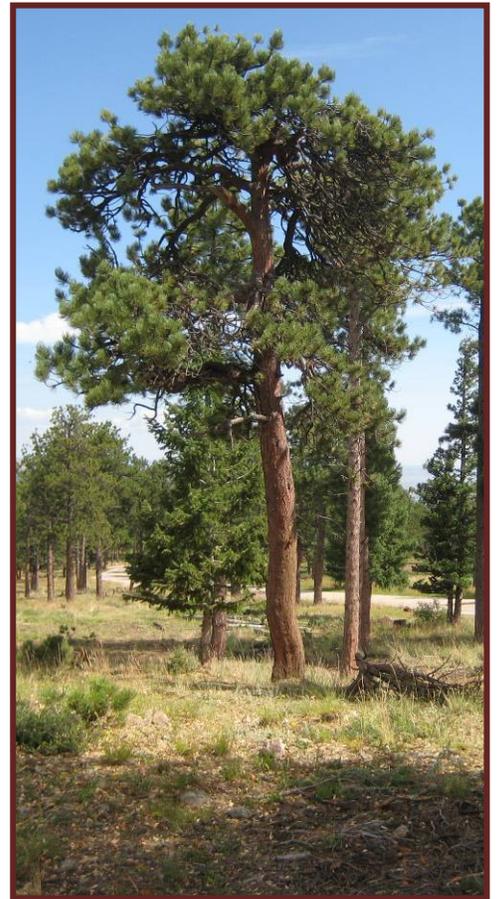
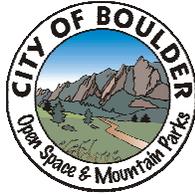


2014 Forest Management Summary Report

City of Boulder Open Space and Mountain Parks
and
City of Boulder Fire Department



Prepared by Chris Wanner, Forest Ecologist
December 2014

EXECUTIVE SUMMARY

The 2014 field season was the eleventh consecutive year Open Space and Mountain Parks (OSMP) committed full time resources to the implementation of the Forest Ecosystem Management Plan. In total, 172 10-hour days were spent on forest management by the OSMP forest restoration crew between March 17 and December 19. As a result of these efforts, 166 forest acres were thinned in 2014, more than in any previous season. The field season also included a continued emphasis on vegetation monitoring, data modeling, mapping, and analysis, and collaborative projects with neighbors, local fire protection districts and the Colorado State Forest Service.

BACKGROUND

In June of 1999, Boulder City Council approved part one of the City of Boulder Forest Ecosystem Management Plan (FEMP). The plan established a framework, policy guidelines, and management direction for forest ecosystem management on City lands. The FEMP focuses on two primary goals:

- Maintain or enhance native plant and animal species, their communities and the ecological processes that sustain them
- Reduce the wildfire risk to forest and human communities

FOREST MANAGEMENT PROGRESS

Forest management on OSMP has shifted over the years from smaller, partial projects to larger complete projects (Figure 1). This shift can be attributed to better equipment, broader scale planning, and more committed staff time. Large complete projects are more efficient because less time is spent on layout and logistics. Larger projects also have ecological benefits. Impacts are greatly decreased by doing one large project instead of a series of smaller ones (one access road, one pass with the skidder, etc.). Large projects also have a more dramatic impact on the landscape by improving more habitat for wildlife and understory plants, increasing vigor and health of entire stands of trees and by decreasing the threat of large catastrophic fire events.

OSMP has been able to extend its effectiveness by working collaboratively with other local groups with similar goals. In 2005, OSMP and the City Fire Department Wildland Division developed the first Service Level Agreement (SLA) to define the annual work plan for both crews. Crew coordination and a strong working relationship with City Fire has continued through 2014. The SLA was expanded in 2012 to an eight year agreement and included commitments by the Fire Department to spend at least 100 days per year on OSMP projects and for OSMP to fund a portion of the new City wildland facility. OSMP staff has also partnered with local fire protection districts, Colorado State Forest Service, and Boulder County to complete larger scale forest management projects in the past few years.

OSMP has also increased its internal capacity by adding equipment and staff dedicated to implementing the FEMP. Over the past five years OSMP has purchased a new tractor, two chippers, and a log trailer to add to the fleet dedicated to forest management work. Since 2004 when the first dedicated OSMP forest management crew was hired, staffing has also increased. In 2013 the crew size doubled to eight crew members for roughly nine months of the year.

OSMP also hired a permanent forest management technician to coordinate crews and oversee much of the field work. This increased staffing level continued during the 2014 season.

