Tank Hill Forest Stewardship Plan

Prepared for: Tank (Hefferan) Hill Property

Sections 21 and 22, Crystal Lake Township, Benzie County, MI

Property of the City of Frankfort, Parks and Recreation Commission

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City of Frankfort
PO Box 351
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Dear City of Frankfort Council Members,

Here is your copy of the Tank Hill Forest Stewardship Plan. The next step will be for all members to read this plan and vote on whether to adopt it and take action. As of November 28, 2011, bid prospectuses have been issued to 9 local logging companies. The bids for the harvest are due on December 23, 2011 and a decision will be made whether or not to, and to whom to, grant a winning bid for the sale of timber. If the sale of timber cannot be completed this year actions can still be taken this summer to improve the forest and some. This Forest Stewardship Plan addresses what actions can be taken pending the decision to pursue either of these two options. Also, pending this decision, this document can be revised and posted on the City of Frankfort Tree Board website to explicitly address and explain to the public the activities being pursued.

Sincerely,
Paul Gerhart

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Introduction

The 15.3 acre property for Tank Hill contains a diverse hardwood forest. This parcel is public property of the City of Frankfort, managed by the City of Frankfort, Parks and Recreations Commission. Its name was derived from it being the placement of the city water tower, visible from most of Frankfort and the neighboring town of Elberta, since the establishment of the city (see cover picture). This hill, along with the forest and water towers upon it, have defined the landscape of the city since its formation and are of indispensable value. Due to recent tree mortality, caused by emerald ash borer (*Agrilus planipennis*) (EAB), a management plan has been sought in order to reduce the liability risk by removing standing dead timber. The forest also faces overall declining ecosystem health as a result of various other anthropogenic causes. As a guideline for improving both forest safety and health, this Forest Stewardship Plan has been drafted to explain the feasibility of removing hazardous dead trees; sustainably harvesting timber products; and reinvesting harvesting revenue towards follow-up activities which will improve ecological, aesthetic and recreational qualities of the forest.

Current Site Conditions / Management Needs

The forest is composed of a diversity of hardwood species, including primarily sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), black cherry (*Prunus serotina*), and white ash (*Fraxinus americana*) (see Table 1).

Table 1: Overstory species composition by basal area and trees per acre in order from highest to lowest basal area.

Species (common name)	Species (scientific name)	Basal area (ft^2/ac)	Percent basal area	Trees per acre
Sugar maple	*Acer saccharum*	41.9	24.8	103.5
American beech	*Fagus grandifolia*	35.3	20.9	20.5
Northern red oak	*Quercus rubra*	30.0	17.7	14.1
Black cherry	*Prunus serotina*	26.3	15.6	19.4
White ash*	*Fraxinus americana*	18.3	10.9	14.9
Snag (dead tree)*	*Snag*	11.3	6.7	19.3
Eastern hemlock	*Tsuga canadensis*	1.4	0.8	0.7
American basswood	*Tilia americana*	1.0	0.6	0.4
Red maple	*Acer rubrum*	1.0	0.6	0.2
Paper birch	*Betula papyrifera*	1.0	0.6	0.1
Ironwood	*Ostrya virginiana*	1.0	0.6	6.3
Yellow birch	*Betula allaghaniensis*	0.5	0.3	0.5
	Grand Total	**157.6****	**100.0**	**180.8****

* although nearly all white ash are dead, they are not counted as snags

** does not include snags

Several other species exist accounting for less than five percent of the total basal area (the horizontal area of every tree as measured at 4.5 feet above ground). Due to a lack of management the forest is extremely dense with a basal area of 158 ft^2/ac. Typically a managed forest is harvested to maintain a basal area between 70 and 90 ft^2/ac.

From the inventory conducted, it has been determined that this forest is very unhealthy. The likelihood of naturally sustaining a diverse composition of tree species is greatly hampered by many ecological impediments. All of these, either directly or indirectly, result from human influences which have accumulated during the development of the surrounding area. Management objectives have been established to address each of these impediments.

Emerald ash borer

The management objective for addressing EAB will be to remove and utilize all hazardous dead trees. Signs of EAB, particularly woodpecker damage, were first seen in the forest in the late winter of 2011. Since its introduction it has killed nearly all overstory white ash on the property (greater than 3 inches in diameter at beast height [dbh], 4.5 feet above the ground), which accounts for 11% of the stand's basal area. These standing dead trees pose a hazard to the public and are the primary reason for the development of this management plan. These trees could be removed and utilized for firewood or timber. Special care must however be taken to ensure that the utilized material is not shipped outside of already infested areas. For this reason it may be useful to organize a program to distribute firewood within Frankfort. Some trees, that do not pose a hazard to property and exist in areas that experience less human traffic, will be retained to provide habitat for tree nesting birds and mammals.

