MANAGEMENT UNIT SUMMARY AND CONVENTIONS USED HEREIN

MANAGEMENT UNIT SUMMARY TABLE

Management Unit Summary Table

Mgmt Unit #	Acres	Mgmt Unit NAME	Classification Code [1]	Forest Type [2]	Site Index [3]	Primary Soils [4]
1	184*	Roads and Trails	All	All	All	All
2	225	North Slope - Mixed oak	AH21	Dry Oak - Heath Forest	BO - 67	1JpD, UoB, UoC
3	28	Black Birch Saplings	BB23	Northern Hardwood Forest	TP - 90	1JpD
4	39	Northern Hardwoods	TM12	Tulip Poplar, Beech, Maple Forest	BO - 67	1JpD
5	527	South Slope - Tulip Poplar	TM11	Tulip Poplar, Beech, Maple Forest	TP - 90	NHE, 1JpD
6	183	Forest Regeneration Projects	AH21, TM11	Dry Oak - Heath Forest Tulip Poplar, Beech, Maple Forest	BO - 67 TP - 90	NHE, 1JpD, UoC
7	21	Mature Black Birch	BB22	Northern Hardwood Forest	BO - 67	UoC, UoB
8	70	Historical/Cultural & High Use Sites	AH21, TM12, TM11	Dry Oak - Heath Forest Tulip Poplar, Beech, Maple Forest Tulip Poplar, Beech, Maple Forest	BO - 67 BO - 67 TP - 90	1JpD
9	12	Environmental Center & Other Open Areas	O2, OM	Cultivated Herbaceous Openings Turf Openings	BO - 67	1JpD

** This area is not in addition to all other mgmt. units but rather is a portion of the other mgmt. units.*

(1)(2) FOREST COVER TYPES (SEE APPENDIX D)

The land *Classification Code* describes the dominant *Forest Type* of an area. The land classification is the smallest unit of land that is inventoried and represents degree of homogeneity within the unit. Each Classification Code consists of a total of four digits. For example, AH21 denotes; AH (Dry Oak – Heath Forest), 2 (Site 2), 1 (Size/Stocking Class 1).

All other land classification units will consist of two digits: For example, O2 denotes; O2 (Cultivated Herbaceous Area).

There is further discussion of this classification system in Appendix D of this document.

(3) SITE INDEX AND SPECIES ABBREVIATIONS

Site index is a measure of growth and productivity of a particular site. It represents the height that a particular species of tree can obtain within a certain period of time (usually based on 50 years). Therefore, the index is represented by defining a species of tree followed by a number which indicates the total height that dominant and codominant trees should be able to obtain by 50 years of age.

The species codes for trees discussed in this document are as follows:

TP	Tulip poplar	**AB**	American Beech	**SAS**	Sassafras
RO	Red Oak	**HIC**	Hickory	**WP**	White Pine
BO	Black Oak	**BB**	Black Birch	**SVB**	Serviceberry
SO	Scarlet Oak	**BG**	Black Gum	**ASP**	Aspen
WO	White Oak	**RM**	Red Maple	**PAW**	Pawpaw
CO	Chestnut Oak	**BC**	Black Cherry	**SM**	Sugar Maple
WA	White Ash	**AIL**	Ailanthus	**NM**	Norway Maple

(4) PRIMARY SOILS FOUND IN EACH MGMT. UNIT

See Management Units with soils overlay map for soils locations as well as soil abbreviations, names, descriptions and forest productivity chart on pages 25 through 30.

STAND LEVEL INFORMATION

MANAGEMENT UNIT #1 Roads and Trails

Acres: 184

OBJECTIVE

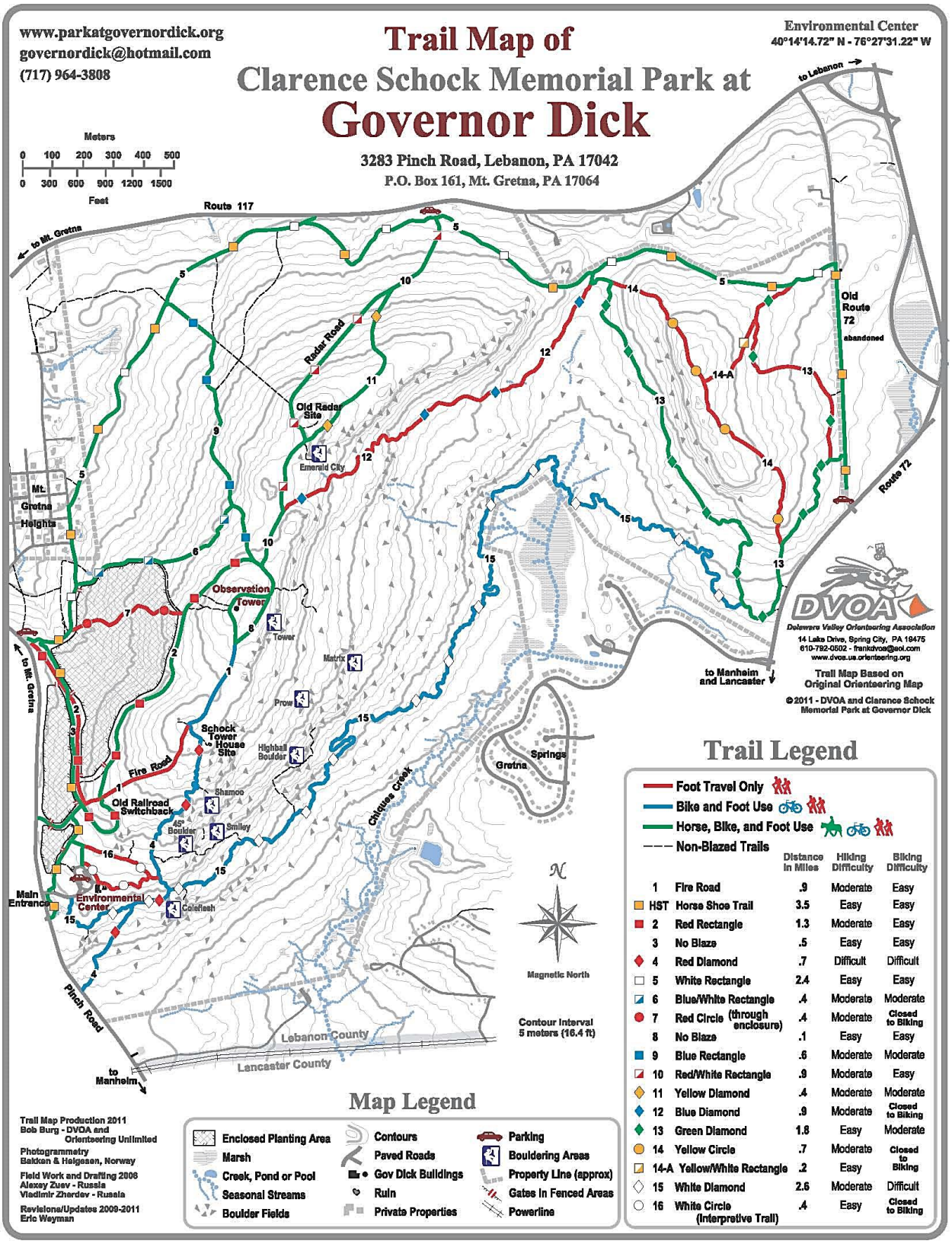
The existing trail system is the "life-blood" of all activities at Gov. Dick. All public activities require at least some use of the trails. In fact, the vast majority of all activities; hiking, biking, horseback-riding, bouldering, and nature studies are accomplished via use of the trails or within 100 feet of the existing trail surfaces. There are obvious exceptions to this statement but the fact remains that the vast majority of all impact (arguably all of which are negative) placed upon the environment by visitors of the park is through the trail system. Therefore, it is imperative that management strategies are *pro-active rather than reactive* to potential environmental problems caused by the public's use of the trail system.

CURRENT DESCRIPTION

The acreage included in Mgmt. Unit #1 is defined as the cumulative area contained within a 100-ft. wide corridor that lies along all "routes of travel" at Gov. Dick. This land area *is not* in addition to the acreage found in other management units but rather a portion of each of the other management units. The extensive network of roads and trails make up about 15.2 miles or 184 acres of transportation corridors through Gov. Dick. For a description of forest types, stocking, dominant species, etc. reference a specific trail segment; determine the corresponding Management Unit(s) in which the trail segment boarders or resides; then read the description for the desired corresponding unit.

Approximately 23 acres of ground surface area is comprised of roads (4.0 miles) and trails (10.6 miles) which together account for less than 2% of the total acreage of the property. Most of the roads are surfaced with crushed stone; the trails are unimproved and constructed only of native soil material. Dirt trails average 6 to 12 feet in width (i.e. cleared vegetation width) and cover approximately 12.9 acres of land. Gravel and paved roads average 15 to 25 feet in width and cover approximately 10.1 acres of land. The trail system at Gov. Dick can be accessed via 14 (approximately) points of entry.

The regionally known Horseshoe Trail traverses the property in an east-west direction. The trail follows or parallels much of the ridgeline inclusive of Gov. Dick Hill. This trail provides a continuous recreational corridor that extends across a multitude of land use types in southeastern Pennsylvania.



		Distance in Miles	Hiking Difficulty	Biking Difficulty
1	Fire Road	.9	Moderate	Easy
HST	Horse Shoe Trail	3.5	Easy	Easy
2	Red Rectangle	1.3	Moderate	Easy
3	No Blaze	.5	Easy	Easy
4	Red Diamond	.7	Difficult	Difficult
5	White Rectangle	2.4	Easy	Easy
6	Blue/White Rectangle	.4	Moderate	Moderate
7	Red Circle (through enclosure)	.4	Moderate	Closed to Biking
8	No Blaze	.1	Easy	Easy
9	Blue Rectangle	.6	Moderate	Moderate
10	Red/White Rectangle	.9	Moderate	Easy
11	Yellow Diamond	.4	Moderate	Moderate
12	Blue Diamond	.9	Moderate	Closed to Biking
13	Green Diamond	1.8	Easy	Moderate
14	Yellow Circle	.7	Moderate	Closed to Biking
14-A	Yellow/White Rectangle	.2	Easy	
15	White Diamond	2.6	Moderate	Difficult
16	White Circle (Interpretive Trail)	.4	Easy	Closed to Biking

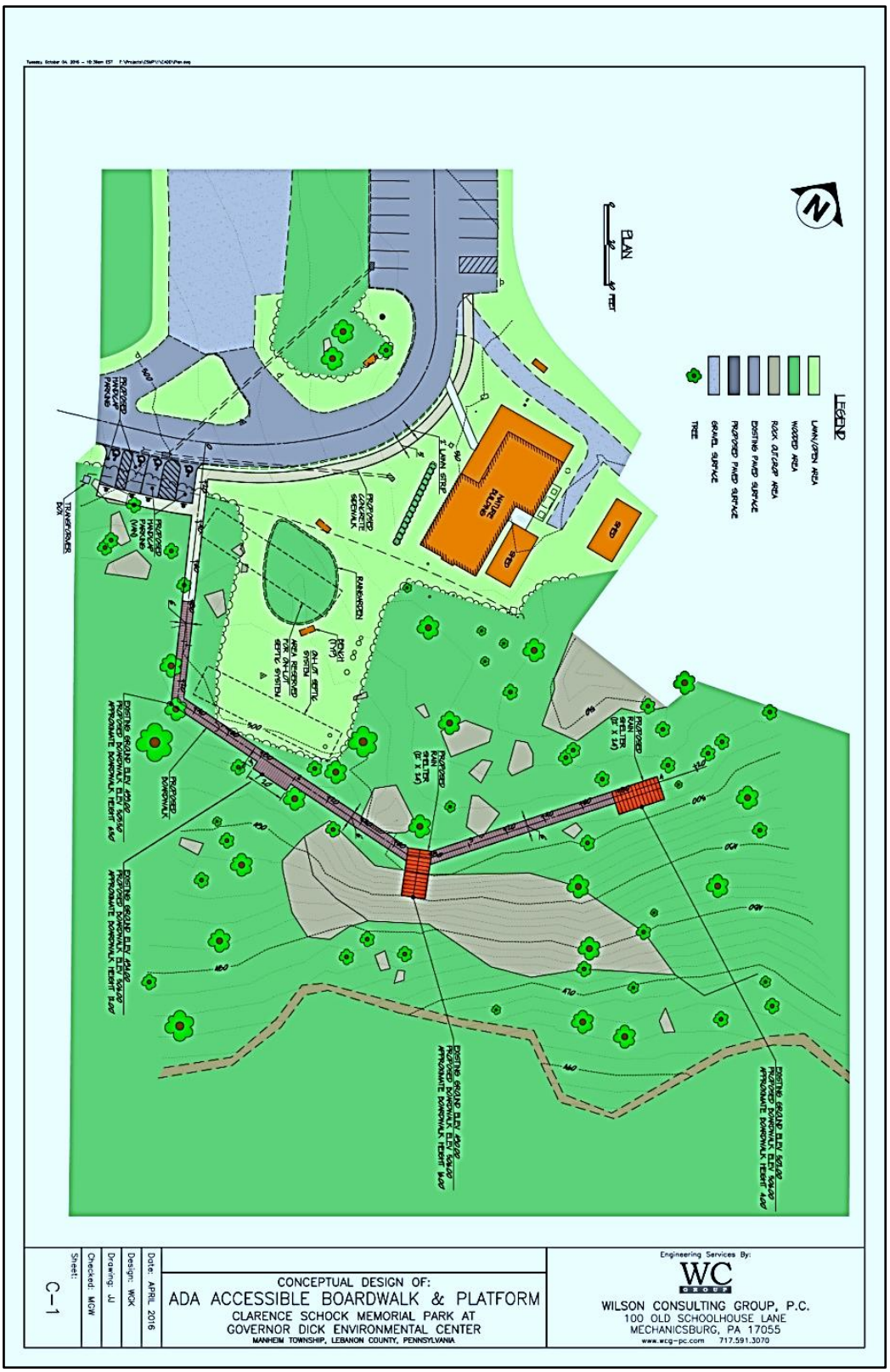
MANAGEMENT RECOMMENDATIONS

Summary of Management Activities

- Systematically reduce invasive plant population by mechanical and/or chemical control methods.
- Implement cultural controls primarily by replacing invasive plants with desirable grasses (as temporary cover), and introducing shade tolerant trees and shrubs.
- Catalog, monitor and plan for the inevitable loss of high-risk overstory trees. Underplant cataloged trees with shade tolerant trees/shrubs and protect from deer browse damage. Remove invasive plants and interfering understory vegetation as necessary to assure successful replacement of the overstory tree.
- Update, expand, improve or create better parking facilities and access corridors at the park.
- Maintain erosion control structures throughout the trail system. Install new erosion control structures as needed to minimize trail degradation.

