

# ***City of Bayfield***

## ***Forest Area Assessment***



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## EXECUTIVE SUMMARY

The City of Bayfield has long recognized that trees provide important economic, ecological and environmental benefits that significantly improve the quality of urban life. City parks, greenspace and forested areas also contribute to these benefits while providing a draw to diverse user groups. Bayfield's wooded areas consist largely of a system of ravines and drainageways. Management of forested areas can be a complex and multi-faceted proposition influenced heavily by personal beliefs of what forested areas are designed for. Management of forested drainageways introduces added factors of water quality and erosion into the already complex equation. Any management scheme must be based on sound science and factual data. This document reports the findings of the inventory and makes specific, prioritized recommendations for managing the forested areas within the city for upcoming years based on resources and needs.

## STATEMENT OF PURPOSE AND SCOPE

This forest area assessment is intended to provide resource management guidance for the City of Bayfield in managing and fulfilling their objectives for the wooded areas within the city's ownership. It is also meant to provide guidance and understanding for the factors that affect a healthy forested ecosystem. The City of Bayfield objectives and sound forest management principles have guided the development of this plan.

This assessment describes the various forest types that occur within each park's forested areas and the management options associated with each type. Management options provided in this plan range from simply doing nothing ("let nature take its course") to more intensive management options for certain forest types. The plan will also give recommendations for complete stewardship of the land including aesthetic, recreational, invasive species, wildlife and water quality management.

## METHODOLOGY

During the summer 2011, Bluestem Forestry Consulting Inc. conducted a forested area assessment. A total of 8 wooded areas were reviewed. These ranged in size from 0.02 acres to 25 acres. Within the larger wooded area, random sample points were established for data collection. Data collected at each point included species, diameter and number of log and pulp cuts and percentage of defect for each tree. A 100<sup>th</sup> acre regeneration plot was embedded at each point where adequate seedling and saplings were found. Invasive species and their density were also noted for each plot. Overall health and quality of the trees in each area were noted as well as soil types, drainage patterns and any other unique features. The data collected were used to

determine the species composition, stocking level, total board footage and cordage as well as its fair market value. On the smaller parcels, an ocular assessment was completed, with no sample points established.



## DESCRIPTIONS AND MANAGEMENT OPTIONS

This section identifies the various forest types would within the city and presents a description along with the management options for each cover type. The best and most appropriate management options are described for each type in order to meet the goals and objectives previously described. Similar forest types were identified in the wooded areas through field examination, collection of stand and site data, and aerial photo interpretation.

A table is included as Attachment 2 that identifies the total merchantable volume and value of timber by species. The volumes were collected from sample plots established within the stand. Values were derived from current (2011) prices actually paid for standing forest products (stumpage) in the area as compiled by the Wisconsin Department of Natural Resources. Volumes and values represent ALL current timber estimated to be growing in the stand. The value represents the total potential income if ALL the timber were harvested. Less income will be realized as various species or products are retained on the property for continued growth and proper management.

A map illustrating the location of wooded properties is included as an attachment.

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### **Bayfield City Ravine (25 acres wooded)**

#### **FOREST TYPE DESCRIPTION: Mixed Pine & Hemlock/Hardwood**

**Description:** For the purposes of this discussion, the city ravine will be defined as the large wooded area north of Washington Ave. This area constitutes the only “real” forest within the city limits. The ravine is a very unique ecosystem that is commonly found along creeks and drainages into Lake Superior. The forest type within this ravine consists of a mix of conifers and hardwood species. The “rim” and upper portions of the ravine are dominated by large white and red pine. The pine average 21 inches in diameter. Red oak, red maple and white birch are interspersed throughout the pine. Further down the slope the pine intermix with hemlock, cedar and sugar maple.

The stand averages 14" in diameter, with young seedlings and saplings currently lacking. This is typical in conifer forests, as the trees tend to grow as one age/size class outcompeting new regeneration. The stocking is at 100 square feet of basal area with areas as high as 150 in the thickest pine area at the top of the ravine. Overall, hemlock accounts for 24% of the total stocking. White pine makes up 20%, red oak 18%, sugar maple 17% and white pine 9%. Other species identified include cedar, red maple, yellow birch, white birch, white spruce, basswood and willow. The health and quality of the trees is good, with no major problems noted. The average growth rate of the forest is slowing due to its increasing age, but is certainly not declining.

