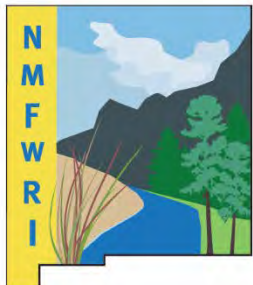




2020

McGaffey CFRP Pre-Treatment Vegetation Monitoring



**New Mexico
Forest and Watershed
Restoration Institute**

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7/2/2020

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Introduction

In summer 2019, the New Mexico Forest and Watershed Restoration Institute (NMFWRI) collected forest vegetation monitoring data on fixed-radius plots in the McGaffey Forest and Rio Grande del Rancho Watershed Restoration in Taos County in the Sangre de Cristo Mountains (referred to as “McGaffey” in the rest of this report). This monitoring is part of the NEPA planning analysis process; NMFWRI was contracted for this work under an agreement with The Nature Conservancy (The Natures Conservancy) as part of a Planning Collaboration Forest Restoration Program (CFRP) grant.

The McGaffey NEPA project analysis area is around 30,000 acres which was identified as a high priority area in various Taos County Watershed Plans and Restoration strategy documents. The area includes Pot Creek, Talpa, Miranda Canyon, Llano Quemado and Rancho de Taos. Much of the land is managed by the Carson National Forest, Camino Real Ranger District.

Significant restoration work has already occurred in the area by a variety of stakeholders including Pot Creek residents, Southern Methodist University, the Taos Soil and Water Conservation District, Taos County, and the Carson National Forest in the form of thinning and prescribed fire, as well as managed wildfire. In 2016, a 524-acre lightning fire on McGaffey Ridge was managed by the Carson National Forest as a successful fuels treatment. The NEPA planning and analysis grant will allow implementation of further restoration work in ponderosa pine, mixed conifer, and riparian.

NMFWRI collaborated with TNC on this project due to an existing partnership through the Rio Grande Water Fund (RGWF) to collect, analyze and store ecological monitoring data for projects using a student crew from NM Highlands University supervised by NMFWRI staff. Monitoring leadership was shared by TNC and NMFWRI and followed standard forest monitoring protocols based on the Common Stand Exam and agreed upon by TNC, NMFWRI, and the Carson National Forest. Data collected on 1/10th acre fixed radius plots included slope, aspect, understory species, ground cover, canopy cover, tree height, diameter, and condition, and surface fuels. Details of the monitoring protocol and example datasheets can be found in Appendix IV.

Establishment of Monitoring Points

Because significant differences exist between planned and collected monitoring plots, NMFWRRI wanted to explain the process for how plots were originally placed in planning, as well as how they were collected during field monitoring.

Stratified Random Sampling Design for McGaffey Project and Planned Points

Due to the large size of the study area (30,000 acres), monitoring site locations were identified using the following techniques to stratify the number of points while capturing the variety of the landscape. To get an idea of the vegetation types, Landfire 2014 Existing Vegetation Types were downloaded for the study area. The top four dominant vegetation types identified were; 1) Ponderosa Pine, 2) Douglas-Fir, 3) Pinyon Juniper Woodlands, 4) White Fir.

Points were distributed to capture a variety of those 4 vegetation types within the following conditions:

1. Outside of Private Land
2. Within a 1/3 mile buffer of a serviceable road (not jeep trails)
3. In areas where one would not traverse over slopes less than 60%. Percent slope was calculated using 2016 LiDAR data.
4. Captured a representative sample of the top four dominate vegetation types.

Once these available areas were identified, the largest general regions these areas were digitized. Within these regions, random points were generated so that no point was closer than 60 meters between each other. In some cases if points landed on roads they were manually shifted away from roads.

Ultimately, 40 planned plot locations were established which, in their distribution, matched the proportion of the four dominant vegetation types. See these plots in Figure 1. Planned monitoring points for McGaffey CFRP.

Differences between Planned and Collected Points

The NMFWRRI monitoring crew's access to monitoring plots during the peak field season was severely restricted by closures of portions of the Carson National Forest due to the Amole wildfire (order 02-469). With coordination with the Carson National Forest, the monitoring crew was able to access portions of the project dominated by Piñon-Juniper and Ponderosa Pine. Heavy rain during the field crew's available time added further complications included making roads impassable by vehicle. Ultimately, the NMFWRRI crew completed 14 of the planned 40 monitoring points, all within the Juniper-Pinyon Pine Woodland and the Interior Ponderosa Pine LANDFIRE veg classes. A map of the planned plots is available in Figure 2. Collected monitoring points for McGaffey CFRP.

McGaffey CFRP Landfire Existing Vegetation Type NMFWRI Monitoring Points (40)

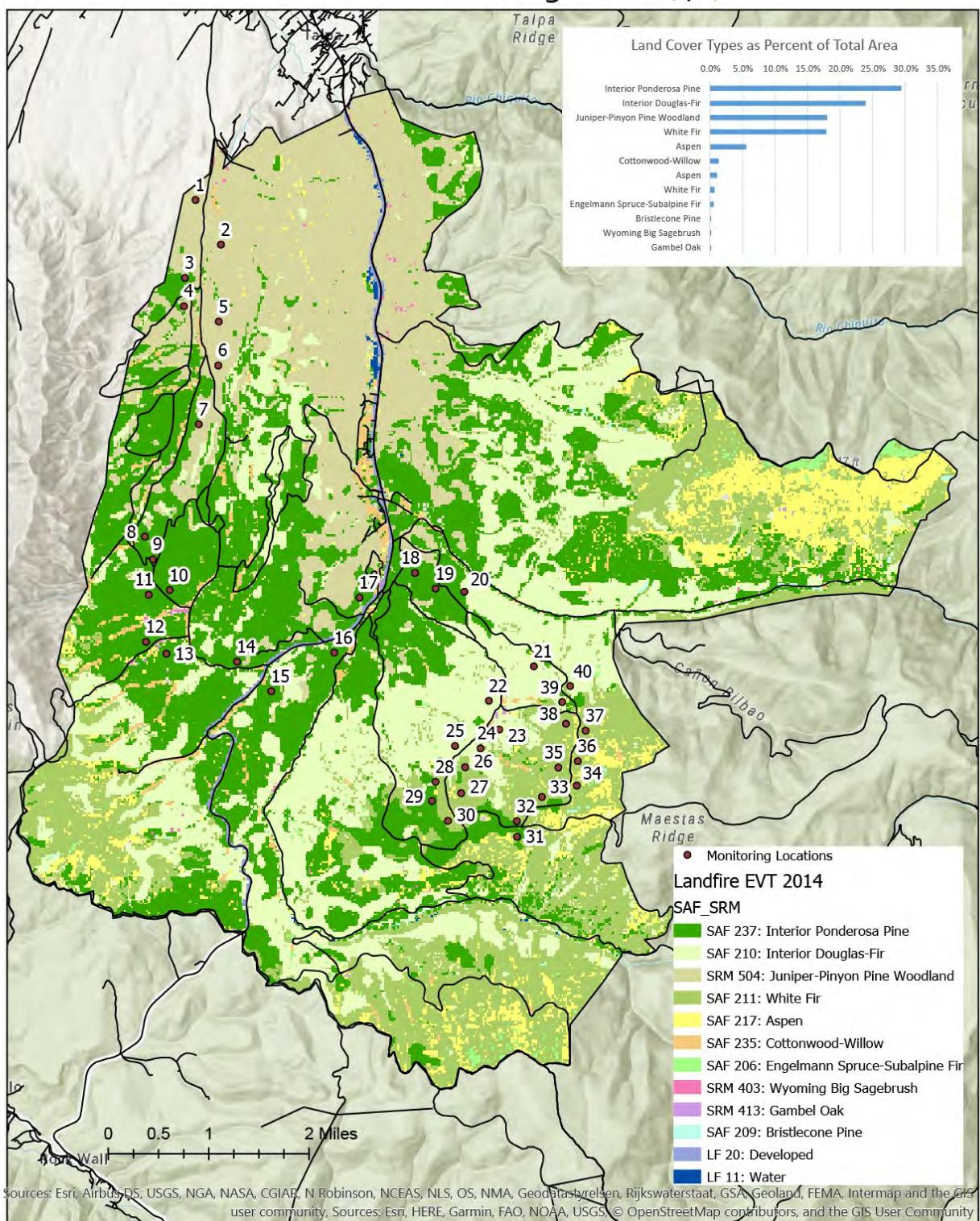


Figure 1. Planned monitoring points for McGaffey CFRP.

NMFWRI McGaffey Monitoring Locations 2019

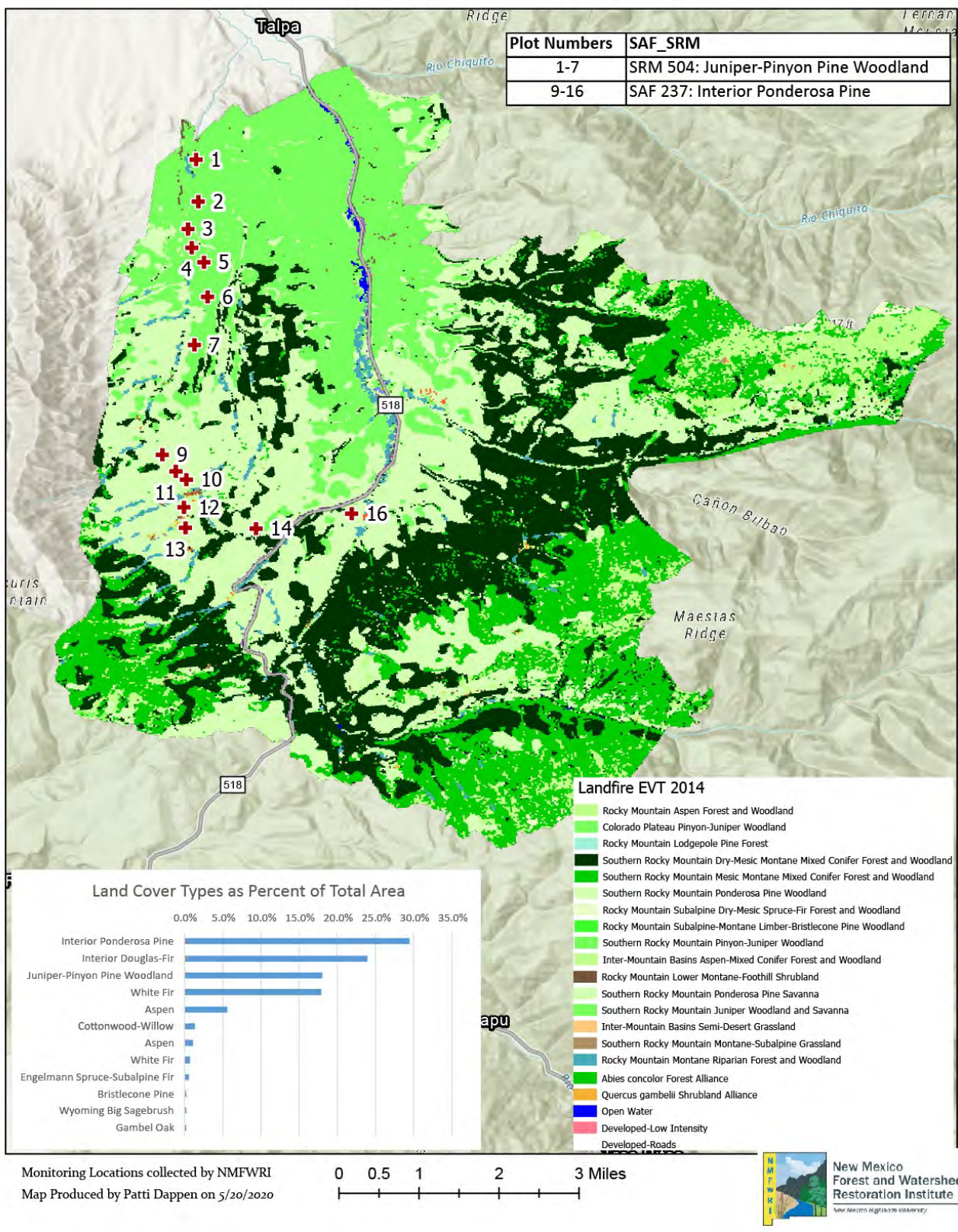


Figure 2. Collected monitoring points for McGaffey CFRP.

Results from Data Collection

Piñon-Juniper

This section presents results from monitoring plots 1 through 7 in LANDFIRE EVT Colorado Plateau Piñon-Juniper (abbreviated CPPJ on some figures).

