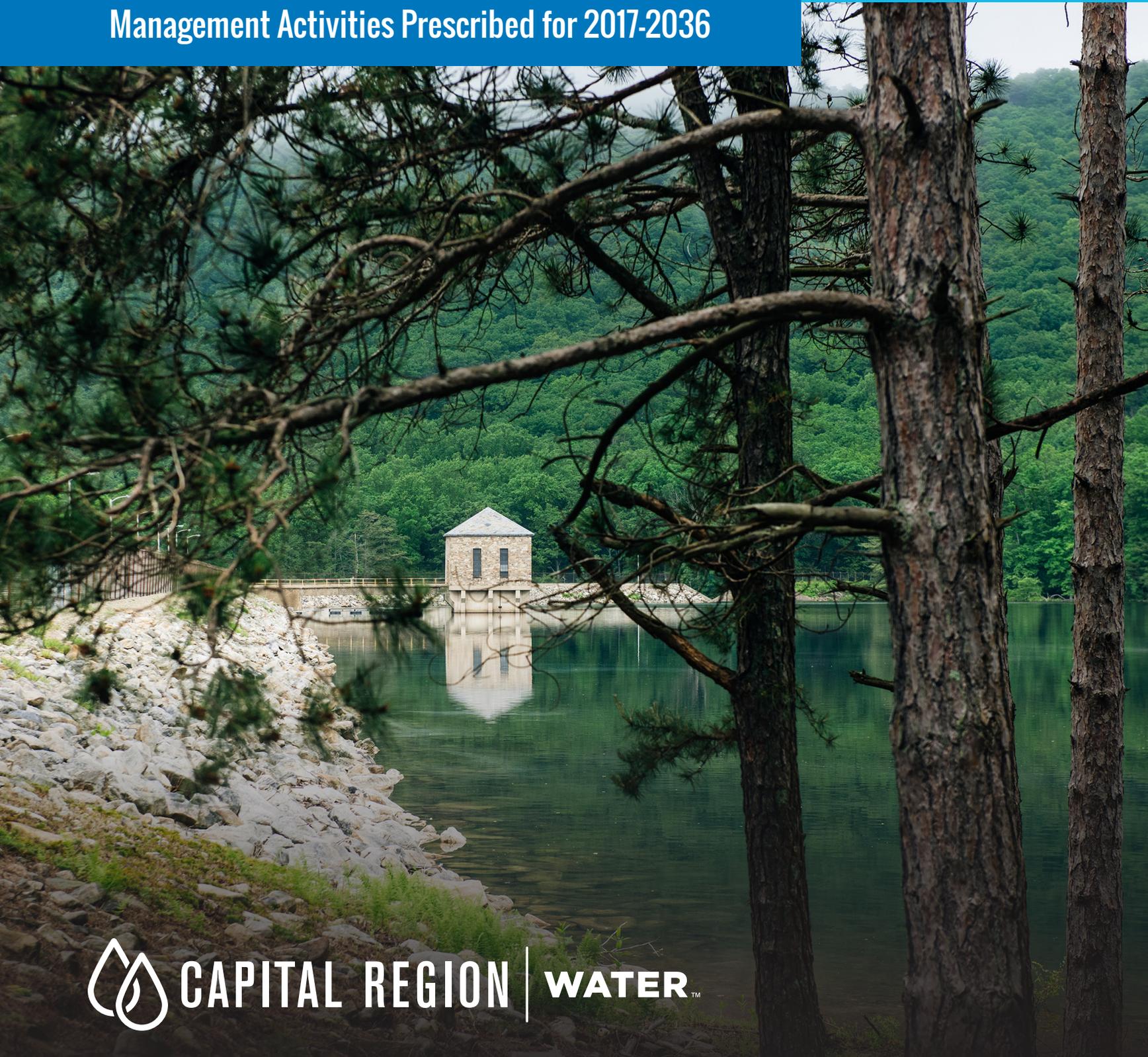


FOREST MANAGEMENT PLAN DEHART PROPERTY

Plan Prepared September 2016; Amended October 2017
Management Activities Prescribed for 2017-2036



CAPITAL REGION | WATER™

Forest Management Plan, DeHart Property

Capital Region Water
212 Locust Street, Suite 500
Harrisburg, PA 17101
888-510-0606

Approximately 7,600 forest acres
(to be adjusted with final survey results in 2017)

Property Location: Latitude 40.488, Longitude -76.689

Rush, Middle Paxton, and Jefferson Townships
Dauphin County, PA

Property Tax ID Numbers:

55-001-005, 55-001-006, 55-001-007, 55-001-008, 55-002-001, 55-002-002, 55-002-003,
55-002-004, 55-002-005, 55-002-006, 55-002-007, 55-002-008, 55-002-009, 55-003-001,
55-003-002, 55-003-003, 55-003-004, 55-003-005, 55-003-006, 55-003-007, 55-003-008,
55-003-009, 55-004-060, 55-004-061, 55-005-001, 55-005-002, 55-006-001, 55-006-002,
55-006-003, 55-006-004

Plan Prepared September 2016; Amended October 2017
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(Note: All included maps and additional maps/details are available in full size files)

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CAPITAL REGIONTM

WATER

1.0 Forest Management Plan



1.1 Statement of Purpose

This forest management plan has been developed to guide Capital Region Water's (CRW) management activities of the DeHart Property in east central Pennsylvania. The property will be part of the Working Woodlands program of The Nature Conservancy (TNC), and, as a result, will be managed in accordance with the FSC US 2010 National Standard as part of TNC's group certificate. As part of Working Woodlands, it's anticipated these properties will be verified to the Voluntary Carbon Standard (VCS) and provide carbon credits to be sold on the voluntary market.

CRW beginnings date to 1957 when the Harrisburg City Council created the Harrisburg Sewerage Authority to build and manage the city's wastewater collection and treatment system. The Water System was originally managed, owned and operated by the City of Harrisburg. In 1990, the Harrisburg Authority (now known as CRW) was created to purchase the Water System from the City and at the same time enter into a 1990 Management Agreement with the City for continued management and operation of the Water System. In 2011, the City was placed under State of Pennsylvania Receivership due to severe financial stresses. As a result, the Commonwealth's Office of the Receiver, the City, and CRW agreed to terminate the 1990 Management Agreement with the City on November 4, 2013. With the termination of this Agreement, CRW has taken back operational and management control of the Water System, including the DeHart Reservoir and surrounding property. The DeHart Reservoir serves as the primary drinking water supply for over 60,000 customers, and as such has considerably high conservation value.

The vision for all properties within The Nature Conservancy's Forest Conservation Program and those enrolled in TNC's private forest landowner program, Working Woodlands, is to restore and sustain high quality ecological values within economically productive forests. As such, CRW is entering into a conservation easement with TNC to further ensure the protection of the property in its natural, scenic, forested, and open space condition, free of additional forest fragmentation or additional development; to maintain excellent water quality in streams and wetlands on the property; to protect any rare plants, animals, or plant communities on the property; and to prevent any use of the property that will significantly impair or interfere with the conservation values or interests of the protection of the DeHart Property. CRW is committed to protecting, conserving and maintaining the forests, streams, wetlands, and other natural resources and the ecological and social benefits that can be derived from them, including but not limited to production and protection of high quality drinking water, and is further committed to managing those forests and their associated forest products in an environmentally sensitive manner while considering the responsibility to optimize financial performance. The easement will further assure long-term, professional, independent third-party certified forest management of the property for the production, management and harvesting of economically valuable timber and related forest products while ensuring the conservation values are protected or enhanced.



1.2 Landscape Description

The CRW property lies almost entirely within Rush Township along with small portions in Middle Paxton and Jefferson Townships in Dauphin County. This is within the Ridge and Valley Province of east central Pennsylvania about 20 miles northeast of Harrisburg. CRW manages the headwaters of Clark Creek, also known as Clark's Creek, starting in the east with the divide with the Wiconisco watershed and continuing west-southwest approximately 13 miles. There is an area of private residential inholdings along Rt. 325 about four miles upstream from the Reservoir. Along the south side of the Creek the ownership is nearly continuous. Clark Creek lies between Peter's Mt. and Stony Mt. The valley and ridges trend east-northeast to west-southwest. Elevations range from over 1600 feet on Stony Mt. to less than 600 feet where Clark Creek leaves the property. DeHart Dam is 1.75 miles east of the property boundary and backs up a Reservoir for four miles. The valley is broad and gently sloping above the Reservoir. Slopes become steeper and the valley narrows from the Reservoir downstream.

Upstream from the Reservoir, slopes range from gentle to moderately steep. In this section neither slope nor rocks limit management to any extent. Riparian wetlands are prevalent on the south side of the Creek, about two to four miles above the Reservoir. There is also a cluster of wetlands near the east end of the property at the watershed divide.

From the Reservoir west, slopes become progressively steeper. In this area, the upper third of the mountain slopes generally become too steep and rocky for management. There are also several areas of surface rock on the lower slopes of Stony Mt. that limit management.

There are numerous small drainages coming into Clark Creek from the north. From the south, spring seeps on the floodplain are common, with little actual surface drainage present.

Access is good along the north side of the Creek as Rt. 325 runs the entire length of the property. Access to the south is limited. CRW developed an access below the dam that provides access to about the southwest third of the property. The southeastern end has a new Game Commission access road across the property. About six miles in between are currently without access.

About 455 acres lie on the north side of Peter's Mt. in the Powell Creek drainage. This will require access across adjacent private lands from the west. The Appalachian Trail angles up Stony Mt. near the southwest corner. National Park Service (NPS) land separates the southwestern most 530 acres from the rest of the property.

The entire property lies within a large block of approximately 100,000 acres of publicly owned continuous forest. The larger area is unofficially and locally known as Saint Anthony's Wilderness due to its rural nature, lack of roads, and wild character. The region has greater global recognition

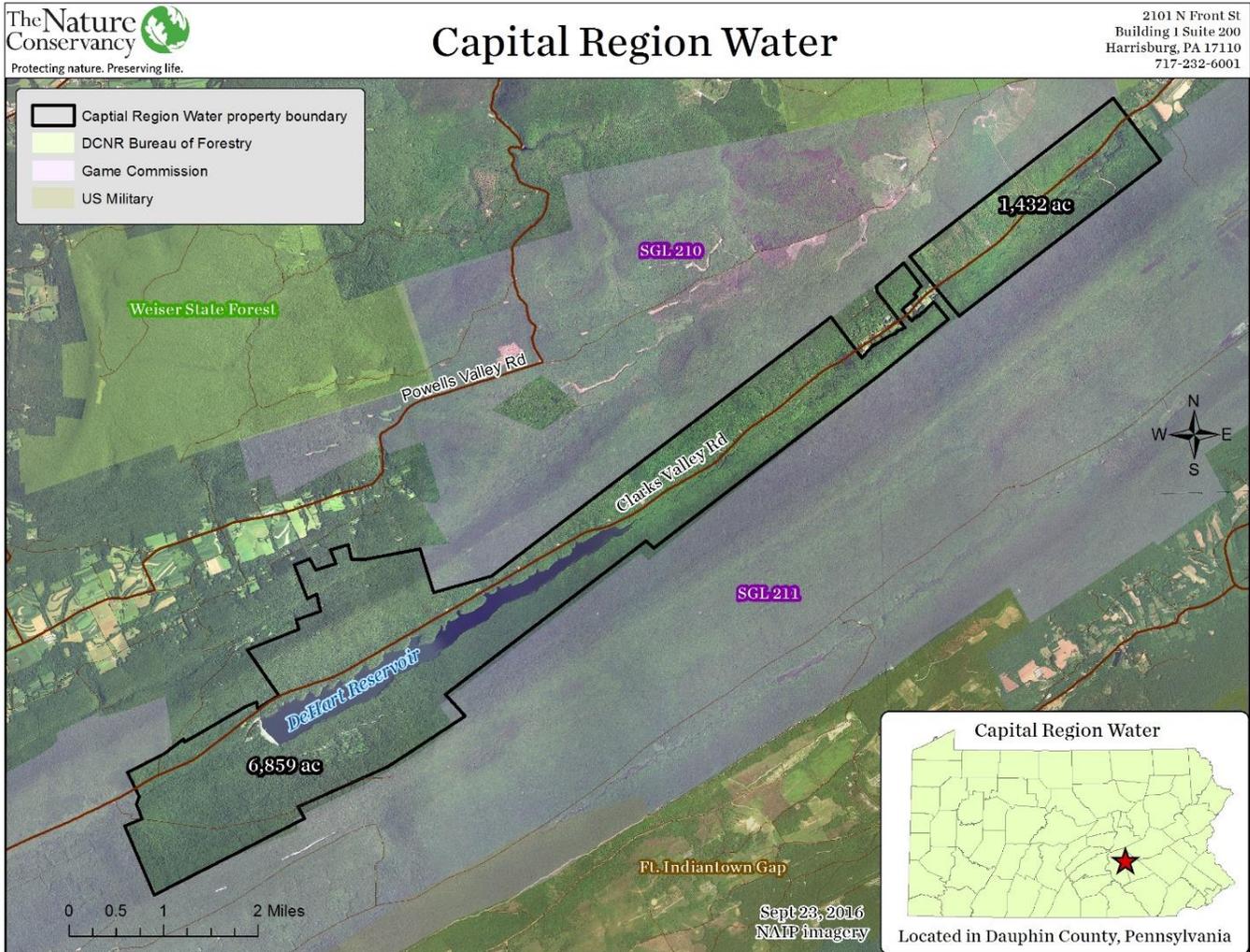


Figure 1-2: DeHart Property Location with Cover Type

1.3 Forest Description

Year Acquired: 1936 Year Management Plan Began: 2016

How Are Boundaries Marked? Currently being surveyed - to be completed 2017

Have forest products been cut within the past 2 years? Yes No **X**

Adjacent Holdings (check all applicable):

| | |
|-------------------------------------|-------------------------|
| <input type="checkbox"/> | Neighborhoods |
| <input type="checkbox"/> | Agriculture |
| <input checked="" type="checkbox"/> | Forests |
| <input type="checkbox"/> | Commercial |
| <input checked="" type="checkbox"/> | Other: Rural residences |



1.0 Forest Management Plan

The CRW property comprises the upper 13 miles of Clark Creek and adjacent watershed. This is a relatively broad valley within the Ridge and Valley Region of east central Pennsylvania. The stream and adjacent slopes run west-southwest through the property. This orientation provides a good aspect for growth with only the upper slopes having sites with low productivity. The majority of the property has sites with good forest productivity (e.g. stand 2).

The forests are dominated by mixed oak species. White oak is by far the most prevalent. Scarlet oak is next most common, especially on the south facing aspects. Red oak replaces scarlet oak on the better quality northern aspects. Chestnut oak is common on the drier sites, with black oak generally minor, except on the slopes north of the Reservoir. Yellow poplar is common on the more mesic (moist) sites, though nearly always as a secondary component of the red or white oak stands. Red maple is common throughout as a component of the oak stands. Black birch is a common component on the northern aspects, but a minor species on the southern slopes. Both species are secondary in value to the oak and poplar, but attain commercially valuable size and quality on this property.

White pine attains excellent size and quality on the property. It is most abundant on or near the valley bottoms, forming some nearly pure stands. Elsewhere it is present as a scattered part of the oak forests. Hemlock was an abundant species in the valley and north facing slopes. Most of the hemlock has died due to the wooly adelgid on the western half of the property, while remaining common and fairly vigorous on the eastern half. There is a rather sharp gradient from dead to healthy hemlocks about the middle of the property. The upper (eastern) portion of the property is a classic frost pocket, due to nearly flat terrain surrounded by steep slopes. The adelgid is cold sensitive. It is possible that the frost pocket has helped protect the hemlocks. Pitch pine once formed a significant forest component on the southern exposures. They are a relatively short-lived tree and have largely succumbed to old age. The scattered remnants and dead snags indicate that pitch pine grew quite well on those areas.

Sassafras is a very common early successional species especially on the southern exposures. Blackgum and serviceberry are common small under and midstory trees, especially on the southern exposures and valley bottom. Striped maple is present in the understory, but only on the best quality sites does it form a dense understory that has a negative competitive impact. Mountain laurel is common, though seldom dense, possibly due to impacts of leaf spot disease. Other species encountered include hickories, yellow birch, aspen, black cherry, beech, basswood, sugar maple, white ash, fire cherry, paw-paw, ailanthus and paulownia.

Two major rounds of forest harvesting have occurred in the last twenty years. Around 2000, several large harvests occurred totaling about 1670 acres. Except for the northwest corner, all of this harvesting has occurred on the southern part of the property. Harvest method has ranged from well conducted improvement cuts to economic clearcuts. Areas that received sufficient sunlight



have developed regeneration. Nearly all regeneration is yellow poplar or birch. Consistently, the heavier the harvest and thus more sunlight allowed on the forest floor the greater the concentration and dominance of yellow poplar. Areas receiving less sunlight have developed mostly to birch. Although the regeneration lacks diversity, the areas dominated by poplar have valuable young stands developing. Those stands, less heavily harvested have less valuable birch regeneration. Two stands totaling about 400 acres are so exclusively regenerating to birch that treating the understory with herbicide and following with an additional harvest to promote poplar and other desirable species is recommended.

Between 2008 and 2011, an additional 1200 acres have been harvested. With one exception these have all been on the north side of Clark Creek. All these harvests have been a moderate to heavy shelterwood harvest. They are all regenerating well with good stocking of desirable species. Poplar still dominates much of the regeneration, but mixed oak is well represented with some white and pitch pine. Red maple is common throughout. In general, the lower slopes are dominated by poplar and the upper slopes dominated by oak. A good diversity of non-commercial, but ecologically important, species such as serviceberry, blackgum, sassafras and aspen are also present. An exception is stand 34. This shelterwood is located on the south side of the property above the dam. The original stand was dominated by high quality red oak. Following the 2011 shelterwood, the site has fully regenerated to a nearly pure stand of yellow poplar.

An additional harvest was conducted about 1995 on the eastern end of the property. Likely around 1940, about 100 acres of abandoned farmland was planted to mixed conifers. Eighteen acres of white pine (stand 18) received an improvement harvest. The result has been an excellent stand of white pine. The rest of the area, about 50 acres, was clearcut at this time. The larger clearcut area has uneven regeneration. Much of what regeneration has developed is black cherry while the area retains old field characteristics. This area also has the heaviest concentration of invasive plants.

Forest Health & Condition Report

A forest health and condition report was produced in 2017. This set of key performance indicators can be used to efficiently and effectively assess the health and condition of forests across the landscape. These indicators or Key Ecological Attributes (KEA) were compiled using forest inventory data from each forest management stand/unit. This data corresponds to the desired future condition of the forest as well as the completed forest inventory in Section 1.7 of the Forest Management Plan. Please note that this is a thematic report card depicting baseline forest conditions. Green is good, yellow is fair, and red is poor. No snag data was collected. Regeneration data collected for the property only represents desirable species. Undesirable species were not tallied as part of the inventory; therefore, composition of total regeneration is not quantified.



1.0 Forest Management Plan

| Mgmt. Unit* | COMPOSITION | | | | STRUCTURE | | REGENERATION | | |
|-------------|--------------|-----|--------------|----------|----------------|-----------------|-------------------|---------------------|--------------------|
| | Stocking (%) | | Tree Species | | live>= 16" dbh | snags>= 10" dbh | all stems (regen) | % desirable (regen) | Deer Browse Impact |
| | TOTAL | AGS | Diversity | Evenness | | | | | |
| 1 | 92 | 89 | 9 | 0.70 | 27 | | 5538 | 100 | 2 |
| 2 | 35 | 29 | 6 | 0.79 | 14 | | 12326 | 100 | 2 |
| 3 | 106 | 47 | 6 | 0.68 | 14 | | 3417 | 100 | 2 |
| 4 | 39 | 27 | 7 | 0.68 | 23 | | 19803 | 100 | 3 |
| 5 | 75 | 55 | 10 | 0.65 | 41 | | 2273 | 100 | 2 |
| 6 | 25 | 11 | 7 | 0.75 | 9 | | 7877 | 100 | 2 |
| 7 | 120 | 109 | 6 | 0.56 | 38 | | 770 | 100 | 2 |
| 8 | 112 | 96 | 11 | 0.60 | 27 | | 6164 | 100 | 2 |
| 9 | 32 | 22 | 5 | 0.96 | 11 | | 14508 | 100 | 2 |
| 10 | 15 | 8 | 9 | 0.81 | 14 | | 12922 | 100 | 2 |
| 11 | 106 | 48 | 10 | 0.53 | 26 | | 4944 | 100 | 2 |
| 12 | 10 | 9 | 6 | 0.90 | 15 | | 9065 | 100 | 2 |
| 13 | 109 | 89 | 13 | 0.68 | 35 | | 1310 | 100 | 2 |
| 14 | 78 | 113 | 6 | 0.91 | 41 | | 2600 | 100 | 2 |
| 15 | 77 | 68 | 10 | 0.83 | 27 | | 10169 | 100 | 2 |
| 16 | 96 | 73 | 11 | 0.73 | 30 | | 3198 | 100 | 2 |
| 17 | 87 | 69 | 10 | 0.79 | 23 | | 1251 | 100 | 2 |
| 18 | 64 | 60 | 4 | 0.17 | 49 | | 3081 | 100 | 2 |
| 19 | 115 | 83 | 14 | 0.64 | 30 | | 1748 | 100 | 4 |
| 20 | 111 | 70 | 10 | 0.82 | 40 | | 825 | 100 | 2 |
| 21 | 64 | 56 | 13 | 0.62 | 19 | | 3411 | 100 | 2 |
| 22 | 66 | 45 | 12 | 0.68 | 10 | | 13913 | 100 | 2 |
| 23 | 119 | 83 | 13 | 0.77 | 24 | | 3901 | 100 | 2 |
| 24 | 95 | 57 | 11 | 0.67 | 23 | | 5881 | 100 | 2 |
| 25 | 112 | 80 | 14 | 0.80 | 14 | | 2234 | 100 | 2 |
| 26 | 120 | 120 | 10 | 0.70 | 33 | | 0 | 100 | 2 |
| 27 | 118 | 102 | 13 | 0.72 | 30 | | 1431 | 100 | 2 |
| 28 | 118 | 97 | 14 | 0.76 | 29 | | 2812 | 100 | 2 |
| 29 | 115 | 91 | 11 | 0.73 | 18 | | 1579 | 100 | 2 |
| 30 | 99 | 68 | 15 | 0.79 | 19 | | 5151 | 100 | 2 |
| 31 | 91 | 74 | 14 | 0.66 | 30 | | 11964 | 100 | 2 |
| 32 | 74 | 44 | 9 | 0.64 | 15 | | 26769 | 100 | 2 |
| 33 | 91 | 70 | 6 | 0.73 | 31 | | 3852 | 100 | 2 |
| 34 | 35 | 22 | 9 | 0.81 | 16 | | 32100 | 100 | 2 |
| 35 | 110 | 77 | 11 | 0.71 | 28 | | 6048 | 100 | 2 |
| 36 | 72 | 58 | 11 | 0.75 | 28 | | 47759 | 100 | 2 |
| 37 | 124 | 107 | 13 | 0.68 | 45 | | 3543 | 100 | 2 |
| 38 | 100 | 83 | 6 | 0.60 | 28 | | 0 | 100 | 2 |
| 39 | | | | | | | | | 2 |
| 40 | 31 | 19 | 9 | 0.75 | 11 | | 10294 | 100 | 2 |
| 41 | 76 | 65 | 11 | 0.74 | 26 | | 6547 | 100 | 2 |
| 42 | 37 | 28 | 10 | 0.65 | 15 | | 9680 | 100 | 2 |
| 43 | 69 | 90 | 10 | 0.64 | 30 | | 308 | 100 | 2 |
| 44 | 85 | 66 | 12 | 0.68 | 13 | | 118 | 100 | 2 |
| 45 | 89 | 73 | 14 | 0.74 | 20 | | 3313 | 100 | 2 |
| 46 | 70 | 113 | 8 | 0.58 | 31 | | 1669 | 100 | 2 |
| 47 | 113 | 91 | 11 | 0.67 | 27 | | 3129 | 100 | 2 |
| 48 | 92 | 84 | 9 | 0.74 | 23 | | 2407 | 100 | 2 |
| 49 | 101 | 77 | 10 | 0.68 | 19 | | 1540 | 100 | 2 |
| 50 | 80 | 59 | 7 | 0.77 | 29 | | 0 | 100 | 3 |
| 51 | 114 | 103 | 9 | 0.78 | 35 | | 9148 | 100 | 2 |
| 52 | 122 | 81 | 8 | 0.84 | 16 | | 5777 | 100 | 2 |
| 53 | 85 | 67 | 5 | 0.89 | 35 | | 1541 | 100 | 2 |

*Condition values were derived from 439 sample points established within the forested portions of the property

| RATING | Stocking (%) | | Tree Species | | live>16" dbh | snags>= 10" dbh | all stems (regen) | % desirable (regen) |
|---------|--------------|----------|------------------------------|-------------|--------------|-----------------|-------------------|---------------------|
| | TOTAL | AGS | Diversity | Evenness | | | | |
| POOR | <44 | <40 | by CPI unit; see table below | 0 to 0.6 | 0 to 3 | 0 to 2 | 0-10k | <25 |
| FAIR | 45 to 58 | 41 to 53 | | 0.61 to 0.7 | 4 to 8 | 3 to 5 | 10,001-15k | 28 to 54 |
| GOOD | 59 to 79 | 54 to 69 | | 0.71 to 0.8 | 9 to 16 | 6 to 8 | 15,001-50k | 55 to 74 |
| V. GOOD | 80+ | 70+ | | 0.81+ | 17+ | 9+ | >50k | >75 |

| RATING | Deer Browse Impact Rating | Tree Species Diversity by CPI | |
|--------|---------------------------|-------------------------------|--------------------|
| | | xeric & subxeric | mesic & palustrine |
| 5 | V. High Impact | <=3 | <=4 |
| 4 | High Impact | 4-8 | 5-9 |
| 3 | Moderate Impact | 9-12 | 10-14 |
| 2 | Low Impact | >12 | >14 |
| 1 | No Impact | | |

Figure 1-3: Forest Health & Condition Report for the 7,600 Forested Acres of the DeHart Property

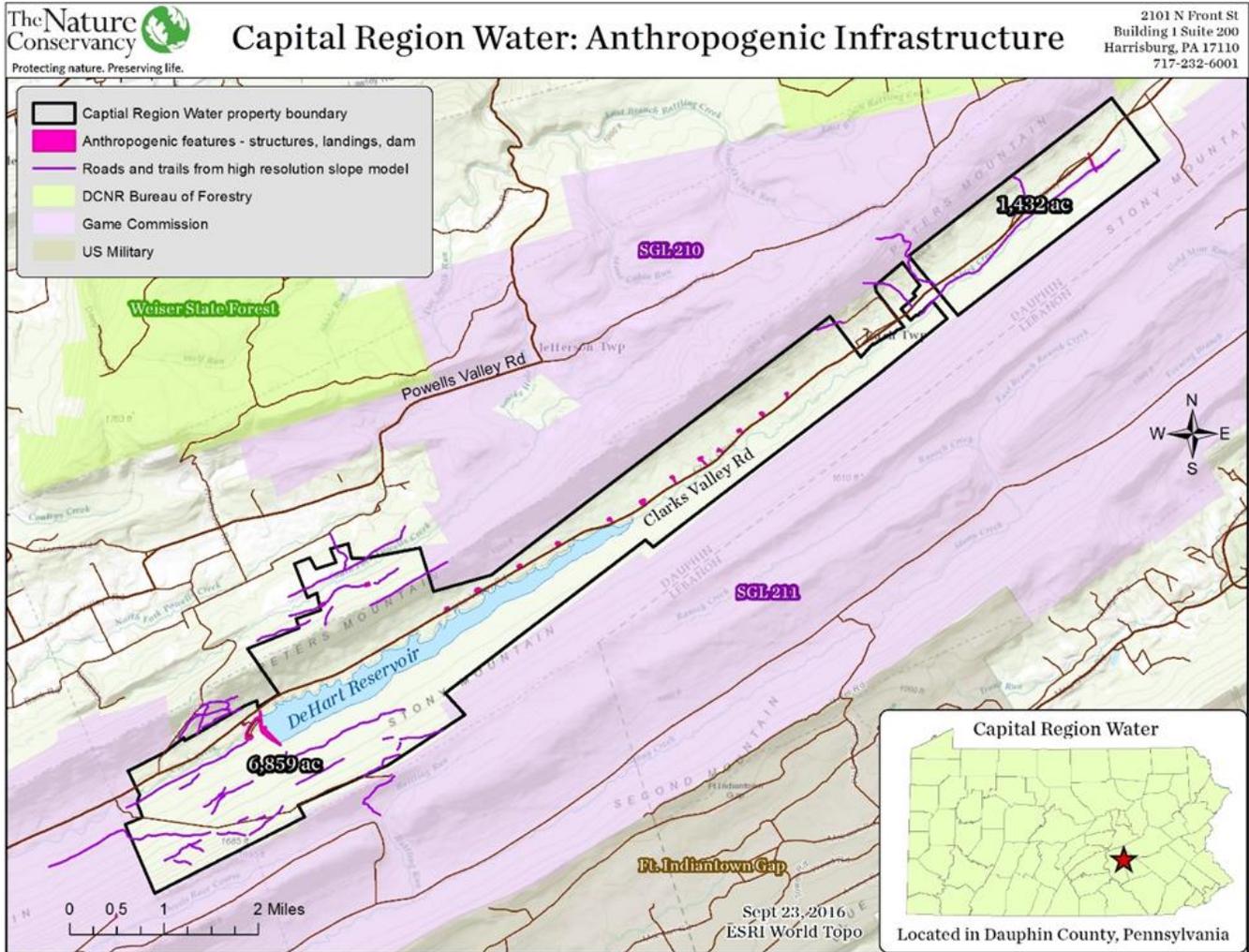


Figure 1-4: Anthropogenic Infrastructure on the DeHart Property

1.4 Environmental Limitations

Clark Creek and DeHart Reservoir dominate the landscape. Being a primary public water supply, significant areas along the Reservoir and stream as well as numerous feeder streams will require Streamside Management restrictions. There are relatively few other wetland features. Exceptions include a significant area of spring seeps and riparian wetlands on the floodplain south of the Creek and upstream of the Reservoir and on the extreme east end of the property near the divide with Wiconisco Creek.

The upper slopes particularly in the western half of the property have excessive rocks and steep slopes that will prevent active management.

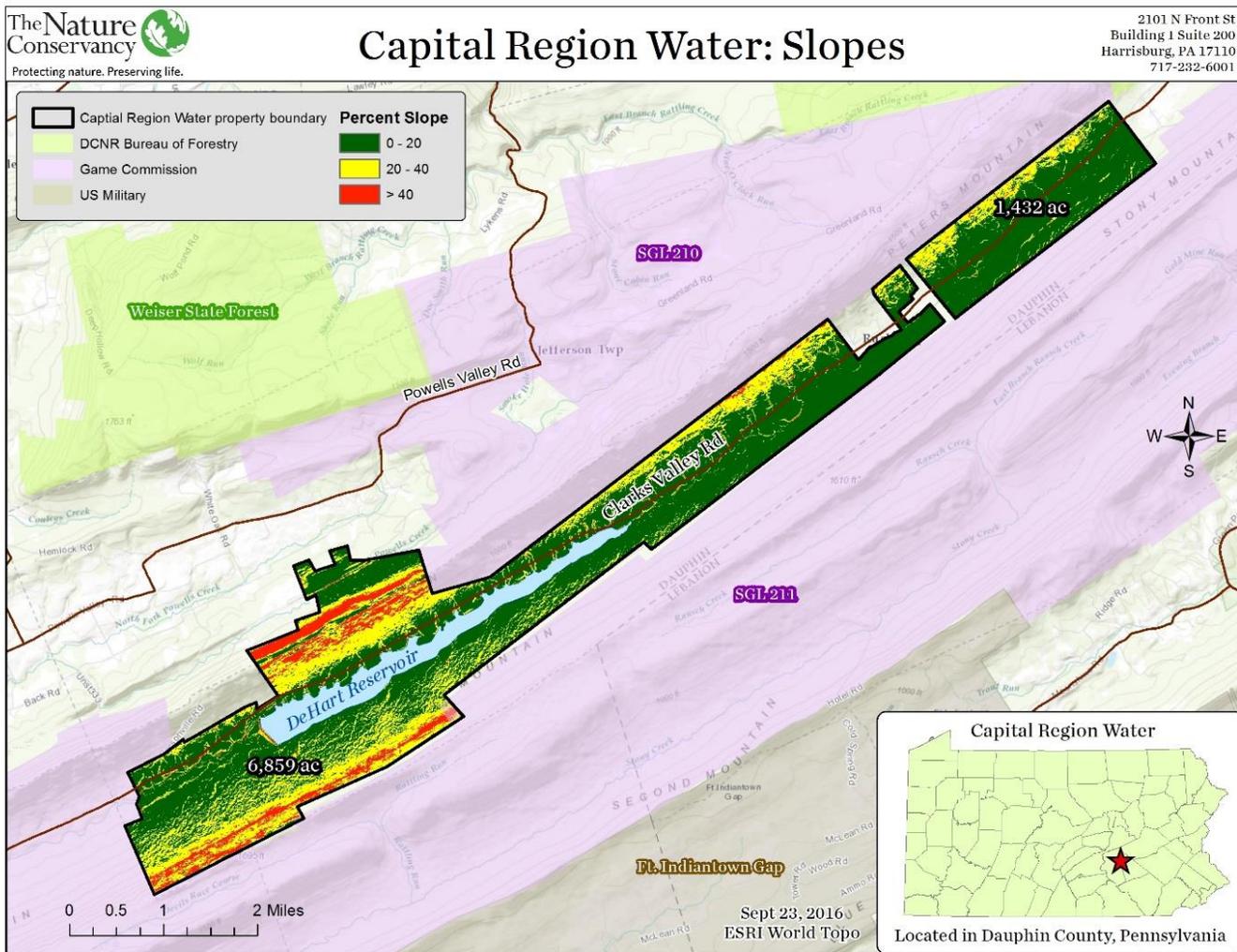


Figure 1-5: Slope on the DeHart Property

The Soil Survey Report (on file and provided) describes 25 different soil types found on the property. The report also provides information on erosion potential for each soil type/location, as well as information pertaining to suitability for various types of equipment.

Invasive plants can be an environmental limitation, but at this point, as long as CRW works diligently to control these plants, this should not limit future forest potential at DeHart.

CRW will carefully proceed with following this forest management plan and commits to the primary objective of water protection and water production. CRW will not take a chance regarding water protection and water production and is willing to forego any management activity that may pose a threat to water protection/production. Therefore, while all planned activities within the scope of this



management plan have been carefully chosen, each activity – prior to initiation – will be further examined for this purpose.

1.5 Historical and Cultural Context

Land Use History: The vast majority of the property has been in continuous forest. It is likely that the original virgin forest was removed prior to 1850. The current forest varies from 95 to 115+ years old, indicating that it was cut from the 1890s through 1920. These young developing forests did not receive cutting for mine props as was common in forests near the anthracite region. This has been very beneficial for the current forests, as prop harvesting usually removed the straightest oak poles, leaving a high-graded forest. There is evidence of some agriculture, particularly on the ~150 acres along Rt. 325 at the east end. There was also some agriculture just west of the inholdings. All these lands are in various stages of reverting to forest. Most of these areas are covered by natural or planted pine forests.

