Eldorado Fire at Walker Ranch
Vegetation Reestablishment Monitoring
Boulder, County
Colorado

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Abstract

This study quantitatively monitored vegetation recovery after fire at 18 locations that were recorded with GPS, marked with survey caps and photographed to allow long-term analysis. The purpose of this study was to provide data that would quantitatively describe post-fire and post-treatment conditions, and monitor change over time. No attempt has been made to compare post-fire vegetation with pre-fire vegetation since no quantitative data were collected prior to the fire. Evaluation of reclamation treatment effectiveness was also beyond the scope of this study since statistically adequate sampling would require a much larger sample size that would include the presence of controls. Controls would require that areas in needed of treatment, not be treated. A complete evaluation of the effectiveness of reclamation would also require a more exact assessment of the vegetation response to burn intensity as well as pre-fire vegetation conditions.

Sites were subjectively selected in 2002 based primarily on post-burn treatments in addition to variation in topography and burn intensity. The vegetation cover data in 2002 and the current 2007 data were collected with a point-intercept scope that allows the integration of forest canopy cover with ground cover, by allowing a single sample point to be projected both upward and downward. This methodology allowed the incorporation of the cover provided by standing dead trees as well as the incorporation of future changes in forest canopy as live tree species become reestablished. The data were also recorded in a manner that allows vegetation and ground cover under the tree canopy to be distinguished from the same values in open areas between trees.

Species composition and species dominance were measured using a combination of a 100 square meter plot for species density, and point-intercept sampling (100 sample points) on a 50-meter transect to quantify species cover dominance. This same methodology has been used by City of Boulder Open Space to monitor tall grass prairie and prairie dog habitat.

The recovery of these burned areas needed to be monitored in order to answer the following questions:

1. How well did the erosion control and seeding work?

2. Which reclamation species did best?

3. Which reclamation species were not successful?

4. How well did the natives recover on their own?

5. Are noxious weeds becoming a problem, and if so which species?

6. What is the current risk of erosion due to bare soil?

Summary

1. How well did the erosion control and seeding work?

The purpose of erosion control is to minimize rill and gully formation. This can best be accomplished by minimizing the amount of bare ground exposed to raindrop impacts and overland sheet flow.

The average bare soil in the 16 burned samples decreased about 44% between 2002 and 2007.

Bare Soil	Average	St.Dev.	Low/High	Sample 17 unburned	Sample 18 unburned
2002	36%	9%	16% - 54%	33%	1%
2007	16%	8.3%	3% - 31%	26%	1%

The average vegetation cover in the 16 burned samples increased about 48% from 2002 to 2007.

Vegetation Cover	Average	St.Dev.	Low/High	Sample 17 unburned	Sample 18 unburned
2002	30%	6%	21% - 39%	26%	63%
2007	44.4%	11.3%	28% - 62%	42%	58%

The Revised Universal Soil Loss Equation RUSLE indicates that when all other factors are held constant (e.g., slope, soil texture), a vegetation cover of about 30% results in the greatest proportional reduction in erosion.

The classification subgroup that most consistently received seeding (Group B n=6) had an average vegetation cover of 27% in 2002 and 32.2% in 2007. About 13% vegetation cover was provided by the reclamation species in 2002 and about 2% was still present in 2007. The 2002 report made the following comment, "… the question should be asked whether or not it would be more reasonable to simply increase ground cover by 13% using persistent mulch (e.g. wood fiber/chips) and allow natives to recover." This may be true, but there was also a reduced amount of cheatgrass observed in the seeded samples in 2007. This is an interesting correlation, but why this might be happening is unknown.

2. Which reclamation species did best?

Within the classification subgroup that most consistently received seeding (Group B n=6), mountain brome (*Ceratochloa carinata*) provide an average of 5.4% (range 0% – 10%) cover in 2002 and 0.0% in 2007, slender wheatgrass (*Elymus trachycaulus*) provided about 5.4% (range 0% – 11%) in 2002 and about 1.7% (range 0% - 7%) in 2007, regreen *(Triticum aestivum x Elytrigia elongata*) provided about 1% (range 0% - 3%) in 2002 and 0.0% in 2007, and blue grama (*Chondrosum gracile*) provided about 0.8% (range 0% - 3%) in 2002 and 0.33% (range 0% - 2%) in 2007.

3. Which reclamation species were not successful?

Blue grama and regreen did not seem to provide significant cover over the two-year period following the fire (2002) and all of the species have decreased since 2002. However, there may be a relationship between areas that were seeded and a reduced amount of cheatgrass in 2007.

4. How well did the natives recover on their own?

Within the classification subgroup that was severely burned but not reseeded, and received only contour log installation (Group A n=3), the average vegetation cover was 37% (s.d. = 2%, range 35% - 39%) in 2002 and 53.3% (s.d. = 4.9%, range 50% - 59%) in 2007. Although this seems much more successful than the seeded Group B (see question 1), Group A (cover increased from 27% to 32%) and B (cover increased from 37% to 53.3%) were on different types of sites. Group A was on steeper NE facing slopes with more trees, and Group B was on flatter NW facing slopes (see Figure 8). This along with other undefined factors may be responsible for the difference.

5. Are noxious weeds becoming a problem, and if so which species?

The predominant weedy species in 2002 were mullein (*Verbascum thapsus*) with 1.28% cover and 78% frequency, Jim hill mustard (*Sisymbrium altissimum*) with 1.5% cover and 61% frequency, cheatgrass (*Anisantha tectorum*) with 1% cover and 72% frequency, Canada thistle (*Breea arvensis*) with 0.56% cover and 39% frequency, and alyssum (*Alyssum minus*) with 0.33% cover and 28% frequency. The predominant weedy species in 2007 were cheatgrass with a 10 fold increase in cover to about 10% with 78% frequency. The cheatgrass problem was greatest in Groups C (17.4%) and D (22%), and least in Groups A (4.7%), B (2%), and E (0%). Group B was the group that most consistently received the seeding treatment. All of the other weedy species have reduced cover with the exception of tumble knapweed (*Acosta diffusa*) which has increased from 0% cover and 11% frequency to 0.5 % cover with 11% frequency. In both years the knapweed was found in samples 9 and 11.

The total cover of introduced species has increased somewhat over the last 5 years. In 2002 the total cover of introduced species was 8% (using the cover value that ignores overstory) and has increased to 12% based primarily on the increase in cheatgrass since most of the other weed species have decreased in cover. When these cover values are compared to the total vegetation cover at the sample locations, the relative cover of the introduced species averaged 25% in 2002 and 28% in 2007. The interesting weed, tobacco weed (*Nicotiana attenuata*) that was observed in 2002 was not found in 2007.

6. What is the current risk of erosion due to bare soil?

Based on a subjective assessment that includes familiarity with the RUSLE annual erosion prediction model, the risk is low. Vegetation cover in the burn areas (Samples 1-16) averaged 30% (range 21% - 39%) in 2002 and 44% (range 28% - 62%) in 2007. The overall ground cover (includes vegetation, litter, rock and standing dead vegetation) averaged 58% (range 43% - 82%) in 2002 and 83.6% (range 68% - 97%) in 2007.

Introduction

The Eldorado fire at Walker Ranch produced areas with variable impacts related to vegetation and soil exposure. Intensive reclamation efforts of selected areas have helped to reduce the risk of severe erosion and the introduction of non-native noxious weedy species. At the same time there is a risk that disturbance activities related to reclamation, including the use of introduced species in the reclamation mix, may have negative effects on long-term native vegetation recovery. This study compares current (2007) conditions to the baseline (2002) conditions and is an essential component of "adaptive management". The actual success or failure of these reclamation methods related to vegetation establishment and reduction of erodible bare soil was not previously monitored.

Adaptive management necessitates a critical review of management actions in order to refine and adjust management practices based on actual results. The purpose of this study was to establish vegetation monitoring sites that will provide long-term quantitative data on vegetation establishment and relate the results to environmental conditions such as slope, aspect, climate, severity of burn, and post-burn treatment. Results include sample specific summary of vegetation conditions, classification of all samples based on the year 2002 vegetation characteristics, and ordination of all samples in the environmental/treatment gradient to allow some assessment of results based on site conditions and treatment.

This study was not designed to provide statistical assessment of success or failure of the reclamation methods. The hypothesis testing that statistical assessment requires, mandates an intensive sampling methodology that must include sample adequacy determination, and untreated controls. The current study utilizes numerical analysis techniques to determine trends that point the way for future hypothesis testing if that is ultimately desired. As stated in the original proposal the following questions were addressed.

The recovery of these burned areas needs to be monitored to answer such questions as:
1. How well did the erosion control and seeding work?
2. Which species did best?
3. Which were not successful?
4. How well did the natives recover on their own?
5. Are weeds becoming a problem, and if so which species?
6. What is the current risk of erosion due to bare soil?

Figures 1(aerial photography) & 2(USGS topography) provide maps of the burn area and the approximate treatment zones with eighteen sample locations. The perimeter of the burn area is identified with a red line. The burn severity areas are identified with black perimeter lines around a red hatch pattern for severely burned areas and a blue hatch pattern for moderately burned areas. The areas within the red perimeter line but outside of the hatch areas were typically unburned but were sometimes lightly burned or had received small spot burns. The treatment areas are identified by magenta perimeter lines and the treatment associated with each area is described in the Methods section of this report. The actual reclamation treatments are

described below. Note that climate stations shown in Figures 1 and 2 were not reestablished in 2007.

The following details regarding the burn were provided by Boulder Area Sustainability Information Network (BASIN) and can be found at the following web site: http://bcn.boulder.co.us/basin/news/Eldorado.html

The Walker Ranch Fire, also referred to as the Eldorado Fire, began about 2 p.m. Friday, Sept. 15, 2000 and consumed some 1100 acres before it was completely contained on Wednesday, September 20th. There was no loss of life and no structures were burned. The Boulder Daily Camera reports that more than 500 people, 74 fire-fighting engines, 273,000 gallons of water and 133,000 gallons of fire retardant were used to bring the fire under control.

The burn occurred along and near South Boulder Creek west and north of Eldorado Springs State Park, primarily on Boulder County Open Space land, but in after the fire there were potentially impacts to the drinking water supplies of the cities of Denver, Louisville and Lafayette which all draw source water for their treatment facilities from South Boulder Creek.

The Colorado State Forest Service has provided a more detailed graphic presentation of the burn chronology at http://lamar.colostate.edu/~csfsbo/fire.htm#

Boulder County provided the following details on the burn impacts and reclamation efforts at the following web site. http://www.co.boulder.co.us/openspace/resources/ecology/walker_fire.htm
Of the 1,062 acres that were burned in the Eldorado Fire, 450 acres were moderately or severely burned.
275 acres were severely burned.

- 50% to 100% of the canopy was burned
- Needles are gone
- Ground cover was partially consumed
- Weak areas of hydrophobic or water resistant soils may be present

175 acres were moderately burned.

- Up to 50% of the canopy was burned
- Needles are gone from many trees, but not all
- Ground cover was partially consumed
- There may be weak areas of hydrophobic soils may be present.

Seeding

Minimal seeding will be used since this fire was relatively small and there are ample native seed sources surrounding the burned areas. Seed will only be hand broadcast onto areas that are at high risk for severe erosion or noxious weed invasion. The following seed mix is being used:

- 28% of the mix will be Blue grama (*Bouteloua gracili*s), a dominant native grass, (Authors Note: the actual value included 30% and 32% in site specific mixes Claire DeLeo – Eldorado Area Rehabilitation Plan Revisions and Summary, undated BCPOS).
- 25% will be Mountain brome (*Bromus marginatus*), a pioneer native grass,

(Authors Note: the actual value included 27% in site specific mixes Claire DeLeo – Eldorado Area Rehabilitation Plan Revisions and Summary, undated BCPOS).

- 32% will be Slender wheatgrass (*Elymus trachycaulus*), a short-lived native perennial, and,
  (Authors Note: the actual value included 35% and 37% in site specific mixes Claire DeLeo – Eldorado Area Rehabilitation Plan Revisions and Summary, undated BCPOS).
- 15% will be "Regreen", a sterile hybrid of Cereal wheat (*Triticum aestivum*) and Tall wheatgrass (*Elytrigia elongata*), short-lived perennials.
  (Authors Note: the actual value included 4% and 10% in site specific mixes Claire DeLeo – Eldorado Area Rehabilitation Plan Revisions and Summary, undated BCPOS).

(Current Author's Comment: Although blue grama grass is a local native, it is not typically the dominant in the upper foothill areas of this burn. Mountain brome (a.k.a. *Ceratochloa carinata* is an introduced species in Colorado although native in some states of the U.S. This species did not naturally occur in the burn areas prior to planting. Slender wheatgrass is also a local native species, but was probably not abundant in the burn area prior to seeding.)

The reasons why introduced or non-local species are used are based on the facts that native species, especially local native species, are either unavailable or expensive. Not all areas were seeded. The areas that were seeded were selected because they were the greatest concern with regard to erosion or noxious weed invasion. The non-native species were chosen based on their ability to produce quick ground cover and yet be short-lived and allow the reestablishment of native species.

(Current Author's Comments: This study allows some evaluation of whether these species were successful at providing quick cover, and permit evaluation of whether of not they are short-lived.)

Mulching

Mulching reduces the erosive action of raindrops hitting bare soil and overland sheet flow. Certified weed-free winter wheat straw is applied at 1 ton (about 50 bales) per acre. Seeds remaining in the straw will germinate and provide a temporary ground cover until native plants can reestablish.

Mulching is also used in conjunction with seeding to provide a protective cover for seeds by reducing soil moisture evaporation.

Contour Straw Wattles (a.k.a. straw logs)

Straw wattles are used on severe to moderately burned slopes with less than 30 percent of the original ground cover remaining. They increase infiltration, add roughness, reduce erosion, and help retain eroded soil on slopes. They are also used to supplement erosion control in areas that do not have enough large trees for contour log felling and in rocky areas where contour log felling is difficult to implement.

Straw wattles are cylinders of compressed weed-free straw. They are made of either wheat or rice straw, and are 8 to 12 inches in diameter and 20 to 25 feet long. They are encased in jute, nylon, or other bio/photo-degradable materials. When installed on the contour of a slope they form a continuous barrier that intercepts water and sediment running down the slope. Straw wattles are effective for about 3 years.

Contour Log Felling
When the original ground cover is lost during a fire, the soil is at risk for erosion. Drainage ways may flood more frequently from increased runoff on the burned slopes. Contour log felling can reduce erosion from rainwater that runs down a slope by cutting dead trees so they fall perpendicular to the main direction of the slope. This technique is used on burned slopes where about 50% or more of the tree canopy is destroyed.

Sawyers cut trees, dropping the trunks along the contour of the slope leaving stumps about 12 inches high to brace the tree from sliding downhill. Tree limbs are removed so that the log lies flat on the ground. Soil is then packed under the log to slow the flow of water and facilitate the deposition of sediment on the upslope side of the log.

A discussion of potential water quality impact was also provided by the following BASIN web site: http://bcn.boulder.co.us/basin/forum/walkerWQ.html
By: Donna Scott, City of Boulder, Water Quality and Environmental Services Potential water quality impacts involve a major tributary to Boulder Creek and a drinking water supply reservoir. It is estimated that 500,000 people receive their drinking water from water resources affected by this fire. These include South Boulder Creek, which is a drinking water source for the cities of Louisville, Lafayette and the town of Superior and Gross Reservoir, a water supply for Denver Water as well as serving Arvada. In addition, several small drainage ways cross the area. Tom Davis Gulch is an intermittent stream which runs west to east right through the most heavily burned areas and is a tributary to South Boulder Creek, just upstream of the city of Lafayette's and the town of Louisville's diversion structures. Gross Reservoir's northern corner is within a few hundred feet of the fire area, and South Boulder Creek forms most of the eastern boundary of the fire.

Figure 1 provides a map of the burn area and the approximate treatment zones with eighteen sample locations. The perimeter of the burn area is identified with a red line. The burn severity areas are identified with black perimeter lines with a red hatch pattern for severely burned areas and a blue hatch pattern for moderately burned areas. The areas within the red perimeter line but outside of the hatch areas were typically unburned but were sometimes lightly burned or had received small spot burns. The treatments areas are identified by magenta perimeter lines and the treatment associated with each area is described in the Methods section of this report.

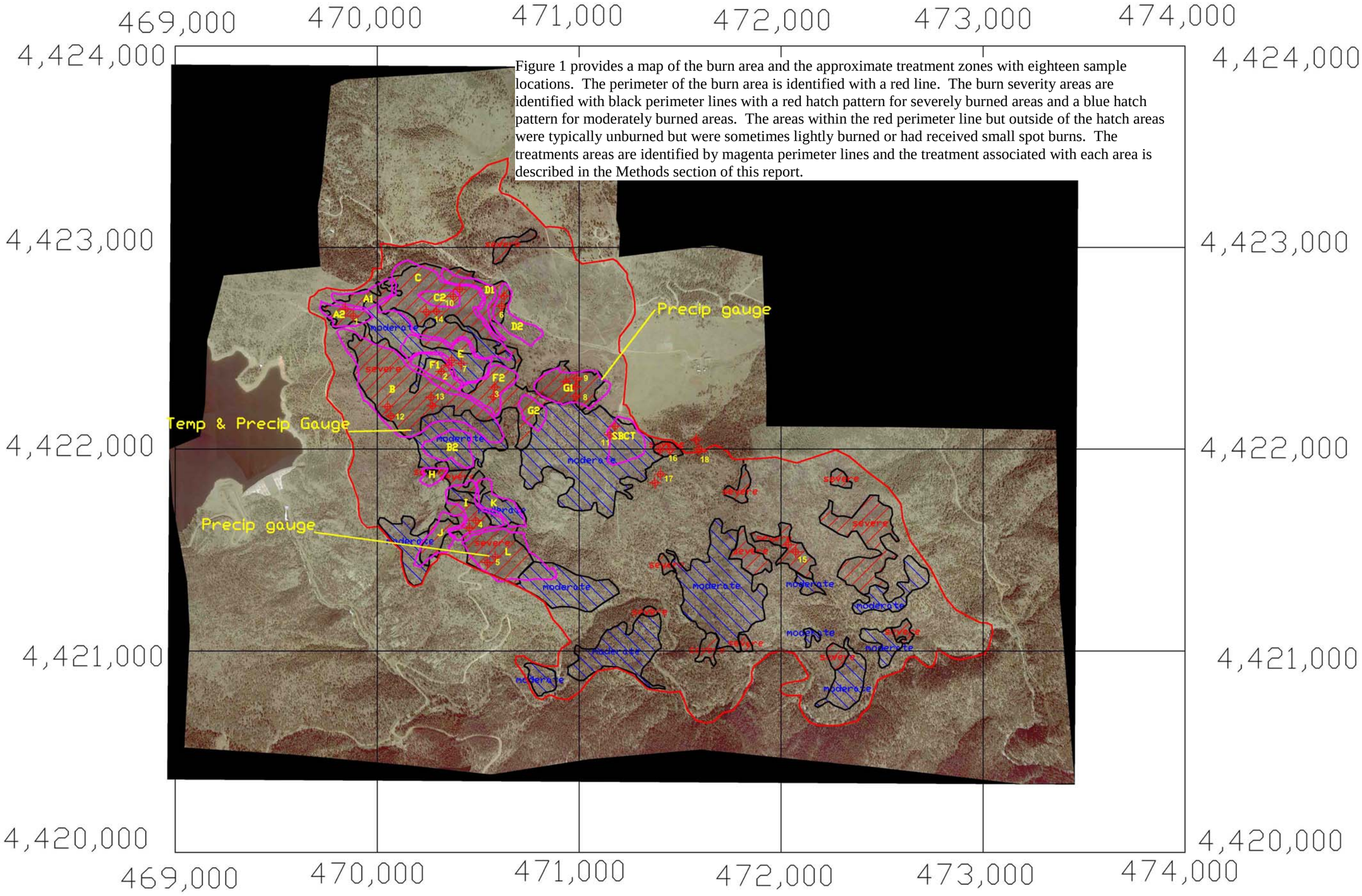


Figure 1. Eldorado Fire at Walker Ranch aerial photography with; burn perimeter, burn severity mapping, treatment areas, and sample locations. Coordinate grid is UTM NAD 27 meter.

Figure 2 provides a map of the burn area and the approximate treatment zones with eighteen sample locations. The perimeter of the burn area is identified with a red line. The burn severity areas are identified with black perimeter lines with a red hatch pattern for severely burned areas and a blue hatch pattern for moderately burned areas. The areas within the red perimeter line but outside of the hatch areas were typically unburned but were sometimes lightly burned or had received small spot burns. The treatments areas are identified by magenta perimeter lines and the treatment associated with each area is described in the Methods section of this report.

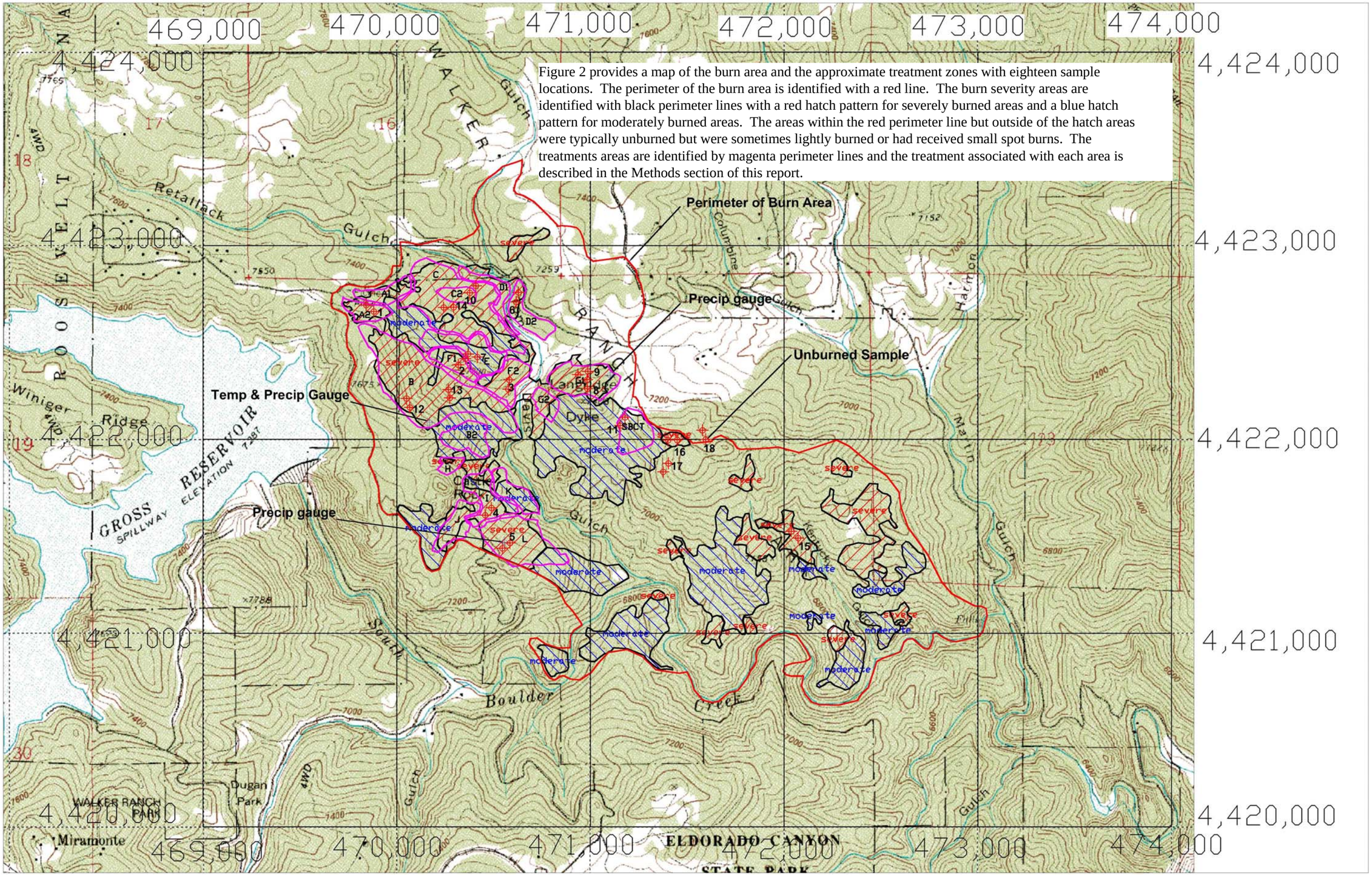


Figure 2. Eldorado Fire at Walker Ranch USGS topographic map with; burn perimeter, burn severity mapping, treatment areas, and sample locations. Coordinate grid is UTM NAD 27 meter.

Methods

Sample Site Selection and Documentation

Eighteen samples were subjectively selected from the study area (Figures 1 & 2) and stratified as much as possible to include the range of burn severity, reclamation treatments and topographic position. Sample 18 was selected from a site that was outside of the burn perimeter in a densely forested site. The mapping of the treatment areas was not precise and required on-site adjustment of plot location and orientation to best fulfill the targeted combination of treatments that each sample was intended to represent. Table 1 summarizes the results of sample selection. The sample transects were marked by a large survey cap and brown carsonite post at the start point, and a white fiberglass pole and small aluminum caps at the end point (Figure 3). The start and end points were recorded with a Trimble Geoexplorer 3 GPS unit that was accurate to approximately +/- 1.5 meters.

