McLellan Conservation Area

Resource Management Plan

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Northwest Management, Inc.
15 W. Crawford
Deer Park, WA 99006-1103
(509) 276-4699
www.consulting-foresters.com
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INTRODUCTION

The McLellan Conservation Area has been inventoried and evaluated in order to develop objectives and management recommendations. The goals of a management plan are to:

1) Identify a set of realistic landowner management objectives;
2) Assess the biological and ecological conditions of the resource; and
3) Design and implement a program to achieve the management objectives; and

Typically, the long-term goal of resource management is to develop and maintain a well-balanced and healthy ecosystem while meeting the landowner’s objectives for the property. Although this plan identifies recommended treatments, the recommendations are flexible. Changing landowner needs, markets, environmental conditions, or regulatory laws may require alterations of the schedules or treatments. A general resource management plan serves as the basis for developing stand treatments that consider not only the timber resource, but also wildlife habitat, soils, noxious weeds, sensitive species, and cultural factors. This plan will provide the Spokane County Department of Parks, Recreation, and Golf with guidelines on the timing of treatments as well as alternative management techniques.
PROPERTY DESCRIPTION

Location
The McLellan Conservation Area is located just across the Spokane River from Tumtum, WA within Spokane County. To locate the property, travel northwest from Spokane on Nine Mile Falls Road (SR 291) and turn left (west) on Charles Road (crossing the Nine Mile Dam bridge). Continue northwest on Charles Road for approximately 5 miles, and turn right at the junction of South Bank Road. Follow South Bank road for approximately 5.8 miles, then turn right on McLellan Lane. Drive 0.7 miles to the end of this road, which lies on the south property line of the Conservation Area.

Legal Description
This 410-acre Conservation Area is located in Section 31, of Township 28 North, Range 41 East, Willamette Meridian, in Spokane County, Washington. The property is partially bounded by the Spokane River on its north, east and west boundaries. The property occupies all of the above section, excluding the portion which is found on the Spokane River.

Road Access
Road access is currently limited, mostly due to the restriction of motorized vehicles to the public. There are two native-surface roads, which are utilized from time to time by County employees for management purposes. The furthest road to the west, known as Brooks Road, provides access to a flat peninsula which protrudes into the Spokane River. The easternmost road winds through a densely stocked area of advanced regeneration (smaller, non-merchantable trees) and dead ends on a steep bank above the river. Both roads have been utilized for management activities in the past, prior to the property being acquired by the Spokane County Department of Parks, Recreation, and Golf. See the following aerial photograph and topographic map (pg. 3 and 4) for the approximate locations of property boundaries and roads.

Topography
The McLellan Conservation Area is situated on a large flat which protrudes into the Spokane River. Topography on the property is mostly level to gently undulating. Several small depressions are present at various locations. There is a steep, north-facing bank which breaks towards the river along the property’s shoreline. Slopes in this area (known as Stand 2) reach 55% for short distances. The average elevation on the property is approximately 1,700 feet.
Road and Property Boundary Topographic Map
PROPERTY GOALS

The forest management goals for the McLellan Conservation Area (C.A.) have been identified as follows:

1. Improve the quality of life for Spokane County citizens through the acquisition, protection, and enhancement of environmentally significant natural areas that can be used for passive recreation activities.

2. Acquire, protect, and enhance open space properties that may provide optimum habitat for many different wildlife species.

3. Practice land stewardship based on long-term ownership and sound forest, range, and riparian management.

4. Reduce the risk of catastrophic wildfire throughout the property, especially in those areas adjacent to private residences.

5. Develop and maintain a healthy forest while creating and maintaining a sustainable and natural forest environment.

6. Restore the property to its historical or “natural”, pre-fire suppression state (where applicable).

7. Maintain and protect water quality of the Spokane River watershed through sound and sustainable forest management practices.

Ownership goals are given primary consideration during the development of recommended forest management actions. For the purposes of this Resource Management Plan, forest management recommendations will be made by classified stand type. A minimum of 10-year planning horizon is considered in terms of planning management activities. In some cases a longer planning horizon may be suggested in order to achieve certain goals. Specific stand recommendations are designed to be realistic and achievable for the landowner based upon the physical limitations of the specific site (topography, soils, elevation, access, and aspect), financial considerations, public opinion/influence, and biological constraints. It may not be possible to achieve every goal on every acre, but stand recommendations will identify where significant potential exists to achieve one or more of the ownership goals. Some general statements can be made in regards to the forest management goals listed above.

**Water Quality**

The most significant potential impact to water quality in managed forests is sediment. The most significant potential source of sediment is runoff from forest roads. Other
common sources of sediment can include erosion associated with timber harvesting and livestock grazing. Forest roads located near streams should receive special consideration in regards to proper road design, road drainage, and stream crossing infrastructure. The roads found on the McLellan C.A. have not been excessively used since its acquisition by the County. However, roads should still be monitored for maintenance purposes, especially on steeper grades where erosion is a factor. The road which descends onto the lower bench along the Spokane River should be evaluated every year to determine if erosion control features are necessary. This is of special concern due to the grade of the road and its relatively close location to the Spokane River. Currently, this road has a substantial amount of native vegetation growing on it, which improves soil stability. However; even in non-motorized areas, these forest roads still receive the highest disturbance levels, either by foot, mountain bike, horses, or by unwanted all terrain vehicles. Adherence to Forestry Best Management Practices and installation of Riparian Management Zones during management activities will significantly reduce the potential for sedimentation.

The health and condition of streamside vegetation should be evaluated periodically. Healthy riparian and wetland areas filter sediments from surface runoff, stabilize stream banks and help to reduce impacts associated with floods. Streamside vegetation also provides shade to maintain cool water temperatures. Many fish species, especially trout, become stressed as water temperatures rise during summer months.

**Fish and Wildlife Habitat**

Wildlife habitat concerns are often best addressed by emulating the natural disturbance regimes that have shaped forest habitats over the past several centuries. It is important to understand the habitat requirements of specific wildlife species and manage for conditions that provide the necessary critical habitat components. In some instances, forest management practices must be modified to achieve wildlife related objectives. Key wildlife habitat components that are lacking should be addressed in the development of recommended stand treatments. Wildlife management professionals can be consulted to provide professional guidance and to evaluate the condition and trend of fish and wildlife habitats. These issues are especially significant in and near riparian areas and wetlands due to the dependence of many wildlife species on these habitats.

Especially important forest wildlife habitat components include large diameter, dead standing and down trees, riparian shrubs, aspen stands and native forage. Availability of hiding and thermal cover should be considered at both the landscape and stand level. Multi-layered forest structures generally provide habitat for the widest array of wildlife species. However, some wildlife species will favor dense single stand structures. Forest landscapes, which provide an assortment of vegetation types, will attract the greatest array of wildlife species.

**Forest Health**

Forest health problems on the McLellan C.A. (also referred to as “McLellan C.A.” in this plan) are substantial at this time. These conditions are due in part to several cumulative factors over the past century, including: 1) Fire suppression 2) Storm events 3) High-grade timber harvesting 4) Lack of proper disturbances (man-made or natural) 5) Lack of stand management. These factors will be discussed in greater detail later in the plan.
Forest health and tree growth rates at the stand level can be maintained or improved by controlling tree stocking levels, tree species diversity and forest stand structure. Stand improvement recommendations will identify the preferred retention tree species for various stand types. Stand improvement practices which emphasize retention of trees exhibiting superior form and growth rates will improve the productivity of forest stands over time. In some cases other management objectives such as wildlife habitat will override the objective of maintaining tree growth rates and stand vigor.

**Wildland Fire**

Risk of fire is always a concern in any forest that receives high public use, especially one located close to private residences and structures. Not only are economic issues at stake but also environmental consequences. While risk of wildfire cannot be eliminated, the implementation of recommended forest management practices can significantly reduce the potential for a catastrophic wildfire. Recommended management practices should always consider issues such as fuel loading and slash disposal, maintenance of fire resistant forest stand structures, and retention of tree species resistant to low intensity wildfire. Maintenance of a usable road system becomes an important element in terms of wildfire suppression, should these activities be required. Although non-motorized use is prohibited at McLellan C.A., a property of this size should have at least a minimal road infrastructure to aid management activities and fire suppression efforts. The terrain at McLellan C.A. is easily negotiated by small fire-fighting equipment, especially Type 6 (heavy-duty pickup) engines.

**Noxious Weeds**

Noxious weed control is a major expense for forest landowners. Methods of control include prevention, herbicide treatments, utilization of biological controls, proper grazing management, and grass seeding. Forest roads, vehicles, and timber harvesting equipment are vectors of dispersal for weed species. Disturbed soils are especially vulnerable to colonization by weed species. Disturbed areas should be seeded with an appropriate seed mix at the earliest appropriate time. Weed prevention strategies must be considered in regards to every management action taken. Landowners must make an ongoing effort to monitor weed populations (especially on roads and recently disturbed areas), identify weed species and stay informed regarding innovative management strategies. All property visitors/users (and workers implementing management activities) who enter the property should be informed and made aware of weed management practices. Contract agreements and land use agreements should clearly state weed management policies. Informational signage at property entry points can help inform visitors to the property.
The most common forest health problem in many forests of the inland west is overstocking (too many trees per acre). This is also the most significant forest health issue on the McLellan C.A.. Overstocking causes tree stress because neighboring trees must compete intensively for light, water, and nutrients. This condition is a function of fire suppression and the lack of appropriate management activities to maintain normal or “functional” stocking levels. Overstocking can lead to numerous forest health risks, including bark beetle outbreaks, increased fire hazard levels, increased susceptibility and quicker spread of forest pathogens, loss of wildlife habitat, and increased mortality rates, all of which have been observed on the McLellan C.A.. It is important to remember that these conditions can never be totally eliminated or avoided. Most of these occurrences are normal functions of forest succession (often referred to as “disturbance events”); however, what is not normal is the extremely high stocking levels present on the property, which can ultimately lead to disturbance events of abnormal size or intensity.

The McLellan Conservation Area is intended to be a source of recreation to the citizens of Spokane County and improve the quality of life for the entire community. To fully achieve this goal, all properties attained under the Conservation Area Program must be managed with forest health being a top priority, as stated in the property goals (p. 5). In so doing, the taxpayers’ investment will be protected, and a more defensible and enjoyable open space will result. The forest resources that are found on the Conservation Area properties can be managed by a regime that provides a healthy forest, a variety of wildlife habitats, and opportunities for public use and education.

**What is a “Healthy Forest?”**

A healthy forest is:

1. Resilient to natural and human disturbance;
2. Biologically diverse;
3. Able to provide a sustained habitat for vegetation, wildlife, and humans.

Trees require adequate light, water and nutrients to maintain their health and grow to their biologic potential. If one or more of these elements are missing or insufficient, the tree experiences stress. Stressed trees are vulnerable to insect pests, disease problems and reduced growth rates.

The abundance of sunlight in the forest is managed by controlling the number, size and density of trees. The optimal amount of sunlight varies with individual tree species present and management goals for the property. For example, lodgepole pine and western larch require full sunlight to reproduce successfully. Sub-alpine fir and Engelmann spruce can reproduce in heavy shade. Douglas-fir is able to reproduce in partial shade. Tree thinning is the primary method used to control forest density, species composition and tree growth. Pre-commercial thinning is applied in young forests before trees have commercial value. The objective is to cut less desirable trees and create additional growing space for the remaining trees. The trees cut can be left in the forest to decompose and recycle nutrients.

Commercial thinning is implemented when trees are larger, older and have commercial value. Cut trees are removed and sold to wood products manufacturers. Before tree thinning is implemented, a forester prepares a silvicultural prescription. The prescription details the goals of the thinning project and describes how, where, and when the work will be accomplished.
The intermountain west typically experiences dry summers. During this period trees depend on moisture stored in the soil to maintain their growth. Deeper soils and cooler aspects (north and east) benefit tree growth because they store greater amounts of water that is available later into the growing season. Where soils are shallow, or the aspect is hot and dry (south and west) tree growth slows during drought periods due to a lack of soil moisture. Shade-intolerant (light loving) species are adapted to grow on hot, sunny areas (south and west aspects) and are more resistant to drought. Shade-tolerant species grow in cool, moist forests found on north and east aspects and adjacent to riparian areas. Shade-tolerant species are less resistant to drought. Thinning reduces the total number of trees competing for water allowing residual trees to obtain soil moisture for a longer period during the growing season. Forest productivity is often enhanced when dense (over-stocked) forests are thinned to reduce competition for soil water.

The availability of nutrients in the soil will influence the potential for tree growth. Nutrient availability is influenced by soil type and the abundance of organic material present in the soil.

**Past Management Activities**

The McLellan C.A. has experienced at least one or two timber harvests within the last 50 years. These harvests removed mostly larger, higher quality timber from the property. Large stumps are evidence of what was taken during these entries. Harvesting in this manner is referred to as “highgrading,” where the largest and best quality trees are harvested as they are obviously the most valuable. This is also sometimes called “thinning from above.” This method of harvesting often removes the best genetics on the site (which is the preferred seed source) and thus compromises the health and viability of the future timber stand. As a result of these past practices, many “old growth” ponderosa pines (also called “yellow pine”) have been removed, although several yellow pines can be found scattered throughout the property.