Cultural Features: Railroads reached into the upper and lower reaches of the property, but did not traverse the property. It is evident that lumbering was a major reason for the development of these railroads. They were abandoned prior to 1920. Some evidence remains of the grades and culverts. Much of this second growth timber was sent to the Witmer sawmill in Dauphin. Based on the size of the sawmill this was likely rather young and small-sized timber when harvested.

No information has been located concerning the harvest of the original virgin timber. The location of the property in close proximity to developing cities and farmland as well as the nearby anthracite industry would indicate a rather early harvest, probably before 1850.

Evidence of old buildings and foundations are present in several places. The more recently abandoned structures were farm related. Older foundations through the valley may have been related to logging and railroading.

DeHart Dam was completed in 1941 to provide a needed water supply to the Harrisburg region and provide Depression-era jobs.

CRW will make every effort to preserve the rich history of the property by not disturbing remnant features and continuing to learn more about the history of the DeHart Dam and surrounding forestland.

Historic and Cultural Resources: Historic and cultural resources are a vital link to past land-use practices in Pennsylvania. The Pennsylvania Historical and Museum Commission (PHMC) has been collecting information concerning archaeological sites and historic resources for the greater part of a century. They offer programs which survey, catalog, and encourage the preservation of such



resources. Currently there are 25,088 archaeological sites and 136,084 historic properties in their files. Access to these paper records is free and open to the public by appointment at the BHP office in Harrisburg.

The Nature Conservancy performed an extensive search on The PA Historical and Museum Commission Bureau for Historic Preservation (PHMC)'s Cultural Resource Geographic System (CRGIS). The CRGIS is a three-tiered GIS program consisting of state-wide historic and geologic site data combined with PA Natural Diversity Inventory (PNDI) information. The result of that assessment showed that there are no known sites of significance within the Capital Region Water property regarding indigenous peoples' or any other historic or cultural resource.

To check on periodic database updates or to request a survey of an area of interest, contact Noël Strattan – CRGIS, Bureau for Historic Preservation; Commonwealth Keystone Bldg, 2nd Floor; 400 North Street; Harrisburg, PA 17120-0093; (phone) 717-214-6572 or email: RA-CRGIS@state.pa.us.

1.6 CRW's Forest Management Goals

The following are overarching goals that will drive the management activities on the CRW properties:

1. **Water:** Preserve and/or enhance the high quality drinking water by improving the capacity of the system to produce the resource. Watershed security must also be maintained to insure the safety of the supply. Critical riparian buffer zones must be maintained and established as necessary. All water resources on the property must be recognized, including any springs, tributaries, and wetlands. In addition, the plan must complement existing operations and source water protection efforts that provide drinking water to over 60,000 people.
2. **Revenue:** Improve the capacity of the watershed and downstream properties to produce carbon-friendly revenue options. Revenue streams will allow CRW to enhance and protect the asset. This includes sustainable timber harvesting and monetizing of ecosystem services.
3. **Ecosystem health:** Maintain and enhance long-term ecosystem health and viability. Identify and conserve high priority conservation areas, contribute to the conservation of biological diversity and habitat, and actively manage the property for resiliency to withstand threats (e.g., invasive species, particularly Hemlock woolly adelgid and gypsy moth, storms, insect invasions, changing climate).
4. **Compliance and recordkeeping:** Ensure any active management of the property exceeds any federal, state and local requirements and best practices. Implementation of the plan must be monitored and documented with incremental benchmarks.



1.7 Desired Future Conditions

CRW's primary objective is to protect the quality of water that the forested watershed provides. Therefore, forest management goals are to maintain and improve forest health and viability. A healthy forest system will be the best protection for CRW's water quality and will also benefit CRW in many other ways. The following defines forest health and lists specific desired forest conditions related to forest health:

Forest Health – Maintaining and improving forest health is a paramount objective of CRW and is a primary focus of this forest management plan. Forest health is a topic of great discussion in the environmental arena. Depending on both perspective and objectives, definitions of forest health will differ among professionals. A simple, working definition could be that a healthy forest has the capacity to both renew itself and sustain itself. Digging deeper, we can say that a healthy forest is viable and productive, and is able to withstand and overcome outside negative forces. For the sake of this management plan, managing forest health will be determined by improvements in the following areas:

- **Diversity of Plants and Habitats** – Diversity has been a key indicator of forest health and wellness for a long time. Forests with diverse plant and animal species are better suited to withstand the inevitable invasion from disease, insect, or exotic species. Diverse forests are also much more interesting to explore. We will manage plant diversity at CRW by creating opportunities for desirable, native plants to flourish. Because plant species vary greatly in their site needs, we will create diverse micro-sites within the forest so that an abundant variety of plants will thrive across the entire property. Additionally, diverse micro-sites will allow us to diversify the habitat of the property. This will increase the amounts and types of forest habitat and wildlife at CRW.
- **Advanced Regeneration** – Regeneration is simply defined as seedlings and small saplings that are capable of replacing the current forest. Advanced Regeneration is simply regeneration that is available in advance of a timber harvest that is designed to begin a process of overstory replacement. Advanced regeneration of most species is now known to be a major contributor to a sustainable timber harvest. Important local exceptions include tulip poplar, pitch pine and aspen that primarily depend on creation of abundant light conditions and an adequate seed source or root suckers for regeneration. Any harvest that is designed to replace the existing overstory must consider the establishment of these regeneration conditions.
- **Deer in Balance with the Habitat** – It's been found that an average deer needs to eat over 5 lbs of woody browse (buds of trees and shrubs) per day. This amount of woody browse would fill your outdoor garbage can. Day after day, each deer that calls CRW home needs to eat enough woody browse to fill that outdoor garbage can. Compounding the issue is the fact that deer prefer certain plants and seldom eat other plants. Based primarily on taste, deer are selective



feeders. For decades on these tracts, deer have eaten the woody browse of their choice. When a deer herd is in balance with its surrounding habitat, the forest is able to produce food for the deer and is able to produce advanced regeneration that is in place to replace its own overstory and become tomorrow's forest. The current deer herd on the CRW property is relatively in balance with its habitat. This desirable condition has developed over the last 20 years following increased antlerless deer harvests and substantial timber harvesting that has increased the deer's food supply. Evidence of this balance can be found by the overwhelming preponderance of tulip poplar in many of the recent shelterwood harvests. Tulip poplar is a preferred browse species and its strong presence would indicate a low to moderate browsing condition. Additionally, blackgum and sassafras seedlings/sprouts, though showing evidence of browsing, are common on these harvests. They are the most preferred common browse species available in this region. Even with this desirable condition, there are pockets of significant browsing usually associated with thick escape cover or limited human access. Deer pressure is a dynamic condition, capable of quick changes. Browse impacts needs to be continually monitored. Enrollment of the property in the Game Commission's Deer Management Assistance Program (DMAP) could be considered as a means to continue control of deer numbers.

- Viability of Overstory and Understory – Trees and shrubs can either be healthy and vibrant, or they can be unhealthy and stagnant. More specifically, if a tree or shrub is not growing, it will soon die. Similarly, a forest that is growing well and has the ability to replace itself can withstand the inevitable obstacle, such as wind/ice damage or insect/disease outbreak. This is not much different from a healthy person being able to fight off infection easier than an unhealthy person. Additionally, a viable overstory and understory produce increased forest benefits. Forests clean our air by using carbon dioxide and providing oxygen; forests protect and filter our water supplies; forests provide a home for countless plants and animals; forests make up a vital part of the economy; forests are a major source of employment; and forests supply the key ingredients for more than 5,000 products. All of these benefits are increased with increasingly healthy forests. Some of CRW's overstory can still be improved. By removing trees with less viability, we can give the most viable trees the room they need to grow and thrive. Crowns of preferred trees can be given room to expand and produce more seed and food for wildlife. Also, the understory can be improved greatly by the replacement of competing and invasive plants with desirable native hardwood seedlings and saplings. Additionally, surrounding the primary goals of protecting water quality and improving forest health, the following forest conditions are also desirable for the CRW property:
 - Species – The desired forest condition would be for all of the desirable and productive species that are currently growing at CRW to continue to grow and even expand their numbers. Management strategies will be designed to increase species that are important for future timber production as well as species that are important to wildlife. Diversity is an



important element for improving forest health. Management strategies will seek to maintain and/or improve the abundance of desirable and productive forest plant species.

- Quality – The management strategy will be to remove trees with decreased vigor and health and allow healthy productive trees to reside. In the long term, this strategy will not only increase the overall quality of the forest, but it will also increase the values associated with the forest and the land. Ideally, the future CRW property will contain vigorous, productive, and desirable trees of high quality and varying age classes.
- Understory – Ideally, the understory would be made up of native species that are on our desirable future forest list. In other words, oak, hickory, and white pine would be prevalent and inter-mixed with and competitive with all the other native species that are currently present at CRW.
- Competing and Invasive Plants – When competing plants and/or invasive plants take hold in a forest understory, they can control it and impede or even eliminate the growth of desirable native forest plants. Ideally, invasive plants would be eliminated from CRW's forests and competing plants would be controlled enough to allow desirable plants to flourish. These are very lofty ideals. It is nearly impossible to either completely eliminate or even completely control these plants that are well adapted to thriving in our forests. However, on the CRW property nearly all invasive plants are located on less than 10% of the land. These areas are nearly all near the highway, stream or adjacent private land. Elimination is impractical if not impossible, but prompt action to control these invasives will allow for a substantial reduction in their coverage and impact. Conversely, they have reached a threshold where rapid expansion is likely if not controlled.

1.8 Landowner Community/Social Involvement

CRW's community outreach and communication programs engage the public to increase stewardship of infrastructure and local waterways, facilitate public participation in major decisions and plans, and provide information about its services and projects. CRW regularly hosts informational meetings, public hearings, and gives presentations to involve the community it serves and uses news outlets, publications, social media, and a website to keep its customers informed. One such example is CRW's outreach to adjoining neighbors and stakeholders surrounding the DeHart Property. In 2015, it was recognized that a boundary survey needed to be completed for the property. Prior to commencement of field work, CRW sent a courtesy letter to nearly 60 nearby neighbors letting them know a survey would be occurring and a community meeting would be hosted to provide more information and answer questions. CRW's commitment to the community is evidenced by a community promise that can be reviewed at www.capitalregionwater.com and further captured through the organizational mission: CRW is a dedicated team of professionals



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devoted to customer satisfaction and stewardship of the community’s water systems from raindrop to river. CRW will continue to be socially involved and to be a good neighbor in the beautiful valley.

There is abundant opportunity to cooperate with neighboring landowners/resources in Clark’s Valley. CRW has established good relationships with neighbors, including PA DCNR - Bureau of Forestry, PA Game Commission, and Fort Indiantown Gap. CRW realizes the importance of good communication; cooperation with these neighbors will only improve the resources, such as water and wildlife, on CRW’s property. CRW will continue communicating with and working closely with DCNR, PGC, and Fort Indiantown Gap with the goal of improving the natural resources in Clark’s Valley.

1.9 Forest Inventory and Monitoring

Inventory for this forest was done using the expert opinion of TNC and/or the landowner representative. Land use was mapped during a thorough walk through and through the use of tax map and aerial photos. Inventory data is projected using industry accepted data from the soil conservation service by locating the property on soils maps. Land use and inventory will be updated according to any type of disturbance on the property, natural or man-made. All monitoring will be carried out by TNC and/or the landowner representative.

Table 1-1: Forest Inventory by Tract

| Tract | Forest Type | Stand Disc | Tree Spec | Stand # | Acreage | Age | Pine Pulp | Pine Saw | Hard Pulp | Hard Saw | Trees/a. | Ave. DBH | Site Index | Dom. Ht. |
|-----------|-------------|-----------------|-------------------------------------|---------|---------|-----|-----------|----------|-----------|----------|----------|-----------|------------|----------|
| Northeast | Hardwood | natural | white, scarlet oak, poplar | 1 | 131 | 97 | 0.4 | 704 | 12.9 | 6750 | 235 | Med saw | 75 | 85 |
| | Hardwood | natural | white, scarlet oak, poplar | 2 | 39 | 97 | 0.2 | 60 | 5.9 | 2934 | 54 | Med saw | 75 | 90 |
| | Hardwood | natural | chestnut, scarlet oak | 3 | 114 | 80 | 0 | 0 | 16.1 | 3942 | 424 | med saw | 65 | 70 |
| | Hardwood | natural | white, chestnut, oak | 6 | 431 | 100 | 0.2 | 164 | 3.6 | 2211 | 34 | Med saw | 75 | 85 |
| | Hardwood | natural | white, scarlet oak, white pine | 8 | 108 | 120 | 1.6 | 1865 | 10.2 | 4460 | 444 | Small saw | 75 | 85 |
| | Softwood | plantation | white, red pine, larch | 14 | 8 | 97 | 13.9 | 11957 | 4.2 | 379 | 199 | Med saw | 80 | 90 |
| | Softwood | plantation | white pine | 18 | 18 | 120 | 10 | 15460 | 0 | 0 | 192 | Large saw | 90 | 110 |
| | Softwood | natural wetland | white pine hemlock | 43 | 22 | 96 | 3.5 | 4907 | 10.2 | 4411 | 272 | med saw | 80 | 95 |
| | Hardwood | natural | black cherry, red maple, white pine | 44 | 90 | 15 | 3.4 | 1374 | 6.7 | 1632 | 383 | pole | 75 | 35 |
| | Hardwood | natural | Chestnut, oak, poplar | 45 | 95 | 96 | 0.2 | 60 | 23.6 | 5993 | 192 | med saw | 75 | 80 |
| | Softwood | natural | Hemlock, white pine | 46 | 16 | 102 | 8.1 | 6626 | 4.7 | 5181 | 181 | med saw | 85 | 100 |
| Southeast | Hardwood | natural | Red, chest, oak, pop | 23 | 107 | 94 | 1.1 | 1042 | 16.2 | 7590 | 245 | Med saw | 80 | 90 |



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| Tract | Forest Type | Stand Disc | Tree Spec | Stand # | Acreage | Age | Pine Pulp | Pine Saw | Hard Pulp | Hard Saw | Trees/a. | Ave. DBH | Site Index | Dom. Ht. |
|--------------|-------------------|-----------------------|------------------------------|---------|---------|-----|-----------|----------|-----------|----------|----------|-----------|------------|----------|
| | Hardwood | natural | birch, white oak | 24 | 188 | 95 | 1.6 | 845 | 12.4 | 4634 | 253 | Med saw | 75 | 80 |
| | Harwood | natural | white oak, bir, hem | 25 | 147 | 87 | 2.6 | 1242 | 13.6 | 3780 | 183 | Small saw | 75 | 80 |
| | Harwood | natural | white oak, hemlock | 26 | 25 | 94 | 7.3 | 2795 | 13.7 | 8751 | 244 | Med saw | 80 | 100 |
| Southcentral | Transition | natural | Hem, white oak, bir | 27 | 276 | 89 | 2.6 | 2186 | 16.2 | 6424 | 491 | Med saw | 80 | 90 |
| | Harwood | natural | white oak, red maple | 28 | 276 | 92 | 0.7 | 738 | 18 | 7305 | 194 | Med saw | 80 | 90 |
| | Harwood | natural | birch, red map, hem | 29 | 81 | 306 | 2.9 | 1175 | 16 | 4146 | 310 | Small saw | 70 | 80 |
| Southwest | Hardwood | natural | red oak, poplar, bir | 20 | 86 | 96 | 0 | 201 | 14.2 | 10154 | 155 | Med saw | 80 | 100 |
| | Hardwood | natural | birch, red oak | 21 | 453 | 89 | 0 | 179 | 13.3 | 5159 | 251 | Med saw | 75 | 80 |
| | Harwood | natural | poplar, red maple | 22 | 60 | 79 | 0.2 | 51 | 7.2 | 2716 | 252 | Small saw | 85 | 90 |
| | Hardwood | natural | w. oak, red map, bir | 30 | 61 | 76 | 2.2 | 1068 | 12.8 | 4596 | 239 | Small saw | 80 | 80 |
| | Hardwood | natural | red oak, red maple | 31 | 515 | 92 | 0 | 89 | 12.8 | 6308 | 217 | Med saw | 80 | 90 |
| | Hardwood | natural | poplar, birch | 32 | 188 | 15 | 0 | 221 | 9.5 | 2393 | 285 | pole | 80 | 35 |
| | Hardwood | Natural Noncommer oak | birch, red oak | 33 | 345 | 79 | 0 | 0 | 17.1 | 5081 | 196 | Small saw | 65 | 70 |
| | Hardwood | natural | red oak | 34 | 113 | 96 | 0 | 232 | 4.4 | 4394 | 43 | Large saw | 85 | 100 |
| | Hardwood | natural | Birch, chest, oak | 35 | 109 | 88 | 0.6 | 1488 | 18.5 | 5273 | 204 | Med saw | 75 | 85 |
| | Harwood | natural | Chest, red oak, poplar | 36 | 62 | 93 | 0 | 594 | 10.3 | 6810 | 115 | Med saw | 80 | 95 |
| | Hardwood | natural | White, chest, oak | 37 | 69 | 99 | 0.8 | 916 | 16.5 | 8118 | 380 | Med saw | 80 | 90 |
| | Hardwood | natural Noncomm | birch | 38 | 219 | 85 | 0 | 0 | 20.5 | 4008 | 170 | Small saw | 70 | 75 |
| Northwest | Hardwood | natural | white, scarlet oak | 4 | 96 | 111 | 0 | 115 | 7.3 | 5605 | 49 | Large saw | 80 | 90 |
| | Softwood | natural/plantation | white, red pine | 5 | 34 | 108 | 8.2 | 10964 | 6.3 | 2192 | 284 | Med saw | 90 | 100 |
| | Hardwood/softwood | natural | white oak, hemlock | 7 | 16 | 96 | 4.8 | 2095 | 10.2 | 6330 | 312 | Med saw | 80 | 90 |
| | Hardwood | natural | Scarl, white chest, oak | 9 | 258 | 100 | 0 | 0 | 5.5 | 3138 | 55 | Med saw | 70 | 80 |
| | Hardwood | natural | white, scarlet oak | 10 | 320 | 117 | 0 | 0 | 2.6 | 3562 | 30 | Large saw | 80 | 90 |
| | Hardwood | natural | White, chest, oak, red maple | 11 | 85 | 88 | 0.9 | 84 | 10.9 | 4734 | 82 | Small saw | 75 | 80 |
| | Hardwood | natural | Black, white, chestnut oak | 12 | 210 | 116 | 0 | 0 | 2.9 | 3209 | 19 | Large saw | 75 | 90 |
| | Hardwood | Natural, SMZ | white, scarl oak, red maple | 13 | 97 | 99 | 1.1 | 495 | 14.1 | 7659 | 181 | Med saw | 80 | 90 |
| | Hardwood | natural | white oak, poplar | 15 | 234 | 96 | 0 | 214 | 9.4 | 7582 | 181 | Med saw | 80 | 90 |



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| Tract | Forest Type | Stand Disc | Tree Spec | Stand # | Acreage | Age | Pine Pulp | Pine Saw | Hard Pulp | Hard Saw | Trees/a. | Ave. DBH | Site Index | Dom. Ht. |
|-----------------------|-------------|-----------------|-------------------------------------|---------|---------|-----|-----------|----------|-----------|----------|----------|-----------|------------|----------|
| | Hardwood | natural | white oak | 16 | 102 | 100 | 0.6 | 257 | 11.8 | 6541 | 259 | Med saw | 75 | 85 |
| | Hardwood | Natural, SMZ | white, chest scarlet oak | 17 | 54 | 91 | 0 | 0 | 13.5 | 6076 | 169 | Med saw | 70 | 80 |
| | Hardwood | Natural, LMZ | white, black oak, red maple | 19 | 246 | 94 | 0.3 | 77 | 14.4 | 7402 | 368 | Med saw | 80 | 90 |
| | Hardwood | natural | black, white, chestnut, scarlet oak | 40 | 74 | 98 | 0 | 105 | 3.6 | 2619 | 91 | Med saw | 75 | 85 |
| | Hardwood | Natural, SMZ | white, chest oak, red maple | 41 | 76 | 94 | 0 | 0 | 11 | 5373 | 136 | Med saw | 80 | 90 |
| | Hardwood | natural | chest, black oak | 42 | 77 | 124 | 0 | 70 | 2.9 | 2981 | 56 | Large saw | 75 | 90 |
| | Hardwood | natural | chest, black oak, red maple | 47 | 243 | 95 | 0 | 0 | 15.5 | 6774 | 309 | Med saw | 75 | 80 |
| | Hardwood | natural | chest, res oak, red maple | 48 | 340 | 98 | 0 | 0 | 13.2 | 5338 | 173 | Med saw | 70 | 80 |
| | Hardwood | Natural, SMZ | white oak | 49 | 79 | 86 | 0 | 0 | 14.6 | 5119 | 333 | Small saw | 75 | 80 |
| | Hardwood | natural | red oak, white pine | 50 | 15 | 88 | 3.6 | 1721 | 10.7 | 4515 | 135 | Med saw | 65 | 70 |
| Powell's Creek | Hardwood | natural | red oak, poplar, red maple | 51 | 179 | 81 | 0 | 0 | 16 | 9497 | 193 | Med saw | 80 | 90 |
| | Hardwood | natural | chestnut, white oak | 52 | 112 | 76 | 2.2 | 0 | 17 | 4940 | 403 | Small saw | 70 | 75 |
| | Hardwood | Natural noncomm | chestnut, red oak, | 53 | 199 | 123 | 0 | 0 | 9 | 5268 | 220 | Large | 65 | 75 |

Determination of annual growth rate

The annual growth is calculated using the data from the Natural Resources Conservation Service (NRCS) soil site. The average growth data by forest type/dominant species is applied to the stands and acreages within this management plan and aggregated on the local level. Soil type data from the NRCS soil data was used to develop the site index for this management plan. Growth and productivity will be measured and monitored regularly at CRW's DeHart Property and data will be tracked and management will be adjusted as needed to continue the sustainable forest management of the Property.

Table 1-2: Annual Growth Rate by Tract

| Section | Stand | Ave. DBH Inches | Potential Productivity BF. Scribner (oak) | Potential Productivity BF. Scrib. (Poplar & W. pine) |
|-----------|-------|-----------------|---|--|
| Northeast | 1 | 14.3 | 8500 | 18000 |
| | 2 | 14.4 | 8500 | 18000 |
| | 3 | 11.3 | 5000 | 12000 |
| | 6 | 15.2 | 8500 | 18000 |
| | 8 | 13 | 8500 | 18000 |



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| Section | Stand | Ave. DBH Inches | Potential Productivity BF. Scribner (oak) | Potential Productivity BF. Scrib. (Poplar & W. pine) |
|----------------|-------|-----------------|---|--|
| | 14 | 14.8 | 11600 | 20000 |
| | 18 | 17.4 | 13000 | 30000 |
| | 43 | 15.3 | 11600 | 20000 |
| | 44 | 11.9 | 8500 | 18000 |
| | 45 | 14.3 | 8500 | 18000 |
| | 46 | 16.1 | 8500 | 25000 |
| Northwest | 4 | 16.9 | 11600 | 20000 |
| | 5 | 16.5 | 13000 | 30000 |
| | 7 | 14 | 11600 | 20000 |
| | 9 | 14.7 | 5500 | 15000 |
| | 10 | 18.2 | 11600 | 22000 |
| | 11 | 11.6 | 8500 | 18000 |
| | 12 | 18.5 | 8500 | 18000 |
| | 13 | 15.5 | 11600 | 20000 |
| | 15 | 15.4 | 11600 | 20000 |
| | 16 | 14.1 | 8500 | 18000 |
| | 17 | 13.9 | 5500 | 15000 |
| | 19 | 13.8 | 11600 | 20000 |
| | 40 | 14.7 | 8500 | 18000 |
| | 41 | 15.2 | 11600 | 20000 |
| | 42 | 18.8 | 8500 | 20000 |
| | 47 | 14.4 | 8500 | 20000 |
| 48 | 15.5 | 5500 | 15000 | |
| 49 | 12.6 | 8500 | 18000 | |
| 50 | 15.1 | 5000 | 13000 | |
| Powell's Creek | 51 | 14.8 | 11600 | 20000 |
| | 52 | 11.3 | 5500 | 15000 |
| | 53 | 18 | 5000 | 13000 |
| Southwest | 20 | 16.9 | 11600 | 20000 |
| | 21 | 13.5 | 8500 | 18000 |
| | 22 | 11.7 | 13000 | 25000 |
| | 30 | 12.5 | 11600 | 20000 |
| | 31 | 14.9 | 11600 | 20000 |
| | 32 | 12.3 | 11600 | 20000 |
| | 33 | 13.3 | 5000 | 13000 |
| | 34 | 17.9 | 13000 | 25000 |
| | 35 | 14.1 | 8500 | 18000 |
| | 36 | 15.4 | 11600 | 20000 |
| 37 | 14.9 | 11600 | 20000 | |



| Section | Stand | Ave. DBH Inches | Potential Productivity BF. Scribner (oak) | Potential Productivity BF. Scrib. (Poplar & W. pine) |
|--------------|-------|-----------------|---|--|
| | 38 | 13.5 | 5500 | 15000 |
| Southcentral | 27 | 13.6 | 11600 | 20000 |
| | 28 | 14.4 | 11600 | 20000 |
| | 29 | 12.4 | 5500 | 15000 |
| | | | | |
| Southeast | 23 | 15 | 11600 | 20000 |
| | 24 | 14.1 | 8500 | 18000 |
| | 25 | 12.6 | 8500 | 18000 |
| | 26 | 14.8 | 11600 | 18000 |

Rational for determining annual/periodic harvest

This forest is classified as a “Small or Low Intensity Managed Forest” (SLIMF) by the Forest Stewardship Council guidelines. The landowner will be managing the forest for timber production, wildlife habitat and aesthetic qualities. Harvests are planned from this forest, which will be managed to allow for thinning and/or final harvest as stands reach the appropriate age and quality. All stands will be replanted or naturally regenerated. The management style is by this determination sustainable.

Yields of forest products harvested

All harvested forest products will be tracked and reports provided to CRW on a regular basis.

Costs, productivity and efficiency of forest management activities

Records will be kept for tax/financial purposes on expenses and income related to forest management activities. These values will not be shared during audits.

Monitoring Forest Growth, Response to Activities, and Health

CRW's forest will be monitored regularly with on-site visits. Annual visits will be conducted for forest health purposes and will include walking many sections of the property each year. Additionally, as forest management activities occur, results/forest response will be noted and the managed areas will be monitored regularly.



Boundary lines

A complete land survey will be conducted at DeHart Reservoir property in 2016-2017. Boundary lines will be surveyed and marked. Complete survey mapping will be available by end of survey project. Lines will need to be maintained at least every 5 years.

1.10 Non-Timber Forest Products

Non-Timber Forest Products Present – Public water supply

| | |
|-----|-------------------------------------|
| Yes | <input checked="" type="checkbox"/> |
| No | <input type="checkbox"/> |

- Watershed protection for CRW drinking water supply – over 60,000 customers.
- Property is currently part of the PA Game Commission’s Hunter Access Program per a Cooperative Agreement – it is advisable to continue this strong/fruitful relationship, even though it foregoes the potential to privately lease the property to a hunting club or clubs. Hunting in this area of PA is desirable and hunters are plentiful. The CRW property is directly connected to State Game Lands and is situated to benefit PA’s hunting population greatly.
- CRW will continually explore opportunities to work with the PA Game Commission to improve the forest. The planned forest management activities are designed to improve CRW’s forest and there are many benefits to wildlife that go along with the planned forest management. Additionally, as the PGC expands its ability to improve habitat and even provide grants to cooperating landowners, CRW will continue good communication with PGC and regularly seek opportunities to work together for the benefit of all.
- CRW will explore the PA Department of Conservation and Natural Resources, Bureau of Forestry Forest Stewardship Program. CRW will consider enrollment in the program as an additional commitment to forest stewardship. Program enrollment may also provide additional resources, such as the consultation of DCNR’s Bureau of Forestry to support sound silvicultural management decisions.
- CRW is willing to explore environmental services contracts, such as carbon marketing. With the help of TNC, CRW will seek an opportunity to create an additional income stream by selling carbon offsets to potential corporations in need. Typically, marketing carbon offsets can be a fairly simple and lucrative opportunity for a landowner.



1.11 Silviculture and Management System

Silvicultural System and Management Recommendation

| | |
|--|----------|
| Management activities within 10 years | X |
| No Management activities within 10 years | X |

STAND SUMMARY: Describe activities to take place in each stand

Short Term Goals – i.e. specific stands to be harvested in the next few months

Year 1:

Harvest:

| | |
|--|-----------|
| Stand 9; shelterwood removal | 193 acres |
| Stand 10; shelterwood removal | 300 acres |
| Stand 49; thin from below west section (with stand 12 removal) | 15 acres |
| Stand 22 & northwest part of stand 31; shelterwood removal | 150 acres |
| Stand 23; improvement/ (thin-harvest) | 107 acres |

Herbicide:

| | |
|---|-----------|
| Stand 30 & northwest part of stand 31; broadcast, target birch, STM | 200 acres |
| Stand 24; broadcast, target birch, striped maple | 150 acres |
| Stand 14; broadcast, target barberry | 4 acres |
| Stand 18; broadcast, target barberry | 8 acres |
| Stand 44; broadcast, target invasives | 81 acres |
| Stand 20; broadcast, target striped maple | 110 acres |
| Stand 22; spot, target invasives | |

Year 2:

Harvest:

| | |
|---------------------------------------|-----------|
| Stand 34; shelterwood removal | 130 acres |
| Stand 36; shelterwood removal | 35 acres |
| Stand 20; improvement/ (thin harvest) | 85 acres |
| Stand 37; improvement/ (thin harvest) | 40 acres |
| Stand 24; removal harvest | 150 acres |

Herbicide:

| | |
|---|--|
| Stand 5; spot, target barberry, stiltgrass | |
| Stand 4; spot, target stiltgrass; cut stump, ailanthus, paulownia | |
| Stand 7; spot, target barberry and stiltgrass | |
| Stand 9; spot, target stiltgrass on log landing | |
| Stand 10; spot, target stiltgrass on log landing; cut/stump ailanthus and paulownia | |
| Stand 12; spot, target stiltgrass on log landing | |



Stand 13; spot, target stiltgrass, barberry, euonymus
 Stand 15; spot, target invasives
 Stand 40; spot, target stiltgrass and ailanthus
 Stand 42; spot, target invasives around landing
 Stands 2,6,8,19,47,50; spot , target invasives

Long Term Goals

Years 3 through 10:

Harvest:

| | |
|--|-----------|
| Stand 12; shelterwood removal | 186 acres |
| Stand 40; shelterwood removal | 55 acres |
| Stand 42; shelterwood removal | 72 acres |
| Stands 5 & 7: Group selection | 55 acres |
| Stand 4: Shelterwood removal | 70 acres |
| Stand 15; Group selection | 200 acres |
| Stand 16: Improvement harvest | 90 acres |
| Stand 2: shelterwood removal | 30 acres |
| Stand 6: shelterwood removal | 300 acres |
| Stand 14 & 18: removal | 21 acres |
| Stand 30 & northwest part of stand 31: removal | 200 acres |
| Stand 22: Removal harvest | 60 acres |
| Herbicide: As needed | |

Years 10 through 20:

| | |
|---|-----------|
| Stand 47: improvement harvest | 290 acres |
| Stand 48: clearcut quarter of stand with stand 47 harvest | 65 acres |
| Stand 49: selection harvest east section | 10 acres |
| Stand 8: group selection | 100 acres |
| Stand 25, 26 & 27: improvement harvest | 170 acres |
| Stand 35: Shelterwood | 100 acres |
| Stand 31: Shelterwood | 500 acres |
| Stand 1 & southern part of stand 3: Improvement harvest | 200 acres |
| Stand 11: Shelterwood or straight removal | 70 acres |
| Stand 13: group selection | 20 acres |
| Following will need access via bridge to be built: | |
| Stand 28 and northern part of stand 29: Improvement | 350 acres |
| Stand 27: group selection: | 200 acres |
| Herbicide: As Needed | |



Forest Health

Primary forest insect and disease problems include the ongoing hemlock wooly adelgid infestation and the more recent chestnut oak mortality.

Wooly adelgid has impacted the hemlocks for at least the last 20 years. Hemlock was once a major species on all but the southern exposures. Almost all the hemlock has died on the western half of the property except in some riparian areas. There is a sharp reduction in hemlock mortality on the eastern half of the property, starting just upstream of the Reservoir. Hemlocks are relatively healthy in this area. Very little active adelgid was noted, probably due to the severe winters of 2013-14 and 2014-15. It is likely that adelgid activity will increase with more normal winters, however, the more favorable site conditions and existence of frost pocket conditions will continue to provide some protection on the eastern section.

Significant recent mortality has occurred among the chestnut oaks in nearly all stands. This is apparently the result of native insect defoliators and secondary causes. There is less mortality on the better sites, but overall mortality is about 50%.

Ash is nearly nonexistent on the property so the emerald ash borer is not a factor.

Gypsy moth defoliations have occurred since the 1970's. In areas this has had an impact on the oak component. In the last 20 years mortality has declined as the gypsy moth has become more naturalized. It now seldom exhibits the extreme population spikes that has caused past mortalities. Currently there is a low level of egg masses present, so some future mortality may be expected among susceptible trees.

The deer herd is, now and in the recent past, at low enough levels to allow for diverse and desirable regeneration as well as some improvement in the shrub and herbaceous layers. The increase in advanced oak regeneration and abundance of successful tulip poplar regeneration is a clear indicator of lowered deer populations. All the cutting in the last 15 years has created favorable conditions for deer and some increase in the herd can be expected.

Targeted residual stem density/species parameters for overstory removal

In all overstory removals the presence of acceptable and normally desirable advanced regeneration already exists, thus stem retention is not necessary to achieve basic regeneration goals. A goal of a stand average 10 sq. ft/a of basal area will be retained. This will be an average with some variation desired as part of the diversity in the harvested stand.



Three primary objectives drive the retention of stems in these overstory removals; diversity, wildlife and aesthetics. Diversity includes species, size and spatial considerations.

In general, large trees of species that are underrepresented will be favored. These commonly include hickories and conifers. Den trees and those with significant dieback (future potential dens) will constitute the balance of large trees retained.

In areas with heavy tulip poplar regeneration, some healthy small sawtimber and pole oaks (mostly white oak) will be retained. This will ensure an oak presence in the future in areas where the shelterwood has tended to convert portions of the pre-harvest stand from oak dominated to a future poplar dominated stand.

Most of the sapling and pole size stems were removed in the initial shelterwood harvest. Because of this, remaining saplings of otherwise less desirable species will be retained. These may include serviceberry, blackgum, red maple and sassafras. All have soft mast and have a high likelihood of developing future dens. In addition, they will frequently be overtopped by the developing desirable seedlings and fall back into an understory or midstory position important for bird nesting.

Lastly chestnut oak has had major recent mortality. Remaining healthy chestnut oak trees will be retained in overstory removals.

Parameters for retention of snags and coarse woody debris in whole tree chip operations

Whole tree harvesting and chipping is not expected or preferred, though it should not be ruled out for specific uses. An abundance of snags exist on most sites. This is due to past insect mortality and shock from the initial shelterwood harvest and pitch pine dying due to age. By contract, retention will be a minimum of two snags per acre. With the exception of a few snags with dens which will be specifically marked, the decision as to retention of snags will be the logger's choice, due to safety and operational considerations. In addition, felling of deadwood will not be required, so the logger will normally leave additional snags that do not warrant the expense of harvesting. With the exception of recent blowdown, coarse woody debris is to be retained.