Table 1. Summary of sample locations, treatments, burn severity, and topographic characteristics.

Sample ID	Treatment Unit	Contour	Straw logs (acres)	Seed (acres)	Mulch (acres)	Treatment Summary	Burn Class	Slope-Aspect	
	A1	X	3.1	6	6	Everything	Severe	M - NE	M = moderate
1	A2	X	2	3	5	Everything	Severe	M - NE	
2	F1	X	10.1		2.5	C& S-Logs & Mulch	Severe	M - SE	
3	F2	X	10.1		4.5	C& S-Logs & Mulch	Severe	S - SE	S = Steep
4	I	X	5.8		4	C& S-Logs & Mulch	Severe	M - SE	
5	L	X	5.7		8	C& S-Logs & Mulch	Severe	M - NE	
6	D2	X		5	4	C& Seed & Mulch	Severe	S- W	
7	E	X	2.9			C& Straw Logs	Moderate	Ridge - SE	
	J	X	1.9			C& Straw Logs	Severe		
8 & 9	G1	X		8		C& Seed only	Severe	S - NW	Top & bottom of slope
10	C2	X		some		C& some seed	Severe	Ridge - ENE	Seeded top
11	SBCTrail			1.5 some		Seed only	Moderate	S - SW	
12 & 13	B	X				Contour only	Severe	S - ENE	Top & bottom of slope
	B2	X				Contour only	Moderate		
14	C	X				Contour only	Severe	Drain - ENE	
	D1	X				Contour only	Severe		
	G2	X				Contour only	Severe+Mod		
	H	X				Contour only	Light+Severe		
	K	X				Contour only	Moderate + Sev.		
15	Other Burn					None	Severe	S - NE	
16	Other Burn					None	Severe	S - NW	
17	No burn interior					None	None	M - W	
18	No burn dense exterior					None	None	S - NNE	
18	**TOTAL Samples**								

Data collection

Vegetation Cover Sampling

Vegetation cover was originally sampled at the 18 transects (Figures 1 & 2) on July 16-19, 2002. The 2007 sampling occurred July 21-24. Each 50 meter transect was sampled with 100 points using a point-intercept optical device (Figure 4). Two points were sampled at each meter, one on either side of the transect at 0.5 meter from the transect centerline (Figure 4). The point-intercept optical device uses high quality optics and cross-hairs to project a point in an upward as well as downward direction, allowing the canopy of living or dead trees to be recorded. Whenever an upward point recorded a hit on tree canopy

Sample Transect Start Point


Sample Transect End Point

Aluminum Cap with Transect Number

Figure 3. Sample location markers

(either alive or dead), the additional downward hits were recorded separately to allow the discrimination of points that occurred under a tree canopy.

Each sample point recorded first-hit (top canopy) and additional hits for vegetation by species, as well as litter, bare soil, rock, and standing-dead vegetation. Litter was defined as dead organic matter in contact with the soil or within 1 cm. of the soil surface. "Standing-dead" was defined as organic matter that was over one year old (i.e., not this year's vegetation growth) that was not yet in contact with soil and was below about 1.5 meter above the ground. In this study, all dead standing trees were recorded by species and kept distinct from "standing dead" organic matter.

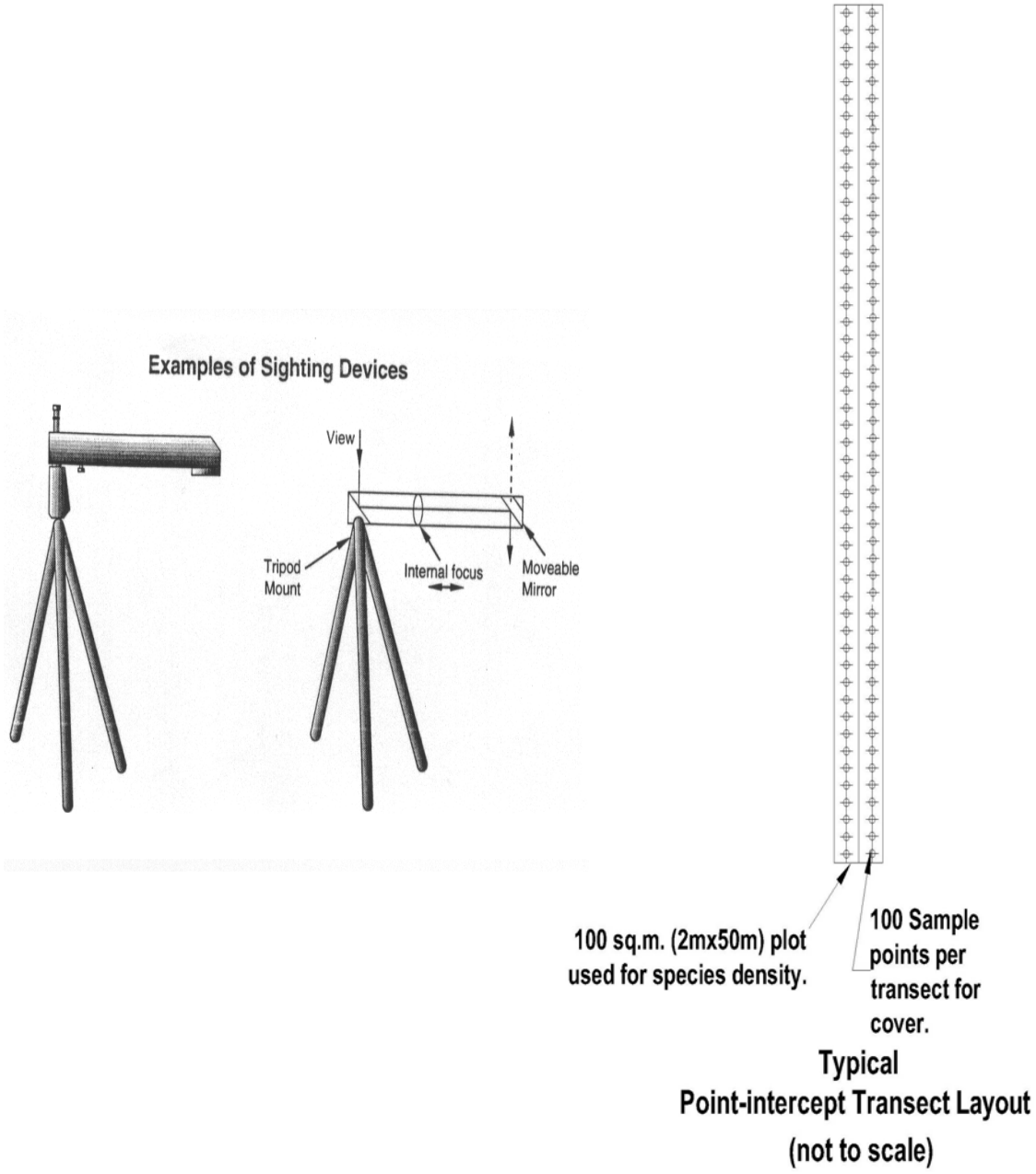


Figure 4. Point-intercept sampling device and the point-intercept transect layout.

Species within one meter (3.28 ft.) of the transect centerline were also recorded as "present". This allowed species with low cover to be represented in the data and provided a species density per 100 square meters (i.e., 50 meters long by 2 meters wide plot). The transect was subjectively oriented to best represent the community/treatment target. This cover sampling methodology is identical to the vegetation monitoring used by Boulder City Open Space and Mountain Parks in their prairie dog studies, and the Boulder County study at the Doniphan Property prairie dog revegetation site.

In 2002 photographs were only taken at the start points of the transects. A horizontally oriented and a vertically photograph were taken at each sample. In 2007 horizontally oriented photographs were taken at both ends of the transects, and an occasional vertical photograph was also taken.

Climate Data

The climate data were not collected in 2007. A climate diagram was prepared that presents the monthly temperature, precipitation, and potential evapotranspiration for the last 5 years and compares it to the last 100 years of record.

Classification

The vegetation cover data were classified in 2002 using the TWINSPAN (Hill, 1979) divisive classification program with the strict convergence criteria of Oksanen & Minchin (1997). This program defines groups of samples based on the similarity of their species composition, and simultaneously groups the species that tend to occur together within each classification group. Certain settings must be entered for TWINSPAN to perform the classification. These settings are described in the following section.

Cover classes and pseudospecies

Because TWINSPAN was originally designed to be used for Presence-Absence (i.e. frequency) data rather than quantitative (i.e. abundance) data, the use of "Pseudospecies" was incorporated into the computer program. The concept of pseudospecies allows greater weight to be given to higher quantitative values. The first setting of TWINSPAN for pseudospecies requires that the cover classes (i.e. cut levels) be defined. TWINSPAN allows a maximum of nine cut levels.

In this study the cut levels were defined as 0.0, 0.2, 1.1, 3.1, 5.1, 7.1, 9.1, 11.1, >11.1. The first cut level included all species cover values that were greater than zero, cut level two included all values that were greater than or equal to 0.2%, cut level three included all values greater than or equal to 1.1%, etc. The 0.2 cut level was used to distinguish those species that were present, but were not tallied as a hit by the cover sample. All of these "present" species were given a value of 0.1. Almost all species had cover values less than 19%. Figure 5 shows the frequency distribution of cover values at the targeted cut levels. A species that was present (SPEX) in the plot but not "hit" was assigned a value of 0.1 and was assigned one pseudospecies (i.e. SPEX1). A species with a cover value of 10% would be assigned eight pseudospecies (i.e. SPEX1, SPEX2, SPEX3, SPEX4, SPEX5, SPE6, SPE7, SPE8) because it could be found to occur within eight of the nine possible cover classes. If the cover classes are not equal in size to each other, there is a *de facto* weighting of the data. For example the species with 10% cover would occur in eight out of nine possible classes, so its weighted cover would be 89% (i.e. 8/9). The net effect is to positively weight the lower cover values and negatively weight the higher cover values. This can be compensated by the weighting option of the TWINSPAN program. For this study the weights given to each class were respectively; 9,000, 45,000, 60,000, 67,500, 90,000, 105,000, 115,714, 123,750, 190,000. For example, the species with 10% cover would be given a weight of 123,750 and would be multiplied by 89 (i.e., the 8/9 = 89% value) = 11,013,750. The maximum weighted value for a species with 100% cover would be 100 x 1,000,000 = 100,000,000. The net weighting for the 10% species is 11,013,750/100,000,000= 11%. The final result is that the cover classes are "unweighted", and more representative of the true cover values.

The TWINSPAN results were used to define the sample and species associations that have resulted from the fire disturbance and reclamation efforts. This is presented in a dendrogram that includes those species, growth forms (i.e., introduced annual forbs, native perennial grasses, etc.), and selected environmental factors that were most closely associated with each division. The determination of these associated growth forms and environmental factors was accomplished using DISCRIM variant of the TWINSPAN program (ter Braak 1982).

Ordination

The samples were ordinated using CANOCO Version 4.0 (ter Braak 1999) which incorporates the strict convergence criteria of Oksanen & Minchin (1997). The ordinations of samples, species, and environmental vectors were produced separately for different combinations of two axes, as well as a simulated three-dimensional scatter plot. The "environmental factors" included reclamation treatments, independent site factors, vegetation related site factors, and growth forms. Table 2 summarizes the environmental factors used in the ordination. Slope was measured in percent, and aspect was composed of the combination of "easterliness" (sine of aspect) and "northerliness" (cosine of aspect). Aspect was recorded with respect to true north. Abbreviations used throughout this report are as follows:

Treatments

- Contour = Contour log felling
- Strwlogs = Straw logs (wattles)
- Seed = Application of seed
- Mulch = Application of Mulch
- Burn Intensity
- Burn = Burn Intensity

Independent Site Factors

- Sloppcnt = Slope in percent
- AspETN = Easterly component of aspect relative to true north
- AspNTN = Northerly component of aspect relative to true north

Vegetation Related Site Factors

- StndDead = Standing Dead vegetation that has been dead for at least one full year, and that is not in contact with mineral soil, litter, or the ground surface.
- Litter = Non-living organic matter, that is in contact with the mineral soil, other litter or the ground surface.

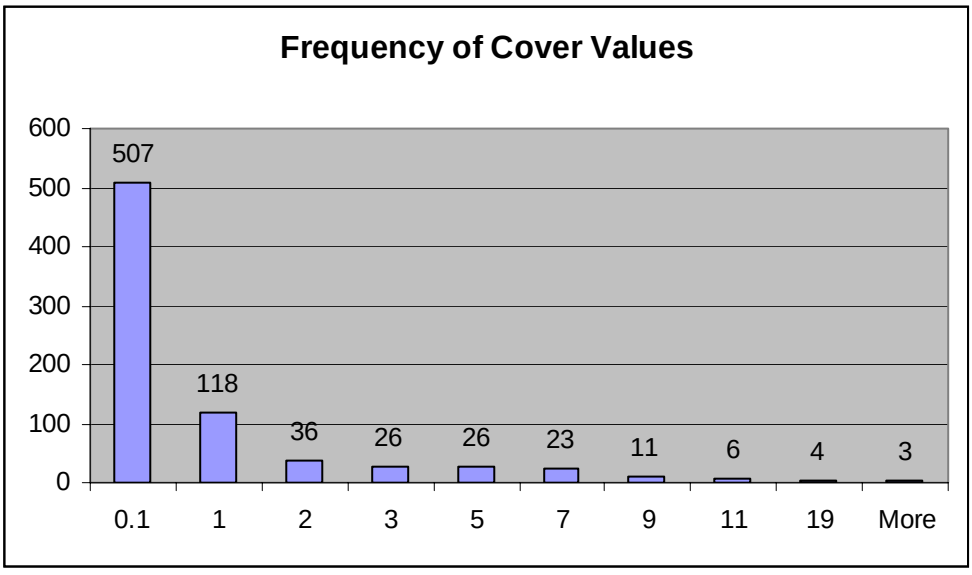


Figure 5. Frequency distribution of cover values.

Baresoil = Soil with no vegetation or litter cover.
Rock = Rock that is greater than 1cm in size in at least one dimension.
TotVeg = Total vegetation cover
SpeDen = Species density (i.e., number of species found within the 100sq.m. [2m x 50m] transect)
Grndcov = Ground cover that will help reduce erosion. Includes total vegetation cover, rock, litter, and standing dead.

Growth Forms

IAF = Introduced Annual & Biennial Forbs
IAG = Introduced Annual Grasses
IPF = Introduced Perennial Forbs
IPGC = Introduced Perennial Grasses (cool season)
NAF = Native Annual & Biennial Forbs
NPF = Native Perennial Forbs
NPGC = Native Perennial Grasses (cool season)
NPGW = Native Perennial Grasses (warm season)
S = Native Shrubs
T = Native Trees
F = Native Ferns
M = Moss

The associations as defined by the TWINSPAN classification were also represented within the ordination using connecting lines or distinct symbols to show the distribution of the classification groups within the ordination. The species that were found to distinguish the classification groups were also presented in separate attribute plots. The attribute plots show the actual cover values of the selected species for each sample. The cover values are represented by circles with a diameter that is proportional to the cover value, and the circles are centered on the location of the sample in the ordination. It is then possible to get a realistic idea of the distribution of cover values for each species with respect to the plant associations and the environmental factors.

Table 2. Summary of Site Factors used in Ordination.

											Samples								
	Ordination Site Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Treatments																			
	Contour	1	1	1	1	1	1	1	1	1	1		1	1	1				
	Strwlogs	1	1	1	1	1		1											
	Seed	1					1		1	1	1	1							
	Mulch	1	1	1	1	1	1												
Burn Intensity																			
	Burn	4	4	4	4	4	4	3	4	4	4	3	4	4	4	4	4	0	0
Independent Site Factors																			
	Sloppcnt	18%	29%	29%	27%	29%	40%	18%	32%	32%	11%	32%	36%	45%	25%	40%	25%	36%	32%
	AspETN	0.2924	0.2250	0.3907	0.7986	0.8746	-0.9563	-0.1908	-0.2924	-0.4540	0.9986	0.6820	0.9962	0.9063	0.9925	0.9205	-0.7547	-0.9563	0.6820
	AspNTN	0.9563	-0.9744	-0.9205	-0.6018	0.4848	0.2924	-0.9816	0.9563	0.8910	-0.0523	-0.7314	0.0872	0.4226	0.1219	0.3907	0.6561	0.2924	0.7314
Vegetation Related Site Factors																			
	StndDead	2	1	4	2	3	0	0	0	1	3	0	1	0	0	3	0	2	0
	Litter	43	19	30	26	30	19	20	16	17	15	19	13	9	15	16	20	29	79
	Baresoil	18	49	37	29	31	49	43	44	51	57	55	37	42	41	31	54	33	2
	Rock	0	1	1	5	1	7	3	9	6	0	0	10	7	1	8	1	10	0
	TotVeg	41	31	32	40	37	24	36	31	26	26	31	51	46	53	45	30	28	73
	SpeDen	49	43	47	46	36	36	39	46	39	35	44	32	31	48	57	40	39	25
	Grndcov	86	52	67	73	71	50	59	56	50	44	50	75	62	69	72	51	69	152
Growth Forms																			
	NAF	0.1	2.0	1.0	2.0	0.1	1.0	3.0	1.0	1.0	3.0	5.0	11.0	4.0	18.0	1.1	6.0	2.0	0.1
	IAF	4.0	1.0	10.0	10.0	20.0	1.0	0.1	0.1	0.1	0.1	5.0	6.0	0.1	4.0	11.0	1.0	1.0	0.0
	IAG	1.0	1.0	0.1	7.0	7.0	1.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	6.0	0.1	0.1	0.1	0.0
	NPF	1.0	20.0	3.0	9.0	7.0	10.0	18.0	5.0	13.0	5.0	3.0	14.0	21.0	14.0	13.0	23.0	7.0	0.1
	IPF	1.1	0.1	6.0	1.0	0.1	1.0	1.0	0.1	0.0	0.1	1.0	4.0	0.1	0.1	0.1	0.1	0.1	0.1
	NPGC	18	6	7	10	2	7	11	10	3	5	11	1	4	2	15	0.1	6	12
	IPGC	12	0.1	0.1	0.1	1	3	1	11	7	10	2	0	0	0	0	0	0	0
	NPGW	3.0	0.0	0.0	0.1	0.1	0.1	0.0	3.0	0.1	1.0	1.0	0.0	0.0	0.0	1.0	0.0	3.0	0.0
	Shrub	1.0	1.0	5.0	1.0	0.1	0.1	2.0	1.0	1.0	2.0	3.0	12.0	13.0	2.0	4.0	0.1	9.0	0.1
	Tree	9.0	12.0	5.0	1.0	7.1	11.0	6.0	10.0	11.0	4.0	29.0	13.0	13.0	18.0	16.0	9.0	1.0	64.0
	Fern	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Moss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0

Results & Discussion:

Data Tables

The vegetation cover data for 2002 and 2007 are presented in Appendix 1 as summary tables that include the original cover data, average and relative cover for each species and growth form, total cover for each sample, and the number of species that occurred within the 100 sq.m. plot for each sample.

This results and discussion section will repeat the findings from 2002 that describe the "baseline" conditions and how those were used to initially classify the samples into groups. The new information will simply compare the overall, group, and individual sample changes over time.

Table 3 presents the 31 most important species observed in 2002, based on a combination of constancy (a term that is equivalent to frequency when comparing samples) and total cover. This list includes those species that were non-preferentials as well as some species that TWINSPAN determined were indicator species for some of the groups. The complete list of the 2002 species used for this analysis sorted by relative importance is presented in Appendix 2 along with the 2007 list of most important species. Also in Appendix 2 is a list of the species with the greatest increase or decrease in importance since the 2002 sampling. A listing of those species that were newly observed as well as those that were observed in 2002 but not in 2007 is included in Appendix 2. The photographs of samples are presented in Appendix 3.

Classification

The TWINSPAN 2-way classification table is presented in Appendix 4. This table presents both the sample and species divisions produced by the TWINSPAN program. The TWINSPAN classification summary is presented in Figure 6 and defined five groups (A-E) based on species composition. The species listed at the top of Figure 6 were common in all groups, and were non-discriminatory. Because samples were selected primarily from fire disturbance sites, no attempt has been made to classify the communities based on typical undisturbed plant community structure.

This classification integrates the results of burn intensity, site conditions, reclamation treatment, and natural revegetation. Figure 6 demonstrates that much of the grouping based on species composition correlates well with reclamation treatments. NO simplistic or definitive conclusion can be made, however, regarding the cause and effect of the treatments, since the treatments were applied subjectively in areas of greatest need. For example, Group A (Samples 12, 13, 14) was severely burned with no treatment and was found to be typified by the presence of quaking aspen (*Populus tremuloides*). The relative absence of aspen in all of the other "treatment" groups does not mean that "treatment" excluded regeneration of aspen. It is more likely that aspen occurred in areas that were more likely to regenerate on their own, or were less of an erosion risk, and were therefore not selected to receive reclamation treatment. On the other hand, when the treatment included seeding, especially with non-native species, the change in community composition due to these species can be assumed to be caused by reclamation efforts.

Although five groups were defined by the classification, only four occur within the burn area. A description of the groups follows the next section, which describes the Ordination results.

Table 3. The 31 most important 2002 species based on cover and frequency in all 18 samples.

Scientific Name	Relative Importance (%)	Constancy (%)	Average Cover All-Hits (%)
Pinus ponderosa ssp. scopulorum (dead)	100.00	66.67	5.61
*Carex pensylvanica ssp. heliophila	65.92	77.78	3.17
⃠Ceanothus fendleri	53.28	94.44	2.11
⃠Phacelia heterophylla	53.24	77.78	2.56
Pseudotsuga menziesii (dead)	42.93	55.56	2.89
⃠Verbascum thapsus	36.36	94.44	1.44
Sisymbrium altissimum	28.10	61.11	1.72
⃠Chenopodium simplex	27.66	77.78	1.33
*Anisantha tectorum	24.72	72.22	1.28
Elymus trachycaulus	19.34	33.33	2.17
*Ceratochloa carinata	18.36	33.33	2.06
⃠Penstemon virens	15.92	88.89	0.67
Artemisia ludoviciana	12.94	72.22	0.67
Geranium caespitosum ssp. caespitosum	12.69	77.78	0.61
Carex spp.	11.10	50.00	0.83
Corydalis aurea	9.95	55.56	0.67
Artemisia frigida	8.96	50.00	0.67
⃠Campanula rotundifolia	8.11	77.78	0.39
⃠Chenopodium leptophyllum	8.11	77.78	0.39
Grindelia squarrosa	7.25	44.44	0.61
Triticum aestivum x Elytrigia elongata	7.19	61.11	0.44
Helianthus pumilus	6.95	66.67	0.39
Breea arvensis	6.34	38.89	0.61
Apocynum androsaemifolium	6.30	22.22	1.06
Chondrosum gracile	5.94	44.44	0.50
Epilobium brachycarpum	5.88	66.67	0.33
Leucopoa kingii	5.88	66.67	0.33
⃠Astragalus miser var. oblongifolius	5.41	72.22	0.28
*Populus tremuloides	4.93	22.22	0.83
Pseudotsuga menziesii	4.88	5.56	3.28
Physocarpus monogynus	4.63	44.44	0.39

⃠ = Nonpreferential species. This symbol marks those species that are evenly distributed among all of the classification groups. The other species showed some degree of preference for specific groups.
* = Indicator species determined by TWINSPAN. These species were closely associated (high fidelity) with specific groups and little or no association with other groups. Although some indicator species were also relatively dominant in the groups, an indicator species may also be present with low cover values. Since the indicator typically occurs only in a specific group and not in the others it is a good indicator for group affiliation when it is observed in a sample.

Ordination

The purpose of the ordination graphic is to reduce an extremely complex system to a fewer number of manageable factors. No presumption is made that all of the most important factors are represented. This is a first approximation that should be refined in an iterative process. The cross-tabulated correlation matrix of the ordination axes and environmental factors is presented in Table 4. Significant correlations are highlighted in blue ($P < .05$) or red ($P < .01$).

CANOCO provides ordinations with four axes that are typically represented two axes at a time. The fourth axis was found to be well represented by the other three axes and is not presented here. These axes do not represent a specific environmental/treatment factor, but rather a two step process that maximizes the dispersion of the samples on each axis. The first step of the ordination "arranges" the samples based on vegetation similarities. The second step then further refines the "arrangement" by creating axes that are linear combinations of all of the environmental/treatment factors. The vectors associated with the environmental/treatment factors are "best fit" axes for these specific factors. The direction of the vector from the origin indicates the direction of increasing values for the factor, and the length of the vector indicates the relative importance of the factor (when compared to the other measured factors) for explaining the variability found in the data.

The ordination graphics are presented in four two-dimensional figures using axes 1 & 2 (i.e., the x- and y-axes respectively) from the CANOCO results, and two simulated 3-dimensional figures. Most of the variability in the data were represented by the first two axes but Samples 17 and 18, the unburned samples, were found to be separated from the cluster of other samples along the 3rd axis. Sample 18, the dense forest sample that was outside of the burn area, was excluded from the ordination because it was so distinctive that it forced all of the other samples into a tight cluster. Sample 17 although distinctive, had similar species composition and allowed a reasonable ordination result.