Figure 1: Top left, white ash tree with serpentine –like feeding damage from EAB larva in the inner bark; top right, mostly defoliated and near dead ash trees with woodpecker damage; bottom left, EAB adult; bottom right, EAB larvae.

Beech bark disease (BBD)

Beech bark disease (BBD) has also been detected on some of the American beech in this stand. This species accounts for 21% of the basal area. BBD was first introduced to Nova Scotia from Europe in the 1890s and has since made its way west to the forests of Northern Michigan (Houston 1983). This disease is caused

by the invasive beech scale insect (*Cryptococcus fagisuga*) that colonizes on the tree's outer bark and feeds on sap within the tree's phloem (the sugar transporting tissue of the inner bark) by piercing the bark with its stylet (piercing mouthpart) and siphoning sap from within the tree's phloem tissue. This feeding weakens the tree but, alone, will not kill it. When these trees are weakened they become more susceptible to establishment of both native and non-native fungi which will eventually kill the tree (Houston 1983).

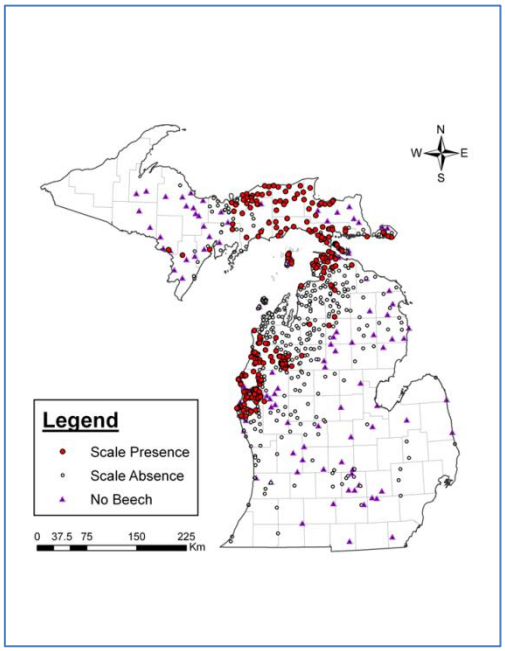

Figure 2: Current range of the beech bark disease scale infestation in Michigan.

The development of the disease can be divided into three basic stages (Houston 1983). The first stage, the advancing front, occurs when the beech scale has been introduced and begins to colonize and feed on susceptible trees. Reducing the density of beech in the early part of this stage, and particularly targeting infested or susceptible individuals for removal, can reduce mortality and help save some beech (Michigan Society of American Forester, 2003). The forests of Benzie County are currently in this stage. BBD has been moving north into the area from the currently infested, central western Lower Peninsula (see Figure 2). This infestation will eventually develop into the second stage, known as the killing front, once fungi are able to establish and kill trees.

One of the particular concerns for management is the condition of the forest in the third stage, following large scale mortality, known as the aftermath forest. In most aftermath forests this disease complex will kill a majority of, but not all, overstory American beech. Some resistant trees have been detected in aftermath forests (McCullough 2000). Beech killed by BBD, cut during a harvest, or extensively damaged by machinery, will regenerate by sending up stems from their roots—a process known as root suckering. If not managed properly, these stems can grow back densely in the understory and compete with other native and desirable vegetation (Nyland 2006). Regenerating stems have also been shown to pose a risk of sustaining a new outbreak of the beech scale as they become abundant enough to sustain the insect's population (Houston 1975). They can typically survive in the understory and will not succumb to BBD until reaching 4 inches dbh (Houston 1994). Root suckering will also further negate "survival of the fittest" amongst American beech since these stems originate from individuals which were not resistant to the pathogen. Therefore killed trees will reproduce more rapidly through root suckering and outcompete both seedlings and root suckers from surviving trees (I have a citation for this somewhere). With proper management the density of root suckers

can be reduced to create growing space for other, more sustainable saplings (Ostrofsky 1986, Kochenderfer 2004, and Kochenderfer 2009).