Intermediate Treatments/Tending

Improvement Thinning – A mid-rotation harvest is designed to control the structure, spacing and species composition of the forest stand by removing or killing designated trees. In a commercial thinning the value of trees removed more than covers the costs of treatment, whereas in pre-commercial TSI (Timber Stand Improvement) an investment is necessary to accomplish the



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treatment. Stocking Guides (such as Roach and Gingrich, 1962) are used to guide spacing and stocking control, reducing treated stands to a condition where the leave trees (trees left on the site) adequately occupy the site in a free to grow state. Mixed Oak forests in northeast Pennsylvania should retain approximately 65-70 sq ft of basal area post thinning in a commercial Improvement Thinning, slightly less in TSI treatments. Leave trees are selected based on good health and form, species, good crown condition, spacing, timber value potential, wildlife or biodiversity value, and seed tree potential. Marking decisions must necessarily be adapted to the composition and condition of the stand such that a threshold for suitable leave trees in a degraded stand is necessarily lower than that of a fully stocked, healthy forest with abundant acceptable stems.

Crop Tree Release - An intermediate treatment focused on the individual trees favored to grow to maturity based on timber, wildlife or ecological value. Normally a target of crop trees per acre is established and designated trees have a crown release thinning on 3-4 sides of the crown to increase vigor and growth rates of the crop tree. There is no prescribed treatment to intermediate areas between crop trees although a modified approach could combine improvement thinning guidelines in these areas with full crop tree release for the subject trees.

Salvage/Sanitation Thinning - A thinning in response to major episodes of mortality or forest stress where harvest decisions are based on evaluations of tree health or risk potential. Salvage harvesting is by definition reactive and not typically a predictable component of forest management planning, but it is a common strategy as more and more introduced insect and disease threats stress our forests along with natural storm damage or drought stress. Dead trees are typically removed along with stressed trees which are unlikely to survive or fulfill management objectives. For instance, an oak tree with over 50% of the crown exhibiting dieback from gypsy moth defoliation will not be able to rebuild its crown and provide adequate growth or acorn production and so should be salvaged. Along recreation areas or trails, dead trees and hazard trees might be removed to increase safety and reduce ongoing maintenance needs.

Free Thinning - Free thinning is not a specific stand treatment but rather a hybrid which recognizes the variable characteristics within the stand and the multiple objectives of landowners. In free thinning the forester reduces stocking within traditional stocking guidelines but may drift between different selection criteria based on the opportunities presented by changing stand characteristics. For instance, given wildlife habitat and timber value growth objectives in a mixed oak stand, a forester may thin out red maple in one area to free up oak crop trees, remove overtopping isolated pine in another area to favor oak, resort to clustered group selection where oak seedlings are well established and daylight an isolated grape vine crop tree. Variability within stands is increasing within our landscape due to increasing pockets of insect/disease mortality, patchiness of seedlings, old diameter limit cutting, and inherently variable soil conditions within our glaciated landscape. Modifying conditions to improve stand performance against goals is therefore a necessarily



“uneven” approach although the outcome should always strive to improve conditions and reduce variability where possible.

Plantation Thinning – Silvicultural thinnings of conifer plantations are typically scheduled incrementally to release the most vigorous stocking from competing trees of poorer quality. Plantations should be managed using stocking guidelines and live crown ratio assessments. Careful consideration should be paid to wind throw risk, operational space for harvesting equipment and the establishment of desirable native tree regeneration. In cases where desirable native species have become established within the plantations, thinning to release native species should be considered. Conversely, plantings may present a cost-effective approach to establishing forest regeneration on sites with poor existing seed source stocking and high levels of competing vegetation.

Forest Regeneration Treatments

Shelterwood harvest – One of the most common regeneration treatments in eastern hardwoods - the shelterwood harvest - is designed to control stocking, seed and sunlight so as to favor establishment of natural seedling regeneration under a “shelter” of partial canopy. This is a staged approach which could actually start with a thinning to favor certain seed producers and stir up the seedbed, followed 5-15 years later by a shelterwood harvest which opens the canopy and reduces stocking to 40-70 sq ft of basal area (30-50% of full stocking), and ending with a removal harvest to release the seedlings and reduce the overstory to 30 sq ft or less which effectively turns site resources over to the new forest represented by the seedling/sapling age class. If forest stands exhibit adequate seedlings the pace of the shelterwood progression can be shortened or stages skipped whereas it can be halted if seedlings are slow to establish or plagued by deer browse. The actual shelterwood harvest should retain healthy dominant and codominant trees of favored species such that suitable seed continues to be deposited into the seedbed. Almost all of the suppressed or midstory stocking should be removed to maximize sunlight on the forest floor while retaining maximum seed production, especially when oak, cherry and other species intolerant of shade are desired.

Seed Tree, Clearcut w/ Residuals, Two Aged – These are all terms for the final harvest to release seedlings to conditions of relatively full sunlight for rapid height growth. Most local hardwood species do not rely on the seed production and dispersal conditions created by the true seed tree silviculture, but it can be used to maintain species representation, protect nesting or perching sites, supplement already established advance regeneration, or address aesthetic concerns. The clearcut w/residual terminology is used commonly with the state forest management and the two-aged management is a forestry term which has been recently adopted by wildlife managers to encourage residual seed production over thick cover conditions for species such as ruffed grouse or golden



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winged warblers. Residual stocking should be reduced to no higher than 25-30 sq ft of basal area to maximize light and ensure a new forest can take hold, the primary objective of this treatment.

Group Selection (aka Patch Cut Release) – A patchy treatment designed to create sunlit openings which mimic the partial openings created naturally by blowdowns, insect mortality, etc. For oak management, it is recommended that the harvest remove groups of trees in an area with a diameter roughly equal to 1-1.5X the height of the timber at a minimum. This treatment can be adapted to react to the natural establishment of seedlings by focusing treatments around pockets of seedlings. Areas between openings can be treated by thinning, salvage or left untouched. In practical terms, this is rarely a primary strategy in regional silviculture, but can be appropriate in special circumstances to either deal with inherent patchiness, encourage regeneration without drastic harvesting in sensitive areas, or create specialized wildlife habitat conditions.

Coppice Regeneration – This treatment is restricted to species which exhibit root sprouting, but can be a valuable habitat management tool in our region, especially where aspen management is possible. Both quaking and bigtooth aspen have a propensity to put up root sprouts which can emerge 20-30 feet distant from a cut stump. Aspen is also a preferred food supply for grouse (buds and flowers), deer (twigs), rabbits, hares and beavers (bark). The regenerating thickets provide excellent habitat for grouse, woodcock, black bear and other species. Harvesting should be accomplished in dormant growth periods when the trees' energy reserves are stored in the roots. Harvesting should be complete and over as large an area as possible to provide maximum sunlight and significant habitat features for target wildlife species. The forester should evaluate need for protective deer fencing as aspen is a preferred browse species of deer and excessive browse will kill shoots and starve the root system of needed energy, eliminating the aspen component from the future forest.

Herbicide Applications – Typically used where understory competing vegetation has become so established it interferes with establishment of preferred species. Typical species that are addressed with herbicide include rhizomous ferns such as hay scented and New York fern, beech sprouts, striped maple or sweetfern. Herbicides are applied by a certified applicator using equipment that can include skidder mounted mist blowers, backpack sprayers, or bark injection or application. Chemicals approved for forestry applications at prescribed concentrations and under proper weather conditions pose little environmental risk. Typical herbicides used in these forestry applications include glyphosate (ROUNDUP), sulfometuron methyl (OUST), and triclopyr (PATHFINDER). Several scientific papers on environmental risks are available upon request. When evaluating impacts, the surfactant or "sticker" used to improve the effectiveness of the herbicide also needs to be considered as it can be a larger issue than the active ingredient. This is especially true around wetlands and open water. It should be pointed out that forestry applications for herbicide use only occur on a small subset of total forest management acres. Any/All herbicide applications will be discussed and planned as described in Invasive Species section.



Deer Fencing – An enclosure fence at least 7 feet tall which attempts to protect developing seedlings from excessive browse pressure exerted by local deer herd. Deer fencing is typically woven wire fencing attached to residual trees or fence posts and installed immediately before or during the regeneration harvest sequence. Costs include \$2.30-2.80/lineal foot to construct, ongoing maintenance costs and another \$0.50-0.75/lineal foot to dismantle. Fences normally need to remain in place for anywhere between 6-12 years depending on the success of the seedlings establishment. Longer periods can increase quality and diversity of growth within the fence but are offset by increasingly problematic maintenance challenges. Since the costs could total \$375-\$600/acre or more, forest managers should thoroughly evaluate the need, shorten the critical period of fencing to minimize maintenance costs, focus on controlling the deer herd to avoid the need, and increasing alternate food supplies/habitat quality to bring better balance to the deer population and its habitat. This becomes increasingly challenging in mixed landscapes with residential developments where deer find refuge and food, including food provided by people who enjoy seeing and protecting the local herd.

DMAP and Hunting – CRW will work cooperatively with the PA Game Commission as a Hunter Access Cooperator to allow public hunting access to the Property. If it's determined the property would benefit from additional hunting, CRW will apply for additional antlerless permits through PGC's Deer Management Assistance Program (DMAP). Yearly DMAP reports will be provided by PGC data and information on annual monitoring of desirable forest vegetation will be added to the reports.

Decision Support

SILVAH (short for Silviculture of Allegheny Hardwoods) is a computer tool for making silvicultural decisions in hardwood stands of the mid-Atlantic and upper Appalachian region. It is an "expert system" in that it recommends appropriate treatments based upon user objectives and overstory, understory, and site data as provided. SILVAH also contains a forest stand growth simulator, provides the ability to test alternative cuts, enables development of a forest-wide inventory database, and facilitates other forest management planning functions. Further information can be found at <http://www.nrs.fs.fed.us/tools/silvah/>.

1.12 Forest Pests - Insects and Disease

The CRW property will be monitored by TNC, CRW, and landowner representatives for current or potential outbreaks with forest pests – insects or disease. CRW will regularly communicate with local DCNR Bureau of Forestry and PA Game Commission staff to ensure an up to date level of information on forest pests. Additionally, as the landowner representatives are working on the



property, any/all issues related to forest health, including forest pest issues, will be reported immediately and plans will be made to deal with the issue. In the case of wide-spread mortality, any salvage operation will need to adhere to the intent and the wording herein related to timber harvesting, including but not limited to access, site layout, harvesting, marketing, clean up, repair, protection, etc. Any case of mortality will need to be assessed prior to planning any salvage operations to see if it can be a viable option for CRW given all the forest management restrictions related to the landowner’s objectives and this plan. See also **Silviculture and Management System** section for information on forest health issues.

1.13 Fire Protection

Fire-protection procedures, use of prescribed fire

- Active Use
- Regeneration Burn
- Silvicultural Management Tool
- Not Active Use (without PGC involvement)

Prescribed fire has not been used as a management option in this forest management plan. Currently, no economic values can be clearly attributed to the use of privately-funded prescribed fire in the watershed, however, it will be important to discuss possibilities with PA Game Commission to see if potential grant opportunities are available that would decrease the need for herbicidal control of competing and invasive plants on some portions of the property. There has been a reduction in the dominance of oak in regenerating stands. On the southern exposures, oak remains a significant component, though mixed with poplar in regenerating stands. On the northern exposures, oak has been almost entirely replaced by tulip poplar. Economically, poplar and oak stands have similar total values, due to poplar’s faster growth and greater volume per acre. White pine has also increased in many areas. These changes have some negatives with regard to wildlife habitat, but also have positives in reducing insect problems, especially gypsy moth outbreaks.



The Dauphin County Department of Public Safety (DPS) takes on the dual role of serving as the County’s primary Public Safety Answering Point (PSAP) for 911 and non-emergency phone calls, as well as preparing for emergencies that may occur through planning and the Emergency Operations Center.

Emergency Services:

Dauphin County Department of Public Safety
Steve Libhart, Director
Dauphin County Department of Public Safety
911 Gibson Blvd.
Steelton, PA 17113
Phone: (717) 558-6800
Fax: (717) 558-6850
Email: dauphinema@dauphinc.org

1.14 Invasive Species

Invasive Plant Species

- More than 10% of the forest impacted
- Less than 10% of the forest impacted

Description (If any found): Invasive plant species are a relatively minor problem. **Barberry** is the most widespread problem. Stands in the narrow corridor between Rt. 325 and Clark Creek have as much as 50% coverage of barberry in the understory. Elsewhere it is scattered or nonexistent. A small amount of **multiflora rose** is scattered.

Stands 4 and 22 both have **ailanthus** and **paulownia** in the regeneration to a noticeable amount. Overall, Stand 22 has the most significant problems with ailanthus, paulownia, multiflora rose, **stiltgrass** and mile a minute weed present. Elsewhere, stiltgrass is present in disturbed areas and drainages, especially below Rt. 325.

The barberry and ailanthus should be treated while it is still manageable. The stiltgrass should be treated in advance in those stands being regenerated.

Within the list of planned management activities, the invasive plants on the CRW property will be systematically controlled with herbicide. Any/all herbicide activity will be planned using best available information and all chemical labels will be followed. Herbicide plans will be derived from on-going consultation with:



Todd Hagenbuch
Vegetation Management Specialist
Technical Questions\Consultations
Field Training and Help
Office / Cell Phone: 570-401-7098
E-mail: thagenbuch@arborchem.com

There may be opportunities in the future to begin controlling invasives with controlled burn, but this would require a cooperative agreement with the PGC and a PGC grant opportunity.

1.15 Road Work and General Maintenance

Roads will be maintained as needed to prevent water quality issues and allow access using BMPs. Roads will be monitored regularly by CRW or landowner representative and improvements will be made when necessary. CRW will seek to improve any situation that is causing erosion/sedimentation and will vigilantly look for any maintenance issues that could pose a threat to water quality and/or water production. Beyond access roads, existing trails will also be monitored. Any new trail or road will be designed to meet strict standards, using BMPs and will only be created where necessary for management purposes. Any new trail or road project will be carefully planned to meet all landowner objectives.

1.16 Environmental Assessments, Safeguards, and Monitoring

Management activity records for this forest will be kept by the landowner and by TNC or landowner representative. As activities are carried out they will be documented in the TNC or landowner representative system. The system will allow records to be kept on past and future management activities in the forest and an accounting of whether the activities prescribed produced the desired results. The property will be monitored yearly to verify that there are no drastic changes to forest health or stocking.

Pennsylvania's best management practices (BMPs) for forestry activities will be followed at all times when management activities are being carried out. Environmental impacts such as rutting and excessive soil movement will be minimized thru the use of professional harvesting contractors.

FSC criteria and indicators in Principle 1, Compliance with laws and principles, apply not only to the forest owner/manager's employees but also to contractors and other forest workers.

Resource monitoring - Yearly monitoring of portions of the property will be done by CRW, TNC or landowner representative.

Active harvest monitoring will be accomplished by landowner representative on a regular basis during and immediately after planned harvest activities. The following inspection form will be utilized:

FOREST MANAGEMENT SERVICES
Forest Multiple-Use Guidance
Forest Stewardship Assistance • Timber Evaluation • Timber Marketing • Herbicide Application

APPALACHIAN FOREST CONSULTANTS

LARRY G. POWELL
QUINTON G. POWELL
MICHAEL T. WOLF



www.appalachianforestconsultants.com

3951 Lincoln Highway
Stoystown, PA 15563
Phone/Fax 814-893-5459

ACTIVE JOB INSPECTION

TRACT _____ COUNTY _____ TOWNSHIP _____

INSPECTOR _____ CREW _____

DATE _____

SILVICULTURAL PRESCRIPTION/GOAL: _____

SAFETY

| | | | |
|-----|----|-----|---|
| yes | no | n/a | Are required PPE available and in use? |
| yes | no | n/a | Are crew members applying safe practices? |
| yes | no | n/a | Are any hazards observable? |

comments: _____

WATER QUALITY

| | | | |
|-----|----|-----|--|
| yes | no | n/a | E&S Plan on site? |
| yes | no | n/a | E&S control measures being implemented properly? |
| yes | no | n/a | SMZ's adequately maintained? |
| yes | no | n/a | Are stream corridors free of debris? |
| yes | no | n/a | Road drainage and water bars properly installed and functioning? |
| yes | no | n/a | Stream crossing(s) properly installed and functioning? |
| yes | no | n/a | Approved spill kit on site? |
| yes | no | n/a | Evidence of spills/dumping on site? |

comments: _____

Figure 1-6: Active Harvesting Inspection Form

| | | | |
|---|----|-----|---|
| ROADS/TRAILS/LANDINGS | | | |
| yes | no | n/a | Is highway access properly maintained? |
| yes | no | n/a | Is landing area properly maintained? |
| yes | no | n/a | Are skid trails adequately located? |
| yes | no | n/a | Are skid trails stable and well maintained? |
| yes | no | n/a | Is there excessive skidding damage to site or residual trees? |
| comments: | | | |
| | | | |
| RESIDUAL STAND | | | |
| Is residual forest overstory being adequately protected? | | | |
| Is residual forest understory being adequately protected? | | | |
| Is slash and debris being adequately managed? | | | |
| Are property and/or management unit lines being observed and protected? | | | |
| comments: | | | |
| | | | |
| ON-SITE DISCUSSIONS and/or RECOMMENDATIONS: | | | |
| | | | |

Figure 1-6: Active Harvesting Inspection Form (continued)

1.17 Identification and Protection for RTE Species

List of possible RTE species present on the property

Present
If yes, list species: _____

Not Present

CRW's planned activities are designed for zero negative affect on any RTE species. CRW will regularly monitor any/all changes in local RTE species list by communicating annually with DCNR Bureau of Forestry and PA Game Commission neighbors. A PNDI search will be conducted every 3-5 years to ensure compliance of planned forestry activities. Any/All planned activities will NOT supersede the protection of any RTE species at the DeHart Reservoir Property. If/when a RTE species becomes known, CRW will discuss the situation with the proper state or federal authority and a strategy will be created that may alter planned forest management activities.

Note: Review of the PNDI search will be required prior to any active harvesting activity at CRW property.

From the PNHP website <http://www.naturalheritage.state.pa.us/>

The Pennsylvania Natural Heritage Program (PNHP) is a member of NatureServe, an international network of natural heritage programs that gather and provide information on the location and status of important ecological resources (plants, vertebrates, invertebrates, natural communities and geologic features). Our purpose is to provide current, reliable, objective information to help inform environmental decisions. PNHP information can be used to guide conservation work and land-use planning, ensuring the maximum conservation benefit with the minimum cost.

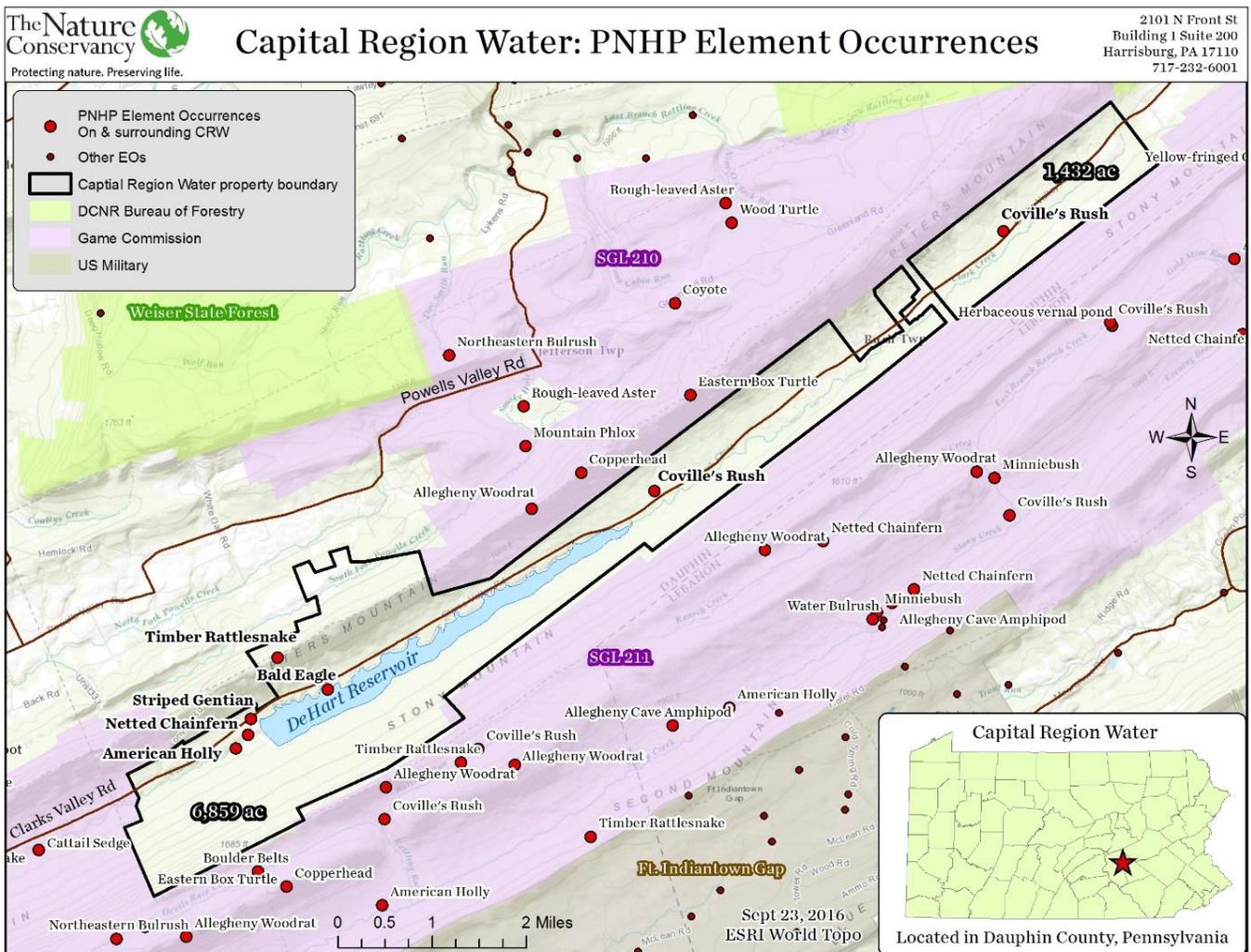


Figure 1-7: PNHP Element Occurrences on and around the DeHart Property.



1.18 Identification and Protection of High Conservation Value Areas and Other Special Areas of the Forest

HCVF if present:

| High Conservation Value Forests possess one or more of the following attributes: | Present | Not Present |
|--|---------|-------------|
| 1. Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values. | | X |
| 2. Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance. | | X |
| 3. Forest areas that are in or contain rare, threatened or endangered ecosystem. | | X |
| 4. Forest areas that provide basic services of nature in critical situations. | X | |
| 5. Forest areas fundamental to meeting basic needs of local communities. | | X |
| 6. Forest areas critical to local communities' traditional cultural identity. | | X |

If "Present" was answered for any of the above criteria describe in detail here:

The DeHart Property is owned and managed for the primary purpose of providing drinking water to the City of Harrisburg and surrounding communities. This is described in more detail in Section 1.20 Water Resources and Riparian Areas.

While working to complete the forest management activities within this plan, CRW, TNC, and landowner representative will seek to find any currently unknown special area deserving protection. If/when found, the area will be mapped and described in a report to TNC and a strategy will be created to protect the area. Protection of a high conservation value/special area will supersede any/all forest improvement activity. Planned activities will only be worked if it is determined that the activity can be accomplished without negatively affecting the high conservation value/special area.

1.19 Description and Justification of Harvesting Techniques, Including equipment to be used

Are there any equipment or other restrictions for the property? Yes No

If yes, what are they?

| Type of Equipment | Check if acceptable for use |
|--------------------------|-----------------------------|
| Conventional Upland Crew | X |
| Low Ground Pressure | X |
| In Woods Chipping | X |

Definitions

Conventional Upland Crew: Individual loggers with chainsaws, one or two skidders and a loader
Low Ground Pressure: Tracked feller buncher, one or two dual skidders or a forwarder, loader
In Woods Chipping: Tracked feller buncher, one or two or more skidders, loader and an in woods chipper

The most likely harvesting techniques are described in the **Silviculture and Management Section** above. Harvest techniques will fall into either a thinning or regeneration category. Focus of any/all harvesting will be adhering to and meeting the landowner objectives/stated management unit objectives, and will continually keep an eye on the future make-up and health of the overall forest.

1.20 Water Resources and Riparian Areas

It is widely known that CRW's DeHart Property contains a highly important water resource.

From the CRW website:

The DeHart Watershed Property is an 8,200 acre property and includes over 7,500 acres of forestland and a 5 mile long Reservoir in northern Dauphin County. This property is the beginning of our water system and a major reason why we have Award Winning Water. Can you swim in it? No, sorry. We monitor, maintain, and protect this land to have the best water quality possible. You can learn more about the property and how you can protect source water quality at our Consider the Source page. The property is along the Kittatinny Ridge Corridor, a landscape recognized for



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its importance as a migration flyway for birds, native brook streams, and forests. - See more at: <http://capitalregionwater.com/managingdehart/#sthash.zpNUv15e.dpuf>.

From the Chesapeake Bay Program website:

Start in [Harrisburg](#), Pennsylvania's capital city and home to about 50,000 people, and follow a few winding roads north. Soon, the hustle and bustle dissolves to a typical rural Pennsylvania scene: hardwood and conifer forests, cold-water trout streams, and family farms scattered across the base of the Appalachians.

Take a turn onto [Pennsylvania Route 325](#) and you'll find yourself traveling parallel to [Clark Creek](#), a 31-mile-long tributary of the Susquehanna River and a popular destination for hikers, hunters, cyclists and fly fishermen alike.

Clark Creek begins in [Tower City, Pennsylvania](#), a coal town in the Schuylkill Valley. It flows through an area appropriately known as Clark's Valley in the [Blue Mountains](#), the easternmost range in the Pennsylvania Appalachians. It then runs beneath a highway into the Susquehanna River near Dauphin.

But what's with all this "Clark," anyway? [William Clark](#) began as a farmer and statesman in Pennsylvania. He then served as treasurer of the United States from Pennsylvania and returned to Dauphin after his stint in Washington.

In the 1940s, the Works Progress Administration dammed Clark Creek to create [DeHart Reservoir](#), which still provides water for Harrisburg residents. The Reservoir, which is still pristine today, is a popular destination for cyclists. Many speak of the [veil of mountain fog](#) that hovers over the Reservoir in the early morning hours.

For [fly fishermen](#), the most interesting part of Clark Creek is the 15 or so miles south of DeHart Reservoir. This 35-foot-wide section of stream is stocked with brook trout. A canopy of thick forest over the stream keeps the water cool year round. Most of the stream is easily accessible from Route 325.

Hikers and hunters will also find this area desirable. The nearby Appalachian Trail goes over Stony and Second mountains, both of which alongside Clark Creek. The trail takes you through an area known as the [St. Anthony Wilderness](#), the largest roadless tract of land in southeastern Pennsylvania. Hikers pass through two ghost towns that were once flourishing mining settlements and [report several century-old abandoned coal mines](#) served by the Reading Railroad. Another sight to watch out for? [Black bears](#).

From Clarks Creek Watershed Preservation Association website:

The mission of the Clarks Creek Watershed Preservation Association (CCWPA) is to preserve, protect and enhance the environmental integrity of Clarks Creek, and to advocate the conservation and sustainability



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of its natural resources while promoting restoration and safety within the watershed.

In the spring of 2010, Michael Yanchuk, at that time the Watershed Specialist with the Dauphin County Conservation District, decided to see if enough interest existed in and about Clarks Creek to create a "Watershed Preservation Association" — a group that would engender local efforts to protect the creek, to clean up pollution, and to help maintain the delicate balance between landowners, creek enthusiasts, Dauphin County, the owners/operators of DeHart Reservoir and Dam, and the City of Harrisburg.

*After many meetings, a core group of landowners, sportsmen and friends of Clarks Creek successfully created such an organization — the **Clarks Creek Watershed Preservation Association**.*

We love our creek! Much of it is still pristine — surrounded by natural areas and teeming with a wide variety of plants and animals. We need to keep it that way, protected by a combination of watchful citizens and responsible laws.

But we know that our watershed is threatened. Development threatens to send runoff into Clarks Creek and its tributaries. A warming climate has brought invasive insect and plant species into the watershed. Even DeHart Dam and Reservoir, long a bastion of solidity and stability both physically and organizationally, may come under stress from natural causes and from changes in its stewardship (it is now owned and operated by the Capital Region Water Authority).

We hope this web site provides a good introduction to our efforts to preserve, protect and enhance our creek and its watershed. Please consult our [ACTIVITIES](#) page for a list of upcoming meetings and activities.

For a PDF "Quick View" of Clarks Creek and its essential data, [select this link](#).

For Clarks Creek Watershed Coldwater Conservation Plan (2012), a detailed study with maps, charts, water quality testing results, and more, [select this link](#).

For a PDF "Fact Sheet" about the CCWPA, [select this link](#).

For information on how to JOIN the CCWPA, [select this link](#)!

The Clarks Creek watershed drains an area of 43.1 square miles in central Dauphin County. The watershed is a long narrow basin approximately 25 miles long with an average width of about 1.5 miles. The stream flows west joining the Susquehanna River northeast of Dauphin Borough. There are no significant tributaries only small streams draining the steep mountainsides; Third and Stony Mountain to the south and Peters Mountain to the north.



The vast majority of the watershed is forested with a significant amount of land in public ownership. Population density is very low. The City of Harrisburg has constructed and maintains a water supply Reservoir in the main stem of the stream in Rush Township. The Reservoir is one of the main sources of drinking water for the city and surrounding area. Topography is typical of the Ridge and Valley physiographic province in Pennsylvania. The ridges of the Clarks Creek watershed are composed mainly of red and gray sandstone with some conglomerate. The valley is underlain with sandstone and shale

Clarks Creek is classified as a High Quality – Cold Water Fishery (HQ-CWF) designated special protection waters. The creek is also classified as a Trout Stocking Fishery (TSF).

Streamside Management and Streamside Management Zones

Management guidelines for the Streamside Management Zone (SMZ) are clearly outlined in Principle 6.5 in the FSC US National Standard. At a minimum, Pennsylvania Best Management Practices and the FSC Appalachian SMZ requirements will be followed to minimize operational impacts and protect water quality during all activities. Several publications and scientific studies addressing buffer zones served as a guide in the establishment of the strategies implemented on the property.

Our management approach to SMZs is as follows:

- **SMZ Delineation:** SMZs have been delineated using the Inner and Outer Zone structure and are reflected in the Management Zones map; all FSC US National SMZ management guidelines will be met or exceeded. A 50 foot Inner Zone and additional 100 foot Outer Zone (total 150 foot buffer) will be recognized along all surface water, including perennial and intermittent streams, ponds, etc., as mapped. These distances will be doubled (300' total buffer with a 100 foot Inner Zone and 200 foot Outer Zone) around both water supply Reservoirs and along the main stem of major creeks and rivers.
- **Inner and Outer Zones:** No harvesting will be pursued within the Inner Zone and harvesting in the Outer Zone will be limited to thinning to retain 60% or greater stocking. There will be no Regeneration Harvests within the Outer Zone. No roads or main skid trails will be located within the total buffer zone except where they approach stream crossings. Stream crossings will be designed and maintained according to BMP's to protect water quality and preserve stream function.
- **High Quality Designations:** While exempt from PA DEP's Riparian Buffer Requirements, CRW commits to maintaining DEP's recommended 150 foot buffer (a 50 foot Inner Zone and 100 foot Outer Zone) on all High Quality (HQ) perennial and intermittent streams. While limited timber harvest activities will occur in the Outer Zone, a 50 foot No-Harvest Inner Zone (except for the removal of wind-thrown trees) will be maintained. CRW also commits to maintaining 60% canopy



cover and No-Harvest on slopes > 40% in the Outer Zone. Both criteria exceed FSC recommendations for the Appalachian Region.

- **Wilderness Trout Streams:** Both the Class A Wild Trout Stream and Wilderness Trout Streams designations qualify streams for either HQ or EV status respectively.
- **Herbicide Use:** Except in significant occurrences of riparian-related invasive species, no broadcast herbicide treatments will be applied within Outer or Inner SMZ; use of herbicides labeled for riparian and wetland use may be used only within Outer and Inner SMZ.
- **Other Significant Wetland Features:** Additionally, other significant wetland features such as springs, seeps, and vernal pools will be mapped and evaluated for their protection needs as it relates to site specific variables, including water quality protection and wildlife features. They will be buffered as follows:
 - Springs and seeps: 100' no entry buffer (except where existing roads cross into this buffer).
 - Vernal pools: 100' no entry buffer for heavy equipment around significant vernal pools, maintaining minimum of 75% canopy cover and promoting establishment/protection of large down and dead woody material; This management zone will be extended outward another 100' where features exist which are conducive to amphibian breeding to protect and enhance this habitat; there will be no broadcast herbicide application within the total buffer.
 - Existing skid trails within wetland buffers will be decommissioned as appropriate.
 - No disturbance or timber harvest activities will occur within wetlands. Wetland buffers will be developed on a case by case basis to ensure exemplary water quality and Exceptional Value wetlands are maintained. Characteristics to evaluate when determining appropriate buffer widths include the steepness and erodibility of surrounding hill slopes, soil permeability and infiltration rates and capacities, as well as the density and type of buffer vegetative cover. Mechanical or silvicultural operations within buffers are permitted solely for the restoration, maintenance, and creation of wetland or riparian values or water quality protection. This could include invasives control, permitted stream crossing construction, or sanitation harvesting to protect stream banks from destabilizing windthrow or culvert pipes from blockage.