Figure 7 presents the sample sites with respect to the "environmental" vectors. The treatment vectors are in red, the environmental site vectors are in black, and the growth form vectors are in green. The direction of the vectors indicates the direction of increasing value for that factor. The length of the vector indicates the relative importance of that vector in the ordination. The position and magnitude of the environmental vector is determined by its ability to maximize its contribution to an explanation of the species and site ordinations. The position of a sample site in the ordination is determined both by its species composition, and its environmental site factors.

Figure 8 presents the samples with respect to the environmental vectors and the zones that are occupied by the groups defined by the TWINSPAN classification results.

Figure 9 presents those species that had the greatest effect on the ordination results. Those species with red font were indicators of the classification groups. The position of a species in the ordination represents its center of distribution and is determined by its cover distribution among the sample sites.

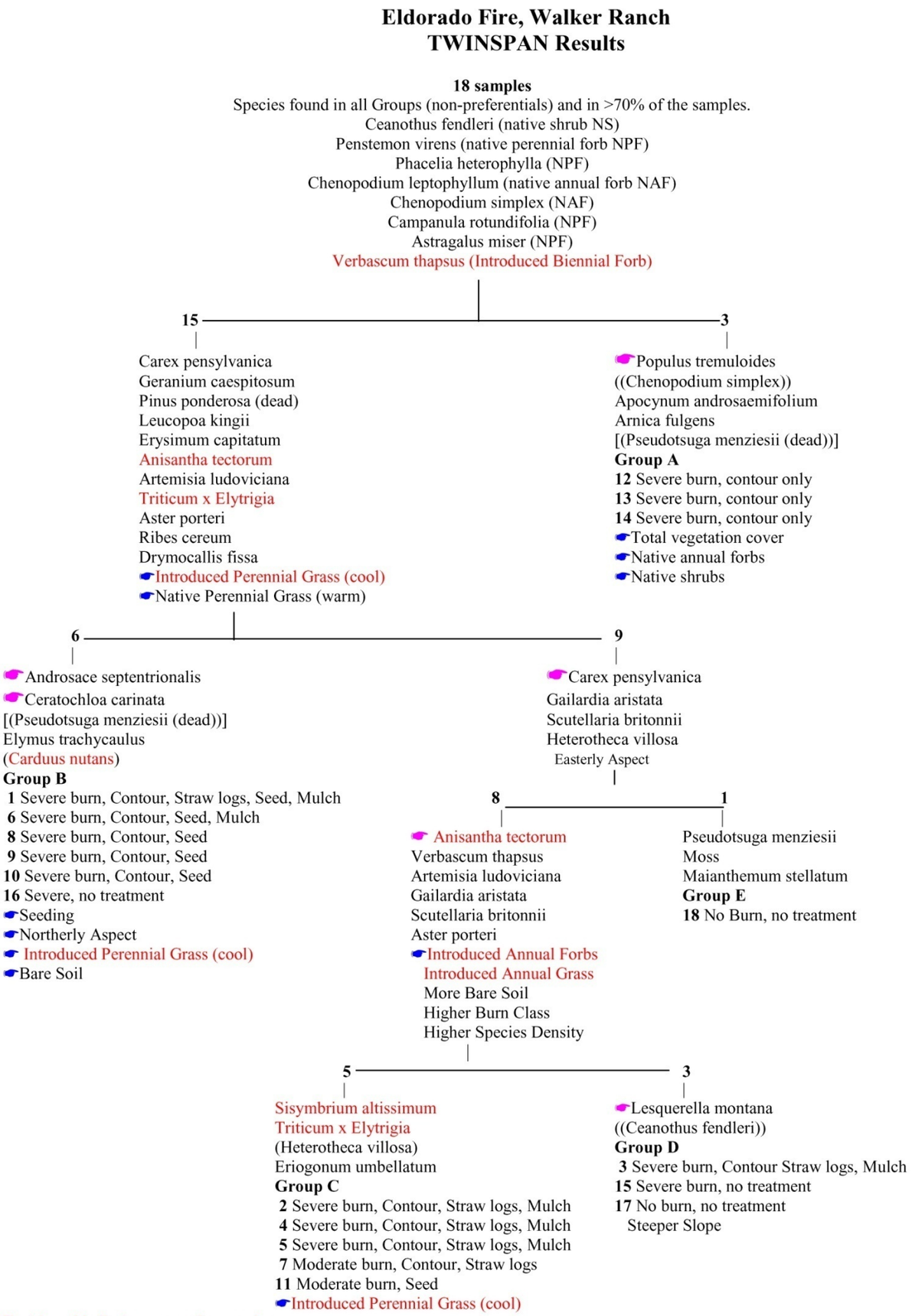
Figure 10 combines the three previous figures and allows simultaneous comparison of samples, species, and environmental factors.

Figure 11 is the 3-dimensional representation of Figure 7 with the samples and treatment vectors projected to permit some visualization of different paired combinations of the three axes. The floor of the simulated cube is a representation of axes 1 & 2, the right wall represents axes 2 & 3, and the left back wall represents axes 1 & 3. The most significant item to notice is that although sample 17 appears to be

close to the other samples when only axes 1 & 2 are used, it can be seen to be separated from the other samples along the 3rd axis.

Figure 12 is similar to Figure 11 but includes the environmental factors.

The graphics in Appendix 5 plot the actual cover values for species at the sample locations in order to allow a more accurate representation of the distribution of species within this same ordination.



Text in red indicates non-native species.

This symbol in magenta is used to mark the indicator species identified by TWINSPAN

This symbol in blue is used to mark the indicator environmental/treatment/growth form factors that are associated with the classification levels. The program DISCRIM was used to identify these indicators. Additional factors that were "preferentials" are sometimes listed below the indicators.

The number of samples in each division is at the top of each column.

Single parenthesis = (xxxxx) = center in a moderately wide distribution

Double parenthesis = ((xxxxx)) = center in a broad distribution

Bracketed parenthesis = [(xxxxx)] = secondary center in moderate distribution

This classification dendrogram presents the species, samples and environmental/treatment/growth form factors that are associated with the groups defined by the TWINSPAN program based on the vegetation composition of the samples.
The program DESCRIM was used to determine the environmental/treatment/growth form factors that are associated with the classification groups that were originally determined by TWINSPAN based on vegetation composition.

TWINSPAN Classification results using total hit (i.e., first and additional hits) data.

Figure 6. TWINSPAN classification of samples based on 2002 vegetation cover data

Table 4. CANOCO Correlation Matrix for 2002 Data.

**** Weighted correlation matrix (weight = sample total) ****

	SPEC AX1	SPEC AX2	SPEC AX3	SPEC AX4	ENVI AX1	ENVI AX2	ENVI AX3	ENVI AX4	Contour	Strawlog	Seed	Mulch	BurnClas	Slopepct	AspectE	AspectN	StndDead	Litter
SPEC AX1	1.0000																	
SPEC AX2	-.0001	1.0000																
SPEC AX3	.0000	.0000	1.0000															
SPEC AX4	.0000	.0000	.0000	1.0000														
ENVI AX1	1.0000	.0000	.0000	.0000	1.0000													
ENVI AX2	-.0001	1.0000	.0000	.0000	.0000	1.0000												
ENVI AX3	.0000	.0000	1.0000	.0000	.0000	.0000	1.0000											
ENVI AX4	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	1.0000										
Contour	.2054	-.1131	**-.5113**	-.1515	.2055	-.1131	**-.5113**	-.1515	1.0000									
Straw lo	**-.5579**	-.1933	-.1500	-.1429	**-.5579**	-.1934	-.1500	-.1429	.4070	1.0000								
Seed	-.0730	**.8204**	-.3454	-.0491	-.0730	**.8204**	-.3454	-.0491	.0151	-.2037	1.0000							
Mulch	-.4631	-.0929	-.3260	-.0439	-.4631	-.0929	-.3260	-.0439	.3988	**.7734**	.0159	1.0000						
Burn Cla	.1977	-.0942	**-.6886**	**-.5324**	.1977	-.0942	**-.6886**	**-.5324**	.4563	.1065	.0407	.2443	1.0000					
Slope pe	.2944	-.1959	.2712	.0379	.2944	-.1959	.2712	.0380	-.2617	**-.4874**	-.1786	-.1995	-.0621	1.0000				
AspectET	.2531	**-.5646**	-.3660	-.2520	.2530	**-.5646**	-.3660	-.2519	.1356	.0314	-.2894	-.0647	.3840	.0249	1.0000			
AspectNT	.3638	.3865	-.3871	**.4970**	.3639	.3865	-.3870	**.4970**	.0003	-.3936	.2800	-.1729	.1675	.1825	-.1890	1.0000		
StndDead	-.2344	-.1032	-.0205	.1457	-.2343	-.1032	-.0205	.1457	-.0262	.4101	-.1722	.4309	.0406	-.1329	.2730	-.0269	1.0000	
Litter	-.4596	.2131	-.1455	.2897	-.4595	.2130	-.1455	.2897	.0455	**.6878**	.1764	**.6817**	-.1738	-.4689	-.2089	.0684	**.4833**	1.0000
Baresoil	.0296	.2359	.1699	-.2528	.0296	.2359	.1699	-.2528	-.1649	-.4625	.2722	-.4132	-.0093	.0156	-.2571	-.2679	**-.5161**	**-.6019**
Rock	.3727	-.0465	.3000	.2217	.3727	-.0464	.3000	.2217	-.0351	-.4478	-.1520	-.3397	-.1714	**.6971**	-.1350	.3291	-.0641	-.4157
TotVeg	**.5071**	**-.6118**	-.1826	-.1089	**.5070**	**-.6118**	-.1827	-.1089	.1655	-.0854	**-.5270**	-.2134	.2771	.1601	**.7038**	.1019	-.0439	-.2181
SpeDen	-.3957	.0947	.0215	-.3036	-.3957	.0947	.0215	-.3036	-.3641	.1303	.0346	.0984	.0833	-.1318	.1095	-.0115	.3106	.2968
Grndcov	.1620	-.3579	-.1558	.2152	.1620	-.3579	-.1558	.2152	.1505	.3364	-.3598	.2680	.0416	-.0028	.3942	.2362	.4135	.4786
NAF	**.5010**	-.4380	-.0483	-.0707	**.5009**	-.4380	-.0483	-.0706	.0813	-.4064	-.3050	-.4434	.0826	-.0554	.3688	-.0730	-.4435	-.4381
IAF	-.3529	-.5261	-.2904	.1569	-.3529	**-.5261**	-.2904	.1569	-.0852	.3651	-.3377	.4009	.1848	.0798	**.4931**	-.0494	**.6533**	.3401
IAG	-.3371	**-.6205**	**-.5513**	.2448	-.3371	**-.6205**	**-.5513**	.2448	.3144	.3421	-.3041	.3935	.1926	-.2300	.3501	-.0381	.1160	.2174
NPF	.2882	-.3906	.2585	-.1917	.2882	-.3906	.2585	-.1917	.0188	-.1780	**-.5978**	-.3175	.1690	.2492	-.0614	-.0452	-.4316	**-.5940**
IPF	.2598	-.1479	.2061	-.2391	.2598	-.1479	.2061	-.2391	.2115	.2222	-.1509	.2232	.0989	.0281	.1510	-.3610	.3121	.1642
NPGC	-.3772	.3965	.0306	-.2786	-.3772	.3964	.0306	-.2786	-.2398	.2946	.3670	.2063	-.0830	-.1207	-.0045	-.0393	.2469	.4570
IPGC	.0059	**.8169**	-.4594	.0675	.0060	**.8169**	-.4594	.0674	.2645	.0346	**.8144**	.0898	.1527	-.4187	-.2233	**.4871**	.0413	.3560
NPGW	-.1002	**.6596**	.0245	.3582	-.1002	**.6596**	.0245	.3582	-.2214	-.0476	**.5128**	-.0264	-.3898	-.1263	-.2585	.4347	.1237	.4619
S	**.7298**	-.2923	.3770	.1083	**.7298**	-.2923	.3770	.1083	-.0016	-.3512	-.3660	-.3908	-.2006	**.5672**	.3282	.0056	-.0555	-.4098
T	.1545	.0138	-.0298	-.4055	.1544	.0138	-.0298	-.4054	-.4064	-.4796	.2445	-.3968	.0930	.3125	.3245	-.0917	-.4387	-.3874
F	-.3622	-.4119	-.2054	.0506	-.3623	-.4119	-.2054	.0506	.1362	.3348	-.1667	.3416	.0835	-.0964	.1545	-.2491	.1434	.1605

	Baresoil	Rock	TotVeg	SpeDen	Grndcov	NAF	IAF	IAG	NPF	IPF	NPGC	IPGC	NPGW	S	T	F
Baresoil	1.0000															
Rock	-.1684	1.0000														
TotVeg	**-.4970**	.1804	1.0000													
SpeDen	-.3499	-.1874	.1321	1.0000												
Grndcov	**-.9514**	.1597	**.6901**	.2970	1.0000											
NAF	.1656	-.0660	**.6341**	-.0650	.1107	1.0000										
IAF	**-.5181**	-.1072	.2719	.2644	**.5057**	-.1313	1.0000									
IAG	-.3311	-.2933	.3360	.1299	.3438	.3001	**.5481**	1.0000								
NPF	.2868	.2050	.2601	-.3016	-.2109	.3016	-.3179	-.0825	1.0000							
IPF	-.1757	.0741	.1324	-.1100	.2859	.0806	.2172	-.2011	-.2532	1.0000						
NPGC	-.4311	-.0632	-.0788	**.6518**	.2799	**-.5100**	.0690	-.2156	**-.4812**	-.0675	1.0000					
IPGC	-.0744	-.1202	-.3360	.1024	-.0412	-.3550	-.2974	-.2219	**-.5505**	-.1677	.4084	1.0000				
NPGW	-.3488	.1256	-.1957	.3484	.2383	-.3477	-.1566	-.2606	**-.6038**	-.1907	**.5988**	**.6877**	1.0000			
S	-.1119	**.5645**	.4668	-.4532	.2501	.2378	-.1088	-.3567	.2627	.3655	-.2542	-.3566	-.1080	1.0000		
T	.3563	-.1566	.2274	.2018	-.2050	.4006	-.0362	-.1453	-.0101	-.1054	.0815	-.1377	-.0769	.0801	1.0000	
F	-.2699	.0579	.0678	.1312	.2071	-.1041	.2382	**.5181**	-.0792	.0070	.1334	-.1411	-.1313	-.1512	-.3621	1.0000

Critical values for correlation coefficients

Degrees of freedom = 17-2 = 15 (sample 18 was excluded because it was unburned and off-site)

$P_{.05}$ = .482

$P_{.01}$ = .606

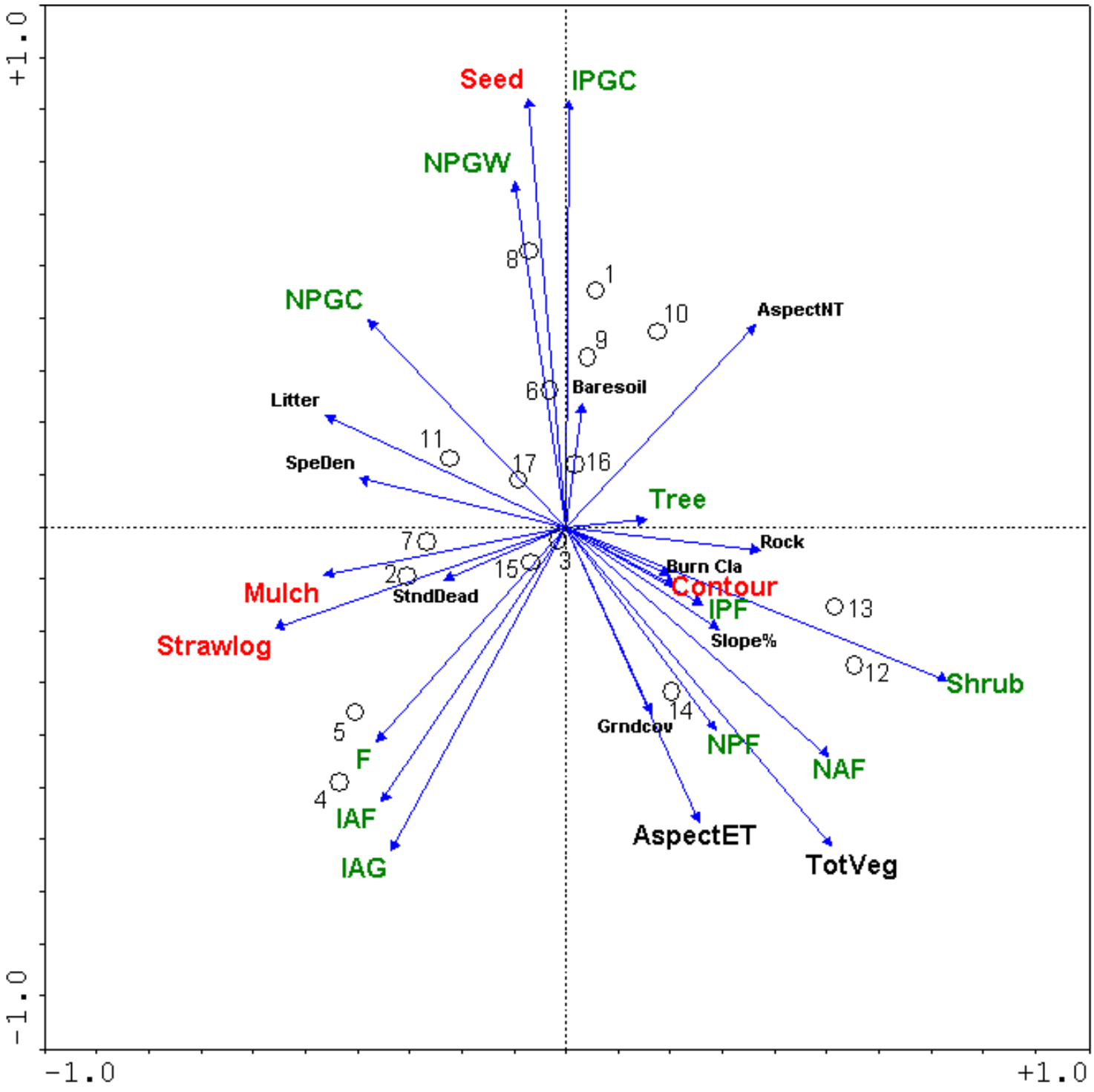


Figure 7. **Axes 1-2 – Environmental/treatment/growth form vectors with sample sites (2002).**

The treatment vectors are in red, the "environmental" site vectors are in black, and the growth form vectors are in green. The direction of the vectors indicates the direction of increasing value for that factor. The length of the vector indicates the relative importance of that vector in the ordination.

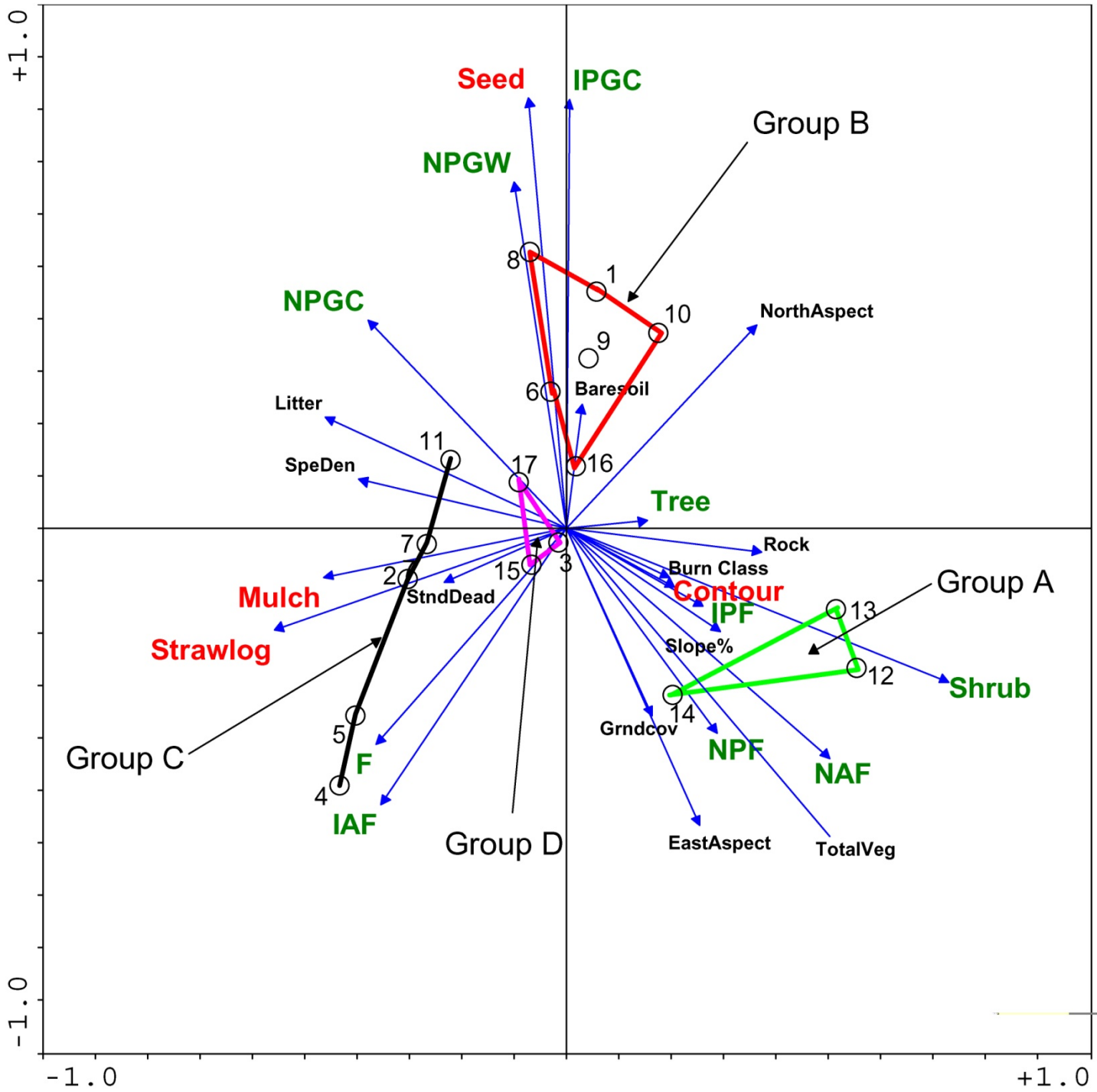


Figure 8. Axes 1-2 Sites, classification groups and vectors (2002).

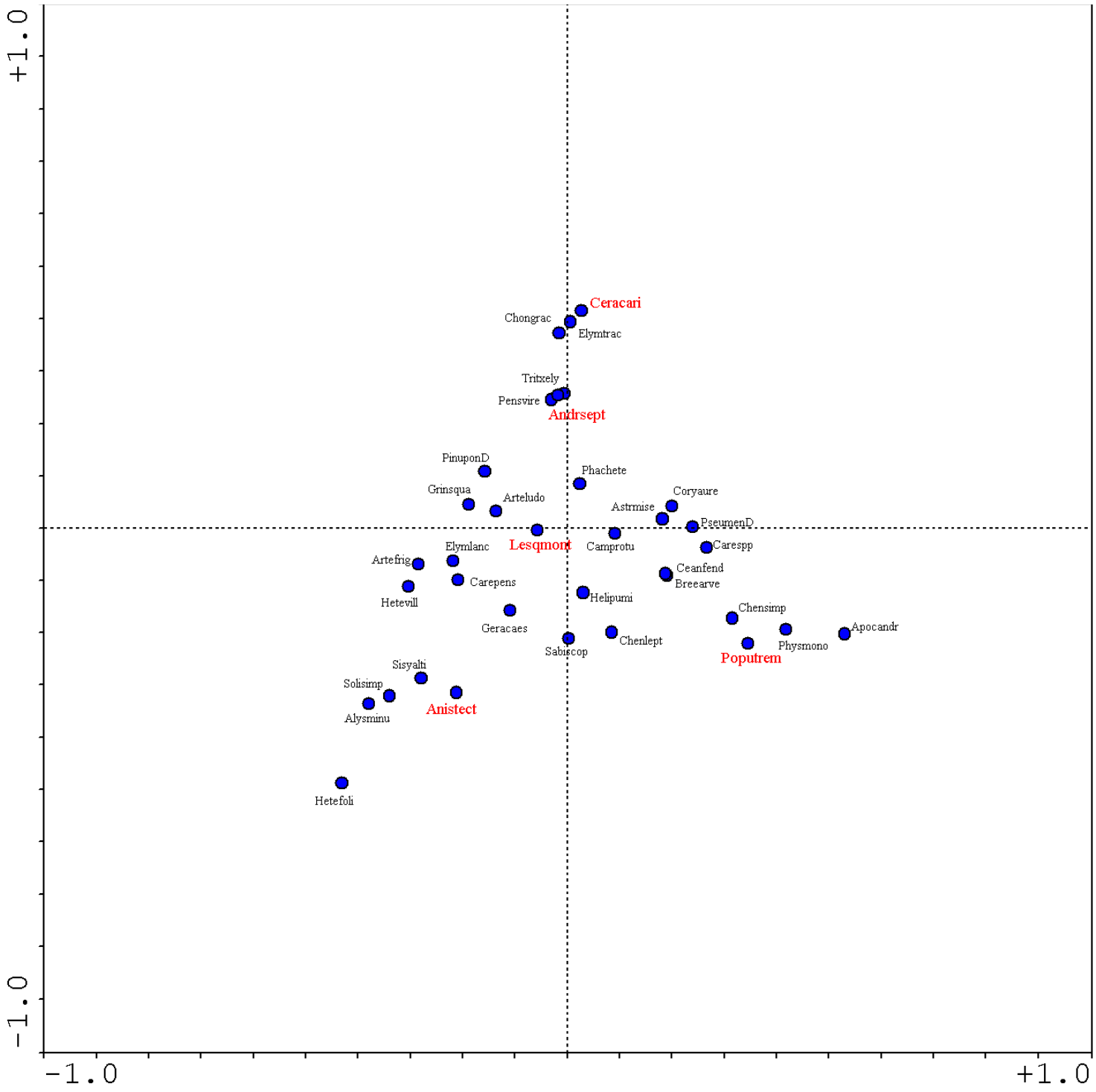


Figure 9. Axes 1-2 Selected Species (2002).

