

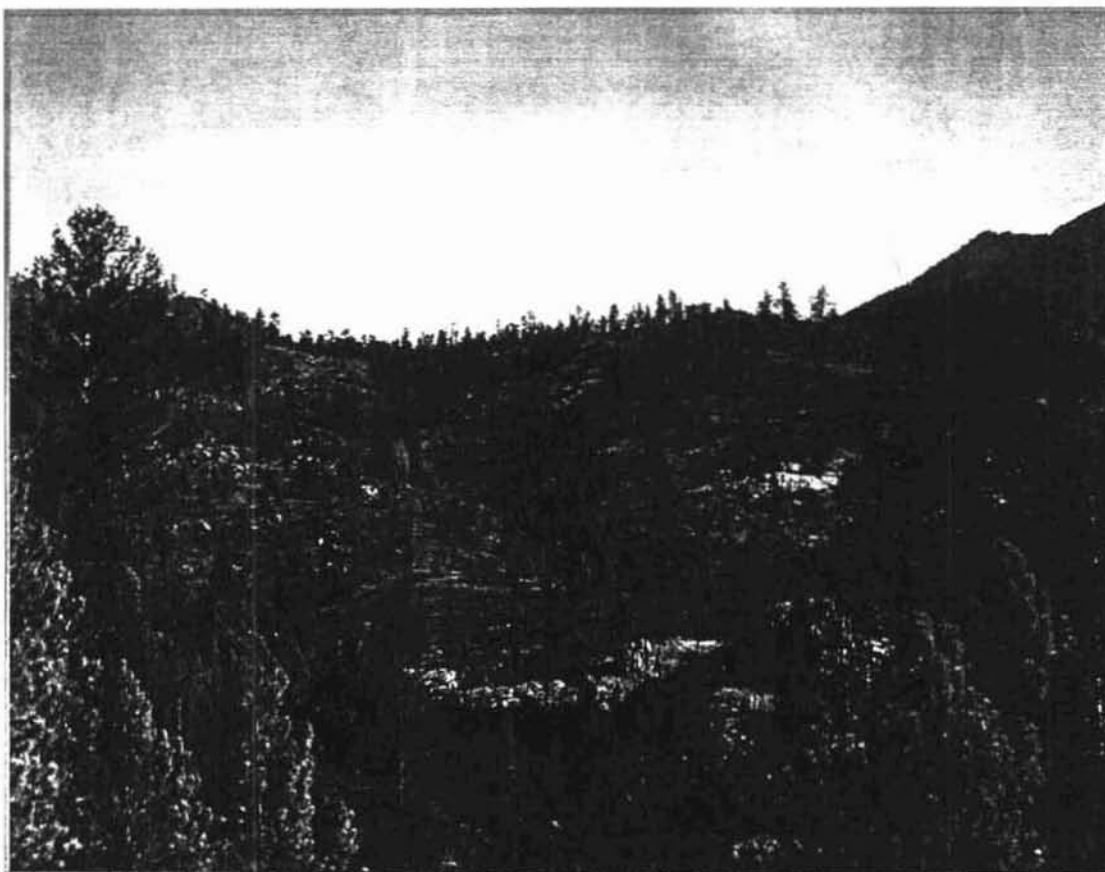


WP NATURAL RESOURCE CONSULTING, INC

NEPA • WILDLIFE • VEGETATION • WETLANDS • WETLANDS • PLANNING

**BOULDER COUNTY PARKS AND OPEN SPACE
SMALL GRANTS PROGRAM 2001**

**"EFFECTS OF WILDFIRE ON PONDEROSA PINE
ECOSYSTEMS AT WALKER RANCH"**



Walker Ranch: Site of Eldorado Wildfire and Research Plots

**BOULDER CO. PARKS AND
OPEN SPACE DEPT.
P.O. BOX 471
BOULDER, CO 80306
ATTN: WALDEN PONDS**

219 WOOD STREET • FORT COLLINS, COLORADO • 80521

P.O. BOX 520604 SALT LAKE CITY, UT 84152

PHONE: (CO) (970) 484-5811 • FAX: (970) 484-5762

PHONE: (UT) (801) 699-5459 • FAX: (801) 583-8668

EMAIL: ERICPETTERSON@MSN.COM AND MINDYWHEELER@CS.COM



ABSTRACT

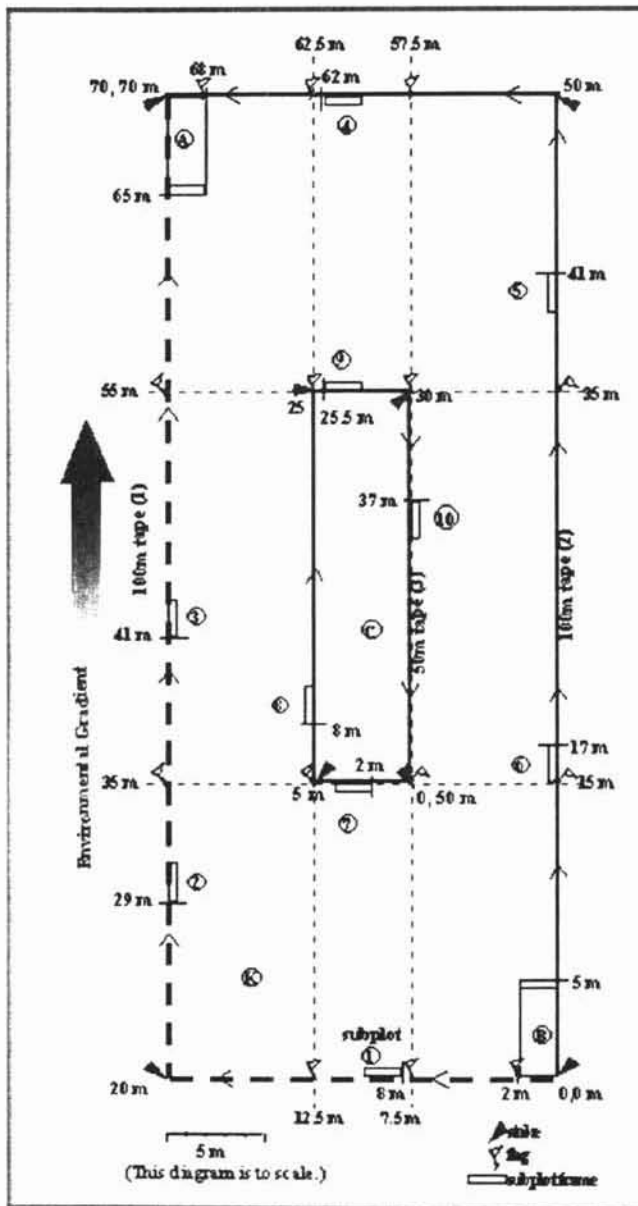
Originally, this research project was designed to investigate the effects of prescribed fire in ponderosa pine communities in Boulder County by collecting pre- and post-burn vegetation and fuels data at two sites on Boulder County Parks and Open Space (BCPOS) properties. These sites were the Walker Ranch and Heil Ranch properties. Pre-burn native and exotic plant species richness, foliar cover, and fuels loading were measured during the summer of 2000 using multi-scaled vegetation plots. Unfortunately, before BCPOS staff was able to burn under prescription the two study areas, the Walker Ranch study site burned in the Eldorado Canyon wildfire in September 2000. Due to the unique opportunity to look at the effects of wildfire with existing pre-burn data, BCPOS staff and WP Natural Resource Consulting concluded that continuing the research under the new task of investigating the effects of wildfire was warranted. However the high fire danger existing at the end of 2000 lead the State of Colorado to place a moratorium on prescribed fires. This moratorium did not allow BCPOS to burn the Heil property. WP Natural Resource Consulting has agreed with BCPOS staff that when Heil is burned, we will collect post-burn data. This report will therefore look at the effects of wildfire specifically at the Walker Ranch property, and will not use data from Heil unless mentioned otherwise. Interestingly, the plots located on Walker Ranch were in an area than had undergone mechanical fuels reductions (thinning from below), while the plots on Heil ranch were in areas that had not undergone fuels reduction.

Total species richness of the vegetation did not change significantly as a result of wildfire (62 ± 9 species pre-burn and 61 ± 6 species post-burn), although post-burn species composition had only a 38% species overlap with pre-burn species. However pre-burn species composition *within* plots had only 40% ($\pm 12\%$) species overlap, while post-burn species composition within plots had only 43% ($\pm 11.5\%$) species overlap. There was no significant change in the total percent of plant cover as a result of wildfire ($46 \pm 7\%$ cover pre-burn and $31 \pm 22\%$ cover post-burn), however, patchy burn severities observed did decrease total plant cover on one plot from 45% down to 6% (primarily due to ponderosa pine canopy loss). This study has lead to 4 generalizations about the effects of wildfire in these ecosystems in Boulder County: (1) Fuels thinning can dramatically reduce fire severity on the landscape scale, which allows understory species diversity to remain high post-burn; (2) Patchy areas of higher intensity/severity fire exist within thinned area which can affect canopy cover and understory species composition and cover; (3) Early seral post-fire plant species which are closely tied to fire events are still found in thinned areas that burn under wildfire conditions; and (4) Plant species composition is very patchy and heterogeneous in both pre- and post-burn conditions at local and landscape scales.



METHODS

Three Modified-Whittaker plots were placed in an area of the Walker Ranch delineated for prescription burning by BCPOS staff. As BCPOS staff already had 2 Modified-Whittaker plots labeled Walker #1 and Walker #2, we numbered our plots Walker #3, #4, and #5 respectively. The Modified-Whittaker plot was selected for use in this study because of its ability to effectively capture landscape scale biodiversity and community composition (Stohlgren et al 1995b). Each plot is 20m x



50m (1000m²) and placed with the long axis along the vegetational gradient with the greatest amount of change. Nested in each plot are ten 1m x 2m (1m²) subplots systematically spaced along the inside perimeter and center subplot, two 2m x 5m (10m²) subplots in alternate corners, and a 5m x 20m (100m²) subplot in the plot center. Each plant species within the ten 1m² subplots was identified and percent foliar cover was estimated to the nearest percent. Average plant height for each species was also recorded within the subplots. The cover of bare mineral soil, rock, and litter was also estimated to the nearest percent. Percent cover of large woody debris greater than 15cm diameter was categorized and recorded as down/dead material rather than litter. Standing snags on the 10m² subplots greater than 10cm diameter at 137cm (i.e., diameter at breast height) was recorded as standing dead, and cover was estimated to the nearest percent. Plant species were also recorded within the 10m² subplots, the 100m² subplot, and the 1000m² plot. Plots were sampled near the time of peak standing crop. Plant species that were not identified in the field were collected (by taking a sample not located within the (sub) plot if possible) and identified at a herbarium. Additional data recorded for each plot included slope, aspect, and elevation, as well as field notes (e.g. general location in relation to notable landmarks). Each plot was permanently marked with four GPS'ed 40cm re-bar stakes located at the corners and

photographs was taken with a digital camera.

SPECIES COVER AND COMPOSITION ANALYSES

The ten 1m² subplots within each of the treated 1000m² plots were averaged for cover analysis. For the species richness comparisons, the 1000m² plot scale was used for non-statistical comparisons. The 1m² subplots, 10m² subplots, 100m² subplots, and 1000m² plots were analyzed separately to assess scale dependency on species richness.