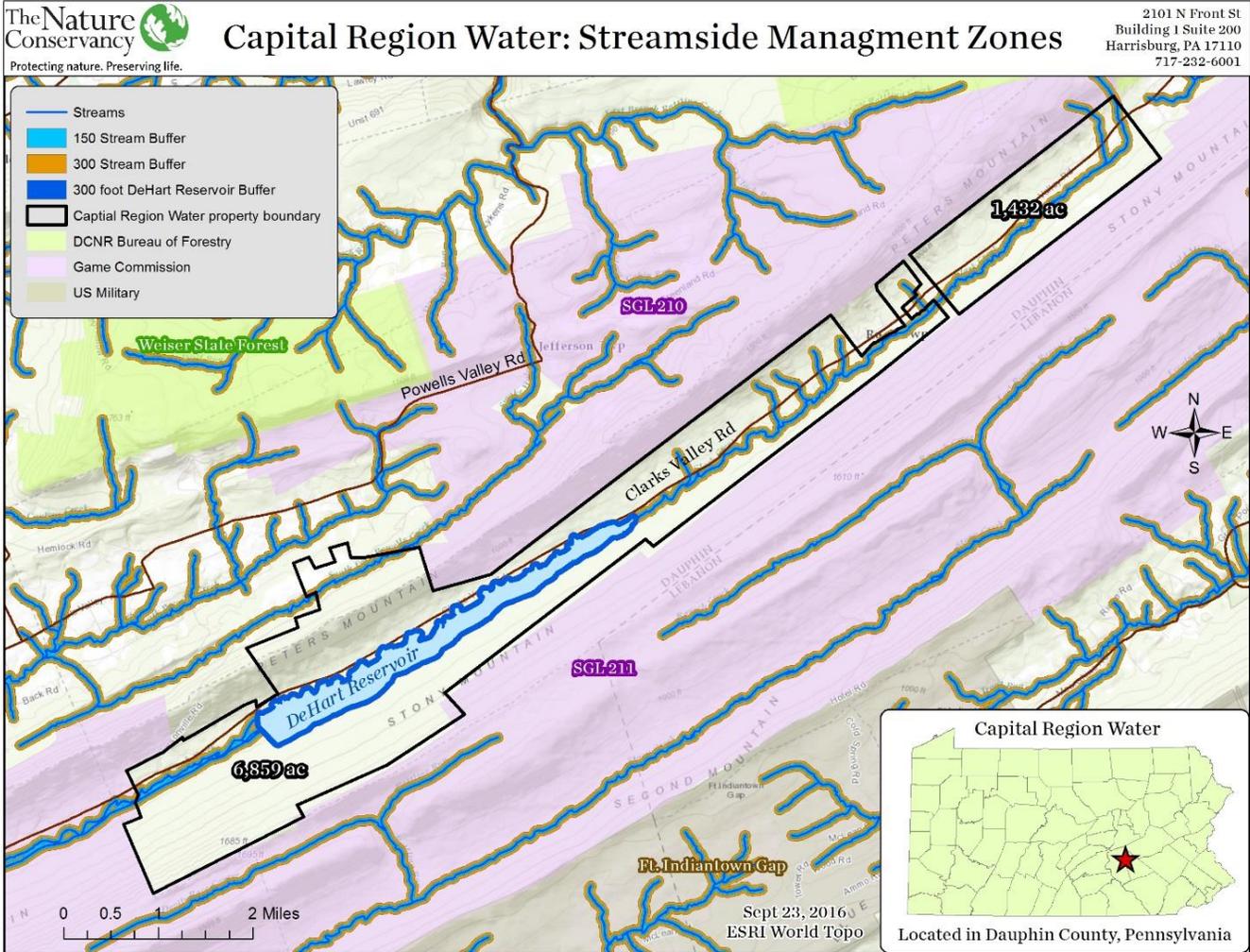


Figure 1-8: Streamside Management Zones on DeHart Property.



1.21 Forest Soils (see Soils report - on file and provided - for further detail)

Table 1-3: Forest Soils Classifications

| Map Unit Symbol | Map Unit Name | Area in Ac. | Percent of Area |
|-----------------|--|-----------------|-----------------|
| AbB2 | Albrights silt loam, 3 to 10% slopes, moderately eroded | 13.7 | 0.20% |
| AnB | Andover gravelly loam, 3 to 8% slopes | 12.1 | 0.20% |
| AoB | Andover very stony loam, 0 to 8% slopes | 158.3 | 2.10% |
| At | Atkins silt loam | 279.4 | 3.70% |
| Bb | Barbour silt loam | 3.3 | 0.00% |
| BvB | Buchanon very stony loam, 0 to 8% slopes | 349.1 | 4.60% |
| CaD | Calvin very stony silt loam, 8 to 25% slopes | 120.6 | 1.60% |
| CaF | Calvin very stony silt loam, 25 to 75% slopes | 27.9 | 0.40% |
| CkC2 | Calvin-Klinesville shaly silt loams, 8 to 15% slopes, moderately eroded | 10.7 | 0.10% |
| CkD2 | Calvin-Klinesville shaly silt loams, 15 to 25% slopes, moderately eroded | 21.7 | 0.30% |
| C1A | Calvin-Leck Kill shaly silt loams, 0 to 3% slopes | 5.1 | 0.10% |
| C1B2 | Calvin-Leck Kill shaly silt loams, 3 to 8% slopes, moderately eroded | 358.7 | 4.70% |
| C1C2 | Calvin-Leck Kill shaly silt loams, 8 to 15% slopes, moderately eroded | 110.1 | 1.40% |
| D1B | Dekalb and Lehew very stony sandy loams, 0 to 8% slopes | 38.5 | 0.50% |
| D1D | Dekalb and Lehew very stony sandy loams, 8 to 25% slopes | 618.7 | 8.10% |
| D1F | Dekalb and Lehew very stony sandy loams, 25% to 80% slopes | 1,082.60 | 14.20% |
| KaE2 | Klinesville shaly silt loam, 25 to 50% slopes, moderately eroded | 21.4 | 0.30% |
| LaB2 | Laidig gravelly loam, 3 to 8% slopes, moderately eroded | 159.5 | 2.10% |
| LaC2 | Laidig gravelly loam, 8 to 20% slopes, moderately eroded | 58.1 | 0.80% |
| LdB | Laidig very stony loam, 0 to 8% slopes | 140.1 | 1.80% |
| LdD | Laidig very stony loam, 8 to 25% slopes | 3,213.50 | 42.10% |
| Ph | Philo silt loam | 1.7 | 0.00% |
| VsC | Very stony land, sloping | 197.6 | 2.60% |
| VsF | Very stony land, steep | 30.7 | 0.40% |
| W | Water | 591 | 7.80% |
| Totals | | 7,624.10 | 100% |



CAPITAL REGIONTM

WATER

2.0 Management Unit Mapping



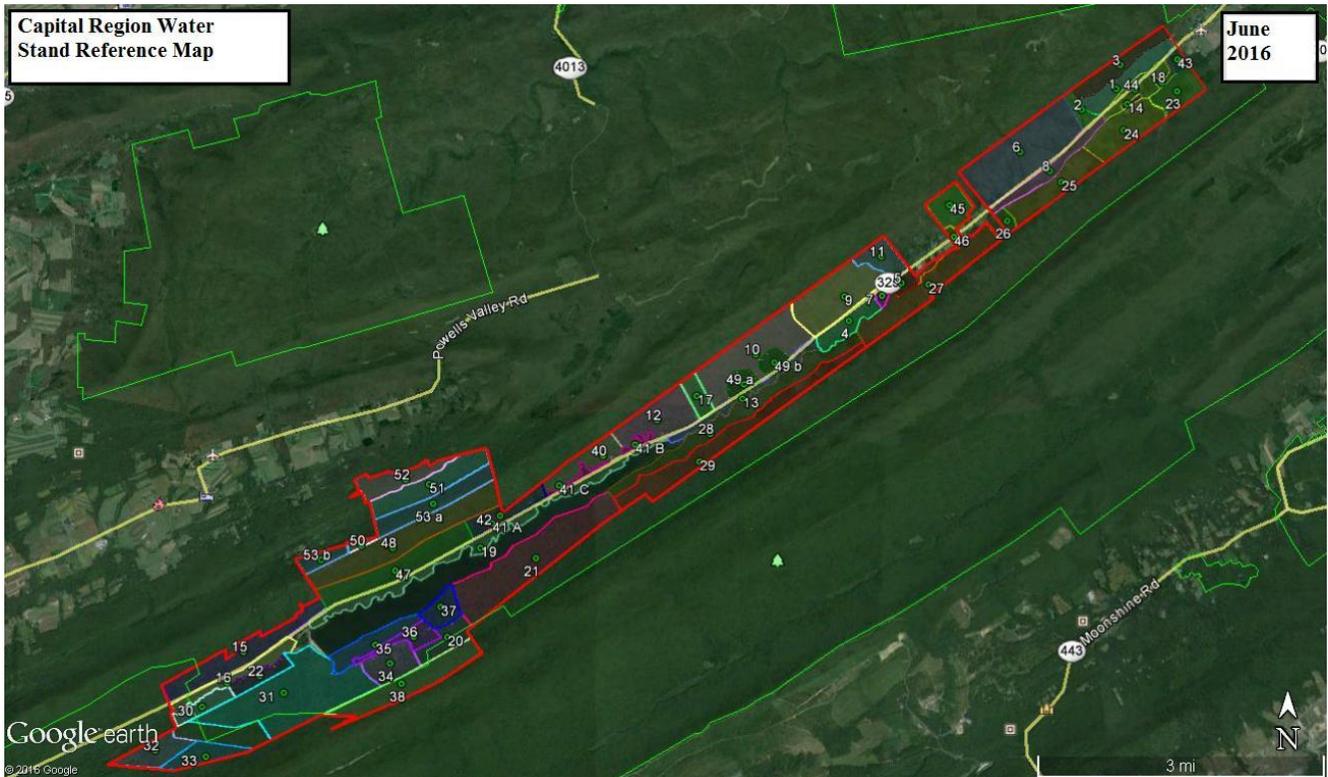


Figure 2-1: Forest Stand Reference Map for DeHart Property on Aerial Photography.



Capital Region Water: Forest Stands

2101 N Front St
Building 1 Suite 200
Harrisburg, PA 17110
717-232-6001

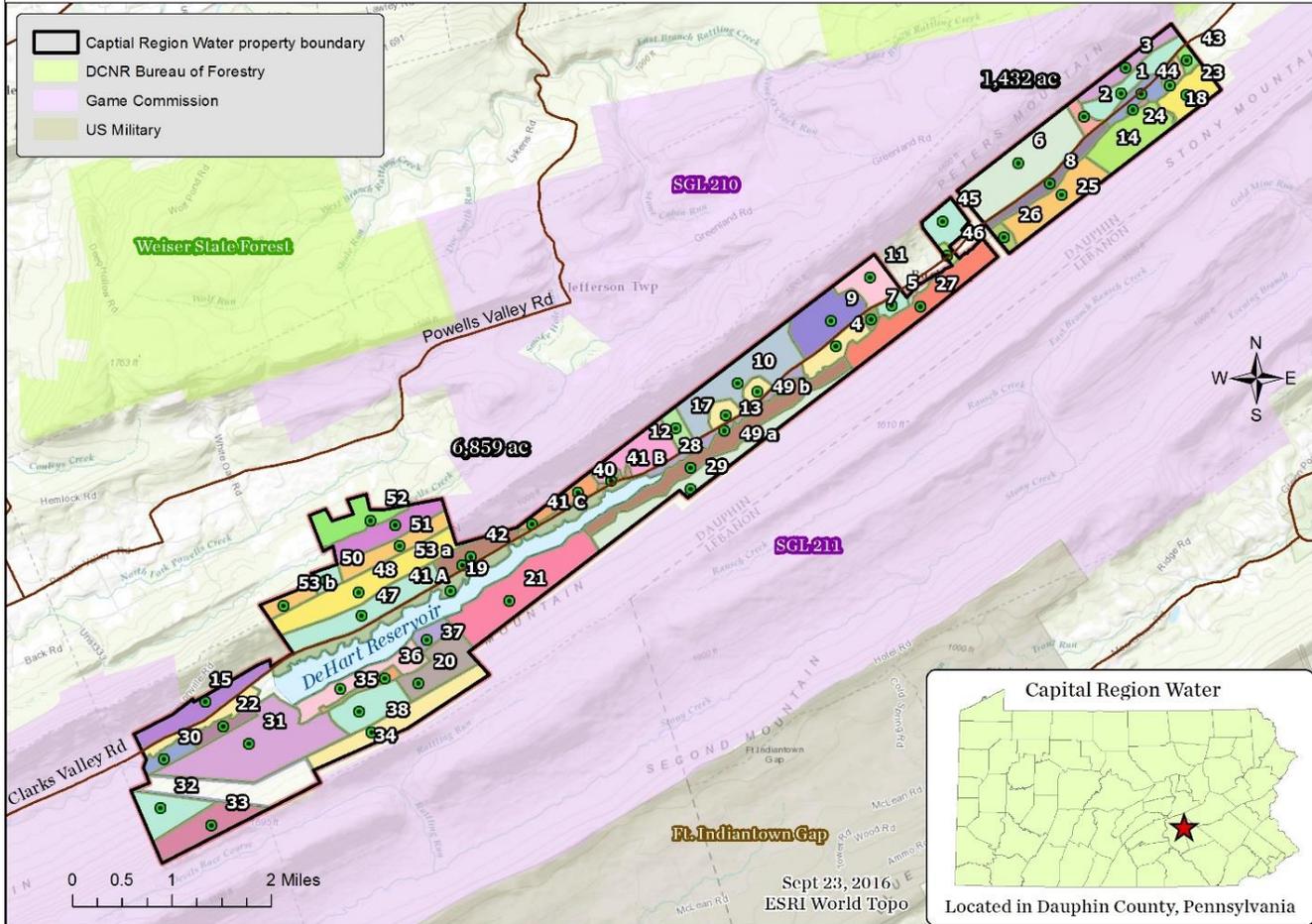


Figure 2-2: Forest Stand Reference Map for DeHart Property



CAPITAL REGIONTM

WATER

3.0 Management Strategies by Tract No. and Stand No.



3.0 Management Strategies by Tract No. and Stand No.

3.1 Northeast Stands (1, 2, 3, 6, 8, 14, 18, 43, 44, 45, 46)

Overview: The Northeast section of the CRW property includes all areas from the inholdings eastward to the property line and from Clark Creek north to the game lands boundary. The areas on both sides of Rt. 325 are nearly flat to gently sloping. Slopes increase to moderate to occasionally steep as the game lands boundary is approached. The overstory is largely dominated by white oak along with scarlet and chestnut oak. White pine is dominant along the stream and in the plantations. The easternmost end contains a wetland that has significant hemlock. Snags and den trees are adequately represented in most stands.

Most of this section has low to moderate deer pressure, corresponding to deer pressure 2 in the SILVAH guidelines. An exception is stand 45 which lies above private land and has a deer pressure of 3. Tulip poplar, oak and white pine are the predominant regenerating species. Nonnative invasive species range from non-existent on the slopes to heavy between the highway and Creek. Barberry and stiltgrass are the primary invasives. Native competitive vegetation is limited to patchy mountain laurel.

Two wetlands transitioning from forested to shrub to herbaceous cover exist in stands 43 and 44. Numerous spring seeps exist along the base of the steeper slope in stand 1. Several vernal pools are located in stand 8 between the highway and Clark Creek. Narrow bands of riparian wetlands are present intermittently along Clark Creek and the lower tributaries.

This area encompasses 921 acres with the following timber types:

| | | |
|------------------------------------|------|-----------|
| Dry oak | (AD) | 537 acres |
| Oak-heath | (AH) | 114 acres |
| Oak-pine | (FA) | 108 acres |
| Black cherry | (BC) | 81 acres |
| Tulip-maple | (TM) | 39 acres |
| Pine plantation | (PP) | 25 acres |
| Hemlock-mixed hardwood palustrine | (UF) | 22 acres |
| Hemlock-white pine-mixed hardwoods | (FR) | 16 acres |

These stands comprise the following stages of forest development:

| | |
|-------------------------|-----------|
| Uncut sawtimber | 485 acres |
| First stage shelterwood | 350 acres |
| Seedling/sapling | 81 acres |



3.0 Management Strategies by Tract No. and Stand No.

Stand 1: 131 acres; Site 2; Dry Oak type (AD)

Location: Northeast portion of the property bounded by Rt. 325 and stand 44 on the south, Stand 2 on the west, Stand 3 on the north and private land on the east. Most of the stand is gently sloping with spring seeps and numerous seasonal and small perennial runs. Aspect is southeast.

Description: This is a dry oak site dominated by small and medium sized white oak sawtimber. Eight water courses with a defined bed and bank cross the stand perpendicular to the axis of the stand. Four of the streams have a perennial flow. Numerous other species are present, particularly tulip poplar along the drainages and white pine in the eastern portion of the stand. The stand has not been cut since stand initiation. No evidence of past charcoal making is present. The extensive white oak component and absence of white pine and tulip, except along the drainages, indicate a likely fire history during stand initiation. Decayed dead wood indicates significant gypsy moth mortality during the 1980's or early 90's. There was light gypsy moth defoliation this year; otherwise the stand is in generally good health. Total basal area is 103 sq. ft/a. with a relative density of 89%. Current estimated net timber volume is 6750 bf/a.

Overstory basal area:

| Species | Saplings | Pole | Sm Saw | Med Saw | Large Saw | Total |
|--------------|----------|-----------|-----------|-----------|-----------|------------|
| White oak | 1 | 15 | 35 | 8 | | 59 |
| Scarlet oak | | 1 | 8 | 5 | | 14 |
| Chestnut oak | | 4 | 1 | | | 5 |
| Tulip poplar | | | 2 | 4 | 4 | 10 |
| White pine | | | 1 | 1 | 1 | 3 |
| Pitch pine | | | 2 | | | 2 |
| Red maple | 2 | 1 | | | | 3 |
| Blackgum | 4 | | | 2 | | 6 |
| Sassafras | | 1 | | | | 1 |
| Total | 7 | 22 | 49 | 20 | 5 | 103 |

Regeneration: Regeneration is sparse but widespread with every plot having some regeneration. This is likely due to overstory shade rather than deer browsing. The only locations where browsing was evident was along the edge of laurel near the drainages and then mostly on witch-hazel and red maple sprouts caused by sapling dieback. About 5500 seedlings per acre are present. Red maple established and new oak were present on most plots. White pine and tulip were abundant on two plots near seed sources.

3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 96 |
| Yellow Poplar | 13 | 481 |
| Conifers | 13 | 1204 |
| New Oak | 0 | 385 |
| Established Oak | 0 | 915 |
| Competitive Oak | 0 | 0 |
| Other Desirables | 0 | 2455 |
| Total Oak | 0 | 1300 |

An additional 1,400 noncommercial blackgum, serviceberry and witch-hazel seedlings per acre are present. These provide diversity and all have wildlife value. All divert browsing pressure from desirable seedlings as blackgum is among the most preferred of all deer browse and witch-hazel and serviceberry are about equal browse preference with oak.

Laurel was present on each plot with an average 34% cover. Except along some drainages, the laurel was not dense and didn't present a problem for regeneration. A general light cover of blueberry exists. This was not tallied as extensive assessment of old oak clear-cuts found a beneficial response to regeneration from a light to moderate blueberry cover. Fern was present on only one plot. No other interfering vegetation was present.

Only a single barberry plant was tallied and the only other invasive found during the cruise was a multi-flora rose plant. Stiltgrass and the common invasive shrubs are present along the road and powerline that forms the south border of the stand.

Prescription: The stand is healthy, with adequate growing space. With all the cutting that has occurred on this property, it is recommended to leave the stand alone for this 10 year management period.

Action: Defer harvest or other active management until next 10 yr. period.

Stand 2: 39 acres; Site 2; Dry oak converting to: Poplar-maple type (TM)

Location: Adjacent to the west of Stand 1. The stand is bounded by stand 1 on the east, Rt. 325 on the south, powerline on the west and game lands on the north. The stand is gentle to steeply sloping with a southeast aspect with a buffered drainage near the west side of the stand.



3.0 Management Strategies by Tract No. and Stand No.

Description: Like much of the property, this site was dominated by small to medium size white, chestnut and scarlet oak sawtimber. A shelterwood harvest was conducted in 2011 or 2012. Residual basal area is 40 sq.ft/a. Small sawtimber accounts for 78%, medium sawtimber 15% and the balance in poles and saplings. White oak comprises 52%, chestnut oak 28%, scarlet oak 11%. Pitch pine, tulip poplar and blackgum account for the rest. Net estimated timber volume is 3,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|---------------|----------|----------|-----------|-----------|--------|-----------|
| White Oak | | 2 | 13 | 9 | | 24 |
| Chestnut Oak | | | 11 | 2 | | 13 |
| Scarlet Oak | | | 3 | 2 | | 5 |
| Yellow Poplar | | | 1 | | | 1 |
| Pitch Pine | | 1 | 1 | | | 2 |
| Blackgum | 1 | | | | | 1 |
| Total | 1 | 3 | 29 | 13 | | 46 |

Regeneration: Regeneration of poplar is excellent with over 9000 seedlings/acre, most of which have grown past deer browse height. There are about 600 competitive and established oak seedlings/a. Other desirables, primarily red maple and sweet birch amount to more than 2000 seedlings/a.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 80 | 9475 |
| Conifers | 0 | 77 |
| New Oak | 0 | 39 |
| Established Oak | 0 | 424 |
| Competitive Oak | 10 | 231 |
| Other Desirables | 10 | 2080 |
| Total Oak | | 693 |

There are nearly 11,000 noncommercial species, primarily sassafras, blackgum and serviceberry per acre. These are a very important component of the regeneration. They all have wildlife and diversity values, more importantly the sassafras and blackgum are among the most preferred of all seedlings as deer browse and considerably preferred to oak seedlings. They serve an important function by drawing deer pressure away from more desired species such as oak and poplar as is evident in this stand. About 90% of the plots are adequately stocked with regeneration. The only unstocked plot has a heavy sedge cover, due to its location next to a retired skid road.



3.0 Management Strategies by Tract No. and Stand No.

Where not shaded by the regeneration, a fairly uniform layer of huckleberry is present with pockets of mountain laurel.

No nonnative invasive plants were found, either in the plots or while walking the stand between plots. The short retired haulroad accessing the stand is covered with stiltgrass. The stiltgrass has not invaded the stand, probably due to the dense regeneration and shrub layer.

Deer impact: the deer impact is at most level 2. No species is being adversely impacted by deer browsing. What browsing is present is a light level of browsing on the blackgum and sassafras. Even the borders of the stand have only been lightly browsed.

Prescription: This stand is a successfully regenerated shelterwood. The shelterwood's residual trees should be removed in the near future to allow regeneration to develop. As this shelterwood is more recent than those to the west, removal should occur after they have been harvested. Some residual trees, especially conifer and den trees should be retained.

Action: Remove shelterwood, retaining 5 to 10 square ft/a. of basal area. Conifers and den trees should be priorities for retention. About 40 square ft/a. of small and medium oak sawtimber should be removed. This harvest should be conducted in the next 3 to 5 years. Schedule for 2019.

Stand 3: 114 acres; site 3 Oak-Heath (AH); non commercial

Location: This stand occupies a moderate to steeply sloping, mid slope position with a southeast aspect. Soils are rocky, though not to the extent of limiting operability. The stand is upslope from stand 1 and is bounded by Game Lands 210 on the north. No road access enters the stand.

Description: This is a "good" site 3 dominated by chestnut and scarlet oak. Quality is poor to fair. Red maple and blackgum saplings and poles are also common. More than half the chestnut oak is dead or dying. This mortality is specific to the chestnut oak. It appears that significant defoliation by gypsy moth and other insects has caused this recent mortality. Other agents, possibly anthracnose have increased the mortality. Chestnut oak is highly susceptible to anthracnose and the extremely wet June and early July would have created favorable conditions for anthracnose. Net estimated live timber volume is 2,500 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Poles | Sm Saw | Med Saw | Total |
|-------------------|-----------|-----------|-----------|----------|-----------|
| Chestnut Oak | | 14 | 11 | 4 | 29 |
| Scarlet Oak | | 6 | 11 | | 17 |
| White Oak | | 1 | | 1 | 2 |
| Red Oak | | | | 1 | 1 |
| Red Maple | 8 | 8 | 2 | | 18 |
| Blackgum | 5 | 8 | | | 13 |
| Dead/Dying CO | | 14 | 16 | 4 | 34 |
| Total Live | 13 | 37 | 24 | 6 | 80 |

Regeneration: About 1500/a sparse but well distributed, established oak seedlings are present. Some white and pitch pine were observed, but not within plots. About 1800/a red maple seedlings are present. On this site red maple is not acceptable regeneration as no saw timber quality red maples were noted and only a few that would even have been pole quality. About 2700/a non-commercial seedlings are present.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 48 |
| New Oak | 0 | 385 |
| Established Oak | 13 | 1155 |
| Total Oak | | 1541 |

Laurel is present on most plots, but not dense. Average cover of laurel is about 20%. Huckleberry is common and dense enough in some places to inhibit regeneration.

Prescription: Site is of poor enough quality with some steep slopes and difficult access to make this stand noncommercial. Significant chestnut oak will be lost due to the ongoing mortality, but harvesting would create significant earth disturbance for little or no net profit. Opportunity will exist to harvest the lower portion of this stand along with the adjacent down slope stand 1.

Left alone a multiage stand will develop with some older trees, especially scarlet oak, an age class resulting from the 1980's gypsy moth mortality and a new age class from the current mortality. Blackgum will be an important component especially of the earlier mortality driven regeneration, but some oak will be present from each age class. This stand will be useful for wildlife and protect the site.

No invasive plants were encountered during the cruise.



3.0 Management Strategies by Tract No. and Stand No.

Action: Defer until 2nd 10 year period. Harvest lower portions of this stand where practical in conjunction with stand 1.

Stand 6: 300?? acres, site 2; Dry oak (AD)

Location: It lies just east of the private land section and north of Rt. 325. The eastern boundary is a powerline.

Description: This stand is a large shelterwood. The lower part is flat to gently sloping. Slope increases to moderately steep at the upper limit of the cutting. Numerous permanent and intermittent streams cross the stand perpendicular to Rt. 325. These streams were well buffered during the first stage shelterwood harvest. This stand had a first cut shelterwood harvest in 2011 and 2012. Residual timber is dominated by small and medium size white, scarlet and chestnut oak. Quality is fair to good. Average basal area is 32 sq. ft/acre. Though the average residual is low, it is greater on the lower, better part of the stand. Significant mortality has impacted the chestnut oak on the upper slope. Net estimated timber volume is 2,375 bd. ft/a.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Large Saw | Total |
|---------------|-----------|------------|-----------|----------|-----------|-------------|
| White Oak | | 2.5 | 13 | 3 | .5 | 19 |
| Chestnut Oak | | | 5 | 1 | | 6 |
| Scarlet Oak | | 1 | .5 | .5 | | 2 |
| Red Oak | | | .5 | | | .5 |
| Yellow Poplar | | | | 1 | .5 | 1.5 |
| Red Maple | .5 | | | | | .5 |
| Pitch Pine | | | 1.5 | .5 | | 2 |
| Total | .5 | 3.5 | 21 | | 1 | 31.5 |

Regeneration: Regeneration is dominated by tulip poplar and oak. Regeneration is present on all plots. 50% of the plots are adequately stocked with poplar or oak. Vigorous aspen was found on several plots and one plot had a large pitch pine seedling. Laurel was found on most plots but averaged less than 10% coverage. Fern and grass were both sparse. One plot next to an old log landing was about 80% covered with sedge. This plot also had large poplar and aspen regeneration to 10 ft. tall.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 39 |
| Yellow Poplar | 40 | 4718 |
| Conifers | 0 | 77 |
| New Oak | 0 | 19 |
| Established Oak | 5 | 1175 |
| Competitive Oak | 10 | 116 |
| Total Oak | | 1310 |

A few barberry and multiflora rose were observed, but none were found on plots. Stiltgrass is present and occasionally dense near landings and lower skid trails.

Prescription: Regeneration is plentiful and is being inhibited by the residual overstory, especially on the better lower part of the stand. About two-thirds of the stand has sufficient volume to warrant an overstory removal. A removal should be conducted leaving appropriate residuals for diversity and wildlife. Existing log landings and skid trails are suitable for reuse.

Action: Remove overstory on the lower 2/3rds of the stand. About 5 to 10 sq. ft/a. should be retained. Priority would be to retain conifers, den trees and other mast producing trees. Schedule harvest in 3 to 5 years. Schedule for 2019.

Stand 8: 108 acres; site 2; oak-pine (FA)

Location: This stand runs between Rt. 325 and Clark Creek from the private in holdings, east to a stand of old field pine. Aspect is essentially flat. A good dirt road, probably abandoned railroad runs parallel to Rt. 325 and Clark Creek providing excellent access.

Description: This is a relatively good site 2 with great diversity. Terrain is an elevated flat along Clark Creek. White and scarlet oak, white pine and red maple account for more than 90% of the stocking. All size classes are well represented including sapling oak and poplar. The stand has a basal area of 116 sq. ft/a. and a relative density of 98%. Estimated net timber volume is 6300 bf.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Total |
|---------------|---------|------|---------|---------|--------|-------|
| White Oak | 4 | 12 | 18 | 2 | 2 | 38 |
| Scarlet Oak | 1 | 2 | 14 | 6 | 4 | 27 |
| Red Maple | 5 | 8 | | 2 | 2 | 16 |
| Yellow Poplar | | 1 | | 1 | | 2 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Total |
|--------------|-----------|-----------|-----------|-----------|----------|------------|
| Hickory | | 2 | | | | 2 |
| Black Cherry | | 1 | | | | 1 |
| Birch | | 1 | | | | 1 |
| White Pine | 7 | 6 | 3 | 8 | 2 | 26 |
| Pitch Pine | | | 1 | | | 1 |
| Hemlock | | 1 | | | | 1 |
| Blackgum | | 1 | | | | 1 |
| Total | 18 | 33 | 37 | 19 | 9 | 116 |

Regeneration: Regeneration is generally abundant with white pine common in the western 2/3rds of the stand and oak, including competitive seedlings common in the eastern portion.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 77 |
| New Oak | 0 | 116 |
| Established Oak | 20 | 3736 |
| Competitive Oak | 20 | 308 |
| Other Desirables | 1772 | |
| Total Oak | | 4160 |
| Saplings | 40 | |

Laurel is heavy in patches, with three plots containing greater than 40% laurel cover, while the other 7 plots had no laurel. Barberry is fairly common with patches of stiltgrass in the stand.

Prescription: This stand should be maintained in an uneven aged condition through group selection. Harvesting should focus on release of desirable regeneration, reduction of undesirable trees and harvesting of mature timber. Unlike stand 5, there is no widespread mortality due to succession. Unless conditions change, harvesting of this stand need not be a priority. Barberry should be controlled prior to any harvesting.

Action: Enhance the uneven-aged condition of the stand through group selection harvests. A series of group harvests should be conducted, harvesting about 1/5th of the stand every 20 years. Barberry and stiltgrass control should be thru spot spraying. Other stands have greater needs and spraying can be delayed. Schedule for 2018. Initial harvest should be scheduled for later in this 10 year period due to greater priority of removing existing shelterwoods on the property. Schedule for 2024.



3.0 Management Strategies by Tract No. and Stand No.

Stand 14: 8 acres; site 2; pine/larch plantation

Location: This stand is north of the stream near the eastern end of the property. It is west of the new Game Commission road. Aspect is flat to slightly southwest.

Description: This plantation was established on abandoned farmland about 50 to 60 years ago. Parallel bands of larch, white pine and red pine were planted. All species did well; however the red pine is declining and dying as is common for the species in central Pennsylvania. The white pine has good growth and form, but is rather limby, limiting potential sawtimber value. The larch is extremely limby, making pulpwood it's only potential value. A few volunteer red maple, black cherry and white pine are also present. The stand is fully stocked. Most of the larch and red pine are small sawtimber. The white pine is mostly in the medium sawtimber class. Total basal area is 158 sq. ft/a. with a relative density of 91%. Estimated net timber volume is 12,300 bd. ft/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|--------------|------------|-----------|-----------|-----------|----------|--------------|
| White pine | | 7.5 | 15 | 30 | 7.5 | 60 |
| Red pine | | 10 | 35 | 2.5 | | 47.5 |
| Larch | | 20 | 2.5 | | | 22.5 |
| Hemlock | 2.5 | 5 | | | | 7.5 |
| Black Cherry | | 2.5 | 5 | | | 7.5 |
| Red maple | | 7.5 | 5 | | | 12.5 |
| Total | 2.5 | 32 | 77 | 32 | 8 | 157.5 |

Regeneration: Regeneration varies by overstory species. Under the white pine, the ground is covered with white pine seedlings including large seedlings and saplings. Regeneration under the red pine is dominated by hemlock saplings. The larch portion of the stand has a heavy cover of barberry with few seedlings.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|----------|-----------------|--------------|
| Conifers | 50 | 2,500 |
| Saplings | | 50 |

Prescription: This stand is a mix of low quality larch and red pine in decline. The white pine is well formed, but limby due to wide planting spacing. Except for some of the white pine, the only value will be for pulpwood, for which this stand is well suited. The barberry needs to be treated by herbicide under the larch component. The regeneration under the pines is excellent. Once the barberry is treated, it is suggested that planting approximately 200 red oak/a. be done under the



3.0 Management Strategies by Tract No. and Stand No.

larch. Native volunteers of poplar, red maple, cherry and white pine should provide additional regeneration to complete stocking of this part of the stand. Red oak is under represented on the property and this will provide an excellent site. The stand should then be clear-cut to release the regeneration. Deer pressure is low enough that fencing or tree shelters will not be needed. The barberry stubble and tree tops will provide adequate protection.

Action: Broadcast spray barberry, about 3 acres. Schedule for 2017.
Plant 200 red oaks/a. (600 total seedlings), schedule for spring 2019.
Remove overstory 2022.

Stand 18: 18 acres; Site 2; White pine plantation

Location: This pine plantation lies near the east end of the property between Rt. 325 and the headwaters of Clark Creek. It forms an L shape with reverting farmland to the northwest and the riparian forest to its south. A good old road forms the southern boundary. Aspect is flat to gently rolling.

Description: Stand 18 is a very productive white pine plantation with an estimated age of 80 years. White pine makes up more than 95% of the basal area. A few larch are also present and were part of the original planting. Well formed sawtimber dominates. The stand had been thinned about 2000. Along with a small amount of blow down, the basal area has been reduced to 138 sq. ft/a. Growth of the remaining trees is excellent. A significant amount of regeneration has resulted from the sunlight provided by the past harvest. Excellent regeneration, including sapling and pole size pines have developed, especially on the eastern half. Barberry is present throughout, especially in the western part. Relative density is 79%. Estimated net timber volume is 15,460 bf/a.

Overstory basal area:

| Species | Saplings | Poles | Sm Saw | Med Saw | Lg Saw | Total |
|--------------|----------|-----------|-----------|-----------|-----------|------------|
| White Pine | 6 | 13 | 34 | 55 | 24 | 132 |
| Larch | | | 3 | 1 | | 4 |
| Hemlock | | 1 | | | | 1 |
| Scotch Pine | | 1 | | | | 1 |
| Total | 6 | 15 | 37 | 56 | 24 | 138 |

Regeneration: Regeneration of white pine is excellent in the eastern half of the stand. Vigorous seedlings, saplings and poles are all present. Regeneration is more sparse in the western half due to excessive barberry competition. No other woody competitive vegetation is present. Stiltgrass is present in a few open areas.

3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 14 | 2861 |
| Other desirables | 0 | 220 |
| Saplings | 29 | |

Prescription: The barberry should be treated on the western half with a broadcast herbicide. The eastern section should be only spot treated to preserve the pine regeneration. An herbicide or formulation that has minimal impact on the pine should be used.

Harvest of the overstory should occur after a few years to allow regeneration to develop on the sprayed sections. An option would be to plant some red oak seedlings after spraying to increase this important but under represented species on the property.

Action: Manage in conjunction with nearby stand 14.

Broadcast spray barberry 2017.

Plant red oak on western area, 200/acre on 3 acres (600 total seedlings) spring 2019.

Remove overstory 2022.

Stand 43: 22 acres; wetlands; noncommercial; Hemlock palustrine-mixed hardwoods (UF)

Location: Stand 43 is located at the extreme east end of the property. It is bounded on the north by Rt. 325; south by stand 23 and west by stand 44. Aspect is gently south to flat.

Description: This stand is primarily wetlands forming the headwaters of Clark Creek. The northern quarter is gently sloping down from Rt.325. This area once had drainage ditches and was farmed. The bulk of the stand is made up of red maple and hemlock in the wet areas. The area previously farmed is predominately large white pine and black walnut. There are several areas of herbaceous and shrub wetlands coving about two acres. The stand is well stocked with 138 sq. ft/a of basal area and a relative density is 89%

The estimated net timber volume of 9,300 b.f/a.