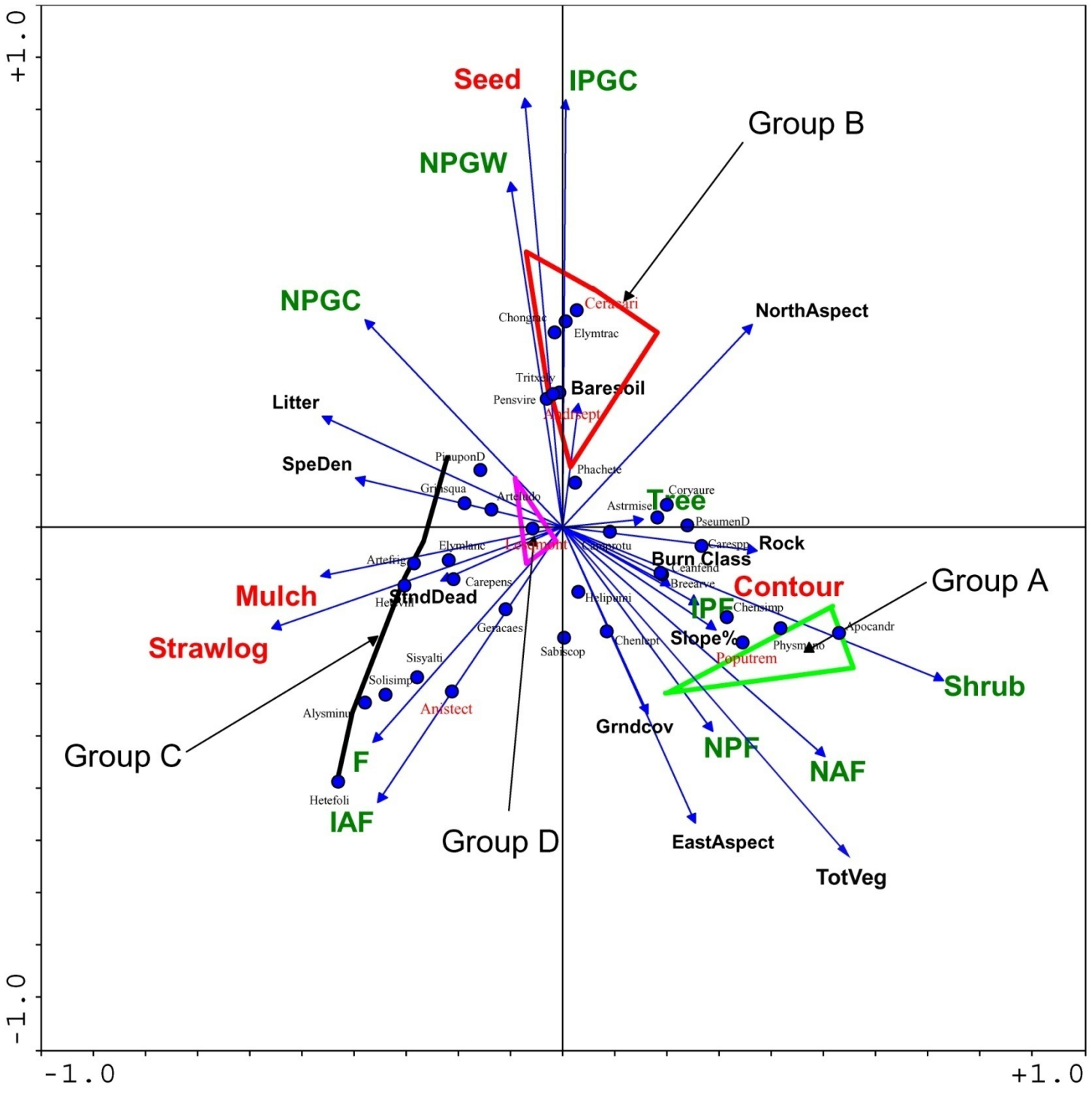


Figure 10. Axes 1-2 Species, groups and environmental vectors (2002).

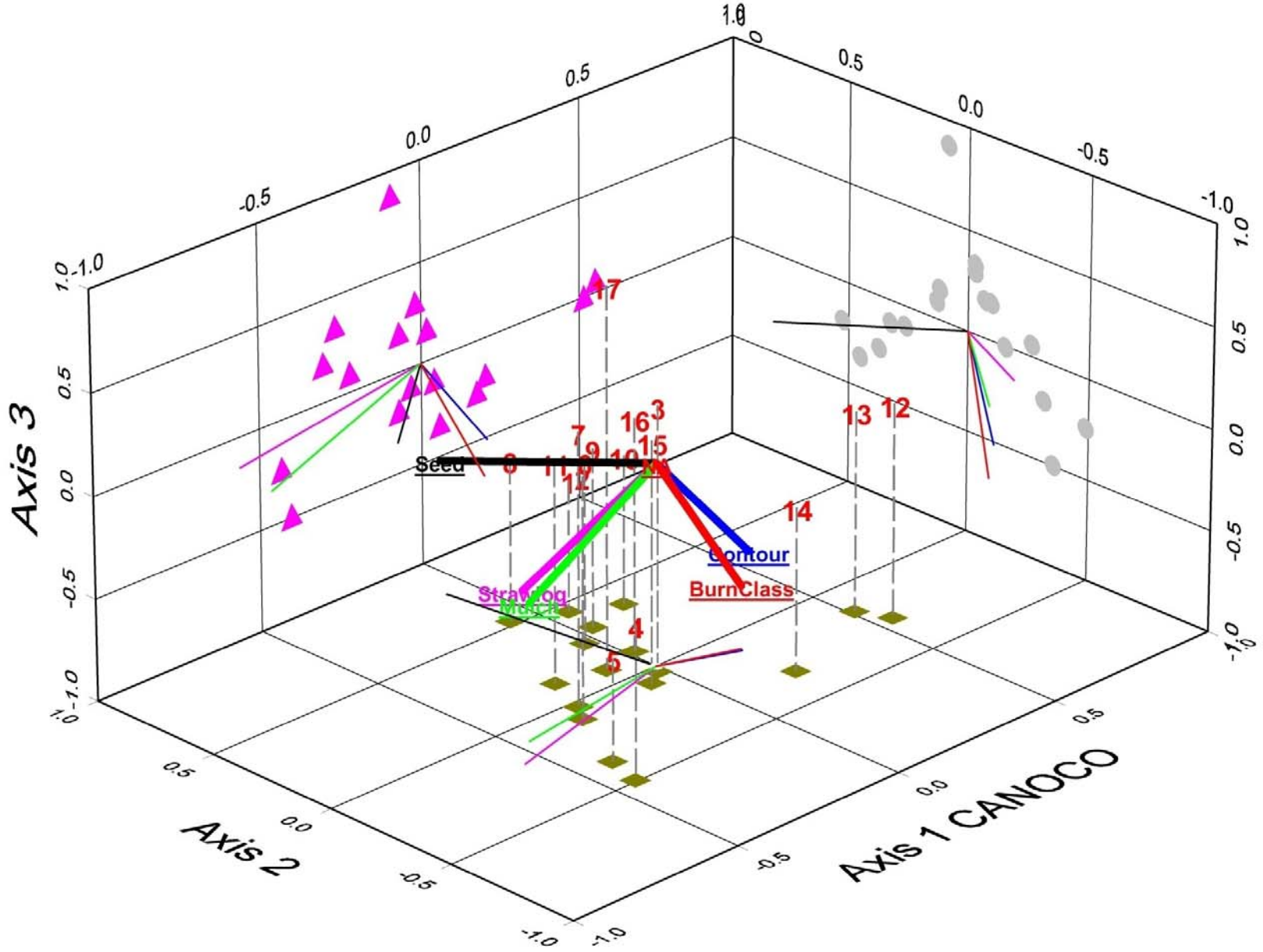


Figure 11. Axes 1-2-3, Sites, and Treatments (2002).

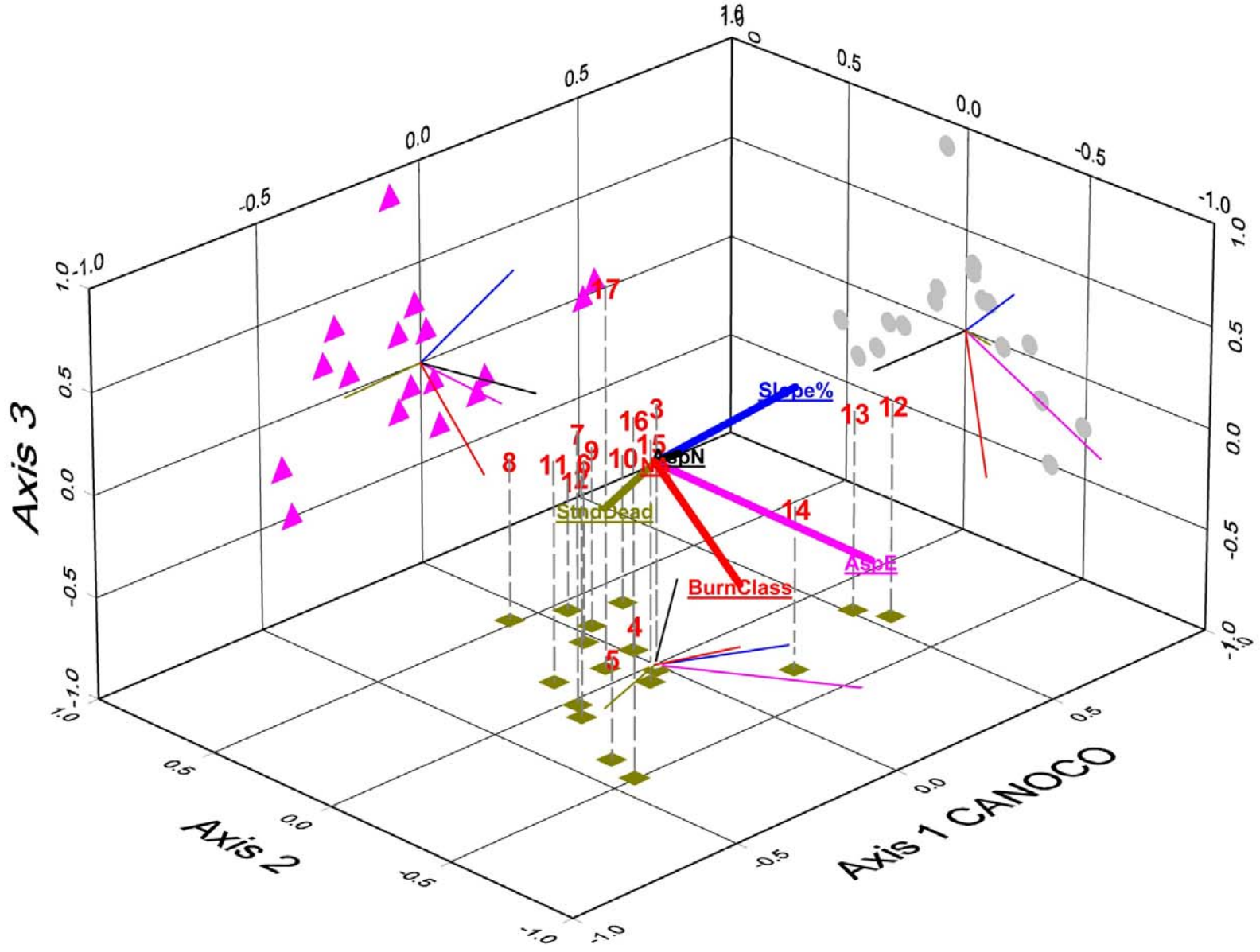
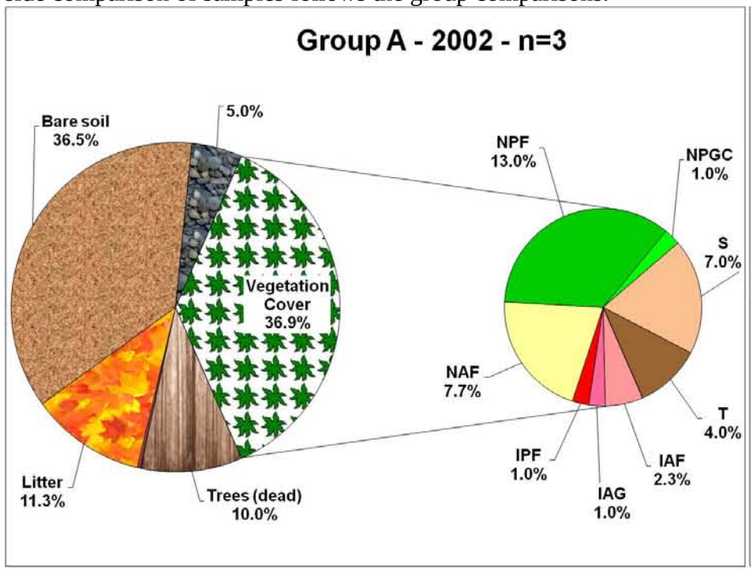


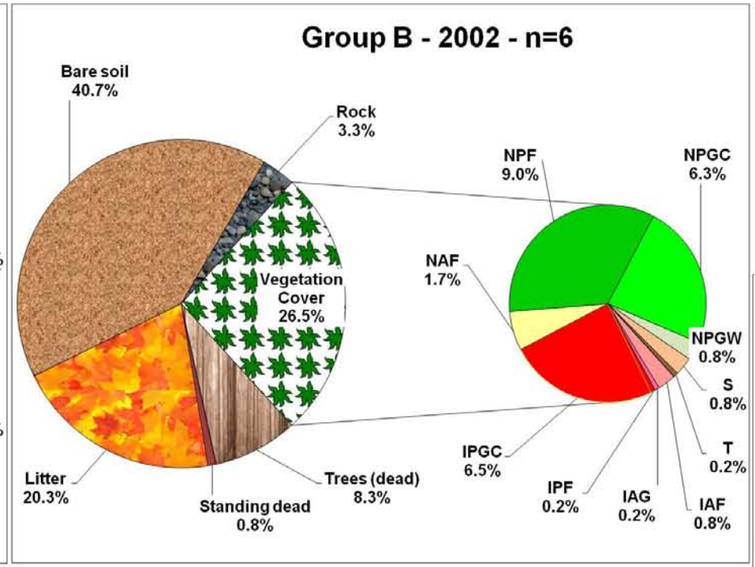
Figure 12. Axes 1-2-3, Sites, and Environmental Factors (2002).

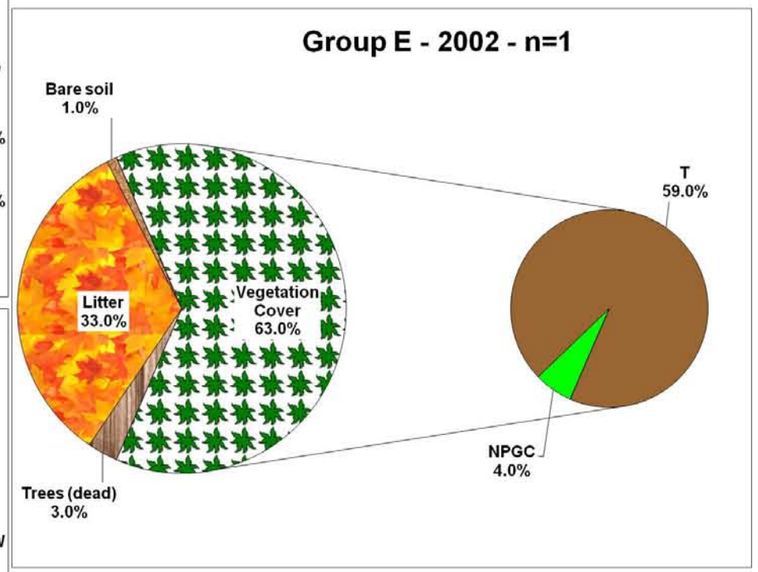
Group Descriptions – Synthesis of 2002 Classification and Ordination with vegetation comparison to 2007

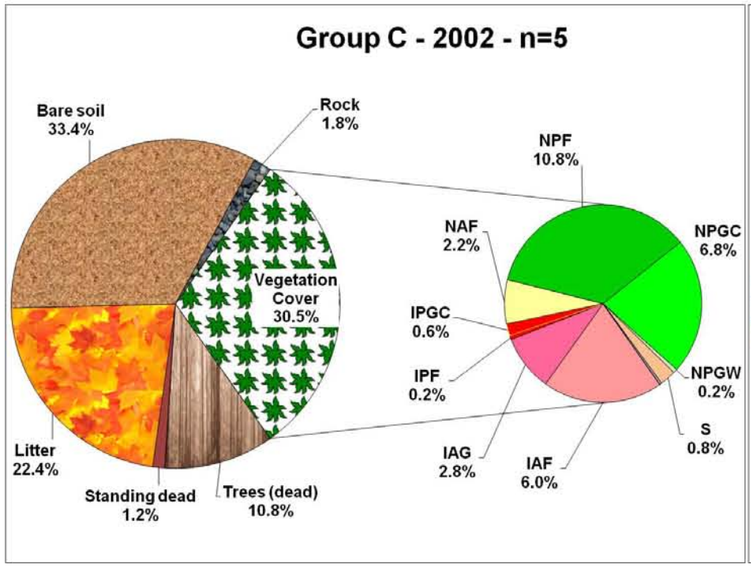
The Groups were originally defined in 2002. Most of the following information for 2002 is schematically summarized in Figure 6 (TWINSPAN classification dendrogram) and Figure 48a (Ground Cover of the TWINSPAN classification groups). The 2007 Ground Cover for the Groups is presented in Figure 48b.

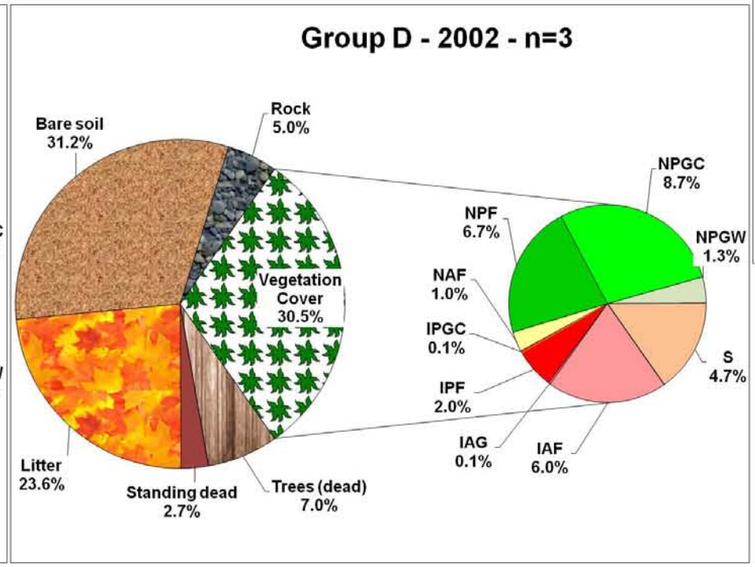
Although five groups were defined by the classification, only four occur within the burn area. Group E was a single sample in an unburned forest. A side-by-side description of the groups follows the 2002 and 2007 figures, and a side-by-side comparison of samples follows the group comparisons.





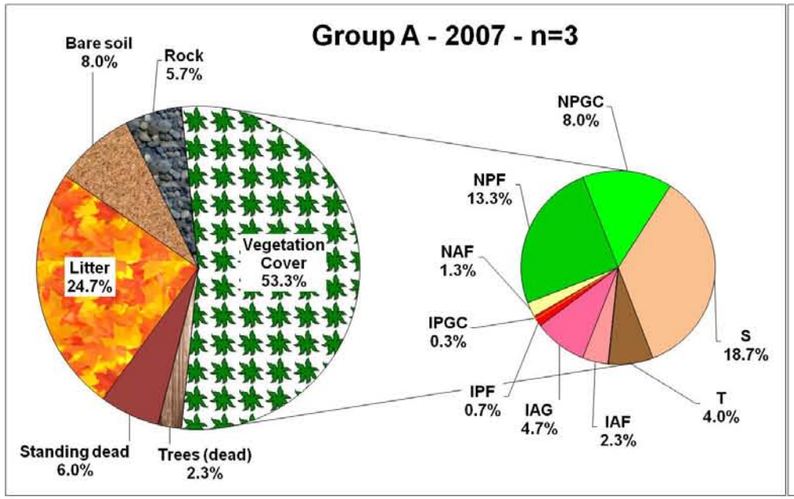


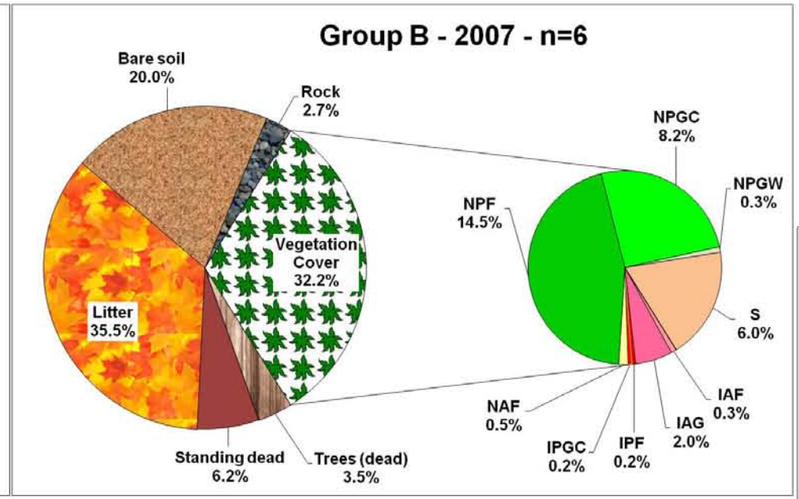


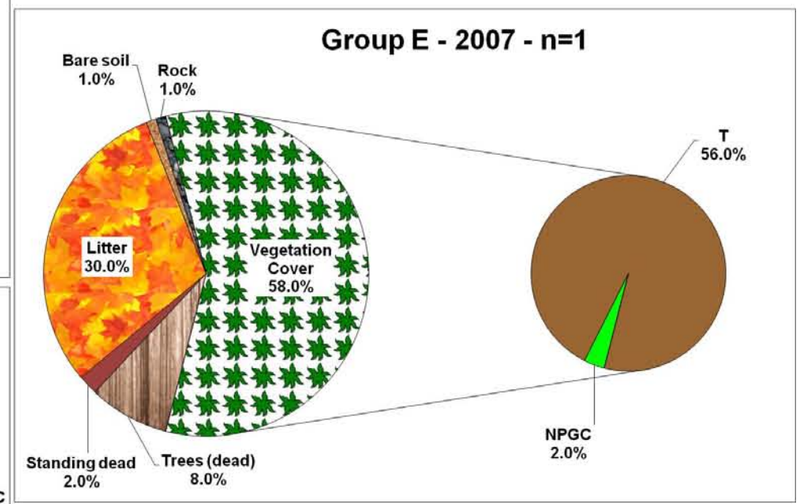


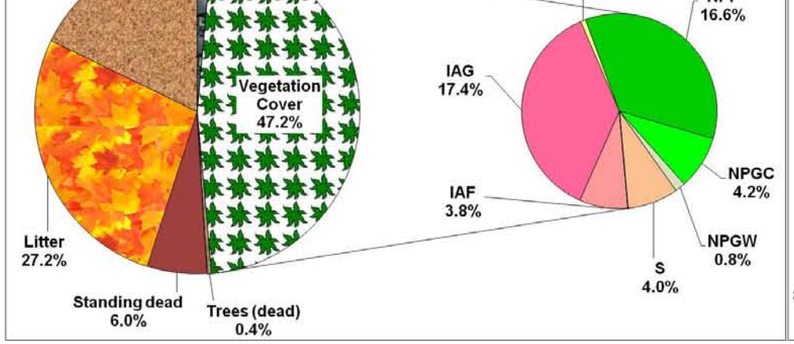
IAF = Introduced Annual & Biennial Forbs
IAG = Introduced Annual Grasses
IPF = Introduced Perennial Forbs
IPGC = Introduced Perennial Grasses (cool season)
NAF = Native Annual & Biennial Forbs
NPF = Native Perennial Forbs
NPGC = Native Perennial Grasses (cool season)
NPGW = Native Perennial Grasses (warm season)
S = Native Shrubs
T = Native Trees
F = Native Ferns
M = Moss

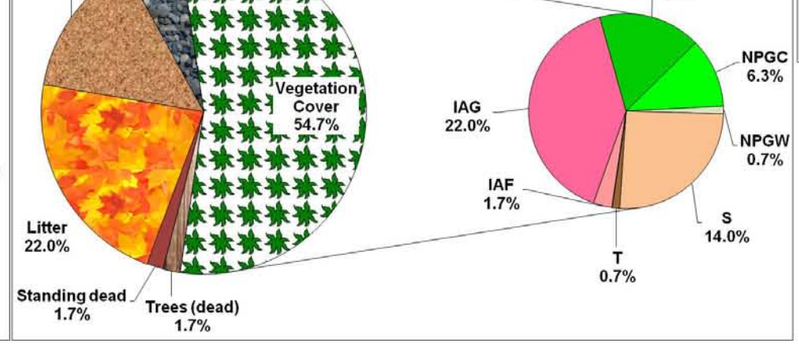
Figure 13a. Ground cover of the TWINSPAN Classification Groups with Growth Form Composition (2002).