These plots had an average slope of 14% and had dominant aspects of North and West. More detail is presented below.

Table 1. Slope for McGaffey CPPJ plots.

Slope (in %)	
Range of slope	
Max	21
Min	5
Mean slope	14
Median slope	16
Mode slope	16

Table 2. Aspect for McGaffey CPPJ plots.

Aspect (cardinal direction)		
Direction	Count	Percent of plots with this aspect
N	3	42.9%
E	0	0.0%
S	0	0.0%
W	4	57.1%

Overstory

Full stand tables are present in the Tables on the following pages. These results are also highlighted with individual figures.

Overall, CPPJ plots had 167 trees per acre (114 live trees per acre and 53 sick trees per acre) with an average basal area of 293 square feet per acre. There were an average of 5.7 snags per acre with an average basal area of 8.4 square feet for acre. The average quadratic mean diameter (QMD) was 15.8 inches. Average height of trees was 30 feet, with a live crown base height of 5 feet.

Table 3. Overstory summary for McGaffey CPPJ.

McGaffey CPPJ			2020		
Summary Table for all Plots			# Sample Trees on plot	Trees per acre	Basal area per acre
Plot Total			121.00	172.86	301.46
Growing Stock	Healthy (H)		0.00	0.00	0.00
	Unhealthy(U)		0.00	0.00	0.00
	Sick (S)		37.00	52.86	128.18
	Living (L)		80.00	114.29	164.89
Sum of Growing Stock			117.00	167.14	293.07
Dead	Dead (D)		4.00	5.71	8.39
Sum of Dead			4.00	5.71	8.39
Plot Total: Growing Stock & Dead	Sum of		121.00	172.86	301.46

Transition from PJ to PIPO are the densest native veg types, and besides having a lot of trees, this area , particularly plot 1, had a lot of multi-stem stem trees. Our monitoring protocol allows measurement at diameter root collar (DRC) for multi-stem oak, piñon, and juniper, and some of these measurements were over 40 inches around. The large basal area values here reflect these measurements.



Figure 3. Plot 1, facing South from PC. Several multi-stemmed juniper are visible.

Table 4. Individual plot summary for McGaffey CPPJ.

McGaffey CPPJ 2020				
Individual Plot Summary Table				
Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
MG_01	22	21	210	1069.85
MG_02	16	16	160	160.91
MG_03	20	20	200	308.89
MG_04	11	11	110	93.07
MG_05	16	15	150	210.86
MG_06	19	17	170	132.59
MG_07	17	17	170	75.31
Total			Average for all Plots	
			TPA	BA/AC
	121.00	117.00	167.14	293.07

Table 5. Woodland Species Table Stand for McGaffey CPPJ.

Stand Table		McGaffey CPPJ																2020		
Woodland Species		Saplings			Pole			Mature Trees										Total by Species	%Species for all G-Stock	
Diameter Class		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32+		
PIED Pinon pine	COUNT	0	0	0	35	19	9	4	2	1	0	0	1	0	0	0	0	0	71.00	
	TPA	0.00	0.00	0.00	50.00	27.14	12.86	5.71	2.86	1.43	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	101.43	60.68%
	BA/AC	0.00	0.00	0.00	9.45	8.83	6.62	4.62	2.70	1.80	0.00	0.00	3.70	0.00	0.00	0.00	0.00	0.00	37.72	12.87%
	AVE HT. (HL)	0.00	0.00	0.00	32	35	41	38	40	55	0.00	0.00	53	0.00	0.00	0.00	0.00	0.00		
JUMO One-seed juniper	COUNT	0	0	0	0	1	2	2	1	1	1	1	0	0	0	0	0	8	17.00	
	TPA	0.00	0.00	0.00	0.00	1.43	2.86	2.86	1.43	1.43	1.43	1.43	0.00	0.00	0.00	0.00	0.00	11.43	24.29	14.53%
	BA/AC	0.00	0.00	0.00	0.00	0.47	1.42	2.29	1.48	1.91	2.38	3.32	0.00	0.00	0.00	0.00	0.00	170.69	183.96	62.77%
	AVE HT. (HL)	0.00	0.00	0.00	0.00	15	15	13	15	15	16	10	0.00	0.00	0.00	0.00	0.00	14		
JUSC2 Rocky Mnt juniper	COUNT	0	0	0	4	2	2	4	2	0	0	1	1	1	0	1	2	2	22.00	
	TPA	0.00	0.00	0.00	5.71	2.86	2.86	5.71	2.86	0.00	0.00	1.43	1.43	1.43	0.00	1.43	2.86	2.86	31.43	18.80%
	BA/AC	0.00	0.00	0.00	0.92	1.01	1.53	4.37	2.80	0.00	0.00	3.09	3.98	4.27	0.00	6.52	14.24	24.23	66.96	22.85%
	AVE HT. (HL)	0.00	0.00	0.00	42	12	19	19	16	0.00	0.00	15	18	23	0.00	38	19	16		
Woodland Species Sub-total	COUNT	0	0	0	39	22	13	10	5	2	1	2	2	1	0	1	2	10	110.00	
	TPA	0.00	0.00	0.00	55.71	31.43	18.57	14.29	7.14	2.86	1.43	2.86	2.86	1.43	0.00	1.43	2.86	14.29	157.14	94.02%
	BA/AC	0.00	0.00	0.00	10.38	10.31	9.57	11.28	6.98	3.71	2.38	6.42	7.68	4.27	0.00	6.52	14.24	194.92	288.64	98.49%
	AVE HT. (HL)	0.00	0.00	0.00	33	32	34	26	25	34	16	12	35	23	0.00	38	19	14		
Summary by Size Class for Woodland Species	TPA	0.00			105.71			51.43										157.14		
	TPA %	0.00%			67.27%			32.73%										100.00%		
	BA/AC	0.00			30.26			258.38										288.64		
	BA/AC %	0.00%			10.48%			89.52%										100.00%		
	QUADRATIC MEAN DIA.	0.00			7.24			30.35										18.35		
	AVE HT. (HL)	0.00			33			17										18		

Table 6. Forestland Species Stand Table for McGaffey CPPJ.

Stand Table		McGaffey CPPJ																2020		
Forestland Species		Saplings			Pole			Mature Trees										Total by Species & Covertypes	%Species for all G-Stock	
Diameter Class		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32		
PIPO Ponderosa pine	COUNT	0	0	0	2	3	0	1	1	0	0	0	0	0	0	0	0	0	7.00	
	TPA	0.00	0.00	0.00	2.86	4.29	0.00	1.43	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	5.98%
	BA/AC	0.00	0.00	0.00	0.56	1.35	0.00	1.05	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.43	1.51%
	AVE HT. (HL)	0.00	0.00	0.00	40.00	44.15	0.00	68.00	57.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Forestland Species Sub-total	COUNT	0	0	0	2	3	0	1	1	0	0	0	0	0	0	0	0	0	7.00	
	TPA	0.00	0.00	0.00	2.86	4.29	0.00	1.43	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	5.98%
	BA/AC	0.00	0.00	0.00	0.56	1.35	0.00	1.05	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.43	1.51%
	AVE HT. (HL)	0.00	0.00	0.00	40	44	0.00	68	57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Summary by Size Class for Forestland Species	TPA	0.00			7.14			2.86										10.00		
	TPA %	0.00%			71.43%			28.57%										100.00%		
	BA/AC	0.00			1.92			2.51										4.43		
	BA/AC %	0.00%			43.28%			56.72%										100.00%		
	QUADRATIC MEAN DIA.	0.00			7.01			12.69										9.01		
	AVE HT. (HL)	0.00			43			62										54		

Table 7. Overall Stand Table for McGaffey CPPJ.

Stand Total	Diameter Class	Saplings			Pole			Tree or Sawlog											Total by Class, Growing Stock & Dead	% by Class, Growing Stock vs Dead
		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32		
Growing Stock (All living trees in woodland & forestland)	COUNT	0	0	0	41	25	13	11	6	2	1	2	2	1	0	1	2	10	117.00	
	TPA	0.00	0.00	0.00	58.57	35.71	18.57	15.71	8.57	2.86	1.43	2.86	2.86	1.43	0.00	1.43	2.86	14.29	167.14	96.69%
	BA/AC	0.00	0.00	0.00	10.94	11.67	9.57	12.32	8.44	3.71	2.38	6.42	7.68	4.27	0.00	6.52	14.24	194.92	293.07	97.22%
	AVE HT, H _L	0.00	0.00	0.00	33	33	34	29	30	34	16	12	35	23	0.00	38	19	14		
Summary by Size Class (All living trees in woodland & forestland)	TPA	0.00			112.86			54.29											167.14	
	TPA %	0.00%			67.52%			32.48%											100.00%	
	BA/AC	0.00			32.18			260.89											293.07	
	BA/AC %	0.00%			10.98%			89.02%											100.00%	
	QMD MEAN DIA.	#DIV/0!			7.23			29.68											17.93	
	AVE HT, H _L	0.00			33			17											19	
Dead (All dead trees in woodland & forestland)	COUNT	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	4.00	
	TPA	0.00	0.00	0.00	0.00	1.43	0.00	1.43	1.43	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	5.71	3.31%
	BA/AC	0.00	0.00	0.00	0.00	0.47	0.00	0.95	1.51	0.00	0.00	0.00	0.00	0.00	5.46	0.00	0.00	0.00	8.39	2.78%
	AVE HT, H _L	0.00	0.00	0.00	0.00	19	0.00	8	16	0.00	0.00	0.00	0.00	0.00	24	0.00	0.00	0.00	20	
Total for all sample trees including Growing Stock and Dead	COUNT	0	0	0	41	26	13	12	7	2	1	2	2	1	1	1	2	10	121.00	
	TPA	0.00	0.00	0.00	58.57	37.14	18.57	17.14	10.00	2.86	1.43	2.86	2.86	1.43	1.43	1.43	2.86	14.29	172.86	100.00%
	BA/AC	0.00	0.00	0.00	10.94	12.14	9.57	13.27	9.94	3.71	2.38	6.42	7.68	4.27	5.46	6.52	14.24	194.92	301.46	100.00%
NOTE1: Average Diameter calculated using the Quadratic Mean Diameter (QDM), equivalent equation: $(\text{SQRT}((\text{BA/AC})/\text{TPA}) / .005454)$; NOTE2: Average Height (H _L), calculated using Lorey's height equation for a weighted mean, $H_L = \text{SUM}(bi * hi) / \text{SUM}(bi)$, where bi is basal area of individual tree & hi is height of an individual tree.																				

Live and sick trees recorded on plots included two-needle piñon at 101 trees per acre, Rocky Mountain juniper at 31 trees per acre, oneseed juniper at 24 trees per acre, and ponderosa pine at 10 trees per acre. Most of the sick trees were recorded as piñon with mistletoe.

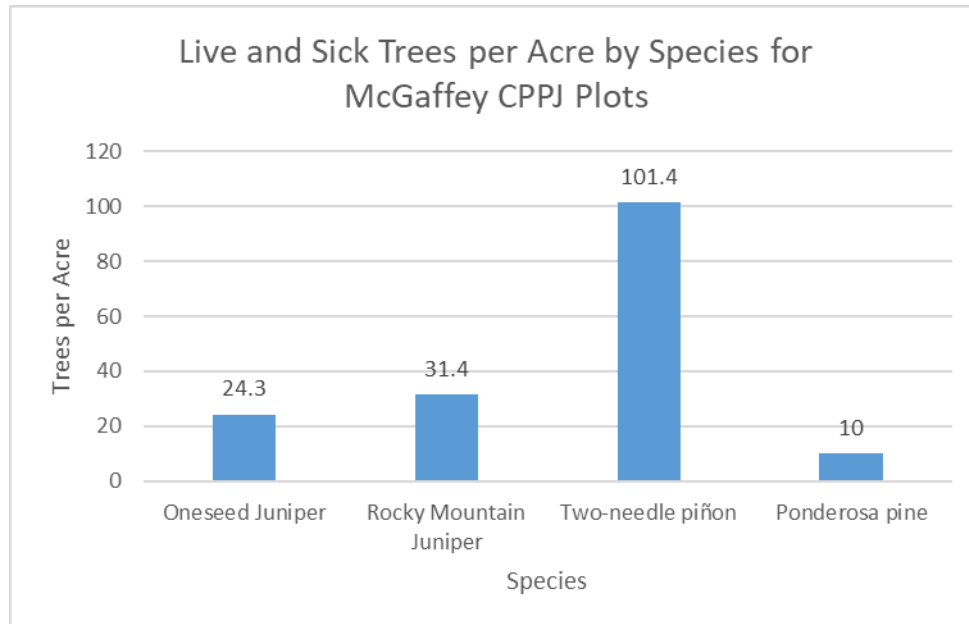


Figure 4. Trees by Species for McGaffey CPPJ.