SPECIES COMPOSITION AND DIVERSITY

Jaccard's Coefficient (Krebs 1989) was used to compare species overlap at the 1-m² subplot scale and the 1000 m² plot scale between pre-burn measurements and post-burn measurements. Jaccard's Coefficient (J) is defined as:

$$J = A/(A+B+C)$$

Where A = the number of species found in both paired sites, B = species found in site 1 but not site 2, and C = species found in site 2 but not site 1. A coefficient of 1.0 would indicate complete overlap (i.e., same species lists) found in site 1 and site 2, and a coefficient of 0.0 would indicate no overlap. Jaccard's Coefficient was used over other similarity indices, since it assumes that all species are equally important. Stohlgren et al. (1997) recommended the use of this index as they found that the majority of the plant species sampled in their studies had less than 1% cover.

FUEL LOADING ESTIMATE

Fuel loading was estimated for each plot using USDA Forest Service Fuels Photo-Series. Pre- and post-burn fuel loading was compared to determine wildfire impacts.

MOUNTAIN PINE BEETLE MONITORING

Presences of mountain pine beetle infested trees were inventoried on each of the plots, and total beetle infected trees pre-and post-burn were compared.

POST-BURN SAMPLING

Plots were sampled for post-burn conditions on July 1, 2001. The same vegetation measurements were taken in 2001 and in 2000.



RESULTS

SPECIES RICHNESS

Species richness of native plants at the 1000m² scale was not affected by wildfire in the thinned plots at Walker Ranch. The number of species averaged across the pre-burn plots was 62, and the number of species averaged across post-burn plots was 61 (Table 1). Species richness of exotic plants was very low in all 1000m² plots, averaging 67 species pre-burn, and 2 species post-burn. Even though there was an increase in exotic plants species post-burn, it was encouraging to see the number of species was not higher given the high number of weeds in the surrounding areas.

Table 1: Effects of wildfire on plant species richness at the 1000m² scale.

| Plot # | # Of Native Species | | # Of Exotic Species | |
|-----------|---------------------|----------------|---------------------|----------------|
| | Pre-burn 2000 | Post-burn 2001 | Pre-burn 2000 | Post-burn 2001 |
| Walker #3 | 71 | 57 | 0 | 2 |
| Walker #4 | 61 | 68 | 0 | 2 |
| Walker #5 | 53 | 58 | 2 | 2 |

PLANT COVER

Native species cover was analyzed with and without woody overstory plant species (i.e., ponderosa pine, Douglas-fir, juniper (*Juniperus scopulorum*)) in order to elucidate the effects of wildfire on community dynamics. In all plots, overstory cover was reduced by wildfire, and in one plot in particular, ponderosa pine overstory was reduced from 27% to 0%.

Table 2: Effects of wildfire on plant cover at the 1m² scale (standard errors are in parenthesis).

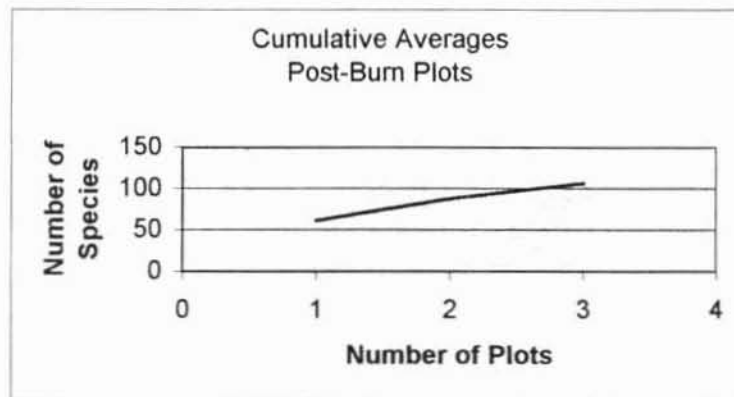
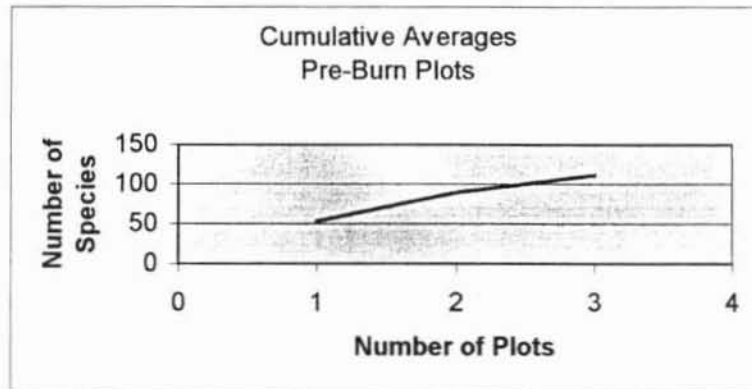
| Plot # | Mean cover (%) of Native Species | | Mean Cover (%) of Exotic Species | |
|-------------------|----------------------------------|----------------|----------------------------------|----------------|
| | Pre-burn 2000 | Post-burn 2001 | Pre-burn 2000 | Post-burn 2001 |
| Walker #3 | 1.45 (.48) | .3 (.65) | 0 | .15 (.2) |
| W-3 w/o overstory | .57 (.87) | .3 (.65) | | |
| Walker #4 | 1.17 (2.56) | .54 (1.07) | 0 | .1 (.14) |
| W-4 w/o overstory | .81 (2.08) | .85 (1.63) | | |
| Walker #5 | 1.36 (3.5) | 1.85 (3.5) | .5 (.7) | .05 (.07) |
| W-5 w/o overstory | .97 (1.84) | 1.21 (2.5) | | |

SPECIES OVERLAP

Despite the relatively minor changes in total species richness between pre- and post-burned plots, there were large variances in species composition both within plot and between pre- and post-burned plots. After looking at the large changes in species composition between pre- and post-burned plots (Jaccard's coefficient = .43, or only 43% species overlap from pre-burn to post-burn plots), the species variance *within* a plot was additionally looked at. Comparing each subplot to all of the other subplots (1m², 10m², and 100m² subplots) within the main plot, and taking the average overlap accomplished this. For pre-burn plots, the within plot species overlap was only 40% (\pm 11.5%), and the post-burn plots had within-plot species overlap of 43% (\pm 12%). This told showed that at smaller scales, species heterogeneity was fairly high even within a homogenous community type. The good news is also that even with low species overlap between pre- and post-burn plots, the number of exotic species invading these sites was low, so native species were the primary colonizers of these burned sites.

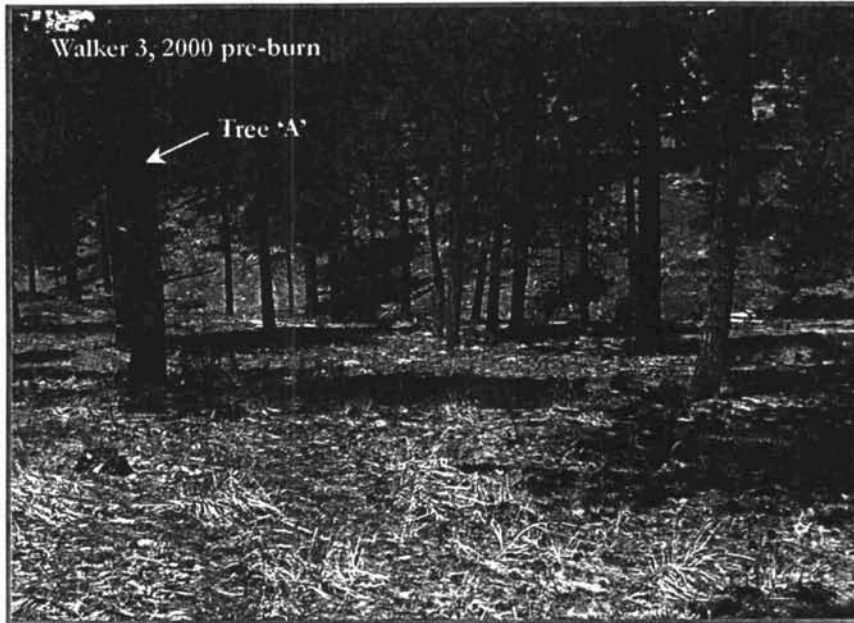
SPECIES AREA RELATIONSHIPS

In this study, post-burn species area relationships closely followed those of the pre-burn conditions. In the post-burn plots, the number of species found at smaller scales was slightly higher, however this difference is minimal at best. The shape of the curves is nearly identical, suggesting that at different levels of sampling, a proportional relationship exists among the number of species found and area surveyed. This proportional relationship also existed across all post-burn sites.



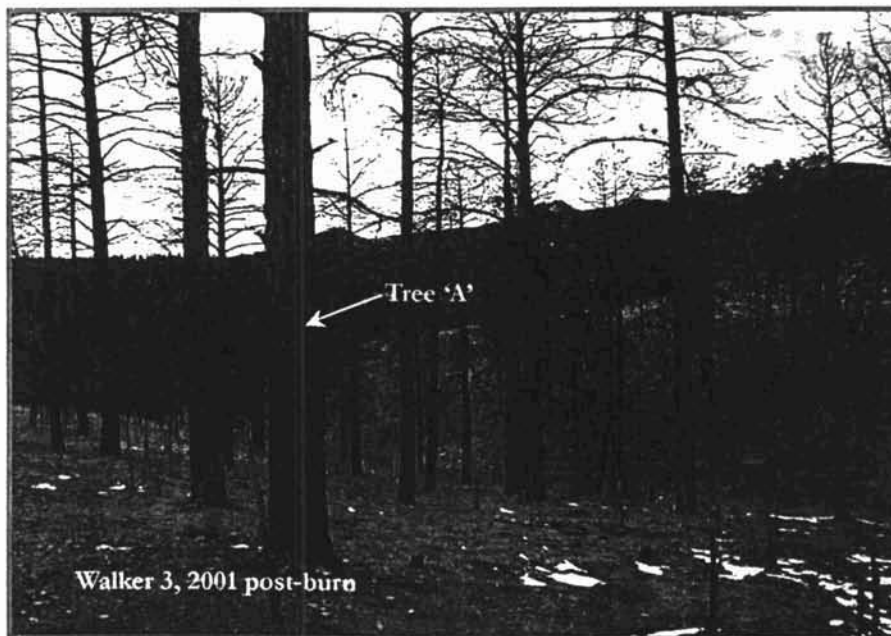
FUELS

Plots placement on Walker Ranch was done in order to capture some of the different stand structures found within the delineated burn area. Open ponderosa, denser stands of ponderosa and meadows with scattered ponderosa were represented. Pre-burn, the down/dead fuels (1000 hour) did not vary much between plots. By far the greatest variation within plots was the amount of canopy cover and variations in grass/forb and litter cover.



| Plot | Size Class | Tons/Acre Pre-Burn | Tons/Acre Post-Burn |
|---------|------------|--------------------|---------------------|
| Walker3 | 0-.25" | .2 | .15 |
| | .25"-1" | .4 | 0 |
| | 1"-3" | .5 | 0 |
| | 3"-9" | .8 | .05 |
| | 9.1"-20" | .5 | .1 |

Walker #3 experienced a high severity crown fire through much of the plot. This severity denuded much of the vegetation in the plot, as well as removed the ponderosa pine canopy. It was interesting



to capture this data in a thinned plot. In the post-burn photo, you can see the small stumps of the removed understory trees. The placement of this stand in a constricted gulch probably lead to the high intensity fire in this plot. Many of these trees will likely fall down in the next few years, adding to the 1000hr fuels profile.