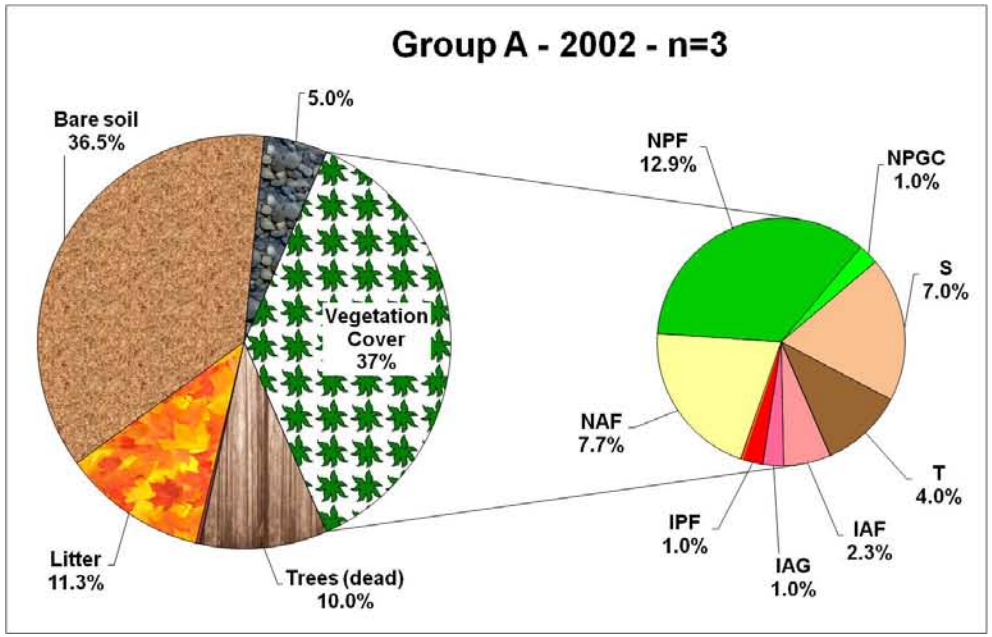
IAF = Introduced Annual & Biennial Forbs
IAG = Introduced Annual Grasses
IPF = Introduced Perennial Forbs
IPGC = Introduced Perennial Grasses (cool season)

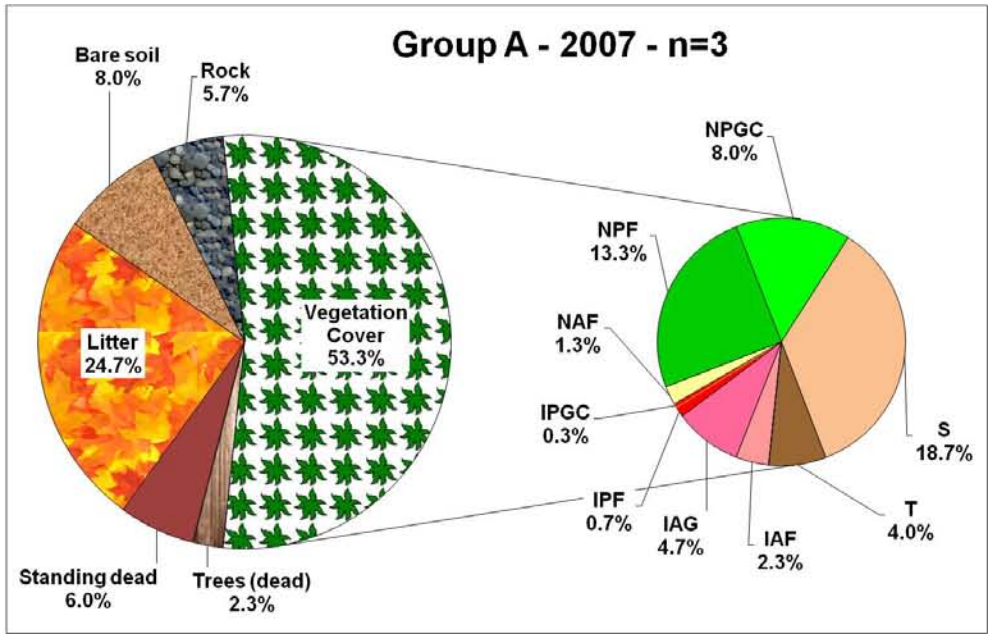
NAF = Native Annual & Biennial Forbs
NPF = Native Perennial Forbs
NPGC = Native Perennial Grasses (cool season)
NPGW = Native Perennial Grasses (warm season)

S = Native Shrubs
T = Native Trees
F = Native Ferns
M = Moss

Figure 13b. Ground cover of the TWINSPAN Classification Groups with Growth Form Composition (2007).

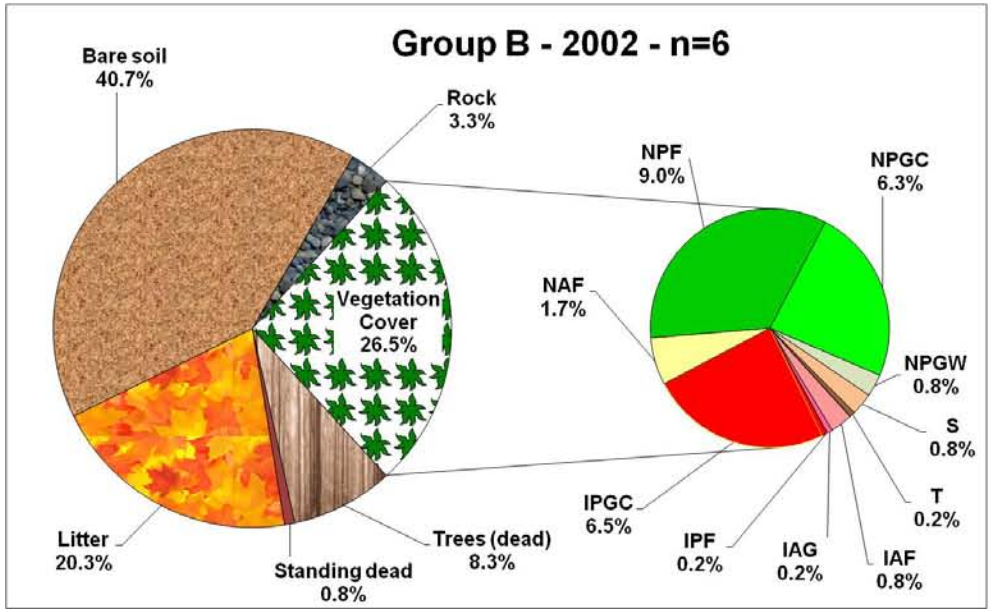
The following are side by side comparisons of the ground cover and growth forms for 2002 and 2007.

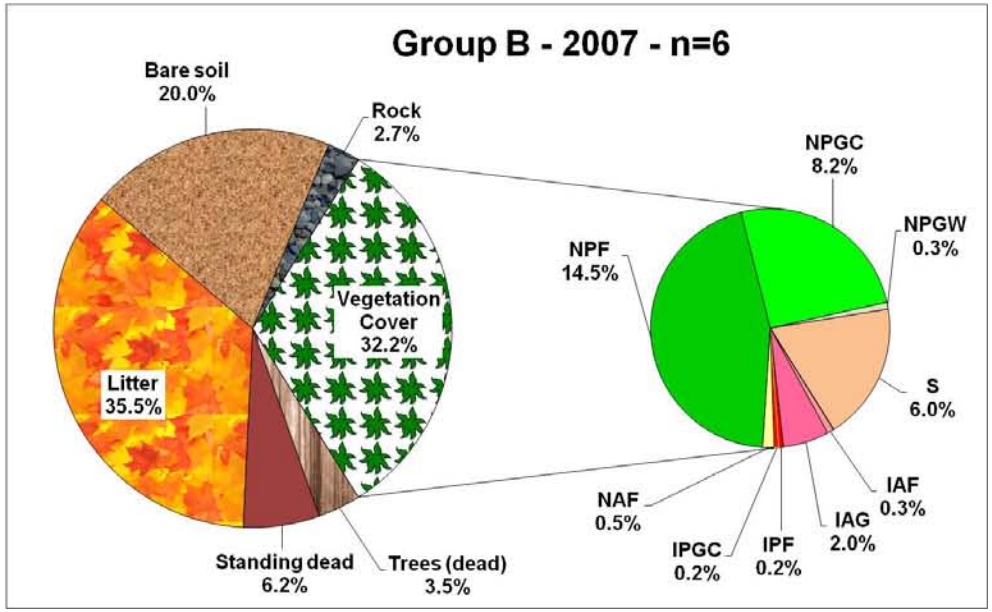




Group **A** in 2002 was composed of 3 samples (12, 13, 14) that were defined in 2002 by the presence of the indicator species quaking aspen. All three samples received the same severe burn classification and received only contour log installation. Group A was distinguished by higher total vegetation cover (36.5%) that was composed of only a small percentage of introduced species (4.3% see Figure 48). It also tended to have higher cover values of native annual forbs and native shrubs. Species density averaged 37.0 species/100 sq.m. in 2002 and 38 species/100 sq.m. in 2007.

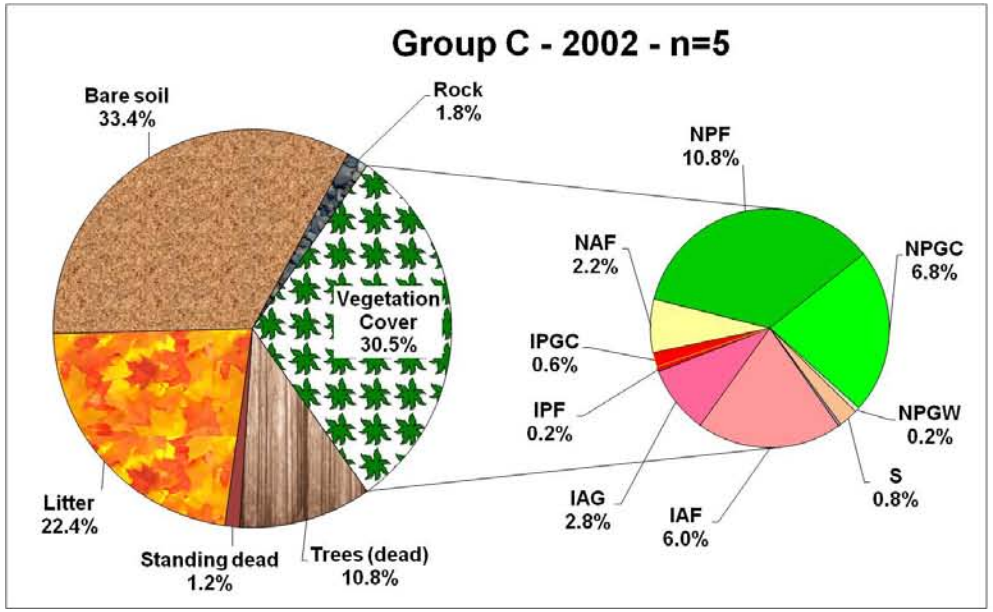
The percentage of bare ground was reduced from 36.5% to 8.0% over the five years and the vegetation cover increased from 37% to 53.3%. The native annual forbs decreased from 7.7% to 1.3%, but the introduced annual grass cheatgrass increased from to 1% to 4.7%. A large increase in shrub cover from 7% to 18.7% is noteworthy and was primarily buckbrush (*Ceanothus fendleri*) with 14.3% cover. The dead standing trees provided 10% cover in 2002 but reduced to 2.3% in 2007. This phenomenon was repeated in most groups as the dead standing trees fell over and were then evaluated as "standing dead" cover. Note that the standing dead cover increased from 0% to 6% over the 5 years. "Standing dead" is defined as organic matter that is over one year old (i.e., not this year's vegetation growth) that is not yet in contact with soil and is below about 1.5 meter above the ground. In this study, all dead standing trees were recorded by species and kept distinct from "standing dead" organic matter. This group and Group B (which was seeded) had the least problem with cheatgrass.

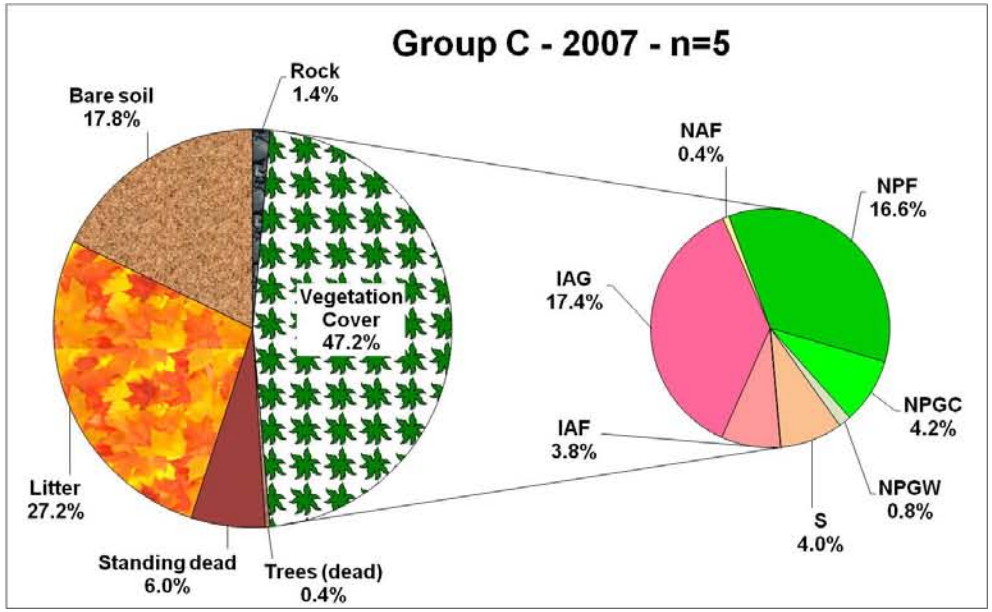




Group **B** in 2002 was composed of 6 samples (1, 6, 8, 9, 10, 16) that were defined primarily by having been severely burned and seeded. Mountain brome and slender wheatgrass were the predominantly distinctive species for this group with the exception of Sample 16. Sample 16 was not seeded but was included in this group primarily due to the standing dead ponderosa and Douglas fir. Sample 16 could be considered transitional to Group A. This group also typically had a more northerly aspect, and more bare soil. These stands may have been denser stands with a denser layer of duff and fewer understory species prior to the fire. The fire may have burned hotter here, and the combination of these factors leads to the decision to apply seed along with some other combination of treatments. The sites may have appeared to be more sterile resulting in a post-fire management decision to apply seed. Total vegetation cover was 26.5% with 7% composed of introduced species and an additional 5.3% provided by slender wheatgrass (one of the reclamation species that is a non-local native). Species density averaged 40.8 species/100 sq.m. in 2002 and 38.2 species/100 sq.m. in 2007.

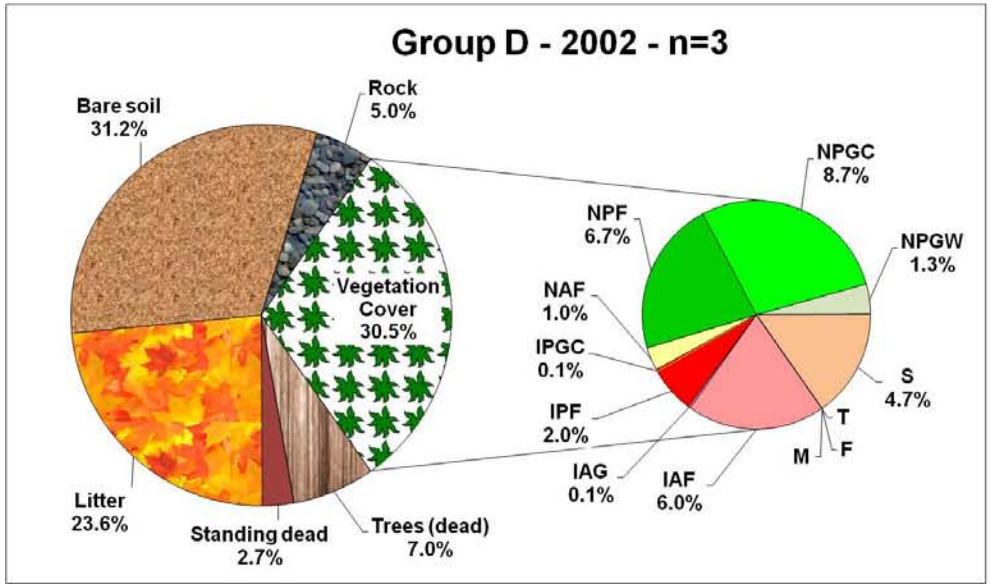
Bare soil decreased from 40.7% in 2002 to 20.0% in 2007. Vegetation cover increased somewhat from 26.5% to 32.2%, but the greatest increase in ground cover was litter which increased from 20.3% to 35.5%. The dead standing trees have converted to "standing dead" cover as described for Group A. A large decrease in the introduced perennial grasses was primarily a decrease in the reclamation species. The native perennial reclamation grass slender wheatgrass (which isn't a local native species) also decreased, but was compensated by increases in the native grasses such as thickspike wheatgrass (*Elymus lanceolatus*) and sun sedge (*Carex pensylvanica* ssp. *heliophila*). This was more than compensated by the increase in native perennial forbs and shrubs (primarily buckbrush). This group which was seeded and Group A had the least problem with cheatgrass.

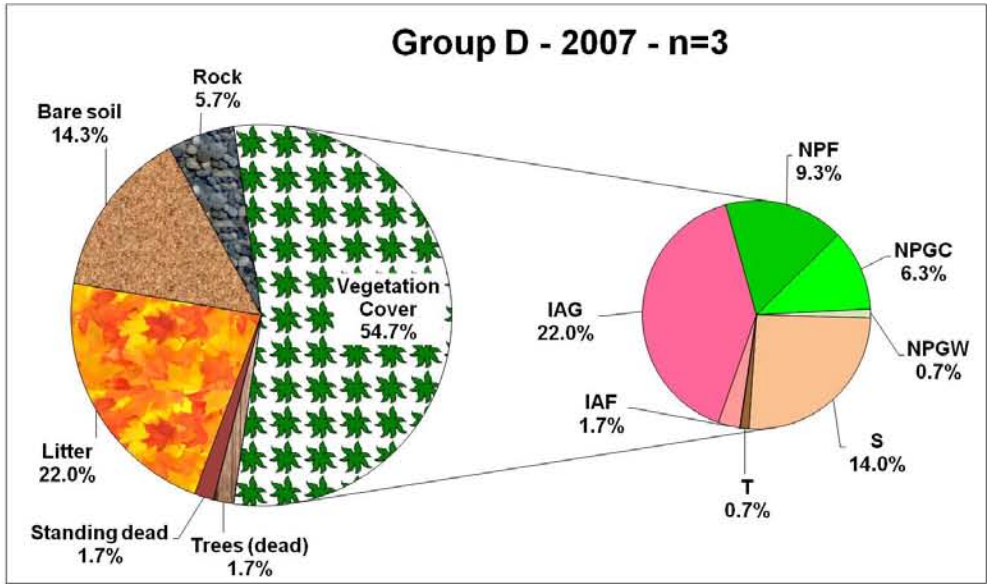




Group **C** in 2002 was composed of 5 samples (2, 4, 5, 7, 11) that were defined primarily by having been severely burned, with contour log felling, straw logs, and mulch treatment with no seeding. Samples 7 and 11 were rated as moderately burned and sample 7 received no mulch or seed, and site 11 received only seeding. A suite of species also typified this group, such as Jim Hill mustard (*Sisymbrium altissimum*), hairy golden aster (*Heterotheca villosa*), and wild buckwheat (*Eriogonum umbellatum var. umbellatum*). The abundance of standing dead ponderosa pine combined with sedge *(Carex pensylvanica ssp. heliophila*) also typified this group. This group had the highest percentage cover of introduced species with about 9.6% cover, but most of this cover was provided by annual introduced species (2.8% from cheatgrass, 5% from Jim Hill mustard, 1.4% from alyssum). Although most of these sites received no seeding, there was still a trace of the introduced reclamation grass species in these areas. This may have been due to migration of seed from the seeded areas due to either human or natural causes such as surface water flow mobilization of the seed. Species density averaged 41.6 species/100 sq.m. in 2002 and 29.2 species/100 sq.m. in 2007. This reduction was due primarily to fewer native perennial forb species.

Bare soil decreased from 33.4% in 2002 to 17.8% in 2007. Vegetation cover increased from 30.5% to 47.2%. Litter increased slightly from 22.4% to 27.2%. The dead standing trees have converted to "standing dead" and possibly litter cover as described for Group A. Although native species cover increased from 20.8% to 26%, the introduced weeds increased from 9.6% to 21% primarily due to cheatgrass which had 17.4% cover. The tumble knapweed has also increased from an average cover of <1% to 1.8% but has been restricted to Sample 11 for both 2002 and 2007. The Jim Hill mustard has been reduced from 5% to less than 1%. The reason why cheatgrass is so successful in this group as well as Group D is purely speculation and may simply be coincidence, but I do note that 4 out of 5 samples in Group C received straw logs, and 5 out of 6 of the samples that received straw log treatments have the greatest cheatgrass cover. Also, 4 out of the 6 samples that received the straw log treatment also were mulched. The cheatgrass distribution is probably related to a complex of factors including proximity to human and wildlife trails. The correlation to treatments may simply be due to chance.

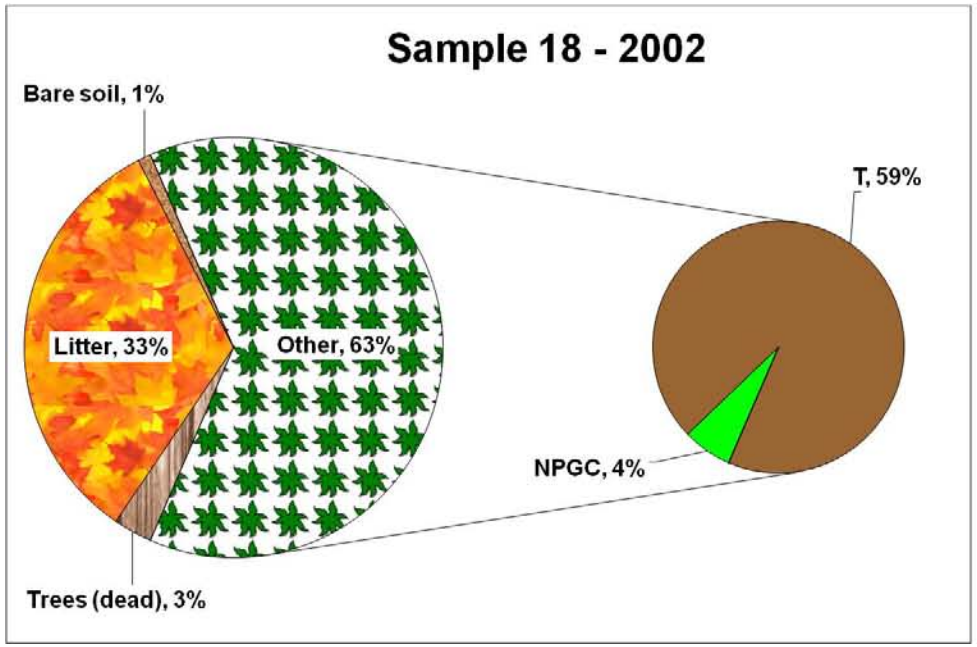


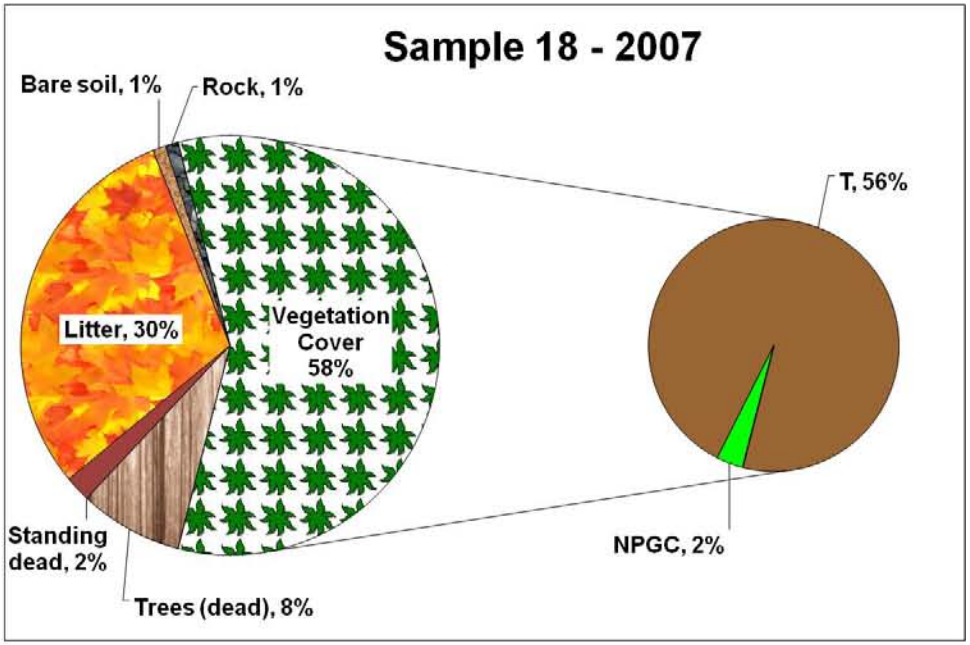


Group **D** in 2002 was composed of 3 samples (3, 15, 17) that were relatively intermediate with respect to many site and treatment characteristics, but were defined primarily by the indicator species bladderpod (*Lesquerella montana*), and relatively high values of buckbrush (*Ceanothus fendleri*) similar to Group A. Sample 17 is distinctly separated from the other two samples in the ordination (Figures 11 & 12). Sample 17 may be included in this group due to similar species composition, but may be distinct due to the greater abundance of many of the species because this site was not burned. Sample 17 may be considered a target point on the trajectory of Samples 3 and 15 toward recovery of the more open forested stands in the burn area. Species density averaged 47.7 species/100 sq.m in 2002 and 33 species/100 sq.m. in 2007. This reduction is species density was due primarily to a reduction of native perennial forbs that were present a low levels in 2002.