Snags were 75% Rocky Mountain juniper, and 25% two-needle piñon. All snags were decay classes 2 and 3.

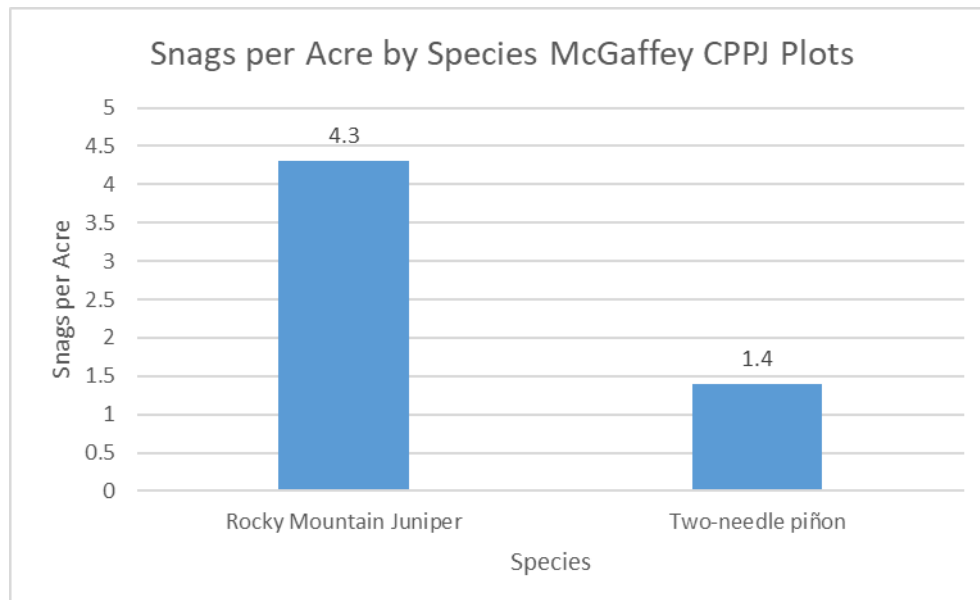


Figure 5. Snags by Species for McGaffey CPPJ.

Saplings averaged 172 live individuals and 29 dead per acre. The live saplings were 42% Rocky Mountain juniper, 33% two-needle piñon, 17% ponderosa pine, and 8% oneseed juniper. The dead saplings were 50% oneseed juniper, and 50% Gambel oak. There were no shrub species recorded in the sapling class, only tree species.

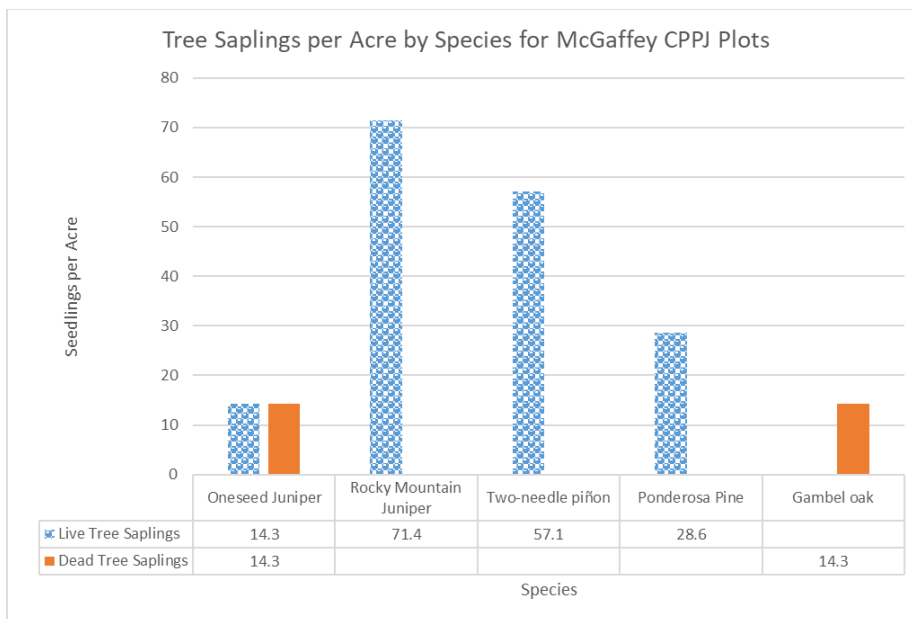


Figure 6. Tree Saplings per Acre by Species for McGaffey CPPJ.

Seedlings of tree species averaged 1660 live individuals and 43 dead per acre. The live seedlings were 68% two-needle piñon, 25% Gambel oak, 2.5% mountain mahogany, 2.5% Rocky Mountain juniper, and 1.7% oneseed juniper. The dead saplings were 67% two-needle piñon, and 33% Rocky Mountain juniper.

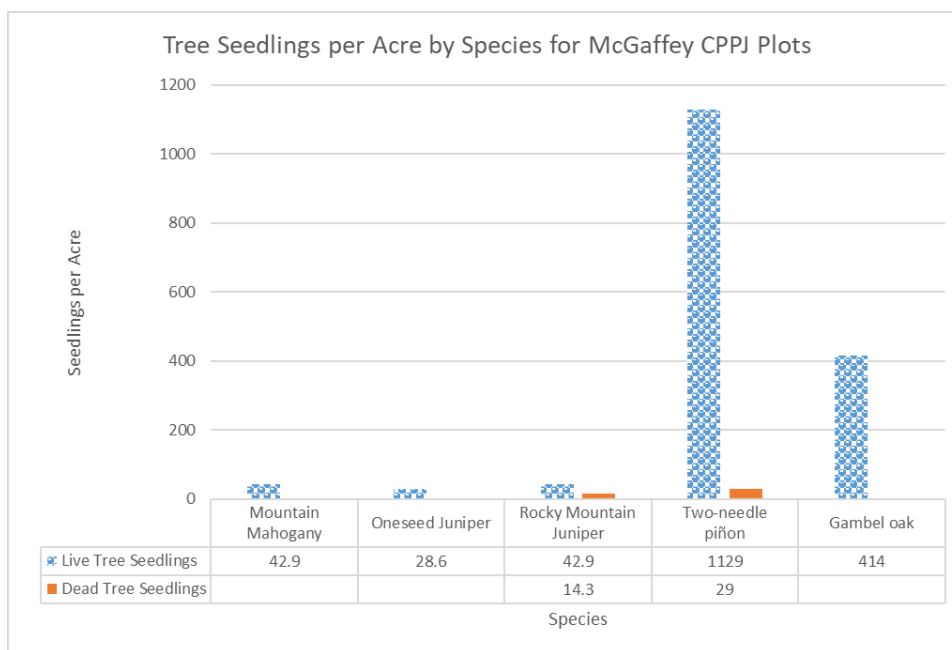


Figure 7. Tree Seedlings per Acre by Species for McGaffey CPPJ.

Seedlings of shrub species averaged 185 live individuals and no dead individuals per acre. The live shrub seedlings were 62% pricklypear cactus, and 38% big sagebrush.

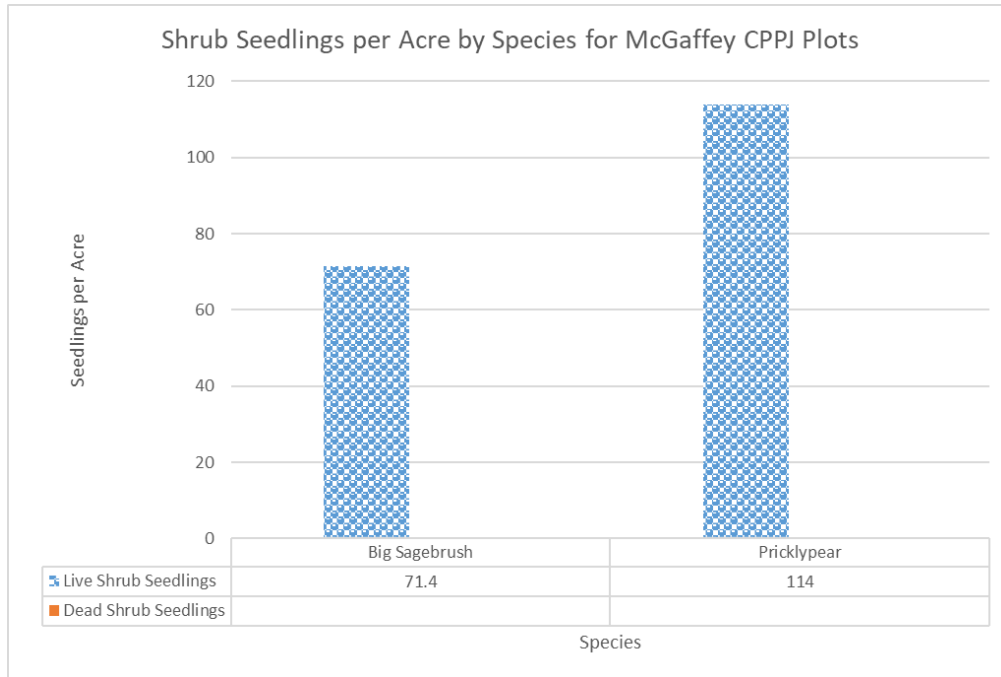


Figure 8. Shrub species of seedling stature by Species for McGaffey CPPJ.

Understory

The average tree canopy as recorded by densiometer was 62%.

Ground cover was dominated by gravel and litter.

Table 8. Canopy and Ground Cover Percent for McGaffey CPPJ.

<i>Mcgaffey CPPJ</i>	Ground cover for entire 1/10th acre plot					
Tree Canopy (Densiometer)	Plant Basal	Bole	Litter	Bare Soil	Rock	Gravel
62%	11%	9%	32%	3%	9%	35%

Due to a miscommunication, percent aerial cover was not recorded for all species as it is typically is, however, all individual plants were recorded on the entire 1/10th acre plot by species and lifeform. This detailed list of all plants on plots can provide useful information about the vegetative structure and community.

Forty-one percent of all individuals tallied were gramanoids, 40% were forbs, 12% were trees, 6 % were cacti, and less than 1% were shrubs.

Table 9. All species tallied on McGaffey CPPJ plots, summarized by lifeform.

Lifeform	Individuals Tallied on all Plots	Percentage
Cactus	373	6.0%
Forb	2485	40.2%
Gramanoid	2544	41.1%
Shrub	56	0.9%
Tree	729	11.8%

When considering all life stages of tree species together, piñon remains dominant, but the prevalence of Gambel oak becomes evident.

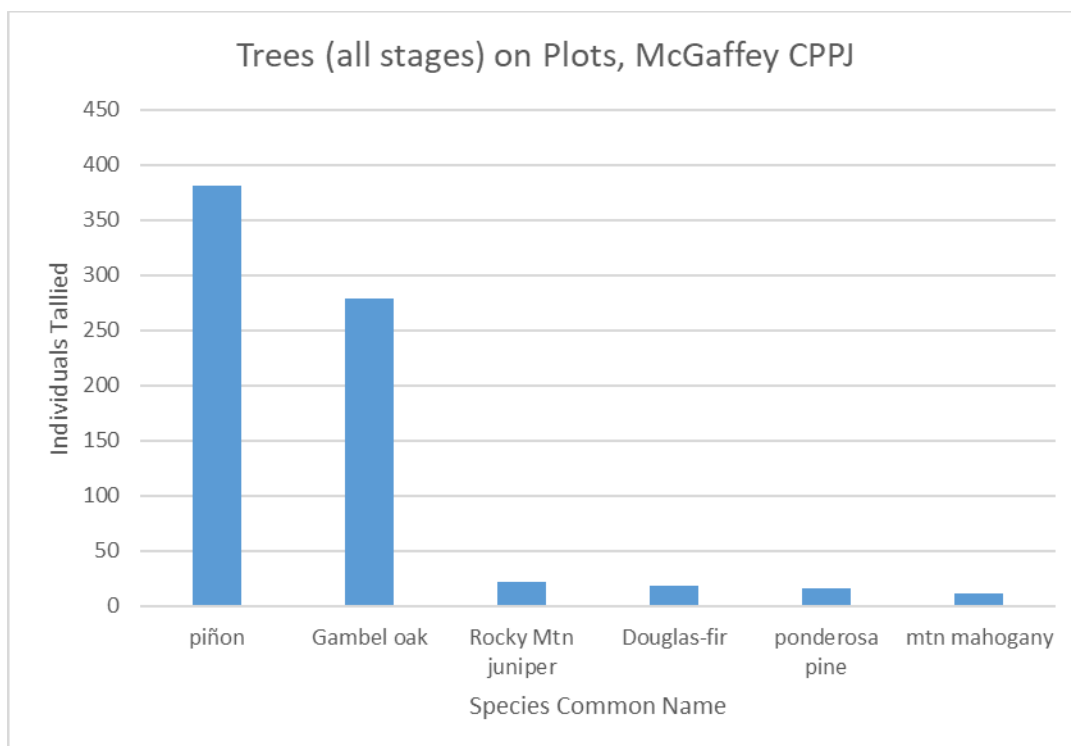


Figure 9. All individuals of trees (all life stages) tallied on CPPJ plots, by species.

