



City of Red Lodge
**Urban Forestry
Management Plan**

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Theresa Whistler and Rue Freeman (*Tree Committee*)
City of Red Lodge Parks, Trees and Recreation Board

James Caniglia, *City Planner*

Jennifer Lyman, *City-contracted Staff (2017 Inventory Lead)*

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Executive Summary

A second public tree inventory was completed in 2017 as part of the effort to update the 2018 Urban Forestry Management Plan (UFMP). The objective was to collect and analyze information on “public” trees within the corporate limits of Red Lodge (i.e., trees on City and county-owned property including parks and street right-of-ways). Results of the 2008 inventory suggested that public trees in Red Lodge reaching maturity lacked the recommended species and age diversity to prevent a large loss of trees from catastrophic insect or disease epidemic that target specific species or genus. The 2017 inventory suggests the majority of public trees are mature, although, young public trees planted in public rights-of-way are adding greater species and age diversity to the City forest. The 2017 inventory finds that 20% of potential planting sites identified in 2008 have been filled with young trees. Continued City tree planting programs the updated preferred tree species list (Appendix B) should further guide diversity of Red Lodge’s urban forest.

Both young and old trees in public areas are in need of maintenance; 360 of these trees need immediate attention. Sixty-one of the 360 are considered “high priority” and in need of pruning to remove deadwood and/or removal. Two of the high priority trees represent a potential public safety hazard and should be addressed immediately. Forty-seven percent of public trees that require immediate maintenance are privately owned and found within street right-of-ways (ROWS). They are the responsibility of the adjacent property owner although that may not be known, so, it is recommended that the City help educate property owners and residents on the need for tree maintenance and enforce ordinance 919 where necessary.

A ten-year work plan to maintain and enhance the City’s urban forest is updated and appended (Appendix A). The work plan suggests 1) improved communication of ordinance No. 919 to strengthen tree care, planning and management, 2) increased tree management responsibility of the Parks Board and Public Works Department, 3) a Citywide tree education campaign and continued cost-share and Arbor Day tree program, 4) an increased allocation of funds toward tree care: additional funding by City taxpayers and/or from outside grant sources and 5) greater outreach and coordination of volunteers to assist with community forestry maintenance.

Implementation of this UFMP requires monitoring, enforcement, and follow-through by all parties involved. The UFMP serves as a strategic approach to sustaining the City’s community trees on a short and long-term basis and will hopefully result in a healthier and safer community forest in Red Lodge.

Chapter 1. Overview

Introduction

Trees have long been recognized for the beauty and value they lend to our homes, neighborhoods, parks and business areas. Not only do trees enhance and beautify our City, they also provide shade and visual screening, conserve energy, help clean the air, store carbon, protect our rivers and streams and provide shelter for wildlife. Trees also increase residential property value by 3.5 to 6% and up to 30% for undeveloped property (University of Washington, 1998a). They have been estimated to have an appraised value of "between \$1,000 and \$10,000" according to the Council of Tree and Landscape Appraisers. The presence of trees may also positively influence consumer attitudes and prices that shopper are willing to pay (University of Washington, 1998b & 2000).

"The net cooling effect of a young, healthy tree is equivalent to ten room- size air conditioners operating 20 hours a day."— **US Department of Agriculture**

The City of Red Lodge is fortunate to be situated in a forested riparian corridor and a climate conducive to continued tree growth. The City is also fortunate that many of its early community members recognized the value of trees and chose to plant a variety of species within the parks and along the streets. The community is now enjoying the benefits of mature trees thanks to the investment and commitment of the early settlers.

Today, the City continues its commitment to the maintenance and enhancement of its "urban forest" by participating in annual Arbor Day activities, membership in the Tree City USA program, and support for the Parks Board and Public Works Department, which plan and maintain public trees.

This Urban Forest Management Plan (UFMP) is the next step towards that commitment. This plan is intended to provide the foundation for an ongoing program that will result in a healthier and safer community forest in Red Lodge. It is a strategic approach to sustaining the City's community trees on a short and long-term basis. This plan includes background information on the history and goals of tree care for the City (Chapter 1), a baseline inventory of public trees (Chapter 2), recommendations for future stewardship of the City's urban forest (Chapter 3), and a work plan and budget that provides short and long term priorities for tree care and maintenance (Chapter 4). Also included as appendices are 1) City ordinances pertaining to trees, 2) a recommended tree list for the City, 3) information about insects and disease present or potentially present in Red Lodge and, 4) a map showing the inventoried trees of Red Lodge. References cited throughout the UFMP and appendices are also included and, when available, hyperlinked websites are listed for further reading of reference materials. Actual tree inventory data for individual trees is located and maintained in a Geographic Information System by the City of Red Lodge.

Community Tree History

Parks, Trees and Recreation Board

The City of Red Lodge established the Parks, Trees and Recreation Board (the Parks Board) originally through Ordinance 810 and currently maintains it by ordinance No. 918 (<http://cityofredlodge.net/wp-content/uploads/2013/10/Ordinance-918.pdf>). This citizen-based advisory board, appointed by the Mayor and approved by City council, is responsible for the oversight of all City parks and public trees. The general responsibility of the Parks Board is to identify park and tree needs. Specifically, the six-member board is to "recommend the planting, pruning and removal of trees, shrubs and other plantings located on public property." They are also chartered to "maintain a list of appointed and not recommended trees for use in public rights of way. "

Funding for the Parks Board comes from the collection of resort taxes. In recent years, the Parks Board has budgeted funds ranging from \$7000-\$9500 annually for public tree planting and routine or ad hoc maintenance. The public works department also contributes resources toward the maintenance of trees. The Parks budget is annually adjusted and supplemented assuming contributions from DNRC and Arbor Day grants.

Tree City USA

Red Lodge celebrated its 18th year membership in the Tree City USA program in 2017. The Tree City USA program, sponsored by the Arbor Day Foundation in cooperation with the USDA Forest Service and the National Association of

State Foresters, provides direction, technical assistance, public attention, and national recognition for urban and community forestry programs in thousands of towns and cities. Red Lodge is one of 3,400 communities to receive this designation nationally, one of 42 cities with the distinction in Montana.

Red Lodge continues to qualify for Tree City USA and meets the four standards established by The Arbor Day Foundation and the National Association of State Foresters. These standards ensure that every qualifying community has a viable tree management plan and program. To remain eligible, the City must have 1) a tree board or department, 2) a tree care ordinance, 3) a community forestry program with an annual budget of at least \$2 per capita, and 4) an annual Arbor Day observance and proclamation.

Arbor Day

Red Lodge celebrates Arbor Day annually, usually in late May or early June to avoid cold spring conditions. A typical day includes a gathering of Parks Board members and community volunteers to maintain or plant, stake and fence

new trees. In 2009, sixteen people, including members of the Red Lodge boys & girls club, contributed about three hours of their time to plant a total of six trees. The trees (chokecherry, maple and elm) were planted, fertilized and fenced at the Carnegie Public Library, Field School Park and the Skateboard Park. From 2010 to 2017, 14 additional Arbor Day trees have been planted around the City (*Figure 1*) Red Lodge celebrated Arbor Day in 2017 by planting two Tatar maples trees in cutouts on the 11th Street W side of the Wells Fargo Bank on Broadway Ave.

A detailed listing of Arbor Day trees planted in Red Lodge is found in Appendix D under Arbor Day Trees, Types and Locations.



Figure 1 - MAP: Red Lodge Arbor Day tree locations

Cost-Share Tree program

Red Lodge initiated a Cost-Share Tree program in 2013 with funding from Montana Department of Natural Resources (MTDNRC). Under the Cost-Share program a Red Lodge property owner can apply to purchase a tree from the City for planting along a City easement or planting strip adjacent to their property. The City evaluates the proposed location, checks for conflict with public works, plants the tree, stakes, and fences it. The landowner is responsible for all other care of the tree (watering, fertilizing, pruning, etc.).

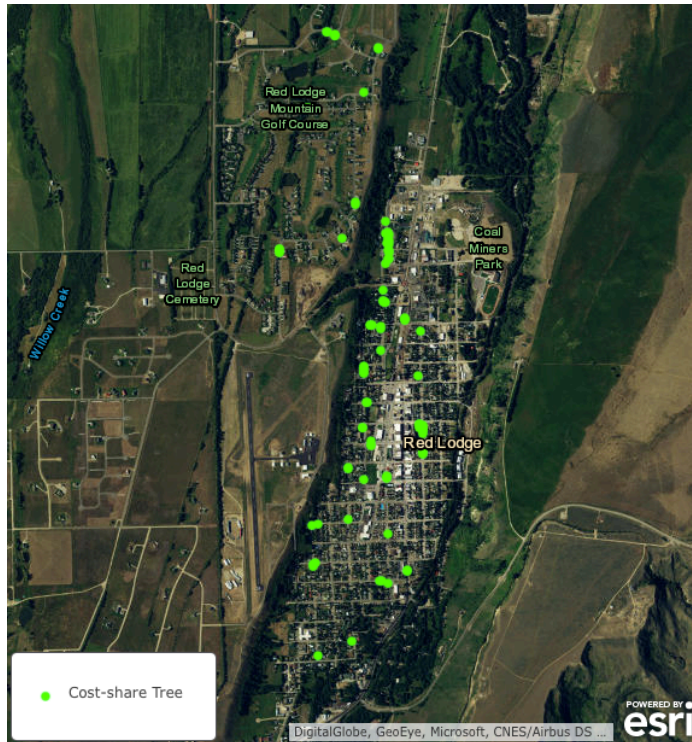


Figure 2 - MAP: Red Lodge cost-share tree locations

From 2013 through 2017, 100 new trees have been added to the Red Lodge urban forest (Figure 2). Twenty-two different varieties of trees comprise the Cost-Share offerings over the years and have led to increased diversity of the City's urban forest.

A detailed listing of cost-share trees planted in Red Lodge is found in Appendix D under Cost-share Trees, Types and Locations.

Northwest Energy Grants

In 2011 Northwest Energy gave 22 trees of seven different cultivars to the City of Red Lodge through their grant program. These were planted throughout the City in "planting-sites" identified during the 2008 survey. Five trees were planted along Broadway and the rest on its side streets (Figure 3).

NWE will make additional reimbursements to Red Lodge for trees that are removed due to power line conflicts. The Parks Board and City Planning will use this money to replant height-appropriate tree species under power lines.

A detailed listing of NWE-granted trees planted in Red Lodge is found in Appendix D under Other-grant Trees, Types and Locations.



Figure 3 - MAP: NWE grant tree locations

Red Lodge Program-trees Summary

From 2009 to the present, a total of 141 trees including 20 Arbor Day, 100 Cost Share, and 22 Northwest Energy Grant trees, have been planted by Red Lodge to add species and age diversity to its urban forest (*Figure 4*). The Red Lodge Tree Program has managed tree planting at 25.8% of 2008 listed potential tree sites (141 trees) within public areas. The 2008 Red Lodge tree inventory identified 546 potential planting sites and the 2017 survey identified 91 additional planting sites to expand options for public tree planting. The City GIS and spatial data analysis is used to target program tree locations by looking at all potential locations and their situations. Red Lodge plans to continue cost-share and Arbor Day planting annually for the long-term as part of its mission to maintain Tree City USA status.

In addition to the City's tree program, MT State Department of Transportation (MDT) has contributed a number of trees and a water delivery system along Hwy 212 on the North end of City as part of the "Red Lodge 8th to Robinson" highway improvement project (2014/2015). The City now manages these trees and those within parks and the core business district. HWY right-of-way trees supplement Red Lodge's urban forest and add diversity through the City's collaboration with MDT.

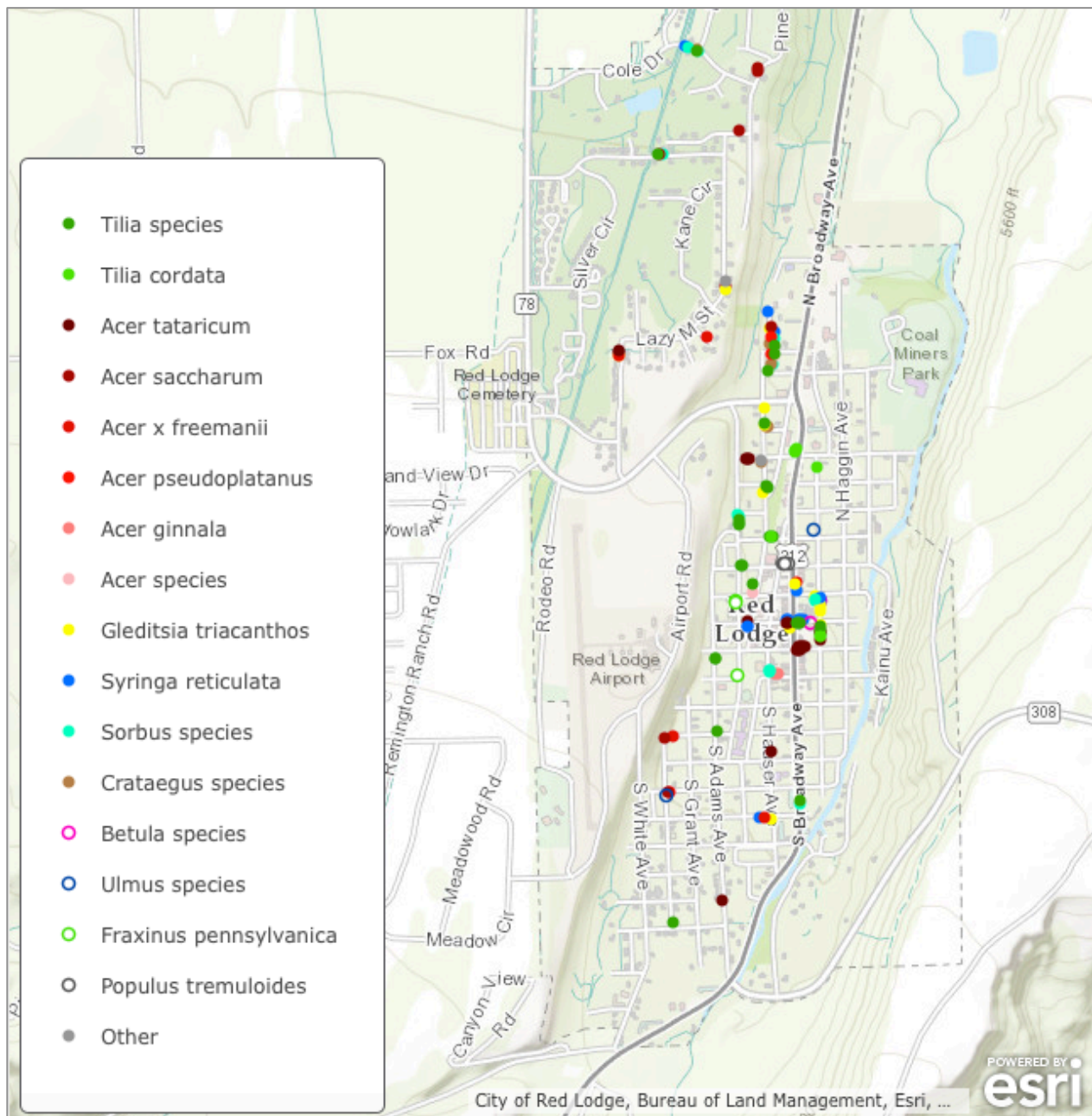


Figure 4 - MAP: Diversity and distribution of Red Lodge "program trees"

Reference to Trees in Community Plans

There are many guiding documents for the City of Red Lodge including the Revitalization Master Plan (1986), Trails Plan (2006), Comprehensive Parks Plan (2015), Active Transportation Plan (2016) and the Growth Policy (2015). Most of these documents discuss parks, recreational opportunities and scenic beauty as being important attractions of Red Lodge. Few specifically mention the role of trees or tree management needs, but one can safely assume that trees contribute to these attractions. Below are a few extracts from these guiding documents that directly or indirectly reference trees.

The revitalization plan discussed landscaping opportunities in Red Lodge and said that over half of the consumers surveyed identified “cleaning and beautifying the City with trees and flowers” as one of the most important improvements for the City, especially along its entrances.

The trails plan mentions the importance of landscaping along trails to improve the scenic quality and experience for people using the trails. It is assumed that such landscaping would include tree planting and/or maintenance.

The 2015 Growth Policy has a stated goal that “existing mature trees and vegetation shall be preserved while hardy, drought resistant landscaping is encouraged” and that the City “will maintain its Tree City USA status and plan to help care for the urban forest resource. In the climate change section, the plan states that a goal should be to “Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO₂.”

Climate & Weather

Results of a Montana Climate Assessment (MCA) were released in September of 2017 by a group of Montanan professors and research associates looking at data from MT DNRC, NOAA, USDA Forest Service, USDA – National Agricultural Statistics Service (NASS), and the US Global Change Research Program (USGCRP). Focus of the assessment is on Montana’s water, forests and agriculture looking at historical climate data ranging from 1950 to 2015 and future climate models from the World Climate Research Program (WCRP). The State is divided into 5 climate divisions; Red Lodge belongs to the “South Central” region east of the Rockies.

The following summary points from the assessment of historical data between 1950 and 2015 should be considered for urban forestry management, work plans, maintenance budgets, preferred and non-preferred tree planting and locations:

- Annual average temperature across Montana has already risen 2.0 – 3.0^o F,
- Greatest deltas in min and max temperatures found in Spring and Winter (average increase 3.9^oF)
- Growing season length is extended with earlier spring and longer summer (~12 days)
- Annual precipitation averages have not changed, but winter precipitation decreased (0.9 inches) while spring precipitation increased 1.3 – 2.0 inches.

The City may consider the following projections from the assessment for future UFMP evaluation and planning:

- Annual average temperature across Montana is expected to increase approximately 4.5 to 6.0^oF by 2050
- “Earlier onset of snowmelt and spring runoff will reduce late-summer water availability in snowmelt-dominated watersheds.”
- Precipitation is expected to increase during winter (not snowpack), spring and fall while decreasing in the summer (especially in the South and Central regions) – maintaining annual mean precipitation overall.
- Number of consecutive dry days should remain within average ranges + or – 3 days though are likely to present more severe droughts

The estimated annual precipitation of Red Lodge ranges from 10” to 14” for most of the City with slightly higher amounts (15” to 24”) on steeper slopes coming off the east and west Rock Creek benches (USDA 1975), most likely due to deposition of snowdrifts. The majority of this precipitation comes in the form of snow. The weight of high-moisture, late spring snows often damage trees in Red Lodge, especially if deciduous trees have leafed out.

High winds in this area can occur in any month. Winds can break or topple larger trees and damage younger saplings, as evidenced by the fall 2007 wind event in Red Lodge and the Beartooth Mountains. Extended periods of hot, breezy days in summer months can dry out soils and result in tree mortality. Over the past 10 years, there has been an overall drought in the Carbon County area, resulting in increased tree mortality and insect and disease occurrence in drought-weakened trees.

USDA winter hardiness zone for Red Lodge is shifted from Zone 4a to Zone 4b, with -20 to -25 degrees F average annual minimum temperatures (USDA 2012). Zone maps have been revised to represent the changes due to climate change and predict where various trees and plants may adapt well. However, almost as important to tree survival is the microclimate conditions city-developed areas. For example, asphalt surfaces surrounding one site make it hot and dry. But around the corner, buildings cast shadows that cut temperatures and minimize evaporation of soil moisture. Sidewalks, curbs and gutters can drain water away from or funnel it into areas, making for either dry or over-saturated soils. Light, wind, temperature, and soil conditions can change abruptly from one spot to another. Urban conditions are frequently more severe for the growth of trees than in natural environments. On the other hand, conditions could also be better due to irrigation or lack of competition.

Seasonal variation in urban areas may also be extreme compared to more natural areas. A site may be hotter in summer and colder in winter. Or, it may be drier in the summer and wetter in the winter due to soil compaction, the presence of paved surfaces, and snow plowing. Snowmelt runoff from roofs may coat trees in ice or encases the ground around trees with ice. Paved areas and buildings generate heat that usually keeps temperatures warmer in all seasons than in more natural areas; a phenomenon known the "urban heat island" effect.

Soils

Soils in the Red Lodge area provide an adequate tree growth medium. According to the Soil Survey of Carbon County (U.S. Department of Agriculture, Soil Conservation Service, 1975), the majority of soils in the corporate limits of Red Lodge consist of the **Charlos association**, a loam to stoney-loam soil that is generally well-drained on 0-8% slopes (Figure 2). The soil generally has 110-120 frost-free days and is moderately suited for hand & mechanical planting due to sandiness.

Steep slopes below the east bench and on the west bench below the Red Lodge golf course are classified as **Heath-Bynum association, steep** soils. Steep slopes on the west bench south of 1st Street are classified as **Thiel-Bynum association, steep** soils. Soil profiles in these areas are generally shallow (20" to 40") due to underlying bedrock outcrops. There are numerous springs discharging from these slopes and places where slumping has occurred. Native quaking aspen and cottonwood frequently grow on wetter portions of these slopes, particularly at springs, wet areas, and adjacent to irrigation ditches. In drier areas, tree cover consists of scattered limber pine, Douglas fir, and various shrubs.

It is important to note that map unit and soil properties for a specific parcel of land may vary somewhat and should be determined by onsite investigation. Site-specific concerns need to be evaluated and considered prior to making tree planting or species selection decisions. Localized soils concerns for tree planting in Red Lodge include areas with coal slag, compacted soils, a high water table depth, poor soil drainage, extremely rocky soils, and steep slopes. The best indicator of soil suitability is to examine trees already growing on or near the given site and try to plant either the same species or species that grow in similar conditions.

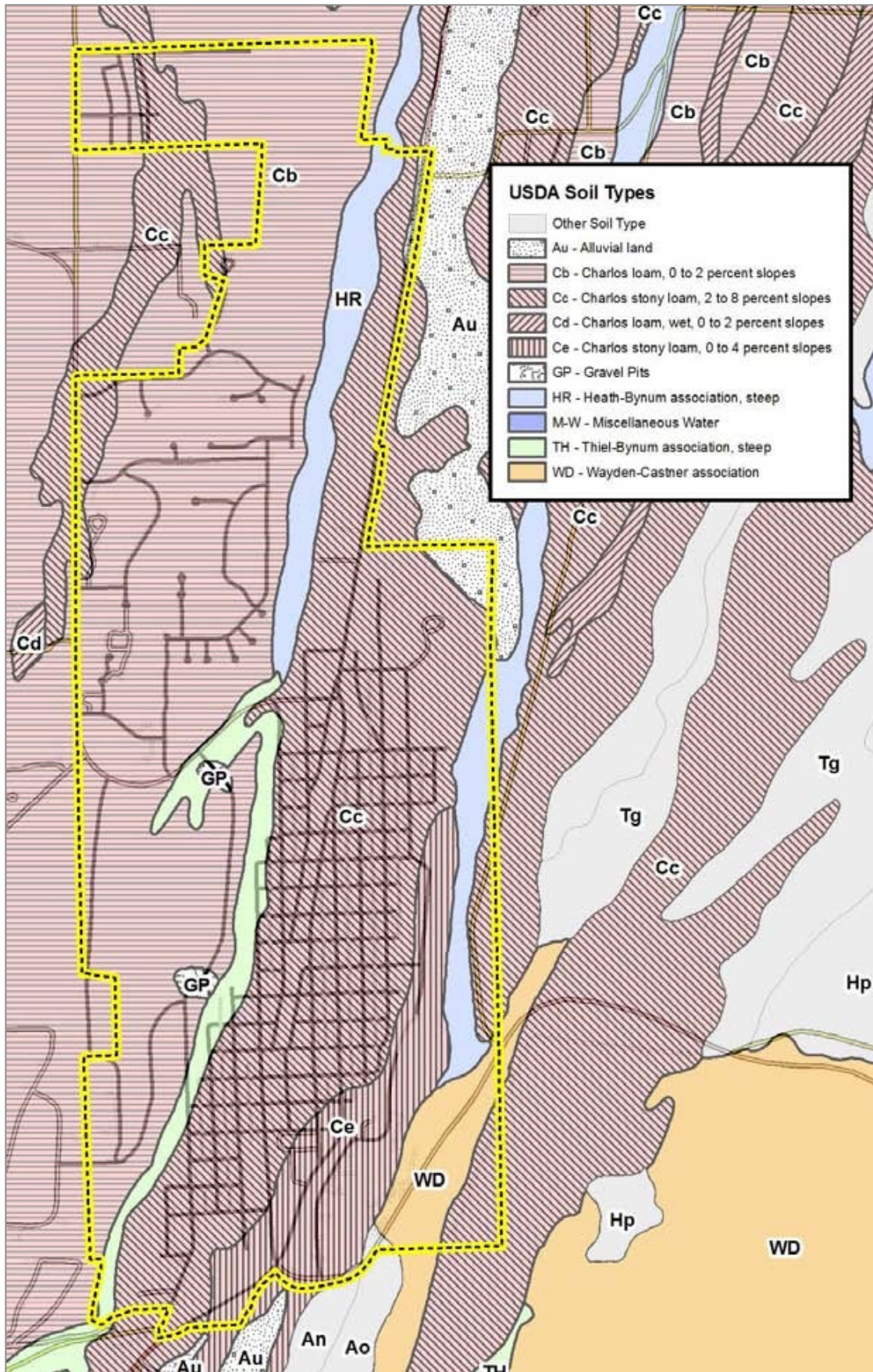


Figure 5 - Soils map of Red Lodge. Data from Natural Resources Conservation Service (1975)

Insects and Disease

Less than one percent of the estimated one million insect species on the earth are pests. An even smaller percentage is considered forest pests. Yet, insects are capable of creating tree and fire hazards, reducing visual quality, affecting wildlife use, and degrading watershed properties.

The urban forest of Red Lodge has a varied occurrence of insect pests. At times the damage caused by these pests may reach levels that require no action because costs of treating are greater than the benefit gained. However, if a pest is detected and accurately identified, steps preventing an increase in population and the ensuing damage should be taken if possible.

Some pests, such as many of the wood-boring insects and canker-causing fungi, are opportunistic, becoming serious problems on trees that are under considerable stress. Inadequate moisture, temperature extremes, wind or snow damage, unfavorable soils, herbicide injury, mechanical injury and tree age may cause tree stress. These factors and others, such as defoliating insects and diseases, often will predispose trees to opportunistic insects and diseases (Zelevnik et al 2005). Maintaining vigorous and healthy trees suited for the location they are planted in is the best defense against insects and disease.

Rather than provide an encyclopedic listing of all potential insect and disease problems, this tree management plan focuses on 1) existing insect and disease problems affecting trees on City lands in Red Lodge and 2) insects and diseases that can potentially affect the largest numbers of trees on City lands. Insect and disease problems were also verified with arborists and a Montana DNRC urban/service forester. Table 1 is a listing of Insects and diseases known to occur in Red Lodge trees and which species is affected. This table originated with the 2008 tree inventory and was updated according to field observations made by the 2017 team. Insects and diseases with potential to occur in Red Lodge are listed in Appendix C. More in- depth information, including descriptions and management options for each listed insect or disease is also provided in Appendix C.

Table 1 - Current insect and disease problems known to occur in Red Lodge

Insect or Disease	Species Affected
White Pine Weevil	Spruce (Engelmann and Colorado Blue), pine species
Cytospora canker	Spruce. Most damaging on Colorado and Norway species
Cooley Spruce Gall Adeigid	Spruce, Douglas fir
Western Spruce Budworm	Douglas fir, all true firs, spruce and larch. May be found in pines
Fireblight	Apples, crabapples, mountain ash, hawthorn and roses
Cankers	Poplar species (aspen, cottonwood, hybrid poplars)
Mountain Pine Beetle	Most native and introduced species of pines
Scale	Green Ash, Poplar species (aspen, cottonwood, hybrid poplars), pine (lodgepole, ponderosa, and ornamentals), willow, apple, occasionally spruce and Douglas fir
Aphids	Conifers and hardwoods
Western Gall Rust	Lodgepole and Ponderosa pines
Western Tent caterpillar	Prunus species
Hackberry Nipple Gall	Hackberry
Leaf spot	Aspen and Poplars showing affectations most greatly late summer through fall
Black Knot	Prunus species (evident in Red Lodge chokecherrys)
Leaf and Stem Galls	Poplars,
Conks	Mountain Ash
Crown Gall	Prunus, Populus, Malus, Rosa, Salix spp.s (Black Poplars in Red Lodge)

Chapter 2. Tree Inventory

Objectives and Limitations

The objective of the tree inventory is to collect and analyze information on “public” trees within the corporate limits of the City of Red Lodge (i.e., trees on city and county-owned property including parks and street rights-of-way). The inventory does not evaluate trees planted on private property unless they impact public sidewalks or overhead wires. The inventory records tree species, location, diameter, condition (including immediate safety hazards) and recommended maintenance and/or removal.

The inventory, while only a snapshot in time, is important because it documents the community forest and establishes a baseline to plan maintenance activities and future plantings. A community forest is dynamic. Environmental conditions, storm damage, insects/disease, urban development, tree death and removals, and new tree plantings contribute to this change. This inventory is considered part of a long-term monitoring program that the City adopts and supports. The inventory data should be kept updated with activity details and re-collected at least once every ten years.

All tree observations were limited to ground-level visual examinations of accessible parts, without dissection, excavation, probing, boring or other invasive procedures. No warranty or guarantee is made, expressed or implied, that structural problems or deficiencies of the observed trees will not occur in the future, from any cause. This report covers only the examined trees and their condition at the time of inspection between June 15 and October 15, 2017. Trees surveyed earlier than September’s early snowstorm (the 21st) were not revisited for updates although many trees were damaged during that storm.

The inventory only includes trees on public property within incorporated City limits as of June 2017 with the exception of trees in the Double Ditch Dog Park (just outside City limits). It does not include trees within Phillips Park (behind Mountain Springs Villa Park), the Spires or Sand Hill subdivisions nor does it include an assessment of each individual tree in heavily forested areas along Rock Creek. All trees at Lions, Pride, Finn, City Pool and School Field Parks are included. Two new parks were dedicated in December 2017: Van Dyke Park, south of the airport on the west bench and Creekside Park, near the intersection of 7th St E and Cooper Ave N along Rock Creek. A sample of trees running along drainage in Van Dyke Park, along trails at Creekside Park and throughout Rotary Park was included.

Methods

The inventory used a tree survey schema modeled after the “I-Tree” program, a peer-reviewed software suite developed by the US Forest Service that provides for urban forestry analysis and benefits assessment evaluations. The Montana Department of Natural Resources and Conservation (MTDNRC) for purposes of this inventory modified and controls the I-Tree software schema. In our 2017 field surveys we used ESRI’s ARC/GIS Collector mobile application for field data collection. We relied on the 2008 survey locations of existing trees for 2017 tree re-location and the iPad/iPhone GPS to capture any new tree locations. Various County GIS base maps were available to surveyors as additional reference during field collection and for later analysis.

The 2017 tree survey consists of four main components: 1) Tree identification; 2) tree profile; 3) tree condition; and 4) recommended maintenance. The design of the 2017 differs from that of 2008 in its expansion of sections related to tree condition and maintenance. For example, the new survey allows input for two categories of tree defects, two maintenance task options, insect/disease damage type, City management, land use type, sidewalk damage, site type, source (whether the tree is a cost-share, arbor day tree or other), and additional notes about the tree. The additional number of attributes collected in 2017 extended the time needed to survey each tree to approximately 10 minutes depending on site and condition.

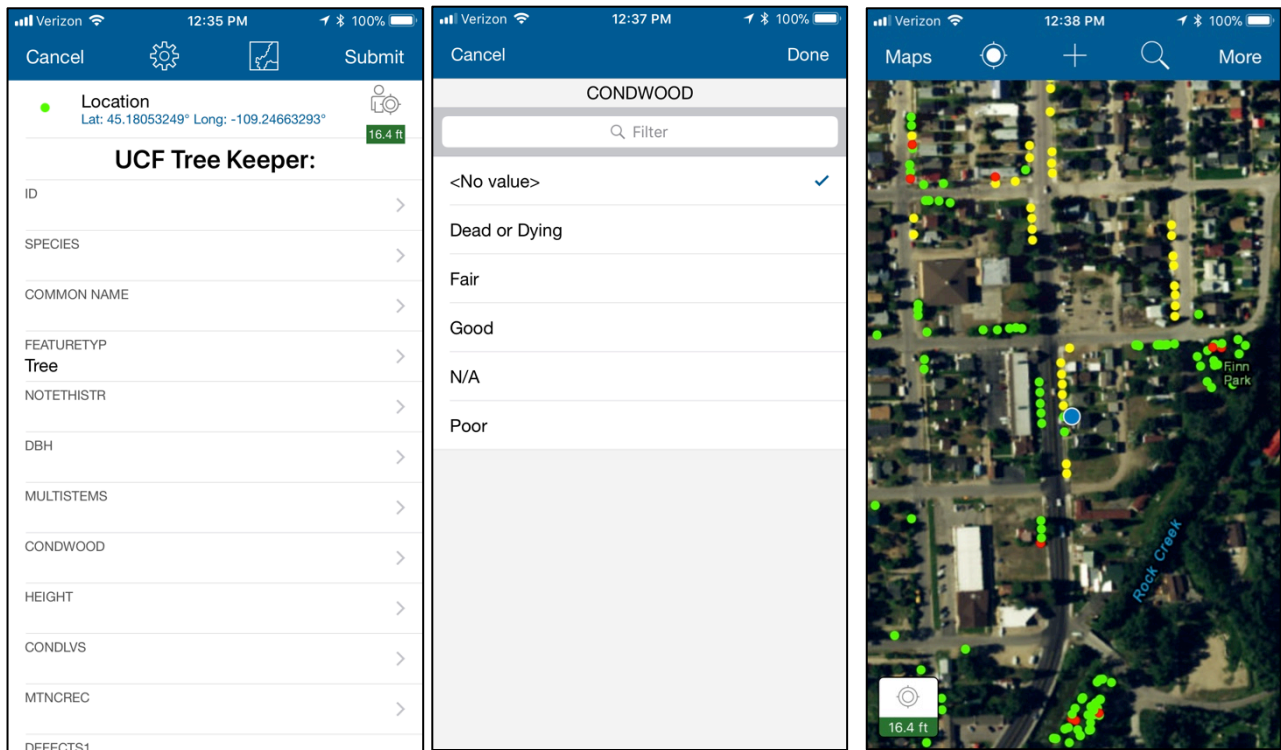


Figure 6 - Displays of ArcGIS Collector application interfaces on iPhone

Table 2 - Data Dictionary for the 2017 Red Lodge Tree Inventory

Data Field Definitions for the Montana Statewide Urban Tree Inventory Geodatabase, 06/07/2016 with modifications specific to Red Lodge Aug. 2017
LOCATION - Latitude, Longitude (using the GPS location on the iPad or iPhone and/or surveyor adjustment)
SPECIES - species name, scientific name selected from list provided by DNRC.
COMMON NAME – general name tree is known by or name nursery assigned per cultivar
FEATURETYP - Denotes whether a record is a tree, planting site or a stump. Field should be filled, not 0, Null or empty.
NOTETHISTR – Note for this tree? Yes – there is an additional note in the NOTE field for this tree No – there are no additional notes for this tree in the NOTE field
DBH - A numeric entry in inches for the diameter at breast height [4.5 ft. (1.37 m.) above the ground]. Non-tree sites, obviously, will not have a DBH. Multi-stem trees are given '999' values in this field and multiple DBH values (by stem) are recorded in the NOTES field.
MULTISTEMS - The number of stems or trunks and situation among tree (at base, DBH, just off ground, etc.)
CONDWOOD (Condition of the Wood): A numeric code to describe the health of the tree's wood (its structural health) 1 = Dead or Dying – ≤ 10% of the trees overall wood is alive. There is little to no hope for saving the tree or it is currently dead. 2 = Poor – any of the following: Dieback of 50% to 90% of small branches; 3 or more major branches dead and priority pruning is required; 50% to 90% of trunk circumference dead, decayed, and/or hollow. 3 = Fair – any of the following: Dieback 15-50% of small branches; 1 or 2 large branches dead; 15-50% of trunk circumference dead; Fruiting bodies may be present. The tree may be suffering from one or more defects that pose a threat to the trees long-term health but can be readily treated.