The objective of BBD management will be to reduce the density of susceptible American beech while mitigating compounding impacts on regeneration of other desirable tree species. During the current advancing front stage, approximately half of the American beech, displaying the least vigor and ability to survive BBD, will be removed. As individual trees begin to develop heavy scale populations in the future, they will be removed as well. Also a variety of herbicide application methods can be applied to reduce beech regeneration following harvests. The specific requirements and costs of these treatments is addressed in the "Follow-up activities" section of this report.

Diversity, Regeneration and Other Considerations

For any ecological system, diversity is the key to sustainability (Wilson, 1988). Therefore one of the primary objectives of management will be to "promote a diversity of tree species that can survive future pathogen invasions." In a survey of 15 Frankfort citizens who attended the public meeting to approve this stewardship plan this objective, in this exact wording, was ranked as the number one priority for Tank Hill management. In order of importance, the other issues of concern were; 2.) preserving natural beauty, 3.) providing recreational opportunities for the public, 4.) providing habitat for wildlife, and 5.) producing income from timber and forest products. Both local citizens and the scientific community understand that if the number of tree species in this forest declines, it will become vulnerable to greater losses if forces such as invasive insects or climate change inflict species-specific mortality to Northwestern Michigan in the future.

Diversity of tree species regeneration amongst seedlings and saplings is quite limited on Tank Hill. The understory is primarily dominated by sugar maple, white ash, and American beech (see Figure 3).

Homogeneous canopy closure and a lack of light availability in the understory have likely played a role in causing an abundance of more shade tolerant sugar maple and American beech. The site does have the ability to support the establishment of many other species, as can be observed based on the overstory composition. However all of the species in Figure 4;

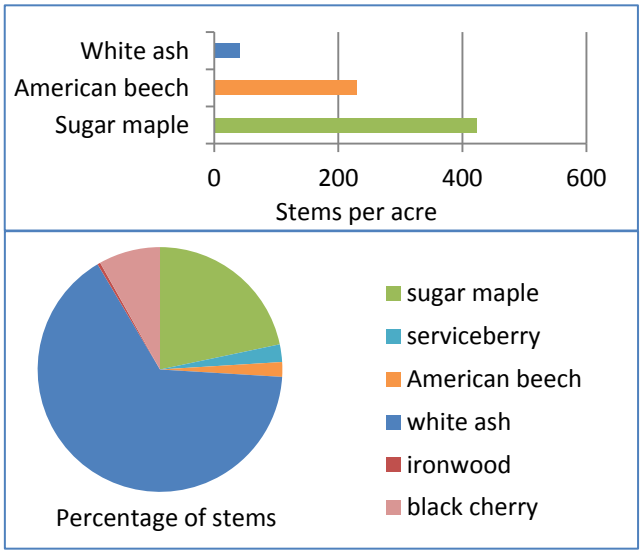

Figure 3: Above, saplings greater than 3' tall and less than 3" diameter; below, seedlings less than 3' tall

with the exception of sugar maple, beech and eastern hemlock (*Tsuga canadensis*); have lesser shade tolerance and require more light and space to achieve a position in the overstory. Given their current size, they were likely allowed to succeed to this position as a result of heavy harvesting around the turn of the 19th century.