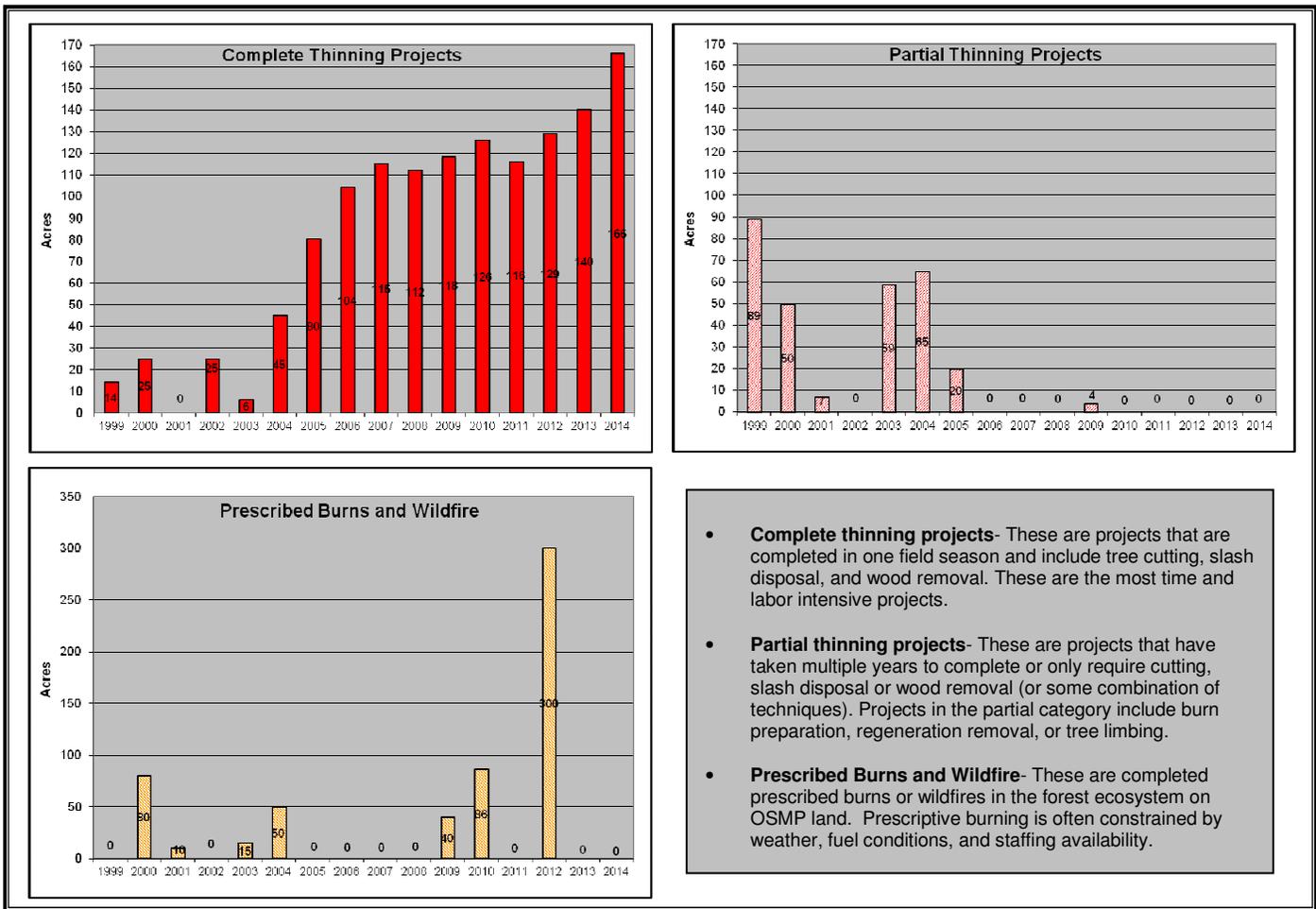


Figure 1: Annual forest management progress

Major Forest Management Projects by Year:

- 2014:** Flagstaff Rd, Cragmoor/Shanahan, Knollwood, Shanahan Ridge 6 HOA
- 2013:** S3, Upper Flagstaff, Kineman (Bison Dr), Knollwood
- 2012:** Bison Dr, Flatirons Vista, Upper Flagstaff, Pine Needle Notch, Canyonside, Flagstaff Fire
- 2011:** Flagstaff Summit, Flatirons Vista, Abbey Pl., Kneale Rd.
- 2010:** Anemone Hill thinning, Watertank thinning, Dome wildfire
- 2009:** Enchanted Mesa thinning, S3 prescribed burn, Flatirons Vista Grassland restoration
- 2008:** Shanahan Ridge (four units east of Mesa Tr.)
- 2007:** Flagstaff Road Corridor, Pinebrook Fuel Break, Marshall Mesa
- 2006:** Lindsay/Jeffco-NE, Marshall Mesa, Lindsay/Jeffco-SE
- 2005:** Lindsay South, Olson/McIntosh, Daman, Enchanted Mesa Reservoir, Lindsay Road
- 2004:** S3 Cutting and Skidding, McIntosh, Conda Meadow, Watertank/FLVI Burn Prep, Lindsay Meadow Burn
- 2003:** S3 Cutting, Volunteer Regen Cutting, Conda Meadow, Lindsay North Burn (3)
- 2002:** ST3, Shanahan/Devils Thumb Neighborhood Thinning
- 2001:** Lindsay North Burns (1, 2), Wittemyer Fuel Break
- 2000:** Lindsay North, Enchanted Mesa, Shanahan Burn
- 1999:** Lindsay North, Enchanted Mesa, Flagstaff Top Shop

2014 FOREST MANAGEMENT CREW

Most of the implementation of the Forest Ecosystem Management Plan is carried out by a dedicated, hard working seasonal crew. In previous years OSMP has hired a crew of three to four crew members for six to nine months depending on available budgets. In 2013 staffing was doubled to include a crew of eight for almost 10 months. This increased budget and staffing level continued during the 2014 season and allowed for a crew of 8 for a total of 10 months. The crew spent a total of 172 work days (down slightly from 184 work days in 2013) on various OSMP projects with most of the emphasis on forest thinning (Figure 2). The forest crew also spent time on other departmental priorities including substantial time on training other OSMP staff and addressing hazards across the system.

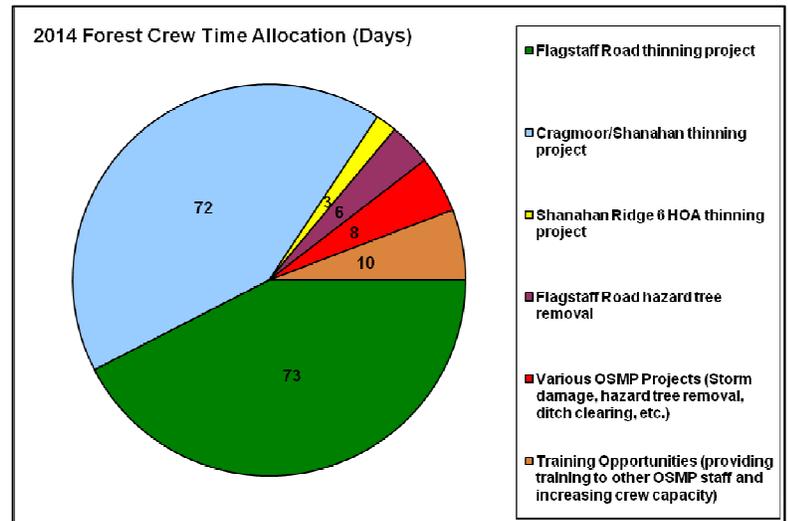


Figure 2: Time spent on 2014 projects by the OSMP forest crew.

In addition to the forest management work completed by OSMP staff, The Fire department's Wildland Division (Fire) worked closely with OSMP staff to meet the goals of the FEMP. In 2014, OSMP and Fire worked to develop a thinning project with a flexible schedule that could be completed by Fire staff throughout the summer. In 2013 this proved to be a very effective way to manage projects with OSMP and Fire crews working according to their respective schedules and addressing other priorities as they arose. In 2014 a project in the Knollwood area was developed that built on work done by the Fire Department in 2013. Fire staff also conducted numerous training courses that directly benefited OSMP crews including conducting annual red card refreshers for all qualified OSMP staff and arranging advanced chainsaw trainings for the OSMP forest crew.

2014 THINNING PROJECTS

A total of 148 days were spent by the OSMP forestry crew on thinning projects in 2014. The Fire department added an additional 14 days of thinning work in the Knollwood area. The OSMP crew also benefited from the help of other work groups. Twelve days were spent working with AmeriCorps, volunteer groups, OSMP Junior Rangers and jail crews. Each group included 8 to 12 individuals who helped chip, drag slash, and load smaller logs. A total of 166 acres were thinned in three treatment areas during the 2014 season.