Details of Management Activities

1) **Trail Corridor Management:** Improve aesthetics and reduce vectoring of invasive plants into interior woodland environments by protecting, reserving, and improving a 100-foot wide transportation corridor along all trails.
2) **Parking Facilities:** Parking facilities are generally *inadequate* relative to the volume of users in all areas including the ***Environmental Center*** located off Pinch Road. Improved parking facilities should be considered for additional parking facilities on Route 117 and Route 72.
3) **Americans with Disabilities Act accessible (ADA) walkway and platform:** Provide recreational opportunities for Americans with disabilities by constructing an appropriate walkway and platform in the area just south and east of the Environmental Center. The preliminary planning and design concept is already underway and monies needed for the concept plans/drawing have already been committed by the Clarence Schock Foundation and by the Lebanon County Commissioners through their Marcellus shale gas program. The preliminary design sketch is included below.


LEGEND
LAWN/OPEN AREA
WOODED AREA
ROCK OUTCROP AREA
EXISTING PAVED SURFACE
PROPOSED PAVED SURFACE
GRAVEL SURFACE
TREE
PLAN
PROPOSED CONCRETE SIDEWALK
LAWN STRIP
EXISTING NATURE BUILDING
PROPOSED PARKING
PROPOSED PARKING (VAN)
TRANSFORMER BOX
RAINGARDEN
ROCKY OUTCROP (TYP)
ON-LOT SEPTIC SYSTEM
NEW RESERVED AREA FOR SEPTIC SYSTEM
PROPOSED RAIN SHELTER (8' X 14')
PROPOSED BOARDWALK
EXISTING GRADE ALONG PROPOSED BOARDWALK
APPROXIMATE BOARDWALK HEIGHT 4.0'
EXISTING GRADE ALONG PROPOSED BOARDWALK
APPROXIMATE BOARDWALK HEIGHT 8.0'
EXISTING GRADE ALONG PROPOSED BOARDWALK
APPROXIMATE BOARDWALK HEIGHT 8.0'
EXISTING GRADE ALONG PROPOSED BOARDWALK
APPROXIMATE BOARDWALK HEIGHT 4.0'
Date: APRIL 2016
Design: WCK
Drawing: JJ
Checked: MCW
Sheet: C-1
CONCEPTUAL DESIGN OF:
ADA ACCESSIBLE BOARDWALK & PLATFORM
CLARENCE SCHOCK MEMORIAL PARK AT
GOVERNOR DICK ENVIRONMENTAL CENTER
MANHEIM TOWNSHIP, LEBANON COUNTY, PENNSYLVANIA
Engineering Services By:
WC GROUP
WILSON CONSULTING GROUP, P.C.
100 OLD SCHOOLHOUSE LANE
MECHANICSBURG, PA 17055
www.wcg-pc.com 717.591.3070

Discussion regarding the ADA Boardwalk and Platform are summarized by Chuck Allwein, Member Board of Directors as follows:

> *"The board felt we have a lot of activities in the park for people that are physically able, but we really, with the exception of the Environmental Center, have nothing for physically incapable people. We have a lot of IU students that would like to use the Center, but they cannot negotiate the topography. We are surrounded by senior communities, and the seniors would love to get out into nature more. We have seen different parks that have put in boardwalks, a flat walkway into the park. We have a lot of boulders and elevation changes and so in order to put in a walkway it will have to be elevated, some areas more, some areas less. There is going to be an ADA sidewalk from the parking lot to the entrance of the boardwalk and that slope will be within the ADA guidelines. It's going to be a concrete sidewalk, colored similar to the porch of the Center. It's going to be five feet wide and it will skirt the front of the Environmental Center. There will also be a two-foot grass strip between the driveway and the sidewalk so that wheelchairs or folks with walkers will not stumble into the driveway. There is going to be additional handicap parking at the entrance to the boardwalk. The boardwalk is approximately 500 feet long and our thinking is that we will be able to add to that in the future if we so desire. The boardwalk is going to run behind our rain garden and go into the forest. The first section will go basically from zero elevation at the driveway entrance to sixteen feet elevation at the first platform. You will be in the trees at that point. Different bird and insect species inhabit different levels of the forest so this will provide a different viewpoint for people. The first platform is going to be cantilevered and the end of it overlooking trail 15 will be sixteen feet high. The walkway continues through the forest to a second platform that is four feet high and it, too, will overlook trail 4 and trail 15. There is a drop-off at the second platform but not nearly as severe as the first platform…The boardwalk has the potential to be continued to tie in with the Interpretive Trail in a future expansion. This is something the state, when they met with us, was very interested in doing, perhaps doing it in stages so that ultimately it wouldn't just terminate there. It could come around and come back to the Center on the Interpretive Trail."*

4) **Environmental Corridor:** Encourage use of the ***Environmental Center*** by constructing a paved or stoned roadway (similar to the ***Environmental Center*** access road) that leads from the ***Environmental Center*** to main road leading to the Observation Tower. Access should be sufficient to permit the passage of wheelchairs and other devices used by disabled patrons of the park. This section of road should provide many points of interest and act as an Environmental "porthole" into the various physical, ecological, geological and cultural interest points available at Gov. Dick. Various displays of can be created and presented in a natural, aesthetically pleasing arrangement along this "information corridor". Semi-private park bench arrangements (casual circular arrangements) can be created on short spur trails adjacent to the information corridor. These semi-private meeting places will encourage small groups of people to enter into discussions of leisure or educational content. Environmental games can be designed to encourage thought through competition. The possibilities of invoking meaningful thought along this education corridor are endless.

5) **Invasive Plant Mitigation along Roads and Trails:** Most invasive plants are found within 100 feet of an existing trail. Few species of invasive plants were found further than 400 feet from an existing trail (ailanthus and Japanese barberry are a notable exceptions). Therefore, it is likely

that the primary mode of introduction into the interior of Gov. Dick is via the trail system. Horses, bikes, and foot traffic (to a lesser extent) are probable vectors for many species of invasive plants. Seeds are picked-up, carried to, and subsequently deposited along the trails of Gov. Dick. Continual public utilization of the trail system, natural seed dissemination via migratory avian and mammalian populations, and windborne seed from nearby invasive plant populations are likely to prevent invasives from ever being totally eradicated at Gov. Dick. Therefore, diligently suppress Invasive plant population when management practices warrant their attention. The establishment of a healthier, more resilient forest ecosystem will go far to suppress the damaging effects of invasive plants.

a) The key to controlling most invasive plants is to reduce the amount of exposed mineral soil and sunlight found on the forest floor. Desirable herbaceous and woody understory vegetation, a healthy leaf litter layer and an abundance of woody debris are all factors that can be managed to reduce the amount of exposed soil in the forest.

b) However, bare mineral soil will always be present on and near the trails so management activities should concentrate on reducing the amount of sunlight that reaches the forest floor and planting temporary "grasses" in troublesome areas that seem to have persistent invasive plant populations. This author has noted that areas that have increased levels of light and have been planted with shade tolerant grasses, seeded and properly limed, fertilized and mulched have been highly successful in precluding invasive plants from becoming re-established in certain areas of the park,

6) **Maintain a 100-foot wide corridor along all existing roads and trails as defined below:**

a) **Step 1:** Encourage "total-shading" of the forest floor using all methods stated herein, whenever and wherever appropriate to reduce the likelihood that invasive plants will germinate and grow.

b) **Step 2:** Large trees have and will continue to drop out of the forest canopy along the trail system. Current conditions are preventing natural tree regeneration and replacement from occurring (see CDL requirements beginning on page 40 for further explanation). Therefore, proactively plan for the eventual loss of "high-risk" overstory trees by:

i) Identify and GPS the locations of the most hazardous or high-risk trees *(public participation is encouraged throughout the following practices).*

(1) Over the next ten years identify, catalog and label 100-200 trees that are most at risk. Use the assistance of a forester to identify these trees based on each trees health, vigor, or potential to disturb, disrupt, or negatively affect the existing trail system and the surrounding biota. Also, consider safety concerns with regards to above ground root structures, broken or dead limbs/crowns, and leaning or root-sprung trees.

(2) Underplant each identified tree with 15-25 shade tolerant trees and/or shrubs. Plant indigenous shade-tolerant species to encourage uneven-aged management opportunities in future stands. Include sugar maple, red spruce, American beech, white spruce, dogwood, redbud, and serviceberry in those species to be planted. A site fully occupied with desirable vegetation is much less likely to become occupied with invasive plants.

(3) Protect all seedlings with deer fencing that is appropriate for the number and distribution of seedlings planted. Fencing methods may range from the standard "total area/full height" fencing used elsewhere in the park to individual tree shelters fabricated from an appropriate wire mesh fencing materials. The height, diameter, gauge, and mesh size of the fabricated shelters should be sufficient to protect each seedling until they reach 3 to 4 inches DBH; metal fencing is preferred over plastic; individual "tube-type" plastic tree shelters are not recommended for this type of planting.

(4) Remove invasive plants and interfering understory vegetation as necessary to secure satisfactory growth rates among the planted seedlings.

ii) Provide for replacement of any overstory trees located along the trail system (in the preceding manor) that for whatever reason falls from the canopy; even if the tree was not identified and cataloged as described above.

iii) Maintain a "Catalog of High-Risk Trees" at all times that includes 100 to 200 trees.

iv) On occasion, certain trees may be recommended/desired to be cut within the trail corridor for various reasons. A current example of this dilemma is the Emerald Ash Borers (EAB) decimation of white ash throughout all portions of the property. Though there are very few ash trees along the trail system as a whole, certain individual trees may require felling and replacement as outlined above. The previous forest stewardship plan did not address any mechanism for an inevitability such as this to occur. Therefore, it is recommended that candidate trees (i.e. cataloged as high-risk or otherwise determined to be hazardous or undesirable) be identified and presented to the board for discussion as to how to handle them on a tree to tree basis.

7) **Encourage Shade-Tolerant Plant Species:** Shade tolerant plant species area elemental to perpetually maintaining aesthetic appeal along the trail corridors at Gov. Dick. Shade tolerant species are able to enhance and sustain visually interesting vegetative structuring and provide desirable habitat components lacking elsewhere within the forest. Therefore, encourage the establishment of shade-tolerant species along the various portions of the trail system "perpetually" over time. This is an ongoing project that should not end. Proceed as follows:

a) Select opportunistic sites (areas of increased sunlight) along existing trails to plant shade tolerant woody plant. Include both conifer and hardwood species. Include both overstory and understory species that are native and "colorful". Include species such as red spruce, white spruce, sugar maple, Eastern hophornbeam, American hornbeam, American beech, American holly, basswood, mountain laurel, serviceberry, dogwood and other species of similar shade tolerance. Study their particular soil type requirements and natural plant associations to determine the best species mixes to plant for a specific location.

b) Remove interfering understory vegetation via herbicides wherever encountered.

c) Protect all seedlings with deer fencing that is appropriate for the number and distribution of seedlings planted. Fencing methods may range from the standard "total area/full height" fencing as currently used elsewhere in the park to individual tree shelters fabricated from an appropriate wire mesh fencing materials. The height, diameter, gauge, and mesh size of the

fabricated shelters should be sufficient to protect each seedling until they reach 3 to 4 inches DBH. Metal fencing is preferred over plastic. Individual "tube-type" plastic tree shelters are not recommended for this type of planting.

d) Plant only short, discrete manageable sections of trail up to 100 feet in length and within 100 feet of the trails edge in this manner. Monitor the progress of the plantings over time to assure that these plantings persist. This is an ongoing project that can be enhanced greatly by forming a "Planting Committee" to design projects, select appropriate locations and species to plant, and ultimately prepare, plant, and protect the planted sites. Input from the Audubon Society and other interest groups would make the projects more interesting. The key to a successful planting program is not to become overwhelmed with work, but rather to build a legacy "plant-by-plant" that contributes to the greater good of the park.

8) **Water Control Structures:** Maintain erosion control structures throughout the trail system. Install new erosion control structures as needed to minimize trail degradation due to erosion.