A sandy soil along the upper portions of the ravine is ideal for mixed pine stands to grow and thrive. The moist and shady conditions near the bottom favor the more shade tolerant sugar maple, hemlock and cedar. Given the soil and site conditions, the forest composition of this site is at its climax state. It contains a species mix that is suited to the site and left undisturbed with maintain itself in various stages of this forest type.

**Invasive Species:** Invasive species are conspicuously absent from this stand. A few buckthorn were noted at the entrance to the hiking trail off Washington Ave. as well as one Japanese barberry plant. The entire rim, bordering private ownership, revealed no further infestations of invasives. A vigilant eye and fast response will continue to keep this area free from invasives.

**EAB Implications:** This ravine will not be adversely affected by an EAB attack. No ash were noted during the field inventory.

**Water Quality Issues:** Despite some extremely steep slopes, very little erosion was noted. The worst erosion problem is located just off the school parking lot. There are 2 areas where the water drains from the pavement down into the ravine. This has created several small washouts. While these are not major concerns, they should be addressed in the future to prevent further problems.

**Timeline for Active Management:** This stand will not be due for management for another 10 years based on the trees quality and site conditions.

**Management Options:**

- **No Management.** Passive or non-management of a stand is always an option. Stands may be chosen to remain unmanaged for a variety of reasons. Philosophical, social and political reasons are common driving forces behind such a decision. Often there is a desire to allow nature to take its course and develop free of human impacts. Some wildlife species prefer relatively undisturbed forests. Aesthetic and recreation opportunities may require that an area be unmanaged to maintain a certain feel of "wilderness". However, occasionally sound management dictates that a stand is left to biological influences only. This occurs largely on extremely wet sites where fluctuating water tables make regeneration difficult or when a site is naturally converting to a desired forest type. There may also be areas that need to be protected and/or preserved such as fragile or special sites and communities.

No management must be considered a viable option for this area. Given the steep slopes and unique forest/ecosystem type, active management may do more harm than good. The aesthetic and water quality attributes of this area far outweigh the timber value. Active forest management tends to push forward or hold back natural succession. This ravine is at its climax forest type, which it can maintain naturally. Active management would not necessarily be any help in pushing the stand in a particular direction. It would serve merely to maintain health and promote further growth and vigor.

- **Intermediate Thinnings.** If left alone, the pine areas will reach maturity and begin to decline, eventually being replaced by new pine and oak. Active management would seek to maintain a higher growth rate and utilize the trees before the growth rate slows the trees begin to decline. This management scheme would require the pine to be thinned and eventually regenerated using a two-cut shelterwood method. Since the trees within this area are relatively young for pine, it is not yet necessary to consider regeneration. The main focus for the next 50-75 years should be on conducting proper intermediate thinnings within this cover type. Intermediate thinnings of the stand are performed until such time as it is determined necessary to regenerate the stand (~150 years). These intermediate thinnings focus on removing the high risk trees, releasing crop trees, removing low vigor and undesirable species, and to improve tree spacing. The goal of these thinnings is to allow the pine continued growth with minimal competition. The intermediate thinning harvest utilizing the individual tree selection method should be conducted by reducing the basal area stocking creating evenly spaced trees throughout the stand. Intermediate harvest should be conducted whenever the stand has again fully utilized its available growing space and the tree growth is slowed by competition. This usually occurs every 15-20 years.

Once the pine has reached its biological maturity on these sites, a two-cut shelterwood harvest would be applied to attempt naturally regenerating the site back to pine. This method is typically applied when the main stand reaches about 120 to 180 years of age on these sites. The shelterwood method is designed to regenerate species that require a moderate amount of sunlight for germination and seedling development as well as a mineral seedbed. Species such as white birch, oak, and white pine regenerate well under these conditions. This method is applied through two cuts; the first removes excess trees and scarifies the ground, and the second removes the remaining trees following successful regeneration.