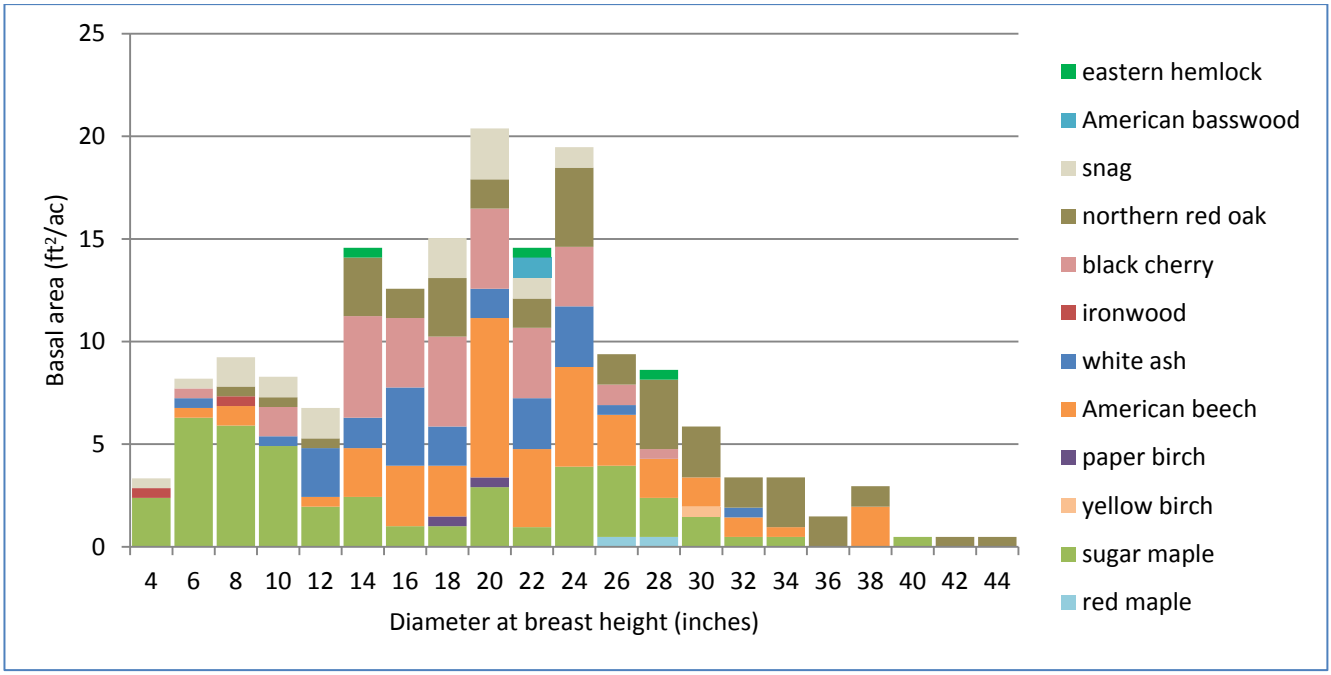

Figure 4: Tank Hill overstory species composition by diameter at breast height and basal area

One of the objectives used to achieve species diversity will be to mimic natural disturbances through management which would allow mid-shade-tolerant and shade-intolerant species to recruit (Franklin 2007). In the historic old-growth forest—that existed before the site was cutover, less shade tolerant species were allowed to establish as a result of larger canopy gap formation. This gap formation results from mortality of larger trees which tend to knock down multiple trees when killed by wind-throw. This can be done by creating gaps to allow for regeneration and recruitment of mid-shade-tolerant species. These gaps can be centered around mid-shade-tolerant seed producing trees that are retained during harvesting—as done by Falk (2010), or these gaps can be planted with seedlings.

The dense infestation of the invasive herbaceous plant garlic mustard (*Alliaria petiolata*) has and will continue to inhibited regeneration, absent concerted eradication efforts. It is advised that the City of Frankfort undertake efforts to coordinate public events to remove and properly dispose of garlic mustard within the forest. In the past, garlic mustard pulling events have been coordinated by the Northwestern Michigan Weed Management Area in collaboration with the Benzie Conservation District. These activities should be continued through the partnership which has been established between the City of Frankfort and

these organizations. In order to encourage the public to pull garlic mustard, and increase the feasibility of removal, an enclosed compost box could be established on site.

With the current level of deer browse, attempts to encourage diverse regeneration could be long and tedious, absent comprehensive efforts to protect seedlings. This may require seedling planting and installation of equipment to prevent deer browse. These activities can be effective, but are extremely expensive, as will be addressed in the "Follow-up activities" section of this report. Also, absent a continued source of revenue from timber harvesting, the funds available to conduct these activities may not suffice. It is advised that the City of Frankfort have a public discussion to address the potential for permitting bow hunting as a means of controlling deer populations as well as draft an ordinance to ban deliberate feeding of deer within city limits.

In promoting diversity species should be favored that have a more ensured potential to survive. The impending invasion of the Asian longhorn beetle *(Anoplophora glabripennis),* which feeds primarily on sugar maple, makes imperative an effort to reverse the current trend towards declining diversity and increased sugar maple dominance should be corrected with management.

With biodiversity in urban forests being of great concern, globally, the City of Frankfort should aim to be at the forefront of this pursuit, leading by example and developing knowledge that can be shared with other communities abroad (Alvey, 2006).

Prescribed Management

In order to systematically satisfy the aforementioned objective, the property has been divided into four separate management units. Each unit will be prescribed to undergo implementation of different activities aimed at satisfying these objectives (see Figure 5).