9) **Trails for Special or Restricted Use:** All trails at Gov. Dick are not able to sustain heavy-use traffic such as that from horseback-riders and bike traffic. Hydric soils, steep terrain, excessive rockiness, seasonally wet or weeping grounds, spring seeps and riparian area are all valid reasons to designate certain trail segments as low-impact, "Foot Travel Only" areas. Handicapped accessible trail segments may also be defined and improved for this purpose. Consider suitable trail segments that are easily accessible via well established and safe parking areas.

10) **Park Benches along Trails:** Set park benches at various locations along the trail system. Ideally the benches should be set off the trail far enough to allow unobstructed use of the trails and adequate room for bikes and horses to remain off-trail. A hitching rail and/or bike rack will add greatly to the appeal of the site. Clear and maintain only as much space as necessary to accommodate the facilities heretofore mentioned. Locate park benches only where drainage is excellent and the presence of standing water is never at question. Always locate on slightly sloping ground. Locate near intersections of trails whenever possible. Do not overpopulate the trail system with benches; rather locate sparingly within a 10-minute walk of existing parking areas. This strategy will help accommodate the elderly or handicapped individuals by providing resting facilities within a mild walk of their vehicles. Try to incorporate several cultural, geologic, or physical points of interest at each park bench. Even tree identification plaques will peak many people's interest.

11) **Vistas:** Several scenic overlooks can be created to increase the enjoyment and appreciation felt by hikers, mountain bikers, and horseback riders. Numerous rock outcrops along the ridgeline of Gov. Dick Hill and several lesser "benches" at lower elevations provide ample opportunities to overlook the woodlands below. Several possible vista locations have been marked on the map. Most vista locations are intended to overlook interior woodland environments and not to overview the countryside. Therefore, do not clear trees from the vista. Encourage vista use by constructing short "spur" trails to their location from nearby existing trails. Name each vista location and post at appropriate spur intersection. Visitor familiarity is enhanced when place names can be referenced to locations they visited at Gov. Dick.

MANAGEMENT UNIT #2 North Slope – Mature Mixed Oak

Acres: 225

Forest Type: .....AH21 – Dry Oak – Heath Forest

Forest Type (SILVAH):.....Mixed Oak

Site Index: .....67 for Black Oak

OBJECTIVE

- Initiate the establishment of oak regeneration - reduce negative impacts caused by competing vegetation and invasive plants; high deer population levels, and inadequate light levels that are impeding the development of advance regeneration within the stand.
- Encourage structural diversity by employing mast trees release techniques and group selection methods when overstory removal harvests are scheduled.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species
- Emerald Ash Borer (EAB) – White ash is very scarce in this management unit. Remove Ash from isolated sites where groupings of white ash exist.

CURRENT DESCRIPTION

Dominant Species: CO, BO, BB, RO
Basal Area: 130 sq. ft.
Relative Density:.....107%

Dominant and Co-Dominant Trees:

Merchantable Medial Diameter:.....18.2"

Class:.....Large sawtimber

Limiting Factor to Regeneration (CDL):

Competing Vegetation: .....☑
Deer: .....☑
Light:.....☑

Invasive Species:

☐ Abundant enough to require control before increasing light levels on the forest floor.

☑ Present or in close proximity to the management unit. Seeds of invasive plants are likely present in the seedbank. Monitor and assess the need to control invasive plants before, during and/or after a planned or unplanned disturbance occur that increase light levels on the forest floor.

☐ Invasive populations are not likely to have significant impact beyond that of native-aggressive vegetation (e.g. fern, spicebush, pawpaw). Control invasives while controlling other interfering understory vegetation.

☐ N/A

SILVAH: Narrative Summary and Analysis (2016 inventory data)
Nonnative invasive species have the potential to displace native vegetation, including desirable timber species. There were no invasives in the overstory, three invasives in the overstory (Japanese stiltgrass, Japanese barberry and multiflora rose), and nine that were found outside the plots (Japanese stiltgrass, Japanese barberry, multiflora rose, ailanthus, garlic mustard, unspecified non-native shrub, Norway maple, Tatarian honeysuckle and elaeagnus).

This mixed oak stand is dominated by Chestnut Oak, Black Oak, Black Birch, Red Oak, Yellow-poplar and Red Maple which together comprise 88 percent of the basal area.

This is a large sawtimber stand, with average medial diameter of 16.6 inches.

If this stand is managed under an even-age silvicultural system, the several species groups will mature at markedly different times. The average time to maturity (MDM = 18 inches) is 0 years. The manager wishes to regenerate the stand now. Effective stand age is about 115 years.

Relative stand density is 107 percent of the average maximum stocking expected in undisturbed stands of similar size and species composition. This density is well above the optimum for best individual tree growth. At this relative density, growth rate of the biggest trees is probably moderate, while growth rate of the medium and smaller-sized trees is probably poor and mortality due to crowding high.

Total growing stock amounts to 130 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 31.1 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 17.2 cords of pulp wood and 10107.1 board feet of sawtimber (International 1/4-inch log rule).

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 17 sq. ft. of basal area and may need to be treated prior to final harvest cutting.

Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand.

Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover and dense fern cover.

MANAGEMENT RECOMMENDATIONS

Summary of Management Activities

SILVAH recommends: Fence, Site Preparation Burn or Herbicide, Monitor Acorns, Re-inventory.
Seedlings are too scarce at this time. Wait for an acorn crop and re-inventory 2-5 years later. This prescription is appropriate for stands that are between large acorn crops and not affected by shade, but interfering vegetation is a problem and a fence is required to exclude deer. Such stands have an adequate seed source but are lacking oak regeneration. The Deer Impact Index is greater than 3, stocking of interfering vegetation is greater than 30 percent, and stocking of thick duff is 30 percent or less. These stands need time for an acorn crop to occur and for subsequent seedling establishment so it is best not to intervene at this time. Depending on the viability of burning the stand, conduct one or more prescribed fires or apply herbicides per the instructions in the Site Prep Burn or Herbicide descriptions. If using fire, conduct one or more burns according to instructions in the Site Prep Burn description. If applying herbicide, use one or more of the methods described in the Herbicide description. Construct a fence per the instructions in the Fencing description. It is important that these treatments are applied

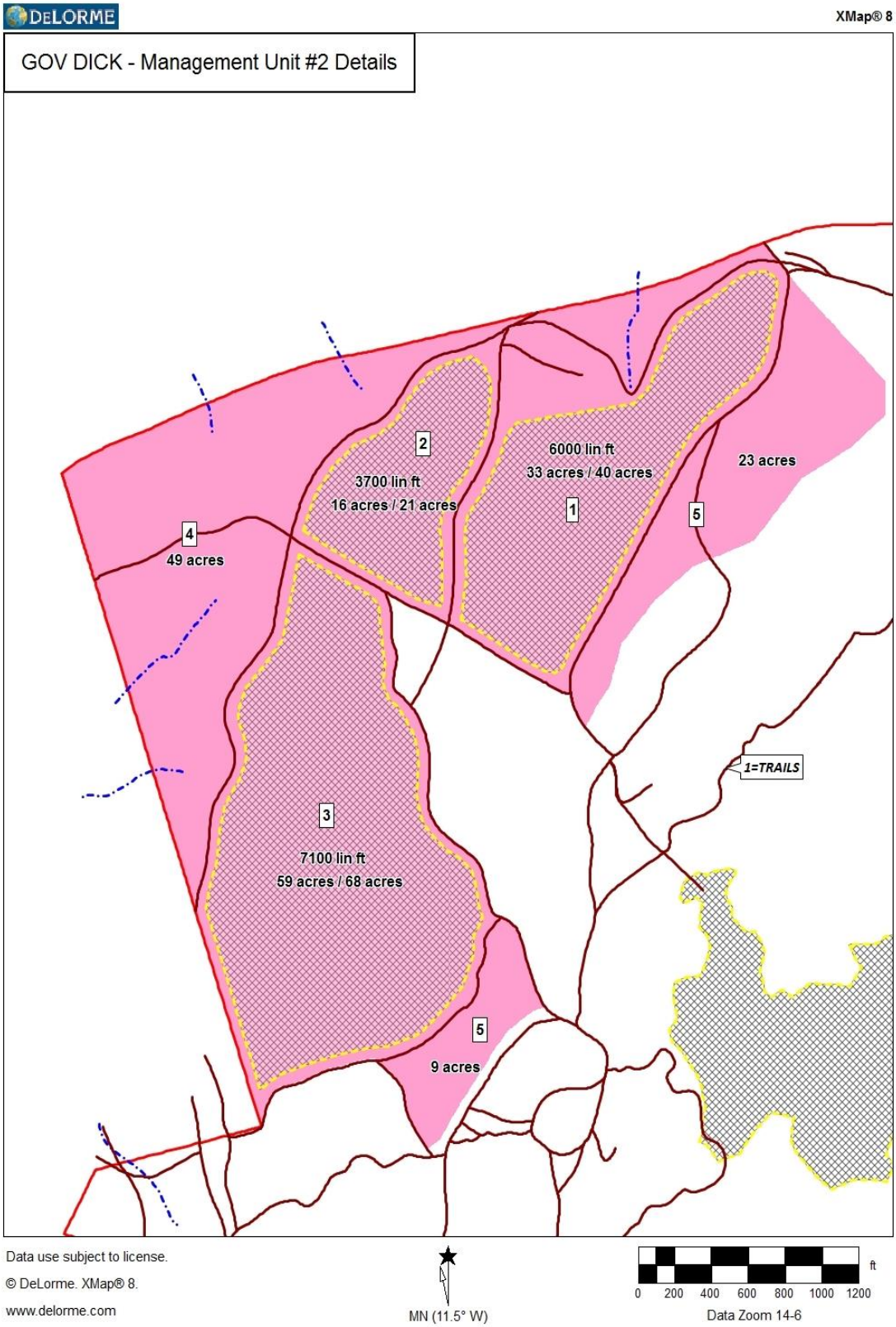
within the same year. Monitor acorn crops and inventory the stand 2 to 5 years after a good acorn crop has established a cohort of new oak seedlings to determine the next treatment.

Additional treatments:

1) *Apply a site-prep burn when conditions are appropriate, or treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season. This type of prescribed fire prepares an oak stand for eventual oak seedling establishment after a future acorn crop. The objective is to reduce dense understory shade and litter loadings so that a larger proportion of an acorn crop successfully germinates and becomes seedlings. Burning can be done in the dormant season (fall or early spring) or growing season (late spring) and at any intensity. However, high-intensity fires (flame lengths greater than 2 feet) in the late spring decrease dense understory shade more quickly than low intensity fires in the fall or early spring. Generally, multiple fires spread over several years are necessary to reduce dense understory shade to a level that improves the survival and growth of new oak seedlings. Do not burn if an acorn crop has just fallen or if new oak seedlings from a recent acorn crop are needed to help regenerate the stand as fire kills acorns and small oak seedlings (Auchmoody and Smith 1993). Please refer to the silvicultural guide for details about implementing this prescription.*

2) *Current deer levels will likely prevent regeneration developing into a new stand. Fencing is recommended to protect seedlings from deer. A fence can be constructed either before or after treatment. If fencing is constructed after treatment, fencing should be done as soon as possible.*

Details of Management Activities



Stand Prescription:

Mgmt. Unit #	Location Number	Sequence	Practice Description	Acres	Fence Perimeter (lin. Ft.)	Year Planned	NRCS Practice Code	NRCS Scenario Number
2	1 and 2	1	Low Shade Removal	42.2		2017	647	6
	1	2	Fence	33	6,000	2019	382	50
	1	3	Herbicide fern, spicebush, pawpaw, invasives before planting	40		2019	490	3
	1	4	Planting : shade-tolerant species (200 seedlings/acre)	8		2020	612	40
	1	5	Mast Tree Release	33		2026	TBD	
	2 and 3	1	Low Shade Removal	48		2018	647	6
	2	2	Fence	16	3,700	2020	382	50
	2	3	Herbicide fern, spicebush, pawpaw, invasives before planting	21		2020	490	3
	2	4	Planting : shade-tolerant species (200 seedlings/acre)	5		2021	612	40
	2	5	Mast Tree Release	16		2026	TBD	
	3 and 4	1	Low Shade Removal	48		2019	647	6
	3	2	Fence	59	7,100	2021	382	50
	3	3	Herbicide fern, spicebush, pawpaw, invasives before planting	68		2021	490	3
	3	4	Planting : shade-tolerant species (200 seedlings/acre)	13		2022	612	40
	3	5	Mast Tree Release including group selections around white pine	59		2026	TBD	
	4 and 5	1	Low Shade Removal	48		2020	647	6
	4	2	Fence - evaluate need for fence one growing season after the completion of pervious fences	TBD	TBD	TBD	382	50
	4	3	Herbicide fern, spicebush, pawpaw, invasives before planting	49		2020	490	3
	4	4	Mast Tree Release including all White Pine	49		2026	TBD	
	5	1	Low Shade Removal	23.8		2021	647	6
	All		Maintain fence perimeters as needed			All		

1) Remove low shade by cutting/mowing all black birch, red maple, black gum and sassafras understory trees 2 to 12 inch DBH. This practice will reduce: basal area by approximately 25 sq. ft. per acre; relative density by approx. 28%; and remove approx. 256 saplings and 38 pole trees per acre. Complete 42.2 acres of low shade removal in locations 1 and 2 the first year. Then in the next three years, complete 48 acres each year. In the 5th year complete 23.8 acres of low shade removal. Remove low shade both inside and outside each planned fence perimeter and along all adjacent trail segments.

2) Construct one fence per year for 3 years. Construct each fence one to two growing seasons after low shade removal has been completed in each of three locations.