<p>4 = Good – > 85% of the wood is alive, and > 85% of the trunk circumference has bark. Overall the tree is in good health with no defects that will affect the trees long-term health. Form is characteristic of the species.</p>
<p>HEIGHT - an estimated tree height in feet (ocular estimates only)</p>
<p>CONDLVS (Condition of the Leaves): A numeric code to describe the health of the tree’s canopy</p> <p>1 = Dead or Dying– Dead, or ≤10% of the leaves present, or if more present ≥ 90% greatly reduced in size, diseased, or chlorotic.</p> <p>2 = Poor – 50% to 90% of the leaves absent, or if present, 50% to 90% reduced in size, diseased, or chlorotic</p> <p>3 = Fair – 50% to 85% of the leaves appear healthy and are present, ≤50% of the leaves of the leaves absent, reduced in size, diseased, or chlorotic</p> <p>4 = Good – ≥85% of the leaves appear healthy, ≤15% reduced in size, diseased or chlorotic</p>
<p>MTNCREC (Maintenance recommendation): A numeric code to describe the recommended maintenance for the tree.</p> <p>The default values are as follows:</p> <p>1 = None – Tree does not need immediate or routine maintenance.</p> <p>2 = Small/Young tree (routine) – Tree is less than 15 ft. tall or < 4 in. DBH and in need of maintenance; health or longevity of tree is not compromised by deferring maintenance for up to five years.</p> <p>3 = Small tree (immediate) – Tree is less than 15 ft. tall or < 4 in. DBH and in need of maintenance; deferring maintenance beyond one year would compromise health or longevity of tree.</p> <p>4 = Large tree (routine) – Tree is more than 15 ft. tall or > 4 in. DBH and in need of maintenance; health or longevity of tree is not compromised by deferring maintenance for up to five years.</p> <p>5 = Large tree (immediate) – Tree is more than 15 ft. tall or > 4 in. DBH and in need of maintenance; deferring maintenance beyond one year would compromise health or longevity of tree.</p> <p>6 = Critical concern (public safety) – Tree should be inspected without delay, and conceivably poses an immediate threat to public safety.</p>
<p>DEFECTS1 – describes the principle problem of the tree. Used only in 2013+ inventories.</p> <p>1 = Trunk scar/cat face- damage to the bark on the trunk, or absence of bark on the trunk</p> <p>2 = Trunk cavity - recess in trunk usually caused by rot</p> <p>3 = Multi-stem - tree has two or more trunks that separate from each other below breast height (4.5 feet), this could also refer to trees that are sprouting from the base</p> <p>4 = Included bark – poor branch attachment wherein bark becomes included inside of the branch union between the branch and the trunk or between co-dominant stems</p> <p>5 = Frost crack – vertical split in the wood of a tree, generally near the base of the bole, caused by internal stresses and low temperatures</p> <p>6 = Girdling/exposed roots – These are two different things. Girdling roots encircle all or part of the trunk of a tree or other roots, and constrict the vascular tissue preventing flow of water and nutrients. Exposed roots are roots that grow close to the surface of the soil and have a portion of which is visible on the surface. If this defect is selected, it could mean that the roots are girdling, exposed or both.</p> <p>7 = Dieback – condition in which the branches in the tree crown die from the tips toward the center.</p> <p>8 = Lean > 15° - main trunk of the tree is leaning more than 15° from vertical</p> <p>9 = Chemical/salt damage – foliage shows signs of damage from salt or chemicals</p> <p>10= Animal or equipment damage – this is a wide category that includes any kind of mechanical damage to the wood of the tree ranging from deer scrape on the bark to cut roots from curb construction</p>
<p>DEFECTS2 - describes the secondary problem of the tree. Used later during the 2017 Red Lodge inventory after finding multiple issues with trees and the desire to record them too using the same standardized classification as DEFECTS1.</p> <p>To make a total count of all Defects, DEFECTS1 and DEFECTS2 fields must be added together.</p>
<p>MTNCTASK1 - (Maintenance task 1): describes the highest priority task to perform on the tree. From June to mid-August, Red Lodge inventory was limited to 1 task and later requested addition of a 2nd task of the same values due to finding a number of trees with multiple tasks required (as high priority). The full list of tasks available during 2017 collection:</p> <ol style="list-style-type: none"> 1 None 2 Stake small tree; Stake/Train (pre-2013) 3 Crown cleaning 4 Crown raising 5 Crown reduction or thinning 6 Remove 7 Treat pest/disease

<p>8 Monitor</p> <p>9 Water</p> <p>10 Train small tree</p> <p>_____ 3 below added to RL collection schema _____</p> <p>11 Adjust tree cage</p> <p>12 Protect from animal/equipment damage</p> <p>13 Remove stakes, tree cage or trunk guard</p>
<p>MTNCTASK2 - (Maintenance task 2): describes the next highest priority task to perform on the tree. From June to mid-August, Red Lodge inventory was limited to 1 task and later requested addition of a 2nd task of the same values due to finding a number of trees with multiple tasks required (as high priority).</p> <p>The full list of tasks available during 2017 collection is the same as MTNCTASK1 above. The team did not revisit earliest inventoried sites to include task 2 though 2nd tasks recorded in NOTES were later updated to this field during QA/QC of data content.</p> <p>To make a total count of all Maintenance Tasks, MTNCTASK1 and MTNCTASK2 fields must be added together.</p>
<p>CITYMANAGE - distinguishes trees owned by the City (Yes) and those privately planted and managed (No).</p> <p>Yes – City owned or managed and City is responsible for maintenance</p> <p>No – privately owned and property owner/tenant is responsible for maintenance</p>
<p>INSECTDIS - (Insect and Disease stress): General categories for common insect and disease agents, the agent was not necessarily found, but symptoms were present. Note: Used only in 2013+ inventories.</p> <p>1 = Bark beetles – infest the phloem of the tree</p> <p>2 = Wood boring insect – bore into the wood of the tree, past the phloem</p> <p>3 = Cone/tip insects – those which infest the cones or growing tips of branches</p> <p>4 = Galls – growth created by insect or disease on leaves or twigs</p> <p>5 = Scale or sapsucking insects – scales or any other sapsucking insect including aphids</p> <p>6 = Defoliators – any insect which eats leaves or needles</p> <p>7 = Witches broom – deformity in branch growth where a dense mat of shoots grows from a single point</p> <p>8 = Conks – a persistent woody fruit of a fungus growing on the wood of a tree</p> <p>9 = Mushrooms on ground – mushrooms growing on the ground within the dripline of a tree, could indicate underground wood decay</p> <p>10 = Slime flux - a bacterial disease of certain trees, primarily elm, cottonwood and boxelder, in which moisture oozes from a wound in the wood</p>
<p>LANDUSE - describes the type of area where the tree is growing, or the land use of the property adjacent to the right of way (i.e. City owned planting strip around church property)</p> <p>The default values for the 2013 and later inventories are as follows:</p> <p>1 = Single-family residential</p> <p>2 = Multi-family residential (duplex, apartments, condos)</p> <p>3 = Small commercial (minimart, retail boutiques, etc.)</p> <p>4 = Industrial/large commercial</p> <p>5 = Park (Greenbelts, park, cemetery)</p> <p>6 = Vacant</p> <p>7 = Other (agricultural, riparian areas, etc.)</p> <p>8 = Church</p> <p>9 = School</p>
<p>SWDAMG – Sidewalk condition adjacent to site</p> <p>0= 0 - Sidewalk has not been disturbed by the tree</p> <p>1= 0- ¾" - Sidewalk is uplifted up to ¾"</p> <p>2 = ¾" to 1 ½" - Sidewalk is uplifted between ¾" to 1 ½"</p> <p>3 > 1 ½ - Sidewalk is uplifted greater than 1 ½ inches</p> <p>4? Greater 3" uplift, crack or split. In some cases, covered by soil or sediment</p>

<p>Site Type - describes the growing space of the tree:</p> <ol style="list-style-type: none"> 1. Front Yard 2. Planting Strip 3. Cutout 4. Median 5. Other maintained 6. Other unmaintained 7. Inside fence
<p>WIRECONFLI: A numeric code to describe utility lines that interfere with or are present above a tree. The default values are as follows:</p> <ol style="list-style-type: none"> 1 = No lines – No utility lines within vicinity of tree crown. 2 = Present and no potential conflict – Utility lines occur within vicinity of tree crown, but crown do not presently intersect wires, and are not expected to conflict within the next five years. 3 = Present and potential conflict – Utility lines occur and are expected to intersect with tree crown within the next five years. 4 = Present and conflicting – Utility lines occur and intersect with tree crown.
<p>SURVEYORID – name of surveyor collecting field data. Red Lodge adopted numeric ids for each the surveyors of the 2017 Tree Inventory:</p> <ol style="list-style-type: none"> 1 = Jennifer Lyman 2 = Tom Lyman 3 = Theresa Whistler
<p>DATE – the Inventory record creation date (entered by surveyor, not automated by collection device)</p>
<p>NOTES - Any additional information about an individual tree; RL 2017 inventory commonly includes:</p> <ul style="list-style-type: none"> • Multiple DBH values (one per stem), • Canopy width (in feet), • % Deadwood, • Any defects not listed in Defects1 or Defects2 or • Additional tasks to MTNCTask1 or MTNCTask2, and • General comments (i.e. growing in middle of sidewalk, tent worms, improper tree for curbside of Hwy, etc.)
<p>SOURCE – how the planting was made possible. Includes 6 attributes:</p> <ul style="list-style-type: none"> • Cost-share tree • Property/business owner • Arbor Day tree • Grant (such as NWE Grant) • Other (and source recorded in NOTES field)

The City selected and contracted Jennifer Lyman, with a Ph.D. in Botany and Plant Science, to lead the inventory effort. Dr. Lyman was a professor of Botany and Environmental Science at Rocky Mountain College in Billings (1994 – 2014) and she had recently conducted a similar tree inventory for Rocky Mountain College in partnership with the Billings Urban Forest Director, Fred Bicha and Arborist Mike Garvey, Billings, MT. Following the inventory, Dr. Lyman created the Management Plan for Rocky Mountain College’s campus trees.

Parks Board Tree Committee members, the inventory lead, City Planner, and Carbon County GIS Manager met with MTDNRC personnel to discuss the survey format, goals, and timelines. Once collection details were settled and the survey team of three outfitted (Jennifer Lyman, Theresa Whistler, Tom Lyman), the tree inventory began.

City tree data collection was conducted mid-June 2017 to mid-October 2017. Data for individual trees is stored within the Carbon County GIS, and made available to the City of Red Lodge for updates and analysis. Once all



Figure 7 - Surveyors Jennifer and Tom Lyman

field data collection ended, the raw data were “scrubbed” and edited for quality assurance and quality of content (QA/QC) using Carbon County’s ArcGIS licenses to access the MapView interface.

Due to the DNRC data schema provided for collection and the City’s requested changes to the schema in August, some of the data from the “Notes” field was migrated to other fields (“Mntctask2” and “Defects2”) during post processing. Surveyors collected multiple DBH measurements, canopy cover, and deadwood percentages within the notes field and parsed them into a query-able format. Final analyses of 2017 data were used to generate comparable statistics and UFMP updates herein.

Inventory Summary

A total of 1426 locations were surveyed including trees, stumps and planting sites consistent with 2008 inventory and DNRC expectations for the 2017 inventory (Table 3). The new data schema enables Red Lodge to identify and monitor progress of program trees within the City: Arbor Day, cost-share or other trees planted with grant fund assistance.

Table 3 - 2017 Red Lodge Tree Inventory Counts

Total Locations Surveyed	1426
Trees	1233
Stumps	102
Planting Sites	91
Total Red Lodge Program Trees Included	135
Arbor Day Trees	14
Cost Share Trees	99
Other Grant Trees	22

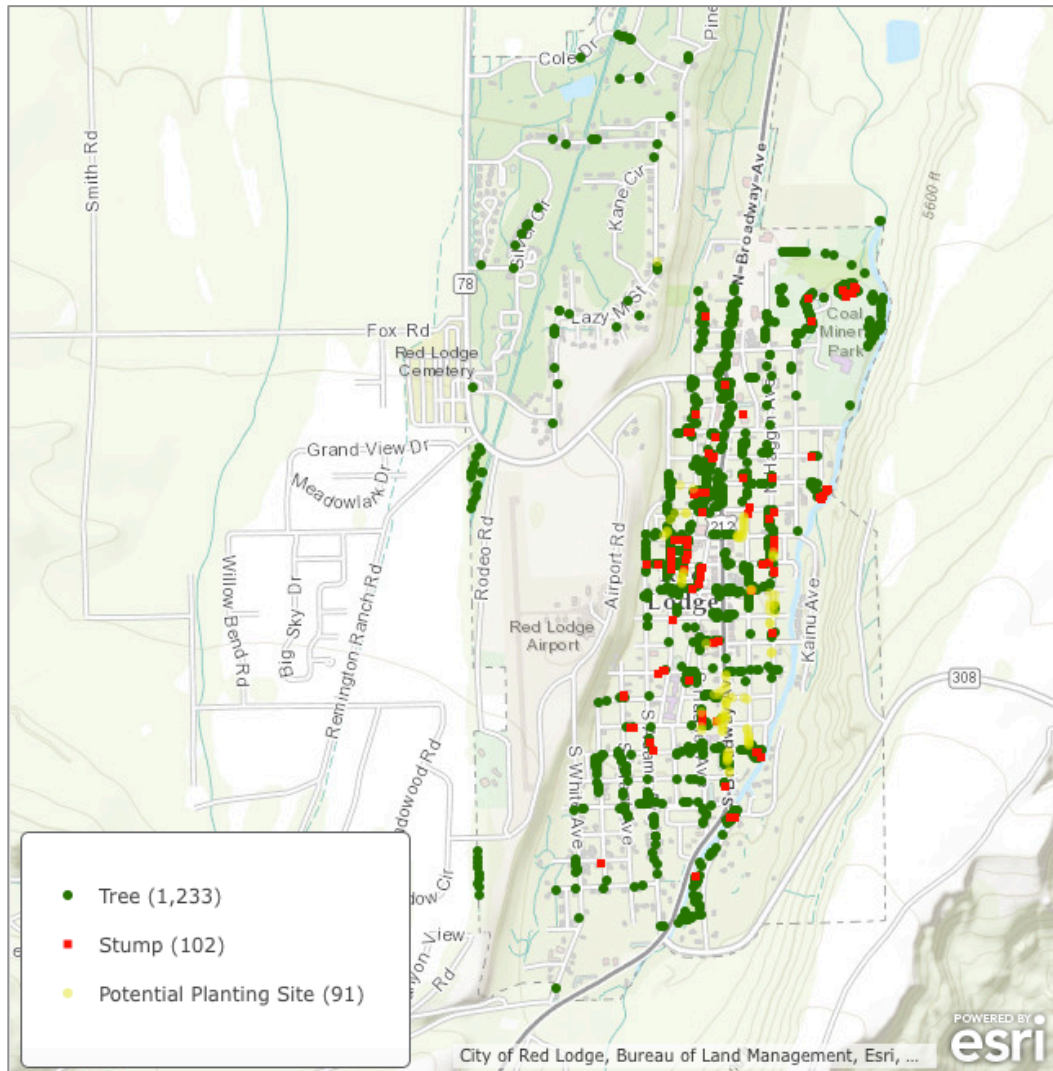


Figure 8 - MAP: Extent, location and count of sites surveyed 2017

The following discussion summarizes the 2017 Inventory results in six sections: 1) species composition and diversity; 2) diameter/height; 3) condition; 4) maintenance requirements; 5) planting opportunities; and 6) recommendations derived from the survey data for optimizing the urban tree program in Red Lodge.

Species composition and diversity

The 2017 tree inventory identified 58 different taxa of public trees. Taxa includes not only species but in some cases, horticultural varieties of species such as “Green Mountain” maple, “Sienna Glenn” maple and other hybrid trees. The most common tree species in the City are black poplar (*Populus trichocarpa*), quaking aspen (*Populus tremuloides*), green ash (*Fraxinus pennsylvanica*), mountain ash (*Sorbus spp.*), Colorado blue spruce (*Picea pungens*), and Engelmann spruce (*Picea engelmannii*). Black poplar, aspen, the American mountain ash type of the mountain ash complex, and Engelmann spruce are native to this landscape. Green ash is native to Montana but does not naturally occur in the Red Lodge area.

Most abundant public tree types in Red Lodge 2017

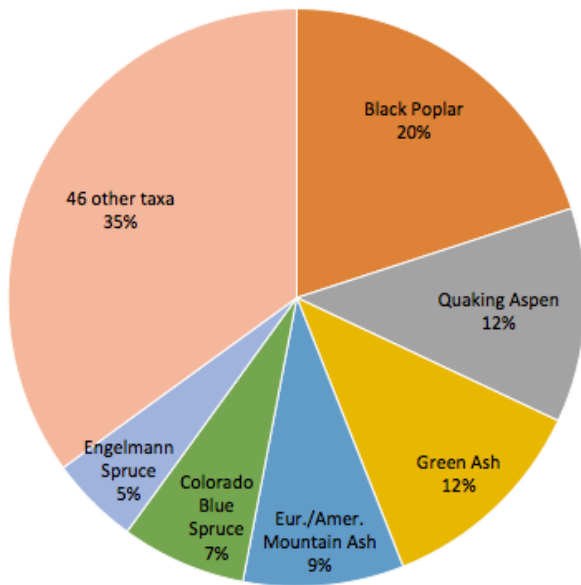


Table 4 - Statistics for tree DBH, height and canopy

	DBH	HEIGHT	CANOPY
Min	0.1	0	0
Max	66	70	60
Mean	8.85	24.57	15
Mode	1	25	20
STDV	8.43	13.59	9.54

Figure 9 - Tree species composition of Red Lodge public trees

A comparison to the 5 most common species reported in the 2009 UFMP to findings in 2017 show the same 5 species dominate the City forest landscape, but the percentages and orders differ (*Figure 10*). Much of this could be attributed to exclusion of private trees in the 2017 inventory. Many blue spruce trees are located on private properties and not within planting strips or rights-of-way. The percentage of poplars is likely impacted due to the “sampling” method utilized in densely forested parks along Rock Creek or other drainages (and not capturing every single tree).

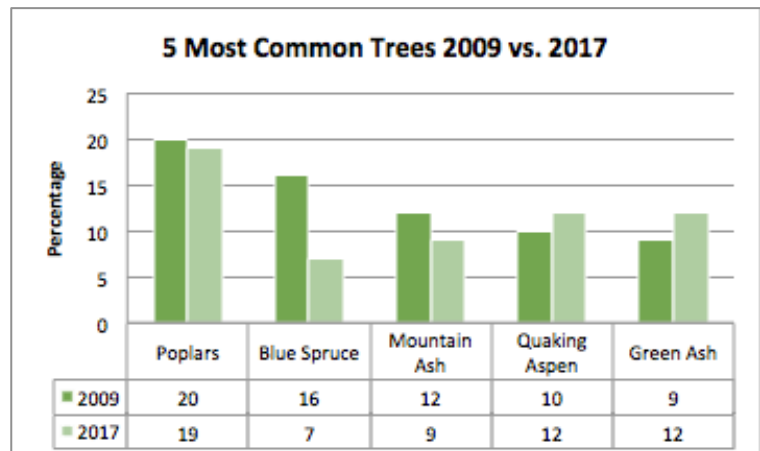


Figure 10 - 5 most common public trees in Red Lodge, 2009 vs. 2017

Table 5 - Tree species surveyed during 2017 Red Lodge Tree Inventory

No	Common Tree Name	Species/Cultivar	Count	Percent
1	Ash, Mountain	<i>Sorbus spp.</i>	25	2.03%
2	Ash, American Mountain	<i>Sorbus Americana (11-17 leaflets)</i>	59	4.79%
3	Ash, European	<i>Sorbus aucuparia (9-15 leaflets)</i>	30	2.43%
4	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>	13	1.05%
5	Ash, Green	<i>Fraxinus pennsylvanica</i>	141	11.44%
6	Ash, 'Patmore' Green	<i>Fraxinus pennsylvanica 'Patmore'</i>	3	0.24%
7	Ash, White	<i>Fraxinus americana</i>	1	0.08%
8	Aspen, Quaking	<i>Populus tremuloides</i>	149	12.08%
9	Birch, Dakota Pinnacle	<i>Betula platyphylla 'Fargo'</i>	2	0.16%
10	Buckeye, Ohio	<i>Aesculus glabra</i>	1	0.08%
11	Unidentified Tree	<i>Prunus spp.</i>	1	0.08%
12	Chokecherry	<i>Prunus virginiana</i>	23	1.87%
13	Chokecherry, Common or Canada Red Cherry	<i>Prunus virginiana 'shubert'</i>	47	3.81%
14	Cherry, European Bird	<i>Prunus padus</i>	3	0.24%
15	Crabapple	<i>Malus spp.</i>	13	1.05%
16	Cottonwood, Lanceleaf	<i>Populus x acuminata</i>	2	0.16%
17	Unidentified tree	<i>Populus species</i>	2	0.16%
18	Black poplar (cottonwood)	<i>Populus balsanifera spp. trichocarpa</i>	237	19.22%
19	Cottonwood, Narrowleaf	<i>Populus angustifolia</i>	1	0.08%
20	Elm, American	<i>Ulmus Americana</i>	3	0.24%
21	Elm, Accolade	<i>Ulmus 'Morton' Accolade</i>	3	0.24%
22	Fir, Douglas	<i>Pseudotsuga menziesil</i>	4	0.32%
23	Hackberry, Northern	<i>Celtis occidentalis</i>	18	1.46%
24	Hawthorn	<i>Crataegus spp.</i>	8	0.65%
25	Hawthorn, Crimson Cloud	<i>Crategus Crimson Cloud</i>	5	0.41%
26	Honeylocust	<i>Gleditsia triacanthos</i>	13	1.05%
27	Honeylocust, Northern Acclaim	<i>Gleditsia triacanthos 'Northern Acclaim'</i>	5	0.41%
28	Honeylocust, 'Skyline'	<i>Gleditsia triacanthos 'Skycole'</i>	6	0.49%
29	Japanese Lilac Tree, 'Ivory Silk'	<i>Syringa reticulata 'Ivory Silk'</i>	20	1.62%
30	Juniper	<i>Juniperus spp.</i>	10	0.81%
31	Juniper, Rocky Mountain	<i>Juniperus scopulorum</i>	9	0.73%
32	Larch	<i>Larix spp.</i>	12	0.97%
33	Linden	<i>Tilia spp.</i>	10	0.81%
34	Linden, Greenspire	<i>Tilia cordata</i>	7	0.57%
35	Linden, 'Harvest Gold'	<i>Tilia mongolica 'Harvest gold'</i>	23	1.87%
36	Maple	<i>Acer spp.</i>	7	0.57%
37	Maple, Amur	<i>Acer ginnala</i>	13	1.05%
38	Maple, Boxelder	<i>Acer negundo</i>	25	2.03%
39	Maple, Norway	<i>Acer platanoides</i>	5	0.41%

40	Maple, Regal Petticoat (Sycamore Maple)	<i>Acer Pseudoplatanus</i>	3	0.24%
41	Maple, Red	<i>Acer rubrum</i>	2	0.16%
42	Maple, Silver	<i>Acer saccharinum</i>	8	0.65%
43	Maple, Sugar	<i>Acer saccharum</i>	3	0.24%
44	Maple, 'Green Mountain'	<i>Acer saccharum 'Green Mountain'</i>	6	0.49%
45	Maple, Tatar	<i>Acer tataricum</i>	25	2.03%
46	Maple, 'Sienna Glenn' Freeman	<i>Acer x freeman 'Sienna'</i>	7	0.57%
47	Oak, unidentified	<i>Quercus spp.</i>	1	0.08%
48	Oak, Bur	<i>Quercus macrocarpa</i>	17	1.38%
49	Oak, Black	<i>Quercus velutina</i>	1	0.08%
50	Olive, Russian (stump only)	<i>Elaeagnus angustifolia</i>	1	0.00%
51	Pine, Lodgepole	<i>Pinus contorta</i>	1	0.08%
52	Pine, Austrian (Black pine)	<i>Pinus nigra</i>	1	0.08%
53	Pine, Ponderosa	<i>Pinus ponderosa</i>	21	1.70%
54	Pine, Scotch	<i>Pinus sylvestris</i>	20	1.62%
55	Spruce, Blue	<i>Picea pungens</i>	91	7.38%
56	Spruce, Engelmann	<i>Picea engelmanni</i>	60	4.87%
57	Spruce, White	<i>Picea glauca</i>	4	0.32%
58	Willow, Peachleaf	<i>Salix amygdaloides</i>	3	0.24%

Poplars (20%) in Red Lodge, a mix of black, plains and narrow leaf cottonwoods, remain concentrated along the banks of Rock Creek including Rotary, Coal Miners, Finn and Creekside Parks. They're also prevalent along the intermittent creeks and drainages at Double Ditch and Van Dyke Parks on the west bench. Mature and aging cottonwood trees dominate Beartooth Lane and the trail just beyond the northern perimeter of the Wildlife Sanctuary (Figure 11).

The City manages Eighty-one percent of Poplars in Red Lodge. Most of these trees are very large with measured heights from 8 to 70 feet and an average of 37 feet. The presence of wood boring insects is commonly found among 40% of them, but 70% of them had some measure of dieback high up in their canopies. Overall, condition of wood in these trees is in the good to fair range (88%) with condition of leaves 97% good to fair.

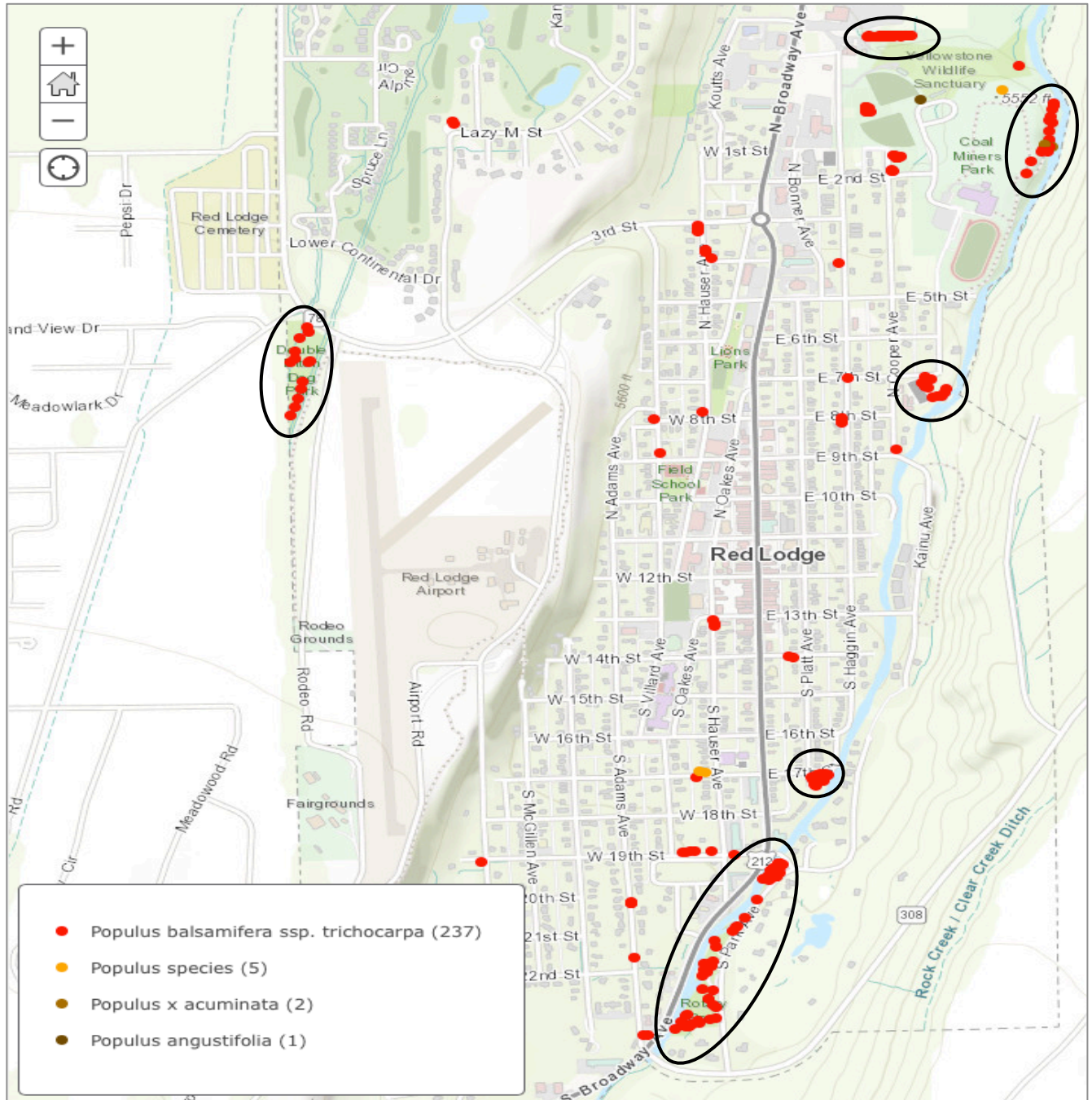


Figure 11 - MAP: Distribution and concentrations of cottonwoods in Red Lodge

Quaking aspen trees (12%) occur throughout managed and natural areas in the City. Some concentrations are found at Lions Park (13) and in 2 stands west of the ball fields at Coal Miners Park. Individual aspen trees pepper residential properties or are intermingled with poplars at Van Dyke and Creekside Parks. A number of quaking aspens are riddled with cankers and many developed leaf spot late in the summer and into the fall. There are 2 problematic stands within Coal Miners Park that exhibit spreading and extensive disease.

The inventory included 151 quaking aspen with varying condition of health due to the number of cankers and leaf spot observed. The aspen location map represents 24 with wood in poor or dead and dying condition (*Figure 12*). Surveyors recorded 108 instances of trunk damage, 58 instances of dieback and 13 instances of topping as defects. Defoliators were found evident 58 times. As a result, 18 aspen are recommended for removal and 16 for treatment. Monitoring is recommended for 41 of them.

Of the quaking aspen sampled for the inventory, the average height is 23' with 119 of them greater than 15 to 49 feet tall. Twenty-eight of the quaking aspen are younger, ranging from 6 to 15 feet tall.

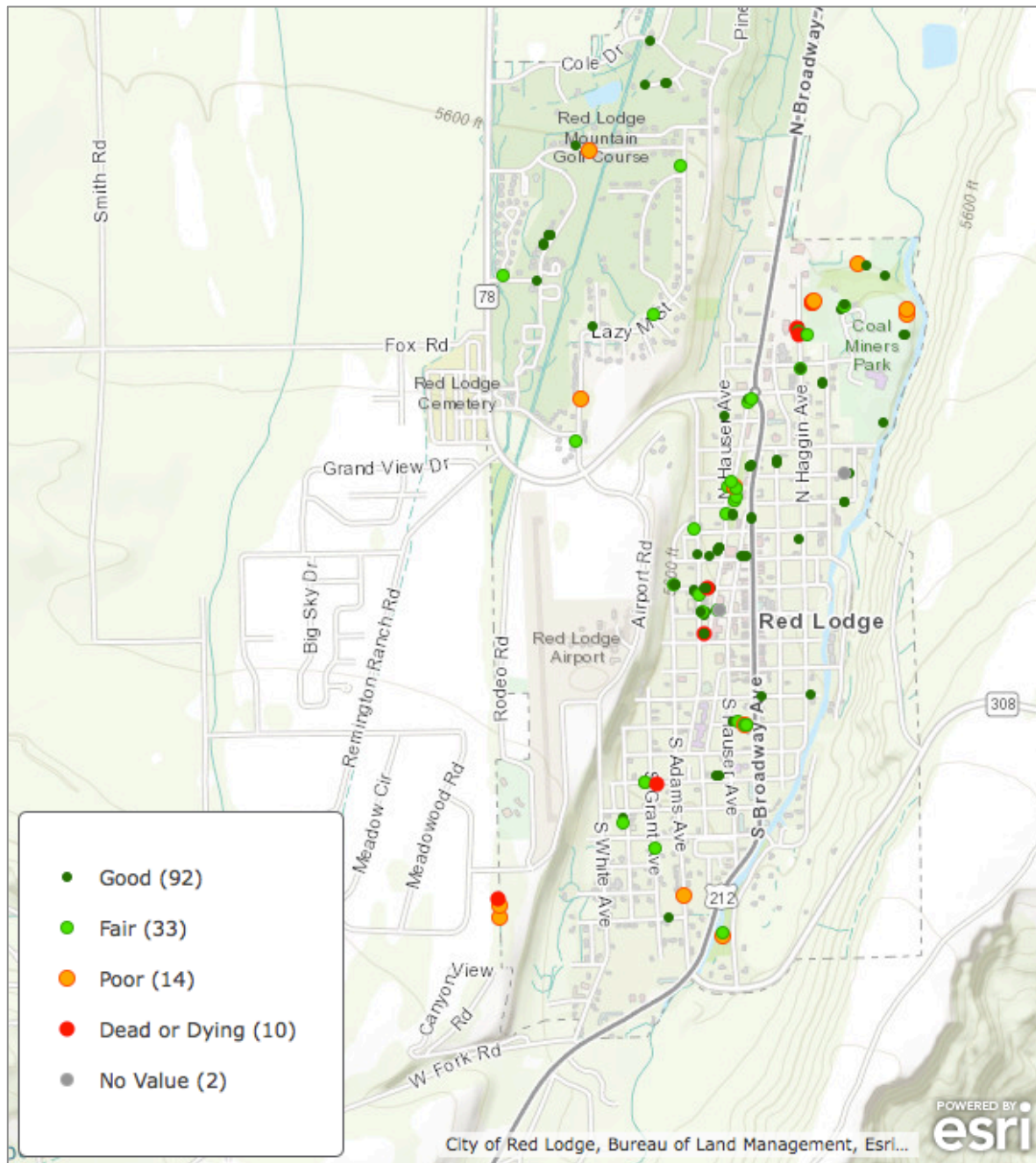


Figure 12 - Quaking aspen locations and condition of wood

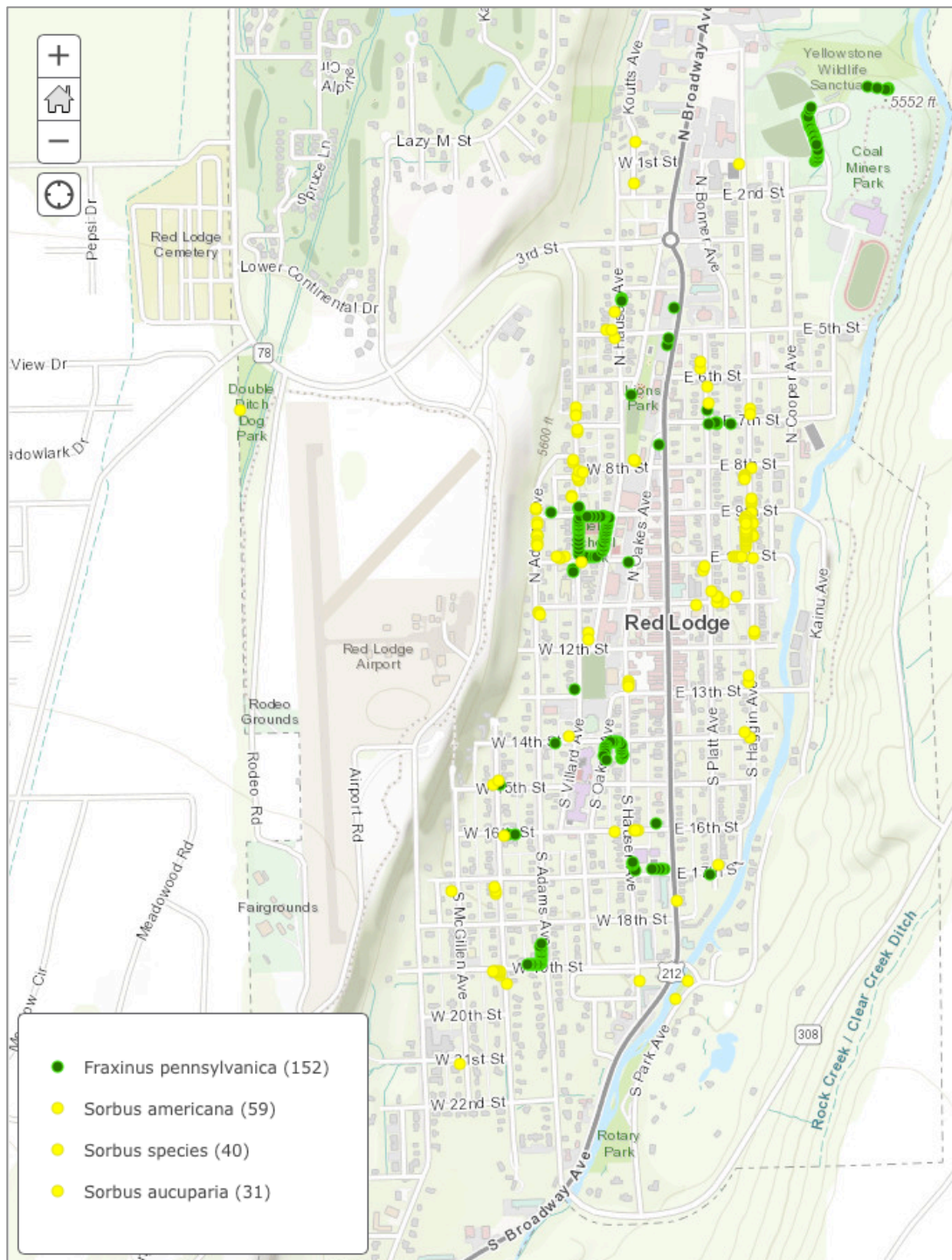


Figure 13 - MAP: Distribution of green ash and mountain ash trees in Red Lodge

Green ash trees (12%) are planted in rows surrounding Field School park, the City swimming pool, Messiah Lutheran Church, Old Roosevelt School and the west side of the parking area at Coal Miners park (Figure 13). Many of the green ash trees at these locations are mature and in conflict with power lines or they may become impactful in the next couple years. Six of the green ash trees under power lines at Field School Park were removed during the summer of 2017 to mitigate potential damage.