3.0 Management Strategies by Tract No. and Stand No.

Basal area:

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Total |
|---------------|----------|-----------|-----------|-----------|-----------|------------|
| Hemlock | | 6 | 22 | 2 | 2 | 32 |
| White Pine | 8 | 8 | 2 | 2 | 10 | 30 |
| Red Maple | | 14 | 16 | 8 | 4 | 42 |
| White Oak | | | 2 | 6 | | 8 |
| Scarlet Oak | | | 4 | 2 | | 6 |
| Yellow Poplar | | 2 | | | 4 | 6 |
| White Ash | | 2 | 2 | 2 | | 6 |
| Yellow Birch | | 2 | 2 | | | 4 |
| Black Birch | | 2 | | | | 2 |
| Black Walnut | | | | 2 | | 2 |
| Total | 8 | 36 | 50 | 24 | 20 | 138 |

Regeneration: Regeneration is sparse due to the dense overstory. Some white pine and hemlock seedlings and saplings were observed, though only one plot contained regeneration in the form of white pine saplings.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|----------|-----------------|--------------|
| Saplings | 20 | |

Barberry was dense near the road. Stiltgrass was present in the open wetland. Otherwise no invasive plants were noted, again due to the dense shade created by the overstory.

Recommendations: Most of this stand should remain undisturbed due the wetlands. Approximately 5 acres of reverted farmland near Rt. 325 contains large white pine and walnut. This area also has dense barberry in the understory. This area could be managed in conjunction with adjacent stand 18.

Action: On five acres nearest the road, control barberry and harvest in conjunction with stand 18. Rest of stand should be left undisturbed.

Broadcast spray barberry 2017.

Remove overstory 2022.



3.0 Management Strategies by Tract No. and Stand No.

Stand 44: 81 acres; Reverting farmland; white pine/black cherry

Location: Near east end of property. Rt. 325 bisects the northern part of the stand. Stand 1 forms the north boundary; stand 8 forms the west boundary; Clark Creek forms the south boundary and stand 18 forms the east boundary. Terrain is gently rolling with a few imbedded wetlands.

Description: This stand is largely reverted farmland with much diversity. Generally white pine, both planted and natural is the most common species. Red maple forms a nearly pure block on the west end of the stand. Several areas were planted to pine and clearcut about 2000. These areas have largely grown back to sapling black cherry. Several acres of sawtimber black walnut are present near some of the old farm buildings.

Barberry is abundant, with significant multiflora rose and bush honeysuckle. Desirable native shrubs such as winterberry, arrow-wood and spicebush are present, especially in moister areas. Basal area is 87 sq. ft/a. with an estimated net volume of 3000 bf/a.

Basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|---------------|-----------|-----------|-----------|-----------|----------|-----------|
| White Pine | | 9 | 6 | 5 | 3 | 23 |
| Virginia Pine | | 6 | | | | 6 |
| Scotch Pine | 1 | 1 | 1 | | | 3 |
| Pitch Pine | | | 1 | 1 | | 2 |
| Red Pine | 2 | | | | | 2 |
| Norway Spruce | | | | 1 | | 1 |
| Red Maple | | 9 | 9 | 2 | 1 | 21 |
| Black Cherry | 8 | 3 | | | | 11 |
| Black Walnut | | 1 | 8 | 4 | | 13 |
| Scarlet Oak | | 1 | 2 | | | 3 |
| White Oak | | | | 1 | | 1 |
| Blackgum | | | 1 | | | 1 |
| Total | 11 | 30 | 28 | 14 | 4 | 87 |

Regeneration: This is a young stand and regeneration is sparse as typical of these stands. The only true advanced regeneration is some white pine saplings and seedlings under the red maple along the western border of the stand. Some areas that are still filling in have some black cherry and pine saplings. Native wet site shrubs such as winterberry, arrow-wood and spice bush are present.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|----------|-----------------|--------------|
| Conifers | 0 | 116 |
| Saplings | 40 | |

Invasive shrubs are a major problem. Barberry mixed with bush honeysuckle and multiflora rose cover most of the abandoned farmland in dense thickets.

Prescription: Control of the invasive shrubs is necessary, both for the future of this stand and to limit the spread of the undesirable shrubs throughout the rest of the property. Much of the area should be treated with a broadcast herbicide. Areas near wetlands and where invasives are less dense should be spot treated. The red maple near the western border is low quality with good white pine regeneration in the understory. This should be harvested along with adjacent stand 14.

Action: Treat invasive shrubs; broadcast spray 2017; follow-up with spot treatment in subsequent years.

Harvest about five acres of red maple adjacent to stand 14; 2022.

Stand 45: 95 acres: Site 2; Dry oak (AD)

Location: Stand 45 lies north of Rt. 325 with private land to both east and west. Game lands are to the north. Access is through stand 46 to Rt. 325. Aspect is southeast. Slopes are moderate at the bottom too steep near the game lands border.

Description: This is one of the few commercial stands on the property dominated by still healthy chestnut oak. Chestnut oak makes up over a third of the basal area and nearly a half of the sawtimber. Some recent mortality has occurred, but much less so than most other stands. The health of living chestnut oak could not be determined in leaf off conditions. White, black and scarlet oak are also present. Two drainages run through the stand. Yellow poplar is common in these areas. Blackgum which is not commercially valuable, but has high wildlife value is common in all size classes. With a basal area of 103 sq. ft/a. and a relative density of 83%, the stand is well stocked, but with adequate growing space for most trees. Old gypsy moth mortality from the 1980's accounts for the current basal area and also has reduced the existing oak component to the minimum necessary to maintain this as an oak stand. Estimated net timber volume is 6,000 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Basal area:

| Species | Sap | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Chestnut Oak | | 9 | 15 | 10 | 3 | 2 | 38 |
| White Oak | | | 4 | 2 | 1 | | 7 |
| Scarlet Oak | | | 4 | 2 | 1 | | 7 |
| Black Oak | | | 4 | | 1 | | 5 |
| Red Oak | | | | 1 | 1 | | 2 |
| Yellow Poplar | | | 3 | 3 | 4 | | 10 |
| Red Maple | | 11 | | | | | 11 |
| Hickory | | | 1 | | | | 1 |
| White Pine | | | 1 | | | | 1 |
| Blackgum | 2 | 10 | 2 | 2 | | | 16 |
| Serviceberry | 1 | | | | | | 1 |
| Sassafras | | | 1 | | | | 1 |
| Dogwood | 2 | | | | | | 2 |
| Total: | 5 | 30 | 34 | 20 | 11 | 2 | 103 |

Regeneration: Observed regeneration is sparse. Red maple is most common along with some established oak, white pine and saplings. Two plots are adequately stocked.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 0 | 39 |
| Conifer | 0 | 231 |
| Established Oak | 0 | 385 |
| Other Desirables | 1 | 2658 |
| Total Oak | | 385 |
| Saplings | 1 | |

Mountain laurel is common but not normally dense. Average coverage is 22%. No invasives were encountered.

Prescription: This is a stand at high risk for significant mortality. The stand should be monitored mid-summer every year for increased mortality and regeneration in a leaf on condition. Location and lower quality of this stand do not warrant extensive efforts for regeneration. Most regeneration can be expected to come from oak stump sprouts. Once dead, stumps don't sprout, therefore, if mortality increases the stand should be regenerated promptly before a majority of the oaks die. The abundant blackgum will sucker extensively and help the limited oak regeneration develop. Blackgum is a prolific sprouter via root suckers. These suckers will help divert deer pressure from



3.0 Management Strategies by Tract No. and Stand No.

the oak regeneration. Should the oaks remain healthy, this stand should be retained for the immediate future.

Action: Monitor oak health and reproduction each summer. Be prepared to regenerate by clearcutting should mortality increase. If the stand remains healthy, retain the stand for at least another decade.

Stand 46: 16 acres; site 1; White pine/hemlock (FR)

Location: This stand is located on both sides of Rt. 325, immediately below stand 45. Private land bounds the east and west sides and Clark Creek forms the southern boundary. Aspect is southeast and slopes are gentle.

Description: This stand lies along the west side of a small stream running into Clark Creek. Growing conditions are good to excellent. Large white pine and hemlocks of all sizes dominate the site. Some nice red oak is also present near the creek. The part of the stand on north side of Rt. 325 will be needed to provide access to stand 45. The lower side has a good woods road as access from Rt. 325. Good quality scarlet and white oak and poplar are also present. Total basal area is 148 sq. ft/a. with a relative density of 94%. Estimated net volume is 11,800 bf/a.

Basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|---------|-------------|-------------|-----------|-------------|----------|--------------|
| White Pine | | 7.5 | 2.5 | 12.5 | 5 | | 27.5 |
| Hemlock | | 32.5 | 20 | 7.5 | 5 | 2.5 | 67.5 |
| Red Oak | | | 2.5 | 7.5 | | | 10 |
| Scarlet Oak | | | 7.5 | 2.5 | 2.5 | | 12.5 |
| White Oak | | | 5 | 2.5 | | 2.5 | 10 |
| Yellow Poplar | | | | 5 | | | 5 |
| Red Maple | | | 7.5 | 2.5 | | | 10 |
| Blackgum | | 2.5 | 2.5 | | | | 5 |
| Total | | 42.5 | 47.5 | 40 | 12.5 | 5 | 147.5 |

Regeneration: Small openings north of Rt. 325 allow for the development of a moderate amount of established oak, white pine and red maple. South of the road regeneration is scarce due to shading from the canopy.

3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-----------------|-----------------|--------------|
| Conifers | 0 | 385 |
| Competitive Oak | 1 | 899 |
| Saplings | 33 | |

Recommendations: Due to the proximity of Rt. 325 and Clark Creek, uneven-aged management should be used. A combination of single tree and small group selection should be used. North of the road group selection is preferred. South of the road single tree selection would be effective at regenerating the dominate hemlock component in that part of the stand. The lower side of the road should have an initial harvest when stands 5 and 7 have their initial harvest. The upper side of the road should have an initial harvest in conjunction with stand 45.

Action: Make an initial uneven-aged harvest of the lower section in conjunction with nearby stands 5 and 7. Initial harvest 2020.

Make an initial harvest in conjunction with regeneration of stand 45. Timing dependent on health of chestnut oak in stand 45 (see stand 44).



3.0 Management Strategies by Tract No. and Stand No.

3.2 Southeast Stands (23, 24, 25, 26)

Overview: The Southeast section of the CRW property includes all areas from the eastern property line west to where a pipeline crosses the property from north to south. Clark Creek forms the northern boundary and game lands the southern boundary. The area is gently sloping and rolling with a few areas having moderate slopes near the game lands. Access is via a newly developed Game Commission access road that crosses CRW property.

There is large species diversity in the overstory. All the upland oaks common to this region are present, with white, red and chestnut oak being most abundant. Other important species include black birch, red maple, tulip poplar, hemlock and white pine. Snags and den trees are adequately represented in most stands. The ongoing hemlock and newer chestnut oak mortalities will ensure an adequate supply of snags for the foreseeable future.

Most of this section has low to moderate deer pressure, corresponding to deer pressure 2 in the SILVAH guidelines. This has not always been the case. Stand 24 was cut heavily about 2000.

Most of this stand has regenerated to birch and striped maple, except on the eastern and southern edges, where lighter cutting has allowed oak and pine to develop. Elsewhere in this section, regeneration is light due to overstory shading, but well distributed. Red maple, birch, oak, pine and hemlock are the predominant regenerating species. Nonnative invasive species are almost non-existent, except for a little barberry and stiltgrass near the creek. Black birch and striped maple are significant native competitive vegetation in stand 24, as a result of the 2000 harvest.

On the rest of the section competitive vegetation is limited to patchy mountain laurel.

One notable wetland covering about 5 acres exists along Clark Creek in the western part of the section. This wetland is mostly forested with hemlock, maple, blackgum and poplar dominant. A few spring seeps exist along the floodplain.

This area encompasses 459 acres with the following timber types:

| | | |
|------------------------------------|------|-----------|
| Dry oak | (AD) | 335 acres |
| Red oak-mixed hardwoods | (AR) | 107 acres |
| Hemlock-mixed hardwood palustrine | (UF) | 5 acres |
| Hemlock-white pine-mixed hardwoods | (FR) | 12 acres |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg. Saw | Total |
|----------------------------|----------|-----------|-----------|-----------|-----------|------------|
| Total Live BA | 6 | 40 | 46 | 35 | 11 | 138 |
| Chestnut Oak (Dead) | | | 8 | 6 | 1 | 15 |

Regeneration: Regeneration is sparse due to shade from the fully stocked overstory. About 2550 seedlings/a. of birch and red maple are present. The birch is concentrated in patches while the maple is broadly distributed. Oak and white pine regeneration, while limited to only a few hundred seedlings per acre, is vigorous and well established. A few poplar and hemlock seedlings were also noted. Hemlock saplings are also present and provide the only actually stocked plots in the analysis.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifer | 0 | |
| Established oak | 0 | |
| Other desirables | 0 | |
| Saplings | 2 | |

The overstory shade limits competitive species as well with only 9% coverage of striped maple and 2% coverage of fern.

Invasives: A limited amount of barberry was the only invasive species noted.

Prescription: This stand provides much better management options for oak than most other stands on the property. Access and operability are good. The lack of competitive and invasive species in the understory plus the presence of vigorous, well distributed oak in the canopy provide the opportunity to manage this stand primarily for oak. An initial harvest as a shelterwood prep cut should be conducted. The goal of this harvest should be to remove as much intermediate shade and competition while maintaining a generally uniform overstory. This will provide sufficient light for the development of desirable oak and pine seedlings; yet provide sufficient shade to limit the rapid growth of less desirable birch seedlings. A goal of a residual basal area of 80 sq. ft/a. should provide the proper conditions.

The significant volume of recently dead chestnut oak provides important economic value if harvested quickly. The dead chestnut oak plus any that are in decline should be harvested. In addition most of the birch should be removed in the same harvest. Removal of this timber will achieve the desired stand conditions. In addition a few other trees should be removed for proper spacing. Removal of some of the tulip poplar will help limit the dominance of poplar in the regeneration. Poplar, while a valuable tree has dominated most of the heavier shelterwood harvests



3.0 Management Strategies by Tract No. and Stand No.

already conducted. The poplar is the primary competition to oak seedlings and limiting poplar regeneration will help the success of oak regeneration.

Action: Thin from below while removing chestnut oak mortality; harvest 2017.

Stand 24: 188 acres; site 2; Dry oak (AD)

Location: Stand 24 is located on the southeastern part of the property. It is west of the new game lands access road. The north boundary is Clark Creek, the south boundary is game lands and the east boundary is the limit of the 2002 harvest.

Description: This is a long narrow stand running parallel with Clark Creek. Slopes are moderate along the upper slope to gentle through much of the rest. Soils are rocky except near Clark Creek. Rocks are not a limiting factor for management.

This stand had a heavy harvest between 2000 and 2002. Mortality may have been the primary reason for the harvest, but significant high grading also occurred. Birch pole and small sawtimber dominate much of the stand. White and chestnut oak are also a significant, though uneven component of the stand. A single plot near the creek contributed a third of the oak volume in the cruise. Red maple and hemlock are a significant component with numerous other species present. In general, quality of the residual timber is fair to poor.

Several health concerns exist. About half of the chestnut oak is recently dead and others likely to die in the near future. Hemlock here, on the eastern portion of the property, is still in fair health. Recent growth and foliage appearance on the hemlocks is good, however, half the hemlocks in this stand have sparse crowns due to past wooly adelgid attacks. The adelgid activity has declined, probably due to successive bad winters. It can be expected to increase when winter conditions return to normal or mild. It has been observed that hemlocks growing on good sites tend to persist better than those trees growing on drier sites. The eastern stands tend to be moister and protected, which may account for the better health of the hemlock here as compared to the western portion of the property.

Except near the stream and on the eastern portion of the stand, regeneration tends to be poor. Heavy birch and striped maple in the understory are preventing desirable regeneration from developing.



3.0 Management Strategies by Tract No. and Stand No.

Basal area averages 109 sq. ft/a. with a relative density of 79%. Estimated net volume is 5400 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg Saw | Cull | Total |
|----------------------------|----------|-----------|-----------|-----------|----------|----------|------------|
| White oak | | 4 | 8 | 6 | | | 18 |
| Chestnut oak | | | 4 | 6 | 1 | | 11 |
| Red oak | | | 1 | 2 | 1 | | 4 |
| Black oak | | | | | 1 | | 1 |
| Red maple | 2 | 3 | 6 | 1 | | 1 | 13 |
| Tulip poplar | | | 1 | | 1 | | 2 |
| Hickory | | | 1 | | | | 1 |
| Birch | 1 | 15 | 14 | 3 | | | 33 |
| Yellow birch | | | 1 | | | | 1 |
| Blackgum | 5 | 3 | | | | | 8 |
| Hemlock | | 9 | 2 | 4 | 1 | | 16 |
| Total | 8 | 34 | 38 | 22 | 5 | 1 | 108 |
| Chestnut oak (dead) | | | | 4 | 8 | | 12 |

Regeneration: Regeneration is sparse with about 1000 small desirable seedlings (oak, red maple, white pine) per acre. Nearly all these seedlings are on the eastern and northern periphery of the stand. Most of the stand has a dense growth of birch and striped maple preventing regeneration. This undesirable competition tends to be 5 to 15 ft. tall and needs to be treated with herbicide to allow desirable regeneration to develop. Some dense patches of laurel, mixed with groups of white pine saplings exist along the northern part of the stand, nearer the stream. Most established oak seedlings are mixed in with the laurel.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifer | 0 | 193 |
| New Oak | 0 | 48 |
| Established Oak | 0 | 674 |
| Total Oak | 0 | 722 |
| Other Desirables | 0 | 270 |



3.0 Management Strategies by Tract No. and Stand No.

No invasive species were tallied and only a few barberries were encountered.

Prescription: This is a good quality, accessible site that needs rehabilitated in the near future. The undesirable competition is at an ideal height to be killed with mist blown herbicide application. The residual overstory is of poor species composition and doesn't provide an opportunity for a traditional shelterwood to be conducted. The overstory should be removed immediately following herbicide application. Done promptly the dead chestnut oak will provide some value for the harvest. A residual of acceptable stems of oak, poplar, red maple, pine and hemlock should be retained. These trees will help serve as a seed source and should not be expected to be removed. About three quarters of the stand needs treated in this manner. The east and north portions will not need herbicide treatment, though the overstory should be partially removed to release regeneration. Much of north section is within 300 ft. of the stream, so leaving a heavier residual in this corridor would be valuable for water quality as well as to provide a seed source.

Action: Broadcast herbicide to kill striped maple and birch; 2017
Conduct a seed tree harvest leaving about 20 sq. ft/a of oak, poplar, red maple and hemlock. Harvest 2018.

Stand 25: 147 acres; site 2; Dry oak (AD)

Location: Stand 25 is located west of stand 24. The boundary is a small ravine running cross slope. More importantly Stand 25 has not been cut since stand initiation. The west boundary is the east boundary of parcel 55-006-002.

Description: This stand is gently sloping except along the southern border where it begins to slope up Stony Mountain. Some areas of surface rock are present, but don't create any management limitations. This is a small sawtimber stand on a good site. Total basal area is 122 sq. ft/a. with a relative density of 94%. White oak predominates with a basal area of 33 sq. ft/a. Total oak component is 46 sq. ft/a. Other significant species include, birch, red maple, hemlock and white pine. Timber quality is good due to the stands uncut condition and heavy stocking. Estimated net volume is 5,000 bf/a.

Forest health is good. Some mortality has occurred with the chestnut oak, however, not enough to warrant stand entry to salvage. Also the scattered mortality will act as a limited natural thinning to provide room for increased growth of other trees. Some crown thinning has occurred due to hemlock mortality, though less than in most of the area.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|----------------------------|-----------|-----------|-----------|-----------|----------|------------|
| White Oak | | 7 | 18 | 6 | 1 | 32 |
| Chestnut Oak | | 3 | 3 | 1 | 1 | 8 |
| Red Oak | | 1 | 2 | 1 | | 4 |
| Scarlet Oak | | | | 1 | | 1 |
| Tulip Poplar | | | | 1 | | 1 |
| Black Birch | 3 | 15 | 12 | | | 30 |
| Yellow Birch | | 3 | 1 | | | 4 |
| Red Maple | 2 | 4 | 4 | | | 10 |
| Blackgum | 4 | | | | | 4 |
| Serviceberry | 1 | 1 | | | | 2 |
| Hemlock | 2 | 10 | 3 | 4 | 1 | 20 |
| White Pine | | 2 | | 1 | 1 | 4 |
| Pitch Pine | | | 2 | | | 2 |
| Total | 12 | 46 | 45 | 16 | 4 | 122 |
| Chestnut Oak (Dead) | | 5 | 3 | | 1 | 9 |

Regeneration: Undergrowth is sparse in this stand due to the shade cast from the fully stocked overstory. A little over 2000 small seedlings per acre are present. Red maple, birch, hemlock and oak are the primary species.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 0 | 462 |
| Established Oak | 0 | 231 |
| Other Desirables | 0 | 1541 |

Undesirable competition is minimal. Striped maple and larger birch were not tallied and were only noticed in a few spots during the cruise. Laurel is present but not creating a problem. No invasive species were tallied or noted.

Prescription: This healthy small sawtimber stand is growing high quality white oak and other species. The fully stocked overstory is preventing understory competition and invasive plants from becoming established. Health problems are minimal. The small chestnut oak component is suffering mortality and hemlocks can be expected to have some mortality from wooly adelgid. These mortalities will serve to create some natural thinning to improve growth of the residuals and allow some regeneration to develop.



3.0 Management Strategies by Tract No. and Stand No.

No activity should be conducted in this stand, until other stands in greater need of management are addressed. No access is currently present, but access will be relatively easy either by building a road west from stand 24 or by accessing directly by a stream crossing from Rt. 325.

Action: Defer harvesting. Conduct an improvement thinning ~2030.

Stand 26: 17 acres; Site 1; white pine-hemlock-oak (FA)

Location: This stand is located east of the pipeline and property break. It corresponds to parcel number 55-006-001. It adjoins stand 25 which is to the east.

Description: This is a small heavily stocked stand of high quality timber, primarily white oak and hemlock. Total basal area is 177 sq. ft/a. with a relative density of 133%. About 45% is oak with white oak 35% of the total. The stand had been thinned about 1990 in what appears to have been an excellent harvest which cut all size classes, leaving the current high quality stand. The existing stand is in very good condition with some butt rot caused by skidding the only problem from the prior harvest. Much of the timber is in medium and large size classes with good form. Estimated net volume is 11,500 bf/a.

The stand is gently sloping from Clark Creek to the game lands boundary. Springs, spring runs and vernal pools are common along the creek. Several acres will need buffered during any management activity.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med. Saw | Lg Saw | Total |
|--------------|---------|-----------|-----------|-----------|-----------|------------|
| White Oak | | 10 | 22 | 23 | 10 | 65 |
| Red Oak | | | 3 | 5 | | 8 |
| Chestnut Oak | | | 5 | | | 5 |
| Scarlet Oak | | | | 2 | | 2 |
| Tulip Poplar | | | 2 | | 3 | 5 |
| Red Maple | | 13 | | 5 | | 18 |
| Black Birch | | 5 | 2 | | | 7 |
| Blackgum | | | 2 | | | 2 |
| White Pine | | 5 | | 2 | 3 | 10 |
| Hemlock | | 35 | 10 | 10 | | 55 |
| Total | | 68 | 47 | 47 | 16 | 177 |



3.0 Management Strategies by Tract No. and Stand No.

Regeneration: Regeneration, competitive vegetation and invasive plants are virtually nonexistent due to overstory shade. A little laurel exists along the southern edge where the site is a little drier and rockier.

Prescription: This is a high value stand on a good site. Despite that, it is a small area with no current access. This stand should be regenerated when access is developed to the larger adjacent stand 25. A shelterwood sequence focusing on removal of the mid canopy shade would be desirable, though with 10 years or more before access is developed conditions may change. Currently the vigorous hemlock component is the primary source of mid-story shade. If woolly adelgid impacts the hemlock significantly the dead hemlock will allow some sunlight to initiate regeneration.

Action: Conduct an improvement thinning ~2030, along with stand 25.



3.0 Management Strategies by Tract No. and Stand No.

3.3 Southcentral Stands (27, 28, 29)

Overview: The Southcentral section of the CRW property is the least accessible portion of their property. This area includes all the land south of the creek from the private parcel dividing it from the southeast, to the upper end of the Reservoir. Clark Creek forms the northern boundary and game lands the southern boundary. The area is gently sloping and rolling with a few areas having moderate slopes near the game lands. No access currently exists from this section.

Conifers, especially hemlock dominate the overstory in the eastern third of the section and again in the southwest edge. Hemlock is generally healthy in the eastern portion which is bottomland interspersed with wetlands to in sharp decline along the southwest edge which is a rocky upland site. In between, white oak is the dominant species. Other significant species include red and chestnut oak, red maple, birch and white pine. Snags and den trees are adequately represented.

The ongoing hemlock and newer chestnut oak mortalities will ensure an adequate supply of snags for the foreseeable future.

Most of this section has low to moderate deer pressure, corresponding to deer pressure 2 in the SILVAH guidelines. Regeneration is spotty due to overstory shading. White pine and hemlock are most prevalent and are abundant in spots. Red maple, birch and oak are also present. Nonnative invasive species were not encountered, except for a little barberry and stiltgrass near the creek. Competitive vegetation is limited to patchy mountain laurel.

The largest wetland on the property covers about 50 acres along Clark Creek in the eastern part of the section. This wetland is mostly forested with hemlock, maple and blackgum dominant. A few spring seeps exist along the floodplain.

As noted above, no access exists into this section. Extension of the road crossing below Dehart Dam and running easterly in the southwest section is impossible due to extensive areas of large rocks. A road could be extended westward from the southeast, with an easement from the Game Commission to get around the private land. This would require development of a new road of about 5 miles. The most practical would be to develop a stream crossing from Rt. 325. All choices would be expensive to develop and maintain. A better option may be to leave this section to continue developing into old growth.



3.0 Management Strategies by Tract No. and Stand No.

This area encompasses 759 acres with the following timber types:

| | | |
|--|------|-----------|
| Dry oak | (AD) | 286 acres |
| Hem-white pine-Red oak-mixed hardwoods | (FR) | 226 acres |
| Hemlock-mixed hardwood palustrine | (UF) | 50 acres |
| Hemlock—tulip poplar-birch | (FT) | 306 acres |

These stands comprise the following stages of forest development:

Uncut sawtimber 868 acres

Stand 27: 276 acres, Site 1, Hemlock/white pine-red oak/mixed hardwoods (FR)

Location: Stand 27 is located west of the private land break in the property. It is bounded on the east by private land, south by game lands and north by Clark Creek. The west boundary is Stand 28

Description: Stand 27 is a heavily stocked stand with a basal area of 158 sq. ft/a. and a relative density of 114%. This is a medium size stand dominated by oak and conifers. The stand has not been managed and stem quality is very good. Net volume is 8600 bf/a. The stand is flat to gently sloping, running along Clark Creek. Soils are alluvial and nearly rock free near the stream to moderately rocky along the south edge. Though discontinuous, several riparian wetlands and spring seeps combine to make wetlands of about 50 acres near Clark Creek. Conditions in the rest of the stand are suitable for management.

Clark Creek will need to be crossed as no access is available. The private land section along with excessive distance makes developing a road from the bridge at the eastern end of the property impractical. Likewise, distance and excessive rock make developing access from the west impossible. The creek is relatively small near the upstream section of the stand. Several old roads exist from Rt. 325 to the creek in this location. Utilizing one of these roads and developing a ford or bridge is the most practical.

Overstory basal area

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Total |
|--------------|---------|------|--------|---------|-----------|-------|
| Red Oak | | | 2 | 4 | 2 | 8 |
| Scarlet Oak | | | | 1 | | 1 |
| Chestnut Oak | | 6 | 4 | 1 | | 11 |
| White Oak | | 5 | 11 | 9 | 1 | 26 |
| Black Birch | 1 | 16 | 12 | 1 | | 30 |
| Red Maple | 2 | 11 | 8 | 4 | | 25 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Total |
|--------------|---------|------|--------|---------|-----------|-------|
| Tulip Poplar | | | 4 | 4 | 1 | 9 |
| White Pine | 2 | 1 | 1 | 1 | 4 | 9 |
| Pitch Pine | | 1 | | | | 1 |
| Hemlock | 6 | 13 | 6 | 5 | 1 | 31 |
| Blackgum | 1 | 2 | | 1 | | 4 |
| Serviceberry | | 1 | | | | 1 |
| Yellow Birch | | 1 | 1 | | | 2 |
| Total | 12 | 57 | 49 | 31 | 9 | 158 |

Regeneration: Due to the dense overstory and midstory, regeneration is sparse as is competitive vegetation. White pine and hemlock saplings and seedlings stock 50% of the plots.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 21 | 1045 |
| Established Oak | 0 | 28 |
| Other Desirables | 0 | 358 |
| Saplings | 29 | |

A little laurel was found along the southern, higher part of the site and striped maple was found on one plot. Invasive plants were not observed except a little stiltgrass along the stream.

Prescription: This is a high quality site. Lack of access has prevented invasive plants from becoming established. The heavy canopy has limited regeneration and competitive vegetation. The stand would benefit from a partial harvest. This harvest could be a first stage shelterwood harvest or the initial harvest in an uneven aged management system. Either method would focus the first cut on removing much of the mid-canopy poles and small sawtimber. This should reduce much of the birch component. Hemlock, while a good tree for the site, should be reduced due to the potential for wooly adelgid damage.

An uneven aged or shelterwood system will promote white pine at the expense of the oaks. Maintaining oaks as a dominant component in the future stand would be difficult and require significant expense and multiple entries in what would be an effort with at best marginal chances of success. The site is well suited to white pine. The pine can be promoted simply by basic silviculture, using commercial harvest as the primary tool. Net value of pine on this site would likely exceed the net value of oaks when costs, risks and the greater stand volume of pine are considered. Tulip poplar would likely increase, while some oak could be maintained on the drier areas.

3.0 Management Strategies by Tract No. and Stand No.

Preventing or at least limiting the establishment of invasive plants should be a high priority.

Limiting the number of stand entries and access as well as quickly establishing an herbaceous cover on disturbed areas should be a priority.

Action: Develop access; conduct a thinning from below along with limited group selection; Schedule for 2021 thru 2025.

Option, leave inaccessible and allow to continue to develop as old growth.

Stand 28: 286 acres, site 1; dry oak (AD)

Location: This stand is along the south side of Clark Creek and the upper end of DeHart Reservoir. This is a long narrow area extending from the stream to the beginning of the slope and rocks.

Description: This stand is similar to adjacent stand 27 except that the soils are elevated from the stream side and better drained than stand 27. This section has been split into two stands with the poorer rocky upslope area identified as stand 29.

This is a fully stocked mixed oak stand with white oak and scarlet oak dominating. Tree quality is good. Considerable birch and red maple is present in the smaller size classes. Tulip poplar and white pine are a modest, but important part of the stand. Basal area is 141 sq. ft/a. with a relative density of 108%. Net volume is 8,000 bf/a.

Overstory basal area

| Species | Saplings | Pole | Sm. Saw | Med Saw | Large Saw | Total |
|--------------|----------|------|---------|---------|-----------|-------|
| White Oak | | 11 | 23 | 16 | 1 | 51 |
| Chestnut Oak | | 4 | 1 | 1 | | 6 |
| Scarlet Oak | | 1 | 2 | 5 | 4 | 12 |
| Red Oak | | | | 3 | | 3 |
| Tulip Poplar | | 1 | 4 | 2 | 1 | 8 |
| Red Maple | 2 | 8 | 10 | 4 | | 24 |
| Black Birch | 1 | 11 | 10 | | | 22 |
| Yellow Birch | | 1 | | | | 1 |
| Hickory | | | 1 | | | 1 |
| White Pine | | 1 | | 2 | 1 | 4 |
| Hemlock | | 2 | 3 | | | 5 |
| Aspen | | | 2 | | | 2 |
| Sassafras | | 1 | | | | 1 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Saplings | Pole | Sm. Saw | Med Saw | Large Saw | Total |
|--------------|----------|-----------|-----------|-----------|-----------|------------|
| Serviceberry | | 1 | | | | 1 |
| Total | 3 | 42 | 56 | 33 | 7 | 141 |

Regeneration: Regeneration is spotty due to the heavy overstory. Seedling and sapling white pine and hemlock stock 40% of the plots. A small amount of red maple and birch is also present.

Some vigorous established and competitive oak seedlings are present, though none fell within the plots.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 77 |
| Conifers | 20 | 1464 |
| Other Desirables | 0 | 1271 |
| Saplings | 20 | |

Laurel is present on 70% of the plots, though heavy on only one plot. Invasive and other competitive vegetation is absent.

Prescription: This is a high quality oak site with a fully stocked stand. Oak comprises slightly more than 50% of the basal area. About 75% of the medium and large trees are oak. A shelterwood sequence starting with a seed cut which would remove much of the pole and small sawtimber birch and red maple, without creating large canopy openings would be most effective. This will promote oak and white pine regeneration. This may also benefit birch seedlings which are undesirable in this stand. A common error in this type of regeneration sequence is to wait too long before removing the overstory. Birch, oak and pine all regenerate under the partial shade provided by the initial harvest, but birch will develop much faster than the oak. It is best to be prepared to remove the overstory within five to ten years of the first cut to limit birch development.

The above is a process for regenerating the stand. However, this is a healthy stand with few problems. Other stands on the property are in much greater need of management, thus these actions should be deferred until other stands are treated. A bridge will need built to access this and adjacent stands.

A modification of this process would be to carry this stand on an extended rotation. Much harvesting has been done on the property in the last 15 years. Other stands need treated in the near future to restore their health or finish a regeneration process. This stand is white oak dominated. White oak is our longest lived oak and can maintain vigor for up to 200 years. Once other stands are treated



3.0 Management Strategies by Tract No. and Stand No.

this stand should have an improvement harvest, which will be similar in design to the first stage shelterwood harvest described above. The difference is that the regeneration process will not be completed, as the existing stand will be allowed to utilize the new growing space.

Yet another option would be to allow this stand to continue developing into old growth.

Action: Thin from below; 2021 thru 2025

Stand 29: 306 acres; Site 2/3; Hemlock-tulip/birch (FT)

Location: Stand 29 is located in a narrow band between stand 28 and the property boundary.

Description: This stand is upslope of the highly productive stand 28. Slope is gentle to moderate. Much of the stand has excessive surface rock that limits or prevents management. Overall the stand is fully stocked, but quality and species composition is below average. Total basal area is 146 sq. ft/a. with a relative density of 102%. Within the rocky areas, birch and hemlock dominate. The birch is generally poor quality and the hemlock has suffered from wooly adelgid defoliation with reduced crowns and some mortality. Somewhat less than half the stand consists of pockets of minimal rock and better timber quality. In these areas are found most of the oak and aspen as well as better quality red maple and birch. Net volume is 5,300 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg. Saw | Cull | Total |
|----------------------|----------|-----------|-----------|-----------|---------|----------|------------|
| Chestnut Oak | | 3 | 8 | 4 | | | 15 |
| Red Oak | | | 3 | 7 | | | 10 |
| Scarlet Oak | | | 1 | 1 | | | 2 |
| White Oak | | | 2 | 2 | | | 4 |
| Black Birch | 1 | 23 | 19 | 2 | | | 45 |
| Yellow Birch | | 2 | 1 | | | | 3 |
| Red Maple | 2 | 8 | 9 | 1 | | | 20 |
| Hemlock | 3 | 14 | 15 | 1 | | 1 | 34 |
| Blackgum | 3 | 3 | | | | | 6 |
| Aspen | | 2 | 5 | | | | 7 |
| Total Live BA | 9 | 55 | 63 | 18 | | 1 | 146 |

Regeneration: Regeneration is sparse due to shade from the fully stocked overstory. Two plots are stocked by white pine and hemlock. Vigorous red maple stocks one plot.