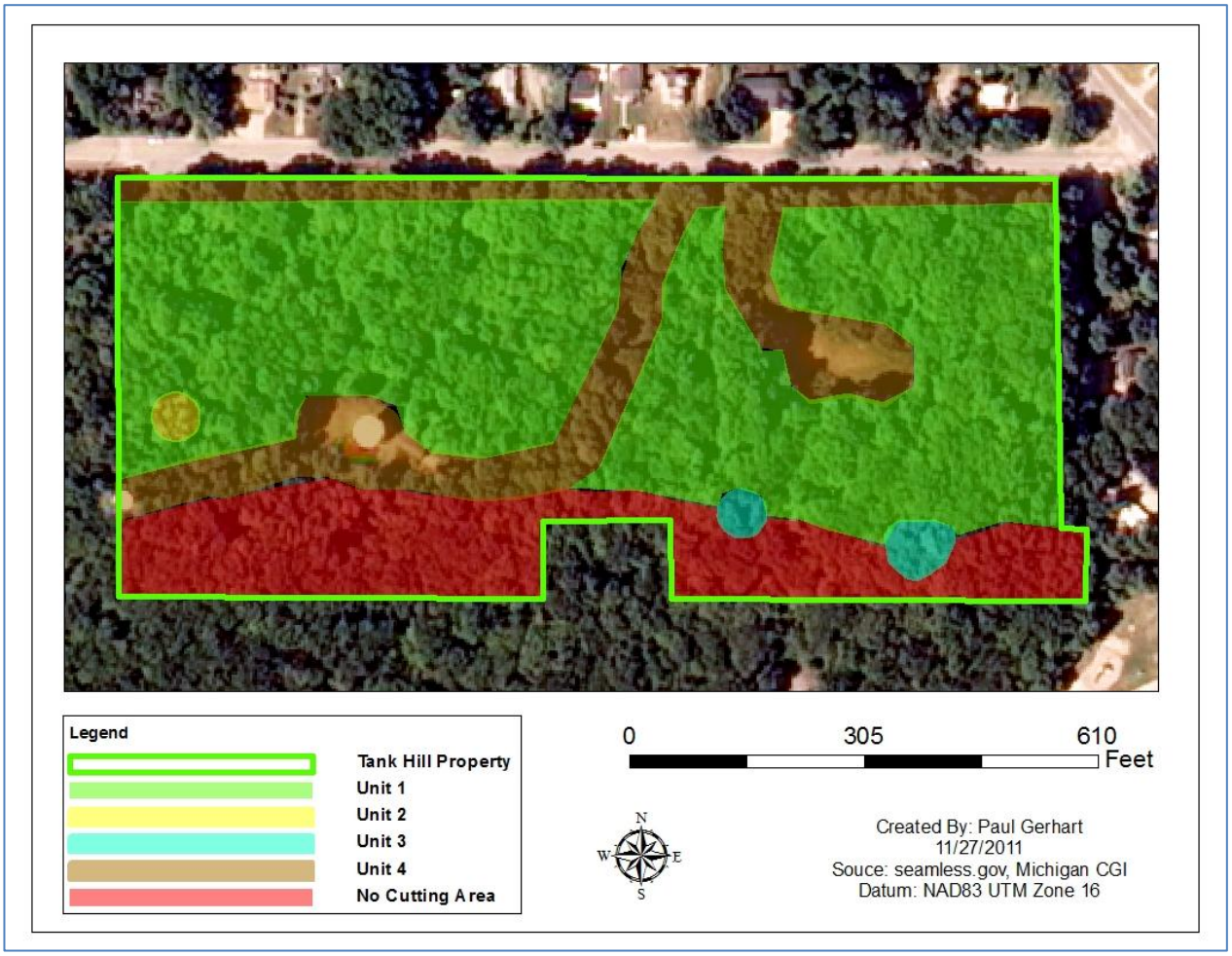

Figure 5: Management units of the Tank Hill property.

Unit 1: The Matrix, single tree selection and salvage cut with under-planting

This is the largest unit which includes the matrix of 8.9 acres that surrounds all other management units. The harvesting method prescribed for this unit will be a single-tree-selection harvest with a unique criteria for tree selection. Most importantly, all dead white ash, except those worthy of retention for wildlife snags, will be removed. Approximately half of the American beech have been marked for removal, discriminating against those with greater likelihood of being killed by BBD (Michigan Society of American

Forester 2009). These included trees with rough bark, thin crowns with missing leaves, hollow centers, and irregular growth form. Black cherry was selected based upon their potential to experience mortality as a result of successional patterns. Also, these trees have high economic value and can be harvested in order to raise more revenue for follow-up activities. Finally sugar maple and northern red oak, of various sizes, have also been selected where necessary to release crop trees (healthy smaller trees with good growth form) and raise more revenue. Within this area some dead trees will also be retained for wildlife habitat. However, these trees have been selected based upon their lack of hazardous branches. Tall standing snags with few or no branches would present less of a threat to people than newly killed trees with many branches destined to fall with time.