Fringed sagewort greatly outnumbered other shrub species on plots.

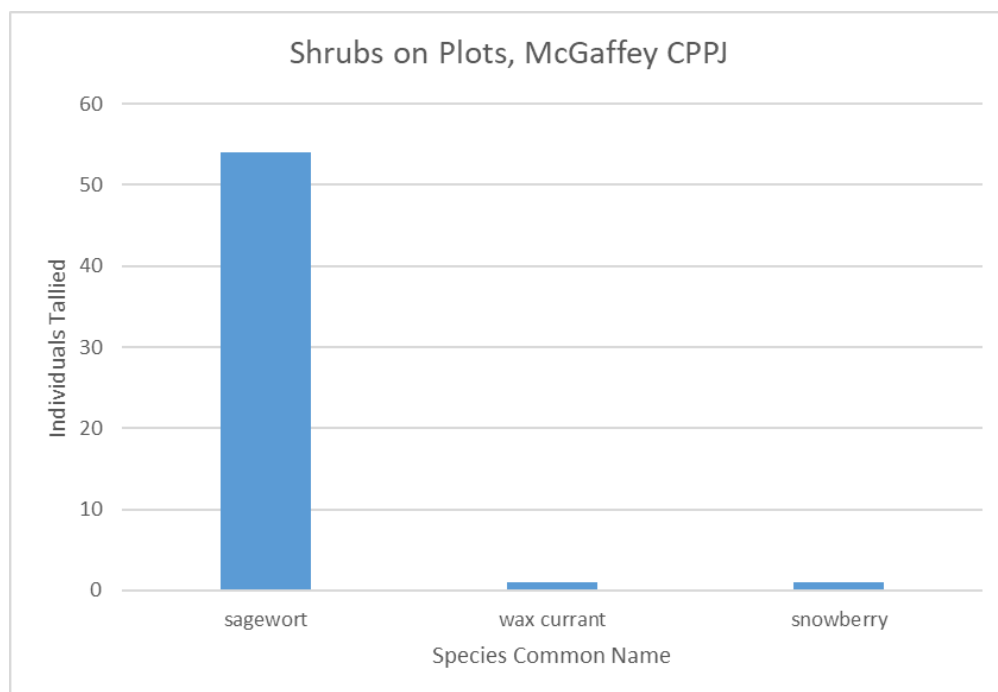


Figure 10. All individuals of shrubs tallied on CPPJ plots, by species.

Pricklypear was abundant.

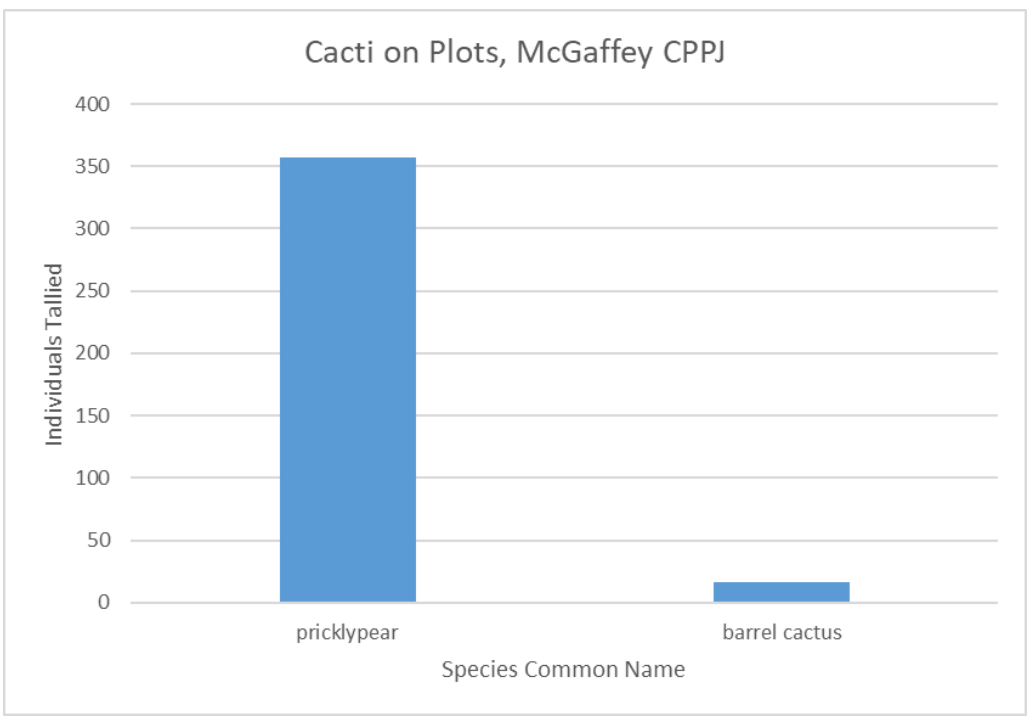


Figure 11. All individuals of cacti tallied on CPPJ plots, by species

In the figure below, multiple unknown (not identified) forbs are counted together. Thirteen other forb species were identified and recorded, including three varieties of buckwheat.

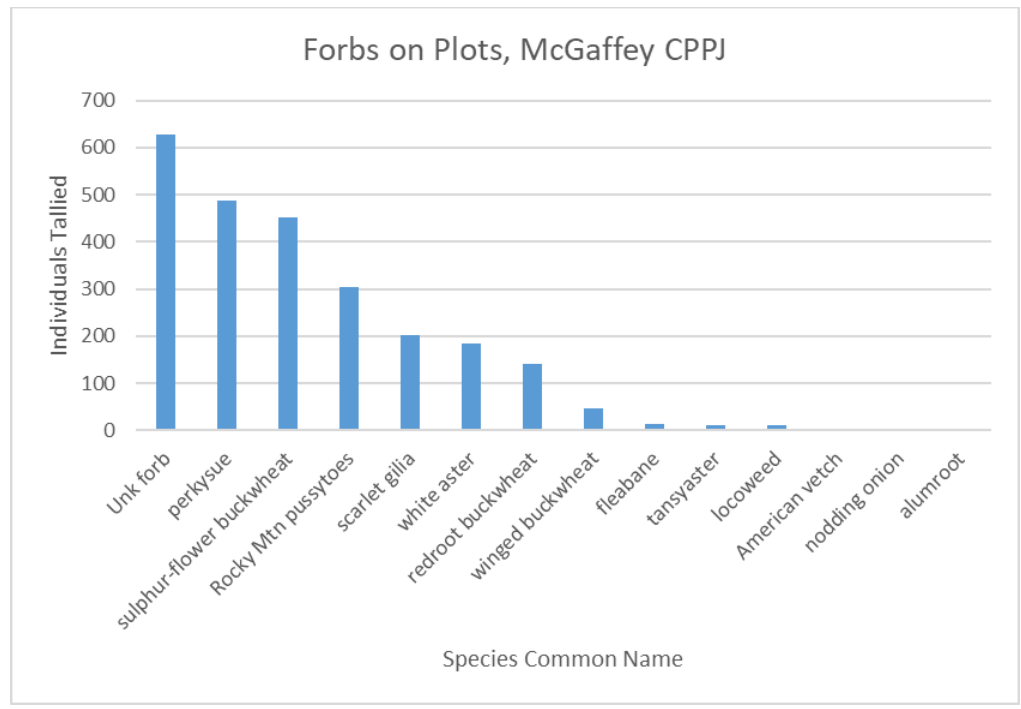


Figure 12. All individuals of forbs tallied on CPPJ plots, by species

Seven species of grasses were recorded; blue grama was dominant. Just as with forbs, the unknown grass category may include multiple unidentified species.

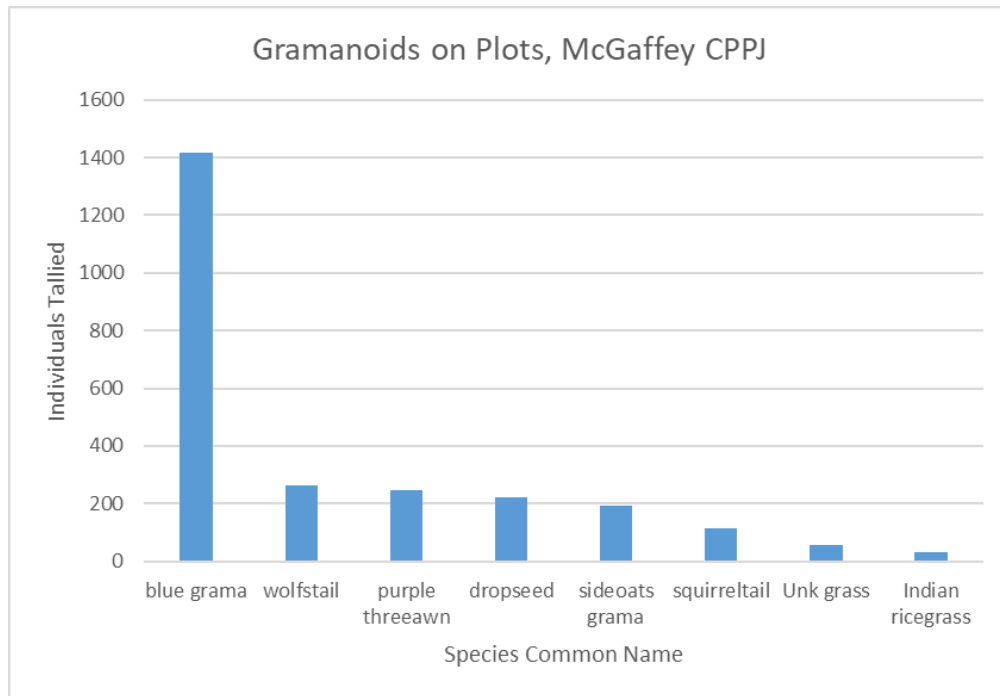


Figure 13. All individuals of gramonoids tallied on CPPJ plots, by species

Fuels

Surface fuels were collected on two Brown's transects, per instruction from the Carson National Forest, to align with their standard monitoring protocol. Overall, plots averaged 2.14 tons per acre of fine wood fuels, and 1.2 tons per acre of coarse (1000-hour) fuels. The decay classes of the 1000-hour fuels were all 2 and 3; no older logs were recorded. This is consistent with the decay classes noted on standing snags.

Litter depth was significant, averaging 2.8 inches (14 tons/acre), consistent with an area which has not burned for many years.

Table 10. Surface Fuels recorded from Brown's transects on McGaffey CPPJ plots.

Fuels - McGaffey CPPJ	
Fuel	Tons/Ac
1-Hour	0.14
10-Hour	1.48
100-Hour	0.52
1000-Hour	1.16
Duff	3.12
Litter	14.02
TOTAL FINE WOOD FUELS	2.14
TOTAL WOOD FUELS	3.29
TOTAL SURFACE FUELS	20.43
Fuel	Depth (inches)
Duff	0.30
Litter	2.80
TOTAL DEPTH	3.10

Ponderosa Pine

This section presents results from monitoring plots 9 through 14 and plot 16 in LANDFIRE EVT Southern Rocky Mountain Ponderosa Pine (abbreviated SRMPP on some figures).

These plots had an average slope of 23% and had dominant aspects of North, East, and South. More detail is presented below.

Table 11. Slope for McGaffey SRMPP plots.

Slope (in %)	
Range of slope	
Max	51
Min	8
Mean slope	23
Median slope	16
Mode slope	16

Table 12. Aspect for McGaffey SRMPP plots.