In addition to timber harvesting, grazing has occurred for many years on the property. The frequency of grazing is unknown; however, according to the fence, amount of grass, and common use of this area as rangeland, it is assumed that grazing has occurred on the property to some extent.

Forest rangelands are an important resource of the west. These transitory rangelands are suitable for grazing livestock as well as for wildlife species. Forest transitory rangelands occur on land where the density of the tree overstory has been reduced or removed creating greater amounts of grasses, forbs, and shrubs. Forage becomes more available on these sites and it is an important food source for wildlife and domestic animals. A variety of uses available on these lands create the potential for conflict, especially between timber and domestic livestock.

Because of the high amount of forage available on transitory rangelands, they are excellent habitat for elk and deer. These animals occupy transitory ranges during all or parts of the year depending on the location and on the availability of hiding and thermal cover. Where conflict between uses occurs, livestock can do considerable tree damage and are often attributed to causing plantation failures. There may be several other causes of damage and mortality to plantations.
Uneven-Aged Forest Management

Uneven-aged silviculture reflects a land manager’s effort to imitate the process of gap succession. Uneven-aged silviculture is typically applied on low-elevation sites where frequent low intensity fires were once common. Ponderosa pine and Douglas-fir forest types are particularly well-suited to uneven-aged management techniques because timber harvesting and tree thinning can be utilized to create forest stand structure similar to those that would naturally develop as a result of low intensity wildfire or other less intrusive forest disturbances.

For example, a selective harvest in an Engelmann spruce stand can simulate bark beetle outbreak; the primary successional function of the spruce beetle is thought to be the release of seedling and sapling-sized Engelmann spruce and sub-alpine fir beneath the recently killed trees. Similar opportunities to simulate stand structures resulting from mountain pine beetle, western pine beetle and Douglas-fir beetle attacks exist in the Douglas-fir stands.

Ecologically, uneven-aged silvicultural methods reflect the land manager’s effort to imitate natural patterns and processes of disturbance and forest succession. Through succession, plant communities develop; through disturbance that development is altered. Major disturbances, such as high intensity wildfire or commercial timber harvest are often severe enough to set a forest plant community back to an initial or “pioneer” successional stage. Less severe and more frequent disturbances, such as low intensity wildfire and insect or disease infestations tend to affect single trees or small groups of trees, altering succession to a lesser degree. This less intrusive process is often referred to as “gap succession”. The “gaps” are small forest openings created by recently killed trees. The successional process occurs in small forest openings (“gaps”) as plants adapted to environmental conditions present in small forest openings begin to occupy the site, compete with one another for growing space, and develop a new forest structure based on physical characteristics of the plants which survive. Young trees that become established in the forest canopy openings form a new tree age class within the stand. The complexity of forest stands increases as multi-layered forest structures develop and the diversity of trees species present in the stand increases.

Advantages of uneven-aged silviculture are that a stand’s structure, productivity, and cover are maintained over time. A diversity of tree sizes are present at any given time within the stand’s development history. Visual impacts associated with timber harvests are minimized as single-tree selection harvests are utilized to remove only designated trees.

Group selection harvesting is used to approximate intensive small-scale disturbances that create larger openings within a stand. Natural examples include localized insect infestation, windthrow, or flare-up of a surface (or ground) fire.

Single tree selection harvesting mimics the smallest scale of succession such as when a single tree falls or dies. Causes of mortality may include lightning, disease, insects, and windthrow. In small gaps, the opening in the forest canopy may fill before regeneration can fully develop. The regeneration in the forest understory may stagnate and persist with little growth and will eventually become suppressed and die.

Gap size in the forest canopy is a critical link to successful regeneration of desirable tree species. Larger gaps favor species intolerant of shade such as western larch and lodgepole pine. Harvest unit layout varies with opening size, shape, density and orientation to provide more natural landscape patterns in the forest. After treatment, residual basal areas of 40-60 square feet per
acre will encourage tree regeneration and limit vulnerability to insect and disease pests associated with stress. Trees left after harvest must be of sufficient size and maturity to be reliable seed bearers. Marking of leave trees in harvest units is often recommended to ensure multiple age classes, variable tree sizes, and healthy seed trees are well-represented in treated stands.

Steep slopes (greater than 40%) are a special challenge given the potential for mechanical damage to the residual stand during repeated harvest entries. Stands where canopy layers are stratified with shade intolerant species in the overstory and tolerant species in the understory require intensive management to ensure adequate regeneration of shade intolerant species. Dense, uneven-aged forest structures dominated by a Douglas-fir can be vulnerable to western spruce budworm and dwarf mistletoe. Multiple stand entries in conifer stands where root disease is present can create conditions favorable to the spread of disease.

**Even-Aged Forest Management**

Washington’s forest areas are subjected to many different fire regimes as the result of the climate, topography and vegetation. Even-aged management is often recommended for forest types that historically experienced mixed to high severity fires. These regimes are most common at higher elevations where fires occur on a less frequent basis and forest fuels tend to build up over a period of 5-30 decades. Even-aged harvest prescriptions are often recommended for lodgepole pine stands. Lodgepole pine/subalpine-fir forests in the Rocky Mountains experience stand replacing fires at intervals of 75–300 years. These fires are severe, resulting in complete or nearly complete mortality in the stand. The term “stand replacing” wildfire is often used to characterize these intensive fires. The eventual outcome is the development of even-aged stands spread out in a mosaic pattern of old burns which are present across the forest landscape.

Even-aged harvest methods are recommended to control insect and disease outbreaks, manage suppressed stands comprised of predominately low vigor trees, create diversity in otherwise homogenous forest landscapes, and treat stands on moderately steep slopes which are prone to damage from multiple harvest entries. The method can also be used to salvage merchantable timber following a wildfire.

An even-aged silvicultural system is a planned sequence of treatments designed to maintain and regenerate a stand with one age class. The range of tree ages is usually less than 20% of the rotation length. Once tree regeneration is well established, intermediate treatments like tree thinning may be used to control stand stocking and species composition several times over the length of the rotation. Thinning is intended to stimulate the growth and vigor of trees by reducing the competition for light, water and nutrients. Thinning is most beneficial in young vigorous stands but may be used in areas with trees that have reached merchantable size.

The rotation length is the period of years required to grow a crop of timber to specified condition of economic or biologic maturity. There are three regeneration harvest methods used in even-aged systems: clearcut, shelterwood and seed tree harvests. These methods vary by the residual stand left after harvesting and the purpose of these residual trees. Each method is designed to regenerate a new stand of shade intolerant tree species.

Clearcuts are a method of regenerating an even-aged stand in which a new age class develops in a fully exposed micro-environment after removal of all trees in the previous stand in a single
cutting. Regeneration can be from natural seeding, direct seeding, planted seedlings and/or advance reproduction.

For a shelterwood harvest prescription, one or more cuttings are made to begin the development of a new age class before the old stand is completely removed. Partial shade from the residual overstory provides protection to newly developing seedlings. This method is commonly used to encourage regeneration of Douglas-fir and ponderosa pine on drier sites and south aspects.

A seed-tree harvest is an even-age management system where only a few widely-spaced residual trees are maintained on site as seed sources. The seed-tree method is very similar to the shelterwood method, differing only in the amount of residual stocking left during harvest and the purpose of the residual overstory trees. In the seed-tree method, fewer trees are left on site and these residual trees serve only as a seed source (seed-trees). Foresters normally use the seed-tree method with light-seeded, wind-disseminated, shade-intolerant species such as western larch.

The choice of even-aged regeneration method will depend on both landowner objectives and the forest type under management. Clearcutting is often less costly than other methods due to fewer stand entries and is therefore the most often preferred method for appropriate species, such as lodgepole pine.

Clearcuts produce the most drastic changes to microclimate, wildlife habitat and aesthetics, and therefore may not be an attractive choice for areas where non-timber forest commodities are emphasized. If not properly planned, clearcuts can increase erosion, landslide and rapid runoff of water. The risk of this type of damage is greatest on steep slopes. Avoiding the use of clearcuts on erosive soils and utilizing appropriate harvest technologies such as cable and mechanical cut-to-length harvesting will protect soils and mitigate potential negative impacts. Historically, foresters have used shelterwood and seed-tree methods to provide alternatives to clearcutting. Most even-aged regeneration systems rely on natural regeneration, but in some cases artificial regeneration (planting or direct seeding) is used as a primary or supplemental source of regeneration.

### Thinning Methods

Cutting of trees in an immature stand for the purpose of stimulating the growth and vigor of residual trees is known as tree thinning. Trees cut in a pre-commercial thinning have no commercial value and normally none of the felled trees are removed for utilization.

Trees cut in a commercial thinning have commercial value and are harvested for utilization as a wood product. The primary objective of both types of tree thinning is to increase the total yield of merchantable wood products produced from a forest stand. Tree thinning operations are implemented to regulate tree stocking rates in a manner that optimizes production of merchantable trees. The principles and benefits associated with tree thinning apply to both even and uneven-aged stands. Thinning is the primary means by which the productivity of overstocked forest stands can be improved.

Trees in a forest stand compete for growing space in the forest canopy and in the soil. Trees in dense stands struggle for existence and have reduced growth and vigor. Reducing the number of trees per acre by removal of less desirable trees allocates light, water and nutrient resources to the most vigorous trees on a site. Vigorous trees tend to occupy superior positions in the forest canopy and have more fully developed crowns. The position of a tree’s crown in the forest canopy is an important criterion when deciding whether it should be cut or retained. Reducing
competition for space in the tree canopy is significant since the tree’s foliage produces the energy on which the tree depends. Retention of vigorous dominant and co-dominant trees that have not developed coarse branches is generally recommended because these trees have crowns that receive sunlight from above and/or from the side. Coarse branches are viewed as an undesirable tree attribute for crop trees because they may lower the quality of log produced from the tree. The selection of trees to be favored and of those to be cut is based not only on the relative position and condition of the crown, but also on the health of the tree, genetic attributes of the tree and condition and quality of the tree bole. Removal of genetically inferior trees will improve the genetics in a forest over time. Undesirable tree species can be targeted for removal from stands during thinning operations and the composition of species within a stand can be controlled to meet various forest management objectives.

Reductions in stand density accomplished by thinning usually encourage faster tree diameter growth and increase the proportion of stem wood large enough for profitable use over time. It may take a period of several decades following a thinning for the stand to reach full occupancy of the site. The beneficial effects of thinning are especially significant in areas where soil moisture is limited during the growing season.

The best criteria for determining when to thin is to evaluate the average live crown ratio of potential crop trees. If the live crown ratios of crop trees fall below 30-40%, thinning may be required to prevent a reduction in growth rate and tree vigor. Pre-commercial thinning is especially important in very dense stands of natural reproduction. These stands are likely to stagnate without early treatment. The ability of trees in stagnated stands to release, decreases with time. Every effort should be made to thin dense stands of young trees at a young age.

Typically, thinning can occur once differentiation of crown classes has occurred. Basal area is a measure of stand density expressed as square feet per acre of tree stem cross sections measured at a point 4.5 feet from the ground. Basal area per acre is easily measured with a timber cruise or field inventory. Basal area targets can be developed for stands that are predominately comprised of merchantable-sized trees. Once a stand exceeds a recommended upper limit of basal area per acre, it can be evaluated to determine if a reduction in basal area is required to improve or maintain growth rates of residual trees. Where appropriate, the basal area of the stand can be reduced to a pre-designated lower basal area per acre limit, and then allowed to grow over time to the upper limit or threshold value. Once the upper basal area limit is achieved, the stand can be re-evaluated for harvest or repeated thinning.

The range of optimum tree stocking rates and basal area will vary by site, stand age, size class, distribution and species composition of a particular forest stand. Generally poor sites will have a lower optimum tree stocking rate than moderate to good sites.

Thinning alters forest development. Species composition is controlled when desirable tree species in good health are retained and less desirable species removed. Desirable tree species will be adapted to the growing conditions on the site and most capable of utilizing available resources to produce merchantable-sized trees in the shortest period of time. Determination of which tree species are most desirable on given sites will depend on several variables. These variables include insect and disease resistance, fire resistance, drought tolerance, shade tolerance, soils and local markets for wood products. Where saw-timber production is the primary objective, the focus of tree thinning is to ensure that crop trees develop vigorous crowns and straight stems with smaller branches.
The advantages of tree thinning are less pronounced in stands comprised of mature trees. The sudden exposure of trees in dense stands can make them vulnerable to windthrow. Trees in dense stands may have poorly developed root systems. Shallow rooted species such as lodgepole pine and Engelmann spruce are especially vulnerable to wind throw following thinning treatments.

Tree thinning is used to accomplish management objectives other than production of merchantable timber. Thinning can increase water yield from watersheds, enhance the development of forest understory vegetation for wildlife or livestock, improve aesthetics of forest stands and reduce fire hazard. A good thinning program will meet one or more of these objectives:

1. To use or sell trees that would otherwise die naturally and eventually decay.
2. To redistribute the total fiber growth of the stand to fewer trees of higher quality, thereby increasing the value of usable fiber.
3. To provide income to pay off investments such as reforestation, pre-commercial thinning and other stand improvement activities.
4. To enhance non-timber resources like wildlife, water quality, recreation, aesthetics and grazing.
5. To improve stand health.
6. Reduce fire hazard.