Following the harvest this area will be receive the installation of 7 foot diameter by 6 foot tall hoop exclosures, designed to protect seedlings from deer (see Figure 6). These will be strategically placed within the most sunlit portions of the largest canopy gaps, in order to increase the success of naturally regenerating and planted seedlings within. Some enclosures could be used to plant seedlings of coniferous shade-tolerant to mid-shade-tolerant eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), and eastern white pine (*Pinus strobus*). Also, saplings grown to above browse height, available from the City of Frankfort nursery, could be planted within this area.

Figure 6: Hoop exclosure installed at the Michigan Technological University, School of Forest Resources and Environmental Science, Ford Forestry Center near Alberta, MI.

Unit 2: Group selection with seed tree retention

This unit encompasses a 60 foot diameter circular area which contains a high concentration of dead ash and late successional black cherry. A “group selection with seed tree retention” will be used to favor the recruitment of black cherry. All of the trees except for one black cherry will be cut (see Figure 7). The single black cherry retained will be able to drop its seed in a more open environment with enough sunlight to favor seedling establishment and recruitment of seedlings into the overstory. This method has been shown to increase black cherry regeneration (Falk, 2010). The individual selected for retention

Figure 7: Location for group selection with seed tree retention. The black cherry seed tree is located in the center of this picture and marked with green flagging.

was chosen for its growth form including; a straight trunk, few epicormic branches, healthy branches with no signs of dieback, and sound wood. Aiming to produce quality trees in the future, these traits should be favored given that, if some may be genetic, the progeny would have a better chance of exhibiting these characteristics.

For follow up management, this area will receive installation of hoop exclosures, without seedling plantings, in order to promote natural black cherry regeneration. This unit should be focused on as a primary location for garlic mustard removal. It would be more worthwhile to have more effort directed towards removing garlic mustard where it inhibits the regeneration of black cherry. This species has high commercial value and is less preferred by Asian longhorn beetle than sugar maple (Sawyer 2010).

Also, it may be necessary in the future to remove competing white ash saplings which could grow just as well in the high light environment and inhibit black cherry regeneration. It has been advised that some removal of understory ash may be necessary to prevent regeneration which could re-sustain an EAB outbreak and likely never grow to achieve a position in the overstory (Michigan Department of Natural Resources, 2011). If removal of ash is needed it will likely be more important in this gap where white ash would recruit well in the higher light environment created. To do so, stems would be sprayed with 10% tryclopyr solution immediately after leaf out in the spring. The necessity of this activity is of less certainty. Studies of ash regeneration in the wake of EAB mortality have shown mixed results. Some studies have shown a continued decline of ash with the remaining seeds from killed parent trees failing to establish new seedlings in the understory (Herms 2009). However, given the currently high ash seedling presence this forest may not follow such a trend.

Unit 3: Group selection with planting

Here two gaps will be formed on south facing slopes in which early-mid successional species, exhibiting lesser shade tolerance, will be planted. This area currently contains a high density of susceptible beech in the overstory (>3in dbh) and a dense understory of root suckering beech saplings (see Figure 8). All American beech and sugar maple greater than 3 feet in height will be removed in this area. Also, with time, it may be necessary to remove

Figure 8: Dense patch of American beech which will be removed to create spacing for replanting.

any new stems of these species that establish.

The trees planted will be one-year-old seedlings of mid-low shade tolerant species which can grow well on dryer, well-drained, south-facing slopes. These could include paper birch (*Betula papyrifera*), white oak (*Quercus alba*), Tulip tree (*Liriodendron tulipifera*), and Amercian basswood (*Tilia americana*). Trees will be planted as one year seedlings inside of Tree Pro® tree protectors (see Figure 9). They will also be isolated from competing vegetation with a 24 inch diameter weed mat. Some may receive a mycorrhizal root stimulator and time released fertilizer in order to encourage faster growth.

Figure 9: Trees in seedling protector tubes. From left to right: American basswood, 15 months old, in Indiana; paper birch, 36 months old, in Indiana; white oak, 15 months old, in Indiana (TreePro, 2011).