Mountain ash trees (9%) are commonly grown in Red Lodge for both their ornamental and habitat value. Residents enjoy the draw of birds and other wildlife that feed off the berries in late Fall into early winter. Heavy concentrations are found along Haggin Avenue especially between 8th and 10th streets (Figure 13). A majority of the mountain ash in Red Lodge is in decline due to diseases contributing to dieback.

Together Blue Spruce (7%) and Engelmann spruce (5%) comprise 12% of Red Lodge public trees. This is the largest set of evergreen trees apart from the City's deciduous trees. The properties and character of these spruce trees add balance to the City's forest. Just over half (45) of the 87 public blue spruce trees are found in City parks or visitor locales: 20 in Lions, 13 in Coal Miners, 9 on the Chamber of Commerce grounds, 5 in Field School and 3 at the City Pool. Forty-two are sprinkled throughout the City in residential front yards or planting strips. Only 3 of those found along sidewalks have caused sidewalk damage. Of the blue spruce trees surveyed, only 13 have a DBH equal to or less than 4 inches. Most blue spruce range from 15 to 55 feet tall and the average height is 28.4 feet (see Figure 14).

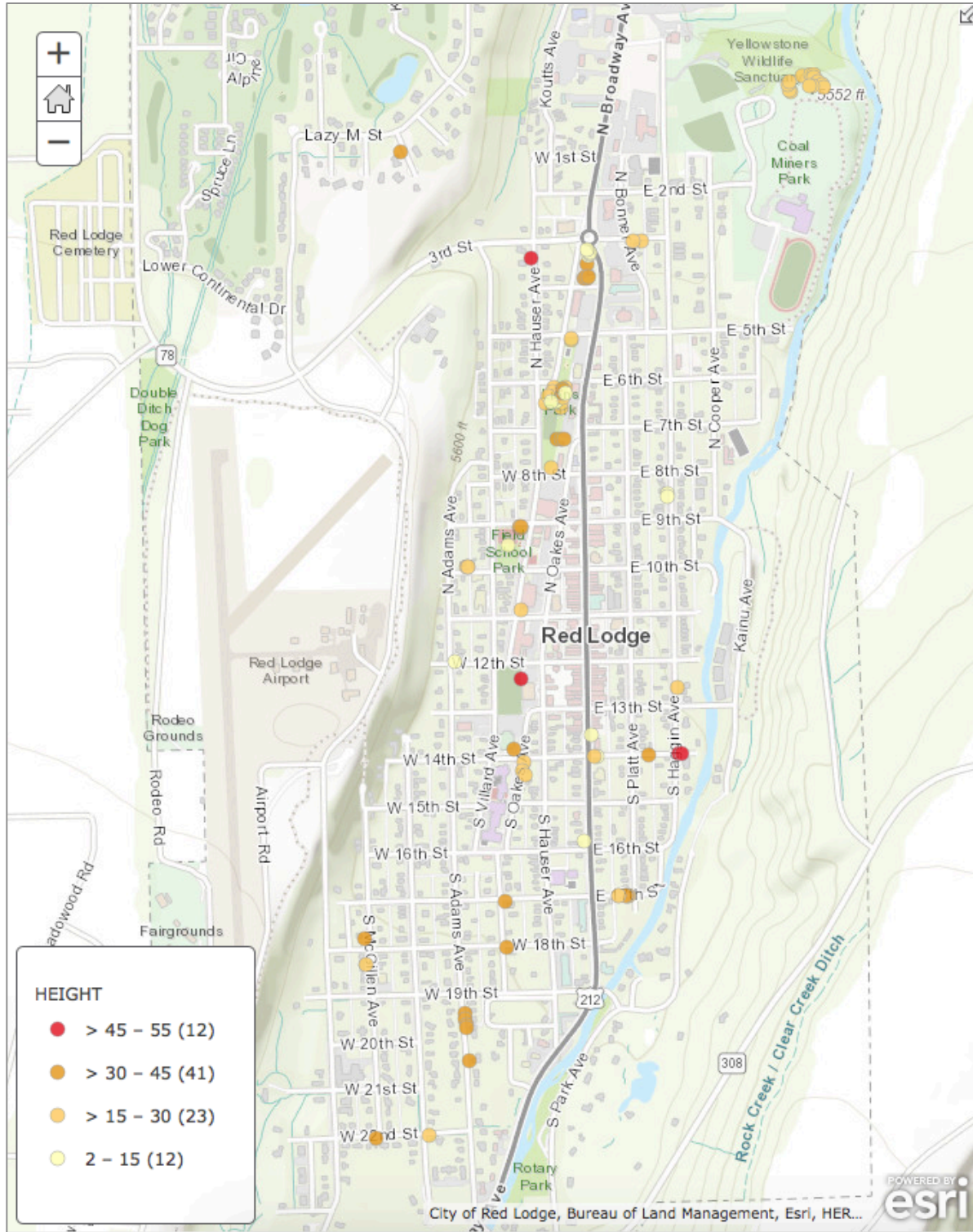


Figure 14 - MAP: Blue spruce public tree locations by height

Most Engelmann spruce (50) are found in front yards and rights-of-way at single resident properties and not in any great number within the parks (Figure 15). There are only 4 at Lions Park and 3 at Coal Miners Park. The greatest of Engelmann spruce trees with their extensive and pronounced roots have caused sidewalk damage (cracking and lifting) in 30 locations. Only 3 of the Engelmann spruce have a DBH less than 4 inches. The average height of these public trees is 36 feet.

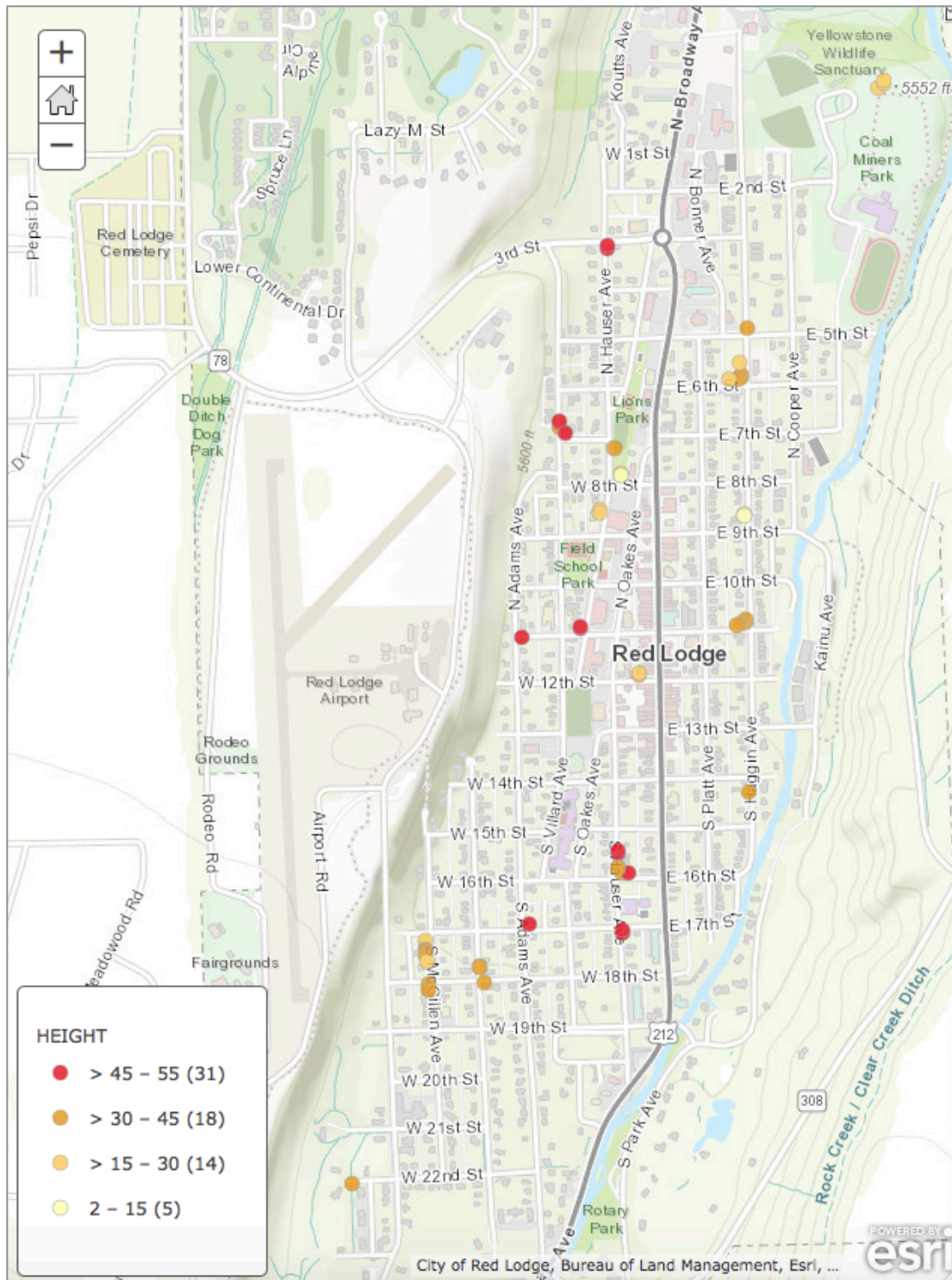


Figure 15 - MAP: Engelmann spruce public tree locations by height

Tree species diversity is low among larger, mature trees on public lands. Lions Park exemplifies a greater diversity of trees among City-managed lands including a greater number of pine, fir and spruce lending to a greener space and habitat year-round. Coal Miners Park has a variety of trees but a higher percentage of poplar and aspen remain

dominant among natural stands and stretches along Rock Creek. Green ashes populate the west side of the parking area.

Other City parks remain generally “naturalized” without introduction of additional tree species other than those that have occurred happenstance and remained undisturbed (see Table 6).

Table 6 - Diversity of trees species among City Parks

Park	Number of Tree species	Dominant Tree Species (Top 3)
Lions	14	Blue Spruce (19), Quaking Aspen (13), Scotch Pine (11)
Coal Miners	13	Black Poplar (92%), Quaking Aspen (6%), Green Ash (2%)
Field School	7	Green Ash (39), Blue Spruce (5), Maple (2)
Rotary	2	Black Poplar (99%), Mountain Ash (1%)
Finn	2	Black Poplar (14), Chokecherry (2)
Pride	3	Honeylocust (3), Engelmann Spruce (2), Ponderosa pine (1)
Skate	0	None
Double Ditch	2	Black Poplar (99%), Mountain Ash (1%)
City Pool	3	Green Ash (19), Blue Spruce (3)
Creekside	2	Black Poplar (90%), Quaking Aspen (10%)
Van Dyke	2	Black Poplar (85%), Quaking Aspen (15%)

Diameter / Height

Surveyors used a simple measuring stick to measure the diameter at breast height (DBH) of the trees. If trees had multiple trunks, the number of trunks and the DBH of each were recorded in the Notes field. Surveyors recorded 308



Figure 16 - Peachleaf willow with largest DBH

multi-stem public trees. Multi-stem conditions suggest there was damage to the tree bud tip in its sapling stage. The largest tree diameter recorded is that of a peachleaf willow with DBH 66” (Figure 16). Ten trees have a DBH greater than 35”; all are black poplars except the one willow. The average DBH in the 2017 tree survey is 8”. As noted from the 2008 survey, “Tree age is sometimes inferred from tree size, especially DBH. However, the relationship varies with species, site quality, management history, and other factors. So, DBH is usually only a crude estimator of tree age”. Figure 17 shows the distribution of inventoried trees by DBH classes in 2017. As in 2008, the data show that a large proportion of trees have a DBH less than 15 inches, suggesting that Red Lodge trees are young.

Many older, mature cottonwoods along riparian areas whose DBH measurements are well above the average were not recorded. Figure 18 shows that the larger DBH (and probably older) trees occur on the northern and southern edges of the City while the trees in the City core are younger.

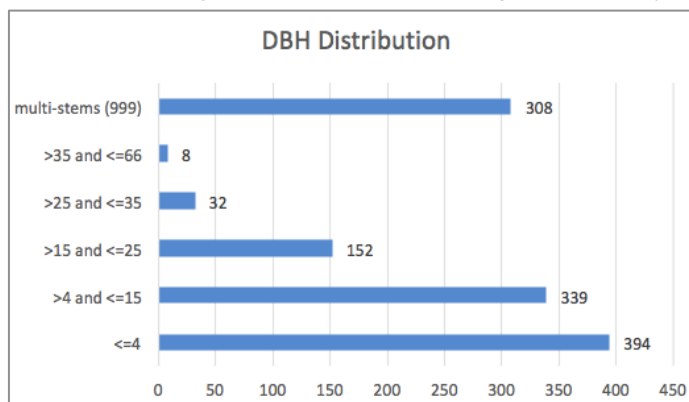


Figure 17 - Distribution of inventoried trees by DBH classes

As in 2008, tree height was visually estimated for the 2017 survey. Four black poplar trees were identified at a height of 70’ feet or more. Three of these tallest trees grow in Finn Park. Eleven trees measure between 60’ and less than 70’ including one Engelmann spruce, a silver maple, and nine black poplars. The average tree height is approximately 24.5 feet (Table 4).

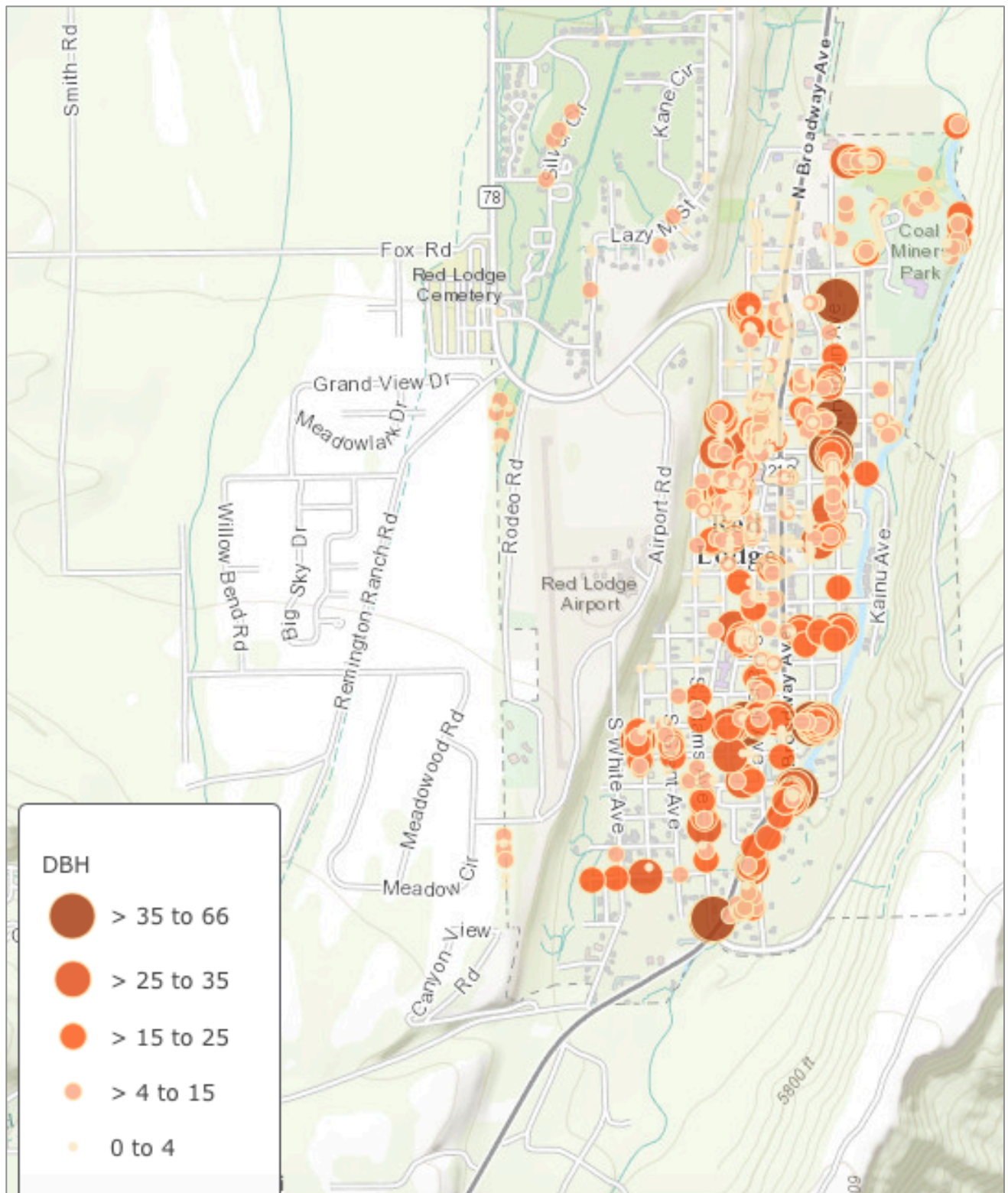


Figure 18 - MAP: DBH distribution and location (multi-stems not included)

Tree canopy

Tree canopy was measured using the same visual estimation method as height and noted for each tree. Recording actual canopy width may help identify potential problems of an individual tree (rather than calculating a tree's canopy assuming its DBH and height produce a close approximation). Using a standard potential canopy width at the time of planting helps to determine proper tree spacing and avoids interference with neighboring trees or blocking line-of-site on roadways. Actual canopy measurements may reveal problems caused by disease, mechanical or animal damage, or simply poor tree placement.



Figure 19 - Peachleaf willow with largest canopy in City survey

A peach-leaved willow has the widest canopy among trees included in the 2017 inventory (Figure 19). At 60 feet wide, it surpasses the black poplar that held the record of 55 feet in the 2008 survey. The average canopy for all 2017 inventoried trees is 15' (Table 4) whereas the average canopy of trees surveyed in 2008 was 13'. Forest-wide canopy cover percentage for the City was not estimated using inventory data.

Condition – leaves and wood

The condition of trees was subjectively measured in 2017 using the same four parameters as in 2008; 1) the condition of leaves, 2) the condition of wood, 3) percent deadwood and 4) presence of cavities and weak forks in the tree (& other defects). The condition of leaves and wood were classified using one of four categories: good, fair, poor and dead (see Table 2 for definitions).

Thirty-one trees were considered to have leaves that are “dead or dying”; 27 trees have leaves in “poor” condition; 108 trees have leaves in fair condition; 1066 trees have leaves in “good” condition.

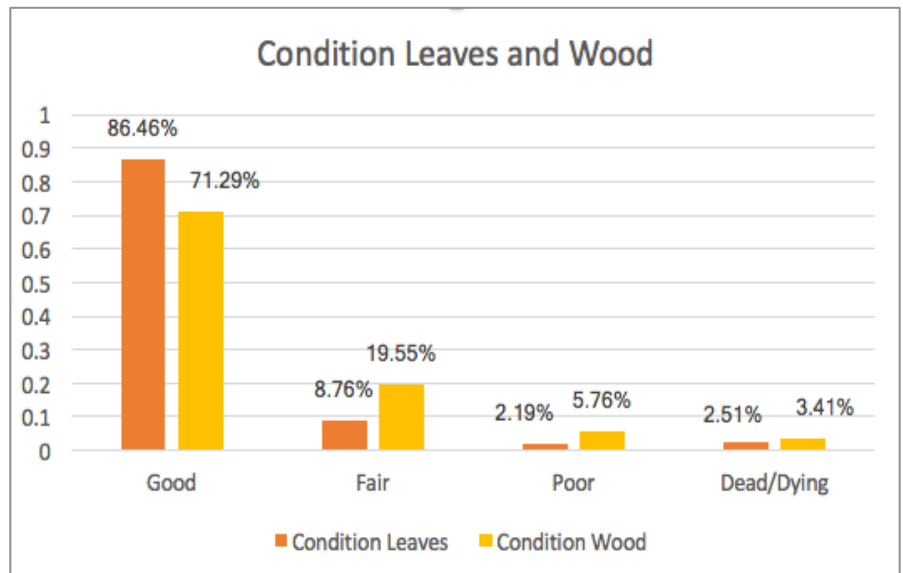


Figure 20 - Wood and leaf condition of inventoried trees

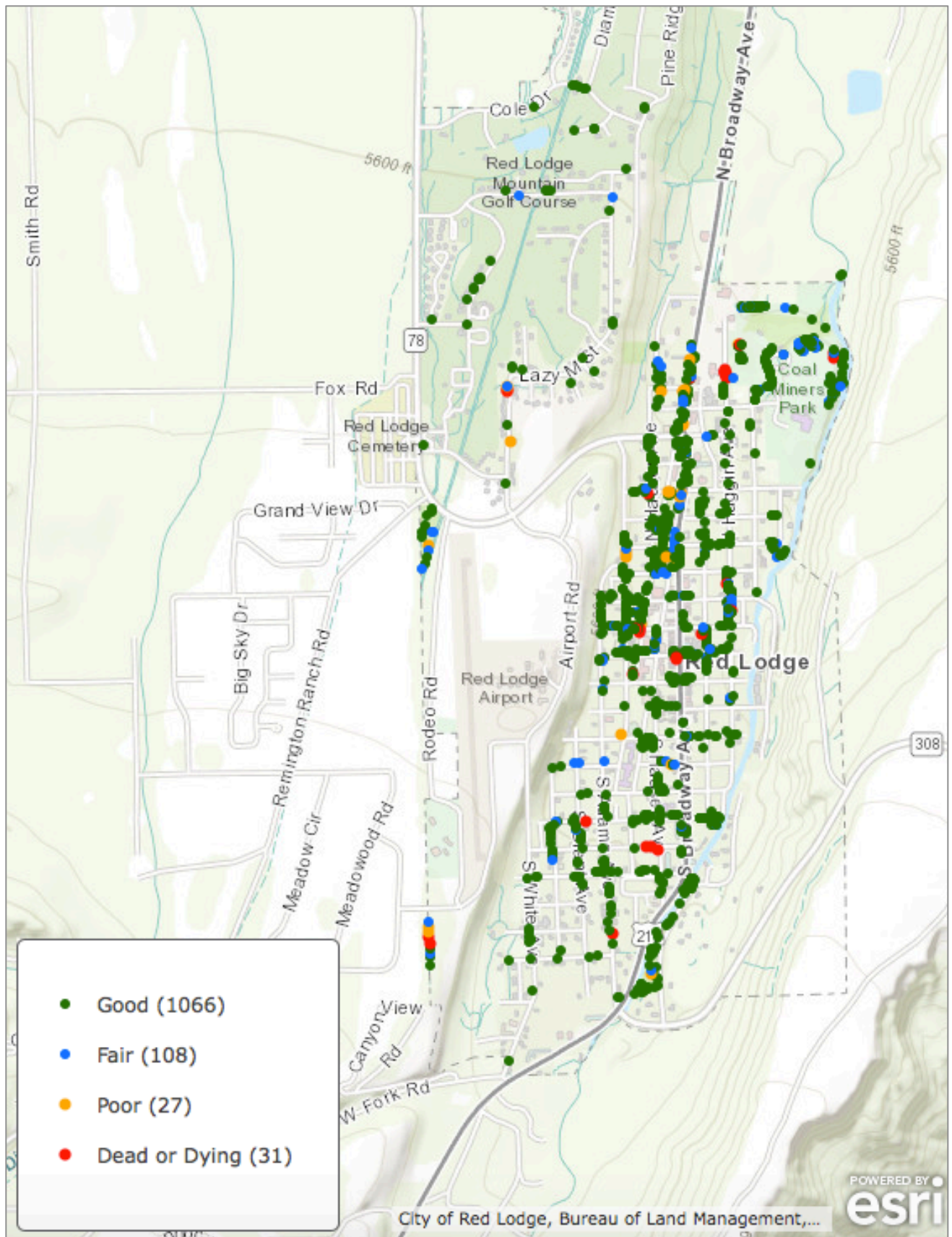


Figure 21 - MAP: Distribution of City trees by condition of leaves

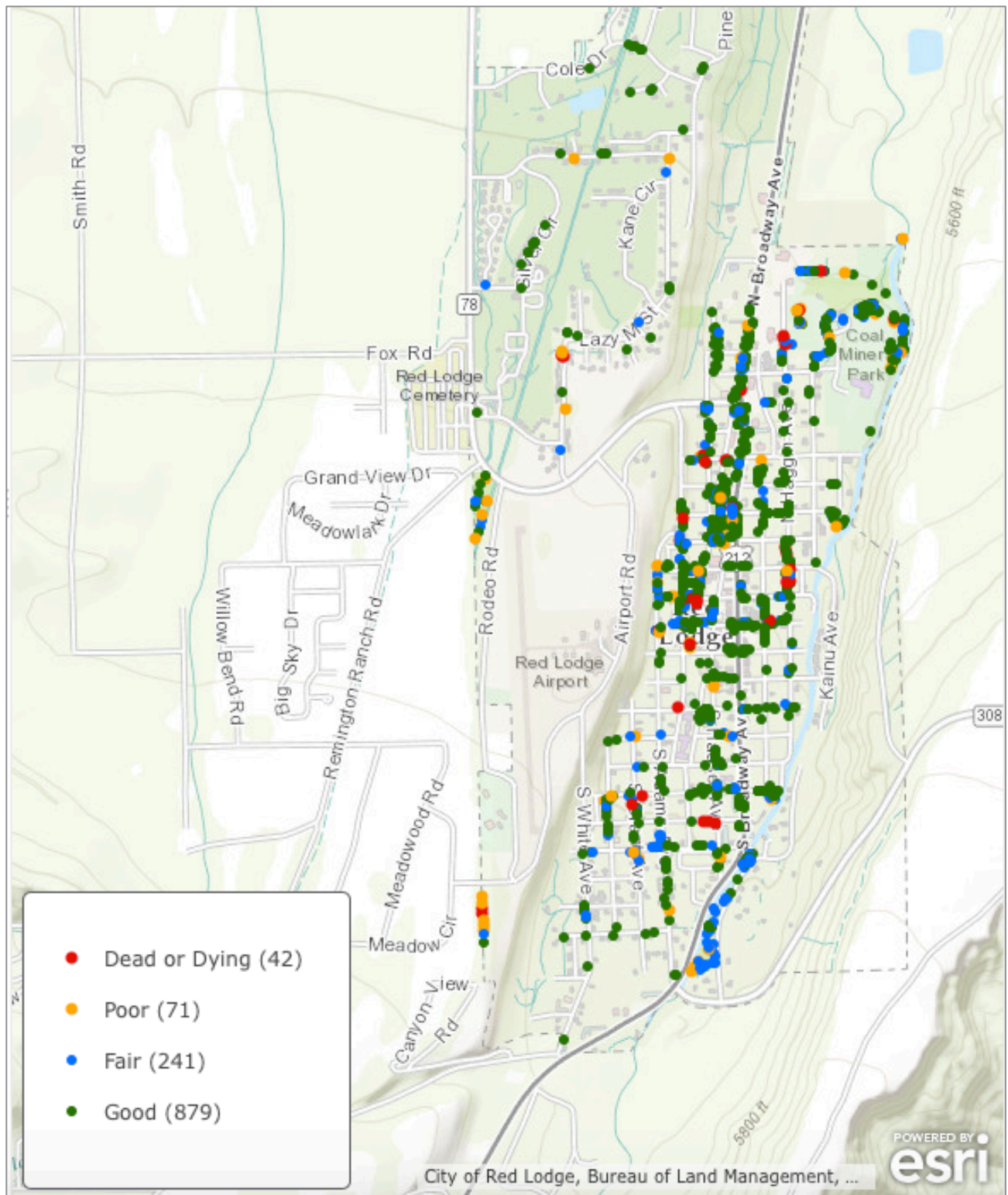


Figure 22 - MAP: Distribution of City trees by condition of wood

Of the 42 trees recorded to have dead or dying wood, 26 of them are smaller trees with dieback. Aspen (10 trees) and mountain ash (14 trees) account for more than half of the trees in this dead or dying wood category though there are a number of Japanese Lilac, Hackberry, Larch, Maple and Honeylocust among the smaller trees also in this category. Dieback of smaller, younger trees is assumed to be due to lack of sufficient water during summer. Seventy-one trees are considered in “poor” condition. The majority of the 71 trees with wood in poor condition comprise black poplar (20), mountain ash (17) and quaking aspen (14). Two hundred and forty one trees have wood

in “fair” condition. Black poplar is most highly represented in the “fair” group (70) with mountain ash (41), green ash (38) and quaking aspen (33) starting to exhibit dieback as they age.

In addition to condition of wood and leaves, tree defects were identified by selecting from a pull down list: chemical/salt damage; dieback; frost crack; girdling/exposed roots; included bark; lean >15%, multi-stem; trunk cavity; trunk scar/cat face; and topped. The defects category is represented twice on the survey so that two defects per tree may be included (defects numbering more than 2 were captured in the “Notes” field). Totals of defects1 and defects2 are added together for total defect counts and analysis of the 2017 data.

Condition - deadwood

Surveyors visually estimated the percent of deadwood per tree within the living tree crown. As noted in the 2008 survey, “Deadwood is an arboricultural term normally used to describe the presence of dead branches located within a living tree’s crown”. However, branches can die for a number of reasons. Many die as a natural process of becoming shaded out by other, higher, more efficient branches. Others may die due to root damage or possibly insects/disease where either the branch itself has been directly harmed or the branch is reacting to a root or trunk attack. Some die from wildlife grazing, wind or snow load. Despite the numerous possible causes deadwood is still used as a general indicator of tree health. Most deadwood branches will ultimately fail and could cause damage to property or injury.”



Figure 23 - Very common site of a mountain ash tree with dieback

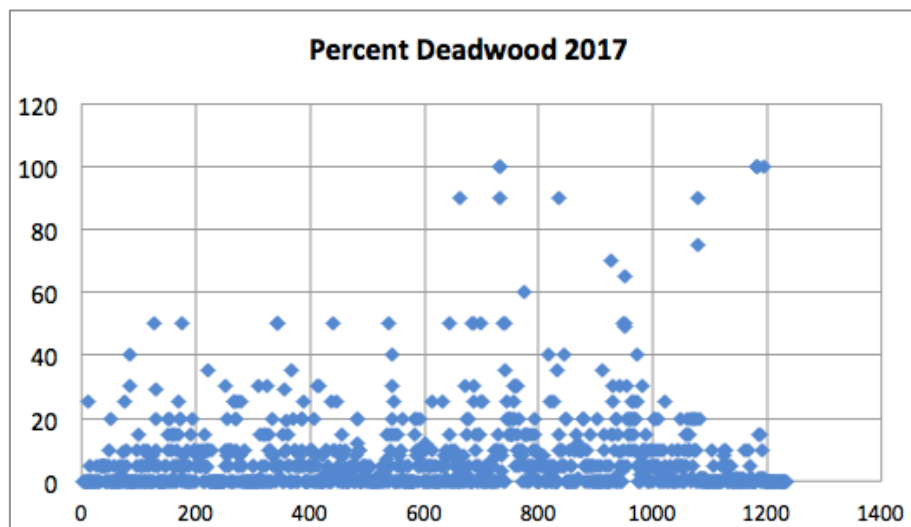
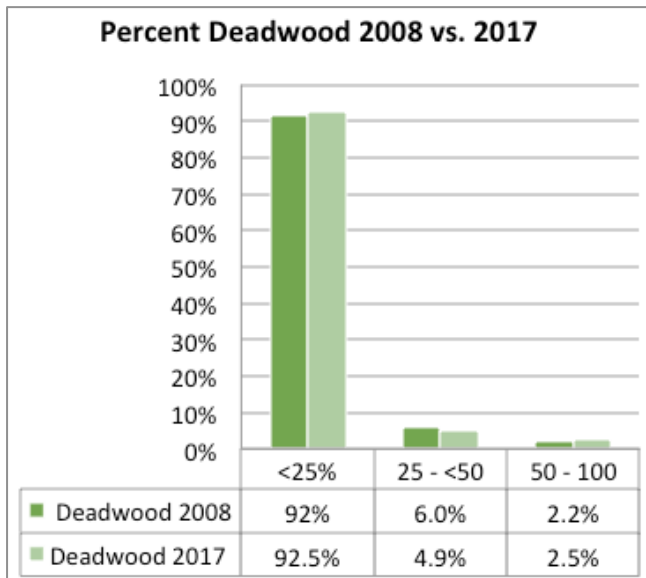


Figure 24 - Percent deadwood of inventoried trees

For the 2017 inventory, the estimated deadwood percentage was recorded as text in the NOTES field and was later parsed into a separate column for analysis. 2017 classification of deadwood is not standardized into four pre-defined classes as in 2008: <25%, 25- 50%, 50-75%, >75%. The results for 2017 are individually charted below on this scatter diagram (Figure 24). Thirty-one trees (2.5% of inventoried trees) have between 50 and 100% deadwood and are in in greatest need of pruning and/or possibly removal.



In comparison to 2008 findings, deadwood measures have not changed significantly (see Figure 25).

Figure 25 - Comparison of percent deadwood 2008 vs. 2017

Condition - Insects and disease

Fifty-three percent of the trees are recorded insect-free or at least symptoms were not visible during the inventory. The most common insect problem for City trees is activity by defoliators (24%), followed by the presence of wood-boring insects (15%) (see Figure 26).

Defoliation due to insects is found among most tree species in the City. It does not appear that insect infestation alone causes significant or sudden loss of leaves or needles or overall viability. However, by late summer spores causing leaf spot noticeably impacted foliage of quaking aspen and poplar trees (Figure 33). Several stands and individual trees free of leaf spot at the beginning of the summer were revisited later in the season and found infected (even those known to have been supplied an abundant, continuous amount of water through the summer). Stands of quaking aspen reported in 2008 to have the same leaf-spot issues and need of immediate attention have stood untreated or unmoved and are found again in need of immediate attention in 2017.