Aspect (cardinal direction)		
Direction	Count	Percent of plots with this aspect
N	2	28.6%
E	2	28.6%
S	2	28.6%
W	1	14.3%

Overstory

Full stand tables are present in the Tables on the following pages. These results are also highlighted with individual figures.

Overall, SRMPP plots had 71 trees per acre (66 live trees per acre and 5.7 sick trees per acre) with an average basal area of 51 square feet per acre. There were an average of 11 snags per acre with an average basal area of 5.9 square feet for acre. The quadratic mean diameter (QMD) was 11.9 inches. Average height of trees was 54 feet, with a live crown base height of 15 feet.

Table 13. Overstory summary for McGaffey SRMPP.

McGaffey SRMPP			2020		
Summary Table for all Plots			# Sample Trees on plot	Trees per acre	Basal area per acre
Plot Total			58.00	82.86	57.08
Growing Stock	Healthy (H)		0.00	0.00	0.00
	Unhealthy(U)		0.00	0.00	0.00
	Sick (S)		4.00	5.71	3.64
	Living (L)		46.00	65.71	47.59
Sum of Growing Stock			50.00	71.43	51.23
Dead	Dead (D)		8.00	11.43	5.86
Sum of Dead			8.00	11.43	5.86
Plot Total:	Sum of		58.00	82.86	57.08
Growing Stock & Dead					

Table 14. Individual plot summary for McGaffey SRMPP.

McGaffey SRMPP 2020				
Individual Plot Summary Table				
Macro Plot Name	Total number of sample trees on plot	Growing Stock		
		Number of growing stock sample trees on plot	Trees per Acre	Basal Area per Acre
MG_09	18	16	160	71.85
MG_10	8	5	50	68.08
MG_11	4	3	30	12.30
MG_12	1	1	10	12.11
MG_13	11	11	110	93.99
MG_14	7	7	70	27.46
MG_16	9	7	70	72.79
Total	58.00	50.00	Average for all Plots	
			TPA	BA/AC
			71.43	51.23

Table 15. Woodland Species Table Stand for McGaffey SRMPP.

Stand Table		McGaffey SRMPP 2020																		
Woodland Species		Saplings			Pole			Mature Trees											Total by Species	%Species for all G-Stock
Diameter Class		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32+		
Pinon pine	PIED	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
	TPA	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	2.00%
	BA/AC	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.64%
	AVE HT. (HL)	0.00	0.00	0.00	28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Rocky Mnt juniper	JUSC2	0	0	0	2	3	2	3	0	0	0	0	0	0	0	0	0	0	10.00	
	TPA	0.00	0.00	0.00	2.86	4.29	2.86	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.29	20.00%
	BA/AC	0.00	0.00	0.00	0.44	1.18	1.36	3.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.15	12.00%
	AVE HT. (HL)	0.00	0.00	0.00	26	34	34	38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Woodland Species Sub-total	COUNT	0	0	0	3	3	2	3	0	0	0	0	0	0	0	0	0	0	11.00	
	TPA	0.00	0.00	0.00	4.29	4.29	2.86	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.71	22.00%
	BA/AC	0.00	0.00	0.00	0.77	1.18	1.36	3.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.47	12.64%
	AVE HT. (HL)	0.00	0.00	0.00	27	34	34	38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Summary by Size Class for Woodland Species	TPA	0.00			11.43			4.29											15.71	
	TPA %	0.00%			72.73%			27.27%											100.00%	
	BA/AC	0.00			3.31			3.17											6.47	
	BA/AC %	0.00%			51.09%			48.91%											100.00%	
	QUADRATIC MEAN DIA.	0.00			7.29			11.64											8.69	
	AVE HT. (HL)	0.00			32			38											35	

Table 16. Forestland Species Stand Table for McGaffey SRMPP.

Stand Table		McGaffey SRMPP 2020																Total by Species & Covertypes	%Species for all G-Stock	
Forestland Species		Saplings			Pole				Mature Trees											
Diameter Class		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32		
ABCO White fir	COUNT	0	0	0	4	0	3	1	0	0	0	0	0	0	0	0	0	0	8.00	
	TPA	0.00	0.00	0.00	5.71	0.00	4.29	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.43	16.00%
	BA/AC	0.00	0.00	0.00	1.06	0.00	2.21	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25	8.29%
	AVE HT. (HL)	0.00	0.00	0.00	40.68	0.00	66.75	65.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
PIPO Ponderosa pine	COUNT	0	0	0	6	5	3	3	4	3	4	0	2	0	0	0	0	0	30.00	
	TPA	0.00	0.00	0.00	8.57	7.14	4.29	4.29	5.71	4.29	5.71	0.00	2.86	0.00	0.00	0.00	0.00	0.00	42.86	60.00%
	BA/AC	0.00	0.00	0.00	1.75	2.66	2.10	3.71	6.47	6.09	9.88	0.00	7.65	0.00	0.00	0.00	0.00	0.00	40.30	78.68%
	AVE HT. (HL)	0.00	0.00	0.00	43.12	62.58	74.36	79.48	70.72	53.46	91.26	0.00	103.57	0.00	0.00	0.00	0.00	0.00		
PSME Douglas-fir	COUNT	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
	TPA	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	2.00%
	BA/AC	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.40%
	AVE HT. (HL)	0.00	0.00	0.00	34.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Forestland Species Sub-total	COUNT	0	0	0	11	5	6	4	4	3	4	0	2	0	0	0	0	0	39.00	
	TPA	0.00	0.00	0.00	15.71	7.14	8.57	5.71	5.71	4.29	5.71	0.00	2.86	0.00	0.00	0.00	0.00	0.00	55.71	78.00%
	BA/AC	0.00	0.00	0.00	3.01	2.66	4.30	4.69	6.47	6.09	9.88	0.00	7.65	0.00	0.00	0.00	0.00	0.00	44.75	87.36%
	AVE HT. (HL)	0.00	0.00	0.00	42	63	70	76	71	53	91	0.00	104	0.00	0.00	0.00	0.00	0.00		
Summary by Size Class for Forestland Species	TPA	0.00			31.43				24.29										55.71	
	TPA %	0.00%			56.41%				43.59%										100.00%	
	BA/AC	0.00			9.97				34.78										44.75	
	BA/AC %	0.00%			22.29%				77.71%										100.00%	
	QUADRATIC MEAN DIA.	#DIV/0!			7.63				16.20										12.14	
	AVE HT. (HL)	0.00			60				82										77	

Table 17. Overall Stand Table for McGaffey CPPJ.

Stand Total	Diameter Class	Saplings			Pole			Tree or Sawlog										Total by Class, Growing Stock & Dead	%by Class, Growing Stock vs Dead	
		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30			32
Growing Stock (All living trees in woodland & forestland)	COUNT	0	0	0	14	8	8	7	4	3	4	0	2	0	0	0	0	0	50.00	
	TPA	0.00	0.00	0.00	20.00	11.43	11.43	10.00	5.71	4.29	5.71	0.00	2.86	0.00	0.00	0.00	0.00	0.00	71.43	86.21%
	BA/AC	0.00	0.00	0.00	3.78	3.84	5.67	7.86	6.47	6.09	9.88	0.00	7.65	0.00	0.00	0.00	0.00	0.00	51.23	89.74%
	AVE HT, H _L	0.00	0.00	0.00	39	54	62	61	71	53	91	0.00	104	0.00	0.00	0.00	0.00	0.00		
Summary by Size Class (All living trees in woodland & forestland)	TPA	0.00			42.86			28.57										71.43		
	TPA %	0.00%			60.00%			40.00%										100.00%		
	BA/AC	0.00			13.28			37.94										51.23		
	BA/AC %	0.00%			25.93%			74.07%										100.00%		
	QMD MEAN DIA.	#DIV/0!			7.54			15.60										11.47		
	AVE HT, H _L	0.00			53			78										71		
Dead (All dead trees in woodland & forestland)	COUNT	0	0	0	5	0	1	0	1	1	0	0	0	0	0	0	0	0	8.00	
	TPA	0.00	0.00	0.00	7.14	0.00	1.43	0.00	1.43	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.43	13.79%
	BA/AC	0.00	0.00	0.00	1.51	0.00	0.72	0.00	1.51	2.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.86	10.26%
	AVE HT, H _L	0.00	0.00	0.00	35	0.00	79	0.00	66	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40	
Total for all sample trees including Growing Stock and Dead	COUNT	0	0	0	19	8	9	7	5	4	4	0	2	0	0	0	0	0	58.00	
	TPA	0.00	0.00	0.00	27.14	11.43	12.86	10.00	7.14	5.71	5.71	0.00	2.86	0.00	0.00	0.00	0.00	0.00	82.86	100.00%
	BA/AC	0.00	0.00	0.00	5.29	3.84	6.38	7.86	7.97	8.21	9.88	0.00	7.65	0.00	0.00	0.00	0.00	0.00	57.08	100.00%
NOTE1: Average Diameter calculated using the Quadratic Mean Diameter (QDM), equivalent equation: (SQRT((BA/AC)/TPA) / .005454) ; NOTE2: Average Height (H _L), calculated using Lorey's height equation for a weighted mean, H _L = SUM(bi * hi) / SUM(bi), where bi is basal area of individual tree & hi is height of an individual tree.																				

Live and sick trees recorded on plots included ponderosa pine at 43 trees per acre, Rocky Mountain juniper at 14 trees per acre, white fir at 11 trees per acre, and piñon and Douglas-fir at 1.4 trees per acre each. Most of the sick trees were recorded as white fir with broom rust and/or insect damage.

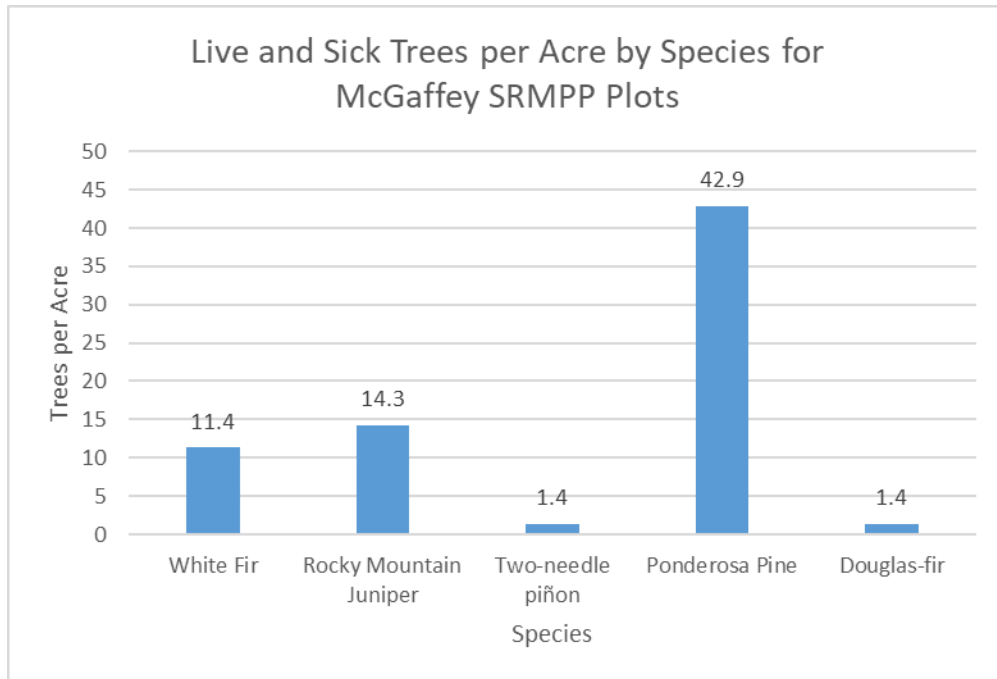


Figure 14. Trees by Species for McGaffey SRMPP.

Snags were 75% ponderosa pine, and 25% white fir. All snags fell into decay classes 1, 2, and 5.