Flagstaff Road

The Flagstaff Road thinning project covered approximately 70 acres between the four and five mile marks of Flagstaff Rd. This project was a continuation and expansion of a project started in 2007 to thin areas along the road to improve forest habitat, create a landscape level fuel break, and improve the road as an emergency egress route in the event of a wildfire or other emergency. The thinning work also builds on the extensive work OSMP has done in other areas along Flagstaff Road and in the Bison Drive area as well as work done on adjacent lands by private property owners and the Rocky Mountain Fire Department. The larger scale benefit of this project also led to funding from the state in the form of a Colorado State Forest Service

grant in the amount of \$15,000. The OSMP forest crew spent a total of 73 work days between March 18 and August 27 on this project which included cutting, skidding, chipping and hauling. A portion of this project was a second entry that followed initial cutting done in 2007.

The 2014 thinning was focused on removing a portion of the trees in the 4" to 12" diameter classes and breaking up the homogenous nature of the stand. Decreasing the overall tree density, increasing forest openings, and creating patches of snags and wildlife trees were all key goals in the project prescription. On average the thinning efforts in the Flagstaff Rd stand decreased the overall stand basal area from 92 sq ft/ acre to 57 sq ft/acre. This density translates to a decrease from 226 trees per acre to 61 trees per acre and an increase in average diameter from 9.9" to 14.3". The canopy cover across the stand decreased by 13% (Figure 3).

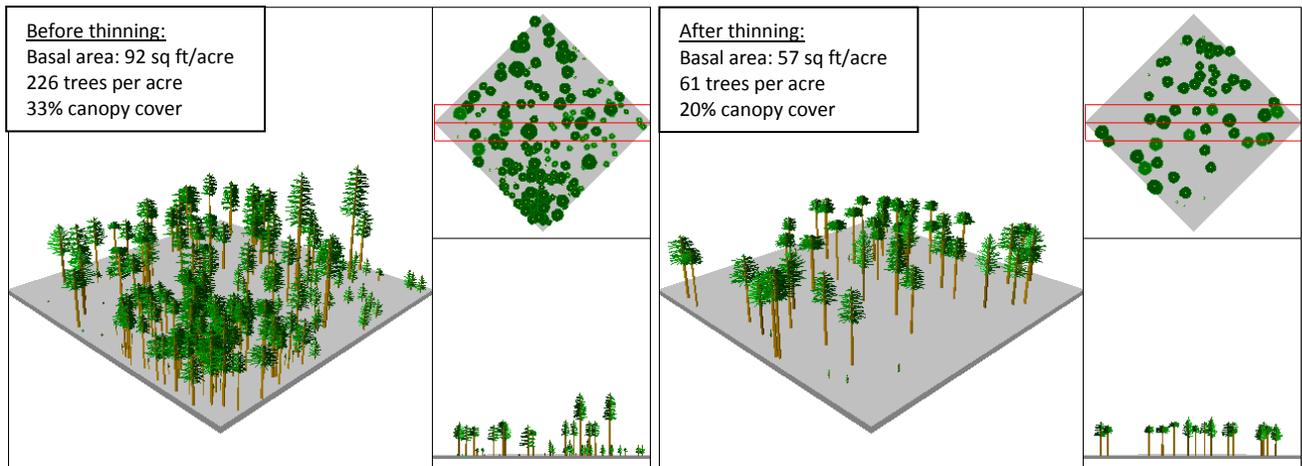


Figure 3: Flagstaff Road overstory structure change due to thinning.

In addition to the thinning in the Flagstaff project area, OSMP staff took advantage of the extended road closure to address hazard trees along the lower portion of Flagstaff Rd. Throughout the summer, traffic on the road dramatically decreased due to construction closures to fix flood damage. These closures allowed the forest crew to remove dead and dying trees that posed a hazard to motorists, cyclists and pedestrians using the road. This hazard tree mitigation occurred in late August between the one and three mile markers of Flagstaff Rd. The work accounted for roughly five additional acres of forest thinning.



A portion of the Flagstaff Road project showing treated (right) and untreated (left) forest conditions.