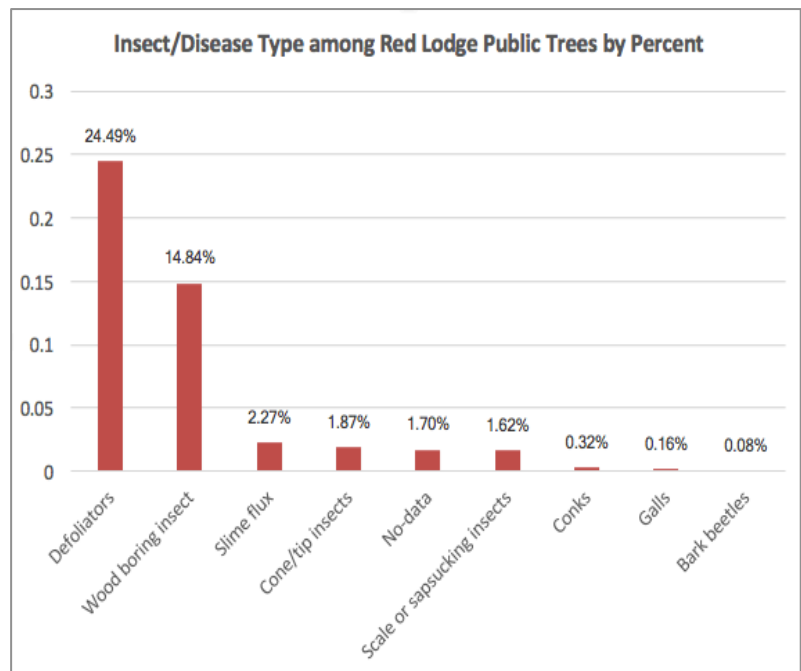


Figure 26 - Insects and diseases in public trees by percent

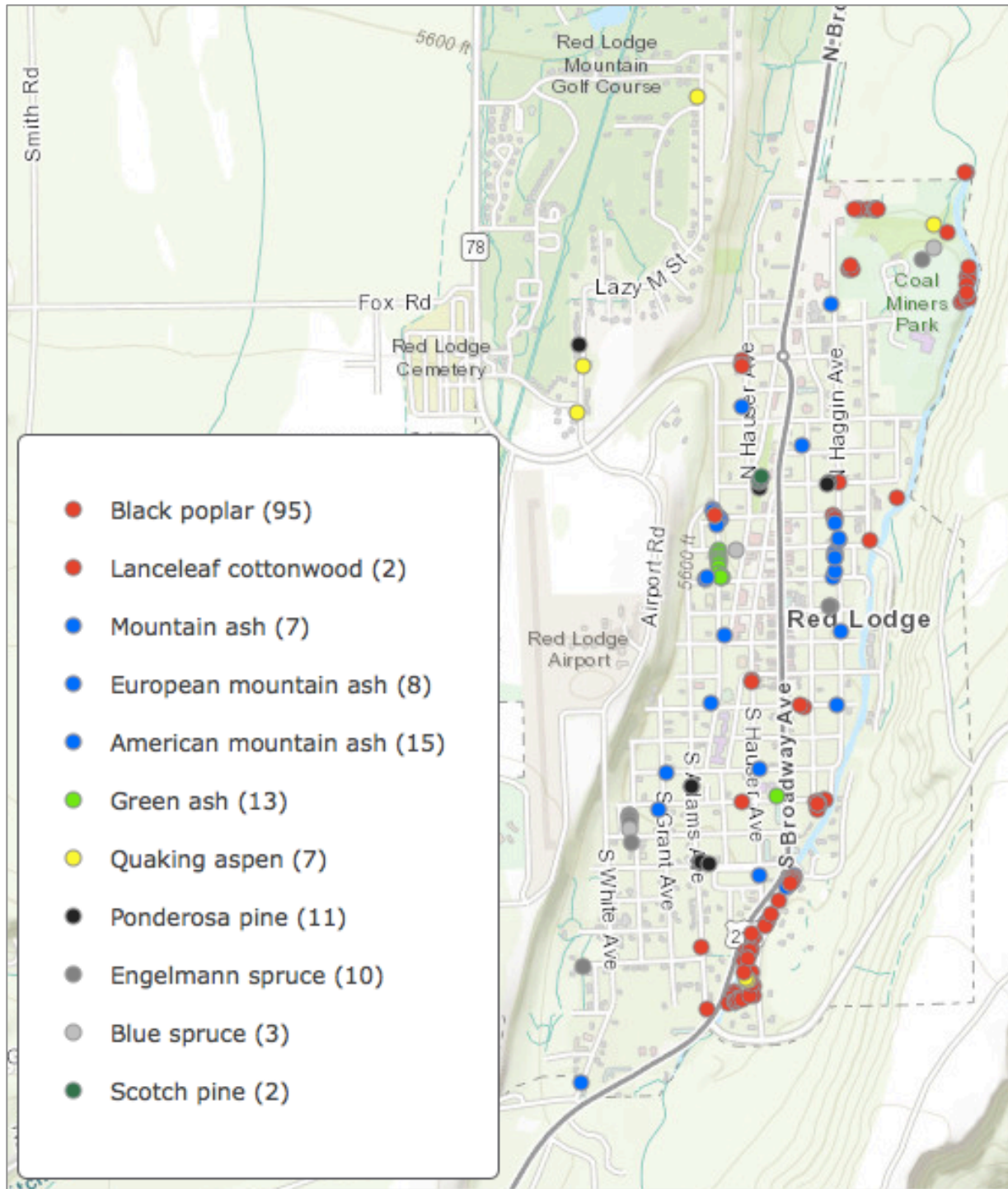


Figure 27 – MAP: Location of public trees with wood boring insects

Wood boring insects - A total of 183 trees show evidence of wood boring insects among City trees. Distribution is throughout Red Lodge though there are several types of trees more greatly impacted (Figure 27). Black poplars and cottonwoods host the greatest number of wood boring insects (97 or 40% of them). Wherever there are concentrations of black poplars/cottonwoods, there are wood boring insects: Finn Park, Rotary Park and Coal Miners Park most notably. Mountain ash varieties comprise 16% or 30 trees hosting wood boring insects. Thirteen green ash trees show evidence of wood boring insects (7%). Twenty-six or 14% of pines and spruces combined have wood boring insects. Wood boring insects were not specifically identified as part of this inventory nor were any traps set out for the purpose of their identification. Evidence is based solely upon observation of bored holes in tree trunks or limbs.

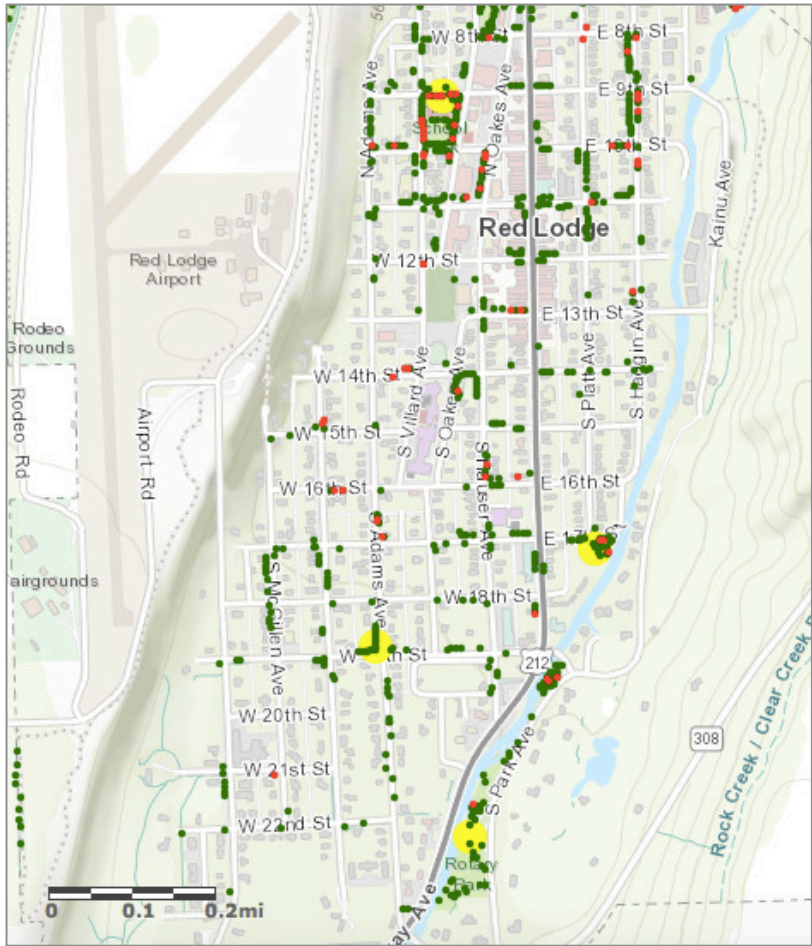


Figure 28 – MAP: Locations of Emerald ash borer insect traps (2008) yellow

The 2008 inventory team strategically placed emerald ash borer traps at 4 locations where there is either a density of green ash trees or evidence of boring insects: Field School Park, Messiah Lutheran Church (intersection of 19th and Adams Ave), Finn Park and Rotary Park (Figure 28).

Green ash trees dominate the perimeter of Field School Park with the exception of 2 replacement trees on the southeast corner (1 maple, 1 elm). The 2017 surveyors found these green ash trees in generally good health though exhibiting some dieback, frost crack and a minor presence of wood boring insects. Several of the green ash trees on the east and west sides of Field School Park have been removed to due to significant dieback and to improve increased canopy growth of neighboring trees. Others were recently removed during the summer of 2017 (north side) due to interference with overhead power lines (Figure 29).

Of the 39 green ash trees in Field School Park, 95% of them have some dieback, 51% of them have either trunk scar/cat face or frost crack depending on how each surveyor interpreted trunk damage. 31% of Field School Park’s green ash trees show evidence of wood boring insects. Insects were not visible or captured during the inventory so presence of emerald ash borers is neither confirmed nor unconfirmed.



Figure 29 - MAP: Green ash locations at Filed School Park

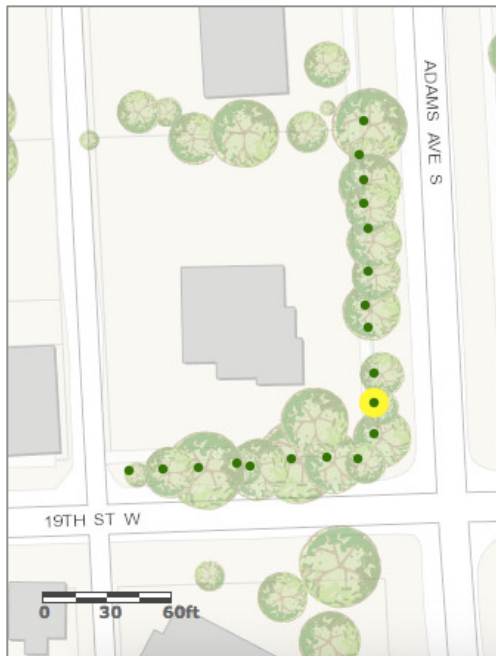


Figure 30 - MAP: Green ash trees surrounding Lutheran Church

Nineteen mature green ash trees line the sidewalks of the Messiah Lutheran Church on 19th St W and Adams Ave (Figure 30). Wood boring insects are not present according to the 2017 survey, but 26% (5) have signs of leaf defoliation.

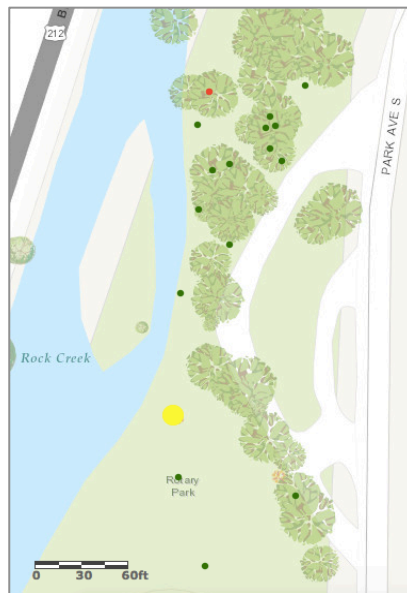
Each of the trees (100%) has some measure of dieback with deadwood ranging from 5% to 30%. On average, these green ash trees present 20% deadwood.

Trunk scar/cat face and/or frost crack damage is exhibited on 63% of these trees while only 2 (11%) have a trunk cavity. Overall, these green ash rows appear healthy and only in need of canopy cleaning or thinning.

Green ash trees surrounding the City pool are younger than those found at the other City parks, Messiah Lutheran Church or Old Roosevelt School. They do not host wood boring insects at this time (2017) and the majority of their issues are related to position under power lines on the northern perimeter, leaning >15% and equipment damage (from weed whacking)



Figure 31 - MAPS: Black poplars at Finn Park (left) and Rotary Park (right)



Black poplars (cottonwoods) dominating Finn and Rotary Parks are populated with wood boring insects common to these mature trees. Unless boring traps set here in 2008 provided evidence of the emerald ash borer, the parks and any adjacent green ash trees (17th St E) still appear to be free of emerald ash boring beetles.

Pathogens causing fireblight, leaf spot and cankers are of greater concern in Red Lodge over insect infestations although insects aid the spread of disease. Insects may be more easily managed through fertilization or pesticide treatment. Numerous poplars, mountain ash and quaking aspen are exhibiting dieback or general decline due to a number of pathogens that are not easily managed (see Table 1).

Disease classification during field data collection in 2017 was limited to selection of defects (pointing to symptoms of disease) and/or attribution through "insectdis" (Table 3). Slime flux, galls and conks could be generally recorded, but diseases such as cankers, gall rust, nipple gall, fireblight, black knot, leaf spot could not be selected for the inventory specifically as observed and were possibly added to the "Note" field at best (some pictures were taken). Cankers among trunks of black poplar, mountain ash and quaking aspen were commonly marked as "trunk scar/cat face" within the defect fields. Many of the mountain ashes were categorized as having animal or equipment damage or trunk scar/cat face defects likely due to fireblight and/or cankers.



Figure 32 - Aspen stand in decay due to untreated cankers (left) and weeping canker on quaking aspen trunk (right)



Figure 33 - Hackberry nipple gall (left), poplar leaves with galls due to insect eggs (right)



Figure 34 - Shoot canker and leaf spot (left), crown gall (bacterial) found on black poplar (right)



Figure 35 - Black knot disease on chokecherry (left) and fungal conk upon a rotting mountain ash limb (right)



Figure 36 - Leaf spot on quaking aspen tree (left), insect galls within canopy of poplar tree (right)

Condition – other agents of damage/defects

Multiple agents including wind, snow, frost, insects, fungi, bacteria, humans and animals can damage trees. During both the 2008 and 2017 inventories, surveyors noted which trees were damaged and the source of damage. However, the two inventories are not comparable for the purpose of identifying trends. The data schemas (and selectable attributes) of the two inventories are different and cannot be compared 1:1. The 2008 “damages” were limited to 6 types: bug/pathogen, frost crack, human caused, lightening, wind breakage or other. The 2017 inventory schema includes a set of 11 damage descriptions (Table 2) including frost crack, but excluding several others recorded in 2008.

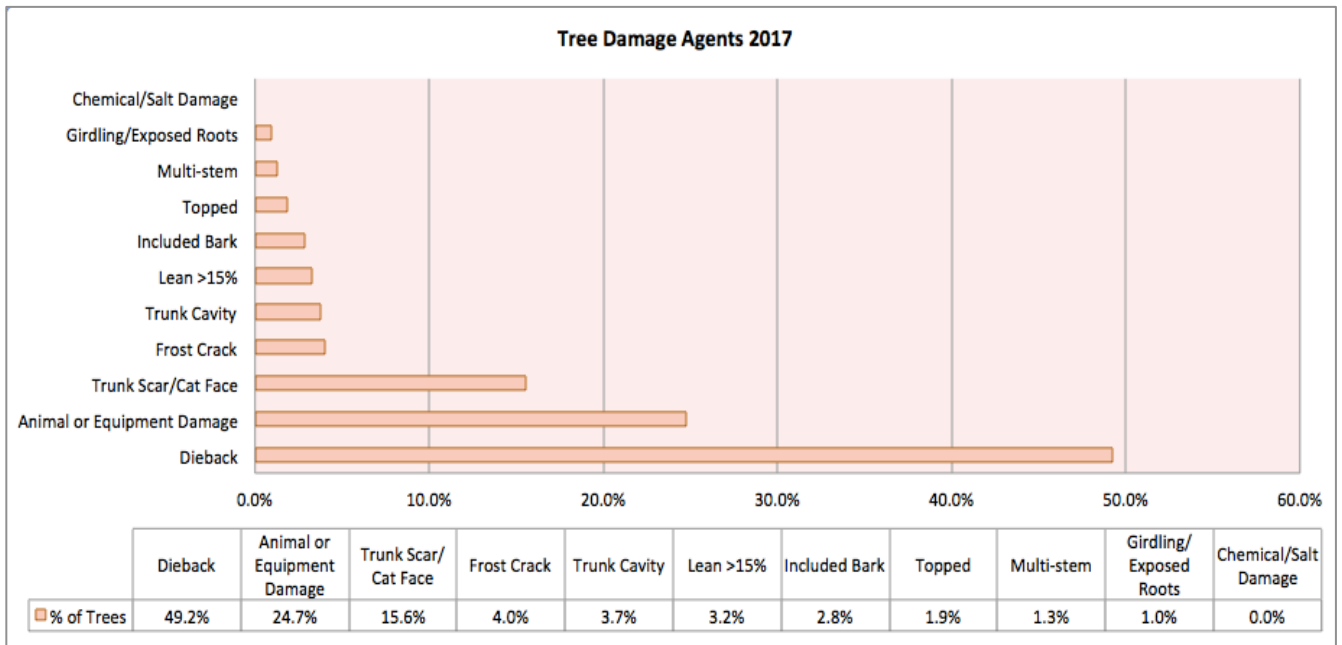


Figure 37 - Common damage agents/defects of 2017 inventoried trees

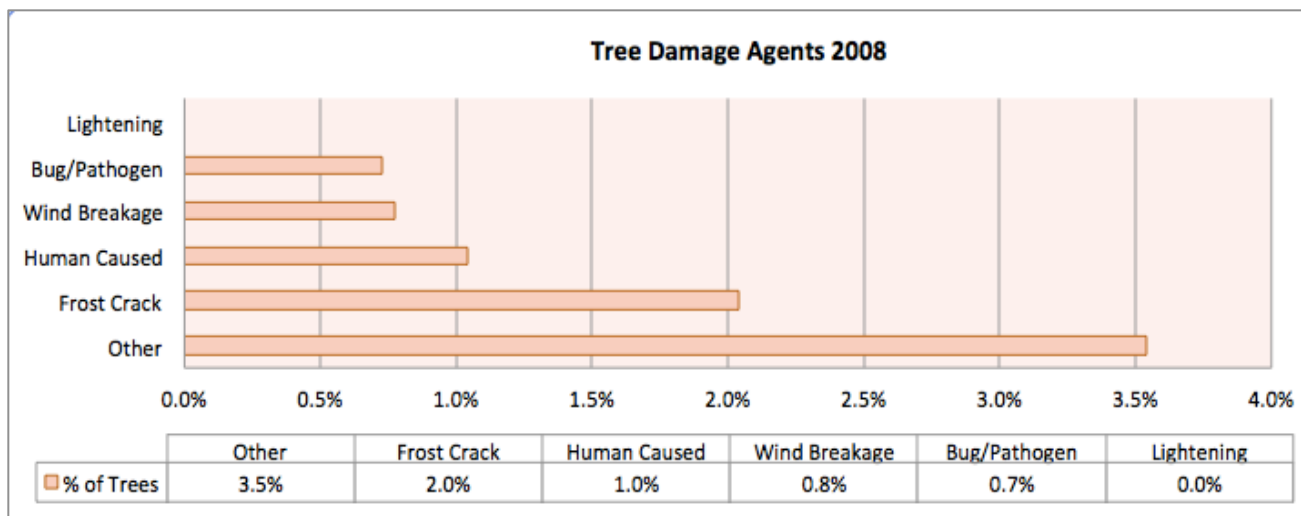


Figure 38 - Common damage agents/defects of 2008 inventoried trees

Dieback is the leading type of tree defect found during the 2017 inventory with over 49% of City trees sharing this problem. Dieback is a condition in which the branches in the tree crown die from the tips toward the center. The amount of dieback may account for a large percentage of a tree’s estimated deadwood in many but not all cases. Not all deadwood found in crowns is caused by dieback.

Dieback is found among young and old trees alike and most visibly among mountain ash, green ash and black poplars; younger trees of all types (without sufficient water) and especially young honeylocust trees. Dieback itself may result from many variable conditions (insects, diseases that girdle stems or limbs, human/animal or equipment damage, lack of water, poor soil or nutrient and other stresses).

The 2008 inventory schema did not provide for attribution of dieback as a defect. If it had, dieback may also have been recognized as a principal agent of damage in 2008 (there is no way of knowing what “other” means in the 2008 record for comparison).

Human/animal or equipment damage is the second largest defect found during the 2017 inventory. It may be compared to the 2008 inventory considering the “human caused” data contains weed whacking or other neglectful acts (guards or cages too small, car door banging on trunks, etc.).

Only 23 trees were recorded to have “human caused” damage in 2008 (*Figure 38*) vs. 305 trees in 2017 (*Figure 37*). All but one of the 2008 trees exhibiting human caused damage were classified as mature and there were only 6 species impacted. Twenty-three tree species were impacted by animal or equipment damage in 2017. Considering increased tree planting activity since 2008 and introduction of a variety of young trees funded by Arbor Day & NWE Grants, Red Lodge’s Cost Share program and Montana DOT additions along Hwy 212, it is not surprising surveyors found an increased percentage of City trees exhibiting human/animal or equipment damage at the time of the 2017 tree inventory (*Figure 39*).

Younger and smaller trees purposely placed along public rights-of-way; in cement cutouts along heavily trafficked roads and in parking areas, are especially prone to animal and/or equipment damage. Young trees are often staked, caged and then left unchecked for mechanical damage that may occur through time. Groomed lawns within City parks or on rights-of-way receive a good amount of weed whacking which may also damage vulnerable unguarded trunks.

Interpretations of human caused damage and animal/equipment damage are not absolutely comparable between the two inventories. The classification of animal and/or equipment damage (2017) is broader than human caused (2008) and for either inventory, classification was subject to the surveyor’s interpretation of what caused damage: improper cutting or pruning, chaining, binding, fit of cage or trunk guards, climbing, hitting with mowers, etc.

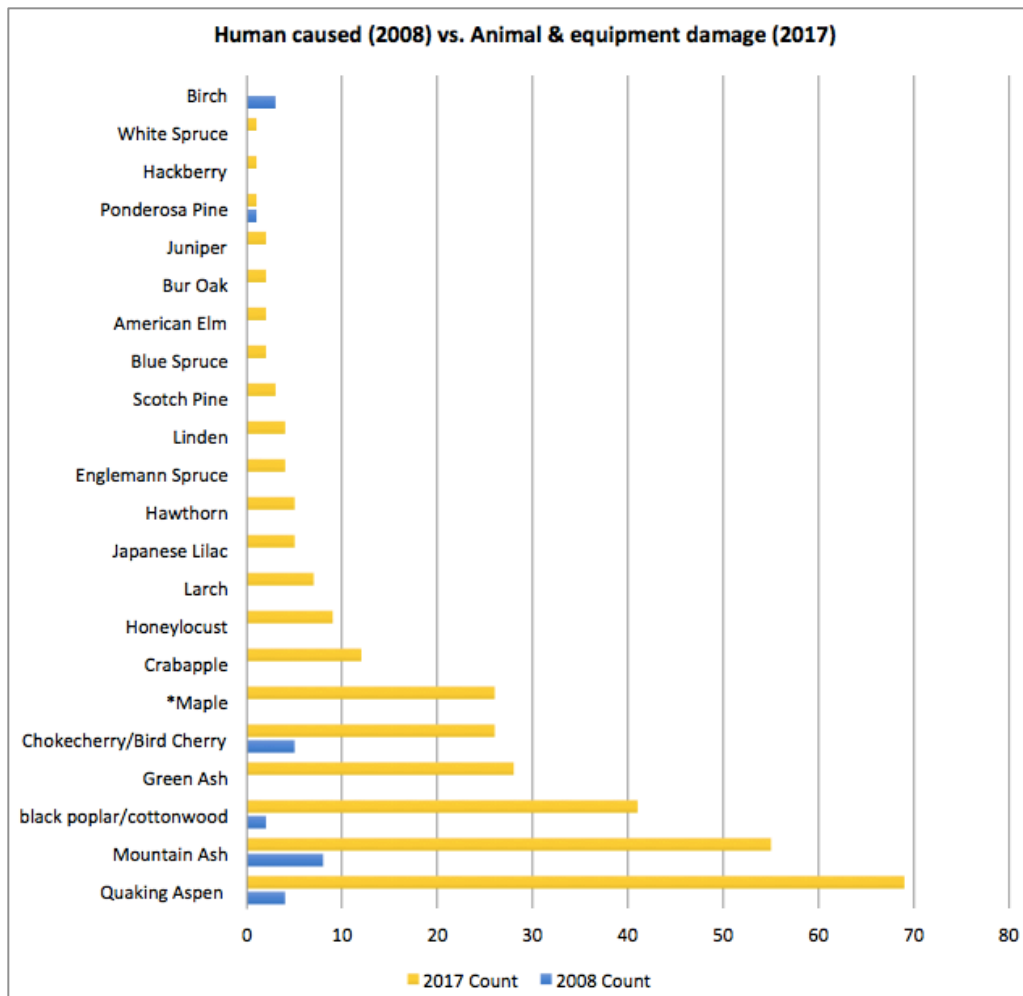


Figure 39 - Human caused (2008) vs. animal/equipment caused damage (2017)

Trunk scar/cat face is the 3rd highest type of damage found during the 2017 inventory. A large number of the Mountain Ash trees with damage to trunks due to cankers or fireblight were marked with this due to the extent of the damage noticeably impacting them. If the cause of trunk scarring was unknown, but the condition of trunk clearly showed some form of scarring or damage, the trunk scar/cat face defect was attributed to the tree.

Frost crack is persistent in its' damage to Red Lodge trees ranking as the 4th highest defect in 2017 and may remain impactful year-after-year due to the extreme weather conditions of the City's climate. Regardless of precautions tree care providers may take to select hardy trees and to protect them, extreme weather conditions cause damage. Frost crack is found primarily among green ash, mountain ash, quaking aspen and poplar/cottonwoods with minor amounts found among other thin barked trees such as chokecherries, maple, apple and linden. The largest delta between 2008 and 2017 shows an increase of frost crack among black poplars (22 of 49) (Figure 41). Most of these poplar trees are mature ranging from 17' to 55' tall with dieback implicated as a secondary defect in most cases.

Organisms of disease find it easier to invade trees through frost cracks or trunks that are scarred, damaged or weakened. Planting trees that are less susceptible to frost crack and protecting trunks from human, animal or equipment damage should be encouraged.



Figure 40 - Frost crack on trunk of young tree

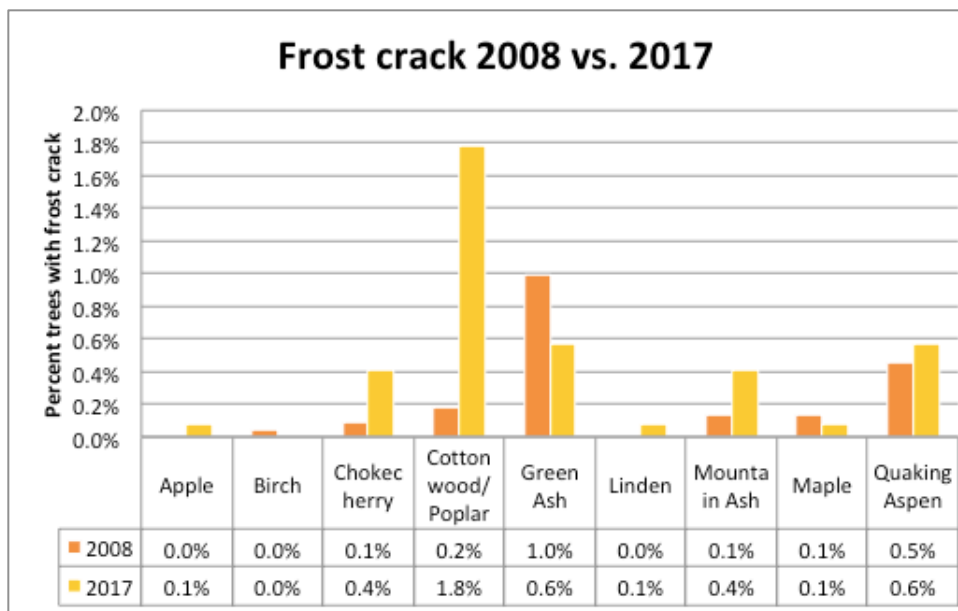


Figure 41 - Frost crack comparison 2008 vs. 2017

Trunk cavities - A tree cavity is a neglected bark injury that can be the result of many factors. The most common causes are improper pruning, mechanical injury and storm damage. Without proper treatment, a cavity will only get worse. The 2017 inventory identified 46 trees with trunk cavities. Black poplars are the majority of trees with trunk cavities: 7 at Rotary Park, 4 at Finn Park and 5 along the row on Beartooth Lane. Average height of poplars with cavities is 42 feet. Green ash trees and quaking aspen tie for number of cavities with 4 each among all 46 trees with cavities. One of the most serious trunk cavities is at the base of a large black poplar in Finn Park because it continues to weather, decay and weaken the base structure of the entire tree without showing outwardly. The cavity is a very low, small 8" high opening near the ground, but it measures 26" deep across the base.

Lean >15° - Seventeen of the trees inventoried in 2008 exhibited severe wind damage due to an event of high gusting winds in 2007. For the 2017 inventory wind damage was not a selectable attribute. A tree with "Lean>15%" defect may suggest damage due to severe wind events and/or prevailing winds, but it cannot be compared 1:1 as caused by wind damage. Forty trees recorded in 2017 show >15% leaning, however, this condition may be due to improper planting or other factors including snow loading and wind. Many small trees sustained damage due to the early snowstorm in September 2017 including breakage of limbs, topping and leaning (from weight). The next surveyors will likely have difficulty attributing breakage or damage to either wind or snow loading during a future inventory.

Included bark - A weak fork is what is known as "included bark." This makes a tree very likely to split during events of high wind or weight loading (from ice or snow). A weak fork may seem insignificant when a tree is young; but if ignored, it can become one of the most serious structural problems in a tree. The 2017 inventory identified 35 trees with weak forks scattered about the City and not within any particular park or location. As well, none of the tree species in particular has a lead on the condition: 7 Shubert chokecherry trees, 7 black poplars, 6 mountain ash and 5 green ash exhibited weak forks.

Topped trees are usually the result of heavy wind, rain and snowstorms and either poor or purposeful pruning damage. The number of topped trees found during the 2017 survey was minimal (24 trees or <2%) and in most cases were the result of pruning to avoid overhead wire line conflict. A number of younger and older trees still fully leaved fell victim to the heavy, early snowstorm of Sept. 21, 2017 (Figure 42). Many program trees (especially maples) were topped as result although results of that storm are not fully contained in the



Figure 42 - Young tree "topped" by early snowstorm

2017 inventory because many of the damaged trees had already been surveyed before the storm.

Tree Maintenance

A properly maintained tree grows well, is less susceptible to insect and disease, and provides many benefits to people and the environment. Improperly maintained trees can inhibit pedestrian traffic, damage property or present a life threatening hazard. Preventative pruning while a tree is young can fix these problems and save the City thousands of dollars into the future. This inventory identified trees that were in need of routine or immediate maintenance and the type of maintenance tasks that are required.

The 2017 survey categorizes trees as either small or large and then which need either routine or immediate attention. Large trees are those with DBH >4 inches and small trees are those with DBH < or = 4 inches. In most cases, trees <= 4" DBH are less than 15 feet tall. In addition to a category of routine or immediate maintenance, trees that were determined to be a public safety concern were noted as "critical concern" (See *Table 1* for definitions).

A high number of public trees (360 or 29%) require immediate maintenance. Two hundred and two of those are large trees (16%) and 156 or 13% are smaller, younger trees (*Figure 43*). A total of 641 public trees inventoried are city-managed (plus those within parks, but not inventoried). Of the 641 city-managed trees 189 or 53% are recommended for immediate maintenance – large and small. Property owners are responsible for the remainder of public trees recommended for immediate maintenance (171 or 47%).

Trees classified as critical concern; large or small with immediate maintenance recommended are considered a priority whether the responsibility falls to the City or individual property owners. Priority maintenance summarized below includes both city-managed trees and privately managed trees.

Priority Maintenance Needs

Two large black poplar trees (over 50' tall) are of critical concern to public safety and require immediate maintenance. One has a large trunk cavity and the other has crown dieback (15%) with sizable dead or weakened limbs that could break in a windstorm or further weathering. The surveyor suggests that an arborist evaluate critical trees most immediately to determine appropriate action.

Of the 202 large public trees that require immediate attention, the most common maintenance task is crown reduction, cleaning, or thinning (67%). Surveyors recommended removal for 36 trees or 14% of trees in the large tree/immediate maintenance class. Treatment for pest/disease is recommended for 10% of the trees, most of which are aspens or cottonwoods. The poplars have been adversely affected by early wet weather followed by a dry, hot summer. Insect, fungal, and bacterial diseases have taken hold and caused problems with health of both leaves and wood. The most common defect in the "large tree, immediate" category is dieback (deadwood in the crown), 49%; 16% have trunk scars, and 11% suffer animal/equipment damage.

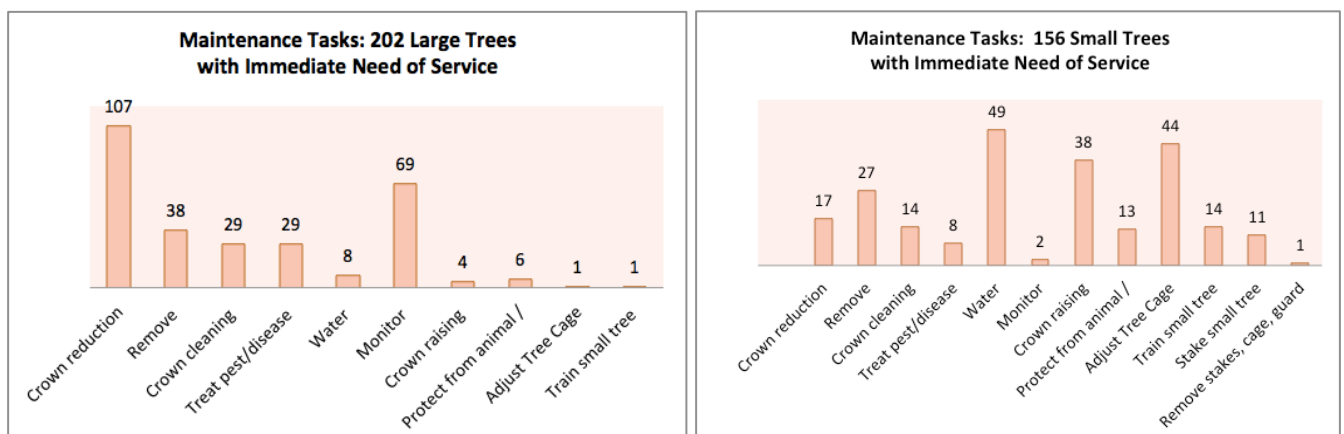


Figure 43 - Large and small trees with immediate maintenance needs

One hundred and fifty six small trees require immediate maintenance. Trees in the small tree/immediate maintenance category exhibited dieback (52%), animal/equipment damage (30%), and trunk scars (11%). Forty-two suffered from lack of water (27%) and 129 (38%) need crown thinning, cleaning or raising (38%).

Surveyors recommend that 27 or 17% of this group of small trees be removed because they are dead or dying. Seven trees need their cages adjusted. Of the small tree/immediate maintenance class, 24 are Red Lodge program trees. Lack of water and the need for crown raising were the most common issues among young trees.



Figure 44 - Young tree in need of cage adjustment

Tree/Wire Conflicts

A total of 136 street trees are either currently in conflict or may potentially conflict with wire lines (Figure 46). The survey identified 55 trees that have “present/conflicting” wire issues. Green ash and Colorado blue spruce species are most numerous in relation to conflict with overhead wires. Eighty-one trees show “present and potential” conflict. A variety of species including green ash (17) trees, black poplars (11), aspens (16), are the most common among a wide variety of species that show potential conflict. Two are Red Lodge program trees that need to be monitored for pruning as their heights increase.

Four green ash trees on the north side of School Field Park were removed in late June 2017 after present and conflicting problems with power lines were identified. Several other green ash trees along the same northern row were topped or trimmed to mitigate conflict until they may be removed in future.



Northwest Energy (NWE) offers to share the cost of tree replacement with the City. It’s the City’s responsibility to grind the stumps and plant replacements. NWE suggested replacing the remaining trees within a five-year cycle, with species that will not conflict with power lines as they mature. Tree specialists noted that digging for water/sewer lines along the streets interferes with root growth and should be monitored. Potential and conflicting trees occur at both homeowner and City properties.