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## **Lesser Ravines**

### **STAND DESCRIPTION: Mixed Hardwoods**

**Description:** This area consists of several small parcels that follow a small ravine/drainage from northwest to southeast and a small area near the eastern end of Washington Ave. These parcels vary from being semi-wooded to having no trees at all. Each area has a slightly different composition but do not warrant being addressed individually. Tree species generally include mixed hardwoods, especially those that prefer wet sites. Boxelder, white and black ash, basswood, willow and red maple are the main species found. The health and quality of the trees is good to fair. Most of the trees are small diameter (<12 inches) and have become established following the last construction project in the area. Many of the parcels are areas where culverts and unground storm sewers converge, begin, or end.

**Invasive Species:** Buckthorn was found as a minor component on 2 parcels. This consisted of only a small area of established stems. Japanese knotweed was noted on several adjacent parcels, but none specifically on city property.

**EAB Implications:** Ash species are a component of many of these parcels. However, it is a minor amount and an attack by EAB will have only a small impact. Most of the ash are small and their death will not adversely impact the nature and purpose of these wooded parcels.

**Timeline for Active Management:** Due to the small size and purpose of these wooded areas, no active management is recommended. The City of Bayfield should be vigilant to any changing conditions of the trees.



## **BUCKTHORN CONTROL**

There are many ways to kill buckthorn and other woody invasive plants that are crowding out valuable natives in Bayfield's wooded areas. Control of buckthorn is a large-scale project. Two options exist for the City. The first is eradication and the second is management. Eradication involves removing and keeping buckthorn off the site. This is a labor intensive project that requires many steps and continued maintenance. Eradication is likely temporary given the adjacent infestations on private property. Management involves "setting back" the buckthorn growth in order to promote new seedling and saplings establishment following or as part of forest management. This typically requires only one or two entries.

The following sections illustrate various methods for control. Buckthorn is aggressive and control methods must also be aggressive.

### **MECHANICAL CONTROL OF BUCKTHORN**

Control of buckthorn without the use of herbicides has been shown to have limited potential. Buckthorn is a prolific sprouter and produces large amounts of seed.

#### **Hand Pulling**

In high quality natural areas where the use of chemicals is a concern, small patches of plants up to 0.4 inch diameter can be pulled when the soil is moist. Larger plants 0.5 inch to 1.5 inch diameters can be dug or pulled using a weed wrench. Disturbed soil will result from these techniques, and should be tamped down to minimize seeding.

#### **Girdling or Hand Cutting**

Girdling (removed phloem connection of roots to shoots while retaining the xylem connection of shoots to roots) or cutting stems between December and March may not be very effective unless followed by an application of glyphosate herbicide. This generally provides a temporary setback but promotes extremely vigorous resprouting. As many as 168,000 stems per acre can resprout from a cut buckthorn patch.

#### **Prescribed Burning**

Prescribed burns in early spring and fall may kill seedlings (especially in the first year of growth), larger stems, and top-killed mature buckthorns, although this method has met with mixed results.

Burning is preferable for fire-shaped communities, but should not be used if it adversely affects the community. Burning annually or biannually to control buckthorns may have to be continued for several years depending on the extent of establishment and the seedbank, which general lasts two to three years. It is generally difficult to burn in dense buckthorn stands as the understory is typically well-shaded, allowing little fuel build-up.

## **CHEMICAL CONTROL OF BUCKTHORN**

### **Time to Apply Chemicals**

For larger buckthorn control or reduction projects, some type of chemical treatment is the best control method. It is important NOT to treat during the spring-flush growth period. This is a time when the sap is running and the plant is using its stored energy reserves to grow, from the break of dormancy in April until late June, or when the plant is fully leafed out. During the spring-flush, the plant generally does not store energy, it spends energy. Chemical treatments work best when the plant is dormant or transporting sugars to its root system (storing energy). Summer, autumn, and winter are the three seasons when chemical treatment of buckthorn is most effective.