Cragmoor/Shanahan Ridge

The Cragmoor thinning project was split between two units covering roughly 80 acres located on the north side of the north fork of the Shanahan trail directly adjacent to the city. In 2014, 65 of the total 80 acres were treated. The OSMP forest crew spent 72 days between September 1 and December 5 in the Cragmoor area. This project builds on work done by OSMP between 2001 and 2013 in the Shanahan Ridge area. This is a low elevation, ponderosa pine forest that has become dense and overgrown over the past 100 years. Due to the higher tree densities in the area, the forests are more susceptible to an intense wildfire and habitat function in the area is negatively impacted. Treatments like the Cragmoor project are designed to address dense fuels in the wildland/urban interface and improve habitat function for native vegetation and wildlife.

The prescription for this area focused on removing a mix of tree diameters between 4" and 12" to increase canopy spacing and remove areas of dense ladder fuels. Prior to treatment this area had a high density of young, small diameter trees and a dense overstory canopy. The larger trees, with ages approaching 150 years, were well distributed in the area, but the dense understory trees were creating competition and a heavy fuel load. After thinning, the average basal area decreased from 118 sq ft/acre to 64 sq ft/acre, which translates to a change from 285 trees per acre to about 107. The canopy cover was decreased by 16% (Figure 4).

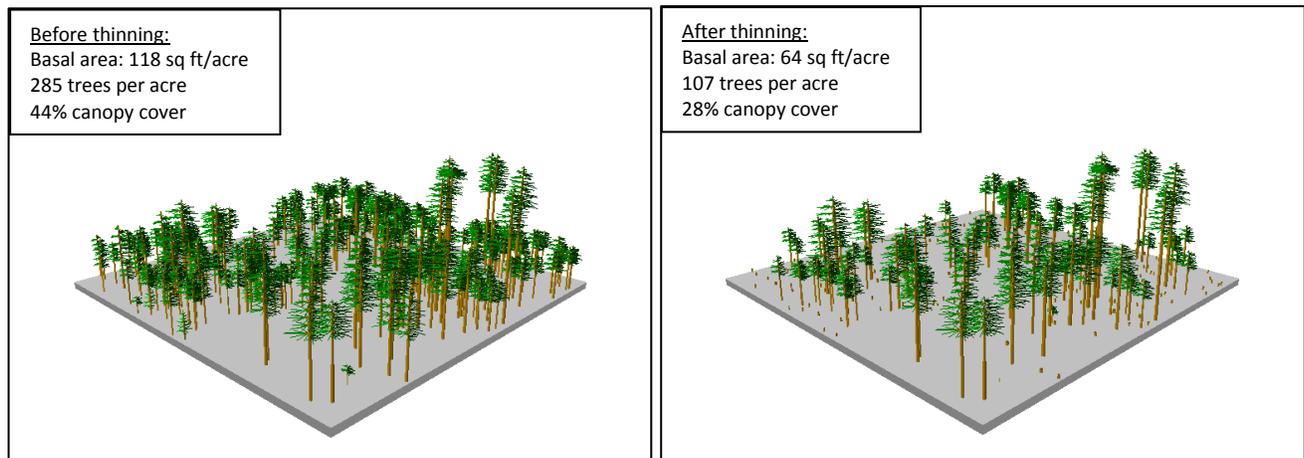


Figure 4: Cragmoor overstory structure change due to thinning.

Additional work was added to the Cragmoor project in mid-August. The Shanahan Ridge 6 homeowners association contacted OSMP early in the summer to request fire mitigation work on adjacent city land. The neighbors had contracted some mitigation work in the HOA common areas and wanted to expand on that. OSMP staff worked with the HOA to develop a plan and the forest crew implemented the tree limbing and thinning between August 13 and 15. Mitigation efforts covered a total of 11 acres adjacent to the neighborhood.

Knollwood

The Knollwood thinning project was located at the mouth of Sunshine Canyon near the Centennial Trailhead and the Knollwood neighborhood. This project was designed as a fire mitigation project to create a fuel break between OSMP land and the city. Thinning completed in 2014 covered 15 acres and was completed by staff from the City Fire Department's Wildland Division. Fire department staff spent roughly 14 days on the project between August 19 and October 21.