Figure 45 - Tree that's been topped and pruned repeatedly to avoid power line conflicts

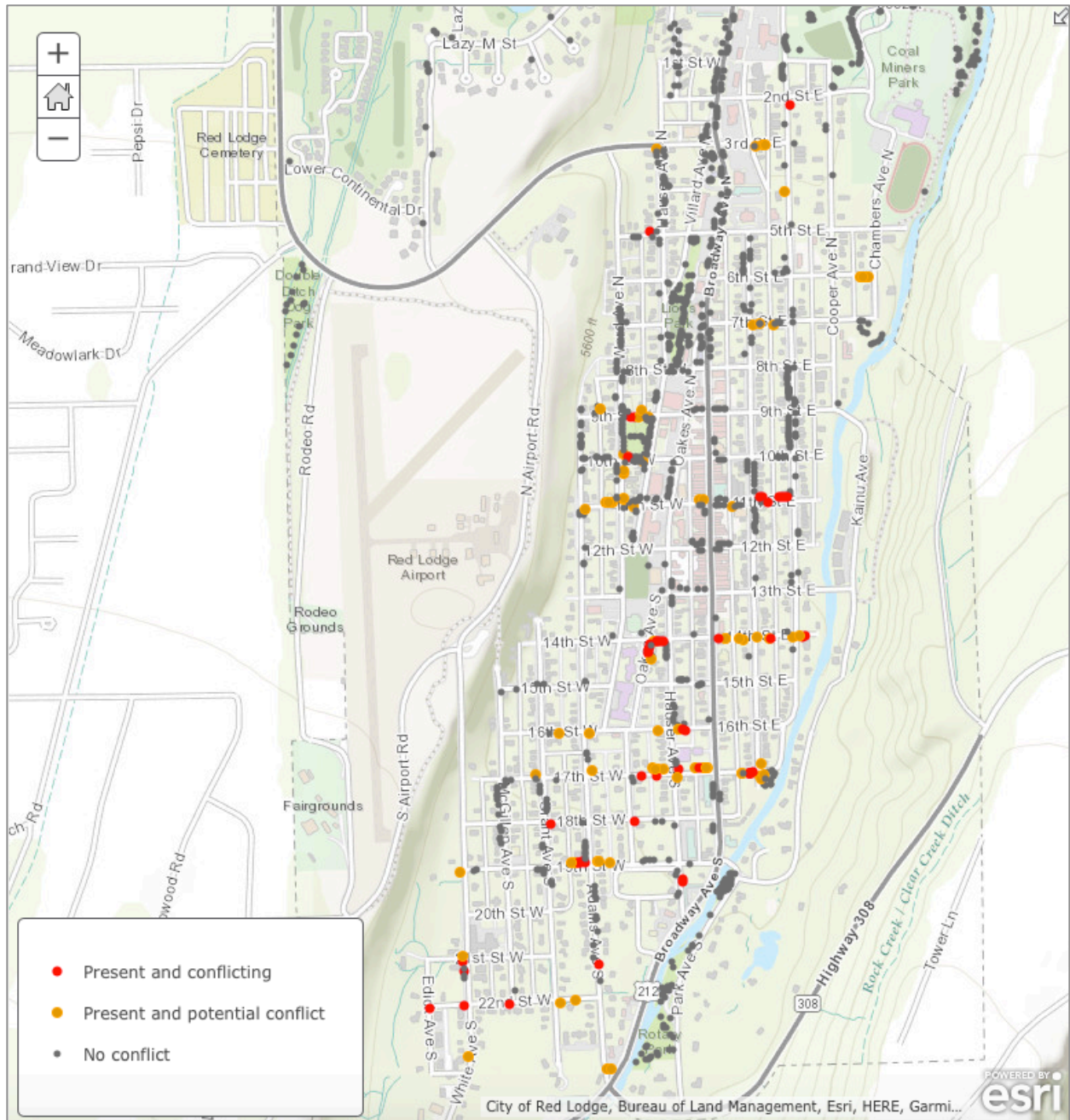


Figure 46 – MAP: City trees with present or potential wire line conflict

Stumps

One hundred and two stumps were observed on public property and mapped during the 2017 survey as opposed to 28 in 2008. Although the 2008 survey recorded 70 trees that should be removed, there isn't any significant evidence that the 102 stumps found in 2017 had any relationship to the 2008 removal recommendations (Figure 47). Of the 70 recommended for removal in 2008, only 8 were found (as stumps) due to action taken by the City within City Parks: 1 in Coal Miners Park, 1 in Finn Park, 2 in Rotary Park and 2 in Lions Park. Two additional stumps along public easements coincided with the 2008 recommendation for removal: 1 due to a power pole conflict and the other for poor condition.

A great number of the 2008 recommendations for tree removal must have been met, but smaller stumps are no longer visible. The majority of stumps found in 2017 have no relationship with 2008 recommendations for tree removals. This result suggests that action is normally taken by property owners to remove trees as needed in response to issues as they occur. The number of incongruous stumps in both surveys suggests there is an on-going

effort to plant new trees but the environment is not highly favorable – a great deal of care and monitoring is necessary to produce a healthy, viable tree in Red Lodge.

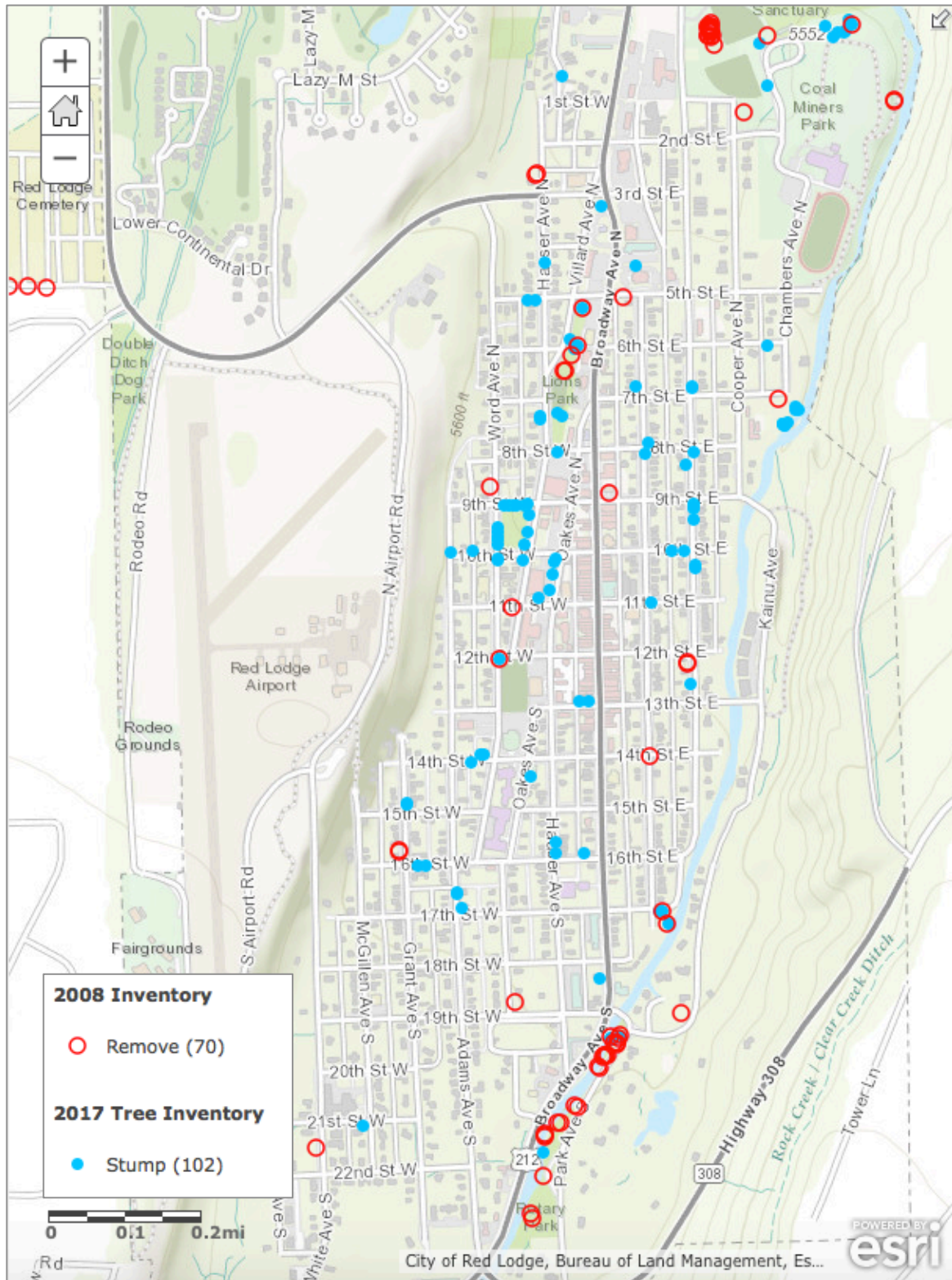


Figure 47 - MAP: 2008 Tree removal recommendations vs. stumps found in 2017

Very few of the 70 trees recommended for removal during the 2008 survey were found again in 2017. Seven of the trees recommended for removal in 2008 are still present and again recommended for removal in 2017. Five of the 7 stumps that haven't been removed since 2008 are located in Finn, Lions and Coal Miners Parks. Seventy of the 77 trees recommended for removal in 2017 are not the same as those recommended in 2008.

Tree Planting Opportunities

The 2008 survey identified 546 potential planting sites along street rights-of-way (ROW) within City boundaries not including parks or other City-owned land. The 2017 survey identified 91 potential street-tree planting sites. Some of those sites are new and some are adjustments to 2008 sites allowing for improved spacing. The 141 trees provided by the Cost-Share, Arbor Day Programs and Northwest Energy Grant trees since 2009 filled almost 26% of all 2008 potential planting sites. Montana Department of Transportation (MDT) highway project, Red Lodge Robinson to 8th project added approximately 93 trees (2014/15).

A new MDT highway project is slated to begin in 2022 on the Two Mile Bridge location (Red Lodge Robinson to 2-mile project). More public trees will be added to Red Lodge rights-of-way along HWY 212 as part of that project. The ability for the City and Parks Board to consult with MDT during the planning phase and implementation of the 2nd Hwy project (or others in the future) presents a huge opportunity to get the right trees in the right locations along the roadways and possibly even presenting opportunity for living wind and snow screens where impactful.

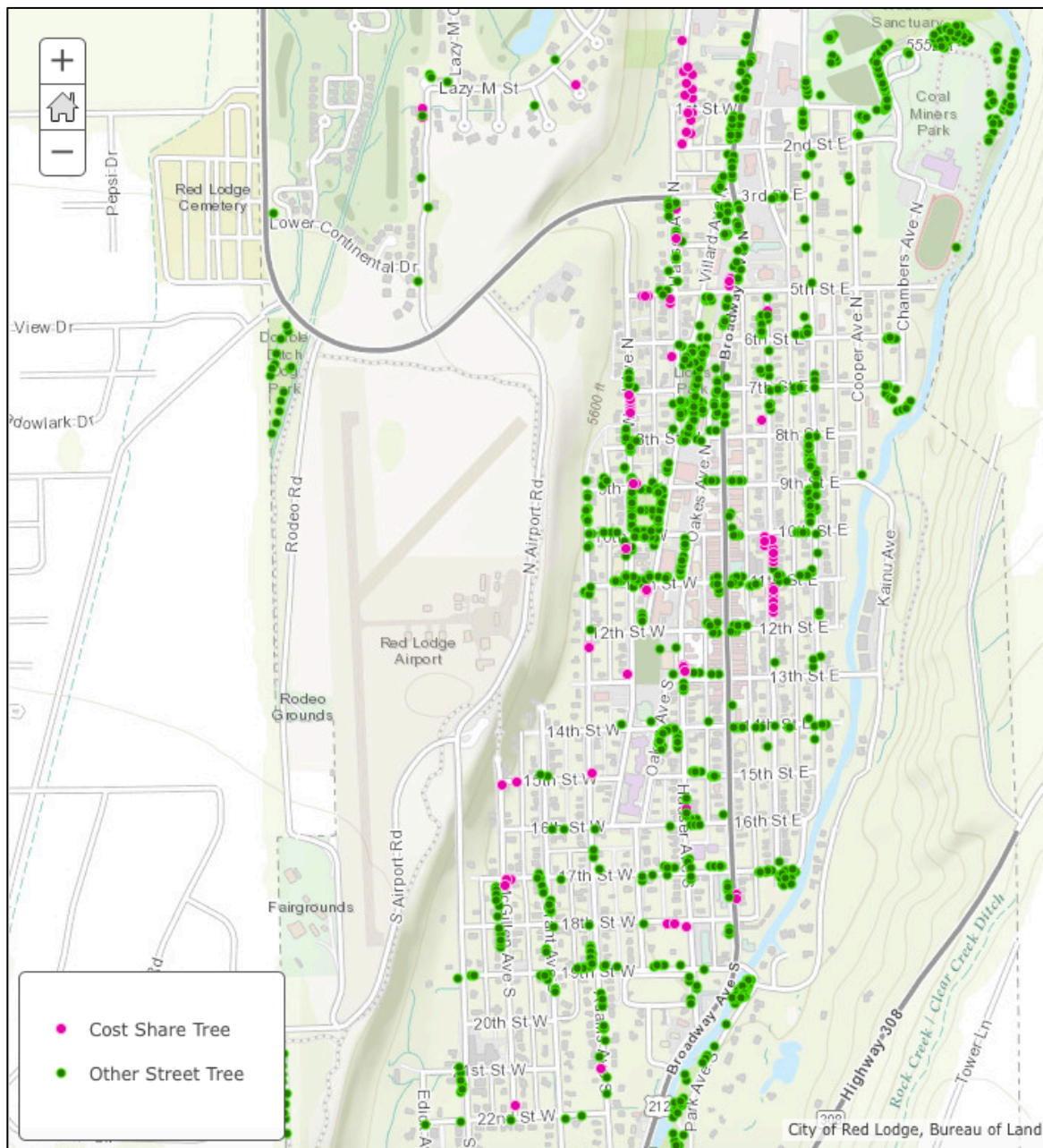


Figure 48 - MAP: Cost-share tree locations relative to Red Lodge street trees (100 added since 2013)

Figure 49 represents 2008 Inventory potential planting sites filtered to show only those where wires are not present or present without potential conflict. It also represents those identified during the 2017 inventory most desirable as future targets because planting strips are present, they're clear of other existing or potential yard-tree canopy cover and no wires are present. The Board's Tree Committee used the 2017 Tree Inventory and the Carbon County GIS to Identify perpendicular and parallel streets nearest the core downtown area to recommend a plan for street trees that may help mitigate conditions of high heat, wind, noise, traffic and pollution while increasing the aesthetic value to residents and visitors of the community.

Although it is desirable, it is not recommended to line Broadway Ave from 8th N to 14th S with trees due until there is a guaranteed water delivery method or irrigation system to support watering. Previously, resident volunteers used their own time and privately owned water truck to water trees in cutouts and in the core section of the City along Broadway from 8th street to 14th street (~150 trees). Outreach to property owners along perpendicular and parallel streets to downtown Broadway is necessary to achieve the desired increased density and diversity of City street trees and deliver greatest public impact. Until the City and/or business owners support watering trees along the core business district, any investment in trees is best spent elsewhere: nearest perpendicular avenues and/or parallel street properties.

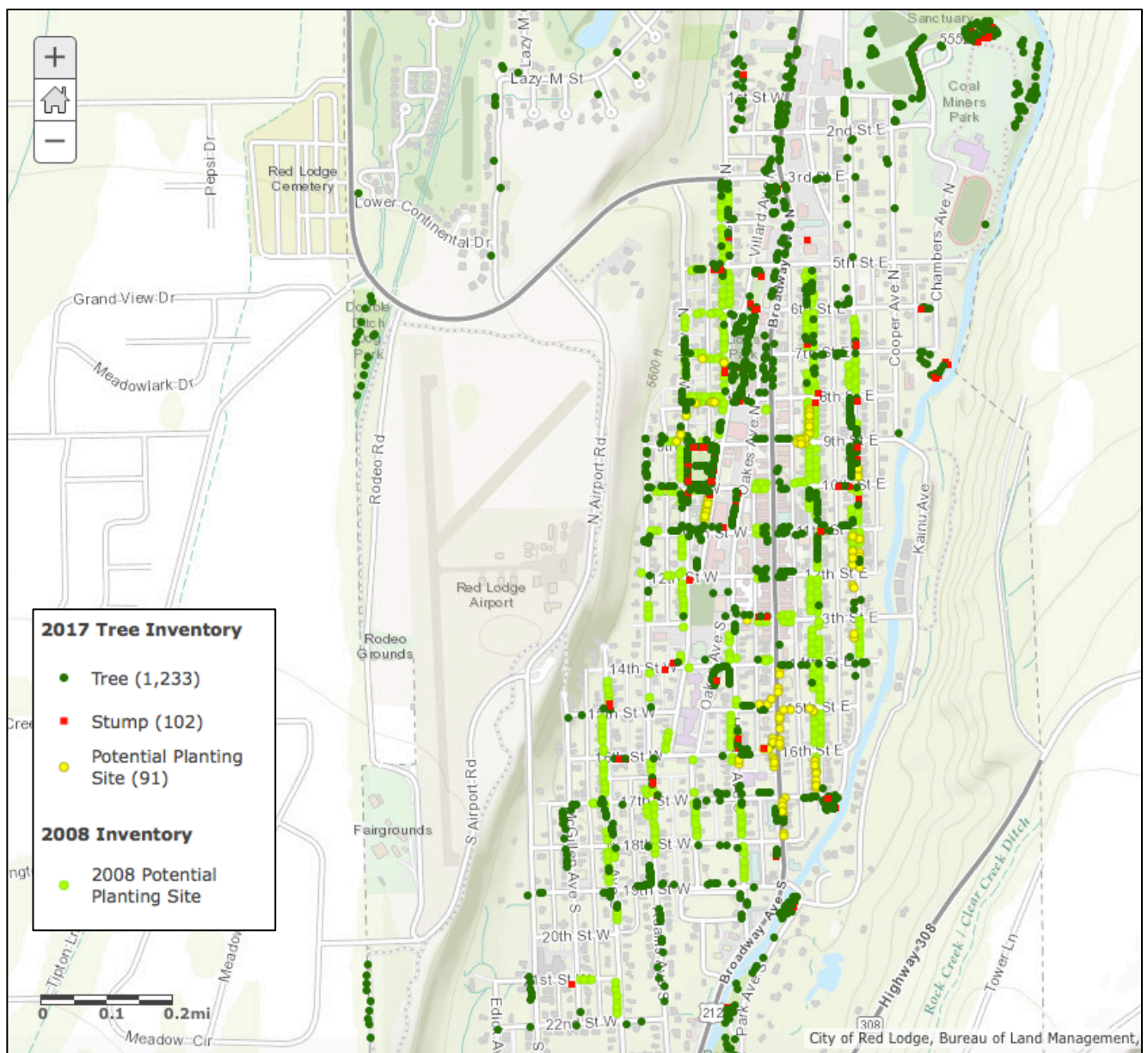


Figure 49 - MAP: Potential tree planting sites along Red Lodge streets

Tree Inventory Summary and Discussion

Red Lodge is making great progress with the management of its urban forest in terms of tree species and age diversity, especially after evaluating street and park trees added over the past 9 years. The urban forest within the City of Red Lodge is progressively becoming more species-diverse within Field School, Coal Miners and Lions Parks, but especially along streets where trees have been added through Arbor Day, cost-share, and the latest MDT plantings along HWY 212.

The 2017 inventory identified 58 species, 18 more species than were identified during the 2008 inventory. The top 3 most common species in 2009 were Poplars (20%), Colorado blue spruce (16%) and mountain ash (12%). The 2017 inventory identifies Poplars (20%), Quaking aspen (12%) and Green ash (12%) as the top 3 most common species.

In community forest management, a general goal is to not have any species make up more than 10% of the total population or 20% of the same genus (Miller, 1996). These forestry goals are to prevent a large loss of trees from catastrophic insect or disease epidemic that target a specific species or genus. Red Lodge has three species that exceed 10 percent of the total population and one genus (*Populus*) is at 20%. In fact, these three species make up 44% of total tree species inventoried. This is an improvement over the 2008 inventory that identified six species that each exceeded 10% of the population. Of course, this is based on an inventory of public trees only and may look different if private trees or all trees within the Rock Creek corridor were included. It's known that not all trees in the riparian corridor and on private lands were included in the inventory, and if so, the overall species composition of cottonwood, aspen, and spruce would be higher. Tree species diversity in Red Lodge does not currently meet Miller's (1986) aforementioned general goals.

It is important to note that tree "species" should not be the only level of concern with City tree diversity. Tree diversity should relate to the range of conditions and objectives in a community rather than to simple numerical standards (Richards, 1993). Species adaptation to local conditions is more critical than diversity per se and Red Lodge plans to maintain naturalized riparian-forested areas and is not forcing or planning to diversity in those locations. The most common species reported in Red Lodge tree inventories (*Populus spp.*) may continue to hover in the 20% and higher category because of natural riparian stands along Rock Creek and other drainages. The same could be true of quaking aspen (12%) naturally occurring in a higher percentage throughout Red Lodge. Many of Red Lodge's parks remain natural and diversification of species is neither desirable nor recommended in these cases.

Red Lodge is fortunate to have a number of mature green ash trees yet the absence of the emerald ash borer for now. Green ash does not occur naturally at this altitude though planted and managed purposefully at various public locations in Red Lodge it the 3rd largest class of public trees (12%) tied with quaking aspen. Since the EAB has not arrived yet to Montana, there's time to begin a mitigation plan. Several groupings of the green ash trees for replacement could be monitored and/or targeted for replacement during a cycle of the next 5 years or so, possibly as the focus of Arbor Day tree planting.

Equally important as species diversity is the need to maintain age diversity. It's difficult to argue that age diversity is increasing in Red Lodge since the tree statistics for 2017 indicate average for DBH is relatively the same (less .15"), average height is ~1.5 feet greater and canopy width averages 2 feet more than 2008 measurements. We can see age diversity in the City forest is making some progress looking at the total 234 young public trees planted, but at the same time, mature trees measured in 2008 are bigger 9 years later and may account for the break-even statistics used to measure age diversity. It's key to understand Red Lodge's success at preserving mature trees and their continued growth does factor into smaller incremental measures of age diversity despite the number of young trees planted the past 9 years.

With average DBH of 8.85 inches, height of 24.6 feet and 15-foot canopy, it may still be inferred that most public trees in Red Lodge are mature or reaching maturity. Providing for age and size diversity in the urban forest is a significant way to reduce the impact of a destructive pest or disease and to ensure the continued replacement of older trees.

Both young and old public trees in the City of Red Lodge are in need of attention, but for different reasons. This inventory identified 61 "priority trees" which need to be examined by a certified arborist or contractor - some may

need immediate pruning or removal. These trees have been classified by the inventory as having either 1) a “critical concern” classification (2), 2) greater than 75% deadwood (15), 3) a direct conflict with an overhead utility line (32), or 4) a weak fork (12).

The number of priority trees grows to 360 if those, young and old, in need of “immediate maintenance” are included. Many of these trees are located in City street right-of-ways and will require the cooperation of adjacent landowners who, under Ordinance 919, are ultimately responsible for these trees. A map showing the distribution of trees by maintenance level is provided in Chapter 4, *Figure 52*.

Several observations about the state of cost-share trees during the 2017 Tree Inventory have led to specific steps for improved care and success for the program. The top 3 issues found among cost-share trees are: need of more water, pruning (for canopy raising or reduction) and adjustment of cages (to avoid mechanical damage). Low-cost improvements to the cost-share program are planned for the purpose of increased success of Red Lodge street trees. The City purchased informational door hangers to better educate the public about how to properly care for their young trees. Gator bags may be given to participants with clearer instruction to water young trees more frequently. The Board is planning public events to educate and draw attention to the program and to recognize volunteers that help care for the City’s public trees.

It was noticed by the 2017 Inventory lead that the number of fir, pine, and spruce in Red Lodge are aging without replenishment. For understandable reasons, these trees are undesirable for planting along sidewalks or water/sewer lines due to the destruction their roots may cause and the potential to block rights-of-ways or and lines-of-sight due to their girth. An additional challenge of planting these in the City is the spread and extent of pine weevil these past 10 years bringing a greater burden of protection against beetle invasion – it’s risky. It’s no small commitment to attempt planting any pine or spruce tree in the present environment. It was also noticed there are very few juniper.

The City cost-share tree program supports deciduous tree planting by default and groomed parks are reaching tree saturation. There is limited room in public spaces for planting evergreens or large-rooting trees. Evergreens and larger deciduous tree species require broad spaces and have greater potential to disturb underground infrastructure and sidewalks. Leaving the City’s forest to chance and hoping residents will plant evergreens or other large tree species on private property is risky and a more proactive promotion to the public should be considered. The longer view of forest management in Red Lodge needs to consider how and where it will replenish many of the majestic yet aging evergreens. Forces of nature such as changing climate and advancement of insects and disease require more active management practices than reaction to maintenance needs for the short-view.

While cost-share trees support (smaller) deciduous tree planting on the whole in Red Lodge, the opportunities to plant larger deciduous and evergreen trees on private property remain at the will and whim of property owners and residents. There is potential opportunity to plant more evergreens or larger maple varieties in backyards, where they may not interfere with power lines, sidewalks, rights-of-way or traffic visibility. Planting larger tree varieties in backyards or parks could help to increase the City forest’s environmental effectiveness while keeping it greener year round. Until incentives to plant larger tree varieties on private property are discovered and practiced, the City can help maintain age and species diversity by planting such trees in its managed parks.

A continued public/private partnership is needed to maintain the momentum and progress gained the past 9 years by the Red Lodge community for its urban forest. There are an increasing number of cities in Montana competing for the same DNRC grants Red Lodge has appreciated. At the same time, increased maintenance and spending on City infrastructure puts great pressure on the Parks (and trees) budget. Reliance on property owners and volunteers to partner with the Parks Board and Public Works is increasingly important for the continued progress of our community forest. The City Parks Board is putting greater emphasis on City forestry and tree care education, presentations and/or or local workshops for its residents this next 10 years.



Figure 50 - Minimal urban forestry in City of Red Lodge circa 1909 – 1924 (Photo courtesy of Carbon County Historical Society & Museum)



Figure 51 – View of Red Lodge's urban forest dotted by mature Engelmann and Blue spruce, winter 2018

Chapter 3. Recommendations

The recommendations from the 2009 Urban Forestry Management Plan remain relevant and in place in this section with some updates based on the 2017 tree inventory. Wholly new recommendations are clearly noted in italics.

This chapter offers recommendations for the future stewardship of the City's urban forest and is divided into six sections; 1) Tree plantings and maintenance, 2) monitoring and evaluation, 3) public education, 4) City ordinances, 5) Administration and 6) Tree programs

Tree plantings and maintenance

When discussing new tree plantings and maintenance of public trees, one must consider the existing and future land use of the area. Recommendations will differ greatly in "natural" versus "managed" areas. Tree plantings and maintenance should complement existing landscaping, facilities and activities occurring in these two distinct areas.

A point-map planning exercise has very little to do with what actually becomes the best planting opportunity year-over-year. Several field observations made during the recent inventory of street trees drives home the need to evaluate a wide range of attributes comprising a complete site and situation assessment ahead of tree planting or setting targets. The Parks Board Tree Committee, City staff (Planner and Public Works), business/property owners, organizations and residents may want to consider the following checklist before planting trees:

1. Does this tree (or trees) add value or potential harm to the planting site?
2. Are there overhead power lines this tree could interfere with as it matures?
3. Are there underground gas, water, sewer, fiber or cable lines the root system of this tree will interfere with as it matures?
4. Is there a way to water this tree and a commitment to do so on-going?
5. Is the height and width of this tree at maturity going to impact rights-of-way, visibility or property boundaries?
6. Does this tree have enough spacing to support its expected width or does the spacing/location need adjustment?
7. Can this tree be protected from car parking, plowing, animals, and mowing or other yard equipment damage?
8. Can this tree be protected from insects and disease or is it a really bad choice in light of known issues in the area?
9. Does the planting location have soil or ground cover required to sustain growth (what mitigation may be required)?

The number of potential tree planting sites in public locations is not nearly exhausted. Improvements to overall public tree fitness may also increase with continued consultation with local area nurseries, DNRC and Arbor Day nurseries. The number and variety of trees in public spaces will continue to increase though guidance of cost-share and Arbor Day programs, but are not limited to those choices or activities. Red Lodge residents independently demonstrate their enthusiasm for tree planting whether or not all plantings are successful. The proof is in the number of street trees (and stumps) recorded in City rights-of-way that are not recorded as program trees.

Natural Areas

Natural areas are relatively undisturbed. The typical resident also considers them to be "natural," because of their size and location. These areas tend to occupy land considered unbuildable due to poor accessibility, rugged topography, or inappropriate hydrology, such as steep slopes between the benches and the valley floor, the Rock Creek corridor, and corridors along various ditch systems. Other types of natural area in this category may include: flood plains, wetlands, ponds, waste areas, abandoned land and old landfills and mine waste at Coal Miners Park.

Activities occurring in natural areas range from casual recreation to no activity at all. Increasingly, these areas are seen as valuable components of Red Lodge's environment, because of their aesthetic qualities and their value as natural habitat. As additional development occurs within and around Red Lodge, the value of these areas as open space, wildlife habitat and natural appearance will increase as will the value of these areas for additional development.

Coherent tree and park management policies for these types of areas have not been developed. They typically receive little or no maintenance, and are left to their own devices. These areas have been disturbed by human activities at some point in their history. In most cases, these areas are in some stage of plant succession as wild plants and animals re-establish themselves. For these areas it is recommended to:

- Maintain existing native trees that enhance or maintain the feeling of a "natural" environment by preserving an "uncontrolled" appearance;
- Use native species such as aspen and cottonwood if planting new trees in riparian or wetland areas;
- Plant numerous seedlings rather than potted or burlap trees that have less chance of survival without consistent maintenance (e.g., water);
- Conduct small patch clear-cutting in old and decadent aspen stands to stimulate suckling development;
- Forego tree planting in sage and grassland habitat (e.g., airport area or grassed over coal refuse at Coal Miner's Park) unless portions or the entirety of these areas will be converted to other uses, such as managed parklands. If such conversion is planned, long-term maintenance needs should be accounted for and funded. Until such a plan is in place for a specific natural area, priority should be on addressing physical tree hazards, such as hazardous dead trees or overhanging branches above trails, parking areas, picnic tables, etc.
- Follow the recommendations for creating native landscapes (NRCS, 2008) if natural areas are to be converted to manage tree areas.

The recommendation to forego tree planting in sagebrush and grassland habitat applies to the newly dedicated south Airport Extension (Van Dyke Park) including the West Bench hiking trails near the rodeo grounds. The only area with trees is adjacent to the ditch where balsam poplars dominate. These trees require little or no management.

Managed Areas

Managed areas are all developed areas within Red Lodge and include residential neighborhoods, business districts, streetscapes and City parks. Overall, tree plantings in managed areas should be conducted in a manner that increases species diversity. Public lands plantings of spruce, aspen, cottonwood, green ash, or mountain ash should be discouraged until the respective percentages of these species fall below 10%. Future plantings under wires should include tree species that will never attain a height to interfere with the wires (Appendix B).

Addressing human safety concerns in managed areas should be the highest priority. This includes tree removal and/or trimming to prevent death or injury due to overhead hazards, blocked traffic signs, obstructed sidewalks, etc. Pruning and tree removal should also be accomplished so as to prevent damage to park infrastructure (buildings, picnic tables, playground equipment, etc.) and to prevent damage to utilities (overhead wires or underground utilities). As noted in the tree inventory, 360 public trees are in need of immediate attention.

Small and /or recently planted trees should be routinely evaluated and pruned by a certified arborist. Preventive pruning while a tree is young can prevent numerous future problems and save the City thousands of dollars down the road.

Cavities can create unseen damage such as rot in the branches, trunks, and roots. Trees found to have large cavities should be further examined by a certified arborist with an instrument such as a resistograph to determine if the tree is sound enough to remain on public property. Trees deemed unsound should be removed and replaced.

The City should develop a process to efficiently notify property owners when their street tree presents a safety hazard to others and must be maintained. Notification should be done in writing and include a time limit (e.g., 30 days) to address the problem tree(s). Per Ordinance 919, if the tree is not maintained within the time period specified, the City could hire an arborist to perform the maintenance and bill the property owner or develop a system to cite and fine negligent property owners.

Developed City Parks such as Lions Park, Field School Park, and Skate Park should have site plans developed that include locations of specific tree planting sites and existing and planned infrastructure. This is to help manage limited recreational space, avoid future conflicts in park use, and prevent tree loss in areas where conflicts do occur and trees

need to be removed. The 2 Arbor Day trees planted in the Skate Park did not survive because they were not protected. Future plantings should consider trees within this park are in conflict with skate behavior and the concrete environment.

In parks and City owned boulevards in and immediately adjacent to the Rock Creek riparian corridor (Rotary Park, Finn Park, portions of Coal Miners Park, Creekside Park (and streets adjacent to the creek), management emphasis should focus on maintaining existing cottonwood and aspen trees. This will require trimming large dead branches from cottonwood and ensuring that new saplings growing in the area are protected and managed.

Rotary, Creekside, Finn and east side of Coal Miners Parks should be left in a natural state with minimal pruning along trails only. It may be worth experimenting with removal of one or two of the most decadent large cottonwoods and attempting to foster new growth from the root mass around the stump. To ensure sustainability of riparian forests, small cottonwood and aspen saplings in Finn and Rotary Park adjacent to Rock Creek should be fenced or protected with plastic “vear” cylinders to prevent damage and compaction by park visitors and clipping during lawn mowing.

Residential neighborhoods in Red Lodge typically consist of small private lots with small strips of City-owned lands. Some areas have sidewalks with boulevards and curbs. Others have none. For property owners who utilize the boulevard areas for trees and landscaping, it must be emphasized that it is their responsibility “to prune such trees in such manner that they will not obstruct or shade the street lights, obstruct the passage of pedestrians on sidewalks, obstruct vision of traffic signs, or obstruct view of any street or alley intersection”.

Forty percent of homes in Red Lodge are seasonal and a large number of properties are maintained as rental/income properties. Perhaps absentee owners and their renters are not aware of their responsibility for these public trees or maybe they don’t maintain them out of sheer neglect. Either way, there are many trees that violate ordinance 919. It is recommended that the City attempt to educate property owners of their responsibility and provide incentives for them to maintain their boulevard trees, or as a last effort, enforce the ordinance and cite the landowner.

Subdivision regulations and zoning ordinances should require the developer to plant new trees along new street construction and parking lots. This will help reduce heat absorption into concrete/pavement and keep the surrounding area cooler in addition to helping beautify the area. It is equally important to consider street-side, sub-terrain watering systems along new planting strips to ensure vigor of planted trees.

Tree planting in managed areas should be limited to locations where trees can be adequately watered the first couple years or during drought, fenced to prevent damage from wildlife (mostly deer and moose), staked to prevent wind damage, and otherwise maintained. Tree spacing, placement and species selection should be of primary emphasis to avoid future conflicts with overhead wires, underground utilities and pedestrian walkways.

The 2017 survey focused on identifying trees in City parks that present a potential problem for recreationists who walk or bike the trails, park cars at trail heads, or barbecue and picnic at the picnic tables. Trees identified for removal or pruning should be addressed as soon as possible.

Haggin and Platt Avenues show the greatest number of potential planting sites during both the 2008 and 2017 surveys. However, it is likely that homeowners along the streets may not want to have trees planted on the street-sides adjacent to their houses because these are currently used as parking areas. The “Complete Streets” program would help create the boulevard environment (planting strips or cutouts) needed to improve the urban forest. Shade trees and shrubs included as an integral part as the design would help to enhance the neighborhood appearance of these streets, leaving parking areas intact, and providing partial shade during the hot summer months. Drip irrigation would be recommended in order to insure the long-term survival of the trees.

Monitoring and Evaluation

The City of Red Lodge has built and maintains a comprehensive GIS database of public trees with the completion of the 2008 tree inventory. A separate layer of data for the 2017 tree inventory is managed within the City GIS. Just like

the trees included in the inventory, the database needs maintenance. This involves, at a minimum, updates when trees are planted, removed and maintained by contracted service providers. The custom GPS/GIS program developed for the tree inventory can and should be used to update tree records on going. Updates to the inventory may be managed within the City's GIS database year-over-year leading to the next full 10-year inventory.

It is also recommended that the City develop a rotation schedule for evaluation and maintenance of trees on public lands throughout the City. Hiring a certified arborist to evaluate trees in specific areas and recommending specific work could accomplish this. Perhaps boulevards on City streets could be targeted in even numbered years and City avenues on odd numbered years. Regardless of the schedule, it would need to remain flexible to account for possible widespread or localized events (weather, insects, or diseases) that impact trees. Dependent upon complexity of the work and available budget, the work could be accomplished by an arborist, contractor, City employees, and/or volunteers. The City maintains its awareness that urban forests are dynamic and that all trees need ongoing monitoring and maintenance on a rotational basis.

While beyond the scope of this tree management plan and inventory, it may be worth conducting a future inventory of trees on privately owned residential lands within the City to allow for City lands tree management to account for the total species composition and for insect/disease considerations involving private lands trees. Such an inventory would also be a valuable public outreach and education tool.

2017: A great deal of data has been generated from the 2017 tree survey. It has been instructive to compare the results of this current survey with that of 2008, particularly with regard to the number and location of potential planting sites. We found that trees planted during the intervening nine years, with funds provided by various Red Lodge Tree program grants, have filled almost 26% of the potential planting sites identified in the 2008 survey. If the Red Lodge tree program maintains the same planting schedule or even increases the number of new trees planted per year, more than half the planting sites will have trees in another ten years.

We also note that it is important to continue to add native tree species to the mix of new plantings because they are the ones that appear to have the highest survival rates in severe snow and ice storms like the one that hit Red Lodge in September 2017. Engelmann spruce, lodgepole pine, and Douglas fir handled the storm with very little, if any, damage. The challenge to planting any of these evergreens is that they are undesirable in rights-of-way due to their intrusive root systems, potential to block visibility at ground level and their potential to conflict with wire lines approaching mature heights. Park locations would best suit any of these evergreens.

It is desirable that the City of Red Lodge hires an arborist to prune, adjust tree cages, remove dead trees, grind stumps, and conduct other tree care for the City. It is the culture and environment of this town including its urban forest, the baskets of flowers, parks and benches and large shade trees that attracts tourists and engages our residents. We must not only maintain it, but also continue to improve it.