### **Cut Stump Treatment**

During cutting and brush-hauling operations, stumps can be chemically treated with a paint-brush (single-use foam brushes work well), a wick applicator, or an ultra low volume spray wand. It is very important that water-based herbicide chemicals are applied within 24 hours of the cut. There is NO NEED to drill holes in the stump and pour chemical as some labels suggest—this overexposes you and the environment to herbicide. Stumps can be easily lost under leaves and debris during the cutting process, particularly in later fall. Working with a crew so one can cut while another follows directly behind to treat stumps can be effective. Marking stump locations with wire flags (similar to those used by utilities to mark underground wires or pipes) is also helpful when it comes time to locate the stump for treatment after an area has been cleared. Secure the flags well, so they too will not be dragged away with the brush.

### **Frill Cuts with Chemical Spray**

Frill cuts work effectively on trunk diameters greater than 3 inches. Wound the bark with an ax at a downward angle around the lower circumference of the tree, to create a frill (bark & wood flap). It is not essential that the frills be contiguous 360 degrees around the trunk. Next, apply herbicide (paint brush or spray) to exposed cut areas and adjacent inner bark. Chemical contact with the cambium (the layer just under the bark) is important. Killed buckthorn can be left standing and removed at a later time. This is a good method to stop female trees from producing fruit and to prevent erosion (no root system or soil disturbance) when buckthorn has overtaken steep slopes.

### **Basal Bark Treatment**

When mixed with a diluent (a solvent sometimes containing dye that can be mixed with some herbicides), ester formulations of Triclopyr can be applied directly to the bark at the base of the tree to provide effective control. Spray the lowest 1 ½ feet of bark around the entire circumference of the tree. For diameters 2 inches or less, only half this vertical distance needs to be sprayed. Basal bark treatment is a fast, effective way of controlling trees up to 6 inches in diameter on large sites.

Dead trees can be left standing or cut at a later time. Garlon 4, Crossbow, and Pathfinder II (ready to use) are effective brand-name chemicals (containing the active ingredient Tryclicpyr) for basal bark treatment.

#### **Herbicides that work well on buckthorn:**

Do NOT use more chemical than you need! See specifics below.

1. Glyphosate is a good choice since there is no residual or soil leaching of this herbicide. It is the active ingredient in Roundup and Ortho Basic Solutions Weed & Grass Killer Concentrate (18% Glyphosate). Use for stump, frill and foliar applications. Many different concentrations are available. Check the fine print in the lower label corner.

- 10 to 20% active ingredient is needed for stump and frill applications.
- For the cut stump and frill method, apply immediately after cutting.
- Only 3% active ingredient is necessary for foliar applications (best for seedlings in the late fall).

Rodeo, Aqua Neat, and others are the glyphosate products for aquatic use. Use on glossy buckthorn growing in wet sites (required when within 10 ft. of wetland/pond/stream). Use the same rates as Roundup, above.

2. Tryclicpyramine is the active ingredient in Garlon 3A and Ortho Brush B-Gon.

- Mix with water for **cut stump, frill, and foliar** applications.
- Use goggles when spraying, since exposure to this chemical can cause a burning sensation in eyes.
- For the cut stump and frill method, apply immediately after cutting.

3. Tryclicpyr ester is the active ingredient in Garlon 4, Crossbow, & Pathfinder. (Pathfinder is ready-to-use.)

- Mix with diluent or Kerosene for cut stump, frill and **basal bark** treatments.

*Note: Garlon 3a needs to be applied immediately after the cut. Garlon 4 can be used long after the cut because it will penetrate the stump and bark.*

#### **Wet Sites:**

For areas directly adjoining wetlands, ponds, creeks, and lakes, you must use an herbicide labeled for aquatic use, like Rodeo.\* This is only necessary when working within ten feet of the shoreline.

\* Rodeo is now beyond its legal patent. The glyphosate product may be offered for sale under other brand names such as Aqua Neat.

#### **Tips for spraying in a dense buckthorn thicket**

1. In densely infested areas, use a hand-held tank sprayer; backpack sprayers can be difficult to negotiate through the woods.
2. An ultra low volume spray wand can cut chemical use by 75%.
3. Be sure to wear appropriate protective clothing when using chemicals, especially when mixing concentrate. Use neoprene or chemical resistant gloves, not latex, cloth, or leather. Wear

goggles or safety glasses when mixing chemicals. Be certain to read and follow label instructions.