3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 10 | 308 |
| Other Desirables | 0 | 1271 |
| Saplings | 10 | |

Invasives: No invasives noted.

Prescription: This stand provides limited management opportunities. By itself it would be considered noncommercial. However, this long narrow stand parallels productive stand 28. Those areas of minimal rock should be managed as part of stand 28.

As with the rest of this section, this stand could be allowed to develop as old growth.

Action: Conduct a thinning from below on those areas suitable for management while thinning adjacent stand 28.



3.0 Management Strategies by Tract No. and Stand No.

3.4 Southwest Stands (20, 21, 22, 30, 31, 32, 33, 34, 35, 36, 37, 38)

Overview: The Southwest section of the CRW property includes all areas from the western boundary to near the upper end of the Reservoir and from Clark Creek and the Reservoir south to the game lands boundary. The terrain is gentle near the creek to steep on the mid and upper mountain slope as the game lands boundary is approached. A large and very productive mid-slope bench runs through most of this section. Soils are generally fertile, but with abundant surface rocks. Access is from a recently developed road that runs below the dam, then about two miles east along the bench. The eastern two miles of the stand have no access and extremely rocky conditions make road construction impractical. About 530 acres in the extreme southwest corner are separated by the Appalachian Trail and National Park Service property. About 200 acres of this area were harvested using access across game lands in about 2000. This area has largely regenerated to poplar and birch. The larger portion is non-commercial due to steep slopes and rocks. The Henry Knauber Trail is a well-used connector between the AT and the Horseshoe Trail and traverses this area.

This section is probably the most productive on the property; however rocks and steep terrain make more than 900 acres non-commercial. The overstory is largely dominated by red, chestnut and white oak. Tulip poplar, red maple and black birch are also important species. White pine is scattered throughout. Hemlock was an important component until recently. Woolly adelgid has caused nearly complete mortality of the hemlock in the last decade. Snags and den trees are adequately represented in part due to hemlock and the more recent chestnut oak mortality. Large den trees are fairly common on the steep slopes.

Most of this section has low to moderate deer pressure, corresponding to deer pressure 2 in the SILVAH guidelines. Most uncut areas have sparse regeneration or other ground cover due to overstory shade.

Two rounds of harvesting have occurred. About 1,000 acres were harvested around 2000 with an additional 200 acres harvested in 2010 and 2011. Most harvests have been heavy, shelterwood harvests. Tulip poplar and birch are by far the dominant regeneration on harvested areas. There has been a dramatic response to the light loving poplar in the more heavily harvested areas. Birch tends to dominate where more overstory has left, creating more shade. Pockets of successful red maple and white pine seedlings are also present. It is interesting that the only area with significant oak regeneration is in the area where an improvement harvest was conducted. The general modest increase in light levels and lack of larger openings to stimulate birch regeneration seems to have helped some oak become established in this area.

Nonnative invasive species range from scarce on the slopes to heavy near the creek. Barberry and stiltgrass are the primary invasives, but virtually all common invasives are present in stands 22 and 30, including ailanthus, paulownia, multiflora-rose, mile-a-minute and others. Native competitive



3.0 Management Strategies by Tract No. and Stand No.

vegetation mostly striped maple is significant on some of the most fertile sites. In these areas birch seedlings are also common and should be considered undesirable competition. Wetlands are mostly pockets of riparian wetland in stands 22 and 30. Scattered spring seeps exist on the large bench.

This area encompasses 2344 acres with the following timber types:

| | | |
|------------------------|------|------------|
| Red oak-mixed hardwood | (AR) | 1062 acres |
| Dry oak | (AD) | 777 acres |
| Tulip-maple | (TM) | 286 acres |
| Hemlock-tulip-birch | (FT) | 219 acres |

These stands comprise the following stages of forest development:

| | | |
|-------------------------|------------|--|
| Uncut sawtimber | 1232 acres | (includes 948 acres of non-commercial) |
| Sawtimber, improvement | 374 acres | |
| First stage shelterwood | 573 acres | |
| Seedling/sapling | 165 acres | |

Stand 20: 110 acres; Site 1; Red oak-mixed hardwood type (AR)

Location: Stand 20 is located mid slope on the south side of the Reservoir. The stand is up slope and east of the access road built for the 2012 harvest to the west. The area that was previously marked, but uncut comprises stand 20.

Description: This is a very good quality red oak/tulip poplar stand. It is a lower quality site 1 with some site 2 along the upper slope. The upper half is extremely rocky with the rest of the stand being less rocky. Slopes are gentle to moderate through much of the stand, becoming steep along the upper edge. Tree growth and quality is very good. Even the red maple and black birch have reasonable form and quality.

There is a near complete understory of striped maple throughout the stand. The striped maple is present, but at a lower density on the lower and western parts of the stand. Much of the maple looks fairly young being 10' to 12' tall. There is sufficient birch on and near the stand to present a significant competition problem during regeneration. cursory observation of the adjacent portion of the stand harvested about 3 years ago as a heavy shelterwood has nearly complete regeneration of poplar and birch. Basal area is 138 sq. ft/a. with a relative density of 81%. Net volume is 10,000 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Health of the stand appears good except for significant recent mortality among the chestnut oak. Other than the recent mortality snags are relatively sparse being found on less than 40% of the plots.

Overstory Basal Area:

| Species | Saplings | Poles | Sm. Saw | Med Saw. | Lg Saw | Culls | Total |
|--------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Red Oak | | | 9 | 21 | 5 | | 35 |
| Chestnut Oak | | | 5 | 9 | 1 | 2 | 16 |
| Tulip Poplar | | | 1 | 10 | 4 | | 15 |
| Bl. Birch | | 10 | 15 | 4 | | | 29 |
| Red Maple | | 5 | 15 | 4 | | 1 | 25 |
| Basswood | 1 | | 4 | 1 | | | 6 |
| Blackgum | 1 | 2 | 4 | 2 | | 3 | 12 |
| White Pine | | | | 1 | | | 1 |
| Sassafras | | | | | | 1 | 1 |
| Total | 2 | 17 | 53 | 50 | 10 | 8 | 138 |

Regeneration: Regeneration is generally sparse due to the striped maple interference. Where openings occur there is acceptable regeneration. Several plots on the western section were stocked with other desirables (red maple and hickory seedlings).

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-----------------|-----------------|--------------|
| Yellow Poplar | 0 | 337 |
| Conifer | 0 | 144 |
| New Oak | 0 | 144 |
| Established Oak | 0 | 481 |
| Other Desirable | 25 | 5392 |
| Total Oak | 0 | 626 |

Birch was not counted as other desirables on this site. Striped maple is present on 75% of the plots with an average coverage of 36%. Striped maple provides the potential for major interference for desirable seedlings. Birch is well adapted to this site with a significant seed source. While birch regeneration isn't currently a problem, with any site disturbance, there is likelihood that birch seedlings could overwhelm other regeneration, except for poplar.

Prescription: This stand is a high value stand that is generally healthy, except for the chestnut oak. It is also approaching maturity with major regeneration challenges, especially for the oaks. The extremely rocky soils limit options for controlling the striped maple. Mowing is impossible. Fire is



3.0 Management Strategies by Tract No. and Stand No.

essentially impracticable due to the rocks and long, narrow stand configuration. The size of the striped maple would make it suitable for control by mist blown herbicide. Control of the striped maple needs to consider the risk that birch will fill the growing space provided by the dead maple. In addition poplar would not provide a suitable alternative since the overstory would remain intact providing too much shade for the poplar to develop.

A direct overstory removal would result in a poplar dominated stand with significant birch and a minor oak, maple and pine component. This has occurred in the heavy first cut shelterwood in the stand to the west. A poplar dominated stand would be an acceptable outcome, except that most of the other stands harvested on this north exposure have seen poplar become the dominant species. On this site the oak would not likely compete with the poplar as it has on the harvested south facing slopes.

An option for developing oak regeneration would be to control the striped maple and then do a true first cut shelterwood harvest. This harvest would remove all the birch and most of the chestnut oak along with a few trees of other species to provide adequate spacing for both logging activity and provide light for desirable regeneration. Residual basal area would be 70-90 sq. ft/a instead of the 30-40 sq. ft/a on the previous shelterwood harvests.

Action: Broadcast herbicide; 2017.

Conduct a thinning from below (first cut shelterwood) 2018.

Stand 21: 370 acres, Site 2, Dry oak (AD)

Location: Stand 21 is located immediately northeast of Stand 20. It is bounded on the west by stand 20, east by stand 28, south by game lands and north by the Reservoir.

Description: The stand begins as a high quality red oak, tulip poplar site, but quickly transitions to an average mixed oak site. As you go east poplar quickly drops out and chestnut oak becomes more abundant. Quality declines, but remains good.

Total basal area is 104 sq. ft/a. and relative density is 70%. Red oak and chestnut oak comprised 48 sq. ft/acre basal area. However, nearly all the chestnut oak is dead or dying, presumably from a combination of gypsy moth defoliation and anthracnose. Other oaks have virtually no mortality or signs of decline. Black birch and red maple contribute 42 sq. ft/a. of basal area. Many of these trees became established following gypsy moth caused oak mortality from the 1980's and hemlock mortality from around 2000. Other species are present with significant blackgum in all size classes and scattered large white pine. The pine is important as a seed source for a developing white pine component in the understory. Net volume is 5,300 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

At least a third of the site is covered by excessive, large rocks. The rocks are aligned in lens across the site that would make road building and logging extremely difficult.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Total |
|--------------------------------------|-----------|-----------|-----------|-----------|-----------|------------|
| Red Oak | | 3 | 4 | 7 | 3 | 17 |
| Chestnut Oak | | 2 | | 1 | | 3 |
| Black Oak | | | 4 | 2 | | 6 |
| White Oak | | | 2 | | | 2 |
| Tulip Poplar | | | | 3 | | 3 |
| Hickory | | | 1 | | | 1 |
| Red Maple | 4 | 5 | 3 | 1 | | 13 |
| Black Birch | | 19 | 16 | 4 | | 39 |
| Yellow Birch | | | 3 | | | 3 |
| White Pine | | | | 4 | | 4 |
| Pitch Pine | | | | 1 | | 1 |
| Blackgum | 6 | 2 | 1 | 1 | 1 | 11 |
| Sassafras | | 1 | | | | 1 |
| Total (live) | 10 | 32 | 34 | 24 | 4 | 104 |
| Chestnut Oak (dead and dying) | | | | | | 29 |

Regeneration: Regeneration is well distributed and moderately abundant. Red maple and white pine are vigorous and present on most plots. Oak is less abundant but found on all but two plots. Some large competitive and sapling oak are present, primarily on the rocky areas. Black birch is dominant in areas.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifer | 0 | 770 |
| Established Oak | 0 | 275 |
| Competitive Oak | 0 | 55 |
| Total Oak | 0 | 330 |
| Other Desirables | 0 | 2256 |

Striped maple is present on over 50% of plots, but seldom interfering with desirable regeneration. Invasives were not noted and other competitive vegetation minor.



3.0 Management Strategies by Tract No. and Stand No.

Prescription: This site is commercial quality, but extremely rocky and difficult to manage. Successive mortalities over the last 30 years has removed much of the more valuable oak and replaced it with less valuable birch, gum and red maple. With the current loss of the chestnut oak, any ability to manage this commercially will be gone.

From a silvicultural perspective, the site will remain fully stocked as new regeneration fills in the mortality. At least three age classes will be present. The current regeneration looks to be more valuable than the birch component that filled in following the 1980's mortalities. This is likely due to lower deer browse pressure than in the past and possibly the overall maturity of the residual overstory.

Any management activities would require major earth disturbance, directly upslope of the middle of the Reservoir, with potential impacts on water quality. No economic or silvicultural gain is likely. The site will remain fully stocked providing watershed protection. There will remain the potential for this site to be commercial in the future with changes to technology and markets, but for the foreseeable future no activity should be conducted in this stand.

Action: No active management this period. Re-evaluate after 2025

Stand 22: 60 acres, site 1; Tulip poplar-maple (TM)

Location: This stand is along the south side of Clark Creek, immediately below the dam and treatment facilities. Stand 31 is to the south and stand 30 is to the west.

Description: This site is the portion of the lower bench along the south side of Clark Creek that has been previously harvested. There appears to have been a significant harvest in the early 2000's with a reentry of portion of the stand after 2011. It is likely that the decision to harvest was driven by an effort to salvage mortality, however, the presence of sprouts around large stumps, indicate more of a high grade harvest.

The site is gently sloping with considerable, though scattered rock and some spring seeps. Tulip poplar is the dominant species with a mix of oak and other species.

Total basal area is 67 sq. ft/a. with a relative density of 50%, including some sapling and pole regeneration from the earlier harvest. There is approximately half the basal area typical of a site of this quality. Net volume is 2,700 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Pole | Sm. Saw | Med Saw | Large Saw | Total |
|--------------|-----------|-----------|-----------|----------|-----------|-----------|
| Red Oak | | | 3 | | | 3 |
| Black Oak | | 1 | 1 | | | 2 |
| White Oak | | 4 | 3 | 1 | | 8 |
| Chestnut Oak | | 1 | | | | 1 |
| Tulip Poplar | 6 | 1 | 1 | 5 | 3 | 16 |
| Red Maple | 2 | 9 | 4 | 1 | | 16 |
| Black Birch | 4 | 4 | 6 | | | 14 |
| Hickory | | | 1 | | | 1 |
| White Pine | | | 1 | | | 1 |
| Blackgum | 2 | 1 | | | | 3 |
| Sassafras | | 1 | | | | 1 |
| Paulownia | | 1 | | | | 1 |
| Total | 14 | 23 | 20 | 7 | 3 | 67 |

Regeneration: Regeneration is abundant with all but one plot adequately stocked. Tulip poplar stocks 62% of the plots with 25% stocked with birch. The poplar has dominated in the more heavily cut areas and form a dense stand of saplings. In areas where cutting was not as heavy, birch is most common along with smaller oak and red maple seedlings.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-----------------|-----------------|--------------|
| Black Cherry | 0 | 96 |
| Yellow Poplar | 50 | 2118 |
| Conifers | 0 | 193 |
| Established Oak | 0 | 337 |
| Total Oak | 0 | 337 |
| Other Desirable | 38 | 11169 |
| Saplings | 13 | |

Native competitive vegetation is not a problem.

Invasives: Invasives are common. Landings and skid trails are mostly covered with stiltgrass. A small amount of mile-a-minute is present. Ailanthus and paulownia are scattered among the regeneration. Minor amounts of autumn-olive, multiflora rose and bittersweet were also noted. Ironically, the best oak regeneration is found growing up through stiltgrass.

3.0 Management Strategies by Tract No. and Stand No.

Prescription: Although not a classic shelterwood, the overstory should be removed as soon as possible to release the established regeneration. Tulip poplar is already established and will dominate much of the site. Where residual overstory is heavier, birch will dominate, however this area is relatively minor and enough disturbance should occur during harvest to the birch regeneration to allow some of the established oak and maple to develop. Because of the way conditions are intermingled and the value of promptly removing the overstory to provide light, efforts to promote the oak, beyond providing light through overstory removal would likely be counterproductive.

Invasive control should be implemented while the problem is still small enough to control. This should include basal spray or cut stump treatments of the ailanthus and paulownia and spraying of a low dose treatment of glyphosate to control the stiltgrass and mile-a-minute.

Action: Spot treatment of invasives 2017
Remove overstory to release regeneration 2017

Stand 30: 61 acres; Site 2; Tulip poplar-maple (TM)

Location: Stand 30 is located west, of Stand 22 on the lower bench near Clark Creek.

Description: This site slopes gently upward from the water line paralleling the creek to the base of the mountain. It is a long narrow stand bounded on the east by stand 22 and the west by state game lands. Site quality is slightly lower than the adjacent stand 22, due to poorer drainage and rockier soils. There is a shrub wetland west of middle in the stand comprising about 2 acres. This stand had a mortality/high grade harvest about 2000 along with Stand 22. This stand did not have the follow up harvest in 2011 like stand 22. A diverse species mix exists with no species group dominating. Red maple, white oak, black birch and tulip poplar are the most abundant. Hemlock has significant basal area, but virtually all the hemlock is located in a small area on the east side of the wetland. Basal area is 111 sq. ft/a. and relative density is 77%. Net volume is 4,500 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Cull | Total |
|--------------|---------|------|--------|---------|-----------|------|-------|
| White Oak | | 6 | 4 | 5 | | 1 | 16 |
| Chestnut Oak | | | 1 | 1 | | 1 | 3 |
| Red Oak | | | | 1 | | | 1 |
| Tulip Poplar | | | 4 | 1 | 2 | | 7 |
| Hickory | | 1 | | | | | 1 |
| Basswood | | 1 | | | | | 1 |
| Black Cherry | | | 4 | | | | 4 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Cull | Total |
|--------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Red Maple | | 13 | 10 | 2 | | | 25 |
| Black Birch | 2 | 10 | 5 | | | | 17 |
| Yellow Birch | | 1 | 2 | | | 1 | 4 |
| Hemlock | | 9 | 10 | 2 | | 1 | 22 |
| White Pine | 1 | | | 1 | | | 2 |
| Sassafras | | 1 | | | | | 1 |
| Black Gum | 3 | 2 | | | | | 5 |
| Serviceberry | | 1 | | | | | 1 |
| Total | 6 | 46 | 40 | 13 | 2 | 4 | 111 |

Regeneration: Desirable regeneration is sparse with white pine saplings adequately stocking one plot.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 0 | 144 |
| Established Oak | 0 | 96 |
| Other Desirables | 0 | 481 |
| Saplings | 0 | |

Black birch is common, being found on all but one plot. At this level of stocking and lacking any seedlings of more valuable species, birch should be considered unacceptable competing vegetation. Striped maple is found on 3 plots, averaging 13% on those plots. Mountain laurel is found on 2 plots and does not present a problem. Fern is present on all but one plot and averages about 20% on those areas.

Prescription: This stand is well stocked; however, it does not contain sufficient acceptable trees to warrant carrying the stand. It is likely that mortality and harvesting significantly reduced the number of desirable trees. Growing space is occupied by the lower quality and less valuable species that remain. It is recommended that the stand be treated with herbicide to reduce the component of birch seedlings and fern. A shelterwood harvest is recommended following the spraying. Existing oak, poplar and better red maples should be favored with most poles and birch being removed.

Action: Broadcast herbicide to control birch, striped maple and ferns 2017
 Conduct a shelterwood harvest 2019
 Removal harvest 2023



3.0 Management Strategies by Tract No. and Stand No.

Stand 31: 674 acres, Site 2, Red oak-mixed hardwoods (AR)

Location: Stand 31 is located in the southwest part of the property. It is bounded on the east by the main haulroad south and west by National Park Service (Appalachian Trail) land and north by the base of the mountain which are stands 22 and 30.

Description: This stand occupies the northwest slope of Stony Mt. Slopes are gentle to moderate. Soils are generally rocky, though only excessively rocky in a few areas as evidenced by the partial harvest conducted about 2000. Stand 31 is well stocked with a basal area of 103 sq. ft/a. and a relative density of 71%. Basal area, quality, and species are highly variable. Red maple, birch, red and chestnut oak comprise more than three-fourths of the basal area. Oak comprises a greater percentage of the stocking on the upper half of the stand. Some of the red oak in this area is large with good quality. Lower on the slope, the species are more mixed and quality lower, in part due to logging damage. Net volume is 6,300 bf/a. Several areas where the cutting and natural mortality was greatest have regenerated to tulip poplar. Much of the area where the overstory is greater has developed a dense component of birch seedlings, due to their greater shade tolerance.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Large Saw | Cull | Total |
|-------------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Red Oak | | | 7 | 6 | 7 | | 20 |
| Scarlet Oak | | | | 1 | | | 1 |
| Chestnut Oak | | 1 | 5 | 5 | 1 | 1 | 13 |
| White Oak | | | 3 | 4 | | | 7 |
| Black Oak | | | 1 | 1 | | | 2 |
| Tulip Poplar | 5 | 2 | | 2 | | | 9 |
| Red Maple | 1 | 4 | 11 | 4 | 1 | | 21 |
| Black Birch | 1 | 10 | 10 | 1 | | | 22 |
| Yellow Birch | | 1 | 1 | | | | 2 |
| White Pine | | | | 1 | | | 1 |
| Hemlock | | | 1 | | | | 1 |
| Blackgum | 1 | 3 | 2 | 1 | | 1 | 8 |
| Sassafras | | | | 1 | | 1 | 2 |
| American Chestnut | | 1 | | | | | 1 |
| Total | 8 | 22 | 41 | 27 | 9 | 3 | 110 |

Regeneration: Regeneration is variable with 25% of plots stocked with tulip poplar. One plot is stocked with competitive oak. Small amounts of red maple, oak and white pine is present on most plots not dominated by birch or poplar.

3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-------------------|-----------------|--------------|
| Yellow Poplar | 31 | 1974 |
| Conifers | 0 | 120 |
| Established Oak | 0 | 241 |
| Competitive Oak | 0 | 24 |
| Total Oak | 0 | 265 |
| Other Competitive | 0 | 1444 |
| Saplings | 25 | |

Birch seedlings are dense on 50% of plots. In this stand where birch regeneration is abundant it should be considered undesirable and competitive. Striped maple is present on 62% of the plots, but at rather low density. These tend to be the same areas dominated by birch seedlings which are a much more significant problem on this site. Invasive plants were not observed except for stiltgrass and barberry around the lower log landing.

Prescription: This is a highly variable stand of timber on a good site. The best poplar regeneration should be released. Poplar is most prevalent in the lower, northeast part of this stand. This is adjacent to stand 22 which also has abundant poplar regeneration. These areas should have an overstory removal to release the poplar. The rest of the lower part of the stand should have an herbicide application to kill the birch and striped maple competition. The northwest section, adjacent to stand 30 should then have a shelterwood harvest to remove the birch component and provide sunlight to develop regeneration. The upper half of the stand where oak is prevalent should be left to increase oak regeneration.

Action: Northeast section (approx 150 a.), manage with stand 22, remove overstory; 2017.
 Northwest section (approx. 150 a.), manage with stand 30, herbicide competitive vegetation in 2017; conduct shelterwood harvest 2018. Removal harvest 2023.
 South section (approx. 374 a.), no management this period. Re-evaluate 2026.

Stand 32: 165 acres; Site 2; Tulip poplar-maple (TM)

Location: Stand 32 and 33 occupy a 524 acre triangle of land at the extreme southwest of the property. This area is completely cut off from direct access by the Appalachian Trail (National Park Service) land on the northeast and game lands on the south and west. Stand 32 is the lower, merchantable portion of the tract.

Description: This is a rocky, moderately sloped area running from the lower slope to the edge of the steep upper slope of Stony Mt. Much of this area is marginally workable due to rocks; however, a



3.0 Management Strategies by Tract No. and Stand No.

heavy timber harvest was conducted about 2000. This was an economic clear cut, removing all merchantable timber. Fortunately the merchantable standards were low resulting in a heavy cutting and enough open areas to allow for significant regeneration. Total basal area is 74 sq. ft/a. with a relative density of 58%. Residual timber is about 55 sq. ft/a. of poor quality chestnut oak, birch, red maple and blackgum. Net volume is 2,000 bf/a. Significant regeneration has developed with poplar saplings dominating the more open areas and birch saplings dominating in areas where partial shade remained. The regeneration adds 19 sq. ft/a. of saplings to the total basal area:

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|---------------|-----------|-----------|-----------|-----------|----------|-----------|
| Chestnut Oak | | 2 | 5 | 4 | 3 | 14 |
| Red Oak | | | | 4 | 1 | 5 |
| Yellow Poplar | 11 | | | | | 11 |
| Black Birch | 8 | 2 | 6 | 1 | | 17 |
| Red Maple | | 4 | 8 | 1 | | 13 |
| White Pine | | | | | 1 | 1 |
| Blackgum | | 1 | 5 | | 1 | 7 |
| Sassafras | | 4 | | | | 4 |
| Ailanthus | | 2 | | | | 2 |
| Total | 19 | 15 | 24 | 10 | 6 | 74 |

Regeneration: Regeneration is almost entirely poplar and birch. Poplar dominates in open areas and birch in areas with more residuals.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 38 | 1541 |
| Other Desirables | 63 | 25228 |
| Saplings | 38 | |

Ailanthus was found on one plot. Competitive vegetation and invasives were not otherwise noted.

Prescription: This is a marginally merchantable stand with no direct access. A stand of poplar, birch and low grade residuals is developing. On a better site with good access, it would be recommended to remove most of the residuals to benefit the regeneration; however, on this site no action is suggested. The future stand will be fully stocked with modest value. Access and workability will remain poor. No management is recommended.



3.0 Management Strategies by Tract No. and Stand No.

This tract has limited future timber value and no direct watershed value for the CRW as the drainage area is completely downstream of the Reservoir. Recreation is significant. The Henry Knauber Trail, an important link trail between the AT and the Horseshoe Trail runs through the tract near the west boundary. Though possibly beyond the scope of this plan, a logical use of this separated tract would be to sell it to the Game Commission or National Park Service. Under either ownership the land would remain protected and the other agencies would have better access.

Action: No management activity; could consider sale to PA Game Commission or National Park Service. In lieu of sale, a long term access agreement could be developed with the Game Commission.

Stand 33: 359 acres; Site 3 (Noncommercial); Dry oak (AD)

Location: Stand 33 is the upper, noncommercial portion of the isolated tract that includes stand 32.

Description: This area is the steep, rocky upper slope and ridge line of Stony Mt. The forest is a mixed hardwood forest with birch and chestnut oak predominating. Typical of these sites, stems are short and quality is poor. Average basal area is 120 sq. ft/a. with a relative density of 78%. Net timber volume is 5,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|---------|-----------|-----------|-----------|----------|----------|------------|
| Chestnut Oak | | 10 | 15 | | | | 25 |
| Red Oak | | 5 | 10 | 10 | 5 | | 30 |
| Yellow Poplar | | | 5 | 5 | | | 10 |
| Black Birch | | 25 | 10 | | | 5 | 40 |
| Blackgum | | 5 | 10 | | | | 15 |
| Total | | 45 | 50 | 15 | 5 | 5 | 120 |

Regeneration: Scattered red maple, oak and birch regeneration is present.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Established oak | 0 | 578 |
| Other desirables | 0 | 3274 |

Witch-hazel is a significant understory component.



3.0 Management Strategies by Tract No. and Stand No.

Prescription: This site has no potential commercial value. Den trees and the witch-hazel understory provide important wildlife values. The Henry Knauber Trail is a significant recreation resource. As mentioned under Stand 32, sale of the property to the Game Commission or National Park Service would make sense.

Action: No activity, noncommercial; consider sale to PGC or NPS.

Stand 34: 130 acres; Site 2+; Red oak- mixed hardwoods

Location: Stand 34 lies south of the new haulroad built southeast from the dam breast. It is bounded by the haulroad on the north, stand 20 on the east and stand 31 to the west. The southern, upper limit is the limit of operability, which becomes stand 33.

Description: This stand occupies a broad mid-slope bench with moderately sloping terrain. Site is rocky with extreme rocky conditions limiting workability on the lower part (nearest the road). Growing conditions are good to excellent. A heavy shelterwood was conducted in 2012. The residual basal area is 46 sq. ft/a. with a relative density of 26%. Most remaining trees are high quality. Red oak comprises 67% of the basal area. Net volume is 4,600 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|--------------|---------|----------|----------|-----------|-----------|-----------|
| Red Oak | | 1 | 2 | 14 | 9 | 26 |
| Black Oak | | | | 2 | | 2 |
| Chestnut Oak | | | | 1 | | 1 |
| Tulip Poplar | | 3 | | | 1 | 4 |
| Red Maple | | | 3 | 2 | | 5 |
| Birch | | | 2 | 3 | | 5 |
| Yellow Birch | | | 1 | | | 1 |
| White Pine | | | | | 1 | 1 |
| Sassafras | | 1 | | | | 1 |
| Total | | 7 | 9 | 19 | 11 | 46 |

Regeneration: Regeneration is excellent. Poplar dominates regeneration with more than 15,000 seedlings per acre, many of which are over 8 feet tall. Birch and red maple are also common, but normally overtopped by poplar. A few white pine competitive oak seedlings and oak sprouts are present.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow poplar | 63 | 15695 |
| Conifer | 0 | 241 |
| Competitive oak | 0 | 96 |
| Other desirables | 38 | 16128 |

Stiltgrass was not found on plots. A little was found on the haulroads. It will have no impact on the future stand as the site is nearly 100% occupied by large seedlings.

Prescription: The overstory needs to be removed to allow the regeneration to fully develop. This should be done as soon as possible to limit damage to the developing regeneration. Some areas on the lower portion are too rocky to warrant re-entry into the stand. Overall most the stand is workable.

Action: Remove overstory in 2018.

Stand 35: 126 acres; Site 2; Red oak-mixed hardwoods (AR)

Location: Stand 35 is along the south side of the Reservoir beginning at the haulroad and continuing east about a mile. Stand 36 is the south boundary and stand 37 is the east boundary.

Description: This is a rocky, gently sloping site. Tree quality is only fair. A wide variety of species make up the stand. Birch, chestnut oak, red maple, red oak, blackgum and poplar are all well represented. Hemlock was a major component prior to extensive mortality due to the wooly adelgid. Current basal area is 138 sq. ft/a. with a relative density of 88%. Estimated net volume is 6,700 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|---------|------|--------|---------|--------|------|-------|
| Chestnut Oak | | 3 | 15 | 4 | 2 | 4 | 28 |
| Red Oak | | 1 | 2 | 7 | | 1 | 11 |
| Black Oak | | | | 1 | 1 | | 2 |
| Yellow Poplar | | | 2 | 4 | 1 | | 7 |
| Red Maple | | 6 | 7 | 3 | 1 | | 17 |
| Black Birch | | 24 | 17 | 3 | | 2 | 46 |
| Yellow Birch | | 2 | 1 | | | | 3 |
| White Pine | | | | 2 | 3 | | 5 |
| Hemlock | | 2 | | 4 | 1 | | 7 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|--------------|----------|-----------|-----------|-----------|----------|----------|------------|
| Blackgum | 3 | 5 | 3 | | | | 11 |
| Sassafras | | 1 | | | | | 1 |
| Total | 3 | 44 | 47 | 28 | 9 | 7 | 138 |

Regeneration: Regeneration is well distributed with red maple, white pine and hemlock most prevalent. Established oak was found on half the plots. Unlike many stands on the property with a northern exposure, birch was not abundant.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 50 | 1772 |
| Established Oak | | 270 |
| Other Desirables | 10 | 4006 |

Striped maple was found on 60% of the plots, but with an average cover of only 4.5%. No invasives were encountered.

Prescription: This is a well-stocked stand of average quality. Better quality trees have adequate growing space due to past hemlock and ongoing chestnut oak mortality. Regeneration is developing with minimal competitive vegetation. Rocky conditions would make it difficult to conduct an improvement harvest without significant damage to residual trees.

About a third of the stand is in the lakeside management zone. Any management activities should be deferred.

Action: No activity this management period. Re-evaluate 2026.

Stand 36: 22 acres; Site 2; Red oak-mixed hardwoods

Location: This stand is a narrow area immediately below the haulroad and stand 34.

Description: This stand had a shelterwood harvest in 2011 in conjunction with stand 34. More basal area was left, in part because harvesting was interrupted before completion. Also the site has more of a mixed oak component, rather than the red oak dominance of stand 34. Quality is good and regeneration is excellent. Average basal area is 89 sq. ft/a. with a relative density of 64%. Estimated volume is 6,600 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Pole | Sm. Saw | Med. Saw | Lg. Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|----------|----------|-----------|
| Chestnut Oak | | | 13 | 5 | 2 | | 20 |
| White Oak | | | 2 | 5 | | | 7 |
| Red Oak | | 1 | 10 | 2 | | 2 | 15 |
| Black Oak | | | 2 | 6 | | | 8 |
| Scarlet Oak | | | 2 | | | | 2 |
| Red Maple | 2 | 8 | 3 | 3 | | | 16 |
| Yellow Poplar | | | 2 | 8 | | | 10 |
| Hickory | | 2 | | | | | 2 |
| Black Birch | | 3 | | | | | 3 |
| White Pine | | | | 2 | 1 | | 3 |
| Blackgum | | 3 | | | | | 3 |
| Total | 2 | 17 | 34 | 31 | 3 | 2 | 89 |

Regeneration: Regeneration is overwhelmingly poplar, except for the east end which was cut more lightly. In that area regeneration is more diverse, including oak, red maple and white pine. Poplar dominates 83% of the plots with an average of more than 14,000 seedlings/acre.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow poplar | 83 | 14379 |
| Conifers | 0 | 128 |
| Established oak | 0 | 385 |
| Other desirables | 67 | 32867 |

Competitive vegetation is confined to a little striped maple found on a few plots. No invasives were tallied, though some stiltgrass is present in skid trails.

Prescription: The overstory should be removed in conjunction with Stand 34. This should be done as soon as possible.

Action: Remove overstory in 2018.

Stand 37: 48 acres: site 2; Dry oak (AD)

Location: Stand 37 is down slope of stand 20 and is bounded on the north by the Reservoir. Stand 35 lies to the west and stand 21 to the east.



3.0 Management Strategies by Tract No. and Stand No.

Description: This stand has a gentle to moderate slope and minimal rocks. It has a similar setting as adjacent stands 21 and 35, but is less rocky and much more productive. Two small streams transect the site and the northern portion will fall within the lakeside management zone. This is a diverse stand with 13 species tallied and others noted. However, this is primarily a mixed oak stand with chestnut, white and black oaks contributing 74 sq. ft/a. of the total 144 sq. ft/a. of basal area. Relative density is 110%. Trees are primarily small and medium sized sawtimber with an estimated net volume of 9,000 bf/a. Little mortality is present. Hemlock was not a significant component as in adjacent stands and chestnut oak has not yet exhibited the mortality occurring in many other stands.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Chestnut Oak | | | 14 | 15 | 6 | 2 | 37 |
| White Oak | | | 12 | 4 | 4 | 2 | 22 |
| Black Oak | | 2 | 6 | 4 | | | 12 |
| Red Oak | | | 2 | | | | 2 |
| Yellow Poplar | | | 6 | 4 | | | 10 |
| Red Maple | 2 | 8 | 6 | 4 | | | 20 |
| Sugar Maple | 2 | | | | | | 2 |
| Black Birch | | 8 | 5 | 4 | | | 17 |
| Yellow Birch | | 2 | | | | | 2 |
| White Pine | | | 2 | | 2 | | 4 |
| Hemlock | | | 6 | | | | 6 |
| Blackgum | 4 | 2 | | | | | 6 |
| Sassafras | | 2 | 2 | | | | 4 |
| Total | 8 | 24 | 61 | 35 | 12 | 4 | 144 |

Regeneration: Regeneration is not abundant but is well distributed, especially for a stand with a heavily stocked overstory. White pine, red maple and established oak are present on 40% or more of plots. Birch is minimal being present on only one plot.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 77 |
| Conifer | 20 | 616 |
| Established Oak | 0 | 385 |
| Other Desirables | 0 | 2465 |



3.0 Management Strategies by Tract No. and Stand No.

The only competitive vegetation is striped maple which averages 9% coverage.