If a harvest cannot be conducted in the winter of 2011-2012 management for this unit will still be pursued in the spring/summer of 2012. Beech will be cut and stumps will be sprayed with herbicide in the spring of 2012 immediately after leaf out. Planting could then occur in the fall of 2012 or spring of 2013, when trees are dormant and leafless. Also some saplings, available from the City of Frankfort nursery, which have been grown to above deer browse height could be planted here and further protected with tree protectors (see Figure 10). This area is also located along the southern-most edge of the area which would be subject to harvesting in the winter of 2012-2013 and therefore would not be affected by access of machinery or tree felling.

Figure 10: Excess trees currently available at the City of Frankfort nursery.

Unit 4: Areas with high hazard tree concern

This unit includes all land within 30 feet of the amphitheater, Park Avenue, established roads, and the two water towers. This area is of particular concern because of the frequency of use and increased likelihood

of damage to people and property from falling trees (see Figure 11). If a harvest does not happen in 2011-2012, this area should receive necessary removal of hazard trees before the 2012-2013 harvest. To do so, a firewood buyer could be sought. While hazard tree removal is of particular concern, the criteria for tree selection used in Unit 1 will also be applied here.

After a harvest has been completed, the amphitheater could receive planting with a variety of more aesthetic tree species for public admiration. Along Park Avenue native shrubs could be planted to reduce future demands for management around power lines. However these would have to be able to survive deer browse or be planted at a later time, after efforts towards reducing the deer herd density have produced success. Given lesser priority, the potential for these activities can be assessed after all other follow-up activities have been conducted.

Figure 11: Amphitheater area with fallen American beech.

Timber harvesting

The overall objectives of timber harvesting are to reduce hazards while creating adequate spacing and generating adequate revenue, to fund and make feasible necessary follow-up activities. Within this area, an estimated $7,420 of timber has been marked for removal (see Table 2). In order to acquire a maximum payment for timber the harvesting job will be auctioned to several local loggers. A winning bid will be selected based upon the amount offered for the timber and ability to comply with job performance demands. To ensure proper job performance and avoid damages, a contract will be signed between the City of Frankfort and the selected timber buyer before any harvesting activities commence.

Table 2: Available forest products currently marked for removal. Prices gathered from MDNR Stumpage Report (2011).

Species	Trees	Sawtimber (mbf)	Veneer	Grade 1	Grade 2	Grade 3	Pulp (cords)	Sawlog price ($/mbf)	Pulpwood price ($/cord)	Total Sawtimber Stumpage	Total Pulpwood Stumpage
American beech	87	9.0	NA	3.6	3.2	2.2	26.015	$ 142.00	$ 16.58	$1,271.12	$ 431.33
Black cherry	80	8.0	0.6	1.3	3.6	2.5	7.9	$ 307.22	$ 16.58	$2,452.25	$ 130.82
Northern red oak	47	3.0	1.0	2.1	4.8	2.5	2.8	$ 288.74	$ 12.42	$ 860.36	$ 35.00
Sugar maple	20	1.9	0.4	0.8	2.3	1.2	3.8	$ 304.76	$ 27.72	$ 583.39	$ 103.95
White ash	13	13.2	1.2	2.7	8.7	4.4	14.16	$ 100.00	$ 16.58	$1,317.11	$ 234.77
Totals:	**247**	**35.0**								**$6,484.23**	**$ 935.87**
Total harvest value:											**$7,420.09**

Given some potential for erosion and compaction any, large-scale management requiring wheeled machinery, such as timber harvesting, should be conducted in the winter. Also, harvesting has been restricted to the 12.4 acres north of the steep slopes that face Betsie Bay and downtown Frankfort (see Figure 5). These activities should also occur between mid-December and early-March in order to reduce both soil compaction, when the ground is frozen, and potential residual damage to retained trees (when their bark becomes saturated with sap in the spring). The soil is classified as a Spinks-Coloma Sand with 18 to 70 percent slopes (USDA 2005). This soil type is coarse in texture, somewhat excessively well-drained, and has a low potential for runoff. However, upon physical observation, some more finely textured silts and silty-loams have been identified on the site. Also, in water diversion berms along the access road to the water towers, some clay is present. This indicates that there is a fragipan layer present. Finer textured soils such as these do have a greater potential for compaction and erosion. The likelihood of such impacts however, could be greatly reduced if harvesting is conducted when the ground is frozen.

Follow-up activities

A hypothetical budget for follow-up activities has been created assuming that $5000 in revenue will be available from the harvest. This arbitrary number has been deemed as a safe estimate given that $7400 of timber is currently marked for removal. The costs presented herein have been acquired from various sources. Both the quantities and specific brand of the items priced are not final and could be adjusted with future planning. These adjustments will be made following a post-harvest assessment of available space and budget available to finance follow-up activities.