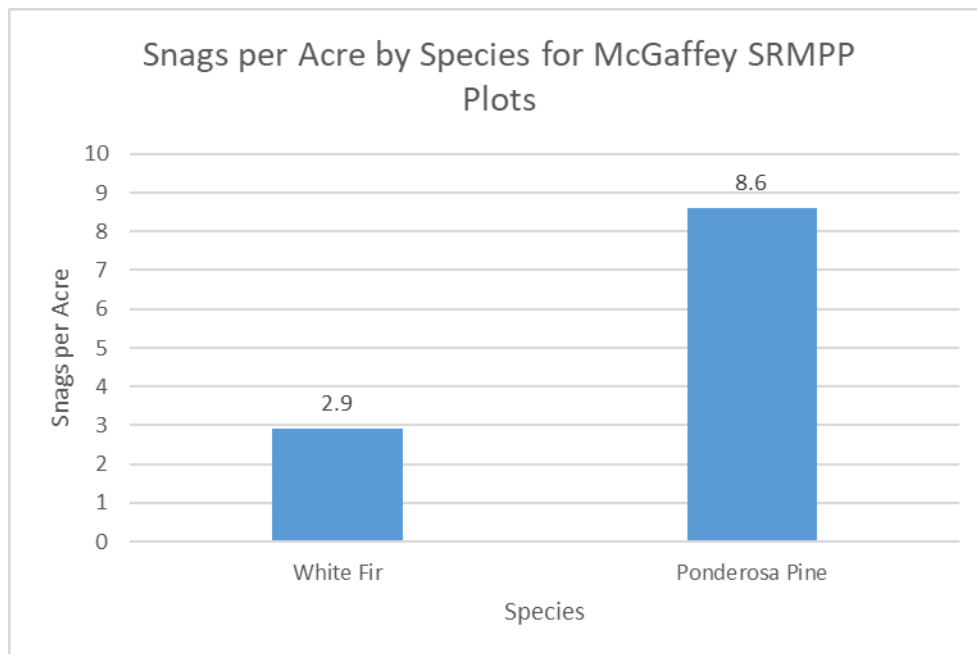


Figure 15. Snags by Species for McGaffey SRMPP.

Saplings averaged 357 live individuals and 14 dead per acre. The live saplings were 44% Gambel oak, 28% white fir, 20% ponderosa pine, and 8% Rocky Mountain juniper. The dead saplings were 100% Gambel oak. There were no shrub species recorded in the sapling class, only tree species.

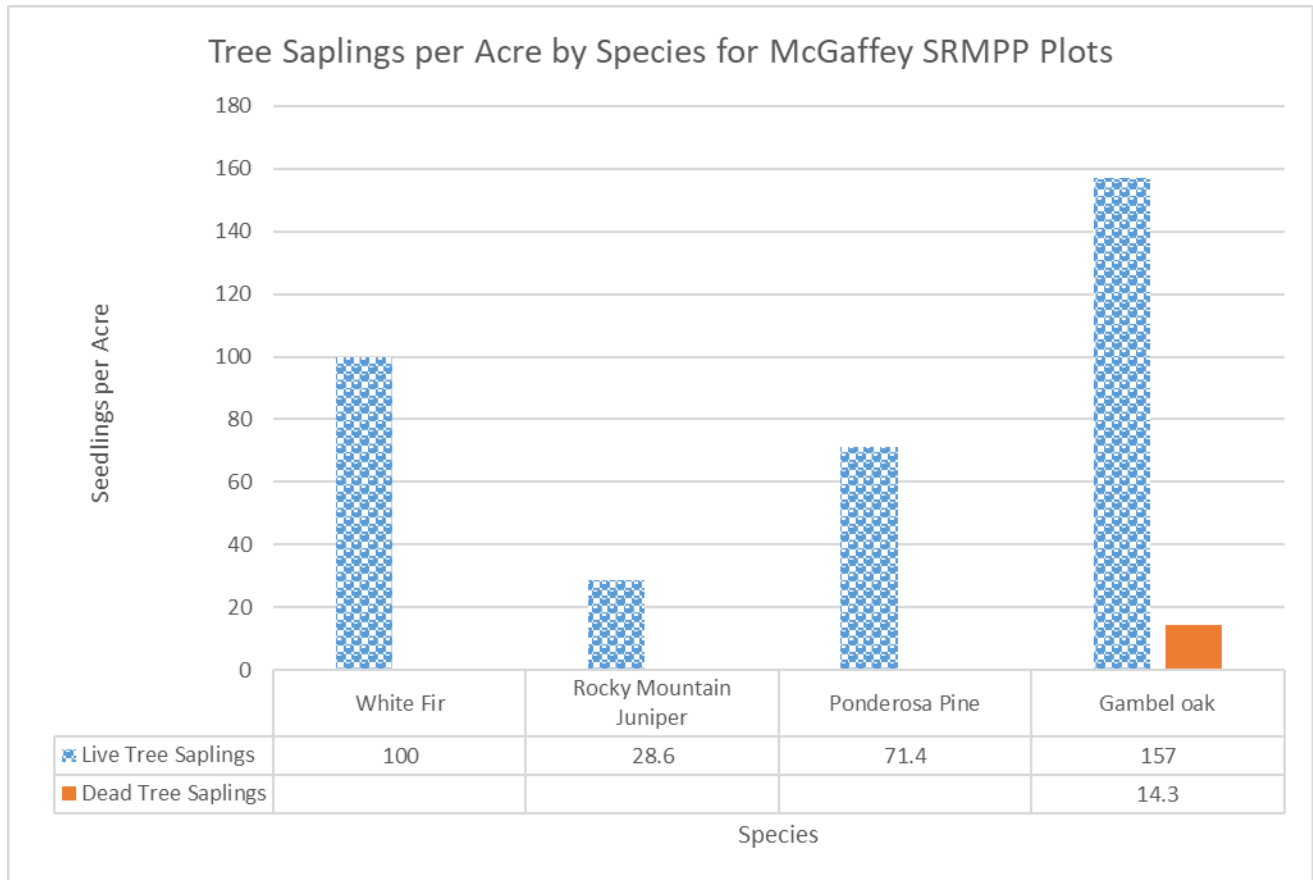


Figure 16. Tree Saplings per Acre by Species for McGaffey SRMPP.

Seedlings of tree species averaged 2000 live individuals and 14 dead per acre. The live seedlings were 74% Gambel oak, 10% Rocky Mountain juniper, 9% white fir, 5% common juniper, and 2% two-needle piñon. The dead saplings were 100% ponderosa pine.

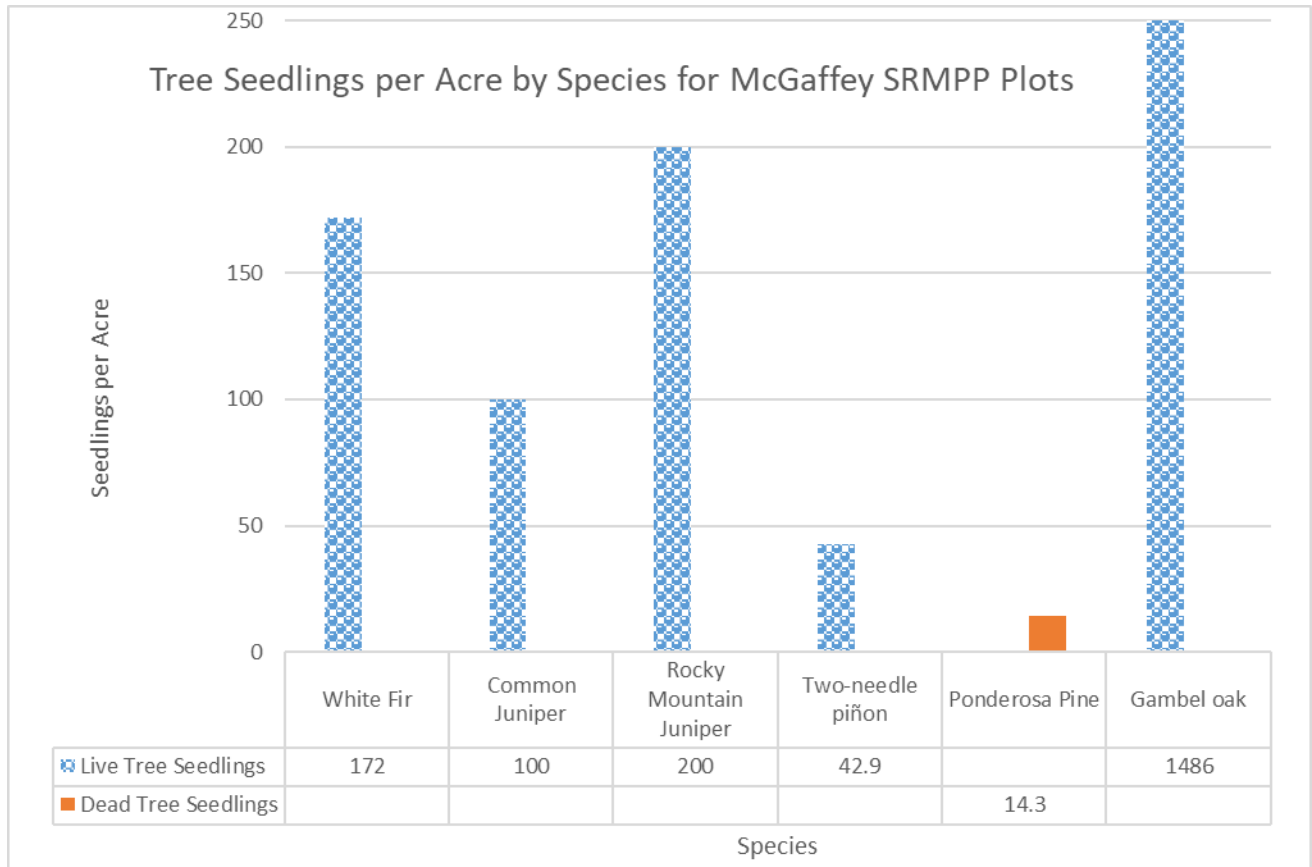


Figure 17. Tree Seedlings per Acre by Species for McGaffey SRMPP.

Seedlings of shrub species averaged 900 live individuals and no dead individuals per acre. The live shrub seedlings were 98% creeping barberry, and 2% mountain-lover.

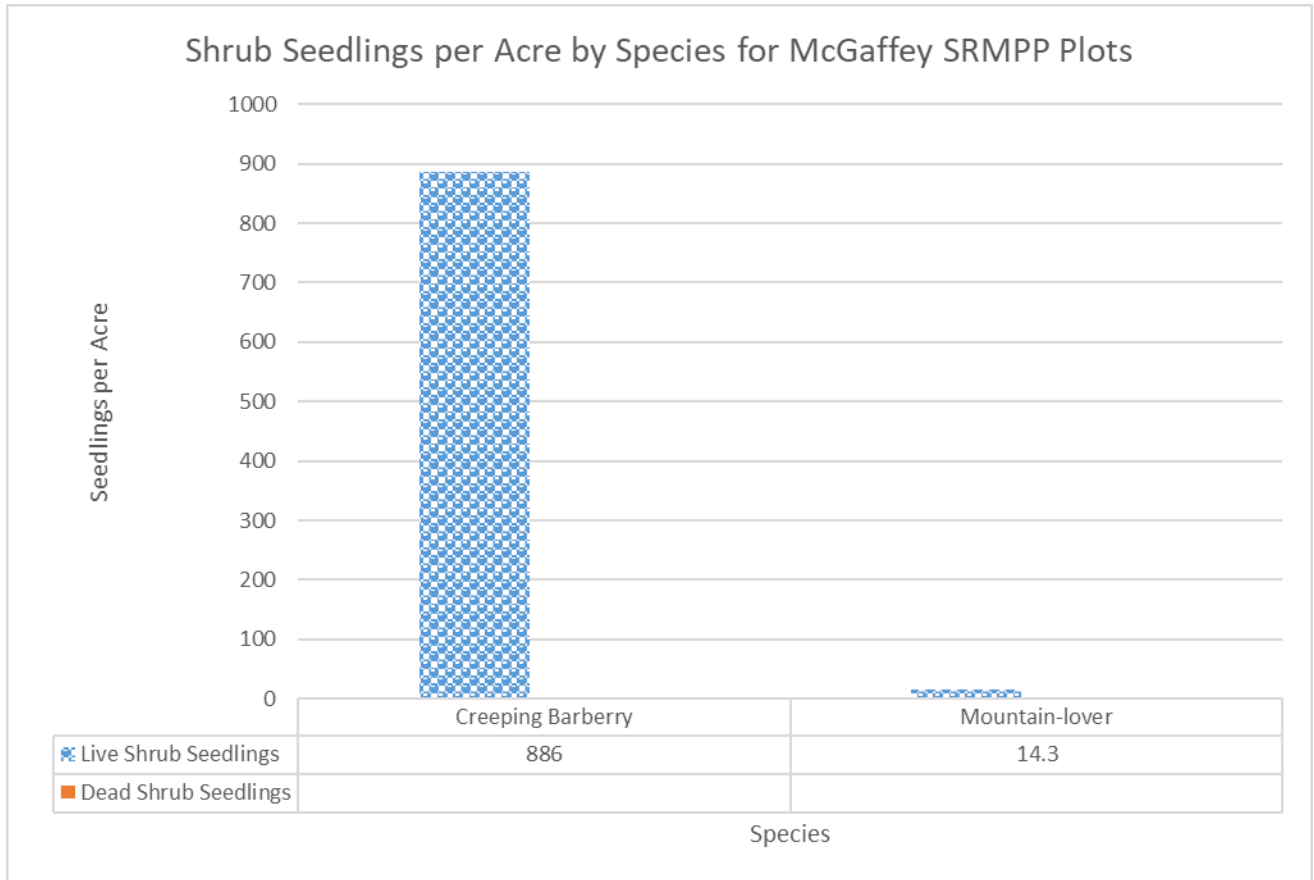


Figure 18. Shrub species of seedling stature by Species for McGaffey SRMPP.