Public Education

Public education and awareness of tree management needs, methods, and responsibilities is lacking in Red Lodge. The following recommendations to help educate the general public on the value and responsibilities of urban tree management could all be included for viewing on the City's website and are under consideration:

- The City of Red Lodge does maintain a public "Urban Forestry" website that includes a copy of the Urban Forestry Management Plan, a list of recommended species for planting in Red Lodge and a link to Ordinance no 919 outlining tree regulations and responsibilities. Public awareness is lacking and the City and Parks Board should take more proactive steps to campaign for urban forestry and highlight the availability of information and the legal responsibilities of property owners along landscaped streets. The campaign may include a series of tree care articles in the local newspaper or the production and Citywide mailing of a pamphlet, which outlines existing City tree ordinance 919, and recommended species lists to be kept handy.
- The City might consider placing placards along representative trees to identify species and year planted. Placards could also be used to recognize donations of trees or tree maintenance in remembrance of loved

ones. The town of Townsend is a City that successfully implemented a tree identification program using placards.

- Maintain and distribute a list of certified arborists that are available to work in the Red Lodge area for the City and private landowners. Solicit contact information from local and regional arborists.
- Distribute “Call before you dig” pamphlets to protect the public safety with regard to excavations near underground utilities.
- Given persistent damage from weed whackers, tight trunk guards, undersized cages presenting mechanical damage to limbs, etc., education should focus on avoiding such damage in the future. Mulch and weed cloth placed around tree bases could be utilized to prevent the need for weed trimming and also increase the amount of water reaching tree roots.

2017: All of the 2008 suggestions for public education are still necessary and important. The 2017 Tree committee designed a door hanger to instruct residents about proper tree care and maintenance. Additional literature will be made available to residents reminding them of their responsibilities involving care of trees in planting strips in front of their property. The Parks Board tree committee has plans to present UFMP summary and recommendations to non-profit groups, local nurseries, public via City website at various public events and gatherings.

Business and homeowners who are permanent residents and those who are absentee, must assume their responsibility to water the trees on City planting strips and cut-outs adjacent to their properties. Volunteers have watered Red Lodge Program trees in the downtown business area from 2015 to 2017. Without dedicated volunteers, businesses and property owners need to assume that responsibility.

City Ordinance

The City of Red Lodge repealed ordinance 810 and other tree regulations into one consolidated ordinance, No. 919 (approved Nov. 2015). Ordinance 919 regulates tree care, responsibility of City and property owners and aligns to recommendations of the Red Lodge Urban Forestry Management Plan. As the Urban Forestry Management Plan is reviewed each 5 years and updated every 10th year following a tree inventory, the ordinance consistently guides the City and community according to the changes and needs of the urban forest. A complete listing of the ordinance and all its provisions is provided in Appendix A.

Ordinance No. 919 provides a good basis for City tree management, a well-defined set of regulations and 3 primary goals that may change through time due to more frequent tree inventories and updates of the Urban Forestry Management Plan (UFMP). The ordinance mimics the goals and identifies the terms of tree planting, care, management and authoritative roles and regulations that support the UFMP. Each the ordinance 919 and the UFMP are central to developing and sustaining a healthy and vigorous forest. Alignment of each to the other should be checked though time relative to updates of tree inventory and analysis.

Primary Goals

It is recommended that the City adopt the following 3 primary goals for its urban forestry management plan and adjust strategies toward meeting those goals according to tree inventory updates:

Goal 1. Prevent a net loss of trees by maintaining a healthy and diverse urban forest

- **Establish and maintain appropriate diversity in tree species and age classes to provide a stable and sustainable urban forest**

Trees have finite life spans and, in urban forests, must be removed as they die. If areas are planted to a single species at one time, a large percentage of the trees will need to be removed over a short time period when they reach the end of their useful life. This results in a rapid reduction in canopy cover, and the loss of many of the benefits provided by the urban forest. This undesirable situation is less likely to occur if the urban forest is composed of a variety of tree age classes, sizes and species.

Continue to establish and maintain appropriate diversity in tree species and age classes to provide a stable and sustainable urban forest

- **Establish and maintain the maximum sustainable amount of tree cover on public and private lands in the City;**

Trees offer many benefits as described in the introduction of the plan and the benefits increase as canopy cover increases. By establishing and maintaining maximum tree cover, the community is able to realize the maximum benefits the urban forest can provide. The maximum amount of tree canopy that Red Lodge can support must be determined by realistically analyzing limitations posed by land use and City resources (budget and workforce).

Encourage new shoots and growth of younger black poplar and quaking aspen along naturalized private and public park banks, stands and groves (such as Finn and Rotary Parks and properties along Rock Creek the length of the City). Recreational use, grass mowing, debris or erosion from flooding or other natural occurrences may inadvertently harm new growth. It's becoming more critical to coax and protect young trees to increase age diversity and ultimately replacement of aging trees within Red Lodge's parks.

Goal 2. Preserve existing trees to the maximum extent reasonable and feasible

Maintain City trees in a healthy and nonhazardous condition through good arboricultural practices

Cultural practices have a major impact on the health of urban trees. Proper and timely pruning can promote good tree structure and health, whereas topping and other improper pruning techniques can result in hazardous structure and decay. By providing for proper tree care and eliminating destructive practices, communities can go a long way toward maintaining their urban forests in a healthy and safe condition.

While maintaining and protecting naturally forested areas, monitor and protect deforested areas that should be sustained without addition of trees or shrubs that may threaten or diminish those environments (bench grasslands and sage meadows).

Goal 3. Where possible, increase trees proportional and/or greater to population growth

- **Increase tree density in existing residential locations**

Projects such as the reconstruction of Haggin Avenue from 1st Street to 17th Street as itemized in the Capital Improvements Plan 2015 – 2019 present the greatest synergy for urban forest management. What better time to design planting strips, irrigation or drainages and defined parking better suited for street trees? As of February 2017 this project is unfunded and its future implementation is yet to be determined. The Parks Board and Public Works department may work together on a plan as the work is prioritized and funded.

Wherever and whenever the City Public Works is engaged in planning or implementing Storm Sewer projects that cause major reconstruction of city streets, it would be advantageous for the Parks Board to explore what may be done to redefine or support planting strips for public trees at that time.

- **Include tree planting and management into plans for housing and business development**

Any multi-family housing or commercial development projects within the City should be in keeping with urban forest management plan's listing of recommended tree species. The City continues to seek any opportunities to partner with developers for a plan or commitment to plant street trees, park space with trees or landscapes suitable to the location and/or irrigation to support privately owned trees along street rights-of-way.

Businesses account for temporal fluctuations of populations and should be held accountable for a share of the urban forest and helping to match the proportion of trees to people. It's the lure of businesses that increases the amount of traffic, noise, heat, CO2, etc. that forest management contends with. The City and Parks Board should especially look for partnerships with city businesses to improve the forestry of the core business district (between 8th Ave N. and 14th Ave S.).

Support of Ordinance No. 919

The Parks, Trees and Recreation Board together with City of Red Lodge shares a great deal of the responsibility for implementation of Red Lodge's Urban Forest Management Plan including a 5 year review and a 10 year revision. The UFMP should be kept consistent with updates to the tree inventory. The tree inventory should be reviewed every 2 years focusing on updates of annual activities and a complete re-inventory at least every 10 years.

Red Lodge is fortunate to have residents and groups that seek partnership and engagement with the City and Parks Board to the benefit of our urban forest. As in any municipality, there are several challenges to the Tree Regulations Ordinance and therefore to urban forestry management in Red Lodge:

- Public awareness and compliance
- Enforcement
- Level of training and tree knowledge among Parks Board, Public Works and other City staff
- Coordination with utilities, business and community organizations, property owners and residents
- Budget and services for unforeseen immediate maintenance of trees, shrubs, bushes in response to storms
- Ordinance and UFMP both state they are inclusive of shrubs and other vegetation that may be key to enhancing and supplementing a healthier, more complete urban forest in Red Lodge. Currently, each UFMP and ordinance is very tree-centric.

In addition to the 3 primary goals referenced above and within Ordinance 919, the Parks Board and/or City of Red Lodge offers supporting documents and procedures, active participation and continuous ideas for improvement as outlined below:

- **Foster community support for the local urban forestry program**

To achieve urban forestry goals, the local government needs the support of the citizens in the community. In most jurisdictions, the overwhelming majority of the trees, which make up the urban forest, are on private property. The care of these privately owned trees is up to the residents of the community. A local government cannot completely control tree management on private lands, but it can take steps to promote proper management of privately owned trees.

The Parks Board is encouraged to attend and participate in various DNRC conferences, Arbor Day learning programs and other State Urban Forestry presentations. Based on the availability of volunteers, any knowledge gained or practices may be shared with the community.

- **Encourage good tree management on privately-owned properties**

Earth Day or Arbor Day events provide Parks Board members an opportunity share tree care tips and brochures with the public. At the local 2017 Earth Day event, the Parks Board and Republic Services^R handed out 200 free pine saplings along with instructions for planting.

The Parks Board designed and printed door-hangers that may be left with residents to gently recommend various adjustments or solutions for improved tree maintenance.

The number of ideas and opportunities to engage, inspire and encourage tree planting on privately owned property is unlimited and will continue to change through time.

- **List trees preferred or not preferred for planting in Red Lodge**

Within the UFMP, the City maintains a preferred tree list for Red Lodge (Appendix B). This list was originally provided by DNRC, reviewed and modified by a local nursery and other knowledgeable people to make it more pragmatic to the City's growing environment and consistent with the UFMP. This list is periodically reviewed and modified every ten years in conjunction with next City tree inventory. The listing is also available to the public via City of Red Lodge website under Urban Forestry (<http://cityofredlodge.net/wp-content/uploads/2015/10/Preferred-and-Prohibited-Tree-Species-.pdf>).

- **Provide Permitting process for right-of-way tree planting**

The City has established a "Landscaping Permit" and permitting process for new tree plantings as required by Ordinance 919. Implementation is a high priority for the City. Without a permitting process in place, the City has no way to ensure that street tree selection and placement conforms to municipal standards. The permit is available to the public via City of Red Lodge website under Urban Forestry <http://cityofredlodge.net/wp-content/uploads/2015/10/Landscaping-Permit-1.pdf> or by request at City Hall.

- **Provide Tree Care Guidelines and Recommendations**

The Parks Board makes available "prescribed guidelines" for the spacing of trees and written recommendations for pruning and trimming. The City has adopted the Tree Owner's Manual (http://cityofredlodge.net/wp-content/uploads/2015/10/tree_owners_manual_web_res.pdf) to provide tree planting and tree care guidelines for the citizens of Red Lodge. The Tree Owner's Manual, which is easily reproduced and available for free public use, is similar to a car owner's manual and includes a parts list, instructions for installation, tips for troubleshooting common issues, recommended service, and more.

Administration

It is in the best interest of the City to have an employee of the Public Works Department trained and certified as an arborist. Given the ongoing tree care needs of the City, an "in-house" arborist would likely save Red Lodge thousands of dollars each year if that person could do the work currently being completed by contractors. The initial cost to shift tree care responsibility to Public Works would initially be high due to training costs and additional equipment that would be need to be purchased (boom truck, saws, harnesses, etc.). However, the return on investment would quickly be realized especially if grant money were secured to cover startup costs. Until this occurs, a professional arborist should be hired under contract to perform tree maintenance as needed.

It is recommended that the annual budget for City tree management be increased to approximately \$16,000 per year based on actual expenses from the Parks budget tracked over the past 10 years and to protect the investment Red Lodge has made in their community forest. The tree budget is likely to fluctuate due to any number of unforeseen environmental events and impacts. This could be accomplished by expanding tree cost-share programs, soliciting sponsorships or donations for tree planting and maintenance in parks, offering "good will" opportunities to local or national businesses, pursuing grants through the Montana Urban and Community Forestry Association, and continuing programs such as Tree City USA and annual Arbor Day grants.

Potential and Continued Tree Programs

Public/Private Cost Share Program

To encourage additional planting of trees, the City implements a cost-share program for "boulevard" trees that began in 2013. Under the cost share program, the City and landowner split the cost of purchasing and planting new trees in boulevards adjacent to the landowner's residence. Landowners are responsible for irrigation and other routine maintenance (pruning, fertilizing, protecting, etc.) after the tree is planted. The cost, number and types of available trees are determined annually with dependency upon City funding and evaluation of previously planted cost share trees. City staff advertises the program each spring with public announcements and flyers.

Tree City USA

The City of Red Lodge is an 18-year participant of the Tree City USA program and should maintain its good standing

along with 41 other communities across Montana. The program offers continuously updated information about tree care, urban forestry management, and recommendations for training and community celebration.

<https://www.arborday.org/>

The City should leverage free enrollment in the Tree Board University training for its current and future Parks Board members and Public Works members including any interested community volunteers. The link/login for training is available on-line: <https://www.treeboardu.org/>. This is a great resource for building tree knowledge among local volunteers and sharing that information with the community. Increased local education and training may make Red Lodge eligible for additional grants or awards administered by the Arbor Day Foundation.

Seedling Program

The Montana Conservation Seedling Nursery, in cooperation with the Montana Extension Service, local Conservation Districts and the Natural Resources Conservation Service, offers low cost tree and shrub seedlings for use in conservation plantings. It is important to note that purchase of trees through this program cannot be for landscaping purposes and that trees offered for sale are generally small tree seedlings. The City can work with the local County Extension Agent or Conservation District personnel to identify conservation planting needs where this program could be utilized. These would include windbreaks, stream bank stabilization/restoration, erosion control, living snow fence, wildlife planting, or reforestation. More information about this program is available at:

<http://dnrc.mt.gov/forestry/Nursery/>

Tax Incentives

A tax or utility bill credit program could be instated in the City of Red Lodge to offer incentives for planting trees. Similar to a State of Minnesota proposal, a refundable tax credit for tree-planting expenses equal to 25% of eligible expenses for each qualifying tree could be offered ([www.taxes.state.mn.us/legal_policy/.../hf0921\(sf0955\)_1.pdf](http://www.taxes.state.mn.us/legal_policy/.../hf0921(sf0955)_1.pdf)).

To encourage survival, it is suggested that any tree planting credit be contingent upon the tree surviving two growing seasons. Such tax credit programs could be beneficial in Red Lodge, in that additional tree canopy would likely be planted on City lands.

Montana Urban and Community Forestry Association (MUCFA) City/Utility Agreement

Red Lodge should negotiate and maintain a formal agreement with Northwestern Energy for Tree Removal and Replacement where trees within rights-of-way present conflict with overhead power lines. The model that's been made available for a city and utility agreement provides for a win/win agreement between both parties and may be suited to the individual challenges and goals of the particular city seeking agreement.

Utility companies utilize City rights-of-way for the purpose of locating, operating and maintaining transmission and distribution power lines. Conflicts often arise when utility companies need to remove problem trees (trees that are dead, diseased, constitute a hazard, or are a public nuisance) growing within the City rights-of-way. The Montana Urban and Community Forestry Association (MUCFA) has developed a model City/Utility Company Tree Removal and Replacement Agreement.

The model is based on an agreement negotiated between the City of Helena, MT and NorthWestern Energy Company in 2013. The Agreement provides a model for cities/towns, and utility companies to negotiate and define roles and responsibilities for eliminating problem trees and planting new trees suitable to the location.

MUCFA made the model Agreement available for use by city/town officials and utility companies. The Agreement is available on the MUCFA website at: <http://dnrc.mt.gov/Forestry/Assistance/Urban/mucfa.asp>.

Chapter 4. Workplan

The following table is a recommended 10-year work plan for City of Red Lodge to manage its urban forest.

City-managed public trees number 641 while the rest (592) is the responsibility of property owners or residents. Property owners are, by ordinance 919 (Appendix A), responsible for maintaining trees adjacent to their property and planted within public rights-of-way. With the City responsible for over half of all public trees, it cannot afford to defer care of younger trees requiring greater attention during their earliest 2 – 3 years. The costs of caring for younger trees are expected to stabilize toward the end of a 10-year cycle after planting, but there is a constant cycle of newly planted trees to tend to.

The general strategy for the tree care portion of this work plan is to immediately address tree safety hazards (predominantly among larger, mature trees), followed by immediate maintenance of younger or struggling trees, then routine maintenance among the general population of trees. Grant applications to DNRC for program development should be completed every year provided City staff resources are able to apply for and administer the grants. Arbor Day grant applications should be submitted annually to the DNRC.

Year	Objectives / Tasks
2018 Yr.1	<ol style="list-style-type: none"> 1. Review and modify (if necessary) the recommended tree list for Red Lodge (mid-Feb) 2. Revise UFMP using 2017 tree inventory data and & obtain City Council adoption (by end of March) 3. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 4. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 5. Parks board members and/or City employees attend tree maintenance and management training (as available) 6. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 7. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 8. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 9. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 10. Implement cost-share tree planting program (June) 11. Implement Arbor Day tree planting and host celebration (June) 12. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 13. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 14. Apply for DNRC Arbor Day grant (by end of Dec.) 15. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 16. Develop strategy to engage and enlist volunteers to support urban tree care/growth 17. Solve water delivery problem for core business district (~150 trees) – public works or other 18. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
2019 Yr.2	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures)

	<ol style="list-style-type: none"> 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
<p>2020 Yr.3</p>	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host "Parks, Trees, Rec" Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
<p>2021 Yr.4</p>	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host "Parks, Trees, Rec" Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
<p>2022 Yr.5</p>	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall)

	<ol style="list-style-type: none"> 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Review UFMP and determine if mid-term updates/adjustments are needed 12. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 13. Apply for DNRC Arbor Day grant (by end of Dec.) 14. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 15. Develop strategy to engage and enlist volunteers to support urban tree care/growth 16. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
<p>2023 Yr.6</p>	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
<p>2024 Yr.7</p>	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.)

	<ol style="list-style-type: none"> 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
2025 Yr.8	<ol style="list-style-type: none"> 1. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 2. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 3. Parks board members and/or City employees attend tree maintenance and management training (as available) 4. Plan for Earth Day and/or other Event to host "Parks, Trees, Rec" Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 5. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 6. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 7. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 8. Implement cost-share tree planting program (June) 9. Implement Arbor Day tree planting and host celebration (June) 10. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 11. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 12. Apply for DNRC Arbor Day grant (by end of Dec.) 13. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 14. Develop strategy to engage and enlist volunteers to support urban tree care/growth 15. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
2026 Yr.9	<ol style="list-style-type: none"> 1. Apply for DNRC Program Development Grant to conduct tree inventory 2. Contract Urban Forestry-related professional to lead inventory 3. Re-inventory public trees & conduct analysis 4. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil, fertilization and/or pruning (spring) 5. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall) 6. Parks board members and/or City employees attend tree maintenance and management training (as available) 7. Plan for Earth Day and/or other Event to host "Parks, Trees, Rec" Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute) 8. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April) 9. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June) 10. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures) 11. Implement cost-share tree planting program (June) 12. Implement Arbor Day tree planting and host celebration (June) 13. Update City trees GIS (add program trees, immediate maintenance tree status, etc.) 14. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.) 15. Apply for DNRC Arbor Day grant (by end of Dec.) 16. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation 17. Develop strategy to engage and enlist volunteers to support urban tree care/growth 18. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff
2027 Yr.10	<ol style="list-style-type: none"> 1. Revise UFMP using 2026 inventory data and analysis 2. Review and modify (if necessary) the preferred and prohibited tree list for Red Lodge ROWs & public land 3. Amend City tree ordinance if recommended (in UFMP) 4. Assess City-managed public trees and contract with certified arborist, evaluate and treat for pine weevil,

fertilization and/or pruning (spring)

5. Contract services to provide routine maintenance of sprinklers along HWY 212 N (bring up in spring, turn down in fall)
6. Parks board members and/or City employees attend tree maintenance and management training (as available)
7. Plan for Earth Day and/or other Event to host “Parks, Trees, Rec” Activities (Park grooming/cleaning/adoption) – March (Plan) & April (execute)
8. Community Outreach & Education – Parks board prepare and present Tree Program Plans & urban forest management plan summary & recommendations (April)
9. Assess/update public tree maintenance recommendations & prepare budget estimates (May/June)
10. Assess privately managed public trees and implement tree care notification process (late spring, through summer into fall – leave door hangers/tree care brochures)
11. Implement cost-share tree planting program (June)
12. Implement Arbor Day tree planting and host celebration (June)
13. Update City trees GIS (add program trees, immediate maintenance tree status, etc.)
14. Target planting sites and Apply for DNRC Program Development grant to continue cost-share tree planting program for the next year (mid Oct.)
15. Apply for DNRC Arbor Day grant (by end of Dec.)
16. Coordinate with Northwestern Energy/Beartooth REI to maintain Tree Line USA participation
17. Develop strategy to engage and enlist volunteers to support urban tree care/growth
18. Develop GIS views/access of City Parks, Trees and Recreation data for Parks Board members and City staff

Successful urban forest growth in Red Lodge and the strong desire to maintain it drives adjustment of this 10-year work plan. The extent of public trees and diversity successfully gained from 2009 to 2017 requires an adjusted budget and dedicated resources to ensure maintenance and sustainability of Red Lodge’s urban forest. The number of Red Lodge public or street trees continues to grow steadily year-over-year.

- The number and extent of City recreational trails continues to grow with progress among various trail user groups and linear park development projects
- The number of dedicated City parks has increased (Van Dyke and Creekside dedicated in 2017)
- The City’s responsibility to ensure safety along trails and in City parks increases with development.
- MDT planted approximately 93 public trees along HWY 212 north of 8th Street and within City limits as part of State highway project during 2014-2015 (Red Lodge 8th to Robinson project). This project included installment of a new irrigation system that also needs to be City-managed and maintained.
- An additional MDT project (Red Lodge Robinson to 2-Mile) is slated for 2022 and will add more public trees
- More severe and unseasonal weather events are likely to occur more frequently as the climate continues to change. Unplanned care for damaged trees is required to ensure public safety and forest health.
- Pine Weevil invasions continue to increase and measures to prevent and/or treat must be regularly met.
- Reliance on volunteers alone to water and care for City trees should not be assumed and does not guarantee sustainability, but rather uncertainty.

Resources and expertise are not easily begotten in a small, economically challenged City such as Red Lodge although to date, reliance on volunteers to maintain and support growth of the urban forest has been successful. Routine and immediate maintenance costs continue to increase among contracted labor, professional services, water services and materials. The work plan above represents estimates to sustain the urban forest and continue growth through the next 10 years (without an additional, non-voluntary water-delivery method for the core business district) and assuming a continuous high level of community volunteerism.

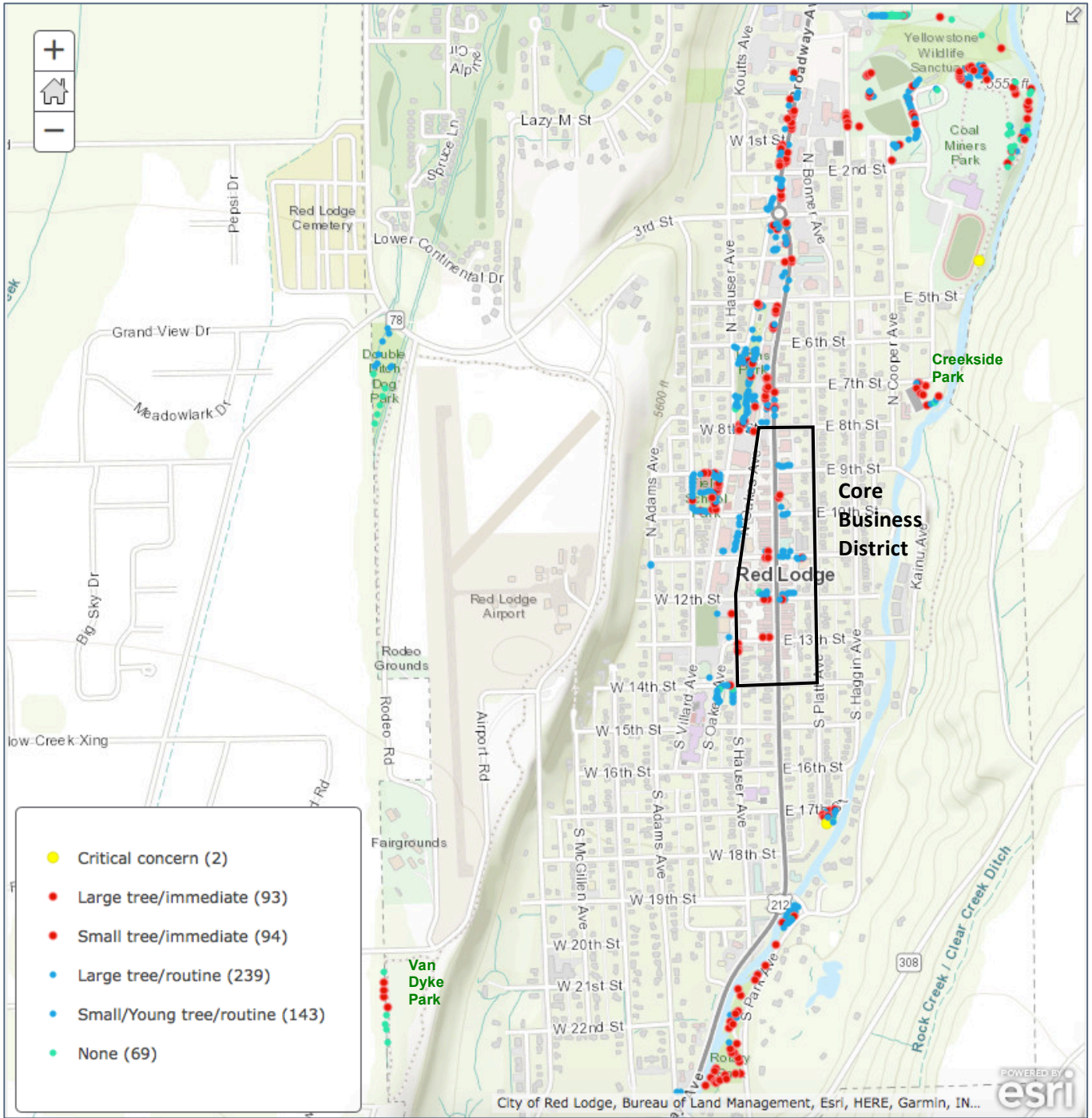


Figure 52 - MAP: City-managed public trees

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11/10/15

ORDINANCE NO. 919

An Ordinance establishing Title 8, Chapter 5 of the Red Lodge City Code concerning the regulations of trees on City owned land and City maintained public rights of way within the City of Red Lodge.

WHEREAS, the City of Red Lodge desires to consolidate its tree regulations into one Ordinance to include those currently identified under Title 8, Chapter 7, and

WHEREAS, The Red Lodge City Council desires to update the tree regulations to incorporate the recommendations of the Red Lodge Urban Forestry Management Plan, and

WHEREAS, the Red Lodge City Council has passed Ordinance 918 establishing Title 8, Chapter 7 of the Red Lodge City Code concerning the composition and the duties and responsibilities of a Red Lodge Parks, Trees and Recreation Board.

Now Therefore,

BE IT ENACTED BY THE CITY COUNCIL OF THE CITY OF RED LODGE, MONTANA:

A new Title 8, Chapter 5 (currently reserved), is hereby adopted as follows to be identified as Tree Regulations:

Chapter 5

Tree Regulations

Section:

- 8-5-1: Short Title**
- 8-5-2: Purpose**
- 8-5-3: Definitions**
- 8-5-4: Urban Forestry Management Plan**
- 8-5-5: Tree Inventory**
- 8-5-6: Street Tree Species List**
- 8-5-7: Spacing**
- 8-5-8: Utilities**
- 8-5-9: Public Tree Care**
- 8-5-10: Tree and Shrub Pruning and Trimming**
- 8-5-11: Tree Topping**
- 8-5-12: Abuse or Mutilation of Public Trees**
- 8-5-13: Planting of Trees**
- 8-5-14: Penalties**

8-5-1: Short Title.

This Chapter shall be known and be cited as the **TREE REGULATIONS OF THE CITY OF RED LODGE, IN THE COUNTY OF CARBON, STATE OF MONTANA.**

8-5-2: Purpose.

It is the purpose of these regulations to promote and protect the public health, safety and general welfare by providing for the regulation of the planting, maintenance and removal of trees, shrubs and other plants on City owned land and City maintained public rights of way within the City of Red Lodge.

8-5-3: Definitions.

As used in this Chapter, the following words and terms shall have the meanings ascribed to them in this Section:

- A. **Park Trees and Plants:** Trees, shrubs, bushes, and other beautification or landscaped plantings, now or hereafter planted or growing within parks within the city of Red Lodge.
- B. **Pruning:** The selective removal of plant parts to meet specific goals and objectives related to protecting the tree.
- C. **Street Trees:** Trees, shrubs, bushes and other woody vegetation, and grasses within City public rights of way.
- D. **Topping:** The reduction of a tree's size using head cuts that shorten limbs or branches back to a predetermined crown limit.
- E. **Tree Drip Line:** The area defined by the outermost circumference of a tree canopy.
- F. **Tree Inventory:** A geographic database containing information regarding street tree species, size, condition and geographic location.
- G. **Trimming:** Removing branches from shrubs and hedges, either for aesthetic, safety or clearance purposes.
- H. **Urban Forestry Management Plan:** A document that outlines a strategic approach to sustaining the City's community trees on a short and long-term basis

8-5-4: Urban Forestry Management Plan

The Parks Board shall oversee review and update of the Urban Forestry Management Plan. The primary goals of this Plan shall be to (1) prevent a net loss of trees by maintaining a healthy and diverse urban forest, (2) preserve existing trees to the maximum extent reasonable and feasible, and (3) where possible, increase trees proportional and/or greater to population growth. This Plan shall outline a strategic approach to sustaining the City's community trees on a short and long-term basis and shall be reviewed every five years and updated as appropriate.

8-5-5: Tree Inventory

A. Goals: The Parks Board shall oversee the development and biennial update of a tree inventory of street and park trees. The Parks Board shall utilize this inventory to prioritize tree maintenance needs, to plan for the community's future and to provide a basis for implementation of the Urban Forestry Management Plan.

B. Components: The tree inventory shall provide tree species, preferably in binomial nomenclature (Latin names, i.e. genus species), size such as DBH (diameter at breast height for deciduous trees) and tree height (for coniferous trees), canopy width, overall condition such a health and maintenance needs, overcrowding, possible problems, present or absence of insects or diseases. Characteristics of the site should also be listed such as soil type and condition, root space and safety.

C. Update: The tree inventory shall be reviewed every two years and updated as needed; and the results shall be examined as part of the Urban Forestry Management Plan.

8-5-6: Street Tree Species List.

The Parks Board shall maintain a list of trees preferred as well as trees not approved for use in parks, public rights of way and other City owned lands based on the ability to withstand insects, diseases and winter cold, and identified by species, growth rate, light requirement with advantages and disadvantages of each tree identified. Such list shall constitute the requirements of the City, be consistent with the landscaping requirements of the City of Red Lodge Zoning Ordinance and shall be open to review. In the event a tree is proposed that is not on the preferred list, the species genus of said tree may be proposed to be added to the preferred list. Said proposal will be reviewed and approved or denied by the Public Works Director in consultation with an ISA Certified Arborist or a licensed landscape architect.

8-5-7: Spacing.

A. Guidelines: The spacing of park trees and plants and street trees shall be in accordance with the prescribed guidelines provided by the Montana Department of Natural Resources and Conservation Community Forester, and included in the Urban Forestry Management Plan.

B. Street Intersections: Trees shall meet the intersection visibility and sight triangle requirements as defined in the Red Lodge Zoning Ordinance, Section 4.5.50, as amended.

C. Fire Hydrants: No tree shall be planted so as to obstruct the use of a fire hydrant as determined by the Public Works Director.

8-5-8: Utilities.

Street trees, shrubs and other woody vegetation shall not be planted under or within ten (10) lateral feet of any overhead utility wire, or over or within five (5) lateral feet of any underground utility or service connection.

Underground utilities include but are not limited to water mains and service connections, sewer mains and service connections, electrical lines, gas lines, telephone lines, fiber optic lines and cable lines.

8-5-9: Public Tree Care.

- A. **Rights of the City:** The City shall have the right to plant, prune, maintain, and remove trees, plants and shrubs within the right-of-way of all streets, alleys, avenues, lanes, squares, and public grounds as may be necessary to ensure public safety or to preserve or enhance the function or beauty of such public grounds. City Staff will make reasonable efforts to discuss major changes with the adjacent property owners before the work is done.
- B. **Authorized Tree Work:** Authorized tree work on or within parks, City lands or the public rights-of-way shall be completed by or in consultation with an International Society of Arboriculture (ISA) Certified Arborist or a licensed landscape architect. Consultation shall be initiated prior to work being performed or if such arborist is present while work is being performed. All other personnel utilized for work on or with trees or shrubs shall be trained to perform the work properly and safely.
- C. **Recommend Removal:** City Staff may recommend removal of any tree or part thereof that is in an unsafe condition or which by reason of its nature may be injurious to public sewer lines, electric power lines, gas lines, water lines, or other public improvements, or is infected with any injurious fungus, insect or other pests.
- D. **Tree Management Applications:** All application and/or use of pesticides, herbicides, insecticides and pheromones for purposes of tree management on City owned lands should be conducted by or under the supervision of a licensed applicator in accordance with product labels and material safety data sheets.

8-5-10: Tree and Shrub Pruning and Trimming.

A. Tree Pruning:

1. The City shall make available to the public the Tree Owner's Manual – National Edition, prepared by the Forest Service, U.S. Department of Agriculture as a guideline for pruning trees. An electronic copy shall be posted on the City's website and a printed copy of the manual shall be available for review at City Hall. Applicable guidebooks developed by the International Society of Arboriculture shall also be made available electronically on the City's website.
2. Pruning and trimming sponsored by the City shall be performed in accordance with the latest revision of the ANSI A300, an American National Standard for Tree Care Operations, and ANSI Z-133.1, Safety Requirements for Pruning, Trimming, Repairing, Maintaining Trees, and for Cutting Brush, or as otherwise in general compliance and approved by the City Council.

- B. **Public Right-of-Way Clearance:** Any person owning or occupying real property adjacent to any public right-of-way upon which property there may be trees shall have the responsibility of routine, maintenance care to include (1) watering, (2) pruning so as to not obstruct the passage of pedestrians on sidewalks, and other light pruning, and (3) raking and removing leaves. The City shall be responsible for pruning trees so they will not obstruct or shade the streetlights, obstruct the vision of traffic signs or obstruct the view of any street or alley intersection. Failure to adequately care for trees consistent with the intent of this section may result in the property owner being billed for pruning costs, related administrative costs and/or

fined. No live, diseased or dead trees that are located on public-right-of way shall be removed by private property owners unless approved by the Public Works Director.

- C. **Funding:** The Parks Board shall annually allocate sufficient funds to maintain the quality of Red Lodge's urban forest.
- D. **Public Utilities:** Any public utility maintaining any overhead or underground utilities shall inform the Public Works Director concerning any proposed maintenance work on the wires, pipes or conduits which would cause injury to street trees. The Public Works Director shall note to the utility any applicable issues to be considered.

8-5-11: Tree Topping.

The topping of park trees and plants or street trees or any other trees on publicly owned or administered property shall not be a normal practice. Trees severely damaged by storms or other causes, existing trees located under utility lines or other obstructions where other pruning practices are impractical as determined by the Public Works Director are excluded from the requirements of this Chapter.

8-5-12: Abuse or Mutilation of Public Trees.

A. **Damaging Trees:** Unless specifically authorized by the Public Works Director, through an approved written permit, no person shall intentionally damage, cut, carve, transplant, or remove any park trees and plants or street trees; attach any rope, wire, nail, advertising poster, or other contrivance to any park trees and plants or street trees; allow any gaseous liquid or solid substance which is harmful to such tree to come in contact with it; or set fire or permit any fire to burn when such fire or the heat thereof will injure any portion of any tree; allow or cause damage to the critical area root zone above and below grounds so as to damage park trees and plants or street trees.

B. **Trenching or Grading Within Drip Line:** At minimum, trenching or grading shall be prohibited within the drip line of such trees unless precautions are followed as agreed upon in advance and in writing by the Public Works Director. Such precautions could include, but not be limited to, marking trees designated for protection with site fencing or other means and preventing soil compaction by prohibiting construction materials from being placed on the ground within the drip line. The Public Works Director shall have the ability to halt development activity if it is found to be in noncompliance with such precautions or other elements of these regulations.