Prescription: This is an overstocked stand of very good quality timber. Other than being overstocked, this stand is free of problems. An improvement thinning is recommended. Chestnut oak, while currently healthy can be expected to suffer some mortality. Thinning should focus on removing birch, reducing chestnut oak and improving spacing of the better trees.

With all the stands in need of regeneration, this healthy stand should have an improvement harvest, then be left for an extended rotation.

Action: Thin from below, reduce chestnut oak component. Harvest in 2018 with stand 20.

Stand 38: 219 acres; Site 2 (Noncommercial); Hemlock-tulip poplar-birch (FT)

Location: Stand 38 is located on the upper slope of Stony Mountain. It lies on the extreme southern edge of the property along the Appalachian Trail corridor.

Description: This site is steep and excessively rocky. The timber harvests of 2000 and 2011 used this stand as their upper limits of workability. Basal area is 120 sq. ft/a. with a relative density of 73%. Birch makes up 66% and red maple 14% of the basal area. Hemlock was the second most common species prior to the woolly adelgid mortality, but now is nearly absent. A few high quality red oaks are scattered in the lower part of the stand, but site conditions prevent management. Estimated net volume is 4,000 bf/a.

Overstory basal area

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|--------------|---------|-----------|-----------|-----------|--------|------|------------|
| Black Birch | | 28 | 28 | 14 | | | 70 |
| Yellow Birch | | 3 | 4 | | | | 7 |
| Red Oak | | | | 3 | | | 3 |
| Red Maple | | 7 | 10 | 6 | | | 23 |
| Sassafras | | 7 | | | | | 7 |
| Black Gum | | | | 10 | | | 10 |
| Total | | 45 | 42 | 33 | | | 120 |

Regeneration: Regeneration is very sparse. No regeneration was noted on plots. Scattered red maple and a few oak seedlings were found while walking between plots. Striped maple was present on all plots with an average density of 18%. No invasive plants were found.



3.0 Management Strategies by Tract No. and Stand No.

Prescription: Due to rocks, slope and limited access, this stand is unworkable. The best use of this stand is to protect the steep slope, provide a scenic buffer between the Appalachian Trail and managed areas lower on the slope. A significant number of trees have den cavities, with about 20 den trees/a. noted. These provide import wildlife habitat that is less common in managed forests.

Action: Noncommercial; no management activity.



3.0 Management Strategies by Tract No. and Stand No.

3.5 Northwest Stands (4, 5, 7, 9, 10, 11, 12, 13, 15, 16, 17, 19, 40, 41, 42, 47, 48, 49, 50)

Overview: The Northwest section of the CRW property includes all areas from the western boundary to the private in holdings on the east and from Clark Creek and the Reservoir north to the game lands boundary and the ridge line of Peter’s Mt. The terrain is gentle near the creek to steep on the mid and upper mountain slope as the game lands boundary and ridgeline is approached. The upper slopes are steep and rocky, but (with a few exceptions) not to the extent that active management is prevented. Access is good with Rt. 325 running along the bottom for the entire length of the section.

Most stands in this section upslope of Rt. 325 have had some harvesting in the last 20 years. More than 800 acres in the east and center of this section have received heavy shelterwood harvests between 2008 and 2011. These have regenerated well and are in need of prompt overstory removal. Much of the rest of the section above Rt. 325 has received lighter harvests prior to 2005. Prior to these recent harvests, white and scarlet oak dominated the stands in this section. Red, chestnut and black oak, red maple and tulip poplar, serviceberry and blackgum were also common. White and pitch pine, hemlock, black and yellow birch, sassafras, and aspen were minor components.

Following are tree heights from the lower slope area of stand 9. Age is approximately 110 to 120 years based on ring counts of adjacent stumps.

| Species | DBH | Total height | Commercial height |
|-------------|-----|--------------|-------------------|
| Poplar | 30" | 110' | 53' |
| White oak | 18" | 85' | 35' |
| White oak | 17" | 80' | 35' |
| Scarlet oak | 17" | 88' | 42' |
| Scarlet oak | 23" | 100' | 50' |
| Red maple | 16" | 85' | 41' |

The lower and mid slopes and areas where cutting was heaviest are regenerating to tulip poplar with a secondary component of oak. Drier areas and areas that received lighter harvesting are regenerating with oak the dominant species. All of the other species present before harvesting are found in the regenerating stands. Birch is not increasing and red maple is common, but in a secondary position to poplar and oak similar to the previous stands. Sassafras and blackgum are common, but the limited deer browsing is focusing on these preferred species and allowing the more desirable species to develop. White and pitch pine are increasing to a small extent. Prompt removal of the residual overstory in these shelterwoods is a priority to keep the abundant regeneration developing.



3.0 Management Strategies by Tract No. and Stand No.

No harvesting has occurred between Rt. 325 and Clark Creek, except for stand 4 at the east end of this section. White oak is dominant in these stands, but with more diversity than above the road with poplar, red oak, hemlock and white pine being more common.

Nonnative invasive species range from scarce on the slopes to common near the creek. Barberry and stiltgrass are the primary invasives. Scattered ailanthus and paulownia are present, especially in stand 4 as well as stand 50 on the ridge top. Native competitive vegetation is mostly mountain laurel. Laurel is common, but seldom dense, likely being held in check by leaf spot fungus. Striped maple and fern are only significant on the ridge top in stand 50.

Wetlands are mostly pockets of riparian wetlands along Clark Creek. Scattered spring seeps and drainages are present in hollows running down the slope. Ten buffered riparian areas exist within the section of recent shelterwoods. Spring seeps are also common on a bench west of the Reservoir and upslope of the highway. Adjacent to the Reservoir wetlands are sparse, probably due to inundation by the Reservoir.

This area encompasses 2251 acres with the following timber types:

| | | |
|--|------|------------|
| Dry oak | (AD) | 1545 acres |
| Red oak-mixed hardwood | (AR) | 402 acres |
| Oak-heath | (AH) | 131 acres |
| Tulip-maple | (TM) | 100 acres |
| Dry white pine-hemlock-oak | (FA) | 50 acres |
| Hem/white pine-red oak/mixed hardwoods | (FR) | 15 acres |

These stands comprise the following stages of forest development:

| | |
|-------------------------|-----------|
| Uncut sawtimber | 948 acres |
| Sawtimber, improvement | 492 acres |
| First stage shelterwood | 877 acres |
| Seedling/sapling | 0 acres |

Stand 4: 96 acres, site 2 Dry oak (AD)

Location: Stand 4 is located west of stand 7. Terrain is gently sloping between Rt. 325 and the Clark Creek riparian corridor. Aspect is nearly flat to gently rolling.

Description: This is a white oak/scarlet oak stand on a good site. The stand received a shelterwood cut in 2010 or 2011. Current basal area is 61 sq. ft/acre of mostly sawtimber. Relative density is 53% and estimated net volume is 5,000 bf/a. A few white and pitch pine and serviceberry provide diversity. No forest health problems were encountered.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Poles | Sm. Saw | Med saw | Large saw | Total |
|--------------|----------|----------|-----------|-----------|-----------|-----------|
| White Oak | | 1 | 25 | 10 | | 36 |
| Scarlet Oak | | | 1 | 11 | 4 | 16 |
| Red Maple | | | 2 | 1 | | 3 |
| Aspen | | | | 1 | | 1 |
| Serviceberry | | 2 | 1 | | | 3 |
| Pine | | | 1 | | 1 | 2 |
| Total | | 4 | 30 | 23 | 4 | 61 |

Regeneration: Regeneration is present on all plots with 10 of 12 plots adequately stocked at deer impact level two. Tulip poplar dominates 4 plots, oak 3 plots and red maple 3 plots. Non-commercial (wildlife) species, primarily serviceberry and blackgum are present throughout. There are approximately 2630 poplar/a, 14,500 red maple/a, 128 competitive oak/a, and 2150 established oak/a. About 4000/a wildlife seedlings are present. A few dominate white pine, pitch pine and aspen were noted between plots.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 321 |
| Yellow Poplar | 33 | 2632 |
| New Oak | 0 | 64 |
| Established Oak | 0 | 2150 |
| Competitive Oak | 0 | 128 |
| Other Desirables | 0 | 14508 |

Laurel was almost completely smashed during logging and now covers about 15% of the forest floor. The regeneration is with or above the laurel, so the laurel is not impacting regeneration. Fern and grasses also cover about 15% of the forest floor and the regeneration is generally above them. A light general cover of huckleberry is present.

Invasive species are present. Stiltgrass is present, particularly on the old skid trails and has spread into low areas. In places this impacts regeneration and native herbaceous plants. A few stems of ailanthus, paulownia and barberry are scattered in the eastern part of the stand.

Prescription: The overstory should be scheduled for removal. Shade from the overstory is slowing development of desirable species such as poplar and oak, while benefiting less desirable species,



3.0 Management Strategies by Tract No. and Stand No.

particularly red maple. Adequate value and quality is present to support a commercial timber sale, leaving some residuals for wildlife and diversity.

Before harvesting the time should be taken to kill the small ailanthus and paulownia. At this stage a day's work with cutting and stump treatment with glyphosphate will control them and prevent a much bigger problem from developing. The stiltgrass present will have minimal impact the developing regeneration, but may create future problems.

Action: Invasive control; cut and stump spray ailanthus and paulownia; Spot foliar spray of barberry and stiltgrass with low concentration of glyphosphate. Schedule for 2018. Remove overstory leaving at least 10 sq. ft/a. favoring serviceberry, den trees and conifers. Schedule for 2020.

Stand 5: 34 acres, site 2+; White pine-hemlock-oak (FA)

Location: South of Rt. 325 and east of the private land section. Most of the stand lies between Rt. 325 and Clark Creek. Terrain is gently rolling with few stones. A few acres are across on the north side of Rt. 325.

Description: This stand is reverted farmland probably having been abandoned around 1900. About half the stand was planted to red pine and white pine. The red pine has done exceptionally well for this part of the state, but is now dying out. There is a strong natural white pine component as well. Pitch pine was common at one time but has nearly died out of the stand. All size classes are represented including saplings and poles to very large white pine and red maples. Vigorous saplings and poles are filling in openings created as red and pitch pine have died. Snags and dead wood of all sizes are common. White pine is very good quality. Red maple is common and oaks are scattered, especially on the unplanted, eastern part of the stand. Basal area is 147 sq. ft/a. with a relative density of 90%. Estimated net volume is 13,000 bf/a.

Overstory basal area:

| Species | Saplings | Poles | Sm. Saw | Med Saw | Lg Saw | Total |
|---------------|----------|-------|---------|---------|--------|-------|
| White Pine | 4 | 7 | 14 | 19 | 13 | 57 |
| Red Pine | | 3 | 26 | 1 | | 30 |
| Pitch Pine | | | 1 | 1 | | 2 |
| Hemlock | | 8 | 1 | 3 | | 12 |
| White Oak | | | 4 | 4 | 1 | 9 |
| Scarlet Oak | | | 1 | 3 | 1 | 5 |
| Red Maple | | 1 | 12 | 10 | 2 | 25 |
| Black Cherry | 1 | | 2 | | | 3 |
| Yellow Poplar | | | | 1 | 1 | 2 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Saplings | Poles | Sm. Saw | Med Saw | Lg Saw | Total |
|--------------|----------|-----------|-----------|-----------|-----------|------------|
| Blackgum | 2 | | | | | 2 |
| Total | 7 | 19 | 61 | 42 | 18 | 147 |

Regeneration: Regeneration is dominated by white pine seedlings and saplings. 60% of the plots are adequately stocked with conifer regeneration.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 116 |
| Conifers | 20 | 1310 |
| New Oak | 0 | 154 |
| Established Oak | 0 | 154 |
| Total Oak | 0 | 308 |
| Other Desirables | 0 | 539 |

Native competing vegetation is sparse. Barberry is common along with pockets of stiltgrass are the primary invasive species present.

Prescription: White pine does exceptionally well on this site. The stand has already developed an uneven-aged characteristic due to the mortality of the red and pitch pine providing growing space for white pine and hemlock regeneration. Being in a sensitive location between Rt. 325 and Clark Creek a combination red pine removal, group selection harvest is suggested. This is best achieved by creation of group openings up to two acres on 1/5th of the area every 20 years.

Additional limited thinning can be conducted between groups. This will benefit the white pine and allow space for some development of other species. Good access exists. The barberry and stiltgrass should be controlled with spot treatment before any harvesting.

Action: Invasive control by spot foliar spray of barberry and stiltgrass with low concentration of glyphosphate. Schedule 2018.

First group selection harvest, focusing on removal of red pine and release of pockets of advanced regeneration. Schedule for 2020 in conjunction with stand 4.

Stand 7: 16 acres; Site 2; pine-hemlock-oak (FA)

Location: This small stand is located between Stands 4 and 5 and is between Clark Creek and Rt. 325. Terrain consists of short, steep slopes to nearly flat near the creek.



3.0 Management Strategies by Tract No. and Stand No.

Description: This small stand is adjacent to the white pine dominated stand 5 that developed on abandoned farmland. It differs in that it was not previously farmed or has had any current harvesting. Greater diversity is present than in adjacent stands. White oak is still most common, but red oak is also a component as well as scarlet oak. Hemlock is abundant in wet areas. Red maple and white pine are also present. Basal area is 141 sq. ft/a. with a relative density of 110%. Estimated net volume is 8,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Small Saw | Med. Saw | Large Saw | Total |
|--------------|-----------|-----------|-----------|-----------|-----------|------------|
| White Oak | | 2 | 30 | 18 | 5 | 55 |
| Red Oak | | 5 | | | 3 | 8 |
| Red Maple | 2 | | 8 | 7 | | 17 |
| White Pine | | | 2 | 5 | | 7 |
| Hemlock | 13 | 20 | 16 | 2 | | 51 |
| Blackgum | | 3 | | | | 3 |
| Total | 15 | 30 | 56 | 32 | 8 | 141 |

Regeneration: Regeneration is a diverse mix of hardwoods and softwoods. Perhaps due to the improved site quality, ferns have some competitive impact on regeneration.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|----------|-----------------|--------------|
| Conifers | 25 | 770 |
| Saplings | 50 | |

No invasive plants were tallied in the plots, but some barberry and stiltgrass is present.

Prescription: Manage this small stand with adjacent stand 5 using group selection to promote the existing conifer regeneration. Another option, may be to leave this stand alone due to its wet soils, except for possible invasive control.

Action: Invasive control by spot foliar spray of barberry and stiltgrass with low concentration of glyphosphate. Schedule with adjacent stands 4 and 5 in 2018.

Group selection harvest similar to adjacent stand 5. Schedule in 2020 with stand 5 harvest.



3.0 Management Strategies by Tract No. and Stand No.

Stand 9: 193 acres; Site 2; Tulip poplar (TM) low and mid slope; Oak heath (AD) upper slope

Location: North of Rt 325 and east of the private holdings, west boundary is large hollow and uncut buffer. South is Rt. 325 and north was limit of operability. This stand had a first stage shelterwood harvest about 2010.

Description: Majority of stand 9 is a mixed oak overstory, with tulip poplar regeneration dominating the lower and mid slope and mixed oak regeneration on the upper slope. Slope position is relative to the property with the “upper slope” actually at mid slope on the mountainside. Lower and mid slope is a good site 2 developing tulip poplar regeneration. The upper slope is an average site 2 developing mixed oak regeneration.

This stand has a good stocking of residual overstory and regeneration throughout. Scarlet, white and chestnut oak make up almost the entire overstory. Basal area is 45 sq. ft/a. with a relative density of 41%. Estimated net volume is 3,000 bf/a.

Overstory basal area:

| Species | sapling | pole | sm. saw | med saw | large saw | Total |
|--------------|----------|----------|-----------|----------|-----------|-----------|
| White Oak | | 1 | 11 | 1 | | 3 |
| Scarlet Oak | | 1 | 10 | 5 | | 16 |
| Chestnut Oak | 1 | 1 | 8 | 1 | | 11 |
| Red Maple | 1 | | 1 | | | 2 |
| Blackgum | | 3 | | | | 3 |
| Total | 2 | 6 | 30 | 7 | | 45 |

In addition snags were found on most plots with an average basal area of 7 sq. ft/acre in snags. Most snags have decayed to the point where only fire or pulp wood value exists, but provide valuable wildlife habitat.

Regeneration: Regeneration is dominated by poplar over the lower and middle sections of the stand with oak dominant on the upper areas. Oak sprouting is common and will supply about 50% of the new stand on the upper slope. In poplar dominated areas the rapid growth of the oak sprouts will provide an oak component in what will be a poplar dominated stand. 80% of plots are adequately stocked with regeneration, 53% poplar; 20% oak and 7% black cherry. In addition white and pitch pine and red maple are present and will add diversity to the new stand.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 7 | 1438 |
| Yellow Poplar | 53 | 6933 |
| Conifer | 0 | 103 |
| Established Oak | 0 | 616 |
| Competitive Oak | 13 | 257 |
| Other Desirables | 0 | 5161 |

This stand has developed successful regeneration. Competitive vegetation is not a problem. Invasive plants are limited to stiltgrass and minimal ailanthus around the log landings.

Prescription: This stand has very successful regeneration following a shelterwood harvest. Regeneration is vigorous and well established. The residual overstory has adequate volume and quality to be profitably removed. Removal will further improve the regeneration which is being retarded in places by shade from the residual overstory.

Action: Schedule overstory removal for 2017. Leave a basal area of 5 to 10 sq. ft/a. Herbicide log landings with grass only herbicide or low concentration of glyphosphate prior to harvest, preferably in late June to control stiltgrass.

Stand 10: 320 acres; site 2+; Dry oak (AD)

Location: Stand 10 is located north of Rt. 325, south of the game lands boundary; west of the broad uncut buffer separating it from stand 9 and east of a buffer separating it from stand 12.

Description: This was the earliest harvest on the CRW property with a first stage shelterwood harvested in 2008 and 2009. The site is mostly gently sloping with minimal surface rocks. The topography is a broad lower slope with a gently concave slope transitioning to the steeper upper slope. The lower and central portions have a residual of primarily white and scarlet oak. Size and quality is good. Atypical of most sites, the site quality improves as you go upslope. There is greater diversity with red, black and chestnut oak, tulip poplar and hickory mixing with the white and scarlet oak. Basal area is 33 sq. ft/a. with a relative density of 27%. Commercial log heights are commonly 2.5 sixteen foot logs or greater. Estimated net volume is 3,500 bf/a.

Spotty mortality has occurred throughout. The average basal area of snags is 8.5 ft/a. The majority of plots have snags present. Most mortality is older with the dead trees having little current value, except for wildlife.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Pole | Sm Saw | Med Saw | Large Saw | Culls | Total |
|--------------|----------|------------|-----------|-------------|------------|------------|-----------|
| White Oak | | | 7 | 3 | | | 10 |
| Scarlet Oak | | | 3 | 5 | 1 | 0.5 | 9.5 |
| Chestnut Oak | | .5 | | 1.5 | | | 2 |
| Red Oak | | | 1 | 2 | 0.5 | | 3.5 |
| Black Oak | | | 1 | 1 | | | 2 |
| Red Maple | 1 | 1 | | 0.5 | | | 2.5 |
| Poplar | | | | | 2 | | 2 |
| Hickory | | | | 0.5 | | | 0.5 |
| Blackgum | | | | | | 1 | 1 |
| Total | 1 | 1.5 | 12 | 13.5 | 3.5 | 1.5 | 33 |

Regeneration: Regeneration has been very successful with 95% of plots stocked. The only “non-stocked” plot was just below the adequate level for several species and is essentially stocked as well. Yellow poplar is dominant on 50% of the plots, oak on 40% and white pine on 5%. Also important is the distribution of oak seedlings with competitive seedlings or sprouts present on 85% of all plots. Because of site quality, species distribution doesn’t vary much across the site. The one clear trend is that poplar dominates nearly all plots in full sun, with oak tending to dominate plots in the partial shade of residuals. It is apparent that the partial shade provided by residuals has limited growth of poplar, but allowed oak to slowly develop.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 50 | 3601 |
| Conifers | 0 | 39 |
| Established Oak | 0 | 693 |
| Competitive Oak | 60 | 1194 |
| Total Oak | | 1887 |
| Other Desirables | 20 | 7395 |

Laurel is found on 55% of plots, but is not inhibiting regeneration. Fern and grass is insignificant. Some stiltgrass is present near log landings and skid trails. Barberry is spotty, but not significant. Ailanthus, paulownia and multiflora rose are rare, but present.

Prescription: Removal of the residual overstory is a high priority. The species, size and quality make this an economically valuable operation. Additionally the residual overstory is beginning to significantly retard development of the oak regeneration. Sunlight provided by removal will allow the oak seedlings to rapidly develop making the future stand a diverse and valuable stand.



3.0 Management Strategies by Tract No. and Stand No.

Action: Schedule an overstory removal for 2017, leaving a basal area of 5 to 10 sq. ft/a. Herbicide log landings and skid trails with grass only herbicide or low concentration of glyphosate prior to harvest, preferably in late June. Cut and stump spray ailanthus and paulownia.

Stand 11: 85 acres; site 2; dry oak (AD)

Location: Stand 11 is located between the shelterwood which comprises Stand 9 on the west and the private in holdings on the east. Rt. 325 is the south boundary and game lands are the north boundary. Two small streams form from spring seeps on the lower east portion of the stand.

Description: This stand comprises several different sites. The largest portion is a moderately sloped, somewhat rocky area that extends from the game lands boundary about halfway down slope. Neither slope nor rocks are severe enough to limit management. The lower portion is the section between the drainages. The entire stand was severely impacted by mortality, gypsy moth or possibly oak leaf roller in the 1970's and 80's. This has created a two age stand, though of very different character based on slope.

The upper half maintains significant residual oak (average BA ~50) with a major blackgum understory. Farther down slope less residual oak (average BA ~30) exists with more pole size tulip poplar and white pine successfully developed as the second age class. Blackgum is present, but not dominating the younger age class. This is probably due to more sunlight provided by the heavier initial mortality and the rapid growth of the young pine and poplar. Live basal area is 105 sq. ft/a. and relative density is 88%. Estimated net volume is 4,800 bf/a. Snags and large woody debris are common. Average basal area of snags is 10 sq. ft/acre.

There is some new mortality among the chestnut oaks.

Overstory basal area:

| Species | Saplings | Poles | Sm. Saw | Med. Saw | Large Saw | Total |
|--------------|----------|-------|---------|----------|-----------|-------|
| White Oak | | | 8 | 4 | | 12 |
| Chestnut Oak | | | 7 | 5 | | 12 |
| Red Oak | | | 3 | 2 | | 5 |
| Black Oak | | | 5 | | | 5 |
| Scarlet Oak | | | 5 | 2 | | 7 |
| Tulip Poplar | | 2 | 2 | 3 | | 7 |
| Red Maple | 3 | 8 | 7 | | | 18 |
| Blackgum | 10 | 22 | | | | 32 |



3.0 Management Strategies by Tract No. and Stand No.

| | | | | | | |
|--------------|-----------|-----------|-----------|-----------|--|------------|
| Sassafras | 2 | | | | | 2 |
| White Pine | 3 | 3 | 2 | | | 8 |
| Total | 18 | 35 | 39 | 16 | | 108 |

Regeneration: Regeneration in the oak/gum section is sparse but well distributed. Small oak and red maple is present throughout. Some areas of lower gum density have good regeneration of established oak. No laurel, grass or ferns are impacting regeneration in this area. The heavy blackgum mid story is responsible for the limited regeneration. Lower on the slope, regeneration is more abundant and diverse with poplar and white pine predominating.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 321 |
| Yellow Poplar | 17 | 899 |
| Conifers | 0 | 257 |
| New Oak | 0 | 385 |
| Established Oak | 0 | 835 |
| Total Oak | 0 | 1220 |
| Other Desirables | 0 | 2247 |
| Saplings | 17 | |

This area has significant laurel, but the laurel is in decline, possibly due to overstory shading and leaf spot disease.

Prescription: Despite the past mortalities, basal area in acceptable growing stock remains sufficient to make this a productive stand. The lower area with pole size white pine and poplar, mixed with larger oak and poplar have created a healthy two-aged stand that should be left alone for the foreseeable future.

The oak/gum area comprising the upper 2/3rds of the stand currently have adequate oak sawtimber stocking to leave this stand to grow. One exception would be if the majority of the chestnut oak dies. This would leave a sparse overstory of oak with an expanded gum mid story. Should this occur it would be prudent to do an overstory removal taking out the gum and most of the oak. This harvest could be scheduled with the overstory removal of the adjacent stand 9. Regeneration of oak would be sufficient to stock a new stand, especially with the blackgum suckers that would develop, acting to draw deer pressure away from the oak.

Action: Monitor upper slope for chestnut oak mortality annually. If mortality increases regenerate the stand, otherwise, defer active management until next decade. Re-evaluate after 2026.



3.0 Management Strategies by Tract No. and Stand No.

Stand 12: 186 acres; Site 2; Red oak-mixed hardwoods (AR)

Location: Northeast of the Reservoir. Stand 12 is bounded by Rt. 325 on the south, stand 40 on the west, game lands on the north and the large SMZ buffer of stand 17 on the east. The stand is gently to steeply sloping. Aspect is southeast.

Description: This is a mixed oak site dominated by medium and large oak sawtimber remaining after a first stage shelterwood harvest cut about 2010. Residual basal area is 32 sq. ft/a, nearly all in sawtimber. Relative density is 25% and estimated net volume is 3,200 bf/a. All species of upland oak are represented and constitute 88% of the basal area. Yellow poplar makes up the rest of the basal area. As with most south facing shelterwoods on the property, site quality improves as you go down slope. Also the proportion of poplar in the overstory and regeneration increases and the proportion of chestnut oak decreases.

Overstory basal area:

| Species | Saplings | Pole | Sm Saw | Med Saw | Large Saw | Total |
|--------------|----------|----------|-----------|-----------|-----------|-----------|
| Black Oak | | 1 | 3 | 4 | | 8 |
| White Oak | | | 3 | 4 | | 7 |
| Scarlet Oak | | | 2 | 1 | 1 | 4 |
| Chestnut Oak | | | 3 | 2 | | 5 |
| Red Oak | | | 1 | 1 | 1 | 3 |
| Tulip Poplar | | | | 1 | 3 | 4 |
| Total | | 1 | 12 | 13 | 5 | 31 |

Regeneration: Regeneration is abundant and present on all plots. 60% meet SILVAH stocking level with poplar dominate on 47% and oak 13%. Other commercial species include red maple and birch. Blackgum, sassafras and serviceberry are common, especially on the mid and upper slope.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 47 | 4468 |
| Established Oak | 0 | 334 |
| Competitive Oak | 13 | 437 |
| Total Oak | | 770 |
| Other Desirables | 0 | 3826 |

Competing vegetation is not present. No invasive plants were found on plots although some stiltgrass was found on log landings and skid trails.



3.0 Management Strategies by Tract No. and Stand No.

Prescription: The stand is a well regenerated shelterwood ready for a final harvest.

Action: Herbicide landings to control stiltgrass; early summer 2017

Harvest overstory leaving a basal area of 5 to 10 sq. ft/a; 2019.

Stand 13: 97 acres; Site 2; Dry oak (AD)

Location: Stand 13 is a long narrow strip between Route 325 and Clark Creek.

Description: Terrain is gently sloping from the road to a short, sharp drop to Clark Creek. With a few exceptions this area does not lay in the floodplain as the terrain forces the floodplain to the south side of the creek. Neither rock nor wet areas cause site limitations. This is a medium sawtimber stand with good species composition and quality. White oak and scarlet oak make up more than half the basal area of 119 sq. ft/a. Relative density is 94% with an estimated volume of 8,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|--------------|----------|----------|-----------|-----------|-----------|------------|
| White Oak | | 10 | 20 | 16 | 4 | 50 |
| Scarlet Oak | | 1 | 3 | 7 | 4 | 15 |
| Black Oak | | | | 1 | | 1 |
| Tulip Poplar | | 1 | 2 | 5 | 1 | 9 |
| Red Maple | 4 | 6 | 9 | 6 | 2 | 27 |
| Hickory | | 1 | | | | 1 |
| Black Birch | | 1 | 1 | | | 2 |
| Yellow Birch | | 1 | | | | 1 |
| White Pine | | 2 | 2 | | | 4 |
| Pitch Pine | | | 1 | 2 | | 3 |
| Hemlock | | 1 | | | | 1 |
| Blackgum | 2 | | 1 | | | 3 |
| Serviceberry | 1 | 1 | | | | 2 |
| Total | 7 | 2 | 39 | 37 | 11 | 119 |

Regeneration: Regeneration is light but well distributed. All plots contain established oak, red maple or white pine, but not at a level sufficient to provide adequate stocking. Mountain laurel is found on 80% of the plots with an average coverage of about 40% on those plots.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % stocked plots | seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 0 | 116 |
| Established Oak | 0 | 462 |
| Other Desirables | 0 | 847 |

Despite the coverage, mountain laurel is suffering from leaf spot and it is neither dense nor tall. Serviceberry seedlings are widespread. These have no commercial potential, but provide important wildlife food and beautiful early spring flowers while not causing serious competition for desirable seedlings.

Stiltgrass and barberry were present on one plot and have the potential to become a problem. Euonymus (burning bush) was found along Rt. 325 near the culvert at the east end of the stand.

Prescription: This stand is in good condition. Providing a scenic buffer and watershed protection is its most valuable role, due to location. Multi-age management to provide continual high canopy cover is recommended. The site is stable and could be readily worked without causing damage to the nearby stream. A harvest to provide additional growing space and salvage the shorter lived scarlet oak would be desirable, however, many stands on the property are in greater need of management and this work should be deferred.

Action: Spot treat invasive plants 2018. Monitor semi-annually.
Group selection harvest in second period; 2026-2035

Stand 15: 234 acres, site 2; Red oak-mixed hardwoods (AR)

Location: This stand is along the north side of Rt. 325 at the northwest corner of the property. Carsonville Rd. runs north through the stand. This is along narrow stand running 1.5 miles from the northwest corner to where the property widens across from the Dehart Dam. It averages about 1000 feet wide, though narrowing towards the east end. Aspect is southeast. Slopes are gentle to moderate.

Description: This stand is on a good site, with site quality declining slightly to the east. Rocks are minimal. There are several spring seeps. Average basal area is 90 sq. ft/a. with a relative density of 64%, though this is variable due to past stand history. There have been several harvests over the last 20 years to individual parts of the stand. Estimated net volume is 6,800 bf/a. Gypsy moth mortality has also created some small openings, especially on the eastern end. In general regeneration is good with poplar dominating openings in the middle and western part. Excellent large oak regeneration is present on the eastern third of the stand.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Saplings | Pole | Sm. Saw | Med Saw | Large Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|-----------|----------|-----------|
| White Oak | | | 8 | 13 | | | 21 |
| Chestnut Oak | | | 10 | 2 | | | 12 |
| Red Oak | | | 2 | 2 | | | 4 |
| Scarlet Oak | | | 1 | 1 | | | 2 |
| Black Oak | | | 1 | 2 | | | 3 |
| Yellow Poplar | 1 | | 4 | 9 | 4 | 1 | 19 |
| Red Maple | 1 | 11 | 4 | | | | 16 |
| Black Birch | | 2 | 3 | 1 | | | 6 |
| White Pine | 1 | | | | 1 | | 2 |
| Blackgum | 2 | | | | | 2 | 4 |
| Total | 5 | 13 | 33 | 30 | 5 | 1 | 87 |

Regeneration: Regeneration is generally excellent. Areas where sufficient light is present have excellent poplar or oak regeneration. Poplar stocks 30%, oak 20% and white pine 10% of the plots. In addition one plot is stocked with vigorous small sawtimber poplar from a previous harvest. Red maple and birch are present, but are being out competed by more desirable regeneration where sunlight is adequate. Essentially, any area exposed to sunlight has developed desirable regeneration in this stand.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 20 | 5431 |
| Conifers | 10 | 347 |
| Established Oak | 0 | 1117 |
| Competitive Oak | 20 | 616 |
| Total Oak | | 1733 |
| Other Desirables | 0 | 2658 |
| Sapling | 10 | |

Grass is fairly heavy on three plots, but these plots also have excellent regeneration, so the grass is not creating a problem.

Invasive Japanese stiltgrass and barberry are present on two plots.

Prescription: The stand has been managed with several smaller regeneration and improvement cuts over the last several decades. These have all been successful. As this stand is highly visible, a similar



3.0 Management Strategies by Tract No. and Stand No.

harvesting pattern should continue. First priority should be to remove the overstory from the areas with excellent regeneration on both ends of the stand.

Action: Spot herbicide treatment of invasives; 2018.

Continue prior harvesting practice of small shelterwood harvests followed by overstory removals. Conduct small overstory removals of areas where first stage shelterwoods previously conducted. Conduct an additional series of small shelterwoods. First harvest 2021.

Stand 16: 102 acres; Site 2; Dry oak (AD)

Location: Stand 16 is located in a narrow band between Rt. 325 and Clark Creek. The west boundary is the game lands and the east is the access to the dam and facilities. This is across the road from stand 15. Aspect is southeast. Slopes are mostly gentle with short steep slopes to Clark Creek.

Description: This stand occupies a series of small flats bisected by shallow hollows. This is a well-stocked white oak stand. Small and medium size white and scarlet oak sawtimber dominate the stand. Basal area is 107 sq. ft./a. with a relative density of 97%. White oak comprises 73% of the total. Scarlet oak with 5% and red maple with 7% of the basal area are the only other species of significance. Serviceberry and blackgum are present in the understory. Mountain laurel is present throughout, but not dense. Estimated net volume is 6,700 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg. Saw | Cull | Total |
|----------------------|-----------|-----------|-----------|-----------|----------|----------|------------|
| White Oak | | 11 | 42 | 22 | 1 | | 76 |
| Chestnut Oak | | 1 | | | | | 1 |
| Scarlet Oak | | | | 3 | 2 | | 5 |
| Black Birch | | 2 | | | | | 2 |
| Red Maple | 4 | 3 | 2 | | | | 9 |
| Hemlock | | 2 | 1 | | | | 3 |
| White Pine | | 1 | | | | | 1 |
| Yellow Poplar | | | | | 1 | | 1 |
| Hickory | 1 | 1 | | | | | 2 |
| Blackgum | 3 | | | | | | 3 |
| Serviceberry | 2 | 1 | 1 | | | | 4 |
| Total Live BA | 10 | 22 | 46 | 25 | 4 | 0 | 107 |

Regeneration: Regeneration of oak, red maple and white pine is scattered throughout the stand, though only two plots, containing oak seedlings, had sufficient seedlings to meet stocking criteria.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 0 | 77 |
| Conifers | 0 | 116 |
| Established Oak | 20 | 1772 |
| Competitive Oak | 0 | 39 |
| Total Oak | | 1810 |
| Other Desirables | 0 | 1194 |

Serviceberry seedlings are common as well. These have no economic value, but considerable wildlife and aesthetic value and are not competitive with other seedlings. Mountain laurel was found on all plots, but was not dense and did not seriously inhibit tree seedlings.

Invasives: No Invasives noted.