3) Apply herbicide to interfering understory vegetation and invasive plants both inside and outside of each planned fence immediately before or immediately after the construction of each fence. The timing of the herbicide application will be dependent on which growing season best matches the planned fence completion date.

4) Plant conifers and shade tolerant species within each fence upon its completion. Refer to Mgmt. Unit #1, Section 7 for further detail. Fall planting is preferred but spring planting is acceptable. 200 seedlings per acre should be planted on approximately 25% of the available area within each fence.

5) Allow white pine to naturally reproduce by increasing light levels on the forest floor. This can be accomplished by culling or harvesting groups of trees adjacent to the white pine. Select one of the best white pine specimen trees on each acre to create a ¼-acre opening in the forest opening. If several likely candidates can be found per acre intersperse mast tree release technique as well. Be conservative with group selections since different areas of white pine can be regenerated at varying intervals in the future. This practice is an important concept since it

takes advantage of existing conifers to naturally increase the amount of low conifer cover on the property. Plan to increase the size of these openings as seedlings become established in the future.

6) Emerald Ash Borer (EAB) – White ash is very scarce in this management unit. Locate and remove white ash from isolated sites where groupings of white ash exist if economically desirable.

Desired Future Stand Condition

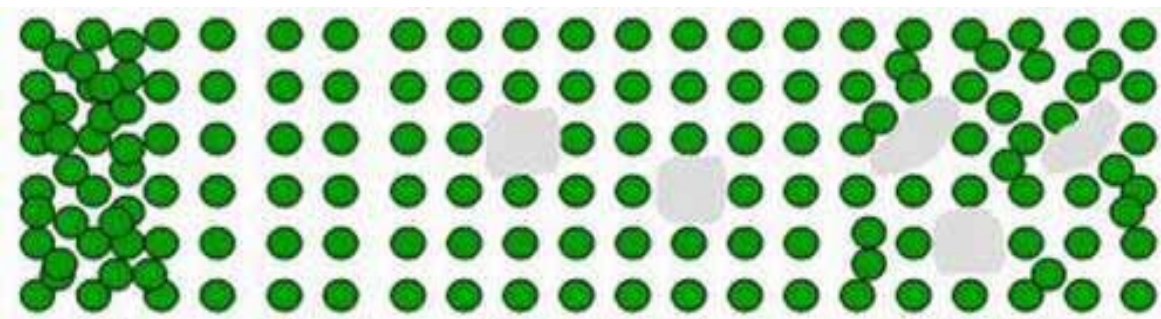
Desired future forest type: Mixed Oak with planted conifers and shade tolerant species, reduce basal area to approx. 105 sq. ft. during the low shade removal process. Future overstory removal should incorporate mast tree release and group selection silvicultural methods to ultimately achieve the stand structure indicated in the "Bird's eye view" (below).

Desired species to naturally regenerate: All Oaks, black gum, sassafras, American beech.

Desired species to plant (if applicable): White pine, white spruce, sugar maple, basswood, others as specified.

Bird's eye view of desired future forest stand (check one):

☐ Wild stand - Some Wildlife ☐ Evenly spaced - Maximizes growth ☐ Evenly spaced with openings Growth + Regeneration ☑ Variable density spaced with openings Some growth + Wildlife + Regeneration



Desired stand structure (check one):

☐ One Canopy Layer ☐ Two Canopy Layer ☑ Three Canopy Layer

MANAGEMENT UNIT #3 Black Birch Saplings

Acres: 28

Forest Type: .....AH21(past) converted to BB23(current)

Forest Type (SILVAH):.....Allegheny Hardwood

Site Index: .....67 for Black Oak

OBJECTIVE

- Control invasive plant species whenever possible by including appropriate portions of this management unit with other invasive plant control projects when feasible.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.

CURRENT DESCRIPTION[2]

Dominant Species: .....BB, BC, Misc. Comm. Spp.

Basal Area: .....96 sq. ft.

Relative density:.....77%

Dominant and Co-Dominant Trees:

Merchantable Medial Diameter:.....7.2"

Class:.....Small poletimber

Invasive Species:

☐ Abundant enough to require control before increasing light levels on the forest floor.

☑ Present or in close proximity to the management unit. Seeds of invasive plants are likely present in the seedbank. Monitor and assess the need to control invasive plants before, during and/or after a planned or unplanned disturbance occur that increase light levels on the forest floor.

☐ Invasive populations are not likely to have significant impact beyond that of native-aggressive vegetation (e.g. fern, spicebush, pawpaw). Control invasives while controlling other interfering understory vegetation.

☐ N/A

Invasive Species Present: Japanese angelica tree, Japanese barberry, Japanese stiltgrass, ailanthus, garlic mustard, multiflora rose, and elaeagnus.

A timber harvest occurred in this management unit around 1995-1998. The original unit probably resembled the timber structure found in Mgmt. Unit #2 – less the growth/stand development that occurred over the last ±20 years (i.e. AH21 – Dry Oak – Heath Forest). The present stand

[2] *Without residuals included.*

indicates that the harvest likely resembled a "clearcut with residuals". There is no evidence that advanced regeneration was present at the time of the harvest nor evidence that any follow-up practices ensued to assure the establishment of desirable regeneration. The present-day stand predominantly regenerated to black birch (44%), black cherry (29%), black gum, tulip poplar, sassafras (total 96% BA). A few oaks and poplar stump sprouts were evident in the last survey as were a preponderance of invasive plants. However, no stump sprouts were observed in this survey and invasive plant populations have subsided likely due to the establishment of a midstory canopy dominated by black birch. No oaks and very few poplars were found originating from seed. Over browsing by deer has likely prevented more desirable species from regenerating successfully. The harvest has transitioned the current plant community type to most closely resemble that of a BB23 classification code.

Non-commercial saplings and poles represent 40 sq.ft. of basal area and may need to be treated in future forest management activities.

MANAGEMENT RECOMMENDATIONS

SILVAH recommends: Defer Cutting (low relative density).
The stand is not yet mature (53 years to maturity) and the user does not wish to begin regeneration now. The relative density is 76.8% which is below the 80% threshold considered necessary for a partial cut. Immature or all-aged stands that are within or below the optimum range of stand density do not need any sort of partial cutting. In such a stand, the best prescription is to leave the stand alone for 10 or 15 years, and then re-examine it to see what treatment is appropriate at that time.

- Control invasive plant species whenever possible by including appropriate portions of this management unit with other invasive plant control projects when feasible.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.

MANAGEMENT UNIT #4 Allegheny Hardwoods

Acres: 39

Forest Type: .....TM12 – Tulip-poplar, beech, maple

Forest Type (SILVAH):.....Allegheny Hardwood

Site Index: .....90 for Tulip poplar

OBJECTIVE

- Control invasive plant species whenever possible by including appropriate portions of this management unit with other invasive plant control projects when feasible.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.
- Emerald Ash Borer (EAB) – Remove Ash from isolated sites where groupings or large individual white ash exist. Commence regeneration activities where significant ash removal occurs.

CURRENT DESCRIPTION

Dominant Species: TP, BB, WA, CO, HIC, AB
Basal Area: .....120 sq. ft.

Relative density:.....64%

Dominant and Co-Dominant Trees:

Merchantable Medial Diameter:.....17.7"

Class:.....Medium/Large Sawtimber

Limiting Factor to Regeneration (CDL):

Competing Vegetation: .....☑
Deer: .....☑
Light:.....☐

Invasive Species:

☑ Abundant enough to require control before increasing light levels on the forest floor.

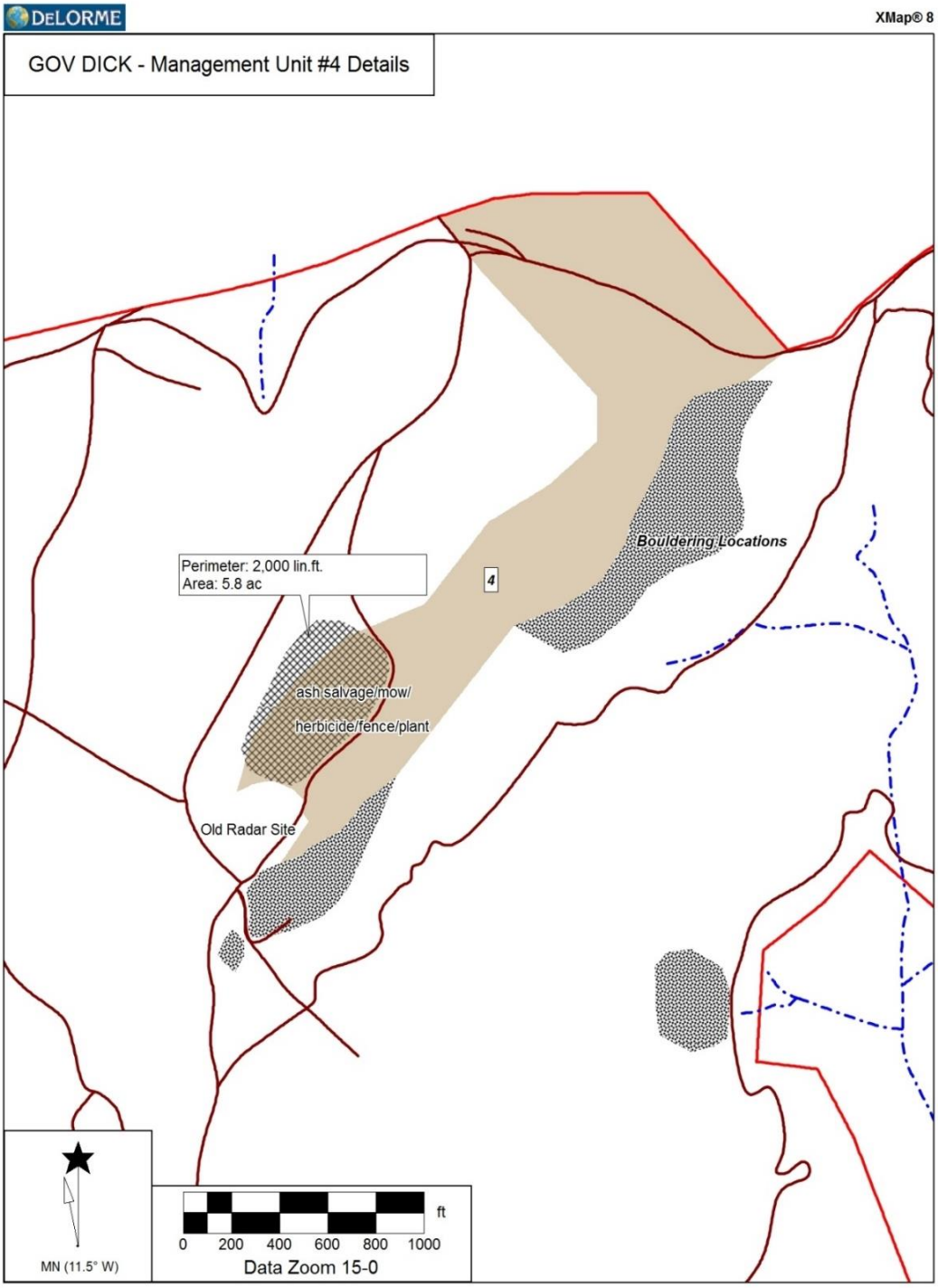
☑ Present or in close proximity to the management unit. Seeds of invasive plants are likely present in the seedbank. Monitor and assess the need to control invasive plants before, during and/or after a planned or unplanned disturbance occur that increase light levels on the forest floor.

☐ Invasive populations are not likely to have significant impact beyond that of native-aggressive vegetation (e.g. fern, spicebush, pawpaw). Control invasives while controlling other interfering understory vegetation.

☐ N/A

Invasive Species Present: Japanese barberry, Japanese stiltgrass, ailanthus, garlic mustard, multiflora rose.

Mgmt. Unit #4 can best be described as a transitional zone between the mixed oaks found in Mgmt. Unit #2 to the north and west of this unit and the nearly pure/very large sawtimber stand of tulip



poplar found in Mgmt. Unit #5 to the south and east. Whereas Mgmt. Unit #2 lays mostly on the northwest aspect of Gov. Dick Mountain and Mgmt. Unit #5 occupies the southwest slope; Mgmt. Unit #2 (and #6) follow the ridge area separating the other two.

Non-commercial saplings and poles represent 13 sq.ft. of basal area and may need to be treated in in current forest management activities.

Interfering Understory Vegetation: Undesirable understory plants may interfere with development of regeneration. Understory plants in this stand include dense low woody cover, dense tall woody cover and dense fern and grass cover.

MANAGEMENT RECOMMENDATIONS

Summary of Management Activities

SILVAH recommends: Herbicide, fence.

A shelterwood sequence, which would normally be recommended here, may not work because relative density is already low and competitive regeneration is lacking; further reductions in density probably won't help. A combination of high deer density and low seed production will probably make it difficult to get adequate competitive regeneration established. Protect the stand from deer browsing with a fence. Overstory density is low enough and seed supply sufficient for competitive regeneration to become established within 3 - 10 years. Fencing is recommended to protect seedlings from deer.

Warnings:

- The merchantable medial diameter (17.7) is just below the 18-inch decision point in Chart A; the stand may be mature.
- The relative density of AGS (38.4) is just above the 35% decision point in Chart A; the stand may not be mature.