Understory

The average tree canopy as recorded by densiometer was 68%.

Ground cover was dominated by plant basal coverage and litter.

Table 18. Canopy and Ground Cover Percent for McGaffey SRMPP.

<i>McGaffey SRMPP</i>	Ground cover for entire 1/10th acre plot					
Tree Canopy (Densiometer)	Plant Basal	Bole	Litter	Bare Soil	Rock	Gravel
68%	50%	7%	27%	5%	9%	1%

Due to a miscommunication, percent aerial cover was not recorded for all species as it is typically is, however, all individual plants were recorded on the entire 1/10th acre plot by species and lifeform. This detailed list of all plants on plots can provide useful information about the vegetative structure and community.

Fifty percent of all individuals tallied were forbs, 23% were gramanoids, 18% were shrubs, and 9% were trees. No cacti were recorded on these plots.

Table 19. All species tallied on McGaffey SRMPP plots, summarized by lifeform.

Lifeform	Individuals Tallied on all Plots	Percentage
Cactus	0	0.0%
Forb	5616	49.8%
Gramanoid	2591	23.0%
Shrub	2030	18.0%
Tree	1039	9.2%

When considering all life stages of tree species together, Gambel oak becomes dominant.

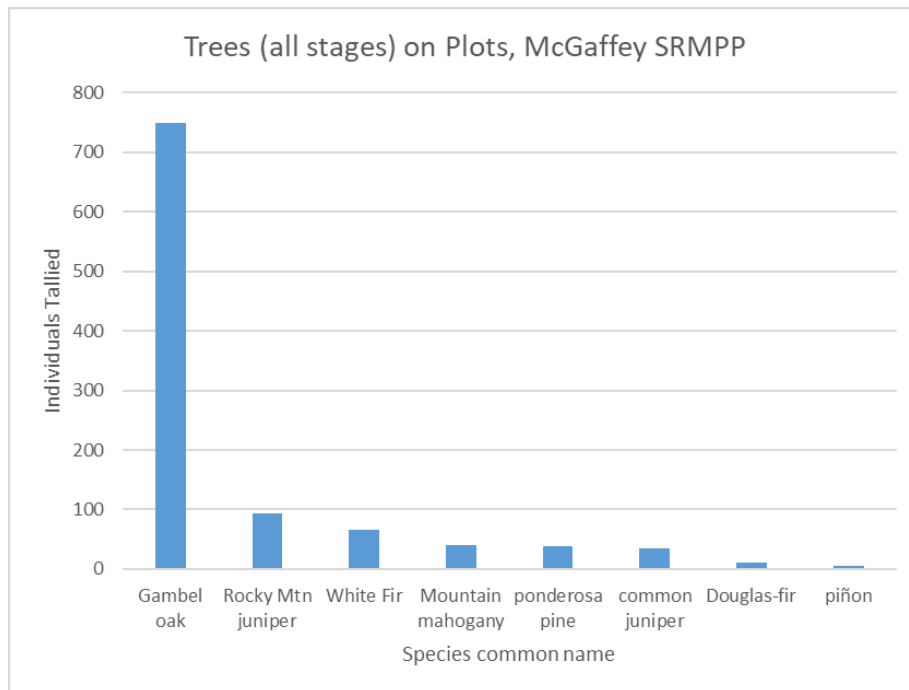


Figure 19. All individuals of trees (all life stages) tallied on SRMPP plots, by species.

Eight shrub species were identified; creeping barberry, Fendler's buckbrush, and fringed sagewort were dominant.

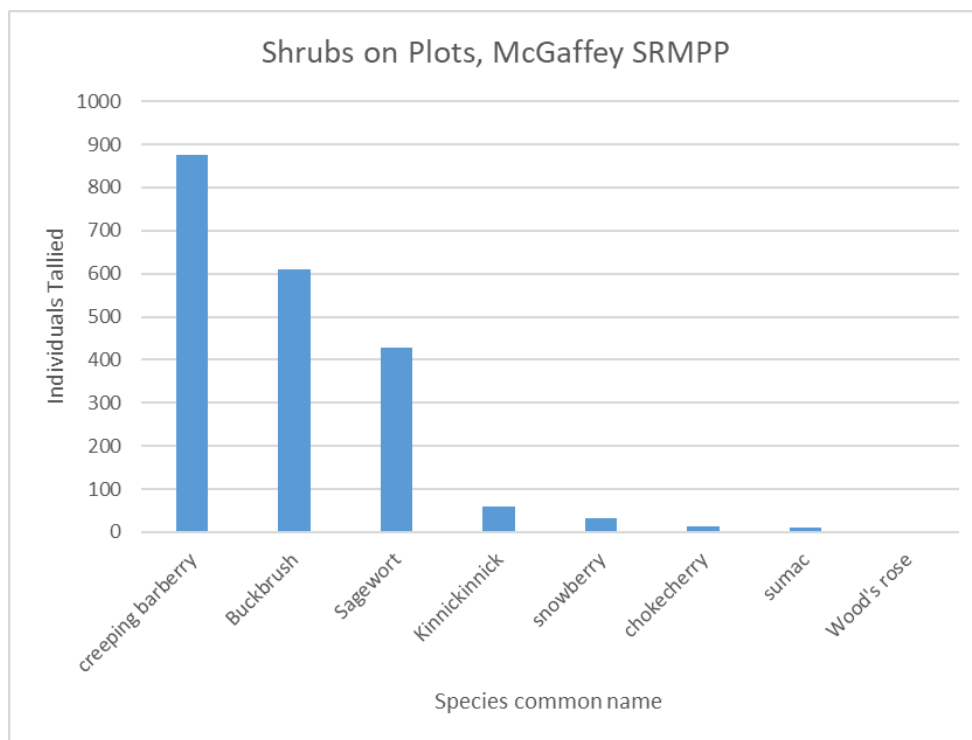


Figure 20. All individuals of shrubs tallied on SRMPP plots, by species.

In the figure below, multiple unknown (not identified) forbs are counted together. The unknown fern category includes only one individual. Twenty-three other forb species were identified and recorded, including Rocky Mountain pussytoes (*anthenaria*), cinquefoil, and multiple buckwheats, asters and hawkweeds.

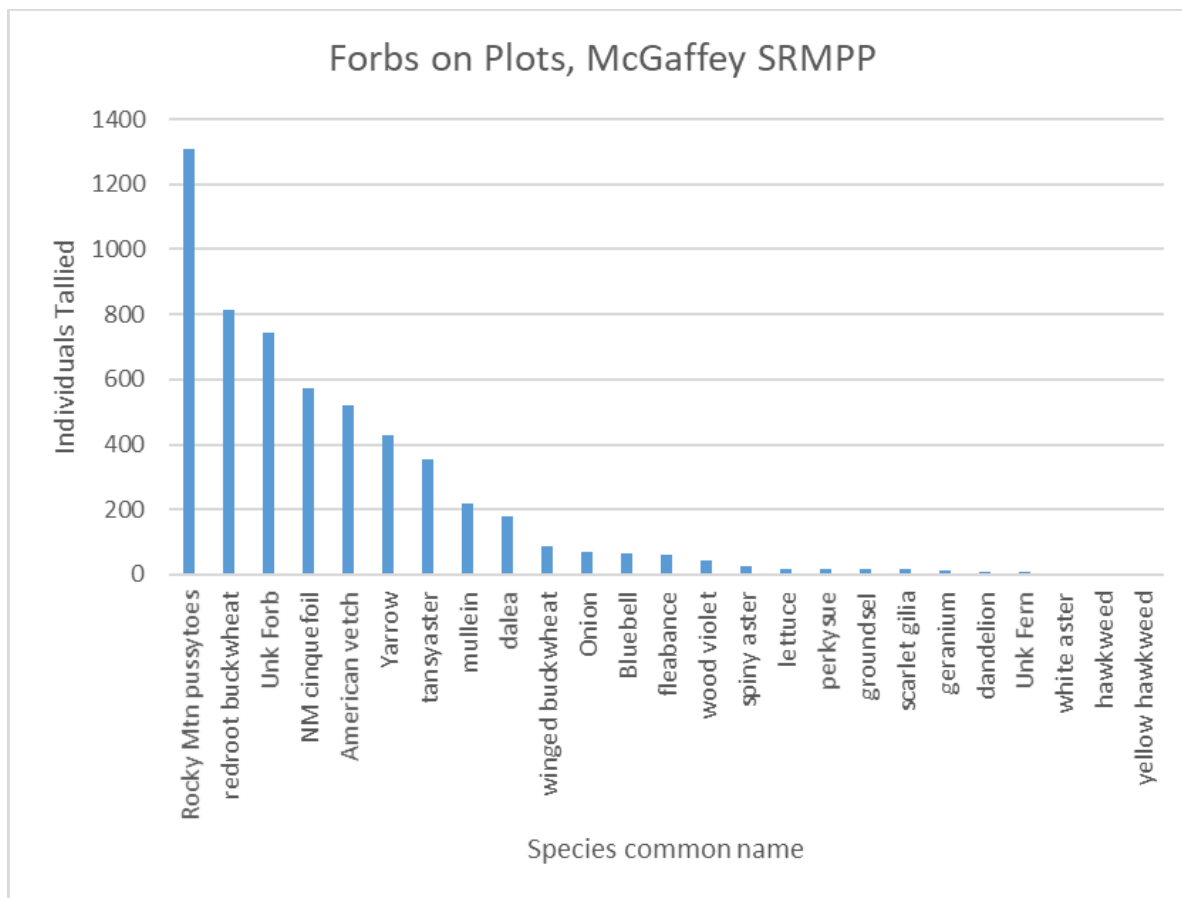


Figure 21. All individuals of forbs tallied on SRMPP plots, by species

Three species of grasses were identified; sand dropseed was dominant. Other grasses were recorded but not identified. Just as with forbs, the unknown grass category may include multiple unidentified species. Sedges were not identified to species level.