Several methods of thinning are available to accomplish various management objectives. The type of thinning selected will depend on age, size, condition, and species composition of the forest stand. Late summer and fall are generally the best time to implement tree thinning. Trees are less susceptible to bark damage at this time, and slash generated from the thinning has less potential to attract bark beetles.

**Low Thinning** – Only trees from lower crown classes (intermediate and overtopped) are cut. Salvage of merchantable trees that ultimately will die is possible if some cut trees are in pole and sawlog size classes. Reduction in crown competition between dominant and co-dominant trees is not significant since most of these trees are retained. Root competition for nutrients is reduced. Fire hazard is reduced by removal of ladder fuels from the forest understory.

**Crown Thinning** – Trees from lower crown classes and co-dominant trees in poor to fair condition are cut. Some dominant trees in poor condition may be cut to favor healthy co-dominants. There is increased potential for harvest of merchantable-sized trees. Root competition for nutrients is reduced. Competition for growing space in forest canopy is reduced. Fire hazard is reduced by removal of ladder fuels in the forest understory and increased average distance between tree crowns.

**Selection Thinning** - Trees from all size classes are cut to release designated crop trees. The emphasis is on retention of healthy vigorous trees of the species preferred for the site. Stocking rates may vary across the stand depending on age class and distribution of healthy trees. This method is generally suited to stands that have multiple age and size classes and varied species composition. Selection thinning is often recommended as the initial treatment in previously untreated natural stands. It is also recommended to maintain or further develop uneven-age stands. Selection thinning in an unevenly stocked stand might remove scattered undesirable dominant trees and co-dominant trees which are crowded or in poor to fair condition, and include low thinning to salvage or remove overtopped and intermediate sized trees. Clumps of
regeneration may be thinned based on spacing guidelines to achieve preferred stocking rates. The development of individual crop trees guides decision making. Attention is directed at releasing potential crop trees of various size classes.

**Variable Density Tree Thinning** – This approach is designed to mimic natural patterns of disturbance. It involves applying an uneven spacing between trees as well as retention of different tree sizes and species. Some patches (at least 50 feet in diameter) are heavily thinned to favor development of shrubs and ground cover. Other patches (also at least 50 feet in diameter) are thinned very lightly or not at all to retain shelter, thermal and hiding cover for wildlife. Variable density units are scattered throughout the landscape. Snags are retained when they do not pose a safety hazard.

**Road System**

Forest road systems provide numerous benefits such as providing access for timber harvesting, livestock grazing, recreation, fire control, and land management. The harvest of forest products usually depends on road access, and decreased road densities can result in increased timber harvesting costs. Roads provide access that can increase the efficiency of fire suppression and can act as linear firebreaks that reduce fire spread.

Detrimental effects associated with roads include sedimentation, habitat fragmentation, and loss in soil productivity, invasion by noxious and exotic weeds, use conflicts and destructive human actions such as trash dumping, illegal hunting and wildfires. Weed species that disperse along roadways can spread to adjacent native plant communities. Actively controlling access, when and how people are permitted to use roads is important if detrimental effects are to be mitigated.

Surface erosion from road surfaces, cut banks, and ditches can be a significant source of sediment in streams. Rates of sediment delivery are highest in the first five years following road construction and can be closely related to traffic volume on unpaved roads. Surface erosion problems are worse where roads are constructed on highly erodible soils. Lack of road maintenance or poorly timed maintenance can contribute to increases on sediment production on existing roads. Implementing improved road construction standards and actively maintaining roads will reduce road related surface erosion. Road location, design, construction and maintenance is especially critical near streams. Placement of surfacing material, installing proper drainage structures and prompt establishment of vegetation on road surfaces are actions that will reduce sediment production from road surfaces.

The two forest roads on the McLellan C.A. are constructed of native soil material and average 10-12 feet in width. These roads experience very little traffic, as the property is closed to public motorized vehicle use. Due to low usage, these roads have an abundance of native vegetation currently growing on them. This improves the stability of the road bed, preventing erosion events. As stated earlier, the forest roads on the McLellan C.A. should be monitored yearly, especially the steeper road which descends to the point on the Spokane River. Noxious weeds are more likely to be found in these areas, as they do receive more use from the general public (trail hikers, mountain bikers, equestrian, etc.) than other areas of the property.

**Wildland Fire**

The wildfire potential (and its ramifications) of the McLellan C.A. is extremely high. The property is much more prone to human-caused fires than private forestlands due to its high public use (even though motorized vehicles and campfires are prohibited). The current stand
conditions on the property would lead to a high-intensity, stand replacing wildfire, due to the extremely high stocking levels and abundance of ladder fuels. This condition also poses a threat to the nearby private property and residences.

The current forest conditions of the McLellan C.A. are a result of fire suppression for the past century and previous timber harvests. A silvicultural prescription that emphasizes forest health and fire hazard reduction should be implemented to protect this public resource, as well as adjacent private resources. The plan will identify stand-level prescriptions which will meet these objectives.

**Insects and Diseases**
Forest health agents common to Spokane County include dwarf mistletoe, western gall rust, spruce bud worm, root rot, bark beetles, and physical damage from weather and animals. All agents affecting this property are native to the area. Eliminating impacts to individual trees is nearly impossible, but minimizing their scope and impact throughout a forest area is achievable. A brief description of these agents follows, as well as current problems and management recommendations.

**Dwarf Mistletoe**
Dwarf mistletoe is very common throughout much of the ponderosa pine on the McLellan C.A.. The frequency of this agent is high and infection levels are moderate to high. Along with overstocking, dwarf mistletoe is one of the primary forest health threats on the property. It is heavily present throughout the entire forest canopy (from overstory to understory). The high stocking levels have helped advance the infection of the parasite. Top kill has been observed as a result, in addition to mortality and loss of vigor.

Dwarf mistletoes are small, leafless, parasitic plants that grow on branches and stems of conifers. They are usually 1 to 5 inches tall and mostly green yellow, brown or orange in color. A host tree is typically infected by only one species of mistletoe. Bunched growths of branches (witches’ brooms) and swollen branches are frequently caused by mistletoe so they are good places to look for mistletoe shoots.
Female plants produce seeds that spread the parasite. Both sexes damage trees. Seeds are produced in small berries. During late summer berries burst and seeds can travel horizontal distances of 10 to 35 feet. The sticky seeds attach to branches and infect them. Birds also carry seeds, but most infection is from nearby infected trees.

The time it takes mistletoe to kill a tree depends on several factors. Damage tends to develop slowly until the tree is heavily infected. Trees are usually killed within about 10 to 15 years once they become heavily infected throughout the crown.

Control of dwarf mistletoe involves reducing the amount of mistletoe to a low level. Heavily infected trees are cut. Lightly infected trees can have branches pruned. All live branches up to the highest infected branch should be cut off. Infected trees can be retained if they are isolated from healthy trees or surrounded by resistant tree species within 40 feet.

If the disease is so advanced that most trees need to be cut, planting mistletoe resistant trees is a good alternative. Douglas-fir, for example, can be replaced with ponderosa pine.

Mistletoe control is generally a long-term process with activities usually focused around harvest or thinning operations to reduce cost. The first step is to select heavily infected trees for removal during current or future harvests. Second, remove infected young trees during pre-commercial thinning operations. Third, prune infected branches off of trees which are left behind but have light infections. Lastly, monitor for mistletoe outbreaks every three to five years. Ponderosa pine mistletoe is host specific to ponderosa pine; however, there are dwarf mistletoes that infect western larch, Douglas-fir and lodgepole pine.

Dwarf mistletoe infection levels are often ranked according to the “Hawksworth Scale” method. Refer to Figure 1 (p. 18) for a description of this ranking method. Foresters often use this method in determining which trees to remove during harvest operations to minimize and control the spread of dwarf mistletoe in a stand.
Hawksworth Scale Ranking Method for Dwarf Mistletoe Infection

Step 1: Divide live crown into thirds
Step 2: Rate each third separately
Assign each third either 0, 1, or 2:
0 - No visible infection
1 - Light, less than 1/2 of branches have mistletoe plants
2 - Heavy, more than 1/2 of branches have mistletoe plants and/or brooms
Step 3: Add ratings of each third to obtain total tree rating

<table>
<thead>
<tr>
<th>Total rating</th>
<th>Infection level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>none</td>
</tr>
<tr>
<td>1 or 2</td>
<td>light</td>
</tr>
<tr>
<td>3 or 4</td>
<td>moderate</td>
</tr>
<tr>
<td>5 or 6</td>
<td>heavy</td>
</tr>
</tbody>
</table>

Example
This third has no visible infection
Less than half this third is infected
More than half this third is infected
Total rating for this tree

Figure 1
Western Gall Rust

Western Gall Rust is a fungus that infects lodgepole pine and ponderosa pine. The fungus can be identified by looking for galls (round swellings) or cankers (deformities) on the branches and bole of infected trees. This disease mainly causes stem malformation, breakage, reduced growth, and tree killing (particularly in younger trees). In large trees it may persist for 50 years or more before death. Currently western gall rust is lightly scattered throughout the ponderosa pine overstory on the McLellan C.A.. It has also been observed within some of the pole and sapling-sized thickets. The impact from the disease is minimal. This disease is windborne and may travel several miles to infect other pines. Due to this high spread area, complete elimination of this disease is unlikely. Its spread can be minimized through the proper selection of heavily infected trees during management operations.

Pine Bark Beetles

Five bark beetles species affect conifer trees in the region including; western pine beetle, mountain pine beetle, red turpentine beetle, pine engraver beetle and Douglas-fir beetle (see images, pp. 21-22). Bark beetles generally favor trees that are water stressed. Trees can become water stressed during a drought or by having too many trees in an area (over-stocked). The bark beetle bores through the bark and lays its eggs in the cambium layer between the bark and the wood; the cambium is full of sugar and nutrients that feed the larvae.

Trees recently killed by bark beetles will have rusty red foliage. A tree can turn from green to red within weeks or months of infestation. Red trees themselves are usually not a forest health risk as the beetles which infested the tree have flown prior to the tree turning red. Other indicators of bark beetle attack such as pitch tubes, boring dust, or frass on the bark of the tree are present immediately upon infestation. Periodic monitoring of forest stands by an experienced forester will indentify beetle infestations prior to becoming epidemics.

The western and mountain pine beetles are considered major tree killers throughout the inter-mountain west. Both prefer trees greater than 6 inches in diameter, but where beetle activity is extremely high, trees smaller than 6 inches can be attacked. These beetles emit attractant chemicals (pheromones) that call other beetles to join in on the attack of a tree. This also enables males and females to mate. The beetles typically attack pine trees during the mid-summer months. The western pine beetle prefers ponderosa pine as its host, whereas the mountain pine beetle is more widespread, attacking nearly all native pine trees in the western United States. Western pine and mountain pine beetles will selectively attack trees which do not have full water balance – trees weakened by drought, root disease, lightning strike, high mistletoe infection, old age, or competitive stress. Such trees do not have strong defense mechanisms that enable them to expel beetle attacks through resin pressure (‘pitching out’ beetles).
Western pine beetles often times attack single trees within a stand that have the previously mentioned symptoms. Often times these individuals are the oldest and largest pines in the area. However; when beetle populations are high, the western pine beetle has been known to attack smaller, pole-size stands as well. The most effective method in controlling western pine beetle populations is through active stand management. Periodic thinnings will help reduce competitive stress between trees, allowing residual trees more growing space and subsequently stronger defense systems. “Thinning from below,” as previously mentioned, is a harvest regime that will expel weaker trees, while saving the healthier, dominant trees and improve the beetle resistance of the stand. Small patch cuts (.25 to 1 acre in size) along with single-tree selection will create a variable stand structure that is also beneficial in preventing beetle infestations.

Mountain pine beetle is associated with dense stands of ponderosa and lodgepole pine that have a high basal area (120 -150 ft²/ac) (Ripley, 1998). Populations of this beetle can build and spread relatively quickly. The key to mountain pine beetle management is to maintain proper stocking levels, and reduce the stand basal area to a level that is not as conducive for beetles, usually between 60 and 80 ft²/ac (Schmid and Amman, 1992), depending on site conditions. Harvesting ‘green’ trees that are infested with beetles (made evident by pitch tubes located on the tree’s bole) prior to mid-July beetle emergence, will also help to minimize spread. Proper tree selection and timing of harvest is critical when treating a stand in this manner.

The red turpentine beetle generally attacks only the bottom six feet of the tree. It usually attacks a tree that is under stress or has already been attacked by another beetle. The exception is if a timber harvest has recently occurred the turpentine beetle will attack the stump of the harvested tree and sometimes trees near those stumps. A tree attacked by only the red turpentine beetle will normally not die unless attacked several years in a row.