Bare soil decreased from 31.2% in 2002 to 14.3% in 2007. Vegetation cover increased greatly from 30.5% to 54.7%, but this was due primarily to a large increase in cheatgrass from 0.1% in 2002 to 22% in 2007. Although the native herbaceous cover has decreased slightly from 16.7% to 16.3%, native shrub cover has increased from 4.7% to 14% due primarily to the increase in buckbrush and birchleaf mountain mahogany (*Cercocarpus montanus*). Bladderpod was present in all three samples in 2002 and was an indicator species, but was observed in only one sample in 2007.

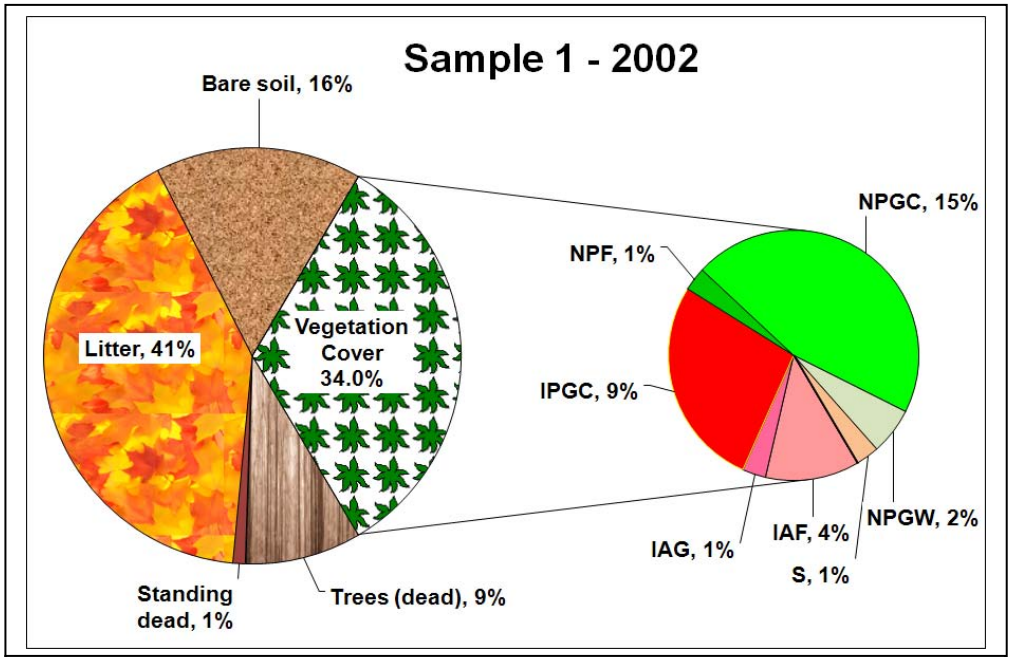
This group and Group C had the worst problem with cheatgrass compared to the other groups.

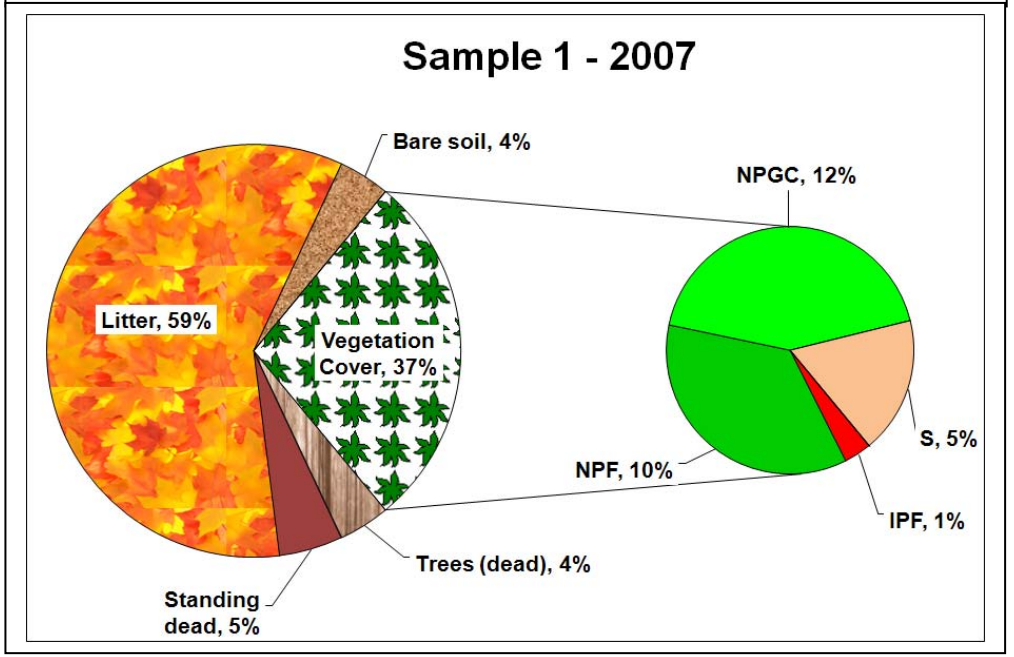




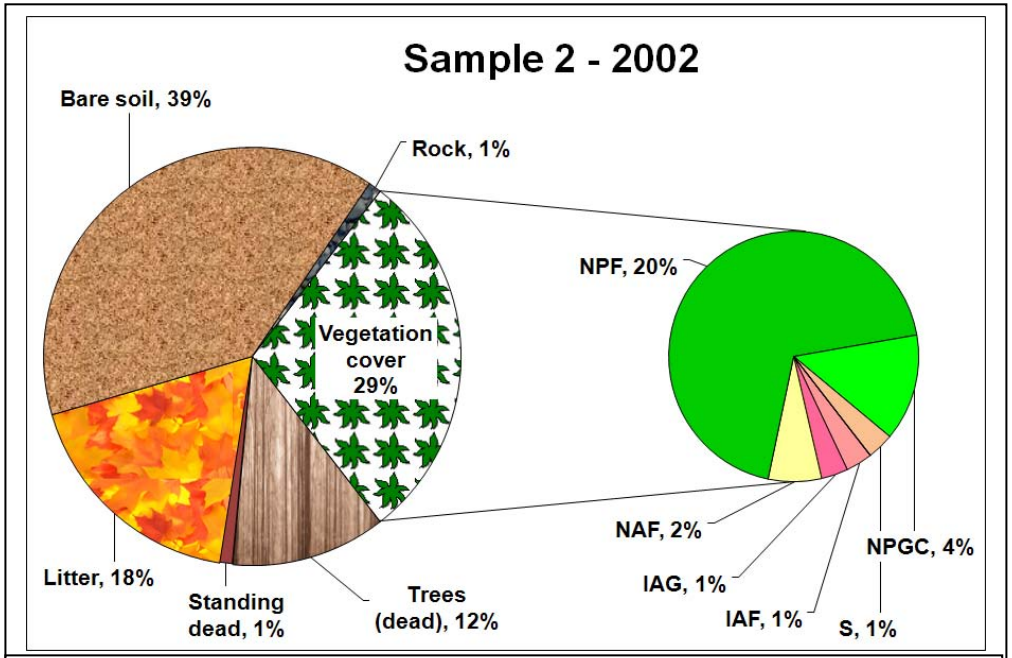
Group **E** was composed of only one off-site sample (Sample 18) in a densely forested north-facing slope. This sample was distinct from all of the other samples because of the dense cover of Douglas fir along with the absence of many of the understory species that were excluded due to the closed canopy. Species density was 25 species/100 sq.m. in 2002 and 38 species in 2007 due primarily to trace amounts of native forbs and grasses.

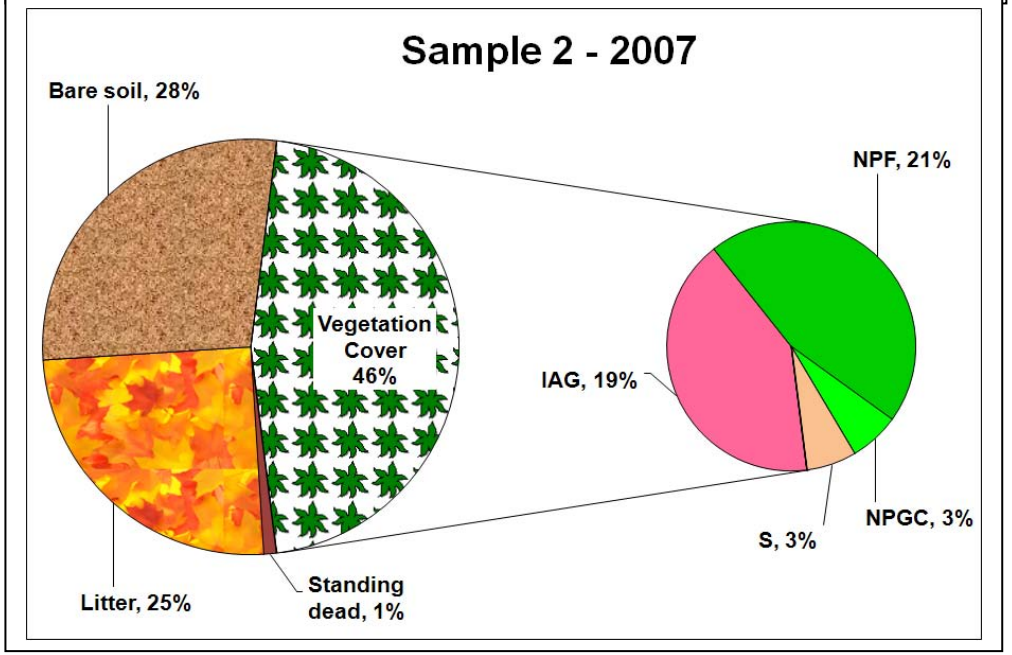
As might be expected, the overall changes in this undisturbed site were minimal.



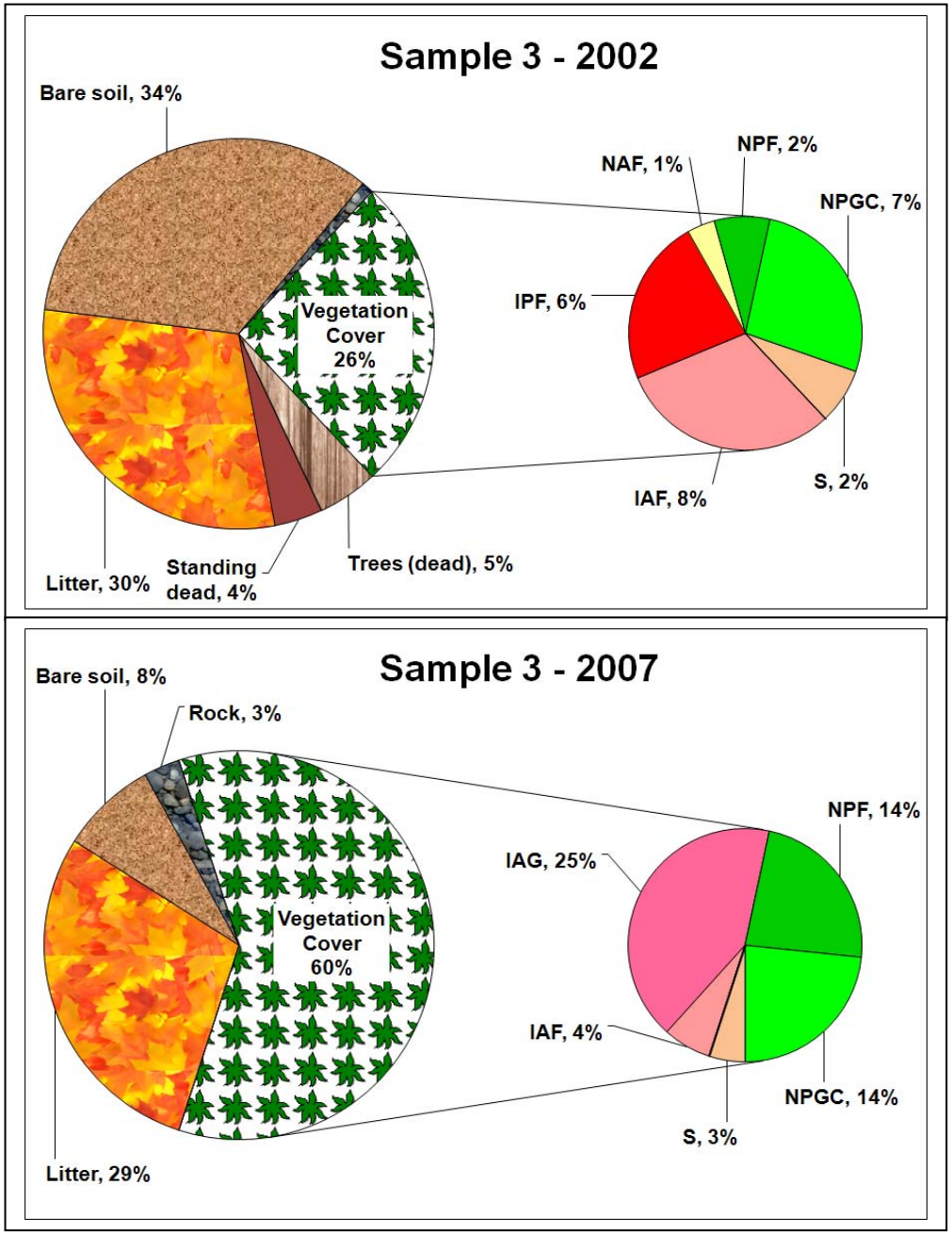


Sample 1 - Severe burn, Contour, Straw logs, Seed, Mulch – Group B. Bare ground was greatly reduced and litter greatly increased. Vegetation cover increased only slightly but there was a large reduction in introduced species including the reclamation grasses that was matched by an increase in native forbs and grasses. Cheatgrass here was minimal, as in other seeded samples. Species density has changed from 49 to 45 species/100 sq.m.

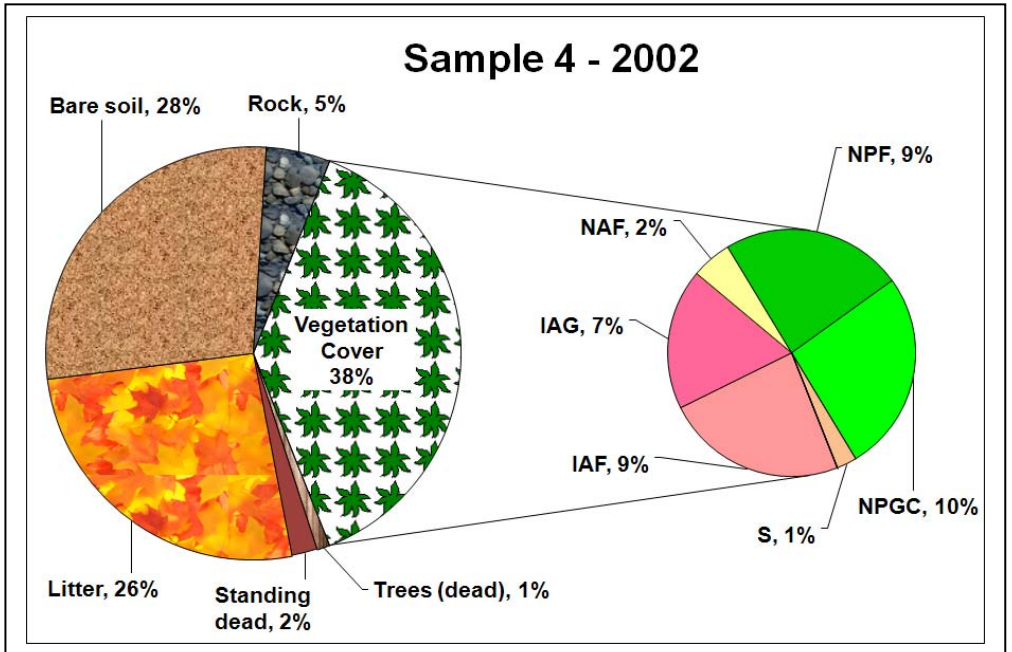


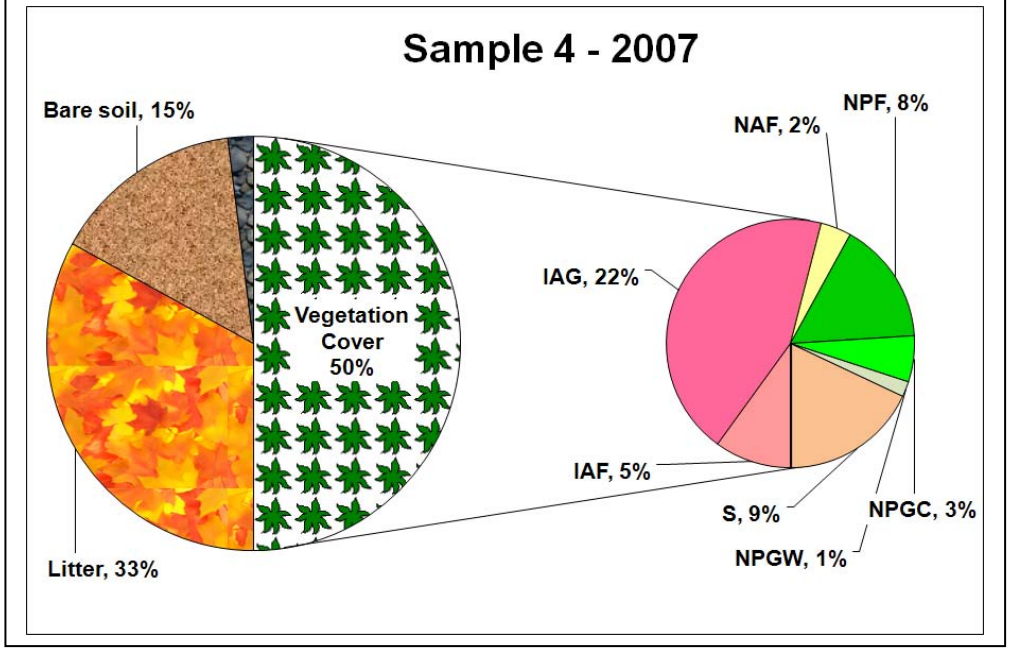


Sample 2 - Severe burn, Contour, Straw logs, Mulch – Group C. Bare soil decreased moderately. The dead standing trees reduced greatly and have fallen over providing ground cover as litter. The vegetation cover has increased greatly, but primarily due to cheatgrass. Species density has changed from 43 to 31 species/100 sq.m.

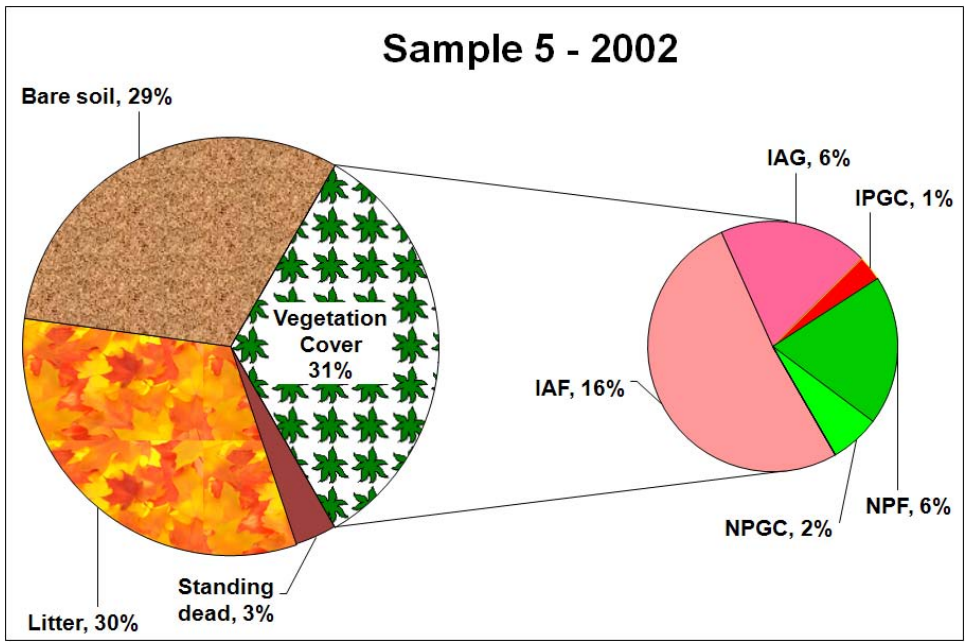


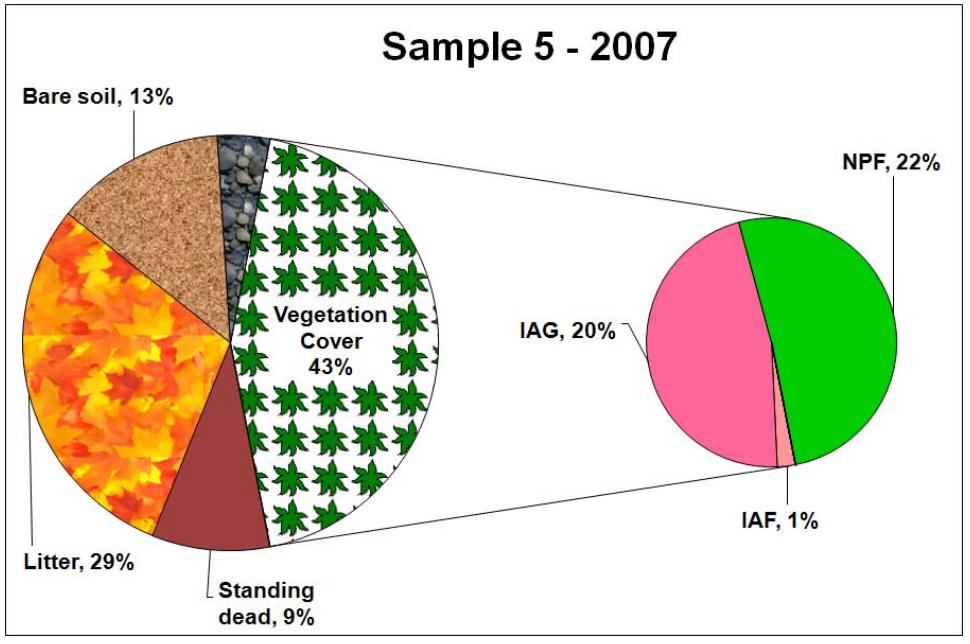
Sample 3 - Severe burn, Contour Straw logs, Mulch – Group D. Bare soil decreased greatly and vegetation cover increased greatly. Although the native species increased moderately, the greatest increase was cheatgrass. Species density has changed from 46 to 28 species/100 sq.m.