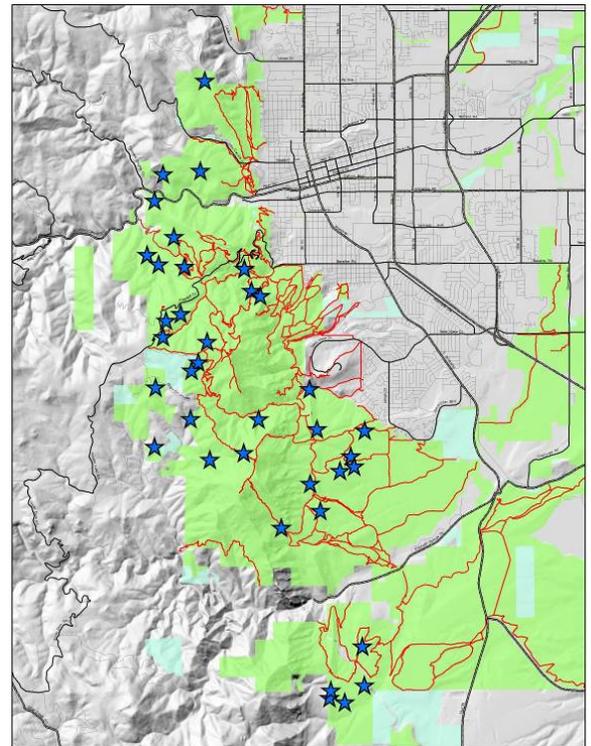
Thinning in this area focused on the removal of primarily small diameter ponderosa pine and some medium sized trees to open up the canopy. All slash created during the project was piled and will be burned in future winters. In the event of a wildfire, this area could be used as a fire break directly adjacent to the city. The open canopy will help reduce fire intensity and increase the effectiveness of air support by allowing slurry drops to reach the ground and suppress combustive surface fuels. The work done in 2014 built on efforts completed in the previous year by the Fire department. In total, 23 acres have been thinned in the Knollwood area.

2014 FOREST MONITORING PROJECTS

Understory Vegetation Monitoring

Forest understory monitoring has been a consistent part of OSMP's forest management. Tracking and quantifying the impacts of thinning on the understory vegetation is an essential part of assessing the success of forestry projects. Over the past ten years, OSMP staff has established numerous monitoring sites in treatment areas across the system's low elevation ponderosa pine stands. These monitoring sites have been used to measure the vegetation cover and composition before and after thinning treatments are implemented. Previous monitoring efforts have shown a dramatic increase in vegetation cover after thinning with native cover almost doubling in treated areas.

In 2011 staff decided to reevaluate the forest monitoring and shift the objectives to a broad scale. The current goals of the understory monitoring are to determine the status and trends of understory vegetation, provide data to better understand the dynamic nature of forest systems, and provide a means of measuring progress towards performance goals. At each monitoring site, information on vegetation species and cover, tree density, canopy cover and litter depth is collected to get a complete picture of the sites vegetation characteristics. The new forest vegetation monitoring project was implemented in 2012 and continued in 2013 and 2014.



Map 1: Understory monitoring sites sampled in 2013.



Understory monitoring plot in the Flagstaff burn following the burn in 2012 (left) and again during the 2014 season.

During the 2014 field season, a total of 37 sites were inventoried across all OSMP forest areas (Map 1). The sites were stratified by forest type to create a representative sample of all OSMP forests. Each sample site will be revisited in future years to account for variations in moisture, temperature and growing season length. All of the sampling in 2014 was completed by OSMP staff between late June and September 3. A total of 20 days were spent by one to three staff members on this monitoring project in 2014.

Overstory and Photo Point Monitoring

Monitoring of forest stand structure and composition is done with permanent photo points and overstory inventories. Photo points have proven to be an effective way to show differences prior to and following treatment. While they are less quantitative than other forms of monitoring, photos can be useful in displaying changes in tree density, understory density, and non-native species composition. Across the treatment areas in 2014, 28 permanent photo points were established. Each point was located using GPS, marked with a tree tag, and the direction of the photos was recorded. The photos for the 2014 projects are attached to this document as Appendix A.

Quantitative data is collected through overstory inventories. OSMP has 337 forest stands mapped across the system. This data is an essential part of OSMP's forest management and provides detailed information about forest structures and overall forest health. Forest overstory data provides the baseline information for all forest prescriptions. In an effort to update our system-wide forest inventory in 2014, staff dramatically increased overstory sampling efforts. The last major inventory effort occurred in 2002 and much of the forest inventory data is over 15 years old. The 2014 season was the start of a re-inventory effort that will likely last the next three to five years. In 2014 a total of 41 stands and 233 plots were re-inventoried covering roughly 1022 acres of OSMP forest.