Pine engraver beetles are slash-breeding insects. The beetles primarily attack fresh, green material on the ground greater than 2 inches in diameter. Examples would be logging slash, tops of trees broken during wind or ice storms, and non-commercial thinning debris (trees cleared around new homes or developments are a prime example). Once green material hits the ground, it is a food source for 3-6 months. After the 3-6 months the sugary (cambium) layer under the bark turns sour. The pine engraver beetle generally attacks slash in May during its first flight. Another flight will occur 8 weeks later. This second flight will look for green slash; if it is not available they will look for stressed trees and attack the top of the tree. Normally the top 5-20
feet of the tree is attacked. The top will die, but not the whole tree. Usually another beetle will come in and kill the weakened tree.

To minimize pine engraver attacks avoid creating logging or thinning slash greater than 2 inches in diameter between January and June. If logging or thinning operations are conducted during these times the following suggestions should minimize a pine engraver problem.

1. Attempt to utilize all material down to two inches in diameter.
2. Pile and burn material greater than two inches within 6 weeks if possible.
3. Chip or remove material greater than two inches in diameter within 6 weeks.
4. Form a green chain of fresh slash; this option provides a continuous supply of food for the beetle through their entire breeding season, keeping them out of standing trees. This option requires precise timing and should only be conducted by someone with experience.

Douglas-fir beetle outbreaks are usually initiated by catastrophic events such as blowdown, or winter breakage. Downed or weakened trees are attacked and beetles build up large populations. The next year, new generations emerge and attack susceptible trees in surrounding stands. Damage in standing trees is greatest in dense stands containing a high percentage of large, mature Douglas-fir.

Salvage of down or weakened Douglas-fir is a primary tool in preventing Douglas-fir bark beetle outbreaks. When attacks have already occurred, removing standing green or faded infested trees will help reduce or prevent further damage in the area. The risk of Douglas-fir beetle damage is reduced when dense mature stands are commercially thinned.

Bark beetle occurrence is a normal disturbance mechanism of the forest. Beetles have evolved with our western forests for millennia. Beetles have an appropriate function in the forest ecosystem, through killing trees individually or in clumps which creates a forest mosaic and wildlife habitat. They are often times
the final killer of trees which have been weakened by other agents (image at right shows a ponderosa pine on McLellan C.A. which was weakened by mistletoe and was likely killed by western pine beetle and now serves as a snag). Management concerns should be focused on treating stands with “unnatural” or high stocking levels (due to fire suppression and lack of active management), which lend themselves to brooding large beetle outbreaks.

Western pine beetle activity has been observed on the McLellan C.A., but activity levels are low at this time. Mostly isolated and small clump mortality was noted. Stand conditions at this time; however, are conducive to future beetle presence and should be monitored and planned for in the stand prescription phase.

**Root Disease**

Root diseases are the most damaging group of tree diseases. Diagnosis and identification is based on:

1. Circular groups of dead and dying trees. Root diseases tend to kill a few trees each year. Look for dying trees at the edge of a group with dead trees towards the center.
2. Thinning tree crowns. Crowns of root diseased trees fade in color, thin from the inside of the tree crown towards the edge. Diseased trees may produce a cone crop, though much of the seed is not viable.
3. Young trees are killed more quickly than older ones.
4. Symptoms and signs are in roots and root crowns. Trees with advanced root disease may have basal resin flow, wood discoloration and decay, and presence of fungal tissue.

Root disease is managed by promoting the establishment and growth of resistant tree species, if possible. The presence of root disease is not a concern on the McLellan C.A. at this time. The presence of these pathogens should be periodically monitored. The two primary root diseases which affect ponderosa pine are Annosum (*Heterobasidion annosum*) and Armillaria (*Armillaria ostoya*). The symptoms of both are very similar, although ponderosa pine is less commonly affected by Armillaria than Douglas-fir and true fir species.

**Elytroderma Needle Cast**

Elytroderma needle cast is found throughout the range of ponderosa pine and lodgepole pine regions of North America. All sizes and age classes are susceptible to this disease. Elytroderma needle cast can be found on the McLellan C.A., but infection levels are low and not of serious concern.

Needles are infected in the summer or early fall of the year. Once the needles are infected, they do not show any signs until the following spring. At this time, the needles turn red then fade to a straw color. The infected needles are cast in early fall for
ponderosa pine and late fall for lodgepole pine. Thin crowns often result from needle casting. On ponderosa pine, infection can produce small, open, and tufted brooms with upturned thickened branches. Shoots supporting brooms have brown necrotic lesions in the inner bark. Needles discolored from infection may display fruiting bodies in spring.

This fungus is a unique needle cast fungus because it can spread from needles to shoots. This results in broom formation and a perennial, systemic infection, allowing the fungus to survive periods of climate unfavorable for spore release. Light infection of less than 25% of the needles causes little damage. Severe infection will produce thin, ragged crowns and growth reduction. Tree or lower crown mortality can result from severe defoliation. Heavy infection can also predispose trees to attacks by other diseases or insects. Younger trees are affected to a greater extent than older trees. Lodgepole pine up to 7 feet in height can become systematically infected and remain stunted with needles in tufts at branch tips.

**Mechanical, Abiotic, and Animal Damage**

Abiotic damages include hail damage and winter damage. All conifer species are vulnerable to damage from climatic factors. Winter damage symptoms usually appear in spring as reddish-brown discolorization of foliage which, when viewed from a distance, appears as a horizontal band (red belt) across a slope. In mountainous areas, injury may be confined to an elevational zone corresponding to the pathway of drying winds or to the transition zone between warm and cold air in a temperature inversion. Red belt damage results from the unseasonable occurrence of warm, dry winds by day, followed by cold air drainage at night, leading to desiccation injury. Frozen soils do not allow lost moisture to be replaced in the needles when used during transpiration. Damaged needles turn yellow to dark brown and are eventually shed. Symptoms are often more pronounced on the windward side of trees. Unopened buds are not usually harmed. Unless damage is severe, most trees usually survive. Damaged trees may be predisposed to attacks by other agents such as beetles.

Animal damage is usually from porcupines killing the tops of pine trees, rodents killing small seedlings, and deer rubbing their antlers or browsing small trees.

**Management Implications**

All of the forest pathogens and insects described above are normal parts of a forest environment. Each agent serves a function in forest development; however, the important factor to remember is the level at which these agents are at work in a stand. In order to protect the forest resource at the McLellan C.A., stand conditions must be evaluated to determine their susceptibility to these agents. Management prescriptions can then be made to prevent epidemic levels of spread or infection from occurring. No single agent can ever be eliminated from a forest, nor should they be. They can only be controlled on a larger scale.
WILDLIFE RESOURCE

All forest-dependent wildlife require food (including water), shelter from inclement weather (both summer and winter), and cover from predators for breeding, rearing of young, and feeding. The mixture of forest vegetation types and landforms determines suitability of habitat for each particular wildlife species. A diverse mixture of tree and shrub species, sizes, and age classes, as well as dead and dying trees in the form of snags and coarse woody debris (fallen trees, management debris, etc.) will increase wildlife species diversity and abundance. The presence of water and associated vegetation (riparian and wetland areas) in proximity to diverse forest habitats enhances biological diversity.

Diverse and persistent forest, shrub and herbaceous plant stands, arranged with consideration to special habitat features such as water, edge, snags, openings and other features, will increase year-round wildlife use of the property. While this property already contains many of these attributes, protecting the riparian and wetland areas can increase usage by wildlife. While species diversity (the number of different species) may not significantly increase, wildlife abundance, the total number of individuals of a species in the area, could be increased with additional plant diversity, maintenance of openings, and protection of old growth trees.

Each wildlife species has a set of specialized requirements, including food, water and cover. If one of these requirements is in short supply, the overall effectiveness of the habitat is reduced. The requirement that is in short supply is referred to as a limiting factor. Cover, food and water requirements can be further broken down into sub-factors.

Cover

High plant diversity across a landscape meets many of the cover requirements for different wildlife species. Cover requirements also differ within a species depending on time of year and the activities of the animal. Cover can be broken down into sub-components of thermal and security cover. These differ in their functions but may occupy the same area.

The vegetation that provides thermal cover is generally denser than security cover. Thermal cover gives animals protection from the elements by providing them with warmer conditions in winter and cooler conditions in summer. Thermal cover requirements vary with species, ranging from conifer thickets for deer and elk to the grass cover used by smaller mammals such as mice and voles.

Security cover provides animals protection from predators. Uses include resting, loafing and bedding, feeding, travel corridors and areas for rearing young.

The most effective habitat includes components of both thermal and security cover in proximity to the other main habitat components of food and water. Interspersion of the important components increases an animal’s ability to travel between and use the various areas. The north-facing hillside (Stand 1) on the McLellan C.A. offers key habitat components that are unique to the remainder of the property. Maintaining the current dense canopy structure allows this area to provide important security cover for local wildlife, while contributing to nutrient cycling and shading that both aid in achieving water quality goals for the property.
Food
High plant diversity also offers a broad variety of foods needed by different species. Deer, moose and elk vary in their food choices. White-tailed deer commonly browse the tips of woody trees and shrubs and will forage on broad-leaved forbs when they are available. Elk graze on herbaceous plants such as grasses and forbs, feeding on browse (shrubs) when it is readily available. Moose are primarily browsers, preferring the tips of woody trees and shrubs, especially willows and red-osier dogwood. They will also consume a variety of broad-leaved forbs depending on availability.

Most bird species present in the local areas feed primarily on fruits and seeds, insects and nectar. A diverse plant base that meets all these components will ensure a diverse bird population.

Water
The need for water varies between species, ranging from the strong association and absolute water requirement of amphibians and aquatic mammals to species that require only minimal amounts for drinking water. Waterfowl, including migratory ducks and geese, use open water for escape areas from predators and also feed on aquatic insects, crustaceans and plants. Shorebirds, such as snipe and herons, use shallow water areas for feeding and will nest along the shorelines.

Habitat Descriptions
Wildlife habitat can be protected, enhanced, and even created when appropriate management techniques are designed and incorporated into associated forest management activities. A brief description of especially significant forest wildlife habitat components follows along with specific management recommendations that will enhance wildlife habitat.

Snags and Coarse Woody Debris
About one-third of forest wildlife species are dependent on snags (standing dead trees) and coarse woody debris (large diameter down logs and trees). More than 60 of these species use tree cavities, holes excavated in trees primarily by woodpeckers, for denning, nesting, and shelter. Most cavity nesters prefer the hard shelled larger diameter snags. These snags have a shell of solid wood and a core of decayed wood. Tall larger diameter snags benefit more species, for a longer period of time, than small diameter snags. However, small diameter and short snags (including stumps at least 3 feet in height) are also utilized for feeding and cover.

Snag dependent wildlife also use living trees which have substantial amounts of stem decay. This includes broken topped trees and trees with large dead and/or broken branches. Many of these defective trees will last for long periods of time and although they have little economic value, they have excellent value to snag-dependent wildlife. Trees with cracked or damaged stems, heart rot, and mistletoe and rust brooms provide additional habitat. Brooms (clumps of deformed branches) caused by these pathogens are readily used by platform nesters such as hawks, owls, eagles, and ospreys and as shelter for mammals such as squirrels and pine martens.
Coarse woody debris goes through a similar decay cycle and use pattern as snags. Larger diameter (greater than 12 inches) and longer length (greater than 6 feet) hard logs last longer and are used by more wildlife species than small (less than 6 inches) softer pieces of woody debris. Ideally, both snags and large diameter down logs should be scattered through forested stands.

The table below summarizes the amount of snags and/or Wildlife Recruitment Trees (WRTs) present in each of the 4 stands on the McLellan Conservation Area. This is valuable information for managing special species of concern (see p. 28) that may inhabit or migrate through the area. Snag recruitment is an easy and valuable management tool for increasing habitat and should be performed in some areas of the property.

![McLellan Conservation Area – Snag Frequency By Stand](image)

<table>
<thead>
<tr>
<th>Stand</th>
<th>Snags/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>3A</td>
<td>0.2</td>
</tr>
<tr>
<td>3B</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Thomas (1979) recommends a rate of 2.25 snags per acre to meet habitat requirements of 100% maximum potential population level of cavity nesters. The Washington DNR requires a minimum of 2 snags or WRTs per acre be retained on even-age harvest units. Snags should be as large in diameter and height as possible. A minimum of 12 inches D.B.H. (diameter at breast height) is a good standard for snag retention. Snag height can vary, but a minimum of 6 feet is often preferred, although some birds and mammals will utilize shorter snags. As the table above shows, snag frequency is somewhat low in Stands 3A, and 3B to meet maximum potential habitat levels (according to Thomas). Snag levels are low in Stands 3A and 3B due to the wildfire occurring in the early 1990s. Snag recruitment will take more time in these areas and will increase as the young stands develop. Management practices in Stands 1 and 2 should provide for future snag recruitment, whether created or preserved.