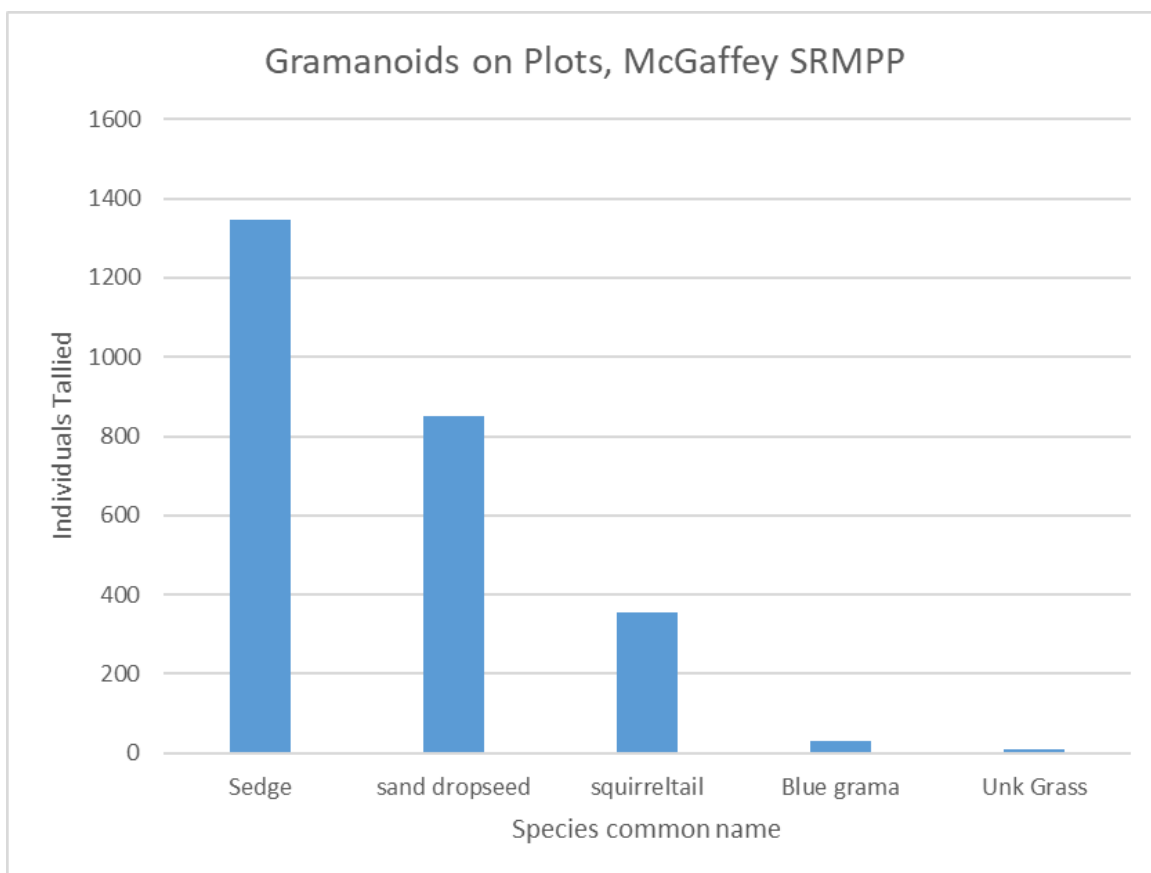


Figure 22. All individuals of gramanoids tallied on SRMPP plots, by species

Fuels

Surface fuels were collected on two Brown's transects, per instruction from the Carson National Forest, to align with their standard monitoring protocol. Overall, plots averaged 1.98 tons per acre of fine wood fuels, and 1.15 tons per acre of coarse (1000-hour) fuels. The decay classes of the 1000-hour fuels were all 3, 4, and 5; no new logs were recorded.

Litter depth averaged 1.9 inches (9.5 tons/acre).

Table 20. Surface Fuels recorded from Brown's transects on McGaffey SRMPP plots.

Fuels - McGaffey SRMPP	
Fuel	Tons/Ac
1-Hour	0.07
10-Hour	1.65
100-Hour	0.26
1000-Hour	1.15
Duff	4.99
Litter	9.51
TOTAL FINE WOOD FUELS	1.98
TOTAL WOOD FUELS	3.14
TOTAL SURFACE FUELS	17.63
Fuel	Depth (inches)
Duff	0.50
Litter	1.90
TOTAL DEPTH	2.40

Appendix I: Coordinates of collected points

Plot	Latitude	Longitude	Elevation (ft)	Class
MG_01	36.31638130	-105.61051784	7274.9	Colorado Plateau Pinyon-Juniper Woodland
MG_02	36.30877844	-105.61011993	7353.1	Colorado Plateau Pinyon-Juniper Woodland
MG_03	36.30382690	-105.61197280	7432.7	Colorado Plateau Pinyon-Juniper Woodland
MG_04	36.30045265	-105.61130022	7555.8	Colorado Plateau Pinyon-Juniper Woodland
MG_05	36.29780812	-105.60910813	7706.1	Colorado Plateau Pinyon-Juniper Woodland
MG_06	36.29156949	-105.60844522	7780.3	Colorado Plateau Pinyon-Juniper Woodland
MG_07	36.28288153	-105.61082600	7839.0	Colorado Plateau Pinyon-Juniper Woodland
MG_09	36.26302216	-105.61661615	8195.3	Southern Rocky Mountain Ponderosa Pine Woodland
MG_10	36.25851598	-105.61228055	8270.8	Southern Rocky Mountain Ponderosa Pine Woodland
MG_11	36.26004211	-105.61416696	8366.4	Southern Rocky Mountain Ponderosa Pine Woodland
MG_12	36.25352563	-105.61271031	8234.1	Southern Rocky Mountain Ponderosa Pine Woodland
MG_13	36.24981755	-105.61243575	8225.5	Southern Rocky Mountain Ponderosa Pine Woodland
MG_14	36.24968040	-105.59968673	7950.7	Southern Rocky Mountain Ponderosa Pine Woodland
MG_16	36.25237992	-105.58241642	7626.5	Southern Rocky Mountain Ponderosa Pine Woodland

Appendix II: Example photos from plots

Piñon-Juniper



MG_02_C, Plot 2 facing south towards plot center from 75 ft north



MG_04_E, Plot 4 facing east from plot center



MG_05_W, Plot 5 facing west from plot center



MG_06_S, Plot 6 facing south from plot center

Ponderosa Pine



MG_09_BR180, Plot 9 facing north towards plot center from 75 south



MG_11_S, Plot 11 facing south from plot center



MG_12_W, Plot 12 facing west from plot center



MG_16_S, Plot 16 facing south from plot center

Appendix III: Species List, Species Recorded on Plots

Symbol	Scientific Name	Common Name	Genus	Family	Prf. Lifeform
2FERN		Fern or fern ally			Undefined
2FORB		Forb (herbaceous, not grass nor grasslike)			Undefined
2GRAM		Graminoid (grass or grasslike)			Undefined
2S		Shrub, other			Undefined
ABCO	<i>Abies concolor</i>	white fir	<i>Abies</i>	Pinaceae	Tree
ACHY	<i>Achnatherum hymenoides</i>	Indian ricegrass	<i>Achnatherum</i>	Poaceae	Graminoid
ACMI2	<i>Achillea millefolium</i>	common yarrow	<i>Achillea</i>	Asteraceae	Forb/herb
ALCE2	<i>Allium cernuum</i>	nodding onion	<i>Allium</i>	Liliaceae	Forb/herb
ANME2	<i>Antennaria media</i>	Rocky Mountain pussytoes	<i>Antennaria</i>	Asteraceae	Forb/herb
ARFR4	<i>Artemisia frigida</i>	prairie sagewort	<i>Artemisia</i>	Asteraceae	Subshrub
ARPU9	<i>Aristida purpurea</i>	purple threeawn	<i>Aristida</i>	Poaceae	Graminoid
ARTR2	<i>Artemisia tridentata</i>	big sagebrush	<i>Artemisia</i>	Asteraceae	Tree
ARUV	<i>Arctostaphylos uva-ursi</i>	kinnikinnick	<i>Arctostaphylos</i>	Ericaceae	Subshrub
BOCU	<i>Bouteloua curtipendula</i>	sideoats grama	<i>Bouteloua</i>	Poaceae	Graminoid
BOGR2	<i>Bouteloua gracilis</i>	blue grama	<i>Bouteloua</i>	Poaceae	Graminoid
CAREX	<i>Carex</i>	sedge	<i>Carex</i>	Cyperaceae	Graminoid
CARO2	<i>Campanula rotundifolia</i>	bluebell bellflower	<i>Campanula</i>	Campanulaceae	Forb/herb
CEFE	<i>Ceanothus fendleri</i>	Fendler's ceanothus	<i>Ceanothus</i>	Rhamnaceae	Shrub
CERCO	<i>Cercocarpus</i>	mountain mahogany	<i>Cercocarpus</i>	Rosaceae	Undefined
CHSP11	<i>Chloracantha spinosa</i>	spiny chloracantha	<i>Chloracantha</i>	Asteraceae	Subshrub
DAFR6	<i>Dasiphora fruticosa</i>	shrubby cinquefoil	<i>Dasiphora</i>	Rosaceae	Shrub
DALE3	<i>Dalea leporina</i>	foxtail prairie clover	<i>Dalea</i>	Fabaceae	Forb/herb

DICA18	<i>Dieteria canescens</i>		Dieteria		Undefined
ELEL5	<i>Elymus elymoides</i>	squirreltail	Elymus	Poaceae	Graminoid
ERAL4	<i>Eriogonum alatum</i>	winged buckwheat	Eriogonum	Polygonaceae	Subshrub
ERFL	<i>Erigeron flagellaris</i>	trailing fleabane	Erigeron	Asteraceae	Forb/herb
ERRA3	<i>Eriogonum racemosum</i>	redroot buckwheat	Eriogonum	Polygonaceae	Subshrub
ERUM	<i>Eriogonum umbellatum</i>	sulphur-flower buckwheat	Eriogonum	Polygonaceae	Subshrub
FEROC	<i>Ferocactus</i>	barrel cactus	Ferocactus	Cactaceae	Undefined
GERAN	<i>Geranium</i>	wild geranium	Geranium	Geraniaceae	Undefined
HEUCH	<i>Heuchera</i>	alumroot	Heuchera	Saxifragaceae	Undefined
HIERA	<i>Hieracium</i>	hawkweed	Hieracium	Asteraceae	Undefined
HIFE	<i>Hieracium fendleri</i>	yellow hawkweed	Hieracium	Asteraceae	Forb/herb
IPAG	<i>Ipomopsis aggregata</i>	scarlet gilia	Ipomopsis	Polemoniaceae	Forb/herb
JUCO6	<i>Juniperus communis</i>	common juniper	Juniperus	Cupressaceae	Tree
JUMO	<i>Juniperus monosperma</i>	oneseed juniper	Juniperus	Cupressaceae	Tree
JUSC2	<i>Juniperus scopulorum</i>	Rocky Mountain juniper	Juniperus	Cupressaceae	Tree
LACTU	<i>Lactuca</i>	lettuce	Lactuca	Asteraceae	Undefined
LYCUR	<i>Lycurus</i>	wolfstail	Lycurus	Poaceae	Undefined
MARE11	<i>Mahonia repens</i>	creeping barberry	Mahonia	Berberidaceae	Subshrub
OPPH	<i>Opuntia phaeacantha</i>	tulip pricklypear	Opuntia	Cactaceae	Shrub
OXYTR	<i>Oxytropis</i>	locoweed	Oxytropis	Fabaceae	Undefined
PAMY	<i>Paxistima myrsinites</i>	Oregon boxleaf	Paxistima	Celastraceae	Shrub
PANE7	<i>Packera neomexicana</i>	New Mexico groundsel	Packera	Asteraceae	Forb/herb
PIED	<i>Pinus edulis</i>	twoneedle pinyon	Pinus	Pinaceae	Tree
PIPO	<i>Pinus ponderosa</i>	ponderosa pine	Pinus	Pinaceae	Tree
POOB3	<i>Potentilla oblancoolata</i>	New Mexico cinquefoil	Potentilla	Rosaceae	Forb/herb
PRVI	<i>Prunus virginiana</i>	chokecherry	Prunus	Rosaceae	Tree
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Pseudotsuga	Pinaceae	Tree

QUGA	<i>Quercus gambelii</i>	Gambel oak	<i>Quercus</i>	Fagaceae	Tree
RHTR	<i>Rhus trilobata</i>	skunkbush sumac	<i>Rhus</i>	Anacardiaceae	Shrub
RICE	<i>Ribes cereum</i>	wax currant	<i>Ribes</i>	Grossulariaceae	Shrub
ROWO	<i>Rosa woodsii</i>	Woods' rose	<i>Rosa</i>	Rosaceae	Subshrub
SPCR	<i>Sporobolus cryptandrus</i>	sand dropseed	<i>Sporobolus</i>	Poaceae	Graminoid
SPORO	<i>Sporobolus</i>	dropseed	<i>Sporobolus</i>	Poaceae	Undefined
SYPIP3	<i>Symphotrichum pilosum var. pilosum</i>	hairy white oldfield aster	<i>Symphotrichum</i>	Asteraceae	Forb/herb
SYRO	<i>Symphoricarpos rotundifolius</i>	roundleaf snowberry	<i>Symphoricarpos</i>	Caprifoliaceae	Shrub
TAOF	<i>Taraxacum officinale</i>	common dandelion	<i>Taraxacum</i>	Asteraceae	Forb/herb
TEAR4	<i>Tetraneuris argentea</i>	perkysue	<i>Tetraneuris</i>	Asteraceae	Forb/herb
VERBA	<i>Verbascum</i>	mullein	<i>Verbascum</i>	Scrophulariaceae	Undefined
VIAM	<i>Vicia americana</i>	American vetch	<i>Vicia</i>	Fabaceae	Vine
VISO	<i>Viola sororia</i>	Wood violet	<i>Viola</i>	Violaceae	Forb/herb

Appendix IV: Monitoring protocols/blank datasheets

****attach CSE from pdf****