Walker 4, pre-burn

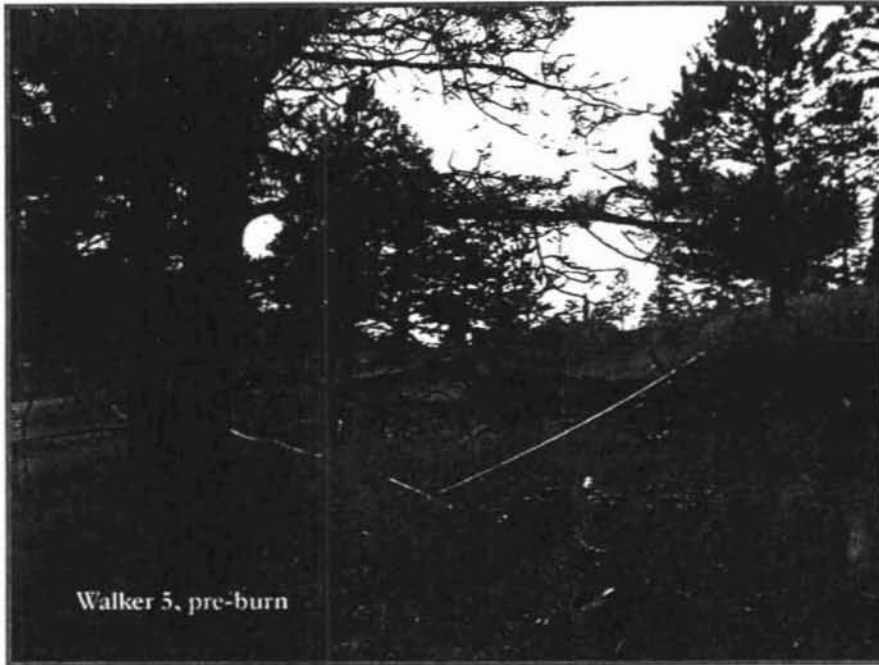
| Plot | Size Class | Tons/Acre pre-burn | Tons/Acre post-burn |
|---------|------------|--------------------|---------------------|
| Walker4 | 0-.25" | .5 | .1 |
| | .25"-1" | 1.2 | 1 |
| | 1"-3" | .8 | .5 |
| | 3"-9" | .7 | |
| | 9.1"-20" | 0 | 0 |



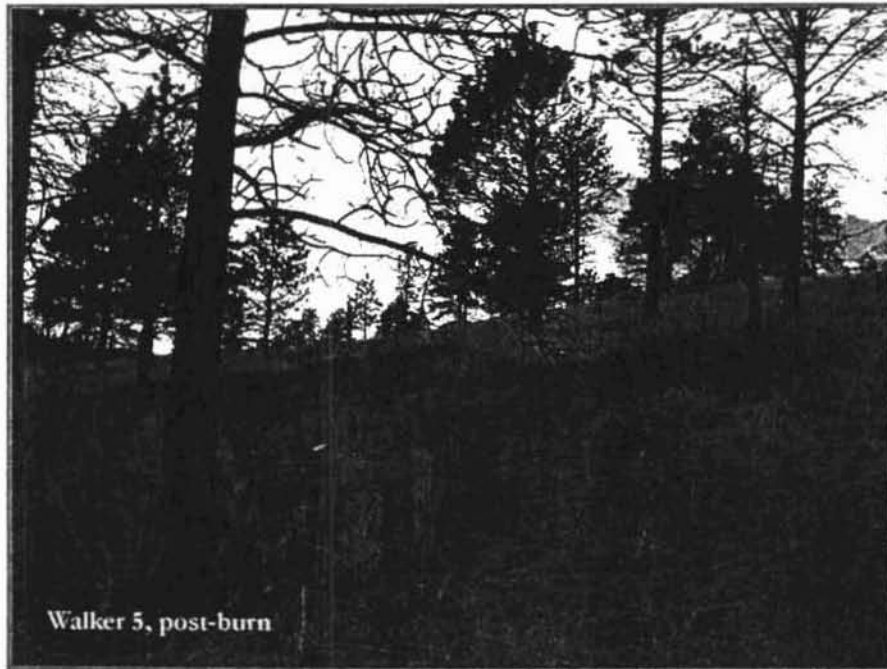
Walker 4, post-burn

Walker 4 had only a few small patches burned, mostly from small spot fires. This was somewhat surprising as fuel connectivity looked high.





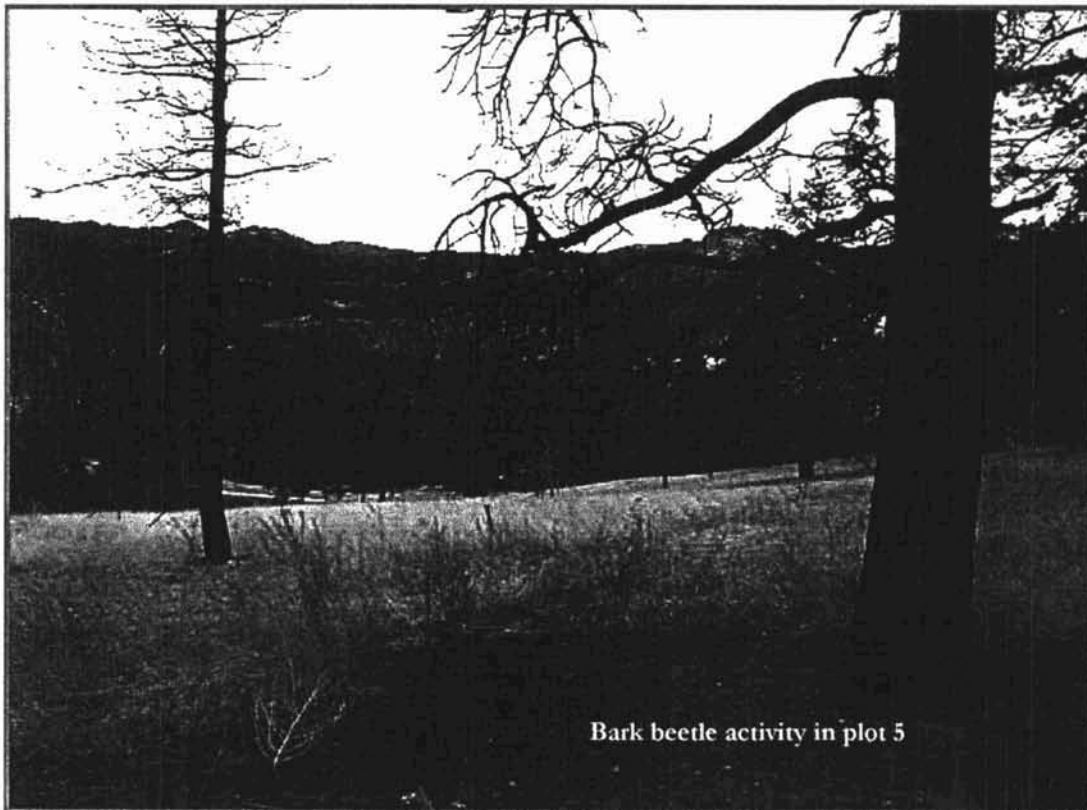
| Plot | Size Class | Tons/Acre pre-burn | Tons/Acre post-burn |
|---------|------------|--------------------|---------------------|
| Walker5 | 0-.25" | .4 | .4 |
| | .25"-1" | 1 | .05 |
| | 1"-3" | .4 | 0 |
| | 3"-9" | .3 | 0 |
| | 9.1"-20" | 1 | 0 |



Walker 5 burned very uniformly, except for a few larger 1000hr fuel pockets in the plot. Some of the trees torched during burning, and others succumbed to pine beetle activity. These trees will likely fall down in the next few years, adding to the 1000hr fuel loading.

BARK BEETLE ACTIVITY

Prior to the Eldorado Canyon fire in September 2000, bark beetle activity was readily observed in individual trees in and around the Walker Ranch property. There were a few clusters of trees infected with bark beetle on the property. As it is widely known that bark beetles concentrate activity in areas of recent fire, it was no surprise that bark beetle activity increased on the Walker Ranch after the Eldorado fire. Bark beetle activity was highest on plot 3, where fire intensities were the highest, and the majority of the ponderosa pine canopy had been consumed by fire. No infested trees were found on plot 4, and only a few trees were found to contain bark beetles on plot 5. It may be beneficial next spring to peel bark from the trees to determine if the beetles produce a successful brood given how much of the canopy was consumed. Additionally, there may be a concern if bark beetle infestations on Walker Ranch persist, and begin to negatively affect any old growth stands of ponderosa pine, or if the beetles move into areas where aesthetics are a priority (i.e. around picnic areas).



Bark beetle activity in plot 5

| Plot | Beetle Infected Trees Pre-Burn | Beetle Infected Trees Post-Burn |
|----------|--------------------------------|---------------------------------|
| Walker 3 | 0 | 17 |
| Walker 4 | 0 | 0 |
| Walker 5 | 0 | 3 |

DISCUSSION

In the plots examined in this study, there was no significant change in native species richness in response to prescribed fire. In plot #3, where fire severity was high, there appeared to be a greater reduction in species richness than in other plots that had lower fire severity (see Armour et al. 1984, Ducey et al. 1996, and Schimmel and Granstrom 1996 for more information on fire intensity and understory responses). Few studies have investigated the effects of fire on species richness (especially at multiple spatial scales), so it is difficult to compare these results to those from other studies. Studies on wildfire and species richness are every more scarce. Some studies (Milburg and Lamont 1995, McArthur et al. 1990) on the effects of prescribed fire and wildfire on species richness indicated a slight to moderate (depending on fire severity) decrease in species richness in the first year following fire, and then a rebounding of diversity, many times surpassing pre-burn conditions in the second year following fire. Long-term data (or short-term data for that matter) are generally lacking on the effects of prescribed fire or wildfire on species richness.

Hobbs and Huenneke (1992) found that even if fire disturbance slightly changed species richness at the plot level, at landscape scales, it could increase heterogeneity by creating new patches of early successional plant communities surrounded by late successional communities. However, this study, although small, does not support this conclusion. With plot #3 burning under high severity conditions, plot #2 barely burning at all, and plot #3 burning under low to moderate severities, according to the literature, one would expect a much higher species richness post-burn than what was observed here. One theory on why higher species diversity was not observed post-burn is that plant communities within Front Range montane systems may have background patchiness diverse enough to mask the effects of many disturbances.

Another reason why species diversity did not change significantly after the burn is that the area was mechanically thinned prior to the fire. The opening of the canopy and creating low-level impacts to the system may have stimulated many species to germinate that were not readily visible when the area was overstocked with smaller ponderosa pine. Therefore, not only did the thinning allow many species to germinate and become established in an otherwise low-species richness site (due to overstocked ponderosa pine), but it also reduced the potential fire severity of the site. If this site had not been thinned, then fire severity would have been much higher, and species richness would have been much lower, mimicking the 300-acre patch of high severity fire south west of the plots on the other side of the county road.

Because of high fuel loading across the western states (Allen 1996, Ffolliott et al. 1996, Weise and Martin 1995), many ecosystems which normally experienced fire in comparatively frequent, low intensity fire regimes are now in danger of high intensity wildfires that can seriously damage native plant populations. To reduce the risk of native plant communities becoming compromised by wildfire events, various land management agencies are utilizing prescribed fire and mechanical fuels treatment. It is important that we further examine the use of prescribed fire and mechanical fuels treatment, and test these methods of fuels reduction to ensure that the best possible applications of these tools are being implemented. Additionally, we need to look at the compounding effects of multiple disturbance agents acting on plant communities, and advise managers of the best course of action to avoid invasions by exotic species.