2015 WORKPLAN

In 2015 OSMP will continue to capitalize on recent equipment additions and forest management expansion efforts. The increased crew size of eight members will be retained and equipment purchased at the end of 2013 and in 2014, including the addition of a new chipper and a new log trailer, will be utilized throughout the upcoming year. In addition to thinning efforts, staff will continue to conduct understory monitoring, expand overstory inventory efforts, conduct vegetation mapping across all OSMP forested areas, and continue collaborative efforts with other local forest and fire managers.

Some thinning projects were postponed in 2014 due to trail damage caused by the 2013 flooding. Treatments along Chapman Drive and in the area of Bear Canyon and the Mesa Trail were postponed when vehicle access to the sites was destroyed by flood water. In 2015 restoration to portions of the trail system should make these projects accessible and will be a priority for completion. OSMP has received a grant of



\$79,000 from the Colorado State Forest Service to complete thinning efforts along Chapman drive. When repairs are made to the road this project area will be a priority for the OSMP forest crew. Other potential project areas for 2015 will include the Flatirons Vista area where multiple years of grassland restoration efforts have already taken place and continued work along Flagstaff Road and in the Shanahan Ridge area. OSMP staff will also continue to work with the City Fire Department on thinning efforts across OSMP along the western edge of the city in the wildland/urban interface.

Monitoring efforts to track treatment effectiveness and overall forest health will continue during the 2015 season. The 37 understory monitoring sites will be resampled in July and August. Staff will also expand efforts to resample overstory inventory sites. This work will continue to focus in low elevation stands where future management is likely. In addition to the forest specific monitoring, staff will continue to revisit the OSMP vegetation mapping efforts. Portions of the mapping are over ten years old and staff will focus on mapping large portions of forested areas to the association level.

RELATED DOCUMENTS

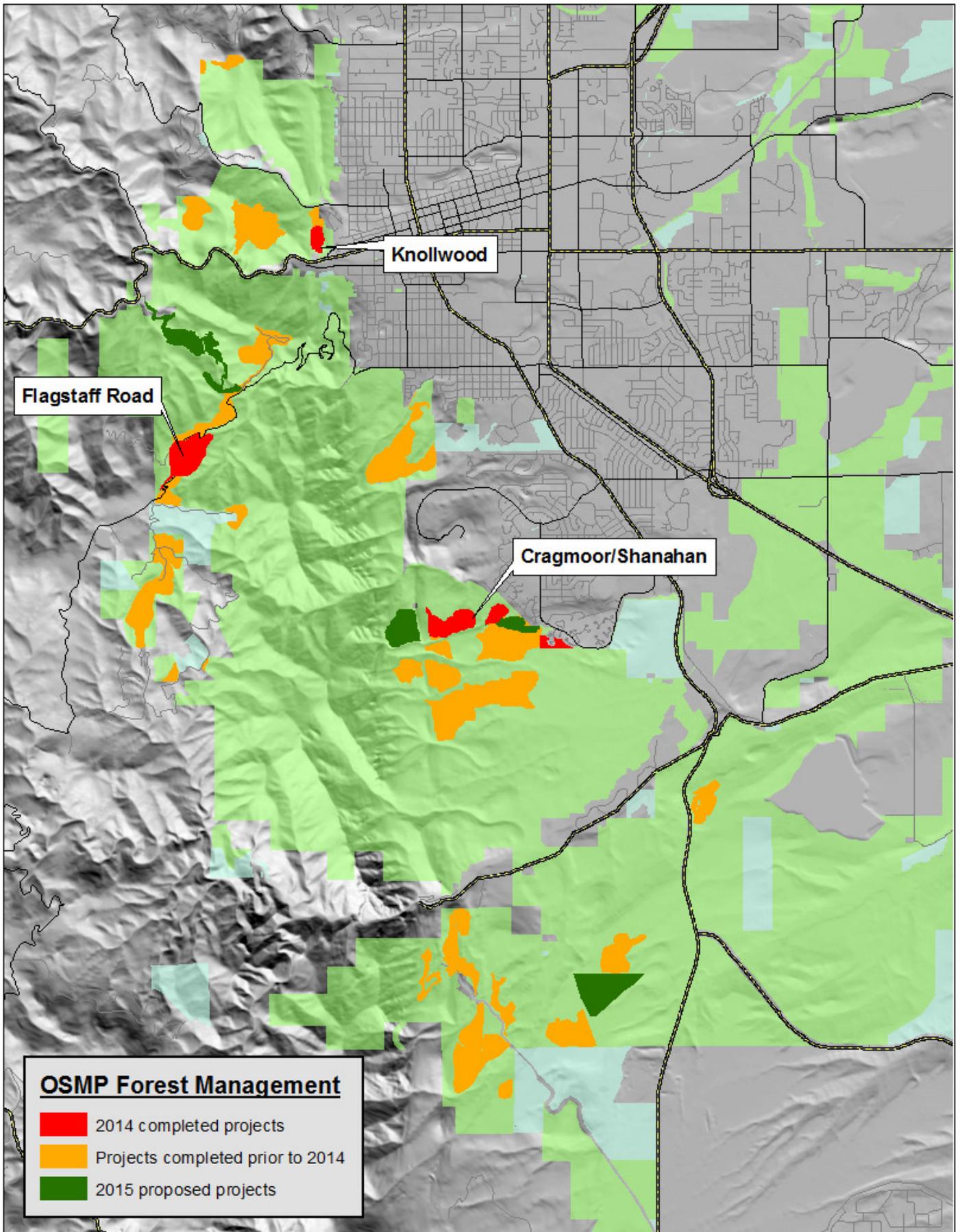
Anchor Point. (2007). *City of Boulder, Wildland Urban Interface, Community Wildfire Protection Plan*. Report prepared for City of Boulder, Fire Department. Boulder, Colorado.