**Before you begin killing buckthorn be absolutely certain that you have identified buckthorn correctly.** There are many native species that are routinely being mistaken for buckthorn and removed. Too often workers are “throwing the baby out with the bathwater.” Valuable remnant woody plants that are regularly confused with buckthorn are: American plum, choke cherry, black cherry, hawthorn, nannyberry, gray dogwood, and others. Even the smallest native plants can bounce back if properly protected after being released from buckthorn competition. Late September through November is an especially good time for treatments, because this is when buckthorn is easiest to identify. Buckthorn leaves remain green and attached while leaves of native plants are turning color and falling.



## JAPANESE KNOTWEED CONTROL

Attempting to remove Japanese knotweed by pulling or digging is generally ineffective due to its extensive underground rhizome network; it may even promote further spreading if pieces of the plant are not disposed of properly. **Effective treatment requires a multi-pronged approach that will need more than one attack.** Cutting the knotweed only removes the aboveground portion and only serves to stimulate the below ground rhizome. In some cases weekly mowing can eventually draw down enough of the plant's reserves to kill it. The best approach to control is through a combination of **cutting** and **herbicide** application. A late spring/early summer treatment followed by an early fall re-treatment is needed. Several years of treatment may be needed for well-established populations. The plant will not resprout from the cut cane, but removing them may aid in finding and treating resprouts in an infested patch. The area will also be more conducive to revegetation if the cut canes are removed. The cut stump treatment with glyphosphate described for buckthorn, is the same prescription necessary for knotweed.

(Source: Wisconsin Department of Natural Resources, Minnesota Department of Natural Resources, EcoDesigns & Consulting – Janet R. Larson)

# **ATTACHMENT 1:**

## ***Volume & Value Tables***

***The volumes were collected from sample plots established within the stand. Values were derived from current (2010) prices actually paid for standing forest products (stumpage) in the area as compiled by the Wisconsin Department of Natural Resources. Volumes and values represent ALL current timber estimated to be growing in the stand. The value represents the total potential income if ALL the timber were harvested. Less income will be realized as various species or products are retained on the property for continued growth and proper management.***

### Estimated cordwood & sawlog volumes and stumpage values for Bayfield City Ravine

Species	Cordwood Volume (Cords)	Stumpage Rate (\$/cord)	Sawlog Volume (MBF)	Stumpage Rate (\$/MBF)	Stumpage Value
Misc. Hardwood	105	\$25.00	1.4	\$100.00	\$2,765.00
Hemlock	87	\$8.00	7.2	\$300.00	\$2,856.00
Red Oak	80	\$17.00	1.6	\$235.00	\$1,736.00
White Pine	50	\$29.00	37.6	\$62.00	\$3,781.20
Red Pine	15	\$41.00	22.8	\$51.00	\$1,777.80
Cedar	10	\$15.00	-	-	\$150.00
<b>TOTALS:</b>	<b>347</b>		<b>70.6</b>		<b>\$13,066.00</b>

# **ATTACHMENT 2:**

## *Glossary of Terms*

### **GLOSSARY OF COMMON FORESTRY TERMS**

<b><u>Term</u></b>	<b><u>Definition</u></b>
Basal Area	Same definition as sfa below.
Clearcut	Method of harvesting in which all trees are removed at the same time. It is effective management for trees which are shade intolerant and cannot thrive under a forested canopy (ie. Aspen, red maple, jack pine)
Dbh	Diameter at breast height. The diameter of the tree as measured at 4½ feet above the ground.
Forest Management	The practical application of biological, physical, quantitative, economic and social principles to regeneration, management, utilization and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Forest management includes management for aesthetics, fish, recreation, urban value, water, wildlife and wood products.
Forest Succession	A predictable series of changes in vegetation over time.
Invasive	A species that does not naturally occur in a specific area and whose introduction does or is likely to cause economic or environmental harm or harm to human health.
Overstory	The upper portion of the trees (crowns) that make up the main canopy in the forest.
sfa	Square feet per acre, also known as basal area. The cross-sectional area 4½ feet above ground expressed in square feet per acre of all trees with a diameter of 5 inches and larger. This represents the amount of solid wood on an area basis.
Understory	Younger trees and shrubs that make up the lower canopy in the forest.

# **ATTACHMENT 3:**

## *Forest Area Map*