The response of exotic species to wildfire in the plots did not seem to be correlated with fire severity. In plot #3, where fire severity was highest, two new weed species invaded the site, yet on plot #4, where only about 1/6 of the plot burned under low severity burning, two new weed species invaded the site as well. Additionally, on plot #5, where the plots burned under low to moderate fire severity, 2 weed species were present pre- and post-burn. Literature indicates that in many instances, noxious weeds actually decrease post-burn, but then rebound and rapidly surpass pre-burn



levels. This is probably due to lack of competition and increased nutrients post-burn. However, in plot #3, where even though only two new noxious weed species were located, one of the species, mullein (*Verbascum thapsus*) has dramatically increased its cover on the site. It would be important for BCPOS staff to allocate more funds to weed control around the burn area while these infestations are still relatively small, as with the large amounts of open ground in the area post-burn, noxious weed invasion could rapidly increase in the next few years.

From what was observed in this study, many plant species showed either functional transience, or spatial and temporal transience. That is, plants either adjusted to variable growing conditions by expanding or contracting their morphological size, state and cover, or took advantage of microsite growing conditions. For example, *Chenopodium leptophyllum*, *Collinsia parviflora*, and *Corydalis aurea*, which were initially present in trace amounts in small microsites, responded exceptionally well to fire. Additionally, with the very low species overlap within plots pre-burn, and between pre- and post-burn plots, these systems seem to be highly heterogeneous in time and space. This high species turnover, which could be an adaptation to high variations in annual precipitation, and/or frequent disturbance events (fire) produces gaps that are continuously appearing in the plant community matrix, in which exotic species can become established (Stohlgren et al. 1999a). Thus, it is possible for exotic species to become established given appropriate growth and reproductive requirements, regardless of management activities. For example, Stohlgren et al. (1999b) have shown that exotic plant species have nearly equal richness, foliar cover, and frequency in montane grazing exclosures as in surrounding grazed landscapes.

However, this study has positively shown that mechanical thinning designed to reduce wildfire threats and potential damage has also a beneficial effects of reducing wildfire severity, which in turn keeps species richness high post-burn. By retaining high species richness post-burn, these systems will be more resilient to future disturbances and to invasion by exotic plant species.



LITERATURE CITED

- Allen, C.D., tech. ed. 1996. Fire effects in southwestern forests: proceedings of the second La Mesa Fire symposium; 1994 March 29-31; Los Alamos, NM. USDA For. Serv. Gen. Tech. Rep. RM-286. 216p.
- Armour, C.D., S.C. Bunting, and L.F. Neuenschwander. 1984. Fire intensity effects on the understory in ponderosa pine forests. *J. of Range Manage.* 37(1): 145-152.
- Ducey, M.J., W.K. Moser, and P.M.S. Ashton. 1996. Effect of fire intensity on understory composition and diversity in a *Kalmia*-dominated oak forest, New England, USA. *Vegetatio* 123:81-90.
- Ffolliott, P.F., L.F. DeBano, M.B. Baker, G.J. Gottfried, G. Solis-Garza, C.B. Edminster, D.G. Neary, L.S. Allen, and R.H. Hamre, tech coords. 1996. Effects of fire on Madrean Province ecosystems - a symposium proceedings. March 11 - 15, 1996; Tucson, Az. RM-GTR-289. USDA For. Serv. Gen. Tech. Rep. RM-289. 277p.
- Gallup, S. 1997. Prescribed fire and restoration of the ponderosa pine-grassland ecotone. Masters Thesis, Dept. of Forest Science, Colorado State University, Fort Collins, CO.
- Hobbs, R.J. and L.F. Huenneke. 1992. Disturbance, diversity, and invasion: implications for conservation. *Conser. Bio.* 6: 324-334.
- Krebs, C.J. 1989. *Ecological Methodology*. Harper and Row, New York.
- McArthur, E.D., E.M. Romney, S.D. Smith, and P.T. Tueller, compilers. 1990. Proceedings-symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management; 1989 April 5-7; Las Vegas, NV. USDA For. Serv. Gen. Tech. Rep. INT-276. 351 p.
- Milburg, P. and B.B. Lamont. 1995. Fire enhances weed invasion of roadside vegetation in southwestern Australia. *Bio. Conser.* 73: 45-49.
- Petterson, E.S. 1999. Fire Effects on Plant Communities in Rocky Mountain Bighorn Sheep Habitat. Masters Thesis, Dept. of Rangeland Ecosystem Science, Colorado State University, Fort Collins, CO
- Schimmel, J. and A. Granstrom. 1996. Fire severity and vegetation response in the boreal Swedish forest. *Ecology* 77:1436-1450.
- Stohlgren, T.J., D. Binkley, G.W. Chong, M.A. Kilkhan, L.D. Schell, K.A. Bull, Y. Otsuki, G. Newman, M. Bashkin, and Y. Son. 1999a. Exotic plant species invade hot spots of native plant diversity. *Ecol. Monog.* 69(1): 25-46.
- Stohlgren, T.J., G.W. Chong, M.A. Kahlkhan, and L.D. Schell. 1997. Rapid assessment of plant diversity patterns: A methodology for landscapes. *Ecol. Monit. and Assess.* 48: 25-43.
- Stohlgren, T.J., L.D. Schell, and B. Vanden Heuvel. 1999b. How grazing and soil quality affect native and exotic plant diversity in Rock Mountain grasslands. *Ecol. App.* 9:45-64.



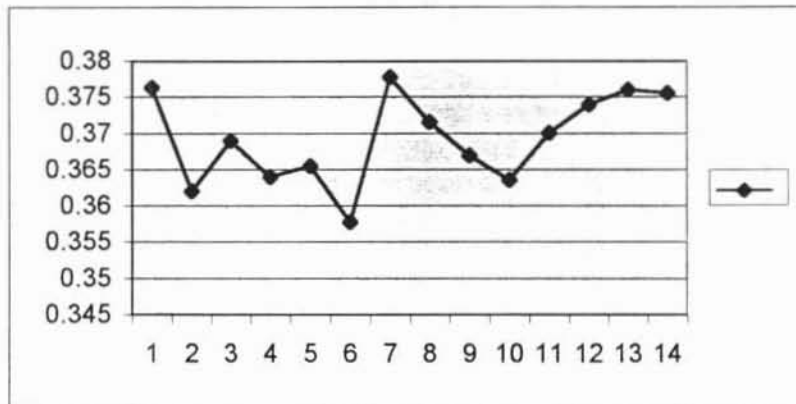
- Stohlgren, T.J., M.B. Falkner, and L.D. Schell. 1995b. A Modified-Whittaker nested vegetation sampling method. *Vegetatio* 117: 113-121.
- Weise, D.R. and R.E. Martin, tech. coords. 1995. The Biswell symposium: fire issues and solutions in urban interface and wildland ecosystems; February 15-17, 1994; Walnut Creek, CA. USDA For. Serv. Gen. Tech. Rep. PSW-158. 199p.



APPENDIX I- JACCARD DATA

Generated Tuesday, December 18, 2001 1:03:06 PM

| First Plot | Second Plot | Jaccard Coefficient | P1 Ct | P2 Ct | P1 Unq | P2 Unq | Com | Running Average |
|------------|-------------|---------------------|-------|-------|--------|--------|-----|-----------------|
| Walker 3 | Walker 4 | 0.375 | 71 | 61 | 35 | 25 | 36 | |
| Walker 3 | Walker 5 | 0.377777778 | 71 | 53 | 37 | 19 | 34 | 0.376389 |
| Walker 3 | Walker 3b | 0.333333333 | 71 | 57 | 39 | 25 | 32 | 0.362037 |
| Walker 3 | Walker 4b | 0.39 | 71 | 68 | 32 | 29 | 39 | 0.369028 |
| Walker 3 | Walker 5b | 0.34375 | 71 | 58 | 38 | 25 | 33 | 0.363972 |
| Walker 4 | Walker 5 | 0.373493976 | 61 | 53 | 30 | 22 | 31 | 0.365559 |
| Walker 4 | Walker 3b | 0.311111111 | 61 | 57 | 33 | 29 | 28 | 0.357781 |
| Walker 4 | Walker 4b | 0.517647059 | 61 | 68 | 17 | 24 | 44 | 0.377764 |
| Walker 4 | Walker 5b | 0.322222222 | 61 | 58 | 32 | 29 | 29 | 0.371593 |
| Walker 5 | Walker 3b | 0.325301205 | 53 | 57 | 26 | 30 | 27 | 0.366964 |
| Walker 5 | Walker 4b | 0.32967033 | 53 | 68 | 23 | 38 | 30 | 0.363573 |
| Walker 5 | Walker 5b | 0.441558442 | 53 | 58 | 19 | 24 | 34 | 0.370072 |
| Walker 3b | Walker 4b | 0.420454545 | 57 | 68 | 20 | 31 | 37 | 0.373948 |
| Walker 3b | Walker 5b | 0.402439024 | 57 | 58 | 24 | 25 | 33 | 0.375983 |
| Walker 4b | Walker 5b | 0.369565217 | 68 | 58 | 34 | 24 | 34 | 0.375555 |



APPENDIX II- SPECIES LISTS BY PLOT

Plot: Walker 2 (Addition)

No doubt of identification

| <i>Native</i> | |
|---------------|--|
| bran | bromus anomalus, nodding brome |
| eras2 | erisimum asperum |
| acla5 | achillea lanulosa |
| elel5 | elymus elymoides, bottlebrush squirreltail |
| elam2 | elymus ambiguus |
| drfi3 | drymocallis fissa |
| crvi4 | cryptantha virgata, miner's candle |
| coum | comandra umbellata, bastard toadflax |
| ciun | cirsium undulatum, wavyleaf thistle |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot |
| cest3 | cerastium strictum |
| cefe | ceanothus fendleri, fendler's ceanothus |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| cage | carex geophila, white mountain sedge |
| erca18 | erigonum campanulatum |
| bofe | boechea fendleri |
| aspo5 | aster porteri, porter's aster |
| asf12 | astragalus flexuosus, flexile milkvetch |
| aruv | arctostaphylos uva-ursi, kinnikinnick |
| arlu | artemisia ludoviciana, louisiana sagewort |
| arfr4 | artemisia frigida, fringed sagewort |
| anro2 | antennaria rosea, rosy pussytoes |
| amps | ambrosia psilostachya, cuman ragweed |
| amla6 | amerosedum lanceolatum |
| alce2 | allium cernuum, nodding onion |
| agda | agropyron dasystachyum |
| caro2 | campanula rotundifolia, bluebell bellflower |
| olal2 | oligoneuron album, |
| stvi4 | stipa viridula |
| somi2 | solidago missouriensis, missouri goldenrod |
| scbr3 | scutellaria brittonii, britton's skullcap |
| rice | ribes cereum, wax currant |
| pupa5 | pulsatilla patens, american pasqueflower |
| psme | pseudotsuga menziesii, douglas fir |
| pipo | pinus ponderosa, ponderosa pine |
| phha | phacelia hastata, silverleaf phacelia |
| oxla3 | oxytropis lambertii, lambert's crazyweed |
| oxde2 | oxytropis deflexa, hangpod crazyweed |
| orlu2 | orthocarpus luteus, yellow owlclover |
| fesa | festuca saximontana, rocky mountain fescue |
| koma | koeleria macrantha, prairie junegrass |
| mumo | muhlenbergia montana, mountain muhly |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| gaar | gaillardia aristata, common gaillardia |
| lipu | liatris punctata, dotted gayfeather |
| lemo3 | lesquerella montana, mountain bladderpod |
| lel | leucopoa kingii |

geca3 geranium caespitosum, pineywoods geranium
 grsq grindelia squarrosa, curlycup gumweed
 hatr harbouria trachyleura, whiskbroom parsley
 hevi4 heterotheca villosa, hairy goldenaster