Coarse woody debris (CWD) is yet another extremely important forest structure that provides habitat to over 100 birds, mammals, and amphibians in eastern Washington (Bottorff, 2009). Coarse woody debris is also valuable for nutrient cycling and soil nutrients. Evaluating a “desirable” amount of coarse woody debris to retain on the forest floor is challenging, especially in low-severity fire regime forests such as that found on McLellan C.A. The erratic behavior and occurrence of ground fires in such fire regimes would have historically left “clumps” of burned and unburned trees, snags, and woody debris scattered across the landscape. This resulted in relatively low woody debris loadings with minor fluctuations. Ultimately, ‘coarse woody debris standards should be designed to mimic the “natural” forest for which they are applied’ (Agee, 2002). For low-severity, managed forest stands, a rate of 10 to 15 tons per acre is reasonable. The table below (pg. 27) summarizes fuel loadings by size class by stand.
This table represents the *average* fuel loading in tons per acre for each stand. Stand 3A has a higher CWD loading than that of Stands 1 and 3B – most likely due to former snags that have fallen (3”+ material) in the years following the early 90s wildfire. 3B, on the other hand, has undergone thinning and pile-burning treatments which have substantially reduced CWD levels. Stand 2 CWD loading is typical for a stand which has undergone harvesting/management practices in the absence of ground fire. Stand 1 is experiencing larger CWD loadings resulting from a lack of management, fire disturbance, and higher timber volumes. A mosaic of CWD loadings is desirable for the McLellan C.A. area to meet habitat objectives, which this table reflects.

### Understory Vegetation

Forest understory vegetation includes grasses, forbs, shrubs and tree regeneration which are present on the forest floor. Understory vegetation tends to become more abundant in forest openings where increased sunlight is available. Grasses, forbs and tall shrubs are common in such areas, providing breeding and cover habitat for ground nesting birds and small mammals. Maintaining these forest understory components, especially in proximity to riparian and wetland habits will enhance wildlife species diversity on the property. Understory vegetation also provides important forage for ungulates such as white-tailed deer, mule deer, elk and moose and also for black and grizzly bears. Especially important forage species found on the property include berry producing shrubs such as snowberry and red-osier dogwood. Willow, red-osier dogwood, aspen and black cottonwood shoots are preferred forage plants. Native forbs will provide a forage resource during summer months when vegetative matter is available. Fescue, timothy, orchard grass and sedge species provide additional forage in forest openings.

The abundance of understory vegetation is determined to a great degree by the density of the forest canopy. Maintaining forest openings and decreasing the density of the forest canopy will increase the abundance and nutritional quality of grasses, forbs, shrubs and deciduous tree sprouts.

### Management Implications

Habitat fragmentation is one of the top reasons for decreasing numbers of wildlife. For this reason, it is important to conserve habitat when possible. Without the proper resources (food, water, and cover) necessary for wildlife to survive, they cannot exist. The Spokane County
Department of Parks, Recreation, and Golf wishes to enhance land acquired under the Conservation Area Program to benefit the general public for passive recreational opportunities including, but not limited to, wildlife viewing. Due to this objective, habitat improvements will need to be addressed.

In order to produce high quality wildlife habitat in a forest land setting managers manipulate the type and arrangement of tree cover present on the property. Generally, wildlife habitat management is achieved by promoting different forest cover types that can provide the necessary food, cover and water requirements for a broad spectrum of wildlife species. Creating a mosaic of forest age classes and types, interspersed with adequate edge habitat, is a feasible way of enhancing local wildlife populations on the McLellan C.A. and the surrounding area.
THREATENED AND ENDANGERED SPECIES

Washington has developed a list of habitats and species that are of special concern in conjunction with federal listings. The Priority Habitats and Species List (PHS List), provides a listing of types of habitats and species that have been deemed priorities for the conservation and management of items on this list. The PHS List can be found online at http://wdfw.wa.gov/wildlife/management/endangered.html.

Species Identification

There are currently no known Threatened or Endangered species or habitats on the McLellan Conservation Area. The bald eagle, white-headed woodpeckers (candidate for listing on the state Endanger Species List), flammulated owl, and golden eagles are on the PHS List, listed as species of concern. Bald eagles are known to use this area; however, the remaining species may or may not use the area on a seasonal basis.

Management Implications

It will be important to continue monitoring this property for the possible inhabitance of Threatened and Endangered species, especially as management goals are achieved. Special considerations will need to be made if a Threatened or Endangered species are found on the property.

Forest management practices can be tailored to meet the needs of the birds identified above. The white-headed woodpecker and flammulated owl, in particular, are dependant on open-canopy ponderosa pine stands. Both species are cavity nesters, requiring most importantly snags and in some cases decaying logs or stumps (especially the white-headed woodpecker) to nest within (Owling.com, 2001). Forest fragmentation, clear-cutting, and even-age forest practices are detrimental to these species (National Audubon Society, 2010). Flammulated owls most often inhabit mid to high-elevation ponderosa pine and pine/fir forest types at 3,000-foot elevation and above (Guenther and Kucera 1978, Jones and Stokes Assn. 1980). It is possible that flammulated owls could use this property from time to time. Providing suitable snag habitat will increase this possibility while benefiting other snag-utilizing species. Bird boxes will also be used by flammulated owls and other cavity nesters. The McLellan C.A. offers a unique opportunity to provide a significant amount of crucial habitat for birds and many other forest-dependant species within a relatively-populated corridor along the Spokane River.

The H C.A. also offers the opportunity to improve and maintain excellent bald eagle habitat along the Spokane River. These large raptors, feeding primarily on fish, prefer relatively open canopy conditions (less than 60%). Bald eagles prefer to rest, perch, and nest in large trees along the edge of water bodies (Wikipedia, 2010). Cottonwood is their preferred tree species, although ponderosa pine is also utilized. Management strategies should include provisions to maintain and/or increase nesting tree habitat along the Spokane River. These habitat features are present within Stand 1 of the McLellan C.A.
SOILS TYPES AND PRODUCTIVITY

Soil Type Descriptions

In terms of soil texture, soil type usually refers to the different sizes of mineral particles in a particular sample. Soil is made up in part of finely ground rock particles, grouped according to size as sand, silt and clay. Each size plays a significantly different role.

For example, the largest particles, sand, determine aeration and drainage characteristics, while the tiniest, sub-microscopic clay particles, are chemically active, binding with water and plant nutrients. The ratio of these sizes determines soil type: clay, loam, clay-loam, silt-loam, and so on. In addition to the mineral composition of soil, humus (organic material), also plays a crucial role in soil characteristics and fertility for plant life.

Refer to the Appendix for a complete soil map of the property.

Map Unit: SwB—Springdale gravelly sandy loam, 0 to 20 percent slopes

This very deep, somewhat excessively drained soil is on nearly level to moderately steep outwash terraces and plains. Most slopes are between 2 and 10 percent. It formed in glacial outwash mixed with some volcanic ash in the upper part. Typically the surface layer is gravelly sandy loam 6 inches thick. The upper substratum is gravelly coarse sandy loam 6 inches thick over very gravelly loamy coarse sand 12 inches thick. The lower substratum is very cobbly coarse sand to a depth of 60 inches or more. Elevations are 1,700 to 2,400 feet. The average annual precipitation is 15 to 18 inches. The frost-free season is about 140 days.

Map Unit: SyB—Springdale cobbly sandy loam, 0 to 20 percent slopes

This very deep, somewhat excessively drained soil is on nearly level to moderately steep outwash terraces and plains. It formed in glacial outwash mixed with some volcanic ash in the upper part. Typically the surface layer is cobbly sandy loam 6 inches thick. The upper substratum is gravelly coarse sandy loam 6 inches thick over very gravelly loamy coarse sand 12 inches thick. The lower substratum is very cobbly coarse sand to a depth of 60 inches or more. Depth to coarse sand ranges from 20 to 36 inches. Elevations are 1,700 to 2,400 feet. The average annual precipitation is 15 to 18 inches. The frost-free season is about 140 days.

Map Unit: SzE—Springdale gravelly loamy sand, 30 to 70 percent slopes

This very deep, somewhat excessively drained soil is on steep to very steep outwash terrace breaks. It formed in glacial outwash mixed with some volcanic ash in the upper part. Typically the surface layer is gravelly loamy sand 11 inches thick. The substratum is gravelly loamy sand 6 inches over very cobbly coarse sand to a depth of 60 inches or more. Elevations are 1,700 to 2,400 feet. The average annual precipitation is 15 to 18 inches. The frost-free season is about 140 days.
Management Implications

The sandy loam soil types found on the McLellan C.A. are typical of those areas located adjacent to the Spokane River. These soils have low erosion hazard ratings, with the exception of Map Unit SzE – Springdale gravelly loamy sand. This type is particularly vulnerable to erosion (based upon slope and erosion factor ‘K’). This soil type is only found on the steeper hillsides of Stand 1, where no active management will occur due to its physical characteristics and adjacency to the Spokane River.

Soil compaction and rutting by vehicles and heavy equipment is possible during wet seasons of the year. Special planning is necessary to avoid soil damage during management operations when equipment is being utilized.

Vegetative productivity of these soils is somewhat low, due to arid conditions, slow decomposition rates, and low available water capacities. With the exception of Stand 1 (which can sustain Douglas-fir), the site and soil conditions of the McLellan C.A. are only suitable for growing ponderosa pine.
NOXIOUS WEEDS

Noxious weeds degrade wildlife habitat, deteriorate streams and waterways, create fire hazards, and poison and injure livestock. By definition, noxious weeds are plant species that are harmful to the environment. Eradication and restoration require that noxious weeds be killed. Noxious weeds are invaders and do not succumb to eradication, prevention, or restoration. Therefore, controlling noxious weeds is expensive and time consuming.

**Species Identification**

All the noxious weeds observed on the property were in areas of past disturbance (roads, log landings, etc). Minimizing the impacts of noxious weeds following timber harvesting, road building and even wildfires requires an integrated approach to noxious weed management. In the areas on the property that have noxious weed infestations, it is important to work towards reestablishing healthy plant communities.

No method or combination of methods can achieve eradication for large weed infestations. However, containment (managing infestation perimeters) or control (managing entire populations) is effective in preventing or greatly limiting seed dispersal into adjacent areas. Infestations should be managed toward reestablishing healthy plant communities. This process begins with shifting the competitive balance from the infestation to the desired plants through re-vegetation after the infestation has been successfully weakened by:

- Mechanical Controls, such as mowing
- Chemical controls, such as herbicide treatments
- Cultural controls, such as grazing and encouraging the growth of desired vegetation: and
- Biological controls, such as weed damaging insects

The McLellan Conservation Area would benefit from the development and implementation of an integrated weed management plan as some noxious weeds are present (e.g. knapweed, dalmatian toadflax, hounds tongue, and hawkweed). Proper implementation of a weed management plan is dependent upon the comprehensive identification and mapping of all noxious weed locations, the use of as many appropriate techniques as possible and frequent monitoring with periodic evaluation.

The Spokane County Weed Board has identified certain species of weeds which are mandated for control. Class “C” and “B” weeds are mandated for control. Class “B Designates” are not currently growing wild throughout the county, but may be present in several areas. Preventing infestations of Class “B Designates” is a high priority to prevent further spread. Refer to the appendix for life histories and management recommendations of Class “C” and Class “B” weeds, along with a few other common species in the area.

**Management Implications**

Many noxious weeds thrive in disturbed areas and thus it is important to address them when creating a management plan that involves activities which may create soil disturbance. Noxious weeds are often the first to begin growing in soils that have been exposed. These noxious weeds rapidly out-compete local vegetation for resources. Wildlife will generally not feed on noxious weeds which may even cause wildlife to avoid infested areas.
The McLellan Conservation Area includes a strong riparian component. Riparian areas are present along the shore of the Spokane River. Plant species common to riparian and wetland areas on the property include black cottonwood, Douglas-fir, ponderosa pine, cattails, black hawthorn, sedges, and rushes. These plants grow in soils that are saturated by water during at least some portion of the year.

The riparian area along the Spokane River, located in Stand 1 of the McLellan C.A., should primarily be passively managed, to ensure water quality and wildlife habitat goals are achieved. All management practices will be implemented to further advance the value of this area for these resource concerns. Refer to page 46 for Management Recommendations.

Ecological Role of Riparian Areas

Riparian and wetland areas are important to water quantity, water quality, stream stability and fisheries habitat. Riparian and wetland areas typically occupy a small percentage (less than 5%) of the forested landscape but are important islands of biological diversity and are ecologically significant. Grazing, timber harvesting and road construction can drastically affect riparian plant communities.

Healthy riparian and wetland areas slow water flow, reducing the impact of downstream flooding. They also filter and spread water and stabilize stream banks during high water events. Grasses, shrubs and trees in the riparian areas catch and hold sediments and attached pollutants from adjacent fields and forests before they can wash into larger water bodies downstream.

Healthy riparian and wetland sites provide critical habitat for many wildlife species. The density and diversity of species is higher in riparian and wetland areas than in range and forest lands. Research conducted at The University of Montana, by Richard Hutto, indicates that in western Montana, 59% of the land bird species use riparian and wetland habitats for breeding purposes, and 36% of those breed only in wetland and riparian areas.

Riparian and wetland areas are vital for livestock grazing and many areas are excellent timber producing sites. Livestock tend to congregate in riparian wetland areas and utilize the vegetation more intensively than on adjacent uplands. Improper livestock use can change, reduce or eliminate vegetation bordering a stream. Overgrazing can cause bank sloughing and sedimentation.