Prescription: This stand lies between the main highway and Clark Creek, below DeHart Dam. In this setting uneven-aged management is recommended for both aesthetic and water quality reasons. The stand could benefit from a thinning to provide more growing space for the better trees. However, this is a healthy stand and other stands are in greater need of treatment.

Action: Conduct an improvement/thinning from below when harvesting occurs in stand 15. Conduct thinning in 2021.

Stand 17: 54 acres: Site 2 (Aquatic buffer); dry oak (AD)

Location: Stand 17 is a broad hollow between stands 10 and 12. Its southern boundary is Rt. 325 and its northern boundary is the game lands. Aspect is generally south. Slopes are gentle to steep.

Description: This a broad hollow with streams running down the mountain on both sides of the hollow. In between the lower part has numerous spring seeps and wet areas. The upper part is dry and moderately steep between the streams. The forest is a small sawtimber stand of mixed oak. White, chestnut, scarlet, and black oak and red maple makes up most of the stand. Basal area is 101 sq. ft/a. with a relative density of 89%. This is an average site 2 with fair quality timber. Estimated net volume is 6,000 bf/a. Mountain laurel is found throughout, but is seldom dense. Greenbriar is also common, especially near the wet areas.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg Saw | Total |
|--------------|---------|------|---------|----------|--------|-------|
| White Oak | | 8 | 13 | 6 | | 27 |
| Chestnut Oak | | 8 | 13 | 2 | | 23 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg Saw | Total |
|---------------|----------|-----------|-----------|-----------|----------|------------|
| Scarlet Oak | | | 10 | 7 | 1 | 18 |
| Black Oak | | | 3 | 5 | | 8 |
| Red Oak | | | | 1 | | 1 |
| Red Maple | | 9 | 3 | | | 12 |
| Yellow Poplar | | | 2 | | 3 | 5 |
| Blackgum | 4 | 1 | | | | 5 |
| Aspen | | | 1 | | | 1 |
| Sassafras | | 1 | | | | 1 |
| Total | 4 | 27 | 45 | 21 | 4 | 101 |

Regeneration: Regeneration is sparse but present in most of the stand. Red maple, oak and poplar are the primary seedlings present.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 0 | 96 |
| Established Oak | 0 | 337 |
| Other Desirables | 0 | 818 |

Mountain laurel is also present throughout, but with an average density of only 18%, does not create a significant problem. Greenbriar is also present, especially near wet areas.

No invasives were noted.

Prescription: Most of this stand falls within the Streamside Management Zone. Because of the springs in the lower portion that are bracketed by the two streams, the entire lower half would fall within the inner or outer management zones. The upper part would have some areas that could be managed, but access would be difficult for a relatively small area of average timber. The wet areas along with the laurel and greenbriar make excellent wildlife habitat. Also, the lower part of the area is visible from Rt. 325. This stand provides a good aesthetic break between the adjacent managed stands.

It is recommended that this stand be left undisturbed.

Action: Maintain streamside buffers. No active management.



3.0 Management Strategies by Tract No. and Stand No.

Stand 19: 246 acres; Site 2; dry oak (AD)

Location: Stand 19 lies on the north shore of the Reservoir between the water and Rt. 325. It is a long narrow stand running about 4 miles.

Description: This stand has gentle to moderate slopes running down to the Reservoir. Width is generally narrow, but varies from less than 100 ft. to greater than 600 feet. White and black oak dominate the stand accounting for more than half the basal area of 125 sq. ft/a. Relative density is 108% with an estimated volume of 7,400 bf/a. Other important species include red maple, chestnut and scarlet oak and yellow poplar. Blackgum is common in the under and midstory.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med. Saw | Lg Saw | Total |
|---------------|----------|-----------|-----------|-----------|----------|------------|
| White Oak | | 5 | 26 | 10 | 3 | 44 |
| Black Oak | | | 8 | 9 | 2 | 19 |
| Chestnut Oak | | 1 | 4 | 2 | 1 | 8 |
| Scarlet Oak | | | 2 | 1 | 1 | 4 |
| Red Oak | | | 2 | | | 2 |
| Red Maple | 3 | 14 | 7 | 1 | | 25 |
| Yellow Poplar | | 1 | | 1 | | 2 |
| Hickory | 1 | 1 | 2 | | | 4 |
| Birch | | | 1 | | | 1 |
| Hemlock | | 1 | 1 | | | 2 |
| Pitch Pine | | | 1 | | | 1 |
| Blackgum | 5 | 4 | 1 | | | 10 |
| Serviceberry | | 1 | | | | 1 |
| Sassafras | | 1 | | | | 1 |
| Total | 9 | 30 | 55 | 24 | 7 | 125 |

Regeneration: Regeneration is well distributed, but abundant only in openings created by mortality. Oak, poplar and white pine are the most abundant species.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 0 | 356 |
| Established Oak | 0 | 770 |
| Competitive Oak | 8 | 237 |
| Other Desirables | 0 | 385 |



3.0 Management Strategies by Tract No. and Stand No.

Prescription: This stand lies between the main highway and the Reservoir. Most area is in the lakeside management zone or aesthetic highway area. A few areas have sufficient width to lie outside either zone; however developing access from Rt. 325 into these limited areas would not be cost effective. Additionally, the presence of this area as an undisturbed buffer between the highway and the Reservoir has significant value from the public’s perception.

Action: No active management is recommended.

Stand 40: 55 acres; site 2 Oak/Heath (AH)

Location: This stand occupies a gentle to steep slope with a southeast aspect. The stand is bounded by stand 12 on the east, a buffered hollow on the west, Rt. 325 on the south, and game lands to the north.

Description: This stand had a shelterwood harvest about 2010. Black, chestnut, scarlet and white oak comprise 76% of the total basal area of 34 sq. ft/a. Relative density is 32%. Small and medium sized sawtimber predominate with an estimated net volume of 2,700 bf/a.

Overstory basal area:

| Species | Saplings | Poles | Sm Saw | Med Saw | Lg. Saw | Total |
|---------------|----------|----------|-----------|----------|----------|-----------|
| Black Oak | | | 5 | 4 | | 9 |
| Chestnut Oak | | 2 | 4 | 1 | | 7 |
| Scarlet Oak | | | 2 | 3 | 1 | 6 |
| White Oak | | | 3 | 1 | | 4 |
| Red Maple | | 3 | 1 | | | 4 |
| Yellow Poplar | 1 | | | | 1 | 2 |
| Pitch Pine | | | 1 | | | 1 |
| Blackgum | | 2 | | | | 2 |
| Sassafras | | 1 | | | | 1 |
| Total | 1 | 8 | 16 | 8 | 2 | 35 |

Regeneration: Regeneration is abundant with 70% of plots stocked with adequate regeneration. Yellow poplar and oak are prevalent.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-----------------|-----------------|--------------|
| Black Cherry | 0 | 39 |
| Yellow Poplar | 40 | 3158 |
| Established Oak | 0 | 308 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Competitive Oak | 40 | 501 |
| Total Oak | | 809 |
| Other Desirables | 10 | 6278 |
| Sapling | 10 | |

Mountain laurel is scattered but presents no interference for the regeneration. Stiltgrass and ailanthus were both found on one plot.

Prescription: This stand is well regenerated and is ready for overstory release. The stiltgrass present should be treated prior to harvest.

Action: Spot treat stiltgrass and ailanthus; 2018
Harvest overstory 2019.

Stand 41: 22acres, site 2; dry oak (AD); SMZ

Location: Stand 41 comprises 5 small drainages within Stands 12, 40 and 42. Terrain is gently to moderately sloping with hollows running under Rt. 325 to DeHart Reservoir.

Description: These are small areas up to 7 acres in size. All protect spring seeps and small drainages within stands which have had an initial shelterwood harvest. Basal area is 88 sq. ft/a. with a relative density of 67%. Estimated net volume is 5,300 bf/a.

Overstory basal area:

| Species | Saplings | Poles | Sm Saw | Med Saw | Large Saw | Total |
|---------------|----------|-----------|-----------|-----------|-----------|-----------|
| White Oak | | 2 | 12 | 4 | 4 | 22 |
| Chestnut Oak | | 4 | 8 | | 2 | 14 |
| Black Oak | | | 2 | 2 | | 4 |
| Red Oak | | | | 2 | | 4 |
| Scarlet Oak | | | 2 | | | 2 |
| Red Maple | | 10 | 6 | 4 | | 20 |
| Yellow Poplar | | | | 4 | 4 | 8 |
| Aspen | | | 4 | | | 4 |
| Birch | | | 2 | 2 | | 4 |
| Hemlock | | 2 | | | | 2 |
| Blackgum | 2 | 4 | | | | 6 |
| Total | 2 | 22 | 36 | 18 | 10 | 88 |



3.0 Management Strategies by Tract No. and Stand No.

Regeneration: Regeneration is present on all plots. 40% of plots are stocked with poplar. Red maple, oak and white pine is also present.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Yellow Poplar | 40 | 2311 |
| Conifers | 0 | 308 |
| Established Oak | 0 | 385 |
| Competitive Oak | 0 | 77 |
| Other Desirables | 20 | 3466 |

Prescription: These small stands protect important watershed features. They should remain without active management to protect these small drainages.

Action: No active management.

Stand 42: 77 acres, site 2; dry oak (AD)

Location: This is the western most in the series of shelterwoods harvested along the north side of Rt. 325 between 2008 and 2011.

Description: This stand is a well regenerated shelterwood. Chestnut oak and black oak comprise 66% of the 37 sq. ft/a. of basal area. Relative density is 33%. More than half the basal area is in medium and large sawtimber with an estimated net volume of 3,000 bf/a. Numerous large cull oaks were left which provide valuable wildlife habitat. Slopes are moderate throughout.

Overstory basal area:

| Species | Saplings | Poles | Sm. Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|----------|----------|-----------|-----------|----------|----------|-----------|
| Chestnut Oak | | | 7 | 8 | | 3 | 18 |
| Black Oak | | | 1 | 6 | | | 7 |
| White Oak | | | 1 | | | 1 | 2 |
| Scarlet Oak | | | 1 | 2 | | | 3 |
| Red Oak | | | | | | 1 | 1 |
| Red Maple | | | | 1 | | | 1 |
| Yellow Poplar | 1 | | | | | 1 | 2 |
| Birch | | 1 | | | | | 1 |
| Pitch Pine | | 1 | | | | | 1 |
| Sassafras | | 1 | | | | | 1 |
| Total | 1 | 2 | 11 | 17 | 2 | 4 | 37 |

3.0 Management Strategies by Tract No. and Stand No.

Regeneration: Regeneration is abundant. 80% of plots are stocked with competitive oak or poplar.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Black Cherry | 0 | 51 |
| Yellow Poplar | 27 | 1849 |
| Established Oak | 0 | 154 |
| Competitive Oak | 53 | 1001 |
| Total oak | | 1155 |
| Other desirables | 20 | 6625 |

No invasive plants were noted on the plots. Multiflora rose and stiltgrass is present around the landings.

Prescription: This shelterwood is successfully regenerated and ready for an overstory removal. The stiltgrass and multiflora rose should be controlled prior to harvest.

Action: Spot treatment of invasives on and around landings. Summer 2018.
Harvest overstory, leaving a basal area of 5 to 10 sq. ft/a; 2019

Stand 47: 243 acres; Site 2; Dry oak (AD)

Location: Stand 47 lies on the north side of Rt. 325 between stand 42 on the east and stand 15 on the west. The upper northern boundary is stand 48 which occupies the steeper upper slopes of Peter’s Mt. Slopes are gentle to moderate with a southeast aspect.

Description: This is a typical site 2 dominated by mixed oak. The stand is well stocked with a basal area of 127 sq. ft/a. and a relative density of 104%. Chestnut oak is prevalent comprising nearly 40% of the stand. Combined, all oak account for 60% of the basal area and nearly all the sawtimber. Estimated net volume is 6700 bf/a. The stand has had spotty disturbances over the last 40 years. An improvement harvest was done on portions of the western half of the stand about 2000. Insect mortality was significant on the eastern half of the stand in the 1970’s and 80’s. The western 2/3rds is a mix of medium and large sawtimber as a result of the partial harvest. Some very large white and chestnut oak are present. Mostly these are low quality though commercial trees. Very good quality medium sawtimber size red, black and scarlet oak are mixed in. The eastern third is mostly pole and small sawtimber chestnut oak, birch and poplar.

Some mortality has occurred with the chestnut oak, but unlike most stands, the chestnut oak is generally healthy.



3.0 Management Strategies by Tract No. and Stand No.

Overstory basal area:

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|-----------|----------|------------|
| Chestnut Oak | | 9 | 16 | 4 | 12 | 1 | 42 |
| White Oak | | | 1 | 1 | 5 | | 7 |
| Black Oak | | | 6 | 4 | | | 10 |
| Red Oak | | 1 | 1 | 5 | 3 | | 10 |
| Scarlet Oak | | 1 | | 3 | | | 4 |
| Yellow Poplar | | 2 | 1 | | | | 3 |
| Red Maple | 5 | 15 | 1 | 1 | | 2 | 24 |
| Birch | 3 | 11 | 1 | | | | 14 |
| Hickory | | 1 | | 3 | | | 4 |
| Blackgum | | 3 | | | | 1 | 4 |
| Sassafras | | 4 | | | | | 4 |
| Total | 8 | 47 | 27 | 21 | 20 | 4 | 127 |

Regeneration: Regeneration is good in the western part of the stand that received the partial cut. Four of the 5 plots in this section are adequately stocked with oak seedlings. The eastern part has significantly less regeneration due to the dense stocking of pole size timber.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Established Oak | 13 | 1974 |
| Competitive Oak | 38 | 481 |
| Total Oak | | 2455 |
| Other Desirables | 0 | 674 |

Neither competitive vegetation nor invasive species were sampled on the plots and overall have a negligible presence in the stand.

Prescription: The western 2/3rds could be regenerated, however, with some many stands on the property needing shelterwood removal harvests; it is recommended that a combination thin from below and removal of scattered large sawtimber be conducted. This will focus growth on the numerous good quality medium and small sawtimber. This should be done after the stands with existing shelterwoods are harvested.

Action: Conducted a thin from below, combined with removal of some of the large sawtimber. Harvest 2025.



3.0 Management Strategies by Tract No. and Stand No.

Stand 48: 340 acres; Site 2; Dry oak (AD)

Location: Upper slope on northwest part of property. Stand is bounded on the south (lower slope) by stand 47 and on the north by the ridge line of Peter’s Mountain. Aspect is southeast. Slopes are generally steep but with several benches and breaks to more gentle slopes.

Description: This is a moderately steep and rocky site. Neither steepness nor rocks prevent management in most areas. Site is surprisingly good for an upper slope, maintaining generally site 2 growing conditions with a significant amount of red oak. Oaks comprise 2/3rd’s of the basal area of 110 sq. ft/a. with a basal area of 91%. Fire damage from a mid rotation fire (1960- 1980) has severely affected timber quality in the western quarter of this stand. Quality is fair to good in the rest of the stand. Estimated net volume is 5,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|--------------|---------|-----------|-----------|-------------|------------|-----------|------------|
| Chestnut Oak | | 5 | 7.5 | 17.5 | 7.5 | 10 | 47.5 |
| White Oak | | | 2.5 | 2.5 | | | 5 |
| Red Oak | | 2.5 | 5 | 5 | | 2.5 | 15 |
| Black Oak | | | 5 | 2.5 | | | 7.5 |
| Scarlet Oak | | | 2.5 | | | | 2.5 |
| Red Maple | | 15 | | | | 2.5 | 17.5 |
| Hickory | | | | 2.5 | | | 2.5 |
| Birch | | 7.5 | | 2.5 | | | 10 |
| Blackgum | | 2.5 | | | | | 2.5 |
| Total | | 35 | 20 | 27.5 | 7.5 | 15 | 110 |

Regeneration: Regeneration is well distributed with oak on most plots. More than 1800 established oak seedlings and 200 competitive oak seedlings per acre are present. Scattered white pine, red maple and birch are also present.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|-----------------|-----------------|--------------|
| Conifers | 0 | 96 |
| Established Oak | 0 | 1829 |
| Competitive Oak | 25 | 193 |
| Total Oak | | 2022 |
| Other Desirable | 0 | 289 |



3.0 Management Strategies by Tract No. and Stand No.

Minor amounts of mountain laurel are present, but not inhibiting desirable regeneration. Prescription: Access and steepness limit some management options for this stand. Partial harvests would be difficult or impractical. However, quality and conditions are adequate to allow for direct overstory removal. These upper slope sites tend to be easiest to regenerate to oak. Significant advanced regeneration exists and stump sprouts tend to be vigorous. Sections of this stand could be regenerated via clearcutting with while harvesting in the lower stand 47. The eastern quarter where regeneration is most abundant should be clearcut with the next stand entry to stand 47.

Action: Conduct an overstory removal for the eastern quarter of this stand while working stand 47; 2025.

Stand 49: 40 acres; site 2; Dry oak (AD)

Location: This stand consists of two hollows within the lower part of the shelterwood that constitutes stand 10. The southern boundary of each stand is Rt. 325. Aspect is generally south with slopes gentle to moderate.

Description: The unharvested hollows that constitute this stand are similar in species composition, but differ in management opportunities. White oak makes up 60% of the basal area. Good quality small sawtimber dominates the stand. The larger, western area of about 25 acres can be readily accessed while working stand 10 as the stream is on the eastern side of the stand and about 23rd's of the stand can be accessed without impacting the SMZ. The east hollow is about 15 acres; however streams bracket the uncut area. While similar in quality, access would need to be from stand 10 with a stream crossing, or a new access, directly off Rt. 325. Basal area is 107 sq. ft/a. with a relative density of 92%. Estimated net volume is 5,000 bf/a.

Overstory basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Total |
|---------------|-----------|-----------|-------------|-----------|------------|--------------|
| White Oak | | 20 | 35 | 10 | | 65 |
| Red Oak | | | 2.5 | | | 2.5 |
| Yellow Poplar | | | 2.5 | | 2.5 | 5 |
| Hickory | | | 2.5 | | | 2.5 |
| Red Maple | 2.5 | 5 | 5 | | | 12.5 |
| Birch | | | 2.5 | | | 2.5 |
| Aspen | | | 2.5 | | | 2.5 |
| Blackgum | 5 | 2.5 | 2.5 | | | 10 |
| Serviceberry | 2.5 | | | | | 2.5 |
| Sassafras | | 2.5 | | | | 2.5 |
| Total | 10 | 30 | 52.5 | 10 | 2.5 | 107.5 |



3.0 Management Strategies by Tract No. and Stand No.

Regeneration: Regeneration is sparse and scattered with about 1500 established oak and red maple seedlings per acre.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Established Oak | 0 | 481 |
| Other Desirables | 0 | 1059 |

Mountain laurel coverage is about 20% and creates no significant competition issues. No nonnative invasive plants were found.

Prescription: This stand would benefit from an improvement harvest conducted as a thinning from below to focus growth on the better trees. About 2/3rds of the west hollow is accessible for harvest while maintaining the stream buffers. About a third of the east is available but will be more difficult to access.

Action: Western hollow; conduct a thinning from below in 2/3rds of area in conjunction with overstory removal of adjacent stand 10. Harvest in 2017.
Eastern hollow; re-evaluate in second management period, consider a group selection harvest in conjunction with harvesting in stand 13 which is across the road. Conduct 2026-2035.

Stand 50: 15 acres; site 2; White pine-red oak-mixed hardwoods (FR)

Location: This stand is located on a long narrow flat on the ridge of Peter’s Mt. The flat averages about 300 feet wide and runs eastward for about a mile from the west end of the property.

Description: This stand occupies a narrow flat on the top of Peter’s Mt. Despite the location good size and quality red oak dominates the stand; however the oak is suffering decline and mortality. There are also pockets of white pine. This stand had a thinning/mortality harvest about 2000. Much of the stand developed a thick understory of striped maple following the harvest. More open areas developed a cover of fern and stiltgrass. Ailanthus is also present. A road runs the length of this stand to access a tower that is no longer standing. This allowed for access to conduct the noted harvest. This road probably provided the pathway for the stiltgrass and ailanthus to invade the stand. Basal area is 100 sq. ft/a. with a relative density of 64%. Estimated net volume is 5,900 bf/a.



3.0 Management Strategies by Tract No. and Stand No.

Basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|---------------|----------|-----------|-----------|-----------|----------|----------|------------|
| Red Oak | | 5 | | 30 | | | 35 |
| Chestnut Oak | | | | | | 5 | 5 |
| White Pine | | 15 | 10 | | | | 25 |
| Red Maple | | 10 | | | | | 10 |
| Birch | | 5 | | | | | 5 |
| Hickory | | 5 | | | | | 5 |
| Striped Maple | | 15 | | | | | 15 |
| Total | 0 | 25 | 30 | 40 | 5 | 0 | 100 |

Regeneration: Regeneration is absent in most of the stand. Fern and striped maple dominate the understory. Some established oak regeneration is present along the southern edge of the stand.

Prescription: If access permits, stand quality warrants rehabilitation. The striped maple, ailanthus and fern should be controlled followed by removal of the declining red oak. The ailanthus should be controlled with basal spray to prevent spreading into adjacent stands even if no other management is undertaken.

Action: Basal spray or hack and squirt herbicide to control ailanthus; 2018
Reassess stand in 2018



3.0 Management Strategies by Tract No. and Stand No.

3.6 Powell’s Creek Stands (51, 52, 53)

Overview: Approximately 490 acres of CRW property lies north of the crest of Peter’s Mountain in the South Powell’s Creek watershed. This section is bounded on the east by state game lands and on the north and west by private property. No access is directly available from the remainder of CRW property. A steep road angles northeast down the slope of Peter’s Mt. from the ridge. This road then runs westerly on the ridge through private land to Carsonville Rd. A better road runs along the base of the north slope of the mountain. This road runs west across private land to Carsonville Rd. and was used to log stand 51 about 2000. It is unknown whether a permanent easement, temporary easement or hand shake agreement was used to gain access at that time. Developing permanent access should be a priority.

Terrain varies from steep on the mid and upper slopes of Peter’s Mt. to gently rolling from the base to South Branch of Powell’s Creek. Beyond the creek there is a short steep slope to a ridge which slopes gently down to the northern boundary. Soils on the mountain are extremely rocky and generally good elsewhere. Riparian wetlands are common along the creek in the eastern part of this section.

The overstory is largely dominated by chestnut and white oak on drier sites and red oak and tulip poplar on mesic sites. White pine is common on the northern portion of this section. Snags and den trees are adequately represented.

Most of this section has low to moderate deer pressure, corresponding to deer pressure 2 in the SILVAH guidelines. Oak and red maples are the predominant regenerating species. Nonnative invasive species were not tallied and are rare in this section. Native competitive vegetation is limited to patches of fern.

This area encompasses 490 acres with the following timber types:

| | | |
|-------------------------|------|---|
| Dry oak | (AD) | 311 acres (includes 199 acres non-commercial) |
| Red oak-mixed hardwoods | (AR) | 179 acres |

These stands comprise the following stages of forest development:

| | |
|----------------------------|-----------|
| Uncut sawtimber | 311 acres |
| Prior improvement thinning | 179 acres |



3.0 Management Strategies by Tract No. and Stand No.

Stand 51: 179 acres; site 2; Red oak-mixed hardwoods (AR)

Location: This stand is located between the lower north slope of Peters Mountain and the South Fork of Powell’s Creek Aspect is northwest and slope is moderate to gentle.

Description: This is a good quality site dominated by red oak and tulip poplar. Much of the stand was heavily impacted by gypsy moths and salvage harvested about 2000. Due to variability in mortality and harvesting there is considerable variation within the stand. Some areas retain a healthy component of large red oak; in other areas red maple and birch pole and small sawtimber has replaced most of the oak; other areas have developed into a vigorous yellow poplar component. Overall quality is good and basal area is consistently around 136 sq. ft/a. with a relative density of 81%. Estimated net timber volume is 9,000 bf/a.

Overstory Basal area:

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Total |
|---------------|------------|-----------|-------------|-------------|----------|--------------|
| Red Oak | | 2.5 | 10 | 17.5 | 5 | 35 |
| Chestnut Oak | | 5 | | 2.5 | | 7.5 |
| White Oak | | | 2.5 | | | 2.5 |
| Scarlet Oak | | | | 5 | | 5 |
| Yellow Poplar | | 2.5 | 17.5 | 10 | | 30 |
| Red Maple | 2.5 | 15 | 14 | 2.5 | | 34 |
| Birch | | 5 | 5 | 2.5 | | 12.5 |
| Blackgum | | 5 | 2.5 | | | 7.5 |
| Sassafrass | | 2.5 | | | | 2.5 |
| Total | 2.5 | 35 | 52.5 | 42.5 | 5 | 136.5 |

Regeneration: Regeneration was adequate to stock 50% of the plots. Oak and red maple was the most abundant regeneration.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Established Oak | 0 | 1733 |
| Competitive Oak | 0 | 193 |
| Other Desirables | 25 | 7222 |

One plot was heavily stocked with fern. Other competitive vegetation was minor and invasives were not noted.



3.0 Management Strategies by Tract No. and Stand No.

Prescription: This stand is healthy. With good access an improvement harvest would be beneficial. Develop access agreement and conduct a thin from below/improvement harvest 2024.

Action: Develop an access agreement. Schedule an improvement/thin from below harvest for 2027.

Stand 52: 112 acres; site 2; dry oak (AD)

Location: This stand is located north of the South Fork of Powell’s Creek to the northern property line. A low ridge runs above the creek. Most of the stand has a gently sloped northern aspect. The ridge tends to be dry and rocky. A short, moderate south slope runs down to the streamside area along the creek. No access exists from other CRW lands. Even with access to adjacent stand 51, the creek would still need to be crossed. Developing access from the north across private land should be a priority.

Description: This stand is dominated by white and chestnut oak, with considerable white pine developing in areas of gypsy moth mortality. Quality is good on much of the northern aspect, becoming poor along the ridge. No harvesting has occurred in this stand. Basal area averages 142 sq. ft/a. with a relative density of 119. Estimated net volume is 4,900 bf/a.

Overstory Basal area:

| Species | Sapling | Pole | Sm Saw | Med Saw | Lg Saw | Cull | Total |
|--------------|-----------|-----------|-----------|-----------|----------|----------|------------|
| Chestnut Oak | | 17 | 10 | | 3 | 3 | 33 |
| White Oak | | | 3 | 20 | | 3 | 26 |
| Scarlet Oak | | 3 | | | | | 3 |
| Red Oak | | | | 7 | | | 7 |
| Red Maple | | 7 | 3 | | | | 10 |
| Birch | 7 | 6 | | | | | 13 |
| White Pine | 3 | 10 | | | | | 13 |
| Blackgum | | 27 | 10 | | | | 37 |
| Total | 10 | 70 | 26 | 27 | 3 | 6 | 142 |

Regeneration: White pine, red maple and oak regeneration is present. 33% of plots are adequately stocked.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Conifers | 0 | 257 |
| Established Oak | 0 | 1412 |
| Other Desirables | 0 | 4108 |



3.0 Management Strategies by Tract No. and Stand No.

| Species | % Stocked Plots | Seedlings/a. |
|----------|-----------------|--------------|
| Saplings | 1 | |

Neither competitive nor invasive vegetation is a problem.

Prescription: This stand is generally healthy with considerable white pine in the younger classes. Develop access. Conduct a thin from below in 2027.

Action: Develop access. Conduct a thin from below in 2027.

Stand 53: 199 acres; site 2; dry oak; (AD) Non-commercial

Location: This stand occupies the steep mid and upper north slope of Peter’s Mt. Soils are rocky.

Description: Chestnut and red oak dominate this site. Numerous large, low value and cull trees are present. Overall, tree heights are short and quality fair. The steep, rocky slopes prevent management of this stand. Basal area is 100 sq. ft/a. with a relative density of 76%. Estimated net volume is 5,000 bf/a.

Overstory Basal area:

| Species | Sapling | Pole | Sm. Saw | Med Saw | Lg Saw | Cull | Total |
|--------------|-----------|-----------|-----------|-----------|----------|-----------|------------|
| Chestnut Oak | | | 5 | 15 | 5 | 15 | 40 |
| Red Oak | | | 10 | 10 | | 5 | 25 |
| Red Maple | 5 | 5 | 5 | | | | 15 |
| Birch | 5 | 5 | | | | 5 | 15 |
| Am. Chestnut | 5 | | | | | | 5 |
| Total | 15 | 10 | 20 | 25 | 5 | 25 | 100 |

Regeneration: Regeneration consists of scattered oak and red maple.



3.0 Management Strategies by Tract No. and Stand No.

Regeneration:

| Species | % Stocked Plots | Seedlings/a. |
|------------------|-----------------|--------------|
| Established Oak | 0 | 193 |
| Other Desirables | 0 | 1384 |

Fern is present in more open areas. No invasive plants were noted.

Prescription: No active management.



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4.0 Cost / Benefit Analysis to Implement

4.1 First and Second Decade

| First Decade | | | | | |
|--|-------|-------|-------|------------------|---------------------|
| Short Term Activities - e.g., specific stands to be harvested in the next few months | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |
| Year 1 | | | | | |
| Harvest | | | | | |
| Stand 9; Shelterwood Removal | 193 | | | 18094 | 120625 |
| Stand 10; Shelterwood Removal | 300 | | | 33750 | 225000 |
| Stand 49: Thin From Below West Section (With Stand 10 Removal) | 15 | | | 1406 | 9375 |
| Stand 22 & Northeast Part Of Stand 31; Shelterwood Removal | 150 | | | 22500 | 150000 |
| Stand 23; Improvement/ (Thin-Harvest) | 107 | | | 10031 | 66875 |
| Herbicide | | | | | |
| Stand 30 & Northwest Part Of Stand 31; Broadcast, Target Birch, Stm | | 200 | | 50000 | |
| Stand 24; Broadcast, Target Birch, Striped Maple | | 150 | | 37500 | |
| Stand 14; Broadcast, Target Barberry | | 4 | | 1000 | |
| Stand 18; Broadcast, Target Barberry | | 8 | | 2000 | |
| Stand 44: Broadcast, Target Invasives | | 81 | | 20250 | |
| Stand 20; Broadcast, Target Striped Maple | | 110 | | 27500 | |
| Stand 22; Spot, Target Invasives | | | 20 | 1500 | |
| Year 2 | | | | | |
| Harvest | | | | | |
| Stand 34; Shelterwood Removal | 130 | | | 14625 | 97500 |
| Stand 36; Shelterwood Removal | 35 | | | 6563 | 43750 |
| Stand 20; Improvement/ (Thin Harvest) | 85 | | | 14344 | 95625 |
| Stand 37; Improvement/ (Thin Harvest) | 40 | | | 4500 | 30000 |
| Stand 24; Removal Harvest | 150 | | | 22500 | 150000 |
| Herbicide | | | | | |
| Stand 5; Spot, Target Barberry, Stiltgrass | | | 20 | 1500 | |
| Stand 4; Spot, Target Stiltgrass; Cut Stump, Ailanthus, Paulownia | | | 20 | 1500 | |

4.0 Cost / Benefit Analysis to Implement Forest Management Plan

| First Decade | | | | | |
|--|-------|-------|-------|------------------|---------------------|
| Short Term Activities - e.g., specific stands to be harvested in the next few months | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |
| Stand 7; Spot, Target Barberry And Stiltgrass | | | 20 | 1500 | |
| Stand 9; Spot, Target Stiltgrass On Log Landing | | | 20 | 1500 | |
| Stand 10; Spot, Target Stiltgrass On Log Landing; Cut/Stump Ailanthus And Paulownia | | | 20 | 1500 | |
| Stand 12; Spot, Target Stiltgrass On Log Landing | | | 20 | 1500 | |
| Stand 13; Spot, Target Stiltgrass, Barberry, Euonymus | | | 20 | 1500 | |
| Stand 15; Spot, Target Invasives | | | 20 | 1500 | |
| Stand 40; Spot, Target Stiltgrass And Ailanthus | | | 20 | 1500 | |
| Stand 42; Spot, Target Invasives Around Landing | | | 20 | 1500 | |
| Stands 2,6,8,19,47,50; Spot , Target Invasives | | | 50 | 3750 | |

| First Decade | | | | | |
|----------------------|-------|-------|-------|------------------|---------------------|
| Long Term Activities | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |

Years 3 Through 10

Harvest

| | | | | | |
|-------------------------------|-----|--|--|-------|--------|
| Stand 12; Shelterwood Removal | 186 | | | 17438 | 116250 |
| Stand 40; Shelterwood Removal | 55 | | | 3094 | 20625 |
| Stand 42; Shelterwood Removal | 72 | | | 4050 | 27000 |
| Stands 5 & 7: Group Selection | 55 | | | 150 | 1000 |
| Stand 4: Shelterwood Removal | 70 | | | 10500 | 70000 |
| Stand 15; Group Selection | 200 | | | 150 | 1000 |
| Stand 16: Improvement Harvest | 90 | | | 6750 | 45000 |
| Stand 2: Shelterwood Removal | 30 | | | 1688 | 11250 |
| Stand 6: Shelterwood Removal | 300 | | | 16875 | 112500 |
| Stand 14 & 18: Removal | 21 | | | 3150 | 21000 |

4.0 Cost / Benefit Analysis to Implement Forest Management Plan

| First Decade | | | | | |
|--|-------------|------------|------------|------------------|---------------------|
| Long Term Activities | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |
| Stand 30 & Northwest Part Of Stand 31: Removal | 200 | | | 22500 | 150000 |
| Stand 22: Removal Harvest | 60 | | | 2250 | 15000 |
| Herbicide | | | | | |
| All Stands - As Needed | | | 500 | 37500 | |
| Years 1-10 TOTALS | 2544 | 553 | 270 | 432906* | 1579375 |

*Includes timber harvest preparation, oversight, marketing, etc. by professional forester (at rate of 15% commission on landowner gross receipts) – As discussed, this can be drastically reduced with long term contract. This Cost/Benefit Analysis can be edited based upon final long-term contract specifics.

| Second Decade | | | | | |
|---|-------|-------|-------|------------------|---------------------|
| Years 10 through 20: | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |
| Stand 47: improvement harvest | 290 | | | | |
| Stand 48: clearcut quarter of stand with stand 47 harvest | 65 | | | | |
| Stand 49: selection harvest east section | 10 | | | | |
| Stand 8: group selection | 100 | | | | |
| Stand 25, 26 & 27: improvement harvest | 170 | | | | |
| Stand 35: Shelterwood | 100 | | | | |
| Stand 31: Shelterwood | 500 | | | | |
| Stand 1 & southern part of stand 3: Improvement harvest | 200 | | | | |
| Stand 11: Shelterwood or straight removal | 70 | | | | |
| Stand 13: group selection | 20 | | | | |
| Stand 51: improvement harvest | 179 | | | | |
| Stand 52: improvement harvest | 112 | | | | |
| Herbicide | | | | | |
| All Stands - As Needed | | | 1000 | 75000 | |

4.0 Cost / Benefit Analysis to Implement Forest Management Plan

| Second Decade | | | | | |
|--|-------------|-------|-------|------------------|---------------------|
| Years 10 through 20: | Acres | Acres | Hours | Approx Cost (\$) | Approx Benefit (\$) |
| Following will need access via bridge to be built | | | | | |
| Stand 28: and northern part of stand 29: Improvement | 350 | | | | |
| Stand 27: group selection: | 200 | | | | |
| Years 10-20 TOTALS | 1816 | | | 244112* | 1127415 |

*Does not include timber harvest preparation, oversight, marketing, etc. by professional forester.



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