Introduced

veth verbascum thapsus, common mullein
 poco poa compressa, canada bluegrass
 brte bromus tectorum, cheatgrass

Native and Introduced

popr poa pratensis, kentucky bluegrass

Uncertain of species

Native

canu14 carex nubicola
 caxe carex xerantica, whitescale sedge

Not identified

Origin not known

elymus spp elymus species



| | |
|--------|--|
| cage | carex geophila, white mountain sedge |
| dain | danthonia intermedia, timber oatgrass |
| dili2 | dichanthelium linearifolium, slimleaf panicum |
| agsm | agropyron smithii |
| buda | buchloe dactyloides, buffalograss |
| coma4 | corallorrhiza maculata, summer coralroot |
| cefe | ceanothus fendleri, fendler's ceanothus |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| canu14 | carex nubicola |

Introduced

| | |
|-------|-----------------------------------|
| brin2 | bromus inermis, smooth brome |
| brte | bromus tectorum, cheatgrass |
| mesa | medicago sativa, alfalfa |
| trdu | tragopogon dubius, yellow salsify |
| cedi3 | centaurea diffusa, white knapweed |

Native and Introduced

| | |
|-------|-------------------------------------|
| popr | poa pratensis, kentucky bluegrass |
| acmi2 | achillea millefolium, common yarrow |

Origin not known

| | |
|-------|--|
| asad3 | astragalus adsurgens, standing milkvetch |
|-------|--|

*Uncertain of species**Origin not known*

| | |
|--------|-----------------------|
| agrop2 | agropyron, wheatgrass |
|--------|-----------------------|

*Not identified**Origin not known*

| | |
|--------------|-----------------------|
| gsshru | god damn shrub |
| 1000hr fuels | 1000 hour fuels cover |
| bospp | boechera species |
| gdshrub | |
| unk for | unknown forb |
| erspp | erigeron spp. |



Plot: Walker 3b

*No doubt of identification**Native*

| | |
|--------|--|
| gatr2 | galium trifidum, threepetal bedstraw |
| hatr | harbouria trachypleura, whiskbroom parsley |
| stco4 | stipa comata |
| luar14 | lupinus argentinus |
| gevi2 | geranium viscosissimum, sticky geranium |
| gaar | gaillardia aristata, common gaillardia |
| hevi4 | heterotheca villosa, hairy goldenaster |
| koma | koeleria macrantha, prairie junegrass |
| leki2 | leucopoa kingii |
| lemo3 | lesquerella montana, mountain bladderpod |
| liin2 | lithospermum incisum, narrowleaf gromwell |
| hepa11 | heuchera parvifolia, littleleaf alumroot |
| luar3 | lupinus argenteus, silvery lupine |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| olal2 | oligoneuron album, |
| oxla3 | oxytropis lambertii, lambert's crazyweed |
| pevi3 | penstemon virens, front range beardtongue |
| phha | phacelia hastata, silverleaf phacelia |
| pipo | pinus ponderosa, ponderosa pine |
| pupa5 | pulsatilla patens, american pasqueflower |
| rowo | rosa woodsii, woods' rose |
| scbr12 | sclerocactus brevispinus, shortspine fishhook cactus |
| somi2 | solidago missouriensis, missouri goldenrod |
| frsp | frasera speciosa, showy frasera |
| chie4 | chenopodium leptophyllum, narrowleaf goosefoot |
| stvi4 | stipa viridula |
| scbr3 | scutellaria brittonii, britton's skullcap |
| canu3 | calochortus nuttallii, sego lily |
| apan2 | apocynum androsaemifolium, spreading dogbane |
| alce2 | allium cernuum, nodding onion |
| arfr4 | artemisia frigida, fringed sagewort |
| arlu | artemisia ludoviciana, louisiana sagewort |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| aspa13 | astragalus parryi, parry's milkvetch |
| aspa21 | aster parryi |
| anro2 | antennaria rosea, rosy pussytoes |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| caro2 | campanula rotundifolia, bluebell bellflower |
| cefe | ceanothus fendleri, fendler's ceanothus |
| coau2 | corydalis aurea, scrambledeggs |
| copa3 | collinsia parviflora, smallflower blue eyed mary |
| crvi4 | cryptantha virgata, miner's candle |
| drfi3 | drymocallis fissa |
| cage | carex geophila, white mountain sedge |

Introduced

| | |
|------|---|
| trdu | tragopogon dubius, yellow salsify |
| | carduus nutans, nodding plumeless thistle |

| | |
|------------------------------|--|
| brin2 | bromus inermis, smooth brome |
| veth | verbascum thapsus, common mullein |
| <i>Native and Introduced</i> | |
| taof | taraxacum officinale, common dandelion |
| acmi2 | achillea millefolium, common yarrow |
| popr | poa pratensis, kentucky bluegrass |
| chal7 | chenopodium album, lambsquarters |
| <i>Origin not known</i> | |
| asad3 | astragalus adsurgens, standing milkvetch |
| <i>Uncertain of species</i> | |
| <i>Origin not known</i> | |
| draba | draba, whitlowgrass |
| arabi2 | arabis, rockcress |
| <i>Not identified</i> | |
| <i>Origin not known</i> | |
| 1000hr fuels | 1000 hour fuels cover |
| cica | cirsium canadensis, canada thistle |



Plot: Walker 4

*No doubt of identification**Native*

| | |
|--------|--|
| fesa | festuca saximontana, rocky mountain fescue |
| canu14 | carex nubicola |
| caoc2 | carex occidentalis, western sedge |
| caro2 | campanula rotundifolia, bluebell bellflower |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot |
| coau2 | corydalis aurea, scrambledeggs |
| copa3 | collinsia parviflora, smallflower blue eyed mary |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| eras2 | erysimum asperum |
| arlu | artemisia ludoviciana, louisiana sagewort |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| drfi3 | drymocallis fissa |
| cage | carex geophila, white mountain sedge |
| brla10 | bromopsis lanatipes |
| gaar | gaillardia aristata, common gaillardia |
| aruv | arctostaphylos uva-ursi, kinnikinnick |
| arfr4 | artemisia frigida, fringed sagewort |
| arfr | arenaria franklinii, franklin's sandwort |
| anse4 | androsace septentrionalis, pygmyflower rockjasmine |
| anro2 | antennaria rosea, rosy pussytoes |
| amla6 | amerosedum lanceolatum |
| agsm | agropyron smithii |
| agda | agropyron dasystachyum |
| asfl2 | astragalus flexuosus, flexile milkvetch |
| pest2 | penstemon strictus, rocky mountain penstemon |
| somi2 | solidago missouriensis, missouri goldenrod |
| smst | smilacina stellata |
| sisc7 | silene scouleri, scouler's campion |
| scbr3 | scutellaria brittonii, britton's skullcap |
| rice | ribes cereum, wax currant |
| pupa5 | pulsatilla patens, american pasqueflower |
| ptal3 | pterogonum alatum |
| psme | pseudotsuga menziesii, douglas fir |
| pipo | pinus ponderosa, ponderosa pine |
| phha | phacelia hastata, silverleaf phacelia |
| pevi3 | penstemon virens, front range beardtongue |
| pevi12 | petalostemon villosus |
| paja | paronychia jamesii, james' nailwort |
| koma | koeleria macrantha, prairie junegrass |
| grsq | grindelia squarrosa, curlycup gumweed |
| ersu2 | erigeron subtrinervis, threenerve fleabane |
| hatr | harbouria trachypleura, whiskbroom parsley |
| hepe | helianthus petiolaris, prairie sunflower |
| gevi2 | geranium viscosissimum, sticky geranium |
| hevi4 | heterotheca villosa, hairy goldenaster |
| ipag | ipomopsis aggregata, skyrocket gilia |
| pk | packera fendleri, fendlers ragwort |

| | |
|-------|---|
| leki2 | leucopoa kingii |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| mufi | muhlenbergia filiculmis, slimstem muhly |
| ola2 | oligoneuron album, |

Introduced

| | |
|------|-----------------------------------|
| brte | bromus tectorum, cheatgrass |
| veth | verbascum thapsus, common mullein |

Native and Introduced

| | |
|-------|-------------------------------------|
| arhi | arabis hirsuta, hairy rockcress |
| acmi2 | achillea millefolium, common yarrow |
| popr | poa pratensis, kentucky bluegrass |

Not identified

Origin not known

| | |
|-------------|---------------------------------------|
| unk grass | unknown grass |
| unk ast | unknown astragalus |
| nusi | nuttallia sinuata (mentzelia sinuata) |
| erig spp | erigeron species |
| unk mustard | unknown mustard |



Plot: Walker 4b

*No doubt of identification**Native*

| | |
|--------|--|
| hatr | harbouria trachypleura, whiskbroom parsley |
| paja | paronychia jamesii, james' nailwort |
| olal2 | oligoneuron album, |
| mumo | muhlenbergia montana, mountain muhly |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| lemo3 | lesquerella montana, mountain bladderpod |
| leki2 | leucopoa kingii |
| koma | koeleria macrantha, prairie junegrass |
| hevi4 | heterotheca villosa, hairy goldenaster |
| pipa | pinus ponderosa, ponderosa pine |
| grsq | grindelia squarrosa, curlycup gumweed |
| gevi2 | geranium viscosissimum, sticky geranium |
| gatr2 | galium trifidum, threepetal bedstraw |
| gaar | gaillardia aristata, common gaillardia |
| fesa | festuca saximontana, rocky mountain fescue |
| ipag | ipomopsis aggregata, skyrocket gilia |
| pupa5 | pulsatilla patens, american pasqueflower |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| stvi4 | stipa viridula |
| stco4 | stipa comata |
| somi2 | solidago missouriensis, missouri goldenrod |
| scbr3 | scutellaria brittonii, britton's skullcap |
| pevi3 | penstemon virens, front range beardtongue |
| rice | ribes cereum, wax currant |
| phha | phacelia hastata, silverleaf phacelia |
| ptal3 | pterogonum alatum |
| psme | pseudotsuga menziesii, douglas fir |
| pohi6 | potentilla hippiana, woolly cinquefoil |
| pogl | poa glauca, glaucous bluegrass |
| pofe | poa fendleriana, muttongrass |
| coau2 | corydalis aurea, scrambledeggs |
| rive | ribes velutinum, desert gooseberry |
| anse4 | androsace septentrionalis, pygmyflower rockjasmine |
| agsp | agropyron spicatum |
| crvi4 | cryptantha virgata, miner's candle |
| anro2 | antennaria rosea, rosy pussytoes |
| ersu2 | erigeron subtrinervis, threenerve fleabane |
| apan2 | apocynum androsaemifolium, spreading dogbane |
| arfr4 | artemisia frigida, fringed sagewort |
| arlu | artemisia ludoviciana, louisiana sagewort |
| aruv | arctostaphylos uva-ursi, kinnikinnick |
| asfl2 | astragalus flexuosus, flexile milkvetch |
| bofe | boechera fendleri |
| brla10 | bromopsis lanatipes |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| am6 | amerosedum lanceolatum |



| | |
|-------|--|
| cage | carex geophila, white mountain sedge |
| drfi3 | drymocallis fissa |
| caoc2 | carex occidentalis, western sedge |
| cest3 | cerastium strictum |
| dain | danthonia intermedia, timber oatgrass |
| copa3 | collinsia parviflora, smallflower blue eyed mary |