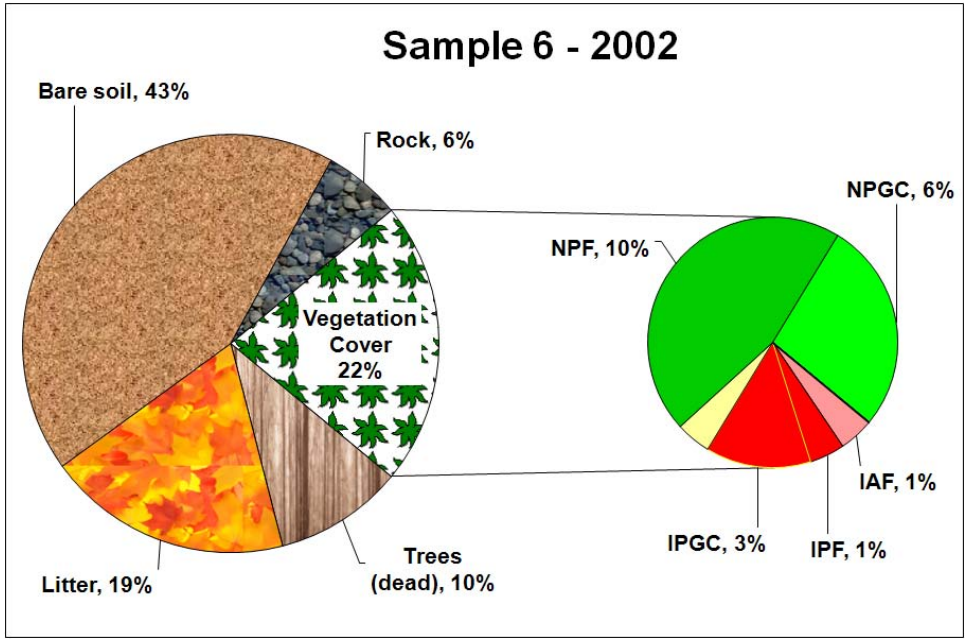


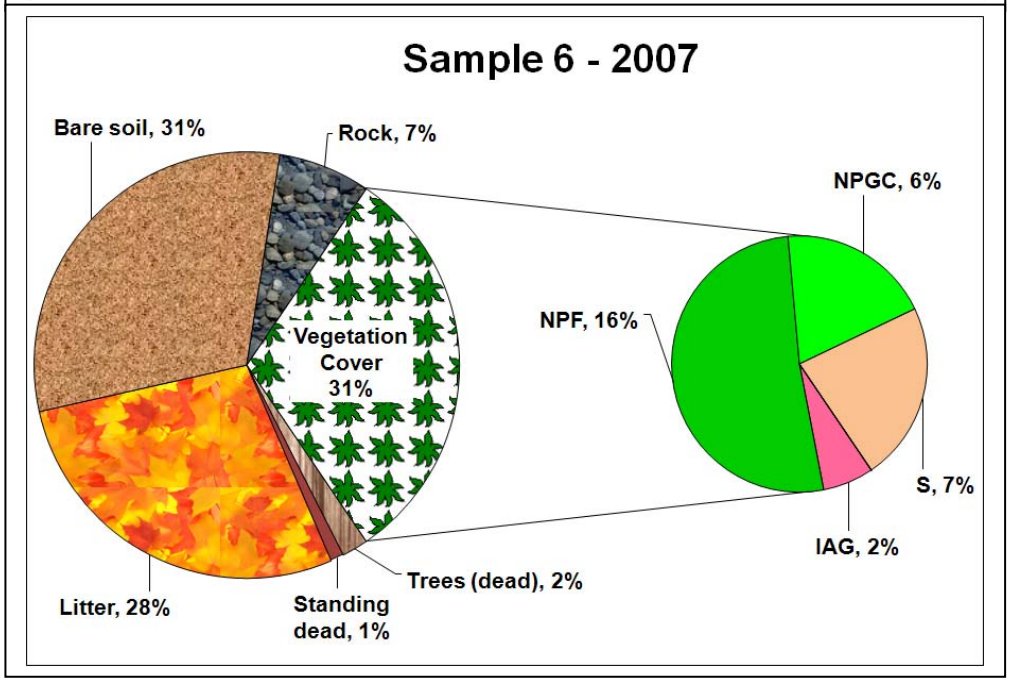
Sample 4 - Severe burn, Contour, Straw logs, Mulch – Group C. Bare ground was reduced greatly with an increase in litter. Although native vegetation cover remained about the same, there was a large shift from native grasses to shrubs, primarily buckbrush. The large increase in total vegetation cover was due primarily to cheatgrass. Species density has changed from 46 to 25 species/100 sq.m.



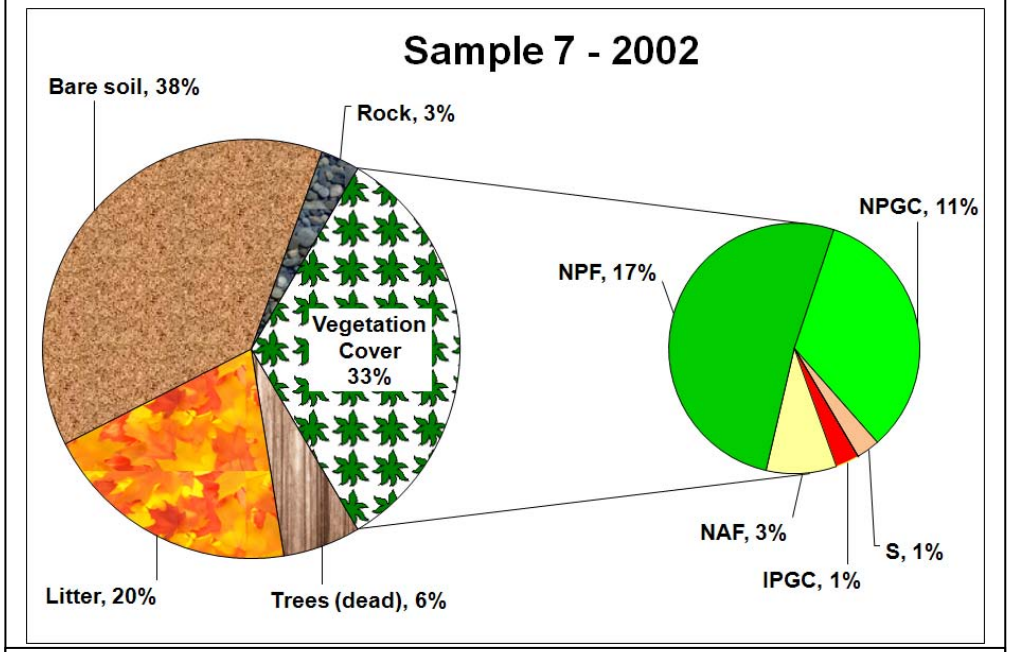


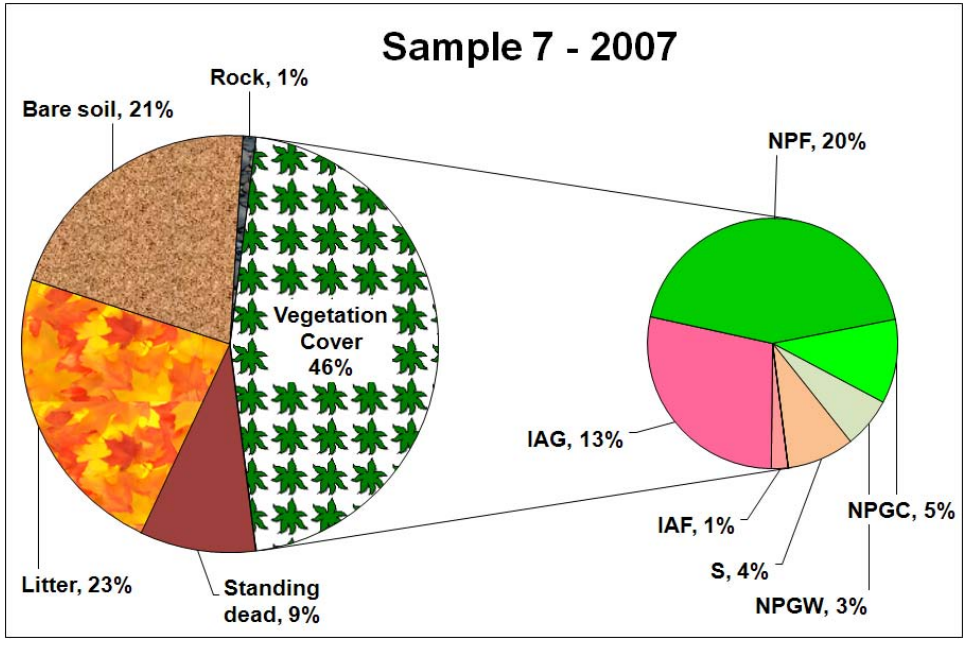
Sample 5 - Severe burn, Contour, Straw logs, Mulch – Group C. Bare soil was greatly reduced, and vegetation cover was increased. Although the site had abundant Jim Hill mustard in 2002, there was none observed in 2007. Cheatgrass and fringed sage (*Artemisia frigid*) are the current site dominants. Species density has changed from 36 to 31 species/100 sq.m.



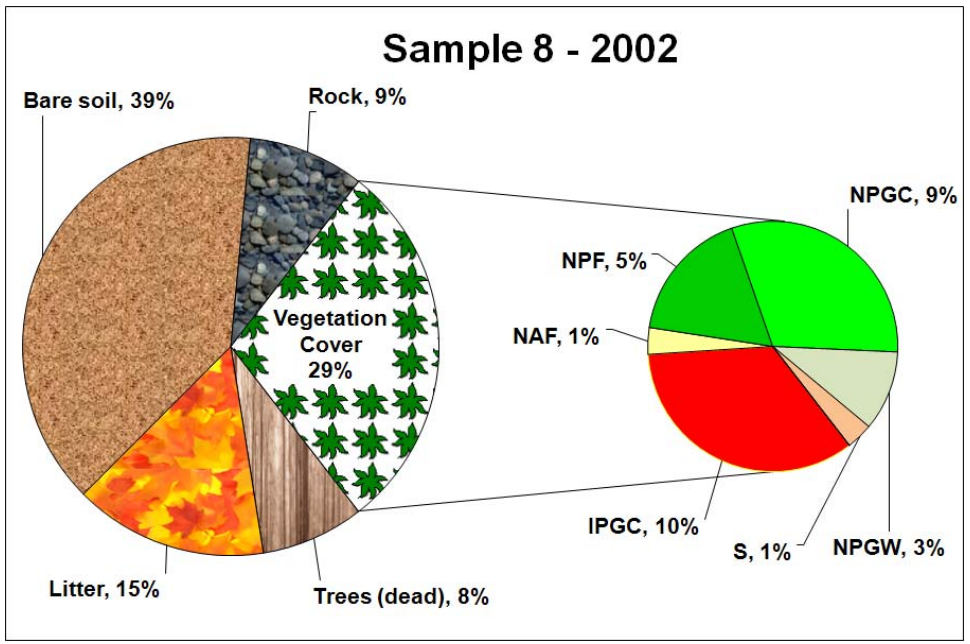


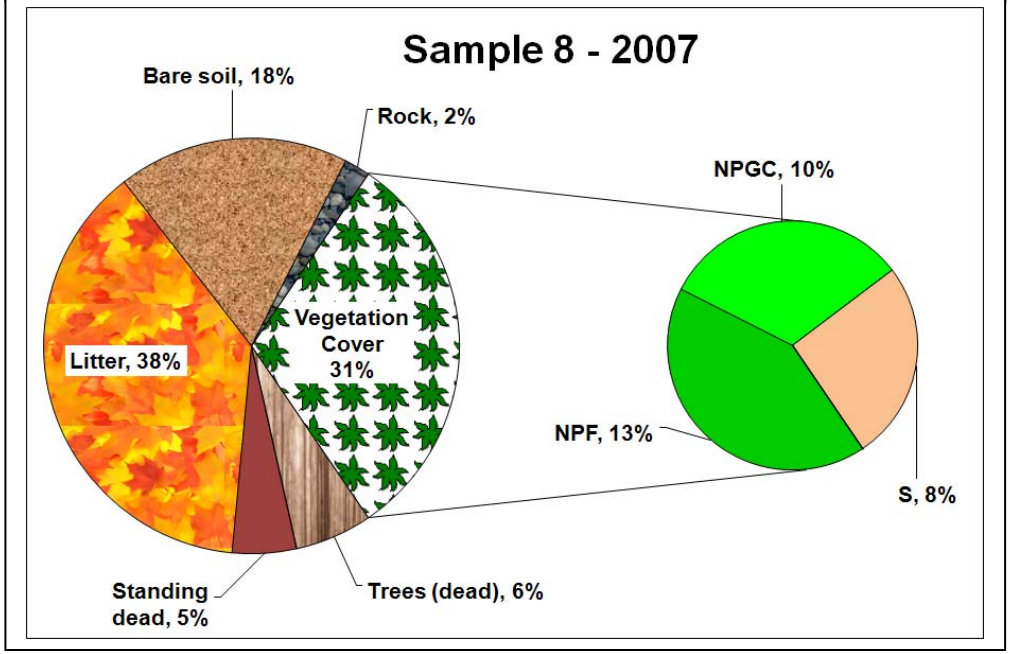
Sample 6 - Severe burn, Contour, Seed, Mulch – Group B. Bare soil has been reduced, primarily due to a combination of increased vegetation cover and litter. The reclamation grass species appear to have been replaced by native perennial forbs and shrubs. The amount of cheatgrass here was low as in most of the seeded areas. Species density has changed from 35 to 38 species/100 sq.m.



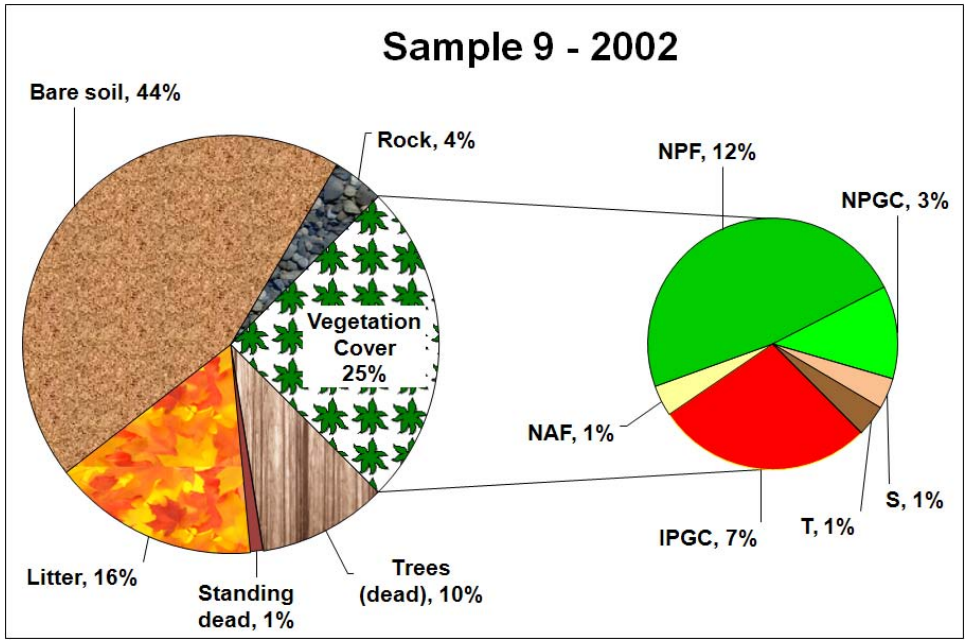


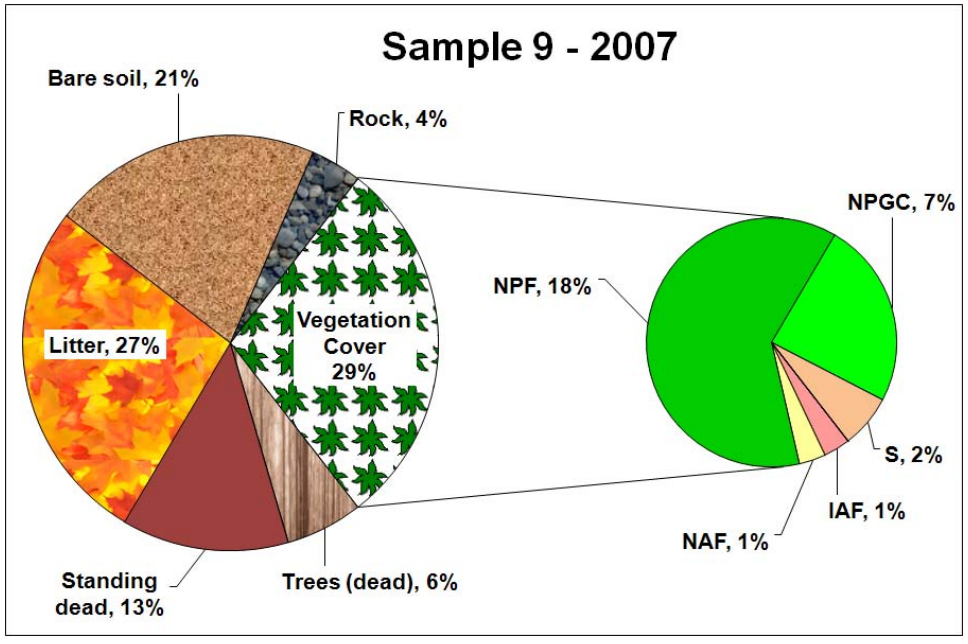
Sample 7 - Moderate burn, Contour, Straw logs – Group C. Most of the dead standing trees have fallen at this site. The bare soil has been reduced and vegetation cover has increased due primarily to the increase in cheatgrass. Golden aster (*Heterotheca foliosa*), fringed sage, and buckbrush are the current dominants. Species density has changed from 38 to 25 species/100 sq.m.



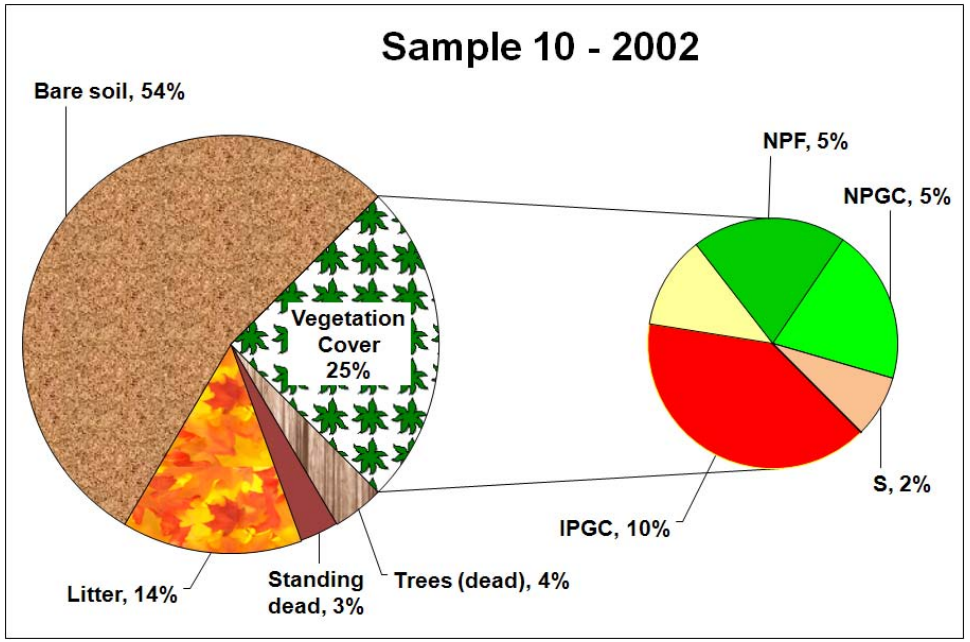


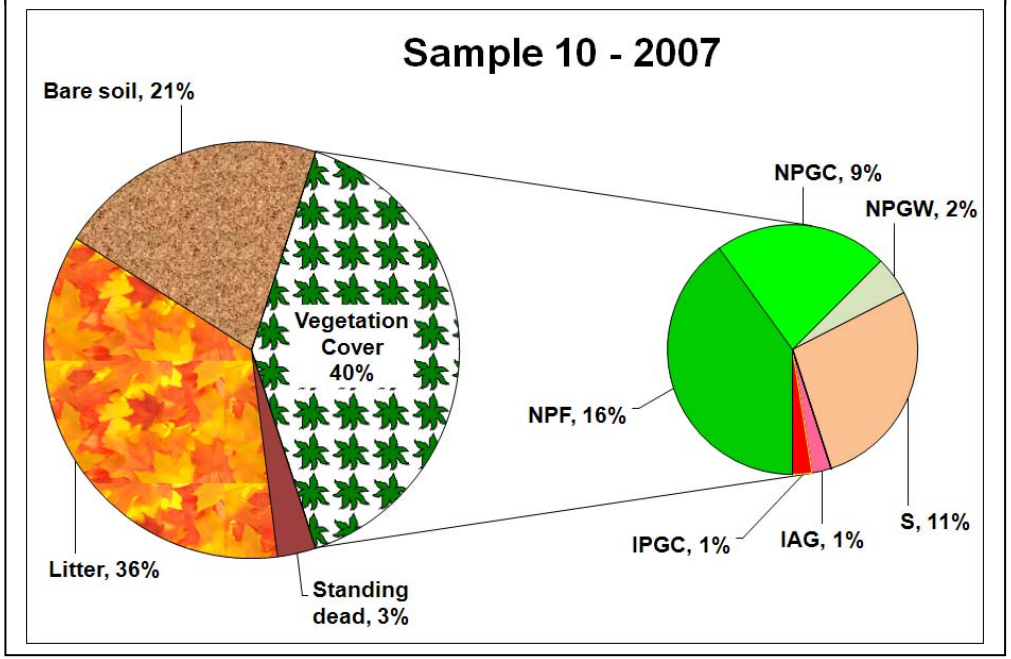
Sample 8 - Severe burn, Contour, Seed – Group B. Bare soil has reduced by about half and litter has increased about the same amount. Some of the dead standing trees have fallen but many are still standing. Reclamation grasses have been replaced by a mix of native perennial forbs and the shrub buckbrush. There was no cheatgrass here as in some of the other seeded areas. Species density has changed from 46 to 32 species/100 sq.m.



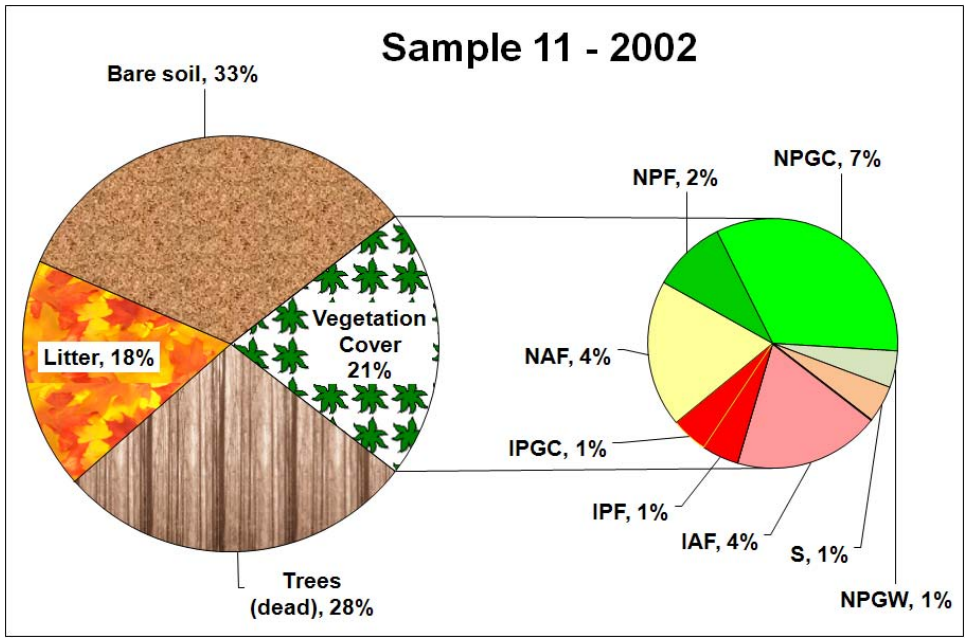


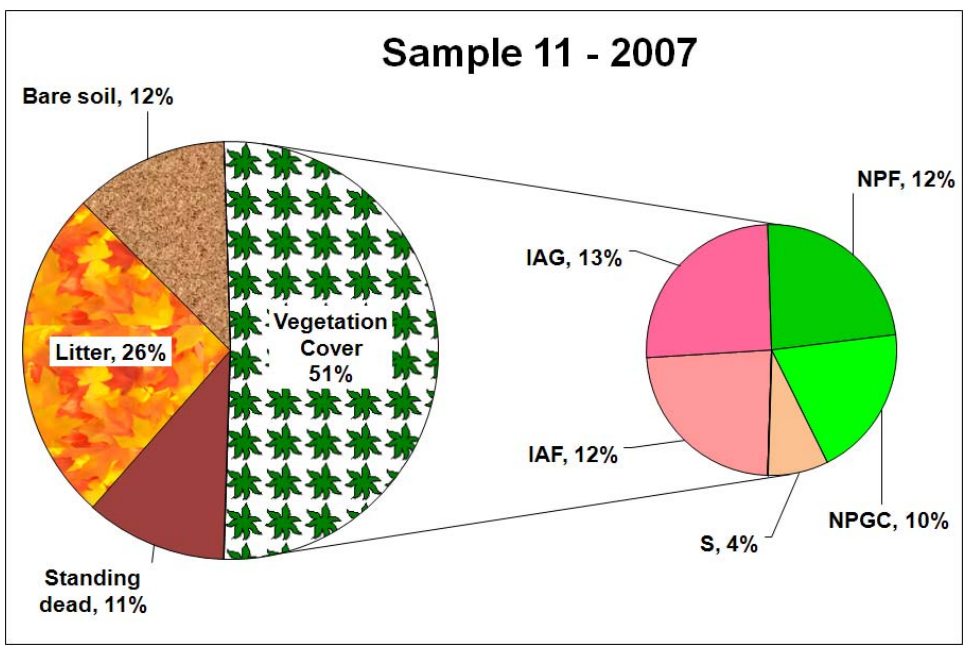
Sample 9 - Severe burn, Contour, Seed – Group B. Bare soil has decreased by about half and litter has increased about a third. Some standing dead trees have fallen and accumulated along the transect giving high standing dead cover. Transect was moved due to a trail that can be seen in the 2007 photo. Reclamation grasses have greatly reduced and native perennial forbs dominate. Species density has changed from 39 to 37 species/100 sq.m.