Additional treatments:

- Treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season. Herbicide is an effective, safe and economical technique for removing vegetation that interferes with establishment and growth of oak regeneration. There are five different application techniques for using herbicides to control interfering vegetation. Each is matched with a specific set of conditions where it will provide effective control. With all, be sure to follow all instructions on the herbicide label, wear appropriate safety clothing and equipment, and follow applicable laws with regard to herbicide applicator licensing. Please refer to the silvicultural guide for details about implementing this prescription.
- Current deer levels will likely prevent regeneration developing into a new stand. Fencing is recommended to protect seedlings from deer. A fence can be constructed either before or after treatment. If fencing is constructed after treatment, fencing should be done as soon as possible.

These prescriptions generally produce the desired results, require an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

Details of Management Activities

Stand Prescription:

1) Emerald Ash Borer (EAB) – This management unit has a higher percentage of white ash than other units. Remove Ash from isolated sites where groupings or large individual white ash exist. Leave already dead ash less than 16" dbh as standing dead trees. Other ash can be left standing if their quality is not sufficient to warrant removal.

2) 5.8 acres have been identified in this unit (see map) that are in particular danger of being overrun with invasives plant populations. Very high concentrations of mile-a-minute (MAM) are located on the fringes of the "old radar site". This area has had multiple herbicide applications in recent years in attempts to control the situation. The identified site contains white ash in numbers sufficient to trigger a proliferation of MAM in the understory once the ash succumbs to the imminent EAB infestation. Therefore, implement the following procedure as soon as possible to mitigate the potential impact of the "lost" overstory trees.

   a) Salvage ash within and near the identified fence area.

   b) Mechanically remove all spicebush, witch hazel, Tartarian honeysuckle, multiflora rose and other shrub species. Include black birch and red maple saplings up to 6 inch dbh. in the mowing process. Mowing is desired for aesthetics; to reduce the amount of low shade; and to prepare the site for fencing and planting. Mowing should include all area up to and including the northern side of trail #11.

   c) Apply Plateau® or Oust® pre-emergent herbicide (or equivalent) in March or April to prevent MAM from spreading/growing into the prepared area.

   d) Apply a broad-spectrum herbicide mix such as Roundup Pro Concentrate® (or equivalent) at a rate of 3 quarts per acre + Garlon 3A® at a rate of 1 qt. per acre. in the latter part of the 2nd growing season (after the mowing). This application will target sprouts that emerge from the mowed shrub and trees.

   e) Construct a deer exclosure fence on the 5.8-acre (approximately 2000 lin.ft.) area any time after the salvage and mowing is complete and before planting as required in the next step.

   f) The soil in this area is among the most fertile found at Gov. Dick and is less rocky than most other areas of the property. Plant 200 shade-tolerant species (per acre): Include both conifer and hardwood species which are both overstory and understory species. Include native and "colorful" species such as red spruce, white spruce, sugar maple, Eastern hophornbeam, American hornbeam, American beech, American holly, basswood, serviceberry, dogwood and other species of similar shade tolerance.

   g) Monitor and continue to remove invasive and interfering understory vegetation via herbicides after the planting. Monitor the progress of the plantings over time to assure that these plantings persist.

   h) Control invasive plant species whenever possible elsewhere in the management unit by including appropriate portions with other invasive plant control projects when feasible.

i) Follow SILVAH recommendations elsewhere in the management unit if and when time and resources permit. Use same methodology as outlined above.

MANAGEMENT UNIT #5 South Slope - Primitive Areas

Acres: .....527 acres

Forest Type: .....TM11 - Tulip poplar, beech, maple

Forest Type (SILVAH):.....Allegheny Hardwood

Site Index: .....90 for tulip polar

OBJECTIVE

- Define and establish a 54-58-acre site where desirable advanced tree regeneration can be created before stocking falls critically low. Control invasive plant species whenever possible by including appropriate portions of this management unit with other invasive plant control projects when feasible.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.
- Emerald Ash Borer (EAB) – Remove Ash from isolated sites where groupings or large individual white ash exist.

CURRENT DESCRIPTION

Dominant Species: TP, BB, WO, HIC
Basal Area: 125

Relative Density:.....61%

Dominant and Co-Dominant Trees:

Average Diameter: .....21.1"

Class:.....Large sawtimber

Limiting Factor to Regeneration CDL:

Competing Vegetation: .....☑
Deer: .....☑
Light:.....☐

Invasive Species:

☑ Abundant enough to require control before increasing light levels on the forest floor.

☐ Present or in close proximity to the management unit. Seeds of invasive plants are likely present in the seedbank. Monitor and assess the need to control invasive plants before, during and/or after a planned or unplanned disturbance occur that increase light levels on the forest floor.

☐ Invasive populations are not likely to have significant impact beyond that of native-aggressive vegetation (e.g. fern, spicebush, pawpaw). Control invasives while controlling other interfering understory vegetation.

☐ N/A

Invasive Species Present: Japanese stiltgrass, Mile-a-minute, Japanese barberry, multiflora rose, garlic mustard, ailanthus, and Norway maple.

Interfering Understory Vegetation: Undesirable understory plants may interfere with development of regeneration. Understory plants in this stand include dense low woody cover, dense tall woody cover and dense fern cover.

This management unit contains large areas of continuous rock outcroppings. Rock, boulders, and "rubble land" cover 100% of the ground surface on approximately 200 acres of this management unit. At least 85 acres of this area are suitable for prime "Bouldering" activities (see included map for locations). The rocks, boulders, and sometimes steep terrain make it impossible for modern ground equipment to traverse the terrain. Cable logging and/or helicopter logging techniques are both too costly and "not-in-line" with the aesthetic and public use values assigned to this property.

On average, the stand has a relative density of 61%. This density is lower than expected for undisturbed stands of similar size and species composition. Many, many downed trees can be observed throughout the unit but are especially evident in the rockiest, most bouldery and exposed sections of the unit. Many downed trees are over 100 feet tall (including the canopy) and range from 24 to 36 inches dbh. The large, heavy-topped trees likely succumb to windthrow as a result of shallow, uneven rooting caused by the rocks and boulders. Species are mostly comprised of tulip-poplar but also include all oak species and ash. Below is an aerial photo showing a sample of uprooted trees in the management unit.

A real and imminent situation is developing in portions of this management unit that cannot easily be remedied. The causes contributing to this phenomenon are as follows:

- As overstory trees continue to drop out of the canopy, invasive and native-aggressive grasses vines, and shrubs are expanding to take their place. Absolutely no meaningful tree regeneration is occurring in this unit to alleviate the situation.
- Deer are also contributing to the lack of regeneration because of their preferential browsing habits. The remoteness of this unit has created a refuge, of sorts, where deer flee the surrounding communities and game lands in search of sanctuary during and after the deer hunting seasons have ended. Deer yarding activity has been observed in this management unit. Deer yarding is an instinct deer have where they reside and browse for extended periods in a small area so that they (the herd) can collectively conserve energy through the winter months. Coyote kills can attest to this phenomenon as me and other park patrons have noted numerous predation sites (of fawn and yearling remains) in the spring of the year.
- The remote nature and physical characteristics of the terrain severely limit the ability to apply silvicultural prescriptions in a meaningful and coherent manner.

Trees of acceptable quality for future growing stock provide enough stocking by themselves to warrant stand management. Non-commercial saplings and poles represent 9 sq. ft. of basal area and may need to be treated prior to final harvest cutting.

A combination of undesirable understory plants and site limitations are likely to interfere with the development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover, dense fern cover and dense grass cover. The limitations on this stand include rocky surfaces.

MANAGEMENT RECOMMENDATIONS

Summary of Management Activities

SILVAH recommends: Fence, artificial regeneration.

A shelterwood sequence, which would normally be recommended here, may not work because relative density is already low and competitive regeneration is lacking; further reductions in density probably won't help. Identify long-term residuals and islands with complex vertical structure. Retain these through the final overstory removal. Favor species (yellow poplar, white oak, black oak, northern red oak and chestnut oak) with high wildlife value for retention and planting.

Warnings:

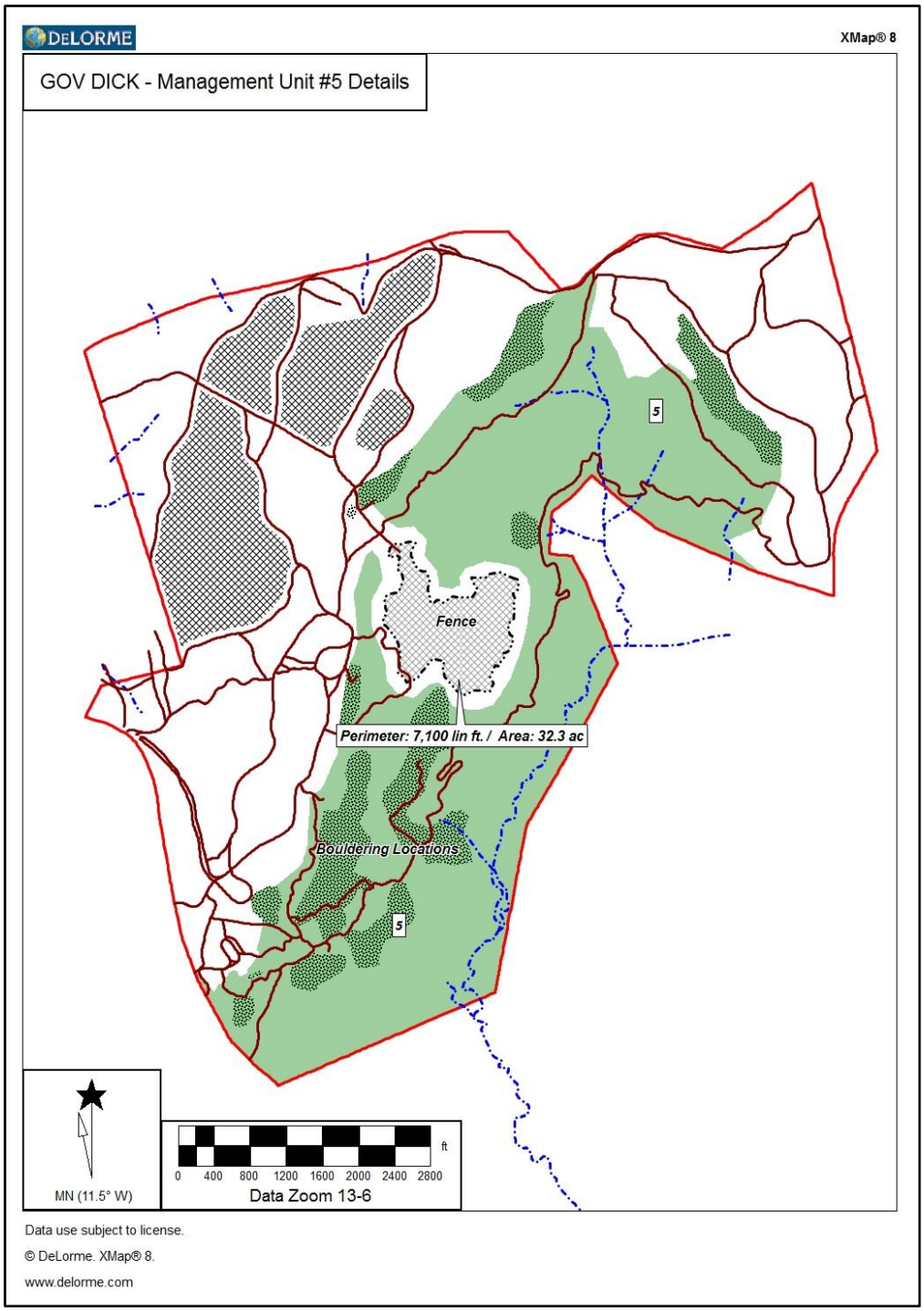
- The relative density of AGS (39.8) is just above the 35% decision point in Chart A; the stand may not be mature.

Additional treatments

- Competitive regeneration is lacking, probably due to inadequate seed supply. Artificial regeneration (tree planting) is suggested. Johnson and others (2002) and Dey and others (2008) provide thorough discussions on the intricacies associated with planting oaks. Please refer to the Silvicultural Guide for details about implementing this prescription.

- Current deer levels will likely prevent regeneration developing into a new stand. Fencing is recommended to protect seedlings from deer. A fence can be constructed either before or after treatment. If fencing is constructed after treatment, fencing should be done as soon as possible.

These prescriptions generally produce the desired results, requires an investment, and usually will yield an economic return at the same time. If such investment meets your organization's economic criteria, we recommend it. If not, we recommend no treatment. In the case of regeneration prescriptions, stands generally will not reproduce without the recommended treatment.