The health of a riparian or wetland area can be defined by its ability to perform its normal functions. These functions include sediment filtering, stream bank building, storing water,
aquifer recharge, providing fish and wildlife habitat and dissipating stream energy. Healthy riparian vegetation stabilizes stream banks and holds soil in the floodplain during flood events. Riparian vegetation shades streams and keeps water temperatures cool, which improves habitat for fish and aquatic invertebrates. Riparian vegetation provides a vast majority of the organic matter necessary to support aquatic communities. Management of riparian/wetland plant communities requires special planning to address all the resource values associated with riparian and wetland plant communities.

Protecting the riparian habitat associated with the Spokane River is a good way to protect native fish habitat in those areas. Timber harvesting activities should be modified or restricted within riparian and wetland areas to protect riparian vegetation. Large woody debris, dead standing trees, and large diameter trees should be retained within riparian and wetland areas. Existing roads should be well vegetated and properly maintained to reduce the potential for erosion and sedimentation.

**Management Implications**

Protection of riparian and wetland habitats is especially significant as these habitats receive a significantly higher degree of use and provide critical habitat for specific wildlife and plant species. Additionally, proper riparian and wetland area management is necessary to maintain the water quality and fisheries habitat. Protecting the riparian areas associated with the McLellan Conservation Area will attract many different species of wildlife, making the riparian areas an excellent place for wildlife viewing.
CULTURAL RESOURCES

Site Identification

There is the remnant of an old cabin on the north end of the McLellan Conservation Area. Only the log walls remain and the cabin appears to be the only structure in the vicinity. The history of the cabin is unknown and therefore it should be protected until further information is discovered. If future management activities are executed in the surrounding area, a proper operational buffer should be installed to protect this potentially valuable cultural resource.

Management Implications

Protecting cultural and/or historic sites is important for the education of future generations. These sites often have religious, sentimental, or educational value and should be preserved.
STAND IDENTIFICATION AND EVALUATION

Forest stand conditions on the McLellan C.A. were evaluated with a field inventory conducted in the Spring of 2007. For purposes of this inventory and evaluation, the forested area on the property was broken into 4 different units or stands, based upon stand characteristics, topography, and timber type. Forest measurement plots were installed on a pre-determined grid to collect a representative and non-biased sample of the resource. The sampling intensity of this forest inventory was approximately 1 plot per 2 acres.

At each plot, data was collected to determine timber volume, size, quality, age, and overall health. In addition to the traditional timber cruise plot, a fixed-radius plot was installed to tally the size and frequency of snags and Wildlife Recruitment Trees (WRTs). Down woody debris was also measured, utilizing the “Browns Transect Method” and were installed on every fifth timber cruise plot. These transects reveal the type, amount, and size of fuel found in the forest understory and are important for understanding fire severity, should one occur, as well as knowing the amount of large woody debris that is available for wildlife.

The Stand Inventory System (SIS) was used to compile, tabulate, and perform statistical analysis of data collected on the property.
Forest Stands and Acreages Delineated on Aerial Photograph

McLellan Conservation Area

Section 31 T28N R41E

Stand 1: 51 acres
Stand 2: 241 acres
Stand 3A: 97 acres
Stand 3B: 21 acres

Stand 1
Stand 2
Stand 3A
Stand 3B
Section Lines

LMM 3/2010
Forest Stands and Acreages Delineated on Topographic Map

Stand 1
Stand 2
Stand 3A
Stand 3B
Inventory Evaluation

Forest inventory is the systematic collection of data and forest information for assessment or analysis. It is also commonly known as timber cruising. It is important for owners to cruise the timber to get an estimate of the value and possible uses of the timber. When taking forest inventory the following are important things to measure and note: species, diameter at breast height (DBH), height, site quality, age, and defects. From the data collected one can calculate the number of trees per acre, the basal area, the volume of trees in an area, and the value of the timber.

Inventories were also taken to collect important wildlife and forest fuels information for the McLellan C.A.. Such data will also aid in drafting a management prescription which meets the multi-use objectives of the County. The following table is a summary of the forest inventory by species present for the 4 stands on the McLellan Conservation Area.

<table>
<thead>
<tr>
<th>McLellan Conservation Area</th>
<th>Total Net Volume --- All Stands</th>
<th>410 Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Volume by Species</td>
<td>Net mbf</td>
<td>Net mbf/acre</td>
</tr>
<tr>
<td>Species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>352.570</td>
<td>0.563</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>1.210</td>
<td>0.002</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>1677.990</td>
<td>2.680</td>
</tr>
<tr>
<td>Total</td>
<td>2031.770</td>
<td>4.956</td>
</tr>
</tbody>
</table>

Percent Net Volume by Species

- Ponderosa pine: 83%
- Lodgepole pine: 0%
- Douglas-fir: 17%
Stand Descriptions

A forest stand is an easily defined area of a property that is relatively uniform in species composition or age and can be managed as a single unit.

Forest Stand 1

Stand 1 consists of the 51-acre area located on the steeper banks above the Spokane River. Slopes are moderate to steep, with maximum gradients reaching 65%. This north and slightly west-facing stand retains more soil moisture during the summer months and is therefore capable of sustaining Douglas-fir. Stand 1 is essentially the only mixed-species stand on the entire property, consisting of ponderosa pine and Douglas-fir with a few isolated lodgepole pine.

A variety of size and age classes make up the forest resource of Stand 1. The forest canopy is multi-layered, ranging from small saplings to large ponderosa pine and Douglas-fir timber in excess of 20 inches diameter at breast height (d.b.h.). The Douglas-fir is in poor to fair health. Signs of root disease and drought stress have been observed, mostly made evident by thinning, fading tree crowns. Dwarf mistletoe has also been observed in the Douglas-fir to a small degree. The ponderosa pine is in fair to good health; however, dwarf mistletoe is also present in this component, much as it is on the remainder of the property. Most infection levels of dwarf mistletoe are light to moderate, typically ranging from 1 to 3 based on Hawksworth’s Scale (see p. 18).

Stand 1, due to its species diversity, location, and heavy crown closure, offers unique habitat for local wildlife. This portion of shoreline on the Spokane River has not been disturbed, which is also valuable in current times. This area offers not only special habitat, but scenic beauty to the surrounding area, especially looking on from the north shore of the river. The islands and shallow waters just north of Stand 1 are excellent features of the property and offer special habitat to many bird species, especially raptors and resting waterfowl.

Stand 1 has undergone very little active management. As a result, this stand is densely stocked and is fully occupying the growth potential of the site. Tree mortality will continue to increase with time, as the stand begins to self-regenerate. The Spokane River (classified
by the Washington DNR as a ‘Shoreline of the State’, or Type ‘S’ water) requires a 200-foot Riparian Management Zone during any timber harvesting operations (this RMZ width also encompasses stream protection requirements of the Spokane County Critical Areas Ordinance). Due to its unique location and stand structure, along with its important habitat elements, Stand 1 will be passively managed to protect these values on the property.

The merchantable timber resource in Stand 1 consists of 774.36 MBF (thousand board feet) or 14.61 MBF per acre. The following table shows the tree distribution by species and diameter class. Stocking levels are important for future stand silviculture prescriptions and have significant impacts on the health and vigor of a forest stand. All timber components (regeneration, pole/sapling, and saw timber) are incorporated into the stocking information.

<table>
<thead>
<tr>
<th>Species</th>
<th>DBH</th>
<th>DF</th>
<th>PP</th>
<th>LP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>301.9</td>
<td>110</td>
<td>1.2</td>
<td>484.6</td>
</tr>
</tbody>
</table>

**Stocking Table**

**Stand 1**

Trees per Acre by Species and Diameter
Stand 2 is the largest forest stand on the McLellan C.A., totaling 241 acres. With the exception of a few Douglas-fir trees, Stand 2 is essentially a single-species stand consisting of small to medium-sized ponderosa pine. This large area receives most of the public use on the property.

Stand 2 is a common forest type in eastern Washington, being part of a fire-dependent ecosystem that relies on frequent natural disturbances (fire) to maintain its resiliency and vigor. Low intensity ground fires historically occurred in such forests approximately every 5 to 15 years. These disturbance events aided in critical functions, such as nutrient cycling, stand vigor, and understory vibrancy. Tree mortality would also occur during these fire events, which maintained a more open and fire-resistant forest while adding random areas of structural diversity (pockets of mortality, un-burned areas, etc.).

Often times, smaller and weaker (suppressed) trees were killed by fire events, leaving the larger and stronger trees to inhabit the site. This type of disturbance created habitat for certain wildlife species as well, such as white-headed wood peckers and flammulated owls.

As a result of a century of fire-suppression and a lack of direct management in recent years, Stand 2 is in a condition where many of the critical functions are not occurring to their fully capacity, if at all. As a result, the stand is susceptible to an increased or “unnatural” frequency of disease and beetle outbreak. The frequency of dwarf mistletoe is a good example of a forest pest that (would have been controlled historically) is spreading at an increased rate due to a lack of disturbance (natural or human). The high fire risk is of special concern, considering the adjacent private property and residences.

Extremely high stocking levels and ladder fuels – especially in the understory - would result in a stand-replacing wildfire (crown fire) throughout much of the stand, as opposed to a low-intensity ground fire.

Currently, there is an average of 983 non-sawtimber (6 inches d.b.h. and small) trees per acre. Likewise, there are approximately 107 merchantable trees (7 inches d.b.h. and greater) per acre. Historical stocking levels of both components would have been much lower due to frequent fire
mortality occurring in the understory and domination of the overstory by larger, widely-spaced trees.

With proper management, the health and function of Stand 2 can be improved. Steps can be taken to mimic historical conditions and provide more beneficial wildlife habitat while reducing the extremely high fire hazards which currently exist.

The merchantable timber resource in Stand 2 consists of 1,145.43 MBF (thousand board feet) or 5.18 MBF per acre. The following table shows the tree distribution by species and diameter class. All timber components (regeneration, pole/sapling, and sawtimber) are incorporated into the stocking information.

<table>
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<th>DBH</th>
<th>DF</th>
<th>PP</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-6”</td>
<td>15.7</td>
<td>967.5</td>
<td>983.2</td>
</tr>
<tr>
<td></td>
<td>7-12”</td>
<td>0.4</td>
<td>81.7</td>
<td>82.1</td>
</tr>
<tr>
<td></td>
<td>13-20”</td>
<td>0.1</td>
<td>24.9</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>20”+</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>16.2</td>
<td>1074.6</td>
<td>1090.8</td>
<td></td>
</tr>
</tbody>
</table>

*Note lack of understory forage available for wildlife*
Forest Stand 3A

Stand 3A is located in an area which burned in a wildfire during the early 1990s. This 97-acre area is extremely overstocked with sapling and pole-sized ponderosa pine. On average, there are approximately 4,053 non-merchantable trees per acre (less than 7 inches d.b.h.). This is by far the most densely-stocked area of the property and exceeds the desirable stocking levels for such a site, which would be approximately 200 to 300 trees per acre. The overstory component consists of widely-spaced ponderosa pine that is small to medium in size. There are approximately 16 overstory trees per acre (having a d.b.h. of at least 10 inches).

Stand 3A is in a much different stage of development than the remainder of the property. Due to a wildfire occurring in the early 1990s, this stand is essentially even-aged, with the exception of a minor overstory cohort. Due to a prepared seed bed and a readily available seed source, this site regenerated extremely well following the wildfire. The regeneration is approximately 25 years old, and was in need of non-commercial thinning about 20 years ago. Today, this area is a ‘jungle’ of small-diameter trees that are intensely competing for very limited moisture and soil nutrients. Competition has been high for many years and many trees have been overtopped and killed as a result. This stand will continue to experience mortality at an increasing rate, if left un-managed.

In addition to being unhealthy, this stand offers limited wildlife habitat due to a lack of understory shrubs and grasses, serving only as an area of thermal and hiding cover. The location and condition of Stand 3A is also a concern in terms of fire hazard. Several private residences and structures are located immediately east of Stand 3A (which abuts the eastern property line), many within 200 feet of the property. Given prevailing wind directions, it would be probable for a wildfire event in Stand 3A to overtake these private properties (as made evident by the aerial photograph – the previous wildfire was driven by southwesterly winds and originates from South Bank Road).
The merchantable timber resource in Stand 3A consists of 110.47 MBF (thousand board feet) or 1.5 MBF per acre. The following table shows the tree distribution by species and diameter class. All timber components (regeneration, pole/sapling, and saw timber) are incorporated into the stocking information.

<table>
<thead>
<tr>
<th>DBH</th>
<th>Species</th>
<th>PP</th>
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<tbody>
<tr>
<td>0-6&quot;</td>
<td>DF 4.3</td>
<td>4053</td>
<td>4057.3</td>
</tr>
<tr>
<td>7-12&quot;</td>
<td>0 25.9</td>
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</tr>
<tr>
<td>20&quot;+</td>
<td>0 0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4083.9</td>
<td>4088.2</td>
</tr>
</tbody>
</table>
Forest Stand 3B

Stand 3B is a 21-acre area located within the perimeter of Stand 3A. This area also burned in the wildfire occurring in the early 1990s, but has undergone recent management to reduce hazardous conditions and improve stand vigor. Non-commercial thinning and piling and burning has been performed to address the concerns outlined for Stand 3A. This work has been performed internally by the Spokane County Department of Parks, Recreation, and Golf.