8-5-13: Planting of Trees in Public Spaces

A. **Permit Required:** The City encourages owners of real estate in the city to improve their premises by planting trees and properly cultivating, protecting and caring for the same in the streets or alleys adjoining their property; provided such trees, or the cultivation or protection thereof, shall in no case interfere with the full use of such streets for public purposes; and further provided, that no person shall plant any tree within the limits of any street, or alley in the city without having first obtained an approved City Right-of-Way Landscaping Permit so to do from the Public Works Director.

- B. Application for Permit:** It shall be the duty of any property owner to make request, in writing, to the Public Works Director stating the species and precise location of each street tree to be planted, and requesting permission thereof. The Public Works Director shall grant such permission if, after personal investigation, the Public Works Director considers the location such that it will allow the normal growth and development of the street tree and the proposed tree species is included in the City's list of preferred trees.
- C. Investigation and Issuance of Permit:** The permit shall specify the location, species and grade of each tree, the method of planting, including the use of a suitable planting mix to amend the native soil. No permit shall be granted unless in compliance with the provisions of this Chapter. Fees for the permit and investigation may be established by resolution of the City Council, and no trees shall be planted except in accordance with the terms of the permit. The Public Works Director shall have ten (10) working days after the receipt of an application to grant said permit, deny the same or approve with conditions. Any denial shall clearly state the reasons for said denial.
- D. Location:** It shall be unlawful for any person to plant any tree so that the roots thereof will reach beyond the property line of said person's property into the streets of the City in such a manner as to interfere with the use of such street or with the municipal wastewater collection system. In the event that roots from trees on privately owned lands cause such interference, the property owner will be required to remove the tree and/or roots. In the event that this does not occur, the property owner will be billed for removal costs, related administrative costs and/or fined.

8-5-14: Penalties:

Any person who violates any of the provisions of this Section shall be guilty of a misdemeanor and upon conviction thereof shall be subject to penalty as set forth in section 1-4-1 of the Red Lodge Municipal Code. Fines should be commensurate with what the fair market value of the trees would have been if they had been cared for in compliance with provisions of this Section.

Effective Date:

This Ordinance shall be effective 30-days after approval of a second reading by the Red Lodge City Council.


Be it ordained by the Council Members of the City of Red Lodge.

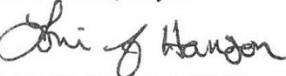
First reading by the Council on the 10th day of November, 2015

Second reading by the Council on the 24th day of November, 2015

PASSED AND APPROVED BY NO LESS THAN FOUR MEMBERS OF THE RED LODGE CITY COUNCIL THIS 24th day of November, 2015

The City of Red Lodge

By: 
Ed Williams, Mayor

Attest: 
Loni Hanson, City Clerk

Appendix B. Preferred and Prohibited Tree Species for Red Lodge

Trees require care throughout their lifetime, but especially in the first several years after planting. Plan carefully and select a tree that fits the intended site. Plant, water, fertilize, prune and protect from wildlife damage as instructed by a local nursery. Selecting trees to plant under wire lines requires consideration of the expected height at maturity. Trees marked with an asterisk are especially suited for planting under wires.

The ability of a tree to withstand insects, diseases, winter wind, and cold, can dependent on its overall health and vigor. The greatest single factor affecting tree vigor in our area is proper watering (which may include fall and winter watering). Another very important factor affecting the health of newly planted trees involves their root system. Many trees are sold in containers. While in containers, root system growth is inhibited. Plant containerized trees with careful attention to cut encircling roots and to untangle and flare roots out and down in the planting hole. With careful attention, these trees can provide our community with increased beauty and vitality in the years to come.

Preferred Trees

Cathy Ritter of the Rocky Mountain Flower Farm compiled the following list for the 2009 UFMP with help from Jim Fisher and Phil Robertson. Two trees are added to the preferred trees listing after evaluation of young trees surveyed during the 2017 inventory: oakleaf mountain ash and Dakota pinnacle birch (*Table 7*). Though they are not prohibited from planting, green ash tree varieties have been removed from the preferred list due to movement of the Emerald ash borer westward and its' inevitable arrival to Montana.

Table 7 - Trees preferred for planting in Red Lodge, MT (Hardiness Zone 4)

TREES UNDER 20 FEET TALL (REQUIRING 20 FOOT LATERAL SPACING)					
<i>*Trees especially suited for planting under wires</i>					
Species	Growth Rate	Light Requirement	Advantages	Limitations	Remarks
Arborvitae (Thuja occidentalis)	Fast	Sun to part shade	Grows well in shade, adapts to alkaline soil, there are many cultivars in a variety of shapes, tall varieties make a nice screen, evergreen	Best in semi- protected location from direct exposure to winter wind and sun, not deer resistant in areas with frequent damage	Popular cultivars are 'Techny' 10-12' or 'Techny Globe' 4-6'
Chokecherry, Amur (Prunus maackii)	Medium	Sun	Attractive early white flowers, small black fruit that birds enjoy, yellow fall color, exfoliating reddish bark (similar to birch)	None serious	May reach 25' tall
*Chokecherry, 'Canada Red' (Prunus virginiana 'Canada Red')	Fast	Sun	Very hardy, green leaves turn purple in summer, oval crown, fruit is an edible chokecherry loved by birds	Requires frequent sucker removal at base, susceptible to X-disease and Black Knot	Cultivar of native species
Crabapple, 'Coralburst' (Prunus 'Coralcole')	Medium	Sun	Compact rounded shape to 10' high, double pink-rose flowers, no fruit, highly rated for disease resistance	None serious	Flowers do not bloom early which can be beneficial with late frost
Crabapple, 'Prairiefire' (Malus 'Prairiefire')	Medium	Sun	Purple foliage in spring turns dark green on red stems, reddish flowers, small persistent fruit, highly resistant to diseases, spreading shape to 20' high	None serious	Flowers do not bloom early which can be beneficial with late frost
Crabapple, 'Radiant' (Malus 'Radiant')	Medium	Sun	Bronze foliage matures to green, early single deep- pink flowers, small persistent fruit, rounded shape to 20' high	Susceptible to apple scab in a wet season	
*Crabapple, 'Royalty' (Malus)	Medium	Sun	Extremely hardy, purple foliage, early red flowers with	May be susceptible to apple- cedar rust and powdery	

'Royalty')			persistent sparse fruit , rounded habit to 15' high	mildew	
* Crabapple, 'Spring Snow' (Malus 'Spring Snow')	Medium	Sun	Abundant early white flowers, fruitless , attractive uniform oval-shaped crown with dense foliage to 20' high	May be susceptible to fireblight and apple scab	
* Flowering Plum, 'Newport' (Prunus cersifera 'Newport')	Medium	Sun	Very attractive purple-red foliage turns reddish in fall, pale pink flowers, spreading shape	Some potential insect and disease problems	
* Flowering Plum, 'Princess Kay' (Prunus nigra 'Princess Kay')	Medium	Sun	Double-flowered selection of a Canadian wild plum, early white profuse flowers, orange- maroon fall color, round to oval shape, very hardy (seldom produces fruit)	Requires good drainage, some potential insect and disease problems, doesn't perform well when stressed	
* Hawthorn, Thornless Cockspur (Crataegus crus-galii var. inermis)	Medium	Sun	Attractive shiny green foliage and white flower clusters, persistent fruit (doesn't drop) , nice shape, purple fall color, good disease resistance	Prefers moist soil, slow to establish, potential insect and disease problems if stressed, prefers semi-protected location	
* Japanese Lilac Tree, 'Ivory Silk' (Syringa reticulata 'Ivory Silk')	Medium	Sun	Compact oval shape, attractive foliage, profuse large white flower clusters in July, easily grown, relatively free from pests	Requires good drainage, slow to establish	
Juniper (Juniperus scopulorum) * Juniper cultivars: 'Cologreen', 'Wichita Blue', 'Medora'	Fast	Sun	Deer resistant, drought resistant, cultivars available in a variety of sizes and shapes, evergreen	Requires good soil drainage and air circulation around foliage, do not overwater, may be subject to magnesium deficiency (treat first with Epsom salts and later with magnesium- rich fertilizer)	'Cologreen' (15-20'), 'Welchi' (10-12'), 'Wichita Blue' (10-15'), 'Medora' (10-12'), Rocky Mountain (30-40' - Montana native species)
* Maple, Amur (Acer ginnala)	Medium slow	Sun to part shade	Rounded shape, fragrant yellowish- white flowers in spring, brilliant red fall color, easy to transplant, tolerates wind, hardy	Abundant seed drop, best with regular watering, yellowing leaves in summer may indicate lack of water or need for chelated iron in soil, may experience temporary tip dieback after a severe winter, may need pruning at first	
* Maple, Tatarian (Acer tataricum)	Medium slow	Sun to part shade	Adaptable to a wide range of sites, yellow-orange fall color, taller and with better tolerance to alkaline soil than Amur Maple	Seldom has serious insect and disease problems	Early snow/ice load on leaves causes great limb damage and/or topping
Pine, Bristlecone (Pinus aristata)	Very slow	Sun	Very long-lived, irregular shape makes an attractive addition to rock garden or as an accent plant, evergreen	Susceptible to mountain pine beetle, white pine blister rust, scale insects	
Serviceberry, 'Autumn Brilliance' (Amelanchier x grandiflora 'Autumn Brilliance')	Medium	Sun	Symmetrical, upright spreading crown, white flowers in spring, brilliant red fall color, dark purple fruit loved by birds	Berries may attract unwanted wildlife, prefers moist well-drained soil, shape can be irregular when young	
TREES 20-40 FEET TALL (REQUIRING 30 FOOT LATERAL SPACING)					
Species	Growth Rate	Light Require-	Advantages	Limitations	Remarks

		ment			
Aspen, Quaking (Populus tremuloides)	Fast	Sun	Slender tree with delicate leaves that "tremble" in the breeze, hardy, adaptable, attractive white bark, yellow fall color	Needs ample moisture, not drought resistant, spreads by suckers	Montana native species
Aspen, Swedish Columnar (Populus tremula 'Erecta')	Slow	Sun	Narrow, columnar shape, leaves similar to Quaking Aspen, substitute for Lombardy Poplar for screening, seedless, red fall color	Needs ample moisture, insects and diseases can be a problem if drought-stressed	
Birch, Dakota Pinnacle (<i>Betula platyphylla</i> 'Fargo')	Medium	Full sun to partial shade	Dense deciduous tree with a strong central leader and a narrowly upright and columnar growth habit (35 x 10 width at base max).	Deer resistant, insect resistant and drought tolerant Very adaptable to both dry and moist locations, Not particular as to soil type or pH. Highly tolerant of urban pollution and will even thrive in inner city environments	Prune in summer after leaves fully developed Mulch around root zone in winter to protect it in colder microclimates Introduced through North Dakota using non-native N. American species
Birch, Paper (Betula papyrifera)	Fast	Sun	Very hardy long-lived birch, adaptable, white papery bark, turns yellow in fall	Susceptible to birch borer, leaf miner, various fungi, prefers moist well-drained soils	Montana native species
Birch, Water (Betula occidentalis)	Fast	Sun	Hardy multi-stemmed tree, cherry-brown bark, yellow-orange- red fall color	Needs moist, well- drained soil	Montana native species
Crabapple, Selkirk (Malus 'Selkirk')	Medium	Sun	Very hardy, foliage red at first then turning bronze- green, pink flowers, small red fruits, fireblight and apple- scab resistant, grows to 25' high	None serious	
Fir, Alpine (Abies lasiocarpa)	Slow	Part sun to shade	Montana native in subalpine landscape, attractive narrow conical shape with short, flat green needles, evergreen	Prefers acidic soil, does not tolerate heat well, do not prune	Try to purchase a tree that originated from a Montana nursery
Fir, Concolor (Abies concolor)	Slow	Part sun to shade	Pyramidal form, soft- silvery-blue needles, evergreen	Requires a sheltered environment (from wind and extreme cold) and well-drained soil	Also called white fir
Linden, 'Greenspire' Littleleaf (Tilia cordata 'Greenspire')	Fast	Sun	Symmetrical pyramidal form, very uniform, neat and tidy, fragrant flowers in June and July, yellow in fall	Prefers moist well- drained soil, if weakened may be susceptible to some insects and diseases	
Linden, 'Lincoln' (Tilia americana 'Lincoln')	Medium	Sun	Narrow pyramidal shape, tolerates alkaline soil, heat, drought, yellow fall color	Relatively pest- free	
Linden, 'Harvest Gold' (Tilia mongolica 'Harvest Gold')	Medium	Sun	Very hardy and adaptable, upright branching, spectacular gold fall color, exfoliating bark, no messy fruit	Relatively pest- free, does best with moist, well- drained soil	
May Day Tree (Prunus padus)	Medium	Sun	Early foliage and fragrant white spring blossoms, small black fruits in mid- summer are a favorite of birds, gold to	Does not tolerate heavy clay soils well, susceptible to Black Knot disease, fruit may attract unwanted deer and moose	

			bronze-red in fall		
Mountain Ash, European (<i>Sorbus aucuparia</i>)	Medium	Sun to light shade	Hardy, dense oval shape, clusters of white flowers in spring, orange-red berries in fall are loved by birds	Requires good drainage, watch for fireblight, sapsuckers, aphids, mites, moose and deer	Recommend 'Mitchred' cultivar - has narrow-oval shape
Mountain Ash, Oakleaf (<i>Sorbus hybrida</i>)	Medium	Full Sun	Upright, oval branching habit becomes more dense and rounded with age. White flower clusters in spring followed by showy reddish-orange berry like clusters. Foliage is dark green on upper surface, white pubescence on undersides.	This tree will tolerate poor soil and difficult growing conditions. Hardy to -40°F Maximum Elevation: 7,500 ft.	
Mountain Ash, Showy (<i>Sorbus decora</i>)	Medium	Sun to light shade	Smaller and hardier than European Mountain Ash, attractive white flower clusters, red fruit (loved by birds) and beautiful fall color	Requires good drainage, watch for fireblight, sapsucker, aphids, mites, moose and deer	Montana native species
Ohio Buckeye (<i>Aesculus glabra</i>)	Slow	Sun	Attractive rounded shape, yellow trumpet-shaped blooms in spring, fall color is yellow to orange-red, good choice for smaller yards	Needs protected location and moist loamy soil, some flower litter, susceptible to leaf scorch, seeds are toxic	'Autumn Splendor' cultivar has no leaf scorch
Pine, Limber (<i>Pinus flexilis</i>)	Moderately slow	Sun	Rounded open shape, tolerates wind and grows well in rocky soil, seeds are important food source for wildlife, evergreen		Montana native species
Pine, Austrian (<i>Pinus nigra</i>)	Fast	Sun	Withstands dry windy conditions and adapts to most soil types, drought resistant once established, evergreen	Some insect and disease problems, avoid fall planting	Windbreak, screen or specimen tree
TREES 40+ FEET TALL (REQUIRING 40 FOOT LATERAL SPACING)					
Species	Growth Rate	Light Requirement	Advantages	Limitations	Remarks
Ash, 'Fallgold' Black (<i>Fraxinus nigra</i> 'Fallgold')	Slow	Sun	Native of Manitoba, very hardy, narrow upright shape, seedless, attractive yellow fall color	Susceptible to male flower gall, borers	
Ash, 'Mancana' (<i>Fraxinus mandshurica</i> 'Mancan')	Fast	Sun	Nice upright oval shape, adaptable to most soil types, provides dense shade, striking yellow fall color, seedless	Smaller size than other ash, not as drought tolerant as green ash, may be subject to frost cracking and fungus	
Douglas-fir (<i>Pseudotsuga menziesii</i>)	Medium	Sun to part shade	Native to Montana, open pyramidal shape with decorative downward-hanging cones, evergreen	Requires moist, well-drained soil, plant in protected location, soak deeply on a regular basis	Try to obtain a tree that originated from a Montana nursery
Hackberry (<i>Celtis occidentalis</i>)	Medium	Sun	Umbrella shape, tolerates cold, wind and alkaline soil, yellow fall color and red berries in winter, interesting bark	Susceptible to nipple gall, powdery mildew, leaf spots and scale insects, slow to establish in clay soil, may be susceptible to late spring frost, not drought tolerant	
Honeylocust, 'Imperial' (<i>Gleditsia triacanthos</i> var. <i>inermis</i> 'Impcole')	Fast	Sun	Thornless, seedless, adaptable, dense symmetrical branching, fern-like foliage turns bright yellow in fall, drought tolerant	Needs semi-protected location, may have some tip dieback in severe winter	
Honeylocust,	Fast	Sun	Rectangular to vase-shaped	Needs semi-protected	

'Shademaster' (Gleditsia triacanthos PNI 2835)			crown, thornless, seedless, yellow in fall, adaptable, drought resistant	location, may have some tip dieback in severe winter, susceptible to webworm, borers, mites, powdery mildew	
Honeylocust, 'Skyline' (Gleditsia triacanthos 'Skycole')	Fast	Sun	A broad taller shape, thornless and usually fruitless, golden fall color, tolerant of most soil, hardy to cold, heat, wind	Needs semi- protected location, good insect resistance, may have some tip dieback in severe winter	
Larch (Larix spp.)	Medium	Sun	Bright green tufts of new needles in spring, brilliant yellow-orange needles in fall before they drop for the winter, not particular about soil, attracts birds	May be difficult to establish, check with your local nursery Wide base may intrude on public rights-of-way (requires set-back)	Larix occidentalis is Montana native species
Linden, 'Redmond' (Tilia americana 'Redmond')	Medium	Sun	Very hardy, glossy leaves and large pyramidal form, clusters of fragrant yellow blooms, bright yellow in fall, tolerates alkaline soil	May be slow to establish the first few years, prefers moist, heavier soil, may sucker around base	
Maple, 'Autumn Blaze' Freeman (Acer x freemanii 'Jeffersred')	Fast	Sun to part shade	Broad oval crown with upright branches, long fall season of dependable color, drought tolerant, resembles silver maple	Shallow root system with some surface roots, may experience some tip die-back from severe winter, susceptible to late spring frost, plant in semi-protected location	
Maple, 'Emerald Lustre' Norway (Acer platanoides 'Pond')	Medium	Sun to part shade	Strong branches form rounded canopy, new foliage is reddish and matures to glossy green, improved vigor and scorch resistance, hardiest of Norway maples	Shallow root system with some surface roots, susceptible to frost cracking on trunk	Do not prune
Maple, 'Emerald Queen' Norway (Acer platanoides 'Emerald Queen')	Medium	Sun to part shade	Dense oval shape, attractive deep green foliage in spring with red tint, yellow fall color, resistant to leaf scorch	Shallow root system with some surface roots, susceptible to frost cracking on trunk	Do not prune
Maple, 'Fall Fiesta' Sugar (Acer saccharum 'Fall Fiesta')	Medium slow	Sun to part shade	Rounded crown with leathery leaves, exceptional yellow-orange-red fall color	Prefers cool, moist soil conditions, questionable in alkaline soil	
Maple, 'Green Mountain' Sugar (Acer saccharum 'Green Mountain')	Medium slow	Sun to part shade	Hardy, broad stately, oval crown, resistant to heat, wind and leaf scorch, turns orange-scarlet in fall	Prefers cool, moist soil conditions but more drought tolerant than other sugar maples, questionable in alkaline soil	
Maple, 'Northwood' Red (Acer rubrum 'Northwood')	Medium	Sun to part shade	Hardiest of red maple cultivars, rounded oval crown with good branching, orange-red in fall	Prefers moist slightly acidic, well-drained soil, performance is questionable in droughty alkaline soil	
Maple, 'Royal Red' Norway (Acer platanoides 'Royal Red')	Slower than green-leafed Norway Maples	Sun to part shade	Maroon foliage throughout season, hardiest of red-leafed Norway maples	Shallow root system with some surface roots, may not perform as well in alkaline soil	Do not prune
Maple, 'Sienna Glen' Freeman (Acer x freemanii 'Sienna')	Fast	Sun to part shade	Hardy, pyramidal shape, deep burgundy in fall, resembles red maple, resistant to frost cracking, sunscald and dieback, tolerant of wet soil	None serious	
Oak, Bur (Quercus macrocarpa)	Slow	Sun	Large rounded shape with very strong branches,	Needs good drainage	Montana native species

			tolerates drought, alkaline soil and soil compaction, hardy		
Pine, Lodgepole (<i>Pinus contorta</i>)	Fast	Sun	Tall thin pyramidal shape, evergreen	Requires regular water, susceptible to mountain pine beetle	Montana native species
Pine, Ponderosa (<i>Pinus ponderosa</i>)	Medium to fast	Sun	Very stately with age; straight, open, orange-colored trunk; long needles; drought-tolerant once established, evergreen	Susceptible to mountain pine beetle	Montana native species
Spruce, Black Hills (<i>Picea glauca</i> var. <i>densata</i>)	Slow to medium	Sun	Dense and symmetrical, cold hardy and resistant to winter injury, deer resistant, evergreen	More resistant to white pine weevil than most spruce	Dwarf Alberta is a popular miniature of this species
Spruce, Colorado Blue (<i>Picea pungens</i>)	Medium	Sun or light shade	Stately, colorful evergreen (comes in blue and green varieties), very deer resistant, tolerates drought better than species, attracts birds for seeds and shelter	Requires adequate moisture, treat immediately for white pine weevil if terminal leader starts to wilt	Montana native species
Spruce, Engelmann (<i>Picea engelmannii</i>)	Medium	Sun or light shade	Densely-branched pyramidal form, needles are blue- green and soft, attracts birds for seeds and shelter, evergreen	May be subject to white pine weevil, aphids, scale, spider mites, tussock moths	Montana native species
Spruce, Norway (<i>Picea abies</i>)	Fast	Sun or light shade	Very hardy, pyramidal shape, dark green foliage, branches become pendulous as tree matures, very deer resistant, attracts birds, evergreen	Susceptible to some insects and diseases, particularly white pine weevil	Slower growing dwarf varieties are 'Pendula' (3-5') and 'Nidiformis' (6-10')

Prohibited Trees

Prohibited trees shall not be planted in streets, avenues or alleys of the city, neither shall any other variety of trees deemed by the Parks Board unfit or undesirable be planted therein. The varieties named herein being deemed dangerous to the health of the city and an interference with the use of the streets or City infrastructure:

- Cottonwood,
- Carolina poplar,
- Canadian poplar,
- Lombardi poplar,
- Silver leaf poplar,
- Russian olive and
- Boxelder.

Appendix C. Tree Disease and Insects

Current insect and disease problems

White Pine Weevil

Species affected: Spruce (Engelmann and Colorado Blue), pine species. White Pine Weevil damage is evident in spruce throughout Red Lodge and has resulted in mortality in City Parks and on boulevards.

Description: The white pine weevil (*Pissodes strobi*) - is a native insect that attacks various species of pine and spruce (Hamil et al 1995, Hagle et al 2003, Mikkelson et al 2005). White pine weevils attack and kill or badly injure terminals on spruce and lodgepole pine reproduction from 1 to 30 feet in height (Photo XX). Leader mortality results in deformity of the main stem or the production of multiple leaders. White pine weevil will kill 2 years' growth. Overwintering is accomplished as adults or larvae. Adults complete development or become active and lay eggs in the latter part of June. Adults are typical weevils with long, curved beaks. They are about one fourth of an inch long and have rough wing covers adorned with red-brown and patches of lighter brown or gray scales. The first evidence of attack in spring is tiny glistening resin droplets exuding from the feeding punctures made by the adults on the previous year's growth, just below the terminal buds. Two to three weeks later, eggs are laid in new punctures that do not produce resin droplets. Feeding punctures and egg niches are made in the bark of terminal shoots. Newly hatched larvae initially feed in the terminal just under the bark. Leaders and terminals will begin to droop following girdling, then die and turn gray or brown. Later, they bore into pith where they remain throughout the larval period. Look for oval pupal cells or "chip cocoons" of *P. strobi* under bark of spruce terminals in August. Weevil attacks cause four types of damage to occur: growth reduction, stem deformation, increased susceptibility to wood decay organisms, and tree mortality. While literature indicates that tree mortality is rare and only occurs in small trees (less than 1.3 m or 4 ft tall) growing very vigorously in full sunlight (Hagle et al 2003), recent infestation of large trees by white pine weevil tree and mortality of small trees has been occurring in Red Lodge, likely due to a combined effect with recent drought.



Figure 53 - Spruce tree terminal killed by White Pine Weevil

Management: Pruning and destroying infected shoots as soon as they are noticed and before adults emerge is the best control. Spring control of adults may be accomplished by spraying terminal leaders with a systemic insecticide, although spraying must be timed with adult weevil or moth activity, a tricky proposition. Because of the short residue properties of most insecticides, it is important that applications be well synchronized with periods of peak adult activity. Chemical control measures can be undertaken either in spring (when the adults emerge from hibernation and start feeding and oviposition) or in fall (after the new adults emerge). Applications in spring can be concentrated to cover the leader and upper branches. Weevils are especially susceptible to control measures during fall when they are feeding on new growth in the upper crown. Using backpack mist-blowers or other ground equipment has been more successful than aerial application. Chemical application in conjunction with pruning of infested leaders gives the best results. When severe infestations occur, pheromone strips that disrupt the mating cycle are available through Pherotech (sales@pherotech.com). (Mikkelson et al 2005, Hamil et al 1995).

Subsequent or simultaneous pruning of laterals and forks can aid the trees in forming a nearly straight main stem. Pruning should be done as close to the topmost unaffected whorl of branches as possible and should be done as soon as possible after the first indication of weevil attack. Usually this means the first sign of wilting. This will prevent the loss of more than one season of growth and reduce the overwintering weevil population. Infested terminals should be destroyed or removed from the site.

Growing spruce under a deciduous canopy, dense stocking in open-grown stands, and planting on well- drained soils

are management strategies that could reduce stem water content at the time of day and year weevils are laying eggs. Plant and maintain numerous small spruce in high densities (6' X 6' or 8' X 8' spacing) until the trees reach about 20 ft in height. Density creates competition, which forces rapid height growth with minimal terminal diameter growth. Competition also forces laterals on weevil- attacked trees to "straighten" quickly.

Cytospora canker

Species affected: Spruce. Most damaging on Colorado and Norway spruces.

Description: The first indications of the fungal disease Cytospora canker (*Cytospora kunzei*) is dying lower branches with bluish-white-colored resin flowing from cankered areas. Upper branches die in subsequent years. Infected inner bark and the cambium tissue directly below the bark are brown, whereas healthy tissues are light-colored. Removal of outer bark slivers just beyond the resin soaking often exposes black pinhead-sized depressions (spore-producing fungal bodies). Cytospora invades trees through wounds. Splashing rain, wind, insects, birds, rodents, and man spread disease spores to new branches or other spruces. Older trees weakened from drought and hail injury are most susceptible. Other environmental stresses such as insect or mechanical injury also favor Cytospora.

Management: Remove and destroy infected branches. The best time to prune is in late winter before spores are released in the spring; however, it is acceptable to prune dead branches at any time of year if the weather is dry. Prune 4 to 6 inches ahead of the canker, cutting back to the nearest living lateral branch or to the trunk. Disinfect tools between cuts to avoid spreading the disease. Fungicides are not effective against Cytospora. (Mikkelsen et al 2005).

Cooley Spruce Gall Adelgid

Species affected: Spruce, Douglas fir. Is present in spruce throughout Red Lodge.

Description: Cooley spruce gall adelgids (*Adelges cooleyi*) are sap-sucking insects that produce brown, pineapple-shaped galls (growths) on branch tips. Look for oval, black nymphs with a white, waxy fringe or oval, dark brown adults covered with white, woolly wax on current Douglas-fir or spruce needles during spring and summer months. In late spring, the unopened galls on spruce are green with shades of pink or purple (Photo XX). Nymphs may be found inside them. Open galls, found in late August, are brown, dry, and resemble small cones. The galls look unsightly, but usually cause little damage. (Mikkelsen et al 2005, Hagle et al 2003, Hanson and Walker undated).



Figure 54 - Cooley spruce gall adelgid in late spring

Management: To reduce adelgid populations, prune galls when they are green or purple and still contain immature adelgids (spring or early summer). By the time galls turn brown, the insects have already migrated to other twigs or nearby trees.

Horticultural soaps or oils can be applied to adults, eggs, or nymphs. Overwintering nymphs can be killed with dormant oils applied to twigs. Insecticides rarely are necessary. However, if many adelgids are present on needle bases, insecticidal soap used in early spring and early fall can reduce populations. Alternatively, apply a granular systemic insecticide over the root zone, then water in. Avoid wide-spectrum insecticides that also kill beneficial insects, which control pests naturally. (Mikkelsen 2005, Hanson and Walker undated).

Western Spruce Budworm

Species affected: Douglas-fir, all true firs, spruce, and larch. May be found on pines. Some spruce in Red Lodge have been injured or killed by spruce budworm.

Description: The western spruce budworm (*Choristoneura occidentalis* Freeman) is the most widely distributed and destructive defoliator of coniferous forests in Western North America (Fellin and Dewey 1982). Larvae or pupae are visible in silken nests of webbed, chewed needles from June until August. Light green to light brown larvae with darker heads mine buds and old needles in spring, then consume new foliage as it appears. Mature larvae have brown heads and bodies with prominent ivory-colored spots and are about one inch long. Pupae are three-fourths of an inch

long and brown and are found in the nests from mid-July into August. Adults are mottled rust-brown and have a wingspan of about seven-eighths of an inch. Female moths lay eggs on needles in a shingle-like pattern in August. Larvae hatch and immediately seek a sheltered spot to overwinter. After several years of heavy defoliation, branch dieback, top kill, and tree mortality can occur. Cones and seeds of all host species are also destroyed. Terminal and lateral new shoots of larch are severed. (Hagle et al 2003).

Management: No typical pattern or trend in western spruce budworm epidemics has been apparent; most of the early epidemics lasted for a few years and then subsided naturally; others persisted longer, at times without spreading over large areas. During prolonged outbreaks when stands become heavily defoliated, starvation can be an important mortality factor in regulating populations. When necessary, individual trees can be sprayed using ground equipment and insecticides such as malathion, carbaryl, and acephate. *Bacillus thuringiensis*, a microbial insecticide registered for use against spruce budworms is a naturally occurring, host-specific pathogen that can also be sprayed. It is environmentally safe to use in sensitive areas such as parks or along rivers or streams where it may not be desirable to use chemical insecticides. (Fellin and Dewey 1982).

Fireblight

Species affected: Fireblight is present in mountain ash in Red Lodge. Fireblight is a common disease of apples, crabapples, mountain ash, hawthorn, and roses (Stack and Lamey 1995, Grabowski 2009).

Description: Fireblight is caused by the bacteria *Erwinia amylovera* which invades the water conducting tissues of trees. This pathogen can infect all members of the Rosaceae family, but most commonly causes problems on apples, crabapples, and mountain ash trees. It overwinters in cankers on larger branches. These often form around a diseased sucker or fruiting spur. The bark on cankers is slightly sunken and discolored. Shoots become curled at the tip and blackened as if scorched by fire. Blossoms may also wilt, fruiting spurs may turn black and be killed, and suckers may be curled and blackened. Foliage pathogens may reach the infection site through several means, the most common of which are passive dispersal by rain splash or wind blowing spores from fruiting bodies on fireblight infected plant parts. Other means include active dispersal by insects (or by humans through mechanical means such as pruning. (Stack and Lamey 1995, Grabowski 2009).

Management: Prune out diseased cankers in late winter. Fireblight can be transmitted on pruning tools, so sterilize pruning tools with 10% bleach, full strength Pine Sol, Lysol (use the type with the red label), or denatured ethyl alcohol (eg. shellac thinner). Bleach and Pine Sol are corrosive; be sure to wash and oil pruning tools after using these products. All infected branches should be burned, buried or disposed of in the trash.

Other susceptible plants include rose, quince, Cotoneaster, and raspberry, which should be removed from the vicinity of trees if there is a fireblight concern.

Cankers

Species affected: Poplar (*Populus* spp.) (aspen, cottonwood, hybrid poplars)

Description: The soft bark of aspen and poplars are easily wounded by abiotic factors, humans, or animals. Wounds can be invaded by disease organisms to form cankers. Cankers caused by fungi in the genera *Cytospora*, *Phomopsis*, *Septoria*, and *Dothichiza* kill areas of the bark on branches and main stems. Cankers weaken branches and main stems. Multiple cankers girdle trees, causing top dieback, breakage, and tree death. Secondary organisms enter trees through cankers, causing stain and decay. Spores which spread the canker fungi are produced in tiny pimple-like fruiting bodies in bark of cankers. In wet weather they ooze from the bark and may be splashed about by wind and rain. The canker fungi infect healthy stems when the spores land on wounds in the bark. Even minute cracks or scars may be sufficient to let in canker fungi. Bark on cankers is sunken and discolored. Foul-smelling sap often oozes from cankers. If healing is taking place, the canker will be surrounded by raised ridges of callus tissue which gradually grow together to heal the canker. Cankers may be any shape, but are often diamond-shaped or elongate. (Stack and Lamey 1995, Johnson et al 1995, Ostry et al 1988). Cankers are a concern in Red Lodge and may be the cause of damage noted as frost cracks in the tree inventory. Approximately 3% of the trees inventoried had frost cracks.



Management: Old poplar stands should be thinned before they begin to decline. Plant only resistant clones or disease-free nursery stock. Certain poplar clones, particularly the Lombardy poplar (*P. nigra`Italica'*), are extremely susceptible to cankers and should not be planted. Drought stress greatly increases the susceptibility of poplars to cankers. Keep trees well watered and promote good growth with proper fertilization. Prune out cankered branches during dry weather and destroy by burying or burning. Small cankers on stems can be removed by cutting away infected bark so there are clean edges around the infection to stimulate growth. Such trimming should be shaped into an ellipse to promote rapid healing. Avoid wounding trees. Treat pruning cuts with a fungicidal wound dressing. Protect young stems from sunscald in winter. *Septoria* canker may be controlled by utilizing septoria leaf spot recommendations (see below). No fungicides have reliably controlled these diseases. (Johnson et al 1995, Ostry et al 1988, Zeleznik et al 2005).

Figure 55 - Fireblight canker on mountain ash tree (photo from Grabowski 2009)

Mountain Pine Beetle

Species affected: Most native and introduced species of pines. Beetles usually select larger pines that have thick phloem and then move on to smaller diameter trees. In Red Lodge, small diameter Scotch pine in the McGillan Street area have been recently infested and killed by Mountain pine beetle.

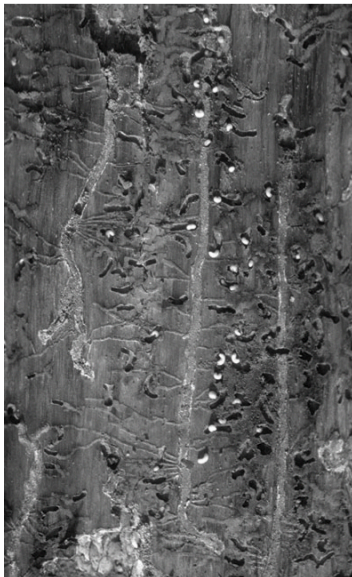


Figure 56 - Mountain pine beetle pitch tubes (left) and galleries (right) in a lodgepole pine

Description: The mountain pine beetle (*Dendroctonus ponderosae* Hopkins) usually results in very obvious pitch tubes on the bark surface at site of attack (Photo XX). Pitch tubes are masses of red, amorphous resin mixed with bark and wood borings. Pitch tubes on unsuccessfully infested trees are larger, three-fourths of an inch to 1 inch (19 to 25 mm) in diameter, and widely scattered over the trunk. When beetles are not present in sufficient numbers, trees can produce enough resin to "pitch out" beetles as they bore into the inner bark. Pitch tubes on successfully infested trees are cream to dark-red masses of resin mixed with boring dust and are one-fourth to one-half inch (6 to 13 mm) in diameter. In addition to pitch tubes, boring dust is evident in bark crevices and around base of successfully infested trees. Both adults and larvae feed in phloem layer of inner bark. Under bark, look for straight, vertical egg galleries with crook or "J" at start which can extend upward 30 inches or more (Photo XX). Galleries are packed tightly with

boring dust. Larvae (grubs) are present during fall and winter and emerge from the bark as adults in midsummer to attack new trees. Mature adults are black and about three- sixteenths inch long. Infested trees fade within a year from yellow-green to red-brown. Thin-bark hosts (primarily lodgepole pine) may have their bark removed by woodpeckers searching for larvae. Feeding girdles the tree. Trees are also inoculated with blue stain fungi clogging water transport system. Usually trees are killed, but some may be strip attacked and survive. Trees less than 5 inches diameter are seldom attacked. The first sign of beetle-caused mortality is generally discolored foliage. Needles on successfully infested trees begin fading and changing color several months to 1 year after the trees have been attacked. Fading begins in the lower crown and progresses upward. Mountain pine beetle can be confused with other pine beetles, such as red turpentine beetle, ips species, and western pine beetle. (Hagle et al 2003, USDA 2006).