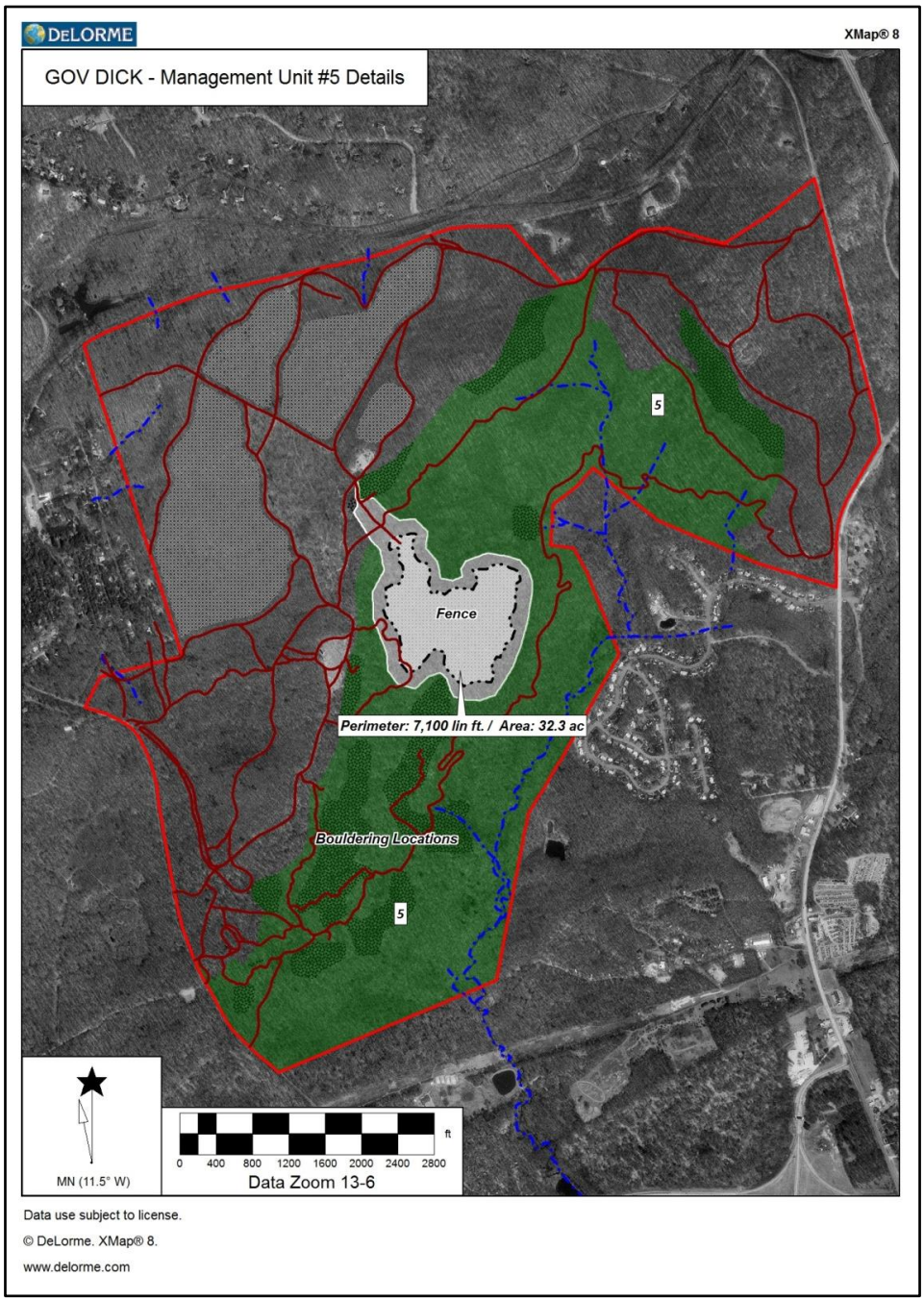


Details of Management Activities

Stand Prescription:

1) Much of this management unit is stable (at this time) and in no imminent danger of decline or collapse. In those areas, little or no action is warranted at this time.

2) However, one area of concern has been identified and defined that needs attention in an attempt to regenerate the site before the site is degraded further. It should be possible to build a 32-acre deer exclosure fence in the location noted on the map below; though site limitations are likely to cause difficulties in construction.



a) First, consult with local Cerulean Warbler habitat specialist to determine the suitability for this site to be considered for a Cerulean Warbler habitat demonstration site. Proceed with his recommendations if conditions are favorable and are able to be integrated into the overall management scheme for this unit.

b) Trees (other than ash) need not be cut during the first stage of the shelterwood sequence as relative density is already low.

c) Herbicide all understory vegetation on the proposed 32-acre fence area AND within approximately 150 feet of the outside perimeter of the fence if rocks, boulders and terrain permit. Total area to be treated is approximately 54-58 acres. The herbicide application outside the fence perimeter should allow natural regeneration to escape significant deer browse damage in hard-to-reach areas amongst the rock and boulders.

d) Construct a deer exclosure fence to encompass approximately 32 acres which is approximately 7,100 lin. ft. in length.

e) Plant 1,000 white spruce and 1,000 white pine in clusters of 20 to 50 seedlings each within the fence. Some clusters should be mostly pine while other groupings should be mostly spruce. Some groupings should be on 10-15 ft. spacing; some should be 15-25 feet apart. Plant where soils permit.

f) Monitor and continue to remove invasive and interfering understory vegetation via herbicides after the planting. Monitor the progress of the plantings over time to assure that these plantings persist. Selective herbicides can be applied over conifers to release for MAM and other invasives if necessary. Consult forester for details.

3) Emerald Ash Borer – Remove ash from the fence area and within the 150-foot wide perimeter around the fence. Other dead trees, leaning trees and others deemed hazardous to the fence should be dropped and utilized if possible.

4) Herbicide interfering understory vegetation and invasive species elsewhere in the mgmt. unit and plant with shade tolerant tree species as time, labor, and resources allow.

Desired Future Stand Condition

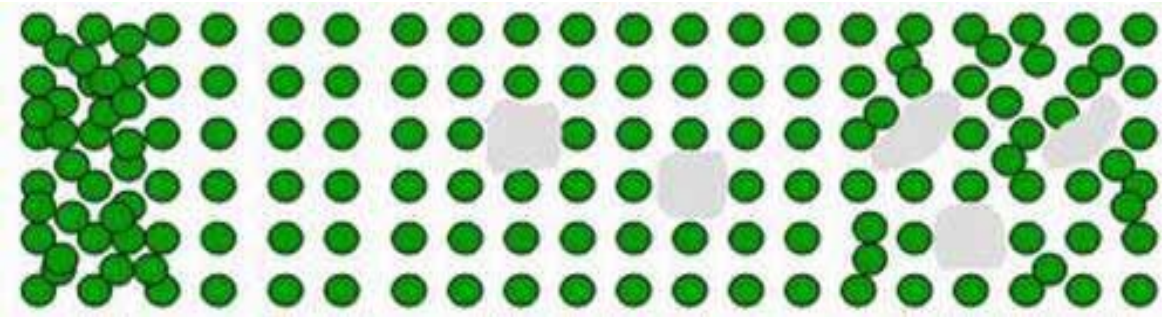
Desired future forest type: TM - Tulip poplar, beech, maple with planted conifers and shade tolerant species, keep basal area at 125 sq. ft. or lower (as needed) to allow for salvage or TSI removal.

Desired species to naturally regenerate: tulip poplar, black gum, sassafras, American beech.

Desired species to plant (if applicable): White pine, white spruce, sugar maple, basswood.

Bird's eye view of desired future forest stand (check one):

- ☐ Wild stand - Some Wildlife
- ☐ Evenly spaced - Maximizes growth
- ☐ Evenly spaced with openings Growth + Regeneration
- ☑ Variable density spaced with openings Some growth + Wildlife + Regeneration



Desired stand structure (check one):

- ☐ One Canopy Layer
- ☑ Two Canopy Layer
- ☐ Three Canopy Layer

MANAGEMENT UNIT #6 Forest Regeneration Projects

Acres: 183

1) Gypsy Moth – Oak Salvage Sale (after harvest)

   Forest Type: .....AH21(original)

   Type of Harvest: .....salvage (dead only)

   Year: 2009

   Acres: 73

   Dominant Species: .....TP, BO, RO

   Basal Area: .....highly variable

   Relative Density:.....highly variable

   Dominant and Co-Dominant Trees:

      Average Diameter: .....greater that 20"

      Class:.....large sawtimber

2) Route 72 Timber Sale (after harvest)

   Forest Type: .....TM11(pre-harvest)

   Type of Harvest: .....shelterwood/thin-harvest/group selection

   Year: 2013

   Acres: 64

      Group Selection (acres): 11

      Shelterwood/thin-harvest: 40

   Dominant Species: .....TP, RO, BO, HIC, WO

   Basal Area: 115

   Relative Density:.....variable 20-60%

   Dominant and Co-Dominant Trees:

      Average Diameter: .....21.1"

      Class:.....Large sawtimber

3) Trail #5 Timber Sale (after harvest)

   Forest Type: .....TM11(pre-harvest)

   Type of Harvest: .....shelterwood/thin-harvest/group selection

   Year: 2014

   Acres: 46

Group Selection (acres):.....6

Shelterwood/thin-harvest:.....32

Dominant Species: .....TP, RO, BO, HIC

Basal Area: 64

Relative Density:.....variable 20-60%

Dominant and Co-Dominant Trees:

Average Diameter: .....21.6"

Class: .....Large sawtimber

OBJECTIVE

Maintain the integrity of the deer fences and continue controlling invasive and interfering vegetation. Monitor the natural and planted reforestation projects. A decline in any planted species should be noted as well as current conditions that may be causing such decline. Take appropriate actions to reduce the mortality of seedlings if possible. Evaluate the need for interfering understory vegetation control outside the fences and take steps to establish desirable regeneration.

CURRENT DESCRIPTION

Three primary forest regeneration projects have occurred in recent years:

1) Gypsy Moth Salvage Harvest: A 72-acre gypsy moth salvage harvest occurred in 2009. During this harvest "Only Dead" trees were harvested due to sensitivity and scrutiny expressed by the local resident. Little to no advanced regeneration existed at the time of the defoliation and harvest. Since the harvest, several TSI projects have taken place. In 2010 three fences (a, b, and c on the map below) were constructed to alleviate deer browse damage. 15,000 seedlings were planted in the fences shortly after their construction to assist with regeneration of the site. A recent survey concluded that only 27% of the planted seedlings remain alive in the stand today. Poor survival rates are likely due to 1) drought conditions that occurred in the spring and early summer of the planting year and 2) native seedling competition. Then in 2013, a TSI was conducted to reduce the number of black birch poles remaining in the stand after the gypsy moth defoliation. Herbicide activities have been ongoing to control MAM and other invasive plants during the regeneration efforts.

2) Route 72 Timber Sale: In 2013 a planned 51-acre harvest occurred that utilized shelterwood, thin-harvest and group selection methods. The purpose of this harvest was to diversify the stand structure through species richness; enhancement of vertical structure and to initiate regeneration which is sorely lacking on the property. A deer exclosure fence (item "d" on map below) was constructed in 2014 that included 23 of the original 51 harvested acres. Group selection harvest occurred on approximately 11 of the 51-acre harvest area.

3) Trail #5 Timber Sale: In 2014, another planned 38-acre harvest occurred that included the same management strategies and techniques as the Route 72 Timber Sale. A deer exclosure fence (item "e" on attached map) was constructed in 2014 that included 18 of the original 38 harvested acres. Group selection harvest occurred on approximately 6 of the 38-acre harvest area.

Herbicide applications were conducted in the summers of 2014, 2015 and 2016 consecutively on the Route 72 and Trail #5 fence projects. The persistence of MAM, ailanthus seed germination and garlic mustard populations required consecutive applications to reduce the threat to planned tree seedling planting that occurred in November 2016.

8,200 seedlings were planted in the two fences (combined) that included 2,000 white spruce, 2,000 white pine, 2,000 red oak, 1,100 sugar maple, and 1,100 black cherry.

The two recent timber harvest areas model the desired level of stand structure complexity that should be encouraged throughout the property. Note the types of silvicultural harvests that were employed and the varying degrees of canopy cover that has been created. Figure 1 shows how varying degrees of crown removal affect the amount of sun reaching the forest floor and how this phenomenon influence the species of tree that is able to germinate and grow in that environment.

Figure 1: Effects of specified silvicultural harvest on light levels reaching the forest floor

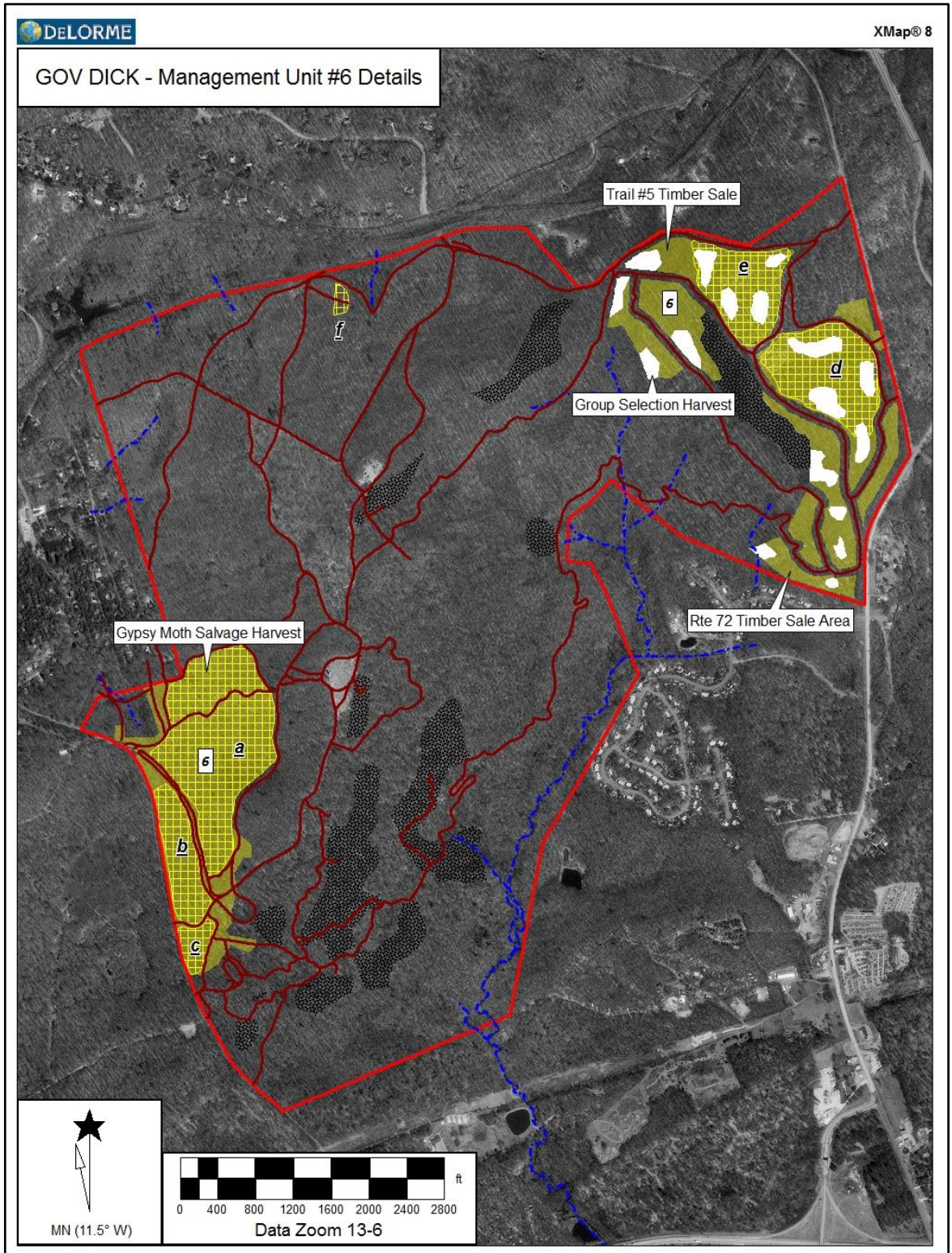
A "CDL" demonstration site has been created to just off Route 117 at location "f" on the map below. This demonstration site exemplifies the concept of "CDL" and is further explained starting on page 40 of this document. Appendix E details the concept and layout of the demonstration site.