Introduced

| | |
|-------|---|
| brte | bromus tectorum, cheatgrass |
| brin2 | bromus inermis, smooth brome |
| canu4 | carduus nutans, nodding plumeless thistle |
| alal3 | alyssum alyssoides, pale madwort |
| veth | verbascum thapsus, common mullein |

Native and Introduced

| | |
|-------|-------------------------------------|
| acmi2 | achillea millefolium, common yarrow |
| chal7 | chenopodium album, lambsquarters |
| popr | poa pratensis, kentucky bluegrass |
| arhi | arabis hirsuta, hairy rockcress |

Origin not known

| | |
|-------|--|
| asad3 | astragalus adsurgens, standing milkvetch |
|-------|--|

*Uncertain of species**Origin not known*

| | |
|-------|----------------|
| poa | poa, bluegrass |
| aster | aster, aster |

*Not identified**Origin not known*

| | |
|----------|---------------------------------------|
| unk poa | unknown poa |
| boechera | boechera species |
| nusi | nuttallia sinuata (mentzelia sinuata) |



Plot: Walker 5

*No doubt of identification**Native*

| | |
|-------|--|
| leki2 | leucopoa kingii |
| mumo | muhlenbergia montana, mountain muhly |
| mufi | muhlenbergia filiculmis, slimstem muhly |
| mofi | monarda fistulosa, wildbergamot beebalm |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| koma | koeleria macrantha, prairie junegrass |
| jusc2 | juniperus scopulorum, rocky mountain juniper |
| juco6 | juniperus communis, common juniper |
| pevi3 | penstemon virens, front range beardtongue |
| hepe | helianthus petiolaris, prairie sunflower |
| hevi4 | heterotheca villosa, hairy goldenaster |
| pevi4 | penstemon virgatus, upright blue beardtongue |
| phho | phlox hoodii, spiny phlox |
| pipo | pinus ponderosa, ponderosa pine |
| pohi6 | potentilla hippiana, woolly cinquefoil |
| rice | ribes cereum, wax currant |
| rowo | rosa woodsii, woods' rose |
| rude | rubus deliciosus, delicious raspberry |
| stvi4 | stipa viridula |
| scbr3 | scutellaria brittonii, britton's skullcap |
| somi2 | solidago missouriensis, missouri goldenrod |
| hatr | harbouria trachypleura, whiskbroom parsley |
| alce2 | allium cernuum, nodding onion |
| sisc7 | silene scouleri, scouler's campion |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| amla6 | amerosedum lanceolatum |
| arfr | arenaria franklinii, franklin's sandwort |
| arfr4 | artemisia frigida, fringed sagewort |
| arlu | artemisia ludoviciana, louisiana sagewort |
| grsq | grindelia squarrosa, curycup gumweed |
| asfl2 | astragalus flexuosus, flexile milkvetch |
| anro2 | antennaria rosea, rosy pussytoes |
| bofe | boechera fendleri |
| agsm | agropyron smithii |
| cage | carex geophila, white mountain sedge |
| cefe | ceanothus fendleri, fendler's ceanothus |
| ciun | cirsium undulatum, wavyleaf thistle |
| cvi4 | cryptantha virgata, miner's candle |
| diac2 | dichanthelium acuminatum, tapered rosette grass |
| drfi3 | drymocallis fissa |
| elef5 | elymus elymoides, bottlebrush squirreltail |
| eras2 | erysimum asperum |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| gaar | gaillardia aristata, common gaillardia |
| gevi2 | geranium viscosissimum, sticky geranium |
| bogr2 | bouteloua gracilis, blue grama |

Introduced

trdu tragopogon dubius, yellow salsify
veth verbascum thapsus, common mullein
poco poa compressa, canada bluegrass

Native and Introduced

acmi2 achillea millefolium, common yarrow
popr poa pratensis, kentucky bluegrass

Uncertain of species

Origin not known

ribes ribes, currant

Not identified

Origin not known

unk forb unknown forb



Plot: Walker 5b

*No doubt of identification**Native*

| | |
|--------|--|
| cefe | ceanothus fendleri, fendler's ceanothus |
| hevi4 | heterotheca villosa, hairy goldenaster |
| hepe | helianthus petiolaris, prairie sunflower |
| gevi2 | geranium viscosissimum, sticky geranium |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| eras2 | erysimum asperum |
| elel5 | elymus elymoides, bottlebrush squirreltail |
| drfi3 | drymocallis fissa |
| copa3 | collinsia parviflora, smallflower blue eyed mary |
| ciun | cirsium undulatum, wavyleaf thistle |
| koma | koeleria macrantha, prairie junegrass |
| cest3 | cerastium strictum |
| hatr | harbouria trachypleura, whiskbroom parsley |
| caoc2 | carex occidentalis, western sedge |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| cage | carex geophila, white mountain sedge |
| bogr2 | bouteloua gracilis, blue grama |
| aspo5 | aster porteri, porter's aster |
| asfl2 | astragalus flexuosus, flexile milkvetch |
| arfr4 | artemisia frigida, fringed sagewort |
| alce2 | allium cernuum, nodding onion |
| alal2 | alopecurus alpinus |
| agsm | agropyron smithii |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot |
| pohi6 | potentilla hippiana, woolly cinquefoil |
| stco4 | stipa comata |
| somi2 | solidago missouriensis, missouri goldenrod |
| siau4 | sisymbrium aureum |
| scbr3 | scutellaria brittonii, britton's skullcap |
| rowo | rosa woodsii, woods' rose |
| rhtr | rhus trilobata, skunkbush sumac |
| ptal3 | pterogonum alatum |
| gaar | gaillardia aristata, common gaillardia |
| prvi | prunus virginiana, common chokecherry |
| lare | lappula redowskii |
| pipo | pinus ponderosa, ponderosa pine |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| pevi3 | penstemon virens, front range beardtongue |
| oxla3 | oxytropis lambertii, lambert's crazyweed |
| oeca10 | oenothera caespitosa, tufted evening-primrose |
| leki2 | leucopoa kingii |
| mofi | monarda fistulosa, wildbergamot beebalm |
| lemo3 | lesquerella montana, mountain bladderpod |
| phha | phacelia hastata, silverleaf phacelia |

Introduced

| | |
|------|-----------------------------------|
| trdu | tragopogon dubius, yellow salsify |
| | alyssum alyssoides, pale madwort |



| | |
|------------------------------|---|
| lase | lactuca serriola, prickly lettuce |
| brte | bromus tectorum, cheatgrass |
| canu4 | carduus nutans, nodding plumeless thistle |
| poco | poa compressa, canada bluegrass |
| veth | verbascum thapsus, common mullein |
| <i>Native and Introduced</i> | |
| <hr/> | |
| popr | poa pratensis, kentucky bluegrass |
| chal7 | chenopodium album, lambsquarters |
| acmi2 | achillea millefolium, common yarrow |
| <i>Origin not known</i> | |
| <hr/> | |
| asad3 | astragalus adsurgens, standing milkvetch |
| <i>Not identified</i> | |
| <hr/> | |
| <i>Origin not known</i> | |
| <hr/> | |
| 1000hr fuels | 1000 hour fuels cover |
| erigonum | erigonum species |
| unk forb | unknown forb |



APPENDIX III- AVERAGE COVER OF SPECIES BY PLOT

Project: WP Consulting- Boulder Cnty Parks- Walker

Plot: Walker 2 (Addition)

| Code | Species | Average Cover |
|-------|--|---------------|
| acla5 | achillea lanulosa | 0.90 |
| agda | agropyron dasystachyum | 0.20 |
| amla6 | amerosedum lanceolatum | 0.00 |
| anro2 | antennaria rosea, rosy pussytoes | 2.80 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.80 |
| aruv | arctostaphylos uva-ursi, kinnikinnick | 5.70 |
| asfl2 | astragalus flexuosus, flexile milkvetch | 0.20 |
| aspo5 | aster porteri, porter's aster | 0.00 |
| bofe | boechera fendleri | 0.00 |
| cage | carex geophila, white mountain sedge | 2.10 |
| caro2 | campanula rotundifolia, bluebell bellflower | 0.00 |
| cefe | ceanothus fendleri, fendler's ceanothus | 9.50 |
| cest3 | cerastium strictum | 0.10 |
| chie4 | chenopodium leptophyllum, narrowleaf goosefoot | 0.00 |
| coum | comandra umbellata, bastard toadflax | 0.00 |
| eiel5 | elymus elymoides, bottlebrush squirreltail | 0.30 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 0.40 |
| geca3 | geranium caespitosum, pineywoods geranium | 0.70 |
| grsq | grindelia squarrosa, curlycup gumweed | 0.00 |
| hatr | harbouria trachypleura, whiskbroom parsley | 0.60 |
| hevi4 | heterotheca villosa, hairy goldenaster | 1.00 |
| koma | koeleria macrantha, prairie junegrass | 0.90 |
| leki2 | leucopoa kingii | 0.50 |
| lemo3 | lesquerella montana, mountain bladderpod | 0.00 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.00 |
| olal2 | oligoneuron album, | 0.40 |
| orlu2 | orthocarpus luteus, yellow owllover | 0.00 |
| oxla3 | oxytropis lambertii, lambert's crazyweed | 0.00 |
| pipa | pinus ponderosa, ponderosa pine | 22.80 |
| poco | poa compressa, canada bluegrass | 0.90 |
| popr | poa pratensis, kentucky bluegrass | 1.50 |
| pupa5 | pulsatilla patens, american pasqueflower | 0.10 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.70 |
| veth | verbascum thapsus, common mullein | 0.10 |



Plot: Walker 3

Plotypes

| Code | Species | Average Cover |
|--------------|--|---------------|
| 1000hr fuels | | 0.90 |
| acmi2 | achillea millefolium, common yarrow | 0.00 |
| agrop2 | agropyron, wheatgrass | 0.00 |
| amia6 | amersedum lanceolatum | 0.10 |
| arfr4 | artemisia frigida, fringed sagewort | 0.10 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.40 |
| asad3 | astragalus adsurgens, standing milkvetch | 0.60 |
| asfl2 | astragalus flexuosus, flexile milkvetch | 0.50 |
| asmi10 | astragalus missouriensis, missouri milkvetch | 0.50 |
| aspa13 | astragalus parryi, parry's milkvetch | 0.20 |
| aspo5 | aster porteri, porter's aster | 0.20 |
| cage | carex geophila, white mountain sedge | 1.40 |
| cali4 | castilleja linariifolia, wyoming indian paintbrush | 0.60 |
| cefe | ceanothus fendleri, fendler's ceanothus | 1.20 |
| drfi3 | drymocallis fissa | 0.00 |
| erfl | erigeron flagellaris, trailing fleabane | 0.00 |
| ersu2 | erigeron subtrinervis, threenerve fleabane | 0.20 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 0.00 |
| fesa | festuca saximontana, rocky mountain fescue | 0.40 |
| gaar | gaillardia aristata, common gaillardia | 0.30 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.30 |
| hatr | harbouria trachypleura, whiskbroom parsley | 0.50 |
| hevi4 | heterotheca villosa, hairy goldenaster | 0.40 |
| koma | koeleria macrantha, prairie junegrass | 0.90 |
| leki2 | leucopoa kingii | 3.60 |
| lemo3 | lesquerella montana, mountain bladderpod | 0.00 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.00 |
| pevi3 | penstemon virens, front range beardtongue | 1.30 |
| pipa | pinus ponderosa, ponderosa pine | 27.80 |
| pupa5 | pulsatilla patens, american pasqueflower | 0.20 |
| rice | ribes cereum, wax currant | 3.50 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.00 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.00 |