Expenses for seedlings, hoop exclosures, and seedling protectors, will utilize $4,034 of budget. In so doing, it could be possible to purchase: 104 hoop exclosure, for $3,038; approximately 500 seedlings for $500 from the Benzie Conservation District or Benzie Central High School Agricultural Science Class; and a package deal of 100 seedling protectors, with mycorrhizal root stimulator, and controlled release fertilizer, for $700 (Tree Pro®, 2011). Saplings can be produced annually from the City of Frankfort Nursery. There is also currently an oversupply of saplings in the nursery which will have to be planted in the coming spring and fall of 2012.

Applying herbicide to the cut beech is estimated to cost $158. Tryclophyr 4E 60% solution diluted to 10% with an oil carrier would be applied to saplings and seedlings (less than 3 in dbh) by means of basal spraying beech between 3 feet tall and 3 inches dbh. In an effort to reduce American beech density and enhance black cherry regeneration in Pennsylvania, Kochenderfer (2004) calculated the costs for removal to be $187/ac for a density of 4139 stems per acre ranging between 2 feet in height and 6 inches dbh. The unit cost

of the generic Tryclopyr herbicide solution used in this study have been cross referenced and do not exceed that of products which would be purchased for this management plan (Keystone Pest Solutions LLC., 2011). Also, this study site had a much greater density of beech regeneration than Tank Hill due to past management, and a more progressed infestation of BBD which would have caused increased root suckering (Nyland 2006). Tank Hill, which does not have a recent history of management, contains an average density of 229 stems/ac between 3 feet in height and 3 inches dbh. Using a conversion factor based on density of stems it can be estimated that $10.34/ac would be needed. This would require a total of $158 to treat all undesirable American beech saplings on Tank Hill. Given that these beech, currently targeted for removal, are smaller than those and have less surface area than those treated by Kochenderfer (2004) it would be safe to use these figures to convert the amount of herbicide needed without underestimating. Also not all saplings on the property will be removed, only those that are believed to have originated from the parent trees which were removed as part of the harvest.

As BBD progresses in the future, removal of beech will occur in the spring and stumps will be treated with 20% glyphosate. The investment required for this maintenance could have a future value cost of $158 if all remaining beech need to be removed. These trees will be cut in the spring after leaf out when the least amount of energy is in the roots. Kochenderfer (2009) found this method to be successful at killing 99% of beech stems within 10 feet of the parent trees removed.

All of these expenses could leave $650 remaining for other operational costs if $5000 can be acquired from the harvest. Some of this could go towards paid labor if deemed necessary. However the remainder should be saved in a general fund for future urban forestry activities throughout the city.

Acquiring labor to conduct follow-up activities will require a concerted community effort. It will be recommended that a sub-committee be formed to oversee the implementation of harvesting activities. This sub-committee should involve an affiliation with Frankfort and Benzie Central High School's. Students from these schools are required to conduct community service in order to graduate. The main focus of the sub-committee should be to plan and organize events that will involve high school students in the implementation of follow up activities.

Post project monitoring / Conclusion

After the follow-up activities are complete, regular monitoring will be necessary in order to ensure long term success. Seedling protectors should be regularly inspected for signs of damage which would leave seedlings vulnerable to deer browse. Hoop exclosures should also be inspected to ensure that they are not

damaged by falling branches or other factors. Road maintenance may be necessary following repeated access. If road repairs are needed they should be conducted in a timely fashion.

The results of follow-up activities could be very useful to guide decision making in preparation for expected future mortality from Asian longhorn beetle, oak wilt, hemlock woolly adelgid, or climate change. If in the future timber must be salvaged to reduce losses imposed by any of these forces it would be useful to know what methods of restoration will be most effective and efficient. Therefore, some seedlings could be measured for growth rates, or saplings and overstory trees could receive installation of dendrometer bands used to measure periodic growth (Keeland, 2011). However, if such research is to be conducted it would require the procurement of funds through a grant proposal.

The most important research which can be conducted on this forest is not so much focused on physical or biological earth sciences but rather the abstract and underdeveloped social science that is urban forestry. To structure this project as a case study an emphasis should be made to follow the community natural resource management approach. This will require continued involvement of community members, devolving of power from the Tree Board to other community members and institutions, linking objectives of economic development and conservation, and also combining traditional values for forests with the science of ecology (Kellert 2000). This is a process which will never be complete but should be continuously practiced and assessed in order to refine the City of Frankfort's approach towards urban forest stewardship.

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