Stand 3B consists mostly of saplings and small poles, found on an average spacing of approximately 12.5 feet. For the most part, these trees are in good health, as they were the largest and healthiest trees chosen for retention during recent non-commercial thinning. A small amount of dwarf mistletoe has been observed, but infection is low and not widespread.

The merchantable timber resource in Stand 3B consists of 2.27 MBF (thousand board feet) or 0.108 MBF per acre. The following table shows the tree distribution by species and diameter class. All timber components (regeneration, pole/sapling, and saw timber) are incorporated into the stocking information.

<table>
<thead>
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<th>DBH</th>
<th>Species</th>
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<th>Total</th>
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</thead>
<tbody>
<tr>
<td>0-6&quot;</td>
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<td>0</td>
<td>278.9</td>
</tr>
<tr>
<td>7-12&quot;</td>
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<td>0</td>
</tr>
<tr>
<td>13-20&quot;</td>
<td>0.9</td>
<td>0</td>
<td>0.9</td>
</tr>
<tr>
<td>20&quot;+</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>279.8</td>
<td></td>
<td>279.8</td>
</tr>
</tbody>
</table>
RESOURCE MANAGEMENT RECOMMENDATIONS

The following sections describe specific recommendations for activities designed to meet the stated objectives of the Spokane County Department of Parks, Recreation, and Golf.

Forest Management Recommendations

Forest management includes a range of human interventions that affect forest ecosystems. These activities include both conservation and economic activities, such as extraction of timber, planting and replanting of various species, building roads and pathways through forests, and techniques for preventing or introducing fire.

Silvicultural Prescriptions

Forest Stand 1

As previously mentioned, the location and habitat features of Stand 1 make this area of the property critical for unique wildlife habitat. This area should be primarily managed as a resting area and a source of thermal and hiding cover for wildlife. Direct timber-related treatments will not take place here due to Forest Practice laws and other habitat values.

A few treatments that could be practiced in this stand include snag recruitment/creation, creation of small canopy openings, and establishment of beneficial wildlife shrubs. These practices will create small canopy openings and increase understory forage for wildlife.

Currently, there are approximately 2.9 snags and/or WRTs per acre in Stand 1. Snags can be easily created by girdling large-diameter trees that would make good candidates for cavity nesters and perching locations for eagles and osprey. For instance, a 15-inch d.b.h. Douglas-fir that shows signs of poor health (such as a weak or thinning crown) would be an excellent candidate for snag-recruitment. Girdling the cambium with a chainsaw will kill the tree and accelerate its availability as a snag. “Topping” larger diameter trees will also create snags and provide readily available platform structures. Small canopy openings (0.5 to 1 acre) can also be created to improve forage availability for ungulates and other small mammals and birds, which is currently lacking due to the dense forest canopy. Invasion of non-native species can be avoided within these canopy openings by minimizing ground disturbance and grass-seeding any disturbed areas with a native seed mix. The nature of such treatments lends to minimal, if any, ground disturbance. Trees removed for this purpose can be utilized for firewood (and potentially donated to the Spokane Neighborhood Action Program (SNAP)) and large butt logs can be left on the forest floor for ground fauna and soil resources.

Native shrubs and deciduous trees may also be planted in these openings to further enhance wildlife value to the property. Species such as quaking aspen, willow, and redosier dogwood are good candidates for planting, as they are heavily used as forage for many types of birds and mammals. Planting should occur in openings near the edge of the river where soils are more saturated – ideally in the transition area between riparian and upland.

Stand 1 offers unique habitat features to a variety of wildlife species, offering thermal and resting cover for big game, along with snags and perching trees for cavity users and raptors. Further management and monitoring of Stand 1 will maintain and/or improve habitat features and increase wildlife viewing opportunities for the public. The management activities mentioned are relatively inexpensive and can be performed in stages.
Forest Stand 2

Stand 2 is the most prominent landscape on the McLellan C.A. As previously mentioned, Stand 2 is a forest that is dependent on frequent, low-intensity fires that historically occurred throughout ponderosa pine forests in this part of the country. A lack of management in the recent decades and suppression of fire have created hazardous and diseased-prone stand conditions.

The ultimate goal of all stand prescriptions for this area of the property is to improve forest health, reduce the current fire hazard, and return the stand to a more “fire-functional” forest. In order to achieve this goal, a sanitation harvest (or a “thinning from below”) is necessary to reduce stocking levels and remove diseased and suppressed trees that are competing with healthier, dominant trees. Ideally, this would consist of a timber harvest on smaller-diameter trees which are either suppressed or heavily infected with dwarf mistletoe (have a Hawksworth rating of 4 to 6). Space will also be created between tree crowns to further reduce the fire hazard throughout the stand. The residual stand would mimic historical conditions – i.e. dominant and co-dominant trees on a wider spacing. The residual stand would benefit from the release of limited soil nutrients and moisture, thereby increasing tree vigor and reducing bark beetle susceptibility as well. Occasional clumps (0.5 to 1 acre) should be left untreated and spread throughout the unit to provide thermal cover for wildlife.

This timber sale would be performed with mechanical harvesting equipment which causes less ground disturbance and is more capable of harvesting and processing small-diameter trees into merchantable logs. The harvested products would consists of pulpwood (down to 3 inches diameter inside bark at the small end) and small sawlogs. This would be a whole-tree harvest where trees are felled and skidded into the landing with limbs and tops intact. Ideally, the harvest would occur in late summer to avoid unwanted beetle activity. Refer to the appendix for an estimated Stumpage Appraisal of this harvest under favorable market conditions.

Reintroducing low intensity fire to this Stand is critical for fully restoring ecosystem function to this part of the property. This can only be accomplished through prescribed burning, performed during a certain time of year with proper fuel moistures and weather conditions. Some preliminary treatments would be necessary prior to prescribed burning, which could be accomplished during the timber sale, as the necessary equipment is already present. Control lines need to be established around the perimeter of the unit and around leave...
islands to prevent fire creeping outside of the prescription area. This can be accomplished with a
dozer or skidder. In addition, small amounts of additional slash should be left on the forest floor
in areas that have a lack of fine fuels to carry a ground fire. This may be performed during the
timber harvest by simply “walking over” a tree with harvesting equipment once it is felled to
snap off limbs. Slash can also be taken from the landing pile and drug back out into the unit with
the grapple on a skidder. Having more consistent fuels to carry the fire will result in higher-
quality burn. Finally, patches of thick regeneration should be non-commercially thinned to
prevent whole clumps from being fire-killed. Some mortality is unavoidable in such areas, but
prior treatment will minimize this effect. Slash created during this treatment should be drug out
into open areas, away from trees and regeneration. A successful prescribed burn in conjunction
with a “thinning from below” will help achieve management objectives by reducing fire risk,
increase nutrient cycling for soil resources, and improving wildlife habitat by increasing
understory forage for wildlife.

Prescribed burning is often used as a tool for the control of invasive late-season annual broadleaf
weed and grass species. Timely burning of a few invasive biennial broadleaf weeds, perennial
grasses and woody species can also be a successful control measure.

Fire is typically used to control weeds in large natural settings but, because burning opens the
understory, it can encourage germination of stored seeds and promote growth of emerging weed
seedlings. For this reason, burns should be conducted for three to five consecutive years if
significant weed populations are present. Chemical treatments following burning are also a
viable option, especially if performed under an Integrated Weed Management Plan. Regardless
of the control method employed, annual monitoring is necessary for a period of at least five years
to ensure that seed stores have been exhausted. A burning program should be linked to the
specific species of weeds found on the property as the effectiveness will vary by species and life
stage of the weed.

If preferred by the Department, such treatments can be performed on a smaller scale (40 acres,
for example) rather than the entire stand at once. This may create opportunities for public
education and awareness, allowing people to have a
“before and after” to witness. Market conditions will also
play a part in scheduling this
treatment. Performing the
timber harvest with a decent
pulp and ponderosa pine
market could potentially
generate income that could
help offset the costs of non-
commercial thinning, habitat
enhancement, and prescribed
burning.

The silvicultural prescriptions
for Stand 2 will benefit forest
health, wildlife habitat, and
public users. They will also make the local area safer from potential wildfires and provide opportunities for public education. School groups could benefit from taking field trips to the McLellan C.A, to learn about forest succession and wildlife habitat. There are many opportunities that can be pursued – all of which help to make the property more beneficial to County citizens.

Forest Stands 3A & 3B
As described earlier, Stands 3A & 3B are in the area of the McLellan C.A. that burned in a wildfire several years ago. Since then, this area has regenerated prolifically, resulting in “dog-hair” thickets of 1 to 4-inch ponderosa pine saplings. Due to its early stage, the silvicultural actions needed in this stand are straightforward – reduce the number of trees to improve stand health and lower the extreme fire hazard. No action is needed in Stand 3B, as it has already been treated. Stand 3A, however, is in need of heavy non-commercial thinning to achieve these goals.

Due to the density of the stand, treatments for non-commercial thinning and slash disposal can be expensive. Traditional methods include hand thinning with chainsaws followed by a method of slash disposal – either chipping, machine piling, or hand piling. These methods, while effective, are very costly in a stand such as Stand 3A. To treat a stand of this nature using traditional methods, cost would range between $850-$1,000 per acre. Mastication is an increasingly-common form of treatment being used on all types of stand improvement and hazardous fuels reduction projects. It can be a viable alternative in extremely dense stands, as it is quicker and often times more cost-effective. There are several types of masticators - one common type consists of a tracked skid steer with a drum style masticating head. The head can be moved up and down by the operator and consists of many carbide teeth that are capable of grinding forest debris and standing trees. Another style is a masticating head mounted on the boom of an excavator. This type of machine is capable of working on steeper slopes and larger-diameter material. It is also more efficient at grinding taller trees since it has substantial reach compared to the skid steer model.

Mastication performs non-commercial thinning and slash disposal simultaneously. It is less precise than manual thinning with chainsaws and the final product is not quite as ‘clean’ looking as chipping or piling and burning. Masticators have more of a grind effect as opposed to a chipping effect. Aggregates are larger than chips, typically ranging from 1 to 8 inches in length (depending on the material being treated).
If a ‘cleaner’ look is desired, more time can be spent grinding material into smaller pieces for increased aesthetic value. Ultimately, mastication is often recommended on larger units and is an excellent way to simultaneously meet objectives and reduce costs. The estimated cost to masticate Stand 3A is between $550 and $700 per acre. Therefore, mastication is the suggested method for treating Stand 3A. As with Stand 2, islands of untreated regeneration should be left and dispersed through the treatment area as cover for wildlife. This stand improvement project will not only increase the fire resistance of the stand, but will accommodate future public use (it is currently too thick to walk through) and increase the safety of private residences to the east of the property. This stand improvement project should be scheduled as soon as possible.

Pruning is another desirable treatment that would be beneficial in Stand 3A. Pruning reduces the chances of a ground fire reaching the canopy of the individual tree or adjacent trees by removal of the lower limbs of trees that can carry flames from the ground to the top of the tree. Pruning the lower limbs off a tree stem is also done to produce higher value, knot-free wood. Young trees are easier to prune and thus less expensive to prune. It is important to never remove more than 50% of a tree’s live crown. For example, if you have a small tree that is twenty feet tall and has green limbs top to bottom then you can prune the lower ten feet without impacting the tree’s health.

**Property Signage**

Potential management issues on the McLellan C.A. include dumping, damage to the roads when wet, wildlife disturbance, safety concerns, unauthorized motorcycle and ATV use. Common methods to control access include gates, physical barriers, and signs. Other methods might include a neighborhood watch program. It is important to determine the cause of the problem before deciding on the best method of access control. Developing good neighbor relations is one possible solution as neighbors may be part of the problem. Garbage dumping on a property often results in more dumping. Prompt removal of dumped material may help to lessen the problem.

The least expensive method for preventing vandalism and misuse is to place informative signs at entrance points to the property and allow for vehicle turn-arounds at closure signs (or gates). Gates allow quick access if needed and are suitable where traffic control is temporary. However, gates often invite vandalism so gates should be sturdy. Gates should be installed close to public roads and in a visible location so problems are noticeable. Physical barriers such as logs, boulders and trenches can limit traffic but also limit access to emergency vehicles. They can also create a potential hazard. Installation of informative road signs along roadway entrances to the property is the recommended action to minimize unwanted ATV use on the property. Signs may need to be replaced on a periodic basis but are much less expensive than road gates. Success of this approach should be monitored over a several-year period.
**Schedule of Activities**

The following treatments are recommended to achieve forest management objectives of the McLellan C.A. Implementation of individual treatments may accomplish multiple objectives. Treatments are listed in order of priority. In general, the highest priority treatment is scheduled to occur within the immediate future.