Plot: Walker 3b

Plotypes

| Code | Species | Average Cover |
|--------------|--|---------------|
| 1000hr fuels | | 3.60 |
| acmi2 | achillea millefolium, common yarrow | 0.00 |
| alce2 | allium cernuum, nodding onion | 0.00 |
| arabi2 | arabis, rockcress | 0.00 |
| arfr4 | artemisia frigida, fringed sagewort | 0.00 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.20 |
| asad3 | astragalus adsurgens, standing milkvetch | 0.10 |
| aspa13 | astragalus parryi, parry's milkvetch | 0.10 |
| cage | carex geophila, white mountain sedge | 1.10 |
| cali4 | castilleja linariifolia, wyoming indian paintbrush | 0.10 |
| chal7 | chenopodium album, lambsquarters | 0.50 |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot | 0.50 |
| cica | | 0.30 |
| copa3 | collinsia parviflora, smallflower blue eyed mary | 0.90 |
| draba | draba, whitlowgrass | 0.00 |
| drfi3 | drymocallis fissa | 0.00 |
| gaar | gaillardia aristata, common gaillardia | 0.40 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.00 |
| hatr | harbouria trachypleura, whiskbroom parsley | 0.40 |
| hepa11 | heuchera parvifolia, littleleaf alumroot | 0.00 |
| koma | koeleria macrantha, prairie junegrass | 0.40 |
| leki2 | leucopoa kingii | 0.40 |
| lemo3 | lesquerella montana, mountain bladderpod | 0.00 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.20 |
| pevi3 | penstemon virens, front range beardtongue | 0.20 |
| phha | phacelia hastata, silverleaf phacelia | 0.00 |
| pipa | pinus ponderosa, ponderosa pine | 0.00 |
| pupa5 | pulsatilla patens, american pasqueflower | 0.50 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.00 |
| taof | taraxacum officinale, common dandelion | 0.00 |
| trdu | tragopogon dubius, yellow salsify | 0.00 |
| veth | verbascum thapsus, common mullein | 0.00 |



Plot: Walker 4

| Code | Species | Average Cover |
|-----------|--|---------------|
| acmi2 | achillea millefolium, common yarrow | 0.20 |
| agsm | agropyron smithii | 0.00 |
| amla6 | amerosedum lanceolatum | 0.00 |
| arfr | arenaria franklinii, franklin's sandwort | 0.20 |
| arfr4 | artemisia frigida, fringed sagewort | 0.10 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.00 |
| aruv | arctostaphylos uva-ursi, kinnikinnick | 7.40 |
| asfl2 | astragalus flexuosus, flexile milkvetch | 0.40 |
| brla10 | bromopsis lanatipes | 0.20 |
| cage | carex geophila, white mountain sedge | 0.60 |
| coau2 | corydalis aurea, scrambledeggs | 0.00 |
| drfi3 | drymocallis fissa | 0.00 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 1.50 |
| fesa | festuca saximontana, rocky mountain fescue | 0.00 |
| gaar | gaillardia aristata, common gaillardia | 0.10 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.30 |
| hatr | harbouria trachypieura, whiskbroom parsley | 0.00 |
| hepe | helianthus petiolaris, prairie sunflower | 0.00 |
| hevi4 | heterotheca villosa, hairy goldenaster | 0.40 |
| koma | koeleria macrantha, prairie junegrass | 0.20 |
| leki2 | leucopoa kingii | 1.20 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.10 |
| mufi | muhlenbergia filiculmis, slimstem muhly | 4.70 |
| olal2 | oligoneuron album, | 0.10 |
| pafe4 | packera fendleri, fendlers ragwort | 0.00 |
| pevi12 | petalostemon villosus | 0.20 |
| pevi3 | penstemon virens, front range beardtongue | 0.20 |
| phha | phacelia hastata, silverleaf phacelia | 0.00 |
| pipa | pinus ponderosa, ponderosa pine | 1.50 |
| popr | poa pratensis, kentucky bluegrass | 0.10 |
| psme | pseudotsuga menziesii, douglas fir | 9.90 |
| pupa5 | pulsatilla patens, american pasqueflower | 0.40 |
| rice | ribes cereum, wax currant | 9.40 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.00 |
| sisc7 | silene scouleri, scouler's campion | 0.30 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.00 |
| unk grass | | 0.00 |



Plot: Walker 4b

Platyces

| Code | Species | Average Cover |
|----------|--|---------------|
| acmi2 | achillea millefolium, common yarrow | 0.70 |
| alal3 | alyssum alyssoides, pale madwort | 0.00 |
| amla6 | amerosedum lanceolatum | 0.70 |
| anse4 | androsace septentrionalis, pygmyflower rockjasmine | 0.00 |
| apan2 | apocynum androsaemifolium, spreading dogbane | 0.00 |
| arfr4 | artemisia frigida, fringed sagewort | 2.20 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.60 |
| aruv | arctostaphylos uva-ursi, kinnikinnick | 4.80 |
| boechera | | 0.00 |
| brin2 | bromus inermis, smooth brome | 0.20 |
| brla10 | bromopsis lanatipes | 0.00 |
| brite | bromus tectorum, cheatgrass | 0.00 |
| cage | carex geophila, white mountain sedge | 0.20 |
| cali4 | castilleja linariifolia, wyoming indian paintbrush | 0.10 |
| cest3 | cerastium strictum | 0.50 |
| chal7 | chenopodium album, lambsquarters | 0.40 |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot | 0.00 |
| coau2 | corydalis aurea, scrambledeggs | 0.20 |
| copa3 | collinsia parviflora, smallflower blue eyed mary | 0.20 |
| civi4 | cryptantha virgata, miner's candle | 0.00 |
| drfi3 | drymocallis fissa | 0.10 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 2.60 |
| fesa | festuca saximontana, rocky mountain fescue | 0.20 |
| gat2 | galium trifidum, threepetal bedstraw | 0.00 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.10 |
| hatr | harbouria trachypleura, whiskbroom parsley | 0.30 |
| hevi4 | heterotheca villosa, hairy goldenaster | 0.70 |
| koma | koeleria macrantha, prairie junegrass | 0.40 |
| leki2 | leucopoa kingii | 2.60 |
| lemo3 | lesquerella montana, mountain bladderpod | 0.10 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.00 |
| mumo | muhlenbergia montana, mountain muhly | 5.90 |
| pevi3 | penstemon virens, front range beardtongue | 0.50 |
| phha | phacelia hastata, silverleaf phacelia | 0.10 |
| pipo | pinus ponderosa, ponderosa pine | 0.80 |
| poa | poa, bluegrass | 0.20 |
| popr | poa pratensis, kentucky bluegrass | 0.90 |
| psme | pseudotsuga menziesii, douglas fir | 3.80 |
| pupa5 | pulsatilla patens, american pasqueflower | 0.00 |
| rice | ribes cereum, wax currant | 7.30 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.00 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.40 |
| veth | verbascum thapsus, common mullein | 0.20 |



Plot: Walker 5

| Code | Species | Average Cover |
|----------|--|---------------|
| acmi2 | achillea millefolium, common yarrow | 0.30 |
| agsm | agropyron smithii | 4.40 |
| alce2 | allium cernuum, nodding onion | 0.00 |
| amia6 | amerosedum lanceolatum | 0.00 |
| arfr | arenaria franklinii, franklin's sandwort | 0.00 |
| arfr4 | artemisia frigida, fringed sagewort | 0.30 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.00 |
| asf12 | astragalus flexuosus, flexile milkvetch | 0.80 |
| bofe | boechera fendleri | 0.00 |
| bogr2 | bouteloua gracilis, blue grama | 0.20 |
| cage | carex geophila, white mountain sedge | 8.90 |
| cali4 | castilleja linariifolia, wyoming indian paintbrush | 0.00 |
| cefe | ceanothus fendleri, fendler's ceanothus | 2.80 |
| ciun | cirsium undulatum, wavyleaf thistle | 0.10 |
| diac2 | dichanthelium acuminatum, tapered rosette grass | 0.00 |
| drfi3 | drymocallis fissa | 0.10 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 0.10 |
| gaar | gaillardia aristata, common gaillardia | 0.00 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.40 |
| grsq | grindelia squarrosa, curlycup gumweed | 0.00 |
| hevi4 | heterotheca villosa, hairy goldenaster | 5.20 |
| jusc2 | juniperus scopulorum, rocky mountain juniper | 0.20 |
| koma | koeleria macrantha, prairie junegrass | 0.80 |
| leki2 | leucopoa kingii | 2.40 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.00 |
| mofi | monarda fistulosa, wildbergamot beebalm | 0.40 |
| mufi | muhlenbergia filiculmis, slimstem muhly | 0.40 |
| mumo | muhlenbergia montana, mountain muhly | 0.30 |
| pevi3 | penstemon virens, front range beardtongue | 0.00 |
| phho | phlox hoodii, spiny phlox | 0.00 |
| pip0 | pinus ponderosa, ponderosa pine | 19.80 |
| poco | poa compressa, canada bluegrass | 0.10 |
| popr | poa pratensis, kentucky bluegrass | 1.60 |
| rice | ribes cereum, wax currant | 1.00 |
| rowo | rosa woodsii, woods' rose | 0.60 |
| sisc7 | silene scouleri, scouler's campion | 0.10 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.30 |
| unk forb | | 0.60 |
| veth | verbascum thapsus, common mullein | 1.00 |



Plot: Walker 5b

Plotypes

| Code | Species | Average Cover |
|--------------|--|---------------|
| 1000hr fuels | | 12.70 |
| acmi2 | achillea millefolium, common yarrow | 0.20 |
| agsm | agropyron smithii | 5.50 |
| alal3 | alyssum alyssoides, pale madwort | 0.00 |
| alce2 | allium cernuum, nodding onion | 0.00 |
| arfr4 | artemisia frigida, fringed sagewort | 0.00 |
| asad3 | astragalus adsurgens, standing milkvetch | 0.40 |
| asfl2 | astragalus flexuosus, flexile milkvetch | 2.20 |
| aspo5 | aster porteri, porter's aster | 0.00 |
| bogr2 | bouteloua gracilis, blue grama | 0.50 |
| cage | carex geophila, white mountain sedge | 4.90 |
| cali4 | castilleja linariifolia, wyoming indian paintbrush | 0.40 |
| cefe | ceanothus fendleri, fendler's ceanothus | 3.70 |
| cest3 | cerastium strictum | 0.00 |
| chle4 | chenopodium leptophyllum, narrowleaf goosefoot | 0.20 |
| ciun | cirsium undulatum, wavyleaf thistle | 0.60 |
| drfi3 | drymocallis fissa | 0.00 |
| elel5 | elymus elymoides, bottlebrush squirreltail | 0.00 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 0.00 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.50 |
| hevi4 | heterotheca villosa, hairy goldenaster | 6.40 |
| koma | koeleria macrantha, prairie junegrass | 0.50 |
| lase | lactuca serriola, prickly lettuce | 0.10 |
| leki2 | leucopoa kingii | 1.00 |
| lemo3 | lesquerella montana, mountain bladderpod | 0.00 |
| mela3 | mertensia lanceolata, lanceleaf bluebells | 0.40 |
| oeca10 | oenothera caespitosa, tufted evening-primrose | 0.10 |
| oxla3 | oxytropis lambertii, lambert's crazyweed | 0.10 |
| pevi3 | penstemon virens, front range beardtongue | 0.20 |
| pipo | pinus ponderosa, ponderosa pine | 14.80 |
| poco | poa compressa, canada bluegrass | 0.10 |
| popr | poa pratensis, kentucky bluegrass | 2.90 |
| rowo | rosa woodsii, woods' rose | 0.50 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.00 |
| somi2 | solidago missouriensis, missouri goldenrod | 0.70 |
| stco4 | stipa comata | 0.40 |
| trdu | tragopogon dubius, yellow salsify | 0.10 |
| unk forb | | 0.70 |
| veth | verbascum thapsus, common mullein | 0.00 |