MANAGEMENT RECOMMENDATIONS

1) The fences represent a substantial investment in the development of future forests. Therefore, maintain the integrity of all fence perimeters. Repair or reconstruct damaged fence sections promptly. Monitor fences (perhaps by using game "trail" cameras) for the presence of deer. Always exclude deer from the fences, especially during the initial 3 years after their construction. The fences at Gov. Dick are relatively small. Just one deer trapped within a fence during the early stages of tree seedling development can mean the difference between a successful and unsuccessful regeneration project.

2) Monitor and continue to remove invasive and interfering understory vegetation via herbicides after the planting. Monitor the progress of the plantings over time to assure that these plantings persist.

3) Evaluate the need for interfering understory vegetation control outside the fences and take steps to establish desirable regeneration.



MANAGEMENT UNIT #7 Mature Black Birch

Acres: 21

Forest Type:.....BB22 - Northern hardwood

Forest Type (SILVAH):.....Northern hardwood

Site Index: .....67 for BO

OBJECTIVE

- Consult with local Cerulean Warbler habitat specialist to determine the suitability for this site to be considered for a Cerulean Warbler habitat demonstration site.
- Establish advanced regeneration on forest floor within the next ten years.
- Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.
- Emerald Ash Borer (EAB) – Remove Ash from isolated sites where groupings or large individual white ash exist.

CURRENT DESCRIPTION

Dominant Species: BB, BO, WO, TP, AB
Basal Area: 120

Relative Density:.....79%

Dominant and Co-Dominant Trees:

Average Diameter: .....17.4”

Class:.....Large sawtimber

Limiting Factor to Regeneration CDL:

Competing Vegetation: .....☑

Deer: .....☑

Light:.....☐

SILVAH: Narrative Summary and Analysis (2016 inventory data)

Non-native invasive species have the potential to displace native vegetation, including desirable timber species. There was one invasive in the overstory (ailanthus), no invasives in the overstory, and seven that were found outside the plots (ailanthus, Japanese barberry, Japanese stiltgrass, garlic mustard, multiflora rose, Norway maple and Tatarian honeysuckle).

This northern hardwood stand is dominated by Black Birch, Black Oak, White Oak, Yellow-poplar and Beech which together comprise 88 percent of the basal area.

This is a large sawtimber stand with average medial diameter of 17.4 inches.

If this stand is managed under an even-age silvicultural system, the several species groups will mature at markedly different times. The average time to maturity (MDM = 18 inches) is 4 years. The manager wishes to regenerate the stand now. Effective stand age is about 112 years.

If this stand is managed under an all-age silvicultural system, the distribution of diameters, proportion of sawtimber, and density of shade-tolerant species would make it difficult to apply selection cutting.

Relative stand density is 79 percent of the average maximum stocking expected in undisturbed stands of similar size and species composition. This density is in the optimum range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.

Thinning to provide more growing space for the better stems is not necessary at this time.

Total growing stock amounts to 120 sq. ft. of basal area per acre. Net total volume in all trees, to a 4-inch top, is 30.7 cords per acre; if divided into pulpwood and sawtimber, the net merchantable volume is 19.7 cords of pulp wood and 7386.9 board feet of sawtimber (International 1/4-inch log rule). The total stand value is estimated to be about 784 dollars per acre.

Trees of acceptable quality for future growing stock provide a fully stocked stand by themselves. Non-commercial saplings and poles represent 13 sq. ft. of basal area and may need to be treated prior to final harvest cutting.

Competitive regeneration of all types is insufficient; harvest cuttings at this time will not likely result in a satisfactory new stand.

Undesirable understory plants may interfere with development of regeneration. Undesirable plants in this stand include dense low woody cover, dense tall woody cover and dense fern cover.
Treatment Description with Marking Instructions (2016).

MANAGEMENT RECOMMENDATIONS

Summary of Management Activities

<u>SILVAH recommends: Shelterwood seed cut, herbicide, fence.</u>
Use a Two-cut Shelterwood sequence to increase competitive regeneration. The first (seed) cut should reduce relative stand density to 60 percent to provide for the establishment of a large number of additional advance seedlings without allowing them to grow rapidly enough to become attractive to deer. The seed cut made now can be followed in 5 to 10 years by final overstory removal (assuming adequate competitive seedlings develop). A combination of high deer density and low seed production will probably make it difficult to get adequate competitive regeneration established. Overstory density is low enough and seed supply sufficient for competitive regeneration to become established within 3 - 10 years. Fencing is recommended to protect seedlings from deer.

Additional treatments

- Treat the undesirable understory plants with an application of herbicide during the appropriate part of the growing season.

- Current deer levels will likely prevent regeneration developing into a new stand. Fencing is recommended to protect seedlings from deer. A fence can be constructed either before or after treatment. If fencing is constructed after treatment, fencing should be done as soon as possible.

Cut Guides: Reduce relative stand density to 60%. Within the size and quality constraints favor the best trees wherever possible. Try to preserve seed sources of scarce species if they are desired in the regeneration; strive for uniform spacing among residuals whenever possible.

Details of Management Activities

1) First, consult with local Cerulean Warbler habitat specialist to determine the suitability for this site to be considered for a Cerulean Warbler habitat demonstration site. Proceed if conditions are favorable.
2) Or wait 5-10 years, and then initiate the establishment of advanced regeneration using the SILVAH prescription outlined above. Time fence construction to coincide with dismantling of adjacent fences.
3) Enhance stand biodiversity by introducing conifers and shade-tolerant species whenever possible by including appropriate portions of this management unit with other planting projects when feasible.
4) Emerald Ash Borer (EAB) – Remove Ash from isolated sites where groupings or large individual white ash exist.

MANAGEMENT UNIT #8 Historical/Cultural and High Use Sites

Acres: 70

Forest Type: AH21, TM12, TM11
(as per current description below)

OBJECTIVE

- Maintain unit for historical, cultural and social values and activities.
- Assimilate activities discussed on Mgmt. Unit #1 and Mgmt. Unit #9 whenever prudent to do so and as resources allow.

CURRENT DESCRIPTION

Mgmt. Unit #8 is best defined by its historical, cultural and social significance rather than by the forest components found in it. Just as the existing trail system is the "life-blood" of all activities at Gov. Dick; Mgmt. Unit #8 can be characterized as the visual backdrop through which perhaps 80% of all visitors pass. Nearly everyone uses this management unit and the related trail system to traverse from the Environmental Center to the Tower at the summit of Gov. Dick Hill at one time or another. The forest types within this mgmt. unit can be identified by slope and aspect. Detailed descriptions of the north and west slopes of this mgmt. unit are similar to Mgmt. Unit #2; Mgmt. Unit #4 descriptions can be applied to the ridgeline areas of this unit; Mgmt. Unit #5 descriptions apply to the southern and easterly aspects of this mgmt. unit.

MANAGEMENT RECOMMENDATIONS

- Maintain unit for historical, cultural and social values and activities.
- Assimilate activities discussed for Mgmt. Unit #1 and Mgmt. Unit #9 into "like" projects for Mgmt. Unit #8 whenever prudent to do so and as resources allow.

MANAGEMENT UNIT #9 Environmental Center & Other Open Space

Acres: 12

OBJECTIVE

- Provide opportunities to educate the public.
- Encourage meadow areas to flourish to prevent encroachment from invasive species.

CURRENT DESCRIPTION

Open space is found in three locations at Gov. Dick:

1) The Environmental Center located off Pinch Road is surrounded by 4 acres of open space.
2) A beautiful 5-acre meadow was recently created at the summit of Governor Dick Hill adjacent to the Observation Tower.
3) The third location is at the old army radar station site (2,000 feet north of the Observation Tower). Just a few years ago, this 3-acre radar site harbored many herbaceous and woody invasive plant species. With assistance from the NRCS, the site is well on its way to supporting a newly established meadow of warm season grasses.

The Observation Tower itself provides a panoramic view of the horizon. Five counties are said to be visible from atop the Tower —Lebanon, Lancaster, Dauphin, York, and Berks. The best view is perhaps towards the south to southwest horizon. Gretna Springs Retirement Community can be seen near the base of the hill. Manheim, Lititz, and Lancaster are somewhat visible further out on the horizon. The Tower is a very popular destination during all seasons of the year. The view offered during the fall foliage season is particularly attractive and peak use probably occurs at this time of year. Bird watchers can also view migratory birds from atop the Tower in the spring and fall seasons. However, a protective safety "cage" affixed to the top of the observation deck creates an obstructed landscape when viewing through binoculars or camera lens.

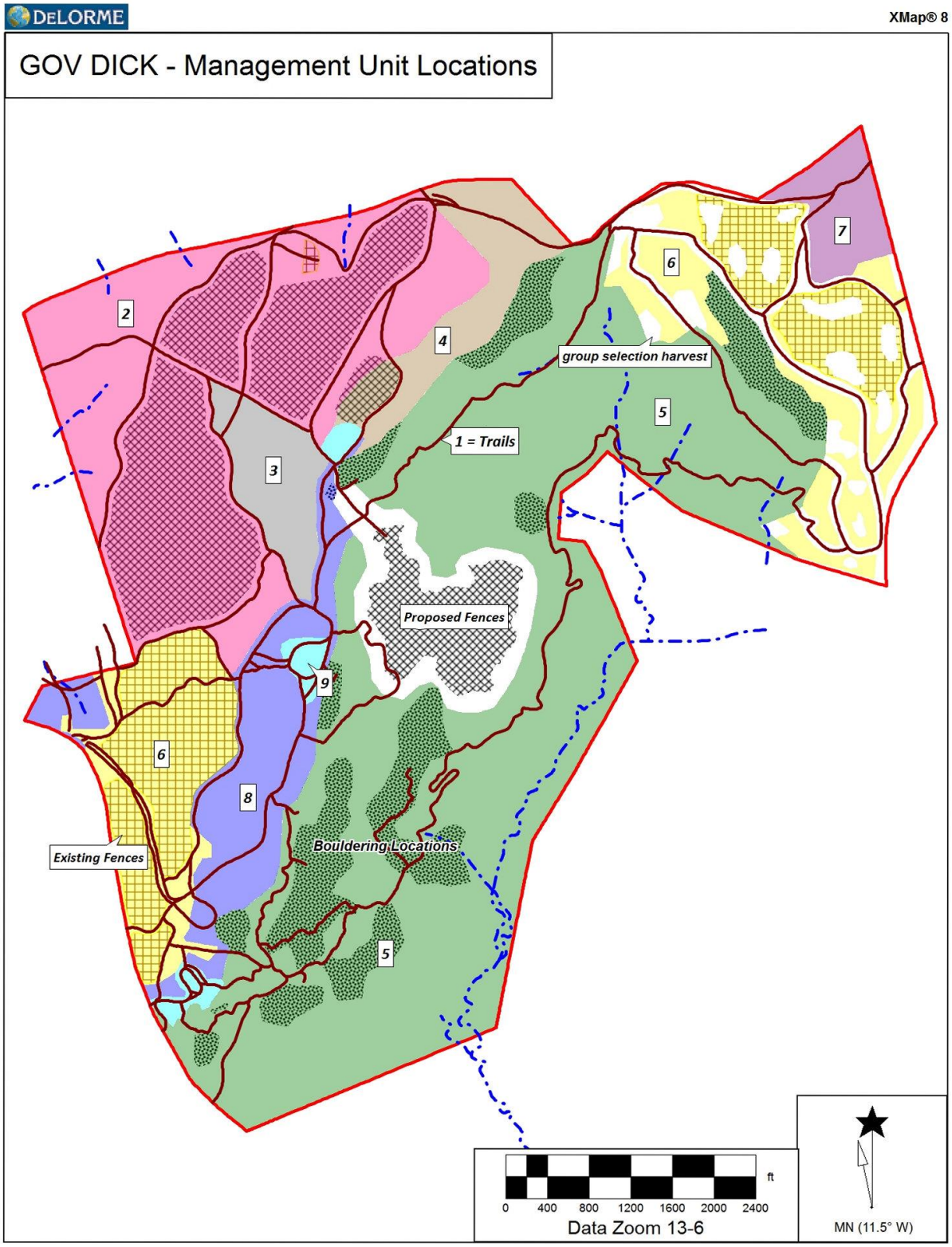
The trails leading to the Tower provide a brisk uphill walk from the well-used parking lot on Pinch Road (located east-southeast of the Tower). The shortest route (from parking lot to the Tower) is about 2,400 feet in length and rises 262 feet in elevation along its course; average grade is 9% slope.