Management: Mountain pine beetles are most effectively managed by providing vigorous growing conditions for host trees by reducing competition from other trees, watering, and fertilization. Preventive spraying before trees become infested can be used to protect individual high-value trees. At best, insecticides provide a temporary control measure that slows infestations. They will not stop an outbreak as long as the beetle food source remains. Periodic treatments will be necessary for as long as the outbreak lasts. Management options include cutting and removing infested trees in fall/winter months, so as to capture and remove beetles while they are still in the tree bark. Other management options in the event of an infestation include insecticide application to tree boles and use of anti- aggregating pheromones to deter beetles. Because they can attract beetles, broken tops and stems from wind storms should be removed from the vicinity of other pine trees. Dead pine stored as firewood can still house beetles that will eventually infest other nearby trees. Beetle killed pine utilized for firewood should be cut into short lengths, and left unshaded, unpiled, and exposed to sunlight. If infested or dead trees are cut and removed, stumps should be cut as low as possible or removed and logs and limbs should be either chipped or piled and burned in an open area away from other pine trees. (USDA 2006, Pherotech 2009).

Scale

Species affected: Green Ash, Poplar (*Populus* spp.) (aspen, cottonwood, hybrid poplars), pine (lodgepole, ponderosa, and ornamentals), willow (*Salix* spp.), Apple (*Malus* spp.), occasionally spruce and Douglas-fir.

Description: Scale insects are a diverse group of insects, with about 1,000 species in North America. Most of the pest species belong to the three most common families of scale insects, which are the armored scale, the soft scale, and the mealybugs. Armored scales, family Diaspididae, have a flattened, platelike cover that is less than 1/8 inch in diameter. The actual insect body is underneath the cover. The covers often have a differently colored, slight protuberance (exuviae, or "nipple"). Concentric rings form as each nymphal stage secretes an enlargement to its cover. Armored scales do not excrete honeydew. Oystershell scale is one damaging armored scale that is killing trees in Yellowstone and Carbon Counties. Pine needle scale or black pine scale may also be present in area conifers. Soft scales, family Coccidae, can be smooth, cottony, or waxy and are 1/4 inch long or less. They are usually larger and more rounded and convex than armored scales. Their surface is the actual body wall of the insect and cannot be removed. Soft scales feed in the fluid-conducting phloem tissue of the plant and excrete abundant honeydew, which is sugary water that drips from their bodies.

When plants are heavily infested with scales, leaves and needles may look wilted, turn yellow, and drop prematurely. Scales sometimes curl leaves or cause deformed blemishes or discolored halos in fruit, leaves, or twigs. Bark infested with armored scales may crack and exude gum. Certain armored scales also feed on fruit, but this damage is often just aesthetic. Soft scales infest leaves and twigs but rarely feed on fruit. A major concern with soft scales is their excretion of abundant honeydew, which contaminates fruit, leaves, and surfaces beneath plants. Honeydew encourages the growth of black sooty mold and attracts ants, which in turn protect scales from natural enemies. When numerous, some scale species weaken plants and cause them to grow slowly. Branches or other plant parts may die if they remain heavily infested with scales. If plant parts die quickly, dead brownish leaves may remain on branches, giving them a scorched appearance. Several years of severe infestations may kill young plants. Certain armored scales may be more likely to kill plants. Soft scales reduce plant vigor, but seldom kill trees or shrubs. (Dreistadt et al 2007, Hagle et al 2003)

Management: Provide plants with good growing conditions and proper care; especially watering, so they are more resistant to scale damage. Prune off and destroy heavily infested twigs and branches to eliminate scales when

infestations are on limited parts of the plant. Scales are often well controlled by beneficial predators and parasites, except when these natural enemies are disrupted by ants, dust, or application of persistent broad-spectrum insecticides. Preserving (conserving) the populations of parasites and predators (such as by controlling pest-tending ants) may be enough to bring about gradual control of scales as natural enemies become more abundant. If scales become too numerous, insecticides or horticultural oil are also options. Thorough spray coverage is especially critical when treating armored scales, as these scales are generally less susceptible to pesticides than soft scales. (Dreistadt et al 2007, Zeleznik et al 2005).

Aphids

Species affected: Conifers and hardwoods. Many species of aphids are host specific, but more than one species can attack a given host. This makes species identification difficult, often requiring an aphid taxonomist. (Zeleznik et al 2005).

Description: Aphids are typically small, soft-bodied insects that suck plant juices, causing discoloration on plant parts. Other symptoms include deformed plant parts (leaves and shoots) and reduced shoot growth. Damage is often minimal unless infestations are very severe and persistent for several years. Aphids secrete large amounts of honeydew, which can become overgrown with unsightly sooty mold. Honeydew causes problems when it lands on cars, picnic tables, and sidewalks, causing them to become sticky and overgrown with sooty mold. Ants often tend aphids for their honeydew secretions. Aphids overwinter as eggs attached to foliage or twigs. Eggs hatch in early spring and the nymphs feed on twigs. The nymphs develop into asexual females that produce nymphs without mating. These nymphs develop into winged and wingless females that continue to reproduce asexually. There are as many as six generations annually, with overwintering eggs deposited in late summer or early fall. (Zeleznik et al 2005).

Management: A few aphids will not substantially damage plants. There are often natural predators present that will keep aphid populations at low levels. If an aphid population is becoming unacceptable, look to see if there are predators (ladybird beetles, lace wings, etc.) present. If present, it may be better to hold off on chemicals and allow nature to take its course. In some cases, a strong jet of water from a hose may be effective in reducing aphids to insignificant levels. If compelled to use pesticides, use an alternative product such as insecticidal soap to reduce the impact on beneficial insects. Many conventional insecticides are labeled for aphids on trees and shrubs or other insecticides may be injected into the tree by professional applicators. (Zeleznik et al 2005).

Potential insect and disease problems

Ash Plant Bug

Species affected: Green ash (*Fraxinus pennsylvanica*). Another species of plant bug affects honey locust trees.

Description: Plant bugs (family Miridae) are a group of insects that pierce plant tissue and feed on sap. The ash plant bug, *Tropidosteptes amoenus* Reuter, only occurs on ash trees (*Fraxinus* spp.). Ash plant bug adults are oval, 3/16 to 1/4 inch long, and pale yellow to brown to almost black with indistinct yellow or pink markings on the back. Immature plant bugs (nymphs) are similar to the adults, but are smaller, wingless, and sometimes lighter in color. Nymphs are sometimes described as looking like large, mobile aphids. Ash plant bugs suck the juices from buds, leaves, seeds, and shoots, causing distortion and premature shedding. Feeding results in tiny, distinct circular discolorations and small, shiny, dark, varnish-like specks of excrement on the undersides of infested leaves. As feeding continues, stippled areas become connected and large areas of the leaf can be damaged. Damaged leaves often linger until autumn. Adults remain active until the first hard frost. Plant bugs generally do not seriously injure vigorously growing trees, although they can detract from their appearance. Young, recently transplanted, and stressed trees are most likely to be damaged. (Kyhl and Hahn 2002, Solomon et al 1993, Zeleznik et al 2005).

Management: The best course of action is to tolerate damage from these ash plant bugs. Individual leaves can be damaged, but generally do not threaten the health of mature trees. Control is justified when leaf injury is easily found throughout the canopy. Dormant oil sprays have been used during the winter months to kill the eggs. Insecticides can be used to control nymphs and adults in the spring to protect the appearance of infested trees. (Kyhl and Hahn 2002, Solomon et al 1993, Zeleznik et al 2005).

Shade tree borers

Species affected: There are numerous shade tree borer species that could affect several tree species in Red Lodge (Table 8).

Table 8 - Tree borer species and hosts (Cranshaw and Leatherman 1999, Zeleznik et al 2005)

Name	Common Hosts
METALLIC WOOD BORERS	
<i>Chrysobothrus femorata</i> , Flatheaded apple-tree borer	Apple, maple, <i>Populus</i> , hardwoods
<i>Agrilus</i> spp.	Honeylocust, birch, currant, oak
<i>Chalcophora</i> spp	Pines
<i>Dicera</i> spp.	Aspen
LONGHORNED BEETLES	
<i>Atimia huahuachae</i>	Juniper
<i>Plectodera scalator</i> , Cottonwood borer	<i>Populus</i> , willow
<i>Saperda calcarata</i> , Poplar borer	Aspen, poplars, willow
<i>Saperda candida</i> , Roundheaded apple-tree borer	Apple.
<i>Saperda inornata</i> , Poplar gall borer	Poplar, cottonwood
<i>Parandra brunnea</i> , Pole borer	Maple, other hardwoods
<i>Neoclytus acuminatus</i> , Redheaded ash borer	Green ash, elm, hackberry, linden, oak
<i>Monochamus</i> spp.	Pines, spruce, fir
<i>Callidium</i> spp.	Pines, juniper
WEEVILS	
<i>Cryptorhynchus lapathi</i> , Poplar and willow borer	Willow, poplar
CLEARWING BORERS	
<i>Podesia syringae</i> , Ash/lilac borer	Green ash, lilac
<i>Sesia tibialis</i> , American hornet moth	Cottonwood
<i>Synanthedon exitiosa</i> , Peach tree borer	<i>Prunus</i> spp. (Cherry)
CARPENTERWORMS	
<i>Prionoxystus robiniae</i> , Carpenterworm	Elm, maple, green ash
DIORYCTRIA BORERS	
<i>Dioryctria ponderosae</i> , Pinyon pitch mass borer	Ponderosa pine
<i>Dioryctria zimmermani</i> , Zimmerman pine moth	Austrian, Scotch pine
HORNTAILS	
<i>Tremex columba</i> , Pigeon tremex	Maple, other hardwoods

Description: Shade tree borers are insects that develop underneath the bark of woody plants. A large number of beetles and moths develop as wood borers in their immature (larval) stage. When full-grown, typically in one to two years, the adult stages cut a hole through the bark and emerge. Eggs of most shade tree borers are laid on the bark, usually within small cracks. Longhorned beetles and horntails deposit their eggs underneath bark. Eggs typically hatch within one to two weeks, and the newly emerged borers chew through the bark. Subsequent borer development takes place just under the bark and in the wood. As the borers tunnel in the tree, they make meandering tracks that are packed with fibrous boring dust called frass. Most of these insects can attack only dying trees, felled logs or trees under stress. Stress to woody plants may be the result of mechanical injury (lawnmowers, weed whackers, construction damage, etc.), recent transplanting, overwatering, drought, or other pathogens. These borers are often incorrectly blamed for damage caused by a pre-existing condition or injury. Certain borers, in particular the “clear-wing borers,” are capable of damaging apparently healthy trees. Though carpenterworms seldom kill trees, their feeding makes trees susceptible to breaking in strong winds. (Cranshaw and Leatherman 1999, Zeleznik et al 2005).

Management: Because most borers attack only stressed trees, promoting vigorous tree growth should be considered the primary approach for borer management. Maintaining steady, adequate moisture is most critical to developing tree defenses to borers. The use of mulches can also assist. For example, trees that have a broad area of mulch over the main root zone better resist attacks from borers than do trees that have roots which must compete with those of

lawn grasses. Borers within trees cannot be successfully treated with insecticides because the insects are in a protected site. Insecticidal control is best achieved if sprays are made during periods of adult activity and egg laying. Insecticide application options include application to soil as a drench, trunk spraying, or canopy spraying. All these insects have slightly different life cycles, so an arborist or entomologist should be consulted to identify the type of borer and the appropriate treatment time (Cranshaw and Leatherman 1999, Zeleznik et al 2005).

Septoria Leaf Spot

Species affected: Poplar (*Populus* spp.) (aspen, cottonwood, hybrid poplars)

Description: This disease is caused by the fungus *Septoria musiva* and occurs on native and hybrid poplars commonly used in landscape plantings. Symptoms vary according to time of infection, hosts, texture and age of leaves. Four types of leaf spot symptoms occur: 1) Small flecks with angular margins; 2) white or silvery spots; 3) brown circular leaf spots with brown or yellow margins; 4) irregular shaped large tan spots in center with dark brown margins. Premature defoliation occurs on highly susceptible trees. With successive years this disease may predispose a tree to other disease pathogens.

Management: Plant tolerant or resistant clones. Sanitation in the field – burial or removal of leaves and stems – can reduce primary infections in the spring. Fungicide can be applied in severe cases in landscape plantings. (Zeleznik et al 2005).

Marssonina Leaf Spot

Species affected: Poplar (*Populus* spp.) (aspen, cottonwood, hybrid poplars)

Description: This disease, caused by fungi in the genus *Marssonina*, may severely defoliate susceptible trees well before normal leaf drop. Dark brown flecks, often with yellow margins, appear on leaves within a few weeks after leaves emerge in spring. Diseased leaves on affected trees appear smaller than normal, turn yellow-bronze, and are shed prematurely. The fungus moves progressively upward in the crown. If viewed from a distance the diseased leaves appear bronzed. On more established plantings and in native stands repeated outbreaks result in branch dieback and predispose trees to secondary pests and low temperature injury. (Stack and Lamey 1995).

Management: Plant poplars resistant to or tolerant of marssonina leafspot. Remove dead and infected twigs from diseased trees. Rake up and destroy fallen leaves during the growing season. In severe cases, fungicide can be applied.

Spruce Beetle

Species affected: Engelmann spruce, Colorado blue spruce, rarely lodgepole pine.

Description: The spruce beetle, *Dendroctonus rufipennis*, is the most significant natural mortality agent of mature spruce and primarily attacks 12"+ diameter spruce. Spruce beetles bore beneath the tree bark and lay eggs. Look for red-brown boring dust on bark, in bark crevices, and on ground around base of tree from mid-May to July. During the winter, woodpeckers will flake off bark that accumulates on the ground or snow around infested trees. Egg galleries average 3 - 12 inches in length, have a slight crook at the start, and extend upward in standing trees. Eggs are deposited on alternate sides of the gallery which is packed with frass. Larvae feed in the phloem, usually gregariously, often forming fan-shaped galleries. Larvae are present for two summers, pupate, then over winter the second year as adults beneath the bark. In standing trees, adults briefly emerge in their second fall and reenter the tree, to overwinter beneath the bark at the root collar where they have protection from snow. Infested trees usually do not turn yellow-green until 1 year after attack. Adult beetles are dark brown to black with reddish-brown wing covers and are about one-fourth inch long (Hagle et al 2003, Holsten et al 1999). Trees weakened by drought, physical damage (such as wind or snow breakage), insects (such as white pine weevil) or other disease are more susceptible to spruce beetle infestations.

Management: No spruce beetle infestations have been noted in Red Lodge, it has been noted on the nearby Custer National Forest in isolated locations. Early monitoring and detection is key to ensure Red Lodge's spruce do not become infested and die. Because they can attract beetles, broken tops and stems from wind storms should be

removed from the vicinity of other spruce trees. Dead spruce stored as firewood can still house beetles that will eventually infest other nearby trees. Spruce utilized for firewood should be cut into short lengths, and left unshaded, unstacked, and exposed to sunlight. If infested or dead trees are cut and removed, stumps should be cut as low as possible or removed and logs and limbs should be either chipped or piled and burned away from other spruce trees. Management options include cutting and removing infested trees in fall/winter months. Other management options in the event of an infestation include insecticide application to tree boles, use of anti-aggregating pheromone packets to deter beetles from infesting individual trees, or use of aggregating pheromones or downed trap trees to capture beetles (Pherotech 2009). If aggregating pheromones or trap trees are utilized, infested material needs to be disposed of in late fall or winter.

Gypsy Moth

Species affected: Potentially all trees. Nationally, quaking aspen are rated as the third most susceptible species (Liebhold 2003). Based on a technical literature review that rates foliage susceptibility (Liebhold et al 1995), Red Lodge's predominant tree species are rated as follows: Mountain ash, aspen, and cottonwood are susceptible; Green ash is immune; and Chokecherry is resistant.

Description: The gypsy moth, *Lymantria dispar*, is one of North America's most devastating forest pests. Damage is caused by larval feeding on the foliage, buds, shoots, and fruits of host plants. The light-brown male gypsy moth is 3/4 inches in length, has front wings mottled with dark irregular lines, and has plumose antenna. The white female gypsy moth is incapable of flight. Gypsy moth egg masses are laid on branches and trunks of trees, but egg masses may be found in any sheltered location. Egg masses are buff colored when first laid but may bleach out over the winter months when exposed to direct sunlight and weathering. The hatching of gypsy moth eggs coincides with budding of most hardwood trees. Larvae emerge from egg masses from early spring through mid-May.

Government attempts to eradicate the gypsy moth since the 1890's have ultimately failed and since that time, the range of gypsy moth has continued to spread. It is inevitable that gypsy moth will continue to expand its range in the future. The gypsy moth is known to feed on the foliage of hundreds of species of plants in North America but its most common hosts are oaks and aspen. When gypsy moth densities reach high levels, large quantities of foliage are consumed and partial or total defoliation of the forest canopy may occur. Several successive years of defoliation, along with contributions by other biotic and abiotic stress factors, may ultimately result in tree mortality. In most northeastern forests, less than 20% of the trees in a forest will die but occasionally tree mortality may be very heavy.

Management: In states that currently do not have established gypsy moth populations (including Montana) grids of pheromone traps are used to detect new, isolated populations. There are no known gypsy moth infestations in Montana, but individuals and small numbers of moths have been previously detected in Glacier National Park, several areas in Wyoming, and Yellowstone National Park. Early monitoring and detection is key to ensure Red Lodge's trees do not become infested and defoliated. In the event that gypsy moths are detected in Red Lodge, chemical and biological pesticides could be sprayed to suppress outbreak gypsy moth populations or pheromones could be used to disrupt mating. If infestations are small, egg masses can be located in the fall, removed, and be put in soapy water to destroy them, If necessary, the City should consult with the Montana DNRC urban forestry program and local extension service to develop a spray program in Red Lodge. Another alternative would be to let an infestation run its course, which could result in a shift in tree species composition to less susceptible species.

Emerald Ash Borer

Species affected: Green Ash and all other ash (*Fraxinus* spp.). Mountain ash (*Sorbus* spp.) are not susceptible.

Description: Emerald ash borer (*Agrilus planipennis* Fairmaire), an invasive insect native to Asia, has killed tens of millions of ash trees in urban, rural and forested settings. The emerald ash borer (EAB) was first discovered in 2002 in Michigan and Ontario and as of June 2009 known infestations were in 12 states and two Canadian provinces. EAB attack only ash trees (*Fraxinus* spp.). attack. EAB adult beetles are metallic green and about 1/2-inch long. Adults leave a D-shaped exit hole in the bark when they emerge in spring. Woodpeckers like EAB larvae; heavy woodpecker damage on ash trees may be a sign of infestation. While this insect has not been observed in Montana, it is of concern because of the high overall percentage of susceptible ash trees in Red Lodge and the potential visitors from infested areas in the Mid-western U.S. to potentially transport firewood containing beetle larvae into the area. Current maps

of known EAB populations can be found at www.emeraldashborer.info.

Management options: Early monitoring and detection of EAB is key to ensure Red Lodge's ash trees do not become infested and die. Large-caliper nursery stock ash from infested areas should not be imported into Red Lodge or sold at local or regional nurseries, as this could result in introduction of larvae. In the event that EAB infestations are detected in the Red Lodge area, insecticides can be effectively used to protect ash trees from EAB (Herms et al 2009).

July 20, 2017 Article in Carbon County News

Volunteers survey town's 2,100 trees

By Alastair Baker
News Editor

In order to keep a healthy eye on Red Lodge's 2,100 trees a small team of volunteers and a contractor are presently busy traipsing the town's sidewalks, public rights of way and parks recording essential data using a geographic data collection application on their phones or tablets to create a tree inventory.

The group, consisting of Jennifer and Tom Lyman and Theresa Whistler, are

collecting the information to help evaluate and make recommendations to those responsible for the care and maintenance of the trees whether it's property owners, city or volunteers.

The project is expected to last into September.

They are looking at items such as: types of damage or defects (mechanical damage inflicted by lawn mowers or weed eaters, for instance) and disease or insects that may be impacting tree health. They are also noting if a tree is too close to a

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power line, assessing any canopy growth limitations (some cages may be too tight), whether the trees are getting enough water especially in the first 2-3 years of growth, and if there are any recommended maintenance tasks. Tree gators and more frequent watering is a common recommendation for younger and newly planted trees: cost-share trees, Arbor Day trees or those along public easements.

The group is not following up on the findings but may notify the owner about the tree and make recommendations or suggestions on how to keep the tree healthier.

"There is a lot of effort to do this inventory," said Whistler. "We're hopeful of getting people to pay more attention to their trees."

"Most of the watering of the trees in the downtown area isn't carried out by the City but by the volunteers," added Jennifer Lyman.

The group is also trying to get volunteers to do some of the pruning that needs to be done.

The last inventory was carried out in 2009. This latest project is covered by a DNRC grant with Parks



Photo by Alastair Baker

Jennifer Lyman checks out a Colorado Blue Spruce at the Smith Mine Memorial Grove at Coal Miners Park. There are approximately up to 20 Spruce trees that need TLC. "They are not getting enough water," said Lyman, despite there being an irrigation system in place. There is no history attached to the system said Lyman.

Board matching funds provided through the resort tax.

Tartarian Flame Maple, and Japanese Lilac "are ideal street trees for planting under power lines," said James Caniglia, City Planner. "These trees grow deep roots and generally have a maximum height of about 30 feet. The roots of some species can cause severe sidewalk and driveway damage, so be mindful of what you are planting. The tree inventory

will help us assess which tree species are thriving in Red Lodge, identify diseases and pruning, water and other needs."

Caniglia also advises that people should call the City to find out where they can plant in a public right-of-way and to ask for utility locates whenever they are unsure at what may be underground. If they come across a large dying tree call Public Works at 425-9557 who will deal with it.

"The Parks Board volunteer group is dedicated to making Red Lodge a pretty place and encourage the growth of a greener Red Lodge" said Whistler.

"Street trees improve a street's look," said Caniglia. "They also help regulate heating and cooling, buffer street noise, act as wind breaks and increase property values." Any homeowner with land adjacent to city owned land (public right-of-ways) may apply for "cost-share" trees.

For more information on how you can help volunteer or what trees to get call James Caniglia at 446-1606, ext. 117.

"Protecting your property rights"

The logo for Carbon County Abstract & Title Company. It features a central shield-shaped emblem with a stylized 'A' and 'T' intertwined. Above the shield, it says "CARBON COUNTY" in an arc. Below the shield, it says "EST. 1909" on either side of the central emblem. Below the shield, it says "ABSTRACT & TITLE COMPANY" in large, bold letters.

Red Lodge Program Tree Listing

Arbor Day Trees, Types and Locations

Arbor Day Trees			
Year	Location	Common Name	Species Scientific Name
2009	6 trees - 2 Skate Park, 4 Locations on side streets	N/A	N/A
2010	Field School Park	Maple	<i>Acer spp.</i>
2011	Along 4 th Street Meats	Tatar Maple	<i>Acer tataricum</i>
2011	Along 4 th Street Meats	Tatar Maple	<i>Acer tataricum</i>
2011	Along 4 th Street Meats	Tatar Maple	<i>Acer tataricum</i>
2014	Funeral Parlor, Broadway N	Quaking Aspen (columnar)	<i>Populus tremuloides</i>
2014	Funeral Parlor, Broadway N	Quaking Aspen (columnar)	<i>Populus tremuloides</i>
2014	Funeral Parlor, Broadway N	Quaking Aspen (columnar)	<i>Populus tremuloides</i>
2014	1 S Platt Ave, City Hall Front	Birch	<i>Betula spp.</i>
2015	9 th at Lions Park Gazebo	Linden, Harvest Gold	<i>Tilia mongolica 'Harvest gold'</i>
2015	9 th at Lions Park Gazebo	Linden, Harvest Gold	<i>Tilia mongolica 'Harvest gold'</i>
2016	Junction 7 Front, 1 Broadway N	Japanese Lilac Tree	<i>Syringa reticulata 'Ivory Silk'</i>
2016	Junction 7 Front, 1 Broadway N	Japanese Lilac Tree	<i>Syringa reticulata 'Ivory Silk'</i>
2017	11 th St W at Wells Fargo Bank	Tatar Maple	<i>Acer tataricum</i>
2017	11 th St W at Wells Fargo Bank	Tatar Maple	<i>Acer tataricum</i>

Cost-share Trees, Types and Locations

Red Lodge Cost Share Trees				
Count	Year	Address	Common Name	spp. / Cultivar
1	2017	905 Coutts	Hawthorn	<i>Crataegus Crimson Cloud</i>
2	2017	19 N Platt	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>
3	2017	19 N Platt	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>
4	2017	23 N Platt	Honeylocust	<i>Gleditsia Northern Acclaim</i>
5	2017	23 N Platt	Honeylocust	<i>Gleditsia Northern Acclaim</i>
6	2017	523 N Hauser	Ash, American Mountain	<i>Sorbus americana</i>
7	2017	523 N Hauser	Hawthorn	<i>Crataegus crimson cloud</i>
8	2017	323 Cole Dr	Japanese Lilac Tree	<i>Syringia reticula 'ivory silk'</i>
9	2017	1001 Coutts Ave	Hawthorn	<i>Crataegus Crimson Cloud</i>
10	2017	1017 Coutts Ave	Honeylocust	<i>Gleditsia Northern Acclaim</i>

1	2016	323 Cole Dr	Crimson Cloud Hawthorn	<i>Crataegus Crimson Cloud</i>
2	2016	323 Cole Dr	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>
3	2016	614 S Broadway	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>
4	2016	614 S Broadway	Linden, "Harvest Gold"	<i>Tilia mongolica</i>
5	2016	16 N Platt	Japanese Lilac Tree	<i>Syringia reticula 'ivory silk'</i>
6	2016	20 N Platt	Japanese Lilac Tree	<i>Syringia reticula 'ivory silk'</i>
7	2016	20 N Platt	Dakota Pinnacle Birch	<i>Betula platyphylla 'Fargo'</i>

8	2016	2 S Platt	Honeylocust 'Skyline'	<i>Gleditsia triacanthos 'Skycole'</i>
9	2016	1184 Lazy M St	Honeylocust 'Skyline'	<i>Gleditsia triacanthos 'Skycole'</i>
10	2016	19 W 4 th St	Linden, 'Harvest Gold'	<i>Tilia mongolica 'Harvest gold'</i>
11	2016	19 W 4 th St	Crimson Cloud Hawthorn	<i>Crataegus Crimson Cloud</i>
12	2016	19 W 4 th St	Crimson Cloud Hawthorn	<i>Crataegus Crimson Cloud</i>
13	2016	19 W 4 th St	Honeylocust 'Skyline'	<i>Gleditsia triacanthos 'Skycole'</i>
14	2016	124 W 7 th St	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>
15	2016	124 W 7 th St	Ash, Oakleaf Mountain	<i>Sorbus hybrida</i>

1	2015	451 Upper Continental Dr	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
2	2015	451 Upper Continental Dr	Harvest Gold Linden	<i>Tilia mongolica</i>
3	2015	Mountain Springs Villa (914-912 Coutts?)	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>
4	2015	Mountain Springs Villa (913 Coutts?)	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>
5	2015	1009 Coutts	Regal Petticoat Maple	<i>Acer Pseudoplatanus</i>
6	2015	901 Coutts	Harvest Gold Linden	<i>Tilia mongolica</i>
7	2015	916 Coutts	Harvest Gold Linden	<i>Tilia mongolica</i>
8	2015	1028 Coutts	Green Mountain Maple	<i>Acer saccharum 'Green Mountain'</i>
9	2015	908 Coutts	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
10	2015	323 Cole Dr	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
11	2015	323 Cole Dr	Harvest Gold Linden	<i>Tilia mongolica</i>
12	2015	124 W 7th St	Harvest Gold Linden	<i>Tilia mongolica</i>
13	2015	124 W 7th St	Harvest Gold Linden	<i>Tilia mongolica</i>
14	2015	124 W 7th St	Harvest Gold Linden	<i>Tilia mongolica</i>
15	2015	1945 Pine Ridge Rd	Green Mountain Maple	<i>Acer saccharum 'Green Mountain'</i>
16	2015	1945 Pine Ridge Rd	Green Mountain Maple	<i>Acer saccharum 'Green Mountain'</i>
17	2015	1004 Coutts	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
18	2015	305 N Platt Ave	Accolade Elm	<i>Ulmus 'Morton' Accolade</i>
19	2015	602 S McGillen Ave	Regal Petticoat Maple	<i>Acer Pseudoplatanus</i>
20	2015	602 S McGillen Ave	Sugar Maple	<i>Acer saccharum</i>
21	2015	602 S McGillen Ave	Accolade Elm	<i>Ulmus 'Morton' Accolade</i>
22	2015	720 N Hauser Ave	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>
23	2015	16 N Platt Ave	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>
24	2015	10 N Platt Ave	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>
25	2015	10 N Platt Ave	Skyline Honelocust	<i>Gleditsia triacanthos 'Skycole'</i>

1	2014	1000 Coutts	Harvest Gold Linden	<i>Tilia mongolica</i>
2	2014	1016 Coutts	Japanese Lilac Tree	<i>Syringa reticulata</i>
3	2014	1117 Coutts	Japanese Lilac Tree	<i>Syringa reticulata</i>
4	2014	1 N Villard Ave	Tatar Maple	<i>Acer tataricum</i>
5	2014	106 S Adams Ave	Harvest Gold Linden	<i>Tilia mongolica</i>
6	2014	106 S Adams Ave	Harvest Gold Linden	<i>Tilia mongolica</i>
7	2014	324 S Adams Ave	Harvest Gold Linden	<i>Tilia mongolica</i>

8	2014	418 S Hauser Ave	Tatar Maple	<i>Acer tataricum</i>
9	2014	451 Upper Continental Dr	Sugar Maple	<i>Acer saccharum</i>
10	2014	122 S Hauser Ave	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
11	2014	122 S Hauser Ave	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
12	2014	122 S Hauser Ave	Oakleaf Mountain Ash	<i>Sorbus hybrida</i>
13	2014	12 S Platt Ave	Tatar Maple	<i>Acer tataricum</i>
14	2014	12 S Platt Ave	Tatar Maple	<i>Acer tataricum</i>
15	2014	989 - 1007 Lazy M St	Honeylocust	<i>Gleditsia Triacanthos 'Northern Acclaim'</i>
16	2014	989 - 1007 Lazy M St	Tatar Maple	<i>Acer tataricum</i>
17	2014	989 - 1007 Lazy M St	Tatar Maple	<i>Acer tataricum</i>
18	2014	989 - 1007 Lazy M St	Sienna Glenn Maple	<i>Acer x freeman 'Sienna'</i>
19	2014	701 S Hauser Ave	Honeylocust	<i>Gleditsia Triacanthos 'Northern Acclaim'</i>
20	2014	701 S Hauser Ave	Japanese Lilac Tree	<i>Syringa reticulata</i>
21	2014	701 S Hauser Ave	Sienna Glenn Maple	<i>Acer x freeman 'Sienna'</i>
22	2014	1024 S McGillen Ave	Harvest Gold Linden	<i>Tilia mongolica</i>
23	2014	1 S Villard Ave	Japanese Lilac Tree	<i>Syringa reticulata</i>
24	2014	1 S Villard Ave	Japanese Lilac Tree	<i>Syringa reticulata</i>
25	2014	419 N Hauser Ave	Honeylocust	<i>Gleditsia Triacanthos 'Northern Acclaim'</i>

1	2013	116 W 5 th St	Tatar Maple	<i>Acer tataricum</i>
2	2013	116 W 5 th St	Tatar Maple	<i>Acer tataricum</i>
3	2013	116 W 5 th St	Tatar Maple	<i>Acer tataricum</i>
4	2013	16 S Platt Ave	Linden, Greenspire	<i>Linden cordata</i>
5	2013	16 S Platt Ave	Linden, Greenspire	<i>Linden cordata</i>
6	2013	514 N Platt Ave	Linden, Greenspire	<i>Linden cordata</i>
7	2013	123 S Word Ave	Ash, Patmore Green	<i>Fraxinus pennsylvanica 'Patmore'</i>
8	2013	Int W 9 th St & N Word	Linden, Harvest gold	<i>Tilia mongolica 'Harvest gold'</i>
9	2013	Int W 9 th St & N Word	Linden, Harvest gold	<i>Tilia mongolica 'Harvest gold'</i>
10	2013	19 N Word Ave	Ash, Patmore Green	<i>Fraxinus pennsylvanica 'Patmore'</i>
11	2013	19 N Word Ave	Ash, Patmore Green	<i>Fraxinus pennsylvanica 'Patmore'</i>
12	2013	840 Bigfoot Cir	Maple, Sienna Glenn Freeman	<i>Acer x freeman 'Sienna'</i>
13	2013	2103 Grizzly Cir	Maple, Green Mountain	<i>Acer saccharum, 'Green Mountain'</i>
14	2013	1260 Lazy M St	Maple, Green Mountain (removed)	<i>Acer saccharum, 'Green Mountain'</i>
15	2013	1260 Lazy M St	Maple, Green Mountain	<i>Acer saccharum, 'Green Mountain'</i>
16	2013	1001 S Adams Ave	Tatarian Maple	<i>Acer tataricum</i>
17	2013	609 Broadway Ave N	Linden, Greenspire	<i>Linden cordata</i>
18	2013	609 Broadway Ave N	Linden, Greenspire	<i>Linden cordata</i>
19	2013	609 Broadway Ave N	Linden, Greenspire	<i>Linden cordata</i>
20	2013	18 S Platt Ave	Tatarian Maple	<i>Acer tataricum</i>
21	2013	422 W 15 th St	Maple, Sienna Glenn Freeman	<i>Acer x freeman 'Sienna'</i>
22	2013	422 W 15 th St	Maple, Green Mountain	<i>Acer saccharum, 'Green Mountain'</i>

23	2013	6 S Platt Ave	Linden, Harvest gold	<i>Tilia mongolica</i> 'Harvest gold'
24	2013	6 S Platt Ave	Linden, Harvest gold	<i>Tilia mongolica</i> 'Harvest gold'
25	2013			

Other-grant Trees, Types and Locations

Northwest Energy Grant Trees				
Year	Quant	Species Scientific Name	Common Name	Location
2011	1	<i>Tilia cordata</i>	Linden, greenspire	9 th at Lions Park Gazebo
2011	1	<i>Acer Tataricum</i>	Tatar Maple	Along 12 St E at Snow Creek Saloon
2011	1	<i>Acer Tataricum</i>	Tatar Maple	Along 12 St E at Snow Creek Saloon
2011	1	<i>Acer Tataricum</i>	Tatar Maple	Along 12 St E at Snow Creek Saloon
2011	1	<i>Acer Tataricum</i>	Tatar Maple	Along 12 St E at Snow Creek Saloon
2011	1	<i>Acer Tataricum</i>	Tatar Maple	Along 12 St E at Snow Creek Saloon
2011	1	<i>Gleditsia triacanthos</i>	Honeylocust	Wells Fargo 1 S Broadway Ave
2011	1	<i>Gleditsia triacanthos</i>	Honeylocust	Wells Fargo 1 S Broadway Ave
2011	1	<i>Gleditsia triacanthos</i>	Honeylocust	Courthouse front on N Broadway
2011	1	<i>Syringia reticulata</i> 'Ivory Silk	Japanese Lilac Tree	Courthouse side off N Broadway
2011	1	<i>Acer x freeman</i> 'Sienna'	Maple, Sienna Glenn Freeman	Courthouse front on N Broadway
2011	1	<i>Syringa reticulata</i> 'Ivory Silk'	Japanese Lilac Tree	Adjacent Pollard on 11 th St E
2011	1	<i>Syringa reticulata</i> 'Ivory Silk'	Japanese Lilac Tree	Adjacent Pollard on 11 th St E
2011	1	<i>Syringa reticulata</i> 'Ivory Silk'	Japanese Lilac Tree	Adjacent Pollard on 11 th St E
2011	1	<i>Tilia mongolica</i> 'Harvest gold'	Linden, Harvest gold	Adjacent Pollard Parking on 11 th E
2011	1	<i>Tilia mongolica</i> 'Harvest gold'	Linden, Harvest gold	Adjacent Pollard Parking on 11 th E
2011	1	<i>Tilia mongolica</i> 'Harvest gold'	Linden, Harvest gold	Adjacent Pollard Parking on 11 th E
2011	1	<i>Tilia mongolica</i> 'Harvest gold'	Linden, Harvest gold	Lions Park median (by Moose Trails)
2011	1	<i>Tilia mongolica</i> 'Harvest gold'	Linden, Harvest gold	Lions Park median (by Moose Trails)
2011	1	<i>Acer ginnala</i>	Amur Maple	RLCF Parking Lot Side Cutouts
2011	1	<i>Acer ginnala</i>	Amur Maple	RLCF Parking Lot Side Cutouts
2011 /12	1	<i>Maple, Unidentified / Tilia spp.</i>	Linden (replacement)	Field School Park SE of Tennis Courts