Available at:

http://csfs.colostate.edu/pages/documents/city_of_boulder_cwpp_main_report_final.pdf

City of Boulder. (1999). *City of Boulder Forest Ecosystem Management Plan, Part 1*, June 1999. City of Boulder Open Space Department, City of Boulder Mountain Parks Division, and City of Boulder Wildland Fire Division, Boulder Fire Department.

Available at: <https://bouldercolorado.gov/osmp/forest-ecosystem-management-plan>



Appendix A: Photo Point Monitoring

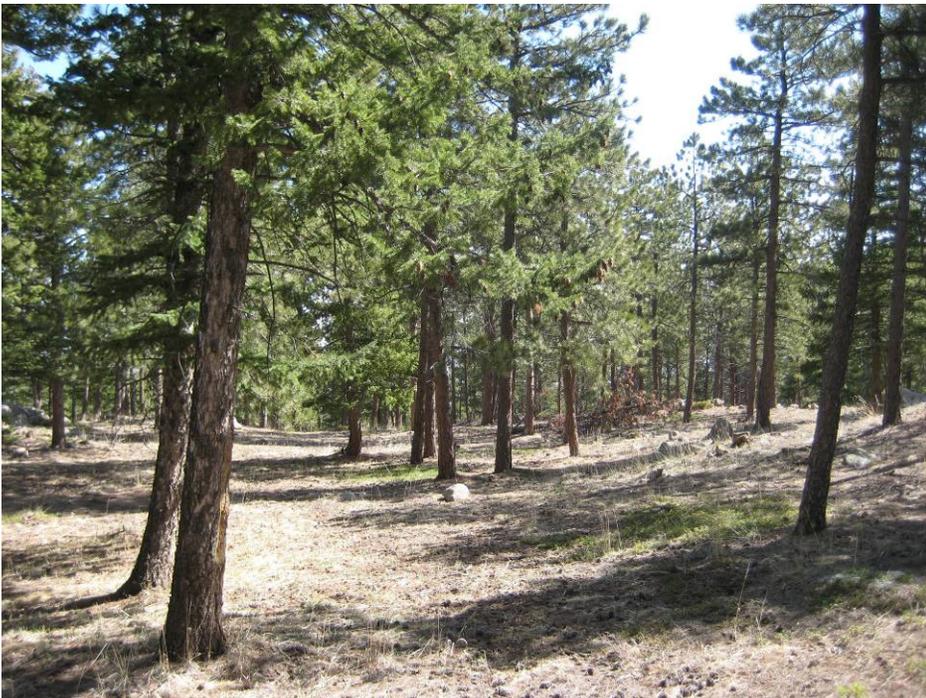
Flagstaff Road



Flagstaff 1: April 11, 2014



September 14, 2014



Flagstaff 2: April 11, 2014



September 14, 2014



Flagstaff 3: April 11, 2014



September 14, 2014



Flagstaff 4: April 11, 2014



September 14, 2014



Flagstaff 5: April 11, 2014



September 14, 2014



Flagstaff 6: April 11, 2014



September 14, 2014



Flagstaff 7: April 11, 2014



September 14, 2014

Cragmoor/Shanahan



Cragmoor 1: September 16, 2014



October 31, 2014



Cragmoor 2: September 16, 2014



October 31, 2014