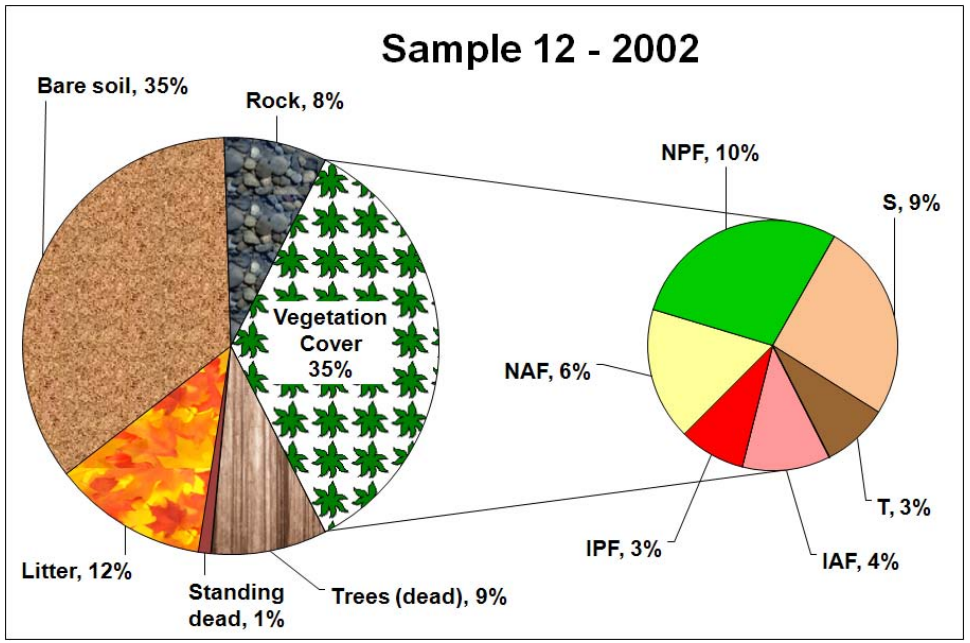


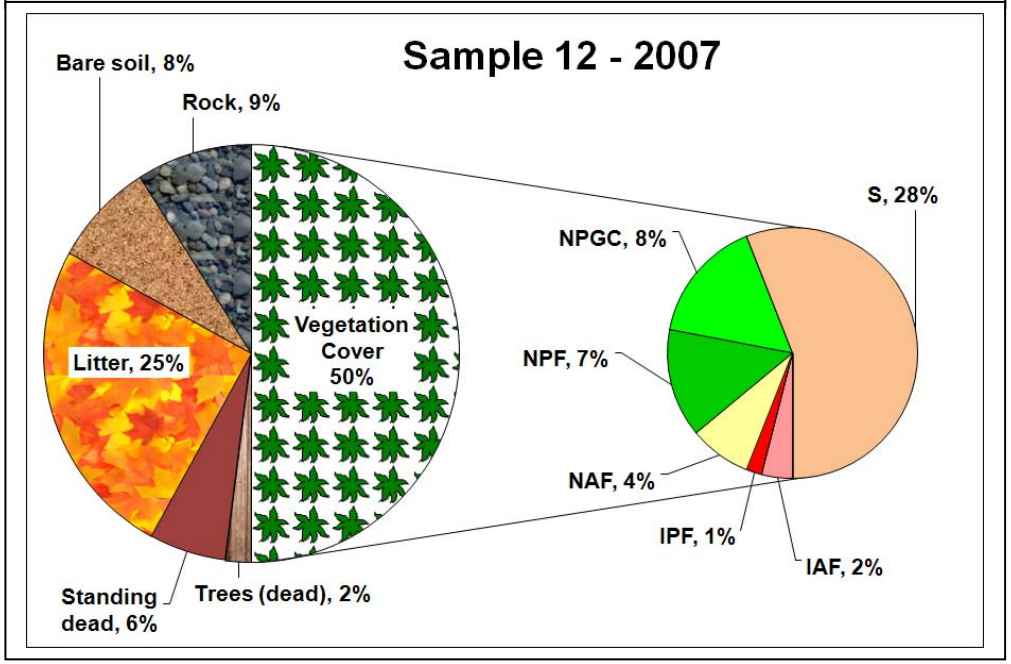
Sample 10 - Severe burn, Contour, Seed – Group B. Bare soil was reduced by more than half and litter increased by more than half. Vegetation cover greatly increased and the reclamation grasses were greatly reduced. The native perennial forbs and shrubs currently dominate. Species density has changed from 35 to 40 species/100 sq.m.



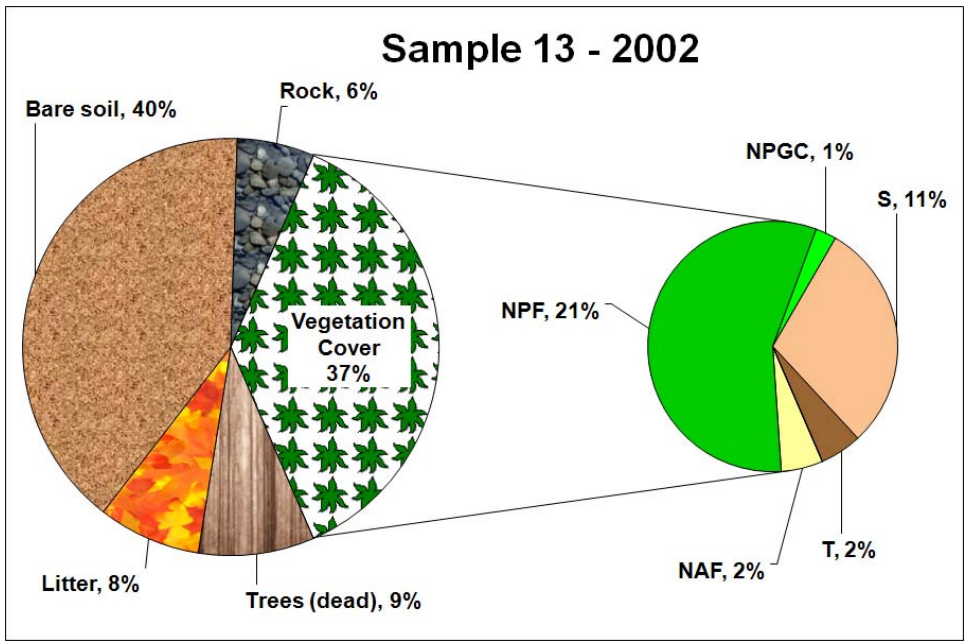


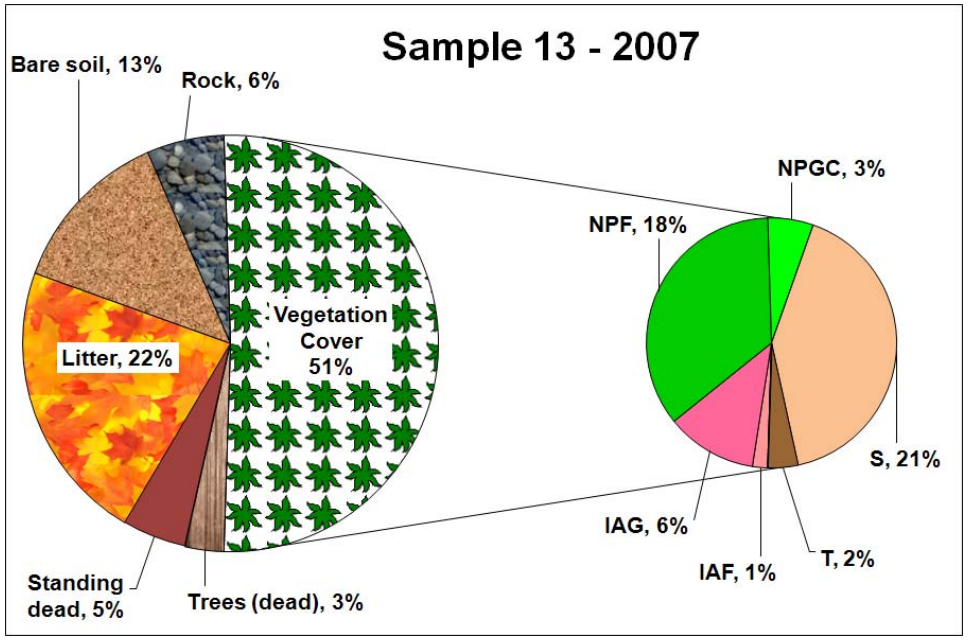
Sample 11 - Moderate burn, Seed – Group C. Bare soil decreased by more than half and the abundant dead standing trees have fallen. Although the vegetation has greatly increased, almost half of the vegetation cover is from weedy species especially cheatgrass and tumble (diffuse) knapweed. Species density has changed from 44 to 34 species/100 sq.m.



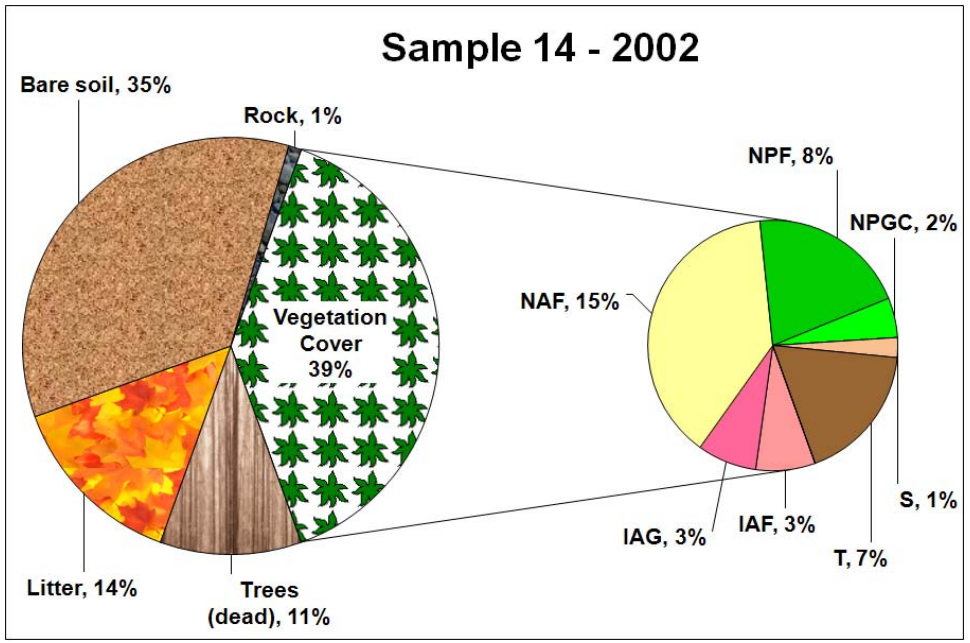


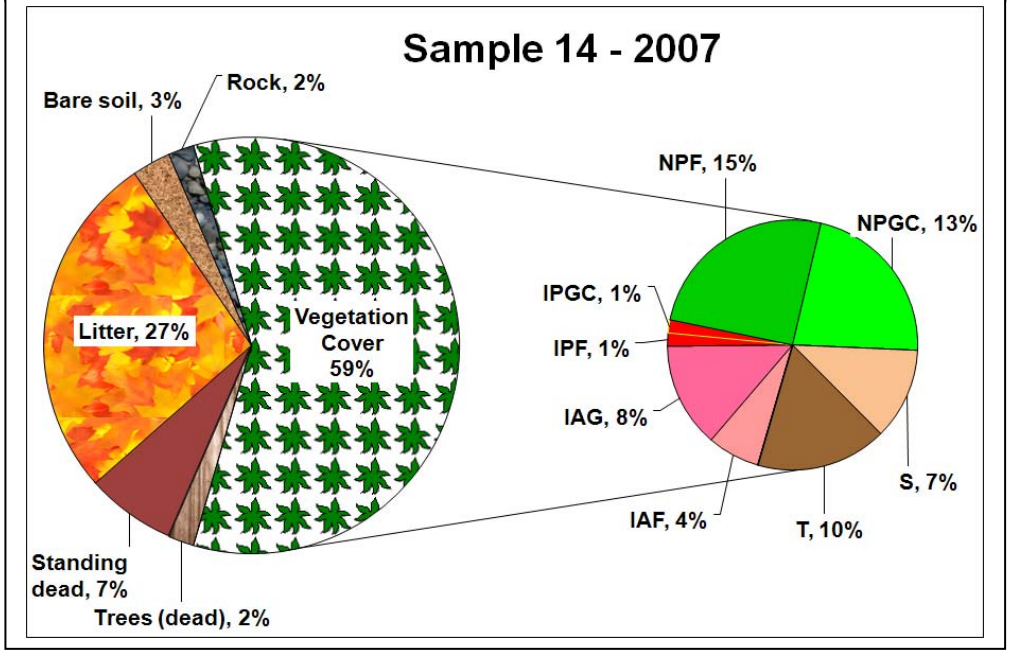
Sample 12 - Severe burn, contour only – Group A. Bare soil was greatly reduced and both litter and cover have increased. Some of the dead standing trees have fallen, but many still remain. The greatest increase in vegetation cover was due to the shrub buckbrush. Aspen has actually decreased in cover but still occurs along the transect. Species density has changed from 31 to 34 species/100 sq.m.



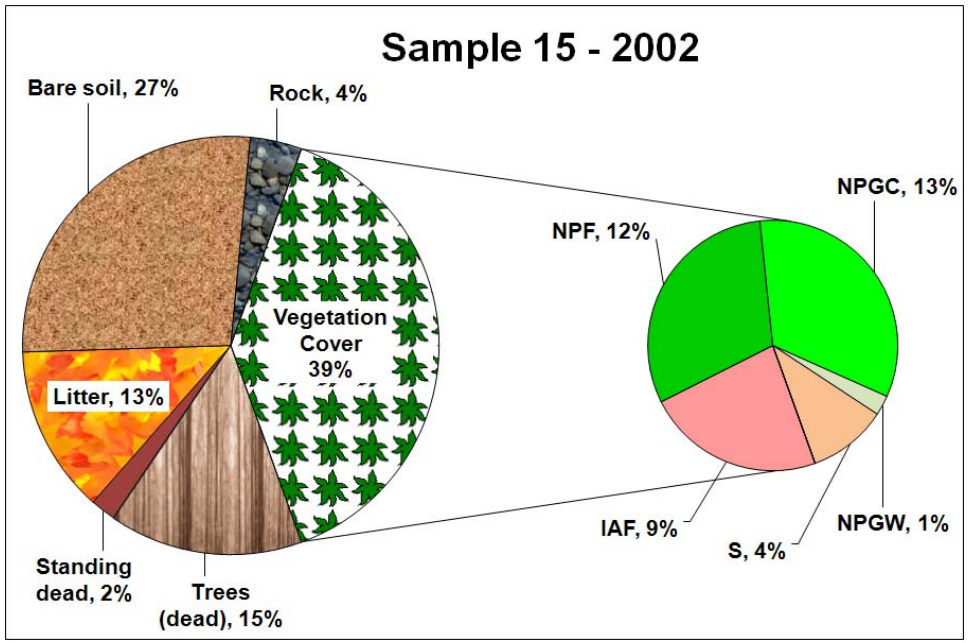


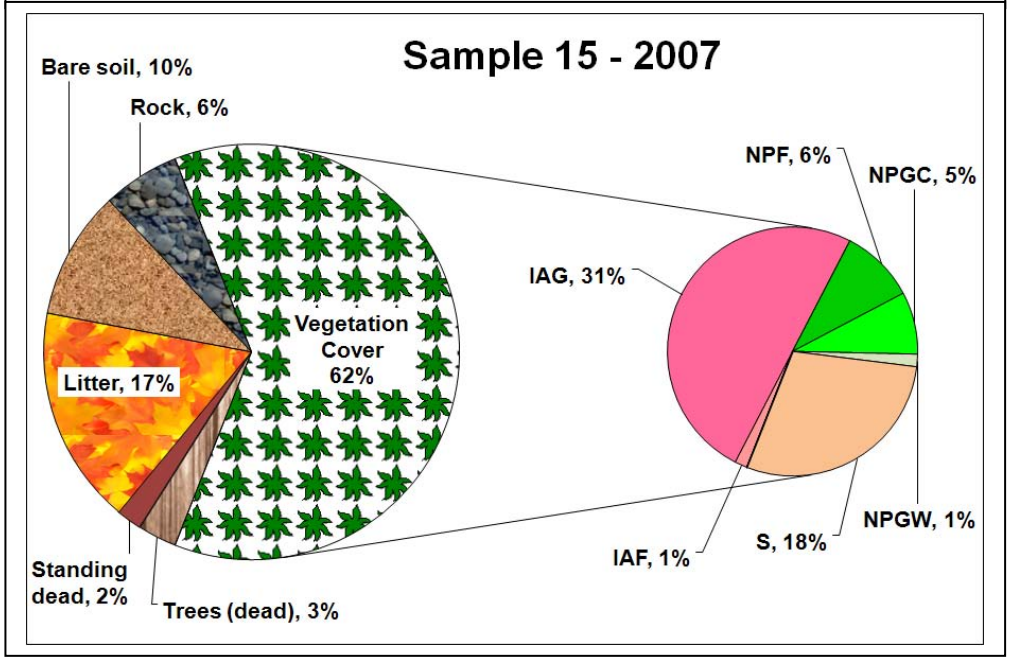
Sample 13 - Severe burn, contour only – Group A. Bare soil was greatly reduced and vegetation cover and litter increased. The greatest increase in vegetation cover was due to buckbrush and cheatgrass. Aspen cover has remained stable, but is increasing in stature. Many of the dead standing trees have fallen. Species density has changed from 31 to 39 species/100 sq.m.



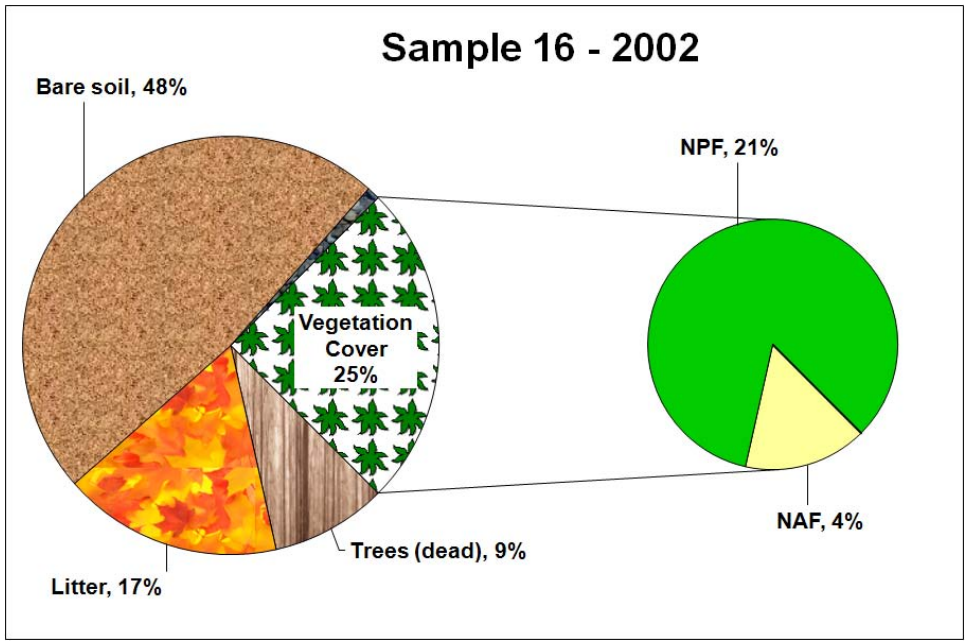


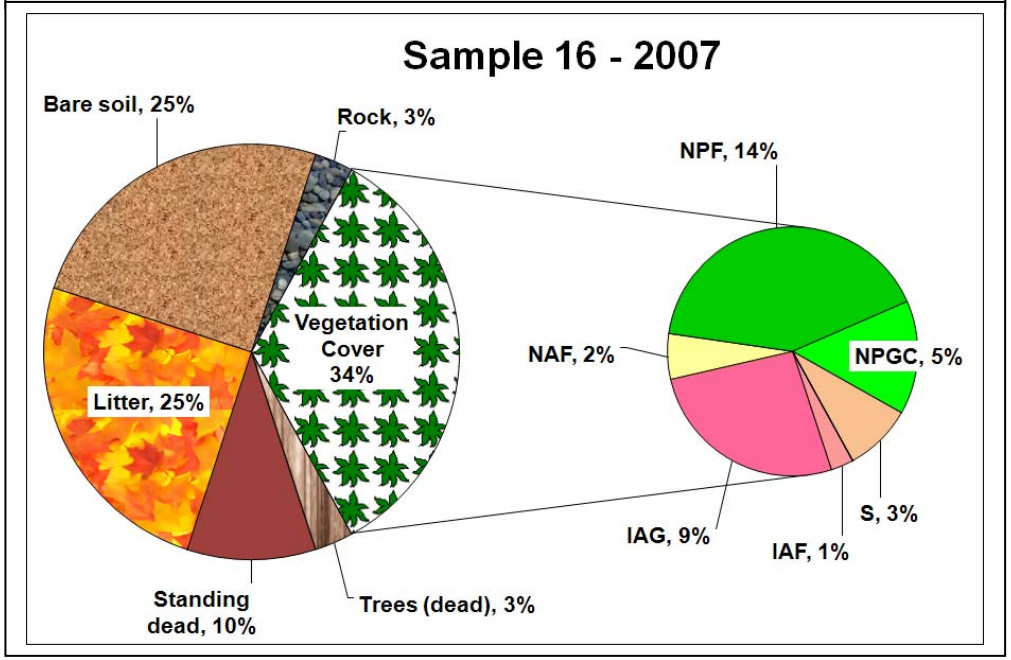
Sample 14 - Severe burn, contour only – Group A. Bare ground was reduced to only 3%. Vegetation cover has increased greatly and many of the dead standing trees, or limbs have fallen. Chenopodium spp. dominated the cover in 2002, but was not observed in 2007. Aspen is increasing in cover and stature, with an abundance of Agasizz bluegrass (*Poa agasizzensis*). Species density has changed from 48 to 40 species/100 sq.m.



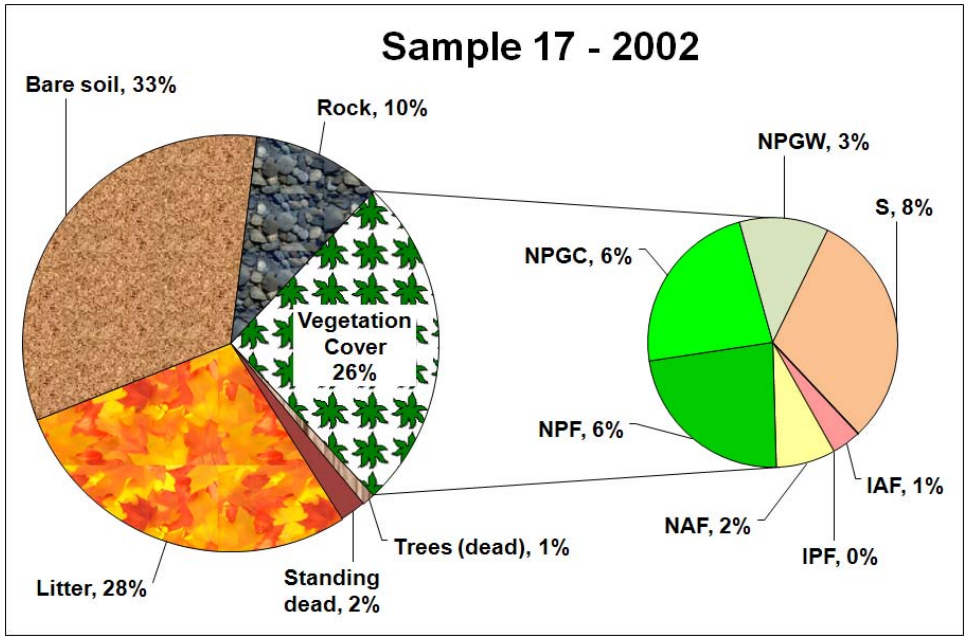