APPENDIX IV- SPECIES LISTS BY PLOT: HEIL RANCH

Plot: Heil 1

*No doubt of identification**Native*

| | |
|--------|--|
| podi11 | poa distans |
| gevi2 | geranium viscosissimum, sticky geranium |
| grsq | grindelia squarrosa, curlycup gumweed |
| gusa2 | gutierrezia sarothrae, broom snakeweed |
| hevi4 | heterotheca villosa, hairy goldenaster |
| mela3 | mertensia lanceolata, lanceleaf bluebells |
| mufi | muhlenbergia filiculmis, slimstem muhly |
| oppo | opuntia polyacantha, plains pricklypear |
| pepu15 | petalostemon purpureus |
| erum | erigonum umbellatum, sulphur wildbuckwheat |
| pipo | pinus ponderosa, ponderosa pine |
| koma | koeleria macrantha, prairie junegrass |
| rhtr | rhus trilobata, skunkbush sumac |
| rice | ribes cereum, wax currant |
| scbr3 | scutellaria brittonii, britton's skullcap |
| scsc | schizachyrium scoparium, little bluestem |
| spr | sporobolus cryptandrus, sand dropseed |
| stco4 | stipa comata |
| syal | symphoricarpos albus, common snowberry |
| yugl | yucca glauca, small soapweed |
| phha | phacelia hastata, silverleaf phacelia |
| arlu | artemisia ludoviciana, louisiana sagewort |
| agda | agropyron dasystachyum |
| agsm | agropyron smithii |
| amac2 | ambrosia acanthicarpa, flatspine burr ragweed |
| arfr4 | artemisia frigida, fringed sagewort |
| bogr2 | bouteloua gracilis, blue grama |
| cage | carex geophila, white mountain sedge |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| cyfr2 | cystopteris fragilis, brittle bladderfern |
| elel5 | elymus elymoides, bottlebrush squirreltail |
| ange | andropogon gerardii, big bluestem |
| eras2 | erysimum asperum |
| drfi3 | drymocallis fissa |
| diol | dichanthelium oligoanthes, heller's rosette grass |
| dili2 | dichanthelium linearifolium, slimleaf panicum |
| dain | danthonia intermedia, timber oatgrass |

Introduced

| | |
|-------|---|
| trdu | tragopogon dubius, yellow salsify |
| veth | verbascum thapsus, common mullein |
| mesa | medicago sativa, alfalfa |
| lida | linaria dalmatica, dalmatian toadflax |
| poco | poa compressa, canada bluegrass |
| brte | bromus tectorum, cheatgrass |
| canu4 | carduus nutans, nodding plumeless thistle |

Native and Introduced

acmi2 achillea millefolium, common yarrow

Uncertain of species

Native

amac2 ambrosia acanthicarpa, flatspine burr ragweed

Not identified

Origin not known

| | |
|--------------|--------------------|
| 100 hr fuels | 100 hr fuels cover |
| erigeron | erigeron species |
| erigonum | erigonum species |
| unk grass | unknown grass |



Plot: Heil 2

*No doubt of identification**Native*

| | |
|-------|--|
| cage | carex geophila, white mountain sedge |
| bogr2 | bouteloua gracilis, blue grama |
| arlu | artemisia ludoviciana, louisiana sagewort |
| arfr4 | artemisia frigida, fringed sagewort |
| arfr | arenaria franklinii, franklin's sandwort |
| agsm | agropyron smithii |
| eras2 | erysimum asperum |
| cyfr2 | cystopteris fragilis, brittle bladderfern |
| alce2 | allium cernuum, nodding onion |
| scsc | schizachyrium scoparium, little bluestem |
| yugl | yucca glauca, small soapweed |
| tugl | turritis glabra |
| troc | tradescantia occidentalis, prairie spiderwort |
| cali4 | castilleja linariifolia, wyoming indian paintbrush |
| stco4 | stipa comata |
| scbr3 | scutellaria brittonii, britton's skullcap |
| rice | ribes cereum, wax currant |
| rhtr | rhus trilobata, skunkbush sumac |
| pip0 | pinus ponderosa, ponderosa pine |
| koma | koeleria macrantha, prairie junegrass |
| phha | phacelia hastata, silverleaf phacelia |
| hevi4 | heterotheca villosa, hairy goldenaster |
| mufi | muhlenbergia filiculmis, slimstem muhly |
| oppo | opuntia polyacantha, plains pricklypear |
| gevi2 | geranium viscosissimum, sticky geranium |

Introduced

| | |
|------|-----------------------------------|
| brte | bromus tectorum, cheatgrass |
| trdu | tragopogon dubius, yellow salsify |

*Uncertain of species**Origin not known*

| | |
|-------|------------------------------|
| pedio | pediocactus, hedgehog cactus |
|-------|------------------------------|

*Not identified**Origin not known*

| | |
|--------------|-----------------------|
| unk forb | unknown forb |
| 1000hr fuels | 1000 hour fuels cover |
| erigeron | erigeron species |



Project: WP Consulting- Boulder Cnty Parks- Heil

Plot: Heil 3

Plots

| Code | Species | Average Cover |
|--------------|---|---------------|
| 1000hr fuels | | 1.80 |
| acmi2 | achillea millefolium, common yarrow | 0.00 |
| agsm | agropyron smithii | 9.70 |
| amac | amaranthus acanthochiton, greenstripe | 0.20 |
| ange | andropogon gerardii, big bluestem | 0.60 |
| brte | bromus tectorum, cheatgrass | 0.00 |
| cage | carex geophila, white mountain sedge | 2.00 |
| carex 3 | | 0.40 |
| carex4 | | 0.00 |
| clover | | 0.00 |
| dain | danthonia intermedia, timber oatgrass | 0.10 |
| diac2 | dichanthelium acuminatum, tapered rosette grass | 0.10 |
| erigeron | | 0.30 |
| gusa2 | gutierrezia sarothrae, broom snakeweed | 0.20 |
| p134 | | 0.10 |
| p364 | | 1.90 |
| pipo | pinus ponderosa, ponderosa pine | 15.50 |
| poco | poa compressa, canada bluegrass | 17.70 |
| polyg | polygala, polygala | 0.20 |
| popr | poa pratensis, kentucky bluegrass | 1.70 |
| rhtr | rhus trilobata, skunkbush sumac | 0.00 |
| rice | ribes cereum, wax currant | 1.50 |
| unk grass | | 0.20 |



APPENDIX IV- SPECIES LISTS BY PLOT: HEIL RANCH

Project: WP Consulting- Boulder Cnty Parks- Heil

Plot: Heil 1

Plots

| Code | Species | Average Cover |
|--------------|--|---------------|
| 100 hr fuels | | 1.20 |
| agda | agropyron dasystachyum | 0.20 |
| amac2 | ambrosia acanthicarpa, flatspine burr ragweed | 0.20 |
| ange | andropogon gerardii, big bluestem | 3.10 |
| arfr4 | artemisia frigida, fringed sagewort | 0.20 |
| arlu | artemisia ludoviciana, louisiana sagewort | 1.30 |
| bogr2 | bouteloua gracilis, blue grama | 3.40 |
| brte | bromus tectorum, cheatgrass | 1.80 |
| cage | carex geophila, white mountain sedge | 3.10 |
| cyfr2 | cystopteris fragilis, brittle bladderfern | 0.00 |
| diol | dichanthelium oligosanthos, heller's rosette grass | 0.30 |
| drfi3 | drymocallis fissa | 0.10 |
| erigonum | | 0.60 |
| erum | erigonum umbellatum, sulphur wildbuckwheat | 0.10 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.00 |
| grsq | grindelia squarrosa, curlycup gumweed | 0.20 |
| gusa2 | gutierrezia sarothrae, broom snakeweed | 0.40 |
| hevi4 | heterotheca villosa, hairy goldenaster | 1.60 |
| koma | koeleria macrantha, prairie junegrass | 0.20 |
| lida | linaria dalmatica, dalmatian toadflax | 0.00 |
| meia3 | mertensia lanceolata, lanceleaf bluebells | 0.00 |
| mesa | medicago sativa, alfalfa | 0.00 |
| mufi | muhlenbergia filiculmis, slimstem muhly | 4.70 |
| oppo | opuntia polyacantha, plains pricklypear | 3.40 |
| phha | phacelia hastata, silverleaf phacelia | 0.00 |
| pipo | pinus ponderosa, ponderosa pine | 8.00 |
| poco | poa compressa, canada bluegrass | 2.00 |
| podl11 | poa distans | 0.30 |
| rice | ribes cereum, wax currant | 0.70 |
| scbr3 | scutellaria brittonii, britton's skullcap | 0.20 |
| scsc | schizachyrium scoparium, little bluestem | 2.90 |
| stco4 | stipa comata | 1.00 |
| trdu | tragopogon dubius, yellow salsify | 0.00 |
| unk grass | | 1.80 |
| yugl | yucca glauca, small soapweed | 0.80 |



Plot: Heil 2

Plotypes

| Code | Species | Average Cover |
|--------------|---|---------------|
| 1000hr fuels | | 3.20 |
| agsm | agropyron smithii | 0.10 |
| alice2 | allium cernuum, nodding onion | 0.00 |
| arlu | artemisia ludoviciana, louisiana sagewort | 0.10 |
| cage | carex geophila, white mountain sedge | 2.40 |
| cyfr2 | cystopteris fragilis, brittle bladderfern | 0.00 |
| gevi2 | geranium viscosissimum, sticky geranium | 0.10 |
| oppo | opuntia polyacantha, plains pricklypear | 0.30 |
| pipo | pinus ponderosa, ponderosa pine | 29.30 |
| yugl | yucca glauca, small soapweed | 0.00 |

Plot: Heil 3

Plotypes

| Code | Species | Average Cover |
|--------------|---|---------------|
| 1000hr fuels | | 1.80 |
| acmi2 | achillea millefolium, common yarrow | 0.00 |
| agsm | agropyron smithii | 9.70 |
| amac | amaranthus acanthochiton, greenstripe | 0.20 |
| ange | andropogon gerardii, big bluestem | 0.60 |
| brte | bromus tectorum, cheatgrass | 0.00 |
| cage | carex geophila, white mountain sedge | 2.00 |
| carex 3 | | 0.40 |
| carex4 | | 0.00 |
| clover | | 0.00 |
| dain | danthonia intermedia, timber oatgrass | 0.10 |
| diac2 | dichanthelium acuminatum, tapered rosette grass | 0.10 |
| erigeron | | 0.30 |
| gusa2 | gutierrezia sarothrae, broom snakeweed | 0.20 |
| p134 | | 0.10 |
| p364 | | 1.90 |
| pipo | pinus ponderosa, ponderosa pine | 15.50 |
| poco | poa compressa, canada bluegrass | 17.70 |
| polyg | polygala, polygala | 0.20 |
| popr | poa pratensis, kentucky bluegrass | 1.70 |
| rhtr | rhus trilobata, skunkbush sumac | 0.00 |
| rice | ribes cereum, wax currant | 1.50 |
| unk grass | | 0.20 |