MANAGEMENT RECOMMENDATIONS

- **Environmental Corridor:** Encourage use of the ***Environmental Center*** by constructing a paved and stoned roadway (similar to the Environmental Center access road) that leads from the Environmental Center to Fire Road. This section of road should provide many points of interest and act as an educational "portal" into the various physical, ecological, geological and cultural interest points available at Gov. Dick. Various displays can be created and presented in a natural, aesthetically pleasing arrangement along this "information corridor". Semi-private park bench arrangements (casual circular arrangements) can be created on short spur trails adjacent to the information corridor. These semi-private meeting places will encourage small groups of people to enter into discussions of leisure or educational content. Environmental games can be designed to encourage thought-through-competition. The possibilities of invoking meaningful thought along this education corridor are endless.

- **Encourage Public Involvement:** Seek public participation from special interest groups to participate in educational workshops. A workshop can be charged with the responsibility to identify naturally occurring points-of-interest or design suitable educational "displays" and construct said display at appropriate points along the trail system. The possibilities are endless. Do not however, proliferate, over stimulate, or otherwise "clutter" the natural surrounding with "things" that are unappealing. Upon first glance at such a display, intrigue and genuine interest should be invoked. Employ local chapters of amateur and professional "nature" groups in the development of historic, cultural, geological, or physical points of interest. The Audubon Society, American Chestnut Foundation, Wild Turkey Federation, Boy Scouts of America, et.al. would be good candidates for such a task. Notable themes may include: charcoal hearth history and accompanying demonstration sites, rocky outcrops and their geologic origin, small gauge rail lines and their significance, and timber harvest sites that offers a pictorial timeline depicting successional stages of forest development (to be added to indefinitely).
- **Encourage meadow areas** to expand to fully occupy the open space at the Radar Site. Maintain the health and vigor of existing meadows. Test for nutrient needs, then lime and fertilize as determined by the nutrient test.

MAP – Management Unit Locations



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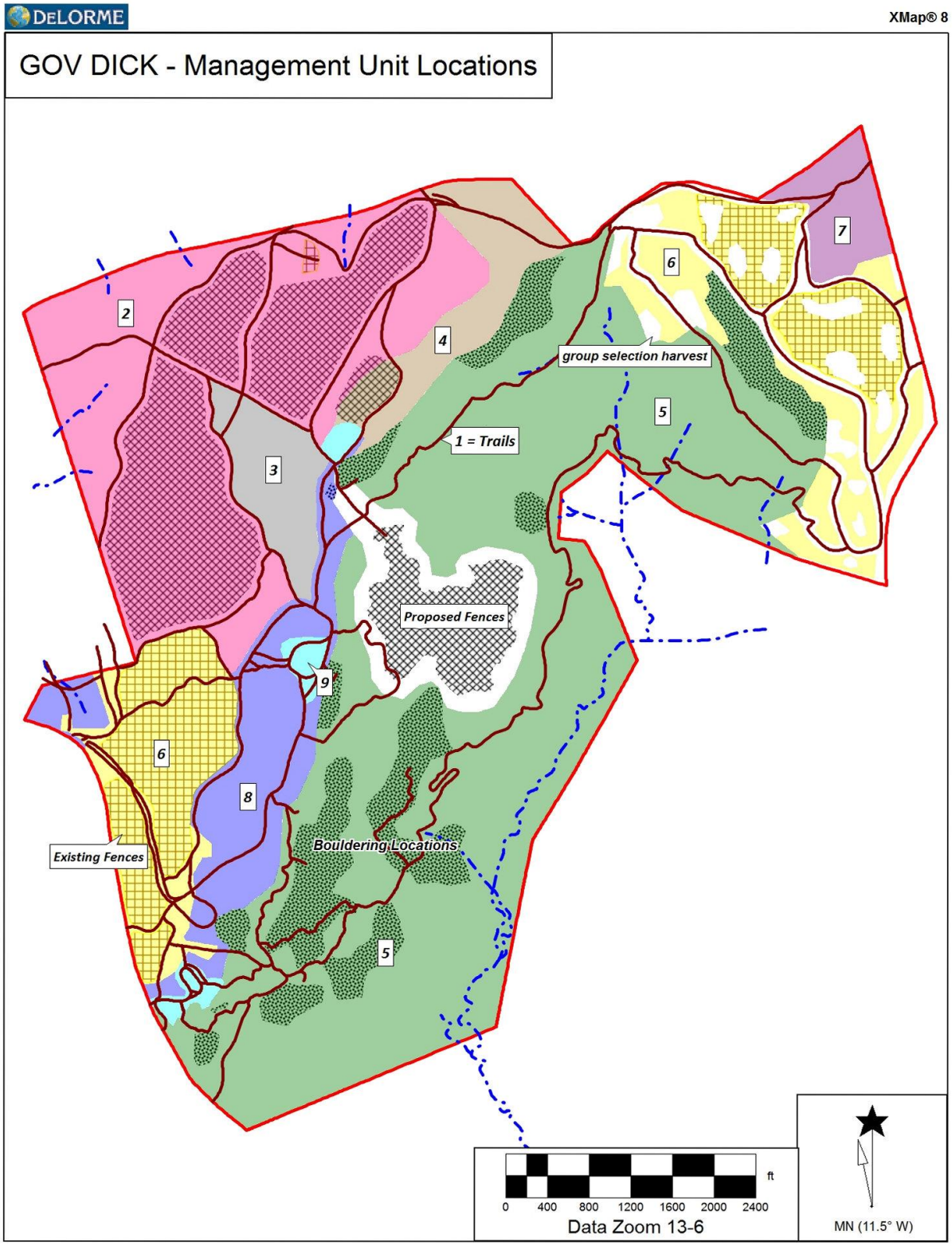
MANAGEMENT ACTIVITY SCHEDULE (by Mgmt. Unit)

Mgmt Unit #	Location #	Sequence	Practice Description	Acres	Fence Perimeter (lin.ft)	Year Planned	NRCS Practice Code	NRCS Scenario #
1			ADA accessible walkway and platform			2017		
			Continue to treat invasive plant within 100 ft corridor throughout trail system - determine location and amount on a yearly basis			All		
			Catelog and label 100-200 high risk trees over next 10 years			All		
			Underplant cateloged trees with seedlings, protect with fencing and remove competition - determine location and amount on a yearly basis			All		
			Encourage shade-tolerant species - determine location and amount on a yearly basis			All		
2	1 and 2	1	Low Shade Removal	42.2		2017	647	6
	1	2	Fence	33	6,000	2019	382	50
	1	3	Herbicide fern, spicebush, pawpaw, invasives before planting	40		2019	490	3
	1	4	Planting : shade-tolerant species (200 seedlings/acre)	8		2020	612	40
	1	5	Mast Tree Release	33		2026	TBD	
	2 and 3	1	Low Shade Removal	48		2018	647	6
	2	2	Fence	16	3,700	2020	382	50
	2	3	Herbicide fern, spicebush, pawpaw, invasives before planting	21		2020	490	3
	2	4	Planting : shade-tolerant species (200 seedlings/acre)	5		2021	612	40
	2	5	Mast Tree Release	16		2026	TBD	
	3 and 4	1	Low Shade Removal	48		2019	647	6
	3	2	Fence	59	7,100	2021	382	50
	3	3	Herbicide fern, spicebush, pawpaw, invasives before planting	68		2021	490	3
	3	4	Planting : shade-tolerant species (200 seedlings/acre)	13		2022	612	40
	3	5	Mast Tree Release including group selections around white pine	59		2026	TBD	
	4 and 5	1	Low Shade Removal	48		2020	647	6
	4	2	Fence - evaluate need for fence one growing season after the completion of pervious fences	TBD	TBD	TBD	382	50
	4	3	Herbicide fern, spicebush, pawpaw, invasives before planting	49		2020	490	3
	4	4	Mast Tree Release including all White Pine	49		2026	TBD	
	5	1	Low Shade Removal	23.8		2021	647	6
	All		Maintain fence perimeters as needed			All		
3			Standard activities when appropriate			All		
4		1	Low Shade Removal	5.8		2017	647	6
		2	Fence	5.8	2,000	2019	382	50
		3	pre-emergent herbicide for MAM, stiltgrass and garlic mustard seedbank	5.8		2017	490	5
		4	Herbicide spicebush, witch-hazel, bb, rm, fern and invasives before planting	5.8		2018	490	3
		5	Planting : shade-tolerant species (200 seedlings/acre)	3		2019	612	40
5		1	Herbicide intefering understory vegetation and invasives	58		2018	490	3
		2	Fence	32	7,100	2018	382	50
		3	Plant 2000 conifers	10		2019	612	40
		4	herbicide and plant as resources allow - determine location and amount on a yearly basis			All	TBD	
6	b		Determine needs of fence "b" and implement asap			2017		
	a,c		Dismantle fences "a" and "c"			2018		
	d,e		Assess progress of regeneration in fences "d" and "e" / update dismantle date			2022		
			Maintain fence perimeters as needed			All		
			monitor and continue to remove problem vegetation - determine location and amount on a yearly basis			All	TBD	
7			Evaluate and update desired course of action for this mgmt unit			2022		
			Standard activities when appropriate			All		
8		1	Standard activities when appropriate			All		
9		1	"Environmental Corridor" Projects			Any		

MAP – Management Unit Locations



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MANAGEMENT ACTIVITY SCHEDULE (by Year)

Year Planned	Mgmt Unit #	Location #	Sequence	Practice Description	Acres	Fence Perimeter (lin.ft)	NRCS Practice Code	NRCS Scenario #
2017	1			ADA accessible walkway and platform				
2017	2	1 and 2	1	Low Shade Removal	42.2		647	6
2017	4		1	Low Shade Removal	5.8		647	6
2017	4		3	pre-emergent herbicide for MAM, stiltgrass and garlic mustard seedbank	5.8		490	5
2017	6	b		Determine needs of fence "b" and implement asap				
2018	2	2 and 3	1	Low Shade Removal	48		647	6
2018	4		4	Herbicide spicebush, witch-hazel, bb, rm, fern and invasives before	5.8		490	3
2018	5		1	Herbicide intefering understory vegetation and invasives	58		490	3
2018	5		2	Fence	32	7,100	382	50
2018	6	a,c		Dismantle fences "a" and "c"				
2019	2	1	2	Fence	33	6,000	382	50
2019	2	1	3	Herbicide fern, spicebush, pawpaw, invasives before planting	40		490	3
2019	2	3 and 4	1	Low Shade Removal	48		647	6
2019	4		2	Fence	5.8	2,000	382	50
2019	4		5	Planting : shade-tolerant species (200 seedlings/acre)	3		612	40
2019	5		3	Plant 2000 conifers	10		612	40
2020	2	1	4	Planting : shade-tolerant species (200 seedlings/acre)	8		612	40
2020	2	2	2	Fence	16	3,700	382	50
2020	2	2	3	Herbicide fern, spicebush, pawpaw, invasives before planting	21		490	3
2020	2	4 and 5	1	Low Shade Removal	48		647	6
2020	2	4	3	Herbicide fern, spicebush, pawpaw, invasives before planting	49		490	3
2021	2	2	4	Planting : shade-tolerant species (200 seedlings/acre)	5		612	40
2021	2	3	2	Fence	59	7,100	382	50
2021	2	3	3	Herbicide fern, spicebush, pawpaw, invasives before planting	68		490	3
2021	2	5	1	Low Shade Removal	23.8		647	6
2022	2	3	4	Planting : shade-tolerant species (200 seedlings/acre)	13		612	40
2022	6	d,e		Assess progress of regeneration in fences "d" and "e" / update dismantle date				
2022	7			Evaluate and update desired course of action for this mgmt unit				
2026	2	1	5	Mast Tree Release	33		TBD	
2026	2	2	5	Mast Tree Release	16		TBD	
2026	2	3	5	Mast Tree Release including group selections around white pine	59		TBD	
2026	2	4	4	Mast Tree Release including all White Pine	49		TBD	
All	1			trail system - determine location and amount on a yearly basis				
All	1			Catelog and label 100-200 high risk trees over next 10 years				
All	1			Underplant cateloged trees with seedlings, protect with fencing				
All	1			Encourage shade-tolerant species - determine location and amount on a yearly basis				
All	2	All		Maintain fence perimeters as needed				
All	3			Standard activities when appropriate				
All	5		4	herbicide and plant as resources allow - determine location and amount on a yearly basis			TBD	
All	6			Maintain fence perimeters as needed				
All	6			monitor and continue to remove problem vegetation - determine location and amount on a yearly basis			TBD	
All	7			Standard activities when appropriate				
All	8		1	Standard activities when appropriate				
Any	9		1	"Environmental Corridor" Project				
TBD	2	4	2	completion of pervious fences	TBD	TBD	382	50