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Activity Type</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2010</td>
<td>Prepare weed management plan</td>
<td>Coordinate with NMI and Spokane County Weed Board to develop an Integrated Weed Management Plan.</td>
</tr>
<tr>
<td>Fall/Winter 2010</td>
<td>Schedule sanitation harvest</td>
<td>Finalize written harvest prescription for Stand 2; schedule harvest based on market and environmental factors.</td>
</tr>
<tr>
<td>Spring 2011</td>
<td>Noxious weed management</td>
<td>Implement weed management plan and continue on annual basis as needed.</td>
</tr>
<tr>
<td>2011</td>
<td>Sanitation harvest</td>
<td>Implement sanitation harvest in Stand 2 (time of year and acreage TBD).</td>
</tr>
<tr>
<td>Summer/Fall 2011</td>
<td>Signage</td>
<td>Install appropriate signage next to gate entrances to reduce misuse.</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Pre Commercial thinning/Hazard reduction</td>
<td>Complete mastication in Stand 3A</td>
</tr>
<tr>
<td>2011</td>
<td>Schedule prescribed underburn</td>
<td>Finalize written burn plan for Stand 2 following sanitation harvest.</td>
</tr>
<tr>
<td>Spring 2012</td>
<td>Prescribed burn</td>
<td>Implement prescribed burn in Stand 2 – acreage dependant on size of harvest.</td>
</tr>
<tr>
<td>Spring 2012</td>
<td>Grass seeding</td>
<td>Broadcast native grass blend on trails and landings associated with the timber sale.</td>
</tr>
<tr>
<td>Spring 2012</td>
<td>Habitat Enhancement</td>
<td>Snag recruitment, creation of openings, and shrub plantings for wildlife habitat</td>
</tr>
<tr>
<td>Year Range</td>
<td>Activity Description</td>
<td>Monitoring/Management Details</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2012-2029</td>
<td>Monitor noxious weed infestations, road signs, and all forest health issues.</td>
<td>Adjust management techniques as necessary. Continue non-commercial thinning, pruning, and slash disposal as necessary.</td>
</tr>
<tr>
<td>2013-2025</td>
<td>Plan &amp; implement additional harvests/prescribed burns.</td>
<td>Plan additional harvest and burn units in Stand 2 (if the whole Stand is not treated in 2011/12).</td>
</tr>
<tr>
<td>2030</td>
<td>Revise Resource Management Plan</td>
<td>Update resource inventory and management plan to address current needs.</td>
</tr>
</tbody>
</table>
**Wildlife Habitat Management Recommendations**

The McLellan Conservation Area is currently used by a wide assortment of wildlife species. White-tailed and mule deer, moose, elk, turkey and ruffed grouse are some of the animals that utilize the property. Other mammals that use the property likely include coyotes, deer mice, little brown myotis (bat), porcupines, raccoons, red squirrels, shrews and voles, and many song birds. Some less common but still likely frequent visitors include the black bear, mountain lion, and bobcat.

It is important to consider habitats (or lack thereof) located around the subject property, this is often called the landscape matrix. This offers an overall picture of how a particular parcel could be managed in comparison to adjacent habitats. The matrix can impact how animals use patches of habitat. Land uses within a matrix can differ in their impact on related wildlife. Conversion of forests to residential development or agriculture is often regarded as permanent habitat loss, while silvicultural disturbances tend to provide a more heterogeneous structure and often provide quality habitat for wildlife. The landscape matrix may provide clues to a land manager of the potential wildlife uses of a particular property and thus, how to manage it.

The McLellan Conservation Area is located on a peninsula bounded by the Spokane River. There are houses flanking the east and west shoreline to the south of the property. The State land to the south of the subject property is quite similar in composition. The main objective for the McLellan Conservation Area should be to improve the understory component. Improving cover through a combination of timber harvest operations, stocking and prescribed burning can increase the overall use of the area by wildlife and maintain a diversity of plant and animal species found on the property. Having a diverse range of landscapes across the property and surrounding areas will provide the necessary requirements for many species.

Edge effect will be implemented into the forest management plan at the time the harvest plans are developed. Creating small openings not only creates additional edge for wildlife but also promotes regeneration. Having heavily stocked areas spread throughout the property can provide the necessary thermal cover for wildlife. Areas of uneven distribution of overstory trees will lead to increased diversity of understory plant species; thus, providing a wide variety of potential food sources and cover for wildlife.

The following are a set of restated recommended management actions designed for the McLellan Conservation Area:

- Create and maintain forest openings through timber harvest.
- Create feathered edges around openings.
- Maintain and/or create snags and identify future snags.
- Maintain coarse woody debris on forest floor.
- Plant desirable species along riparian and throughout interior of property.
- Protect streambank from erosion.
- Place nest boxes in strategic locations.
- Promote new growth through prescribed burning.

**Create and Maintain Openings**

Forest openings provide habitat features not found throughout most forest stands. Forest tree canopies provide deep shade, catch and divert rainwater, intercept snow and deposit branch and
leaf litter on the forest floor, acidifying soils. These and other factors can inhibit grass, forb and shrub production. The reduced competition for sunlight and increase in on-site rainfall, resulting from openings in the forest canopy, provide growing conditions that favor grasses, forbs and shrubs. In addition, the partial shade found in these openings tends to moderate temperatures and retains soil moisture on site. Seed production is generally increased and insect populations thrive, providing food for small mammals and birds. The edges created by the contrast between the forested area and the opening provide additional habitat for a diverse array of wildlife species.

This plan recommends maintaining irregularly shaped openings, systematically placed throughout the property, of one-third of an acre to 2 acres in size. The seedling/sapling stage of forest development is an excellent time to create these openings, as individual trees can be lopped and scattered by hand. The opportunity to maintain existing openings is present throughout the property in areas where few trees currently exist due to site conditions or past harvest activity.

Create feathered edges where openings exist

There have been studies that have determined that animals that inhabit forest edges succumb to a high mortality rate when the structure of the edge is abrupt. This sudden change in structure is claimed to allow predators to locate prey (e.g., nestlings) without much effort. This phenomena is often mitigated by “feathering” the edges, providing a gradual vertical increase in habitat (e.g., meadow, field, shrubs, forest). This “feathering” affect can create more habitat for other species and may also provide a windbreak for the interior of the stand.

Maintain Conifer Thickets and Create Future Thickets

Maintenance of conifer thickets will provide important hiding and thermal cover for big game wildlife. They also provide a secure corridor for travel within the property. Thickets located adjacent to forest openings and riparian/wetland areas will provide secure areas for wildlife.

Maintain or Increase Abundance of Fruit-bearing Shrubs and Deciduous Trees

Fruit bearing shrubs provide forage for black bears, grizzly bears, songbirds and grouse. Planting shrub species such as russet buffaloberry, serviceberry, and redosier dogwood can be undertaken to enhance species diversity and berry production. Deer and elk depend on deciduous shrubs as primary browse forage over much of their range. Because they are highly preferred by deer, bear and elk, biologists often call deciduous shrubs and trees, such as quaking aspen, red-osier dogwood, willow and red-stemmed ceanothus, “ice cream plants”. These plants are also important habitat components for other wildlife species, providing food, cover and nesting values for many birds and mammals.
Thickets of deciduous shrubs and trees will provide excellent winter cover for a variety of mammals and birds. During late winter, grouse will heavily consume buds of aspen and use the aspen stands for thermal cover. Planting hardwoods such as quaking aspen in draws and adjacent to riparian areas improve aesthetics and future wildlife habitat, especially for grouse and elk.

Manage Snags

Retention of snags (dead, standing trees) will increase the use of the forested portion of the property by a number of wildlife species. These species tend to use the snags for nesting, denning, perching, roosting, resting and feeding. Many of the wildlife species associated with snags perform beneficial functions. For instance, bats and tree swallows, both cavity nesters, are consumers of insects, including mosquitoes. Woodpeckers, who use snags for nesting and foraging, consume many insects known to be harmful to trees. Kestrels hunt in open fields, capturing insects and small rodents. Several owl species also use cavities for nesting and hunting. When possible, existing snags should be retained within the forested unit.

Thomas suggests that a range of snag diameters is desirable, with a minimum size of ten inches diameter at breast height (DBH) and 93% of all snag replacements exceeding twelve inches DBH. At least 6% of all retained snags should exceed 20 inches DBH. Trees greater than 16 inches in diameter on the property should be considered as future snags and be maintained. Recruitment snags (dead or dying trees), or those prime snag trees could be located and marked to ensure a consistent, long-term supply of snags on the property. Prior to any thinning or harvesting operations all snags and potential snags will be marked and saved. Trees of low value (high defect) or “character trees” useful to wildlife will be retained whenever possible.

Retain Downed Logs

Retaining downed logs within forest stands will benefit numerous species of wildlife. Species present on the property likely to use the downed logs include squirrels, voles, reptiles and amphibians. The number of downed logs should be twice the suggested minimum for snags and should follow the same basic guidelines for species, lengths and diameters as those listed above for snags.

It is important to retain all existing coarse woody debris greater than 12 inches in diameter especially in or adjacent to wetland and riparian areas. When small amounts of blowdown occur between harvests, consider leaving a portion of the individual tree or large pieces of trees for wildlife.
Create Drumming Logs

“Drumming” logs are downed logs regularly used by male ruffed grouse to drum for a mate and advertise his territory. Commonly, each male grouse will dominate eight to ten acres, to the exclusion of other males, with one hen per male. Grouse will often use drumming logs year after year.

A drumming log can be constructed by placing the end of a large log, six to eight feet or longer, against the trunk of a small tree. A log or even a pile of logs, that will place the grouse about a foot above ground level, and situated where a high number of saplings will develop around it, works best.

Noxious Weed Management Recommendations

Noxious weed infestations identified on the property should be treated promptly and aggressively with an integrated management approach that may use biological, chemical and cultural approaches to eradicate the noxious weeds as quickly as possible. It is recommended that an integrated noxious weed plan be developed with the assistance of the local county weed board.

The property should be continuously monitored for noxious weeds. Disturbed soils should be immediately seeded with a native grass/forb mix. In managing and attempting to mitigate the effects of noxious weeds, prevention is an important tool. All mechanical equipment should be pressure washed prior to arrival on the property.

Riparian Area Management Recommendations

The shoreline surrounding the McLellan Conservation Area should remain as “natural” as possible. This will be achieved by confining all timber harvesting operations to the main plateau and never within 200 feet of the water’s edge.

A riparian zone or riparian area is the interface between land and a stream. Riparian zones are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, their biodiversity, and the influence they have on aquatic ecosystems.

- Maintain a shrub understory in all riparian areas. Understory plants provide food and cover for numerous wildlife species. Shrubs species provide excellent erosion control along streams.
- Maintain a buffer strip of riparian vegetation adjacent to streams and wetlands. Buffer strips reduce sedimentation, stabilize streambanks, and slow flood waters.
- Retain snags and broken top trees for cavity nesting wildlife where they do not present a safety hazard.
- Avoid locating structures and roads in riparian and wetland areas.
- Retain streamsides trees and shrubs for thermal cover, CWD recruitment, and stream bank stability.
- Adhere to Riparian Management Zone Law and implement Forestry Best Management Practices when conducting commercial timber harvest operations.
Cultural Resource Management Recommendations

The only known cultural resource at this time is a log cabin on the north end of the property. It is recommended to preserve this structure, especially during potential treatment projects.
RESOURCE MANAGEMENT PLAN SUMMARY

This Resource Management Plan has been developed for the purposes of reaching a specific set of goals set forth by the landowner. This plan evaluates the forestland managed by the Spokane County Department of Parks, Recreation, and Golf. In this plan a regime has been set forth that attempts to accomplish the goals of maintaining and improving the health and aesthetics of the property. The management regimes describe a plan which projects activity over the next 20 years. This is a feasible planning regime for forestry. At the end of this period, the site should be re-evaluated and a new cruise (inventory) is recommended. Doing so will allow the landowner and a forester to reaffirm the landowner goals, past management practices, and changing environmental regulations.

A Resource Management Plan is a system that identifies and evaluates a set program and identifies goals and objectives for a particular piece of property. The plan outlines a management regime, which will help the landowner meet their described goals and objectives. A management plan is (by design) a tool that provides a pathway for meeting specific goals and objectives; it is not to be a burden to a landowner. As environmental and market conditions change so may the management regime change.
CERTIFICATION

1. Northwest Management, Inc. has no undisclosed interest in the property, present or contemplated.

2. Northwest Management, Inc.’s payment is not contingent upon the volume found.

3. Northwest Management, Inc has inspected the property.

4. This report is true and no important facts have been withheld or overlooked.

5. A cruise is a sampling system used to determine timber volume for timbered property. A statistically reliable cruise will accurately estimate the timber volume provided that the standard error projected is within acceptable limits. A cruise is only an estimate and its accuracy is dependent on the variability of the timber size and volume equations used. Removal of this volume reported is subject to logging quality, market conditions, tree size removed and Forest Practices as described by State and Federal Regulations. Northwest Management, Inc. maintains and updates its cruise information continually.

__________________________  ______________________
Luke M. Machtolf               Date
Northwest Management, Inc.
REFERENCES


APPENDIX

McLellan Conservation Area Stand Tables

Stand 2 Timber Sale: Estimated Stumpage Appraisal

McLellan Conservation Area Soils Map

Forest Productivity with Site Index Base

Noxious Weed Descriptions:
   Class C
   Class B
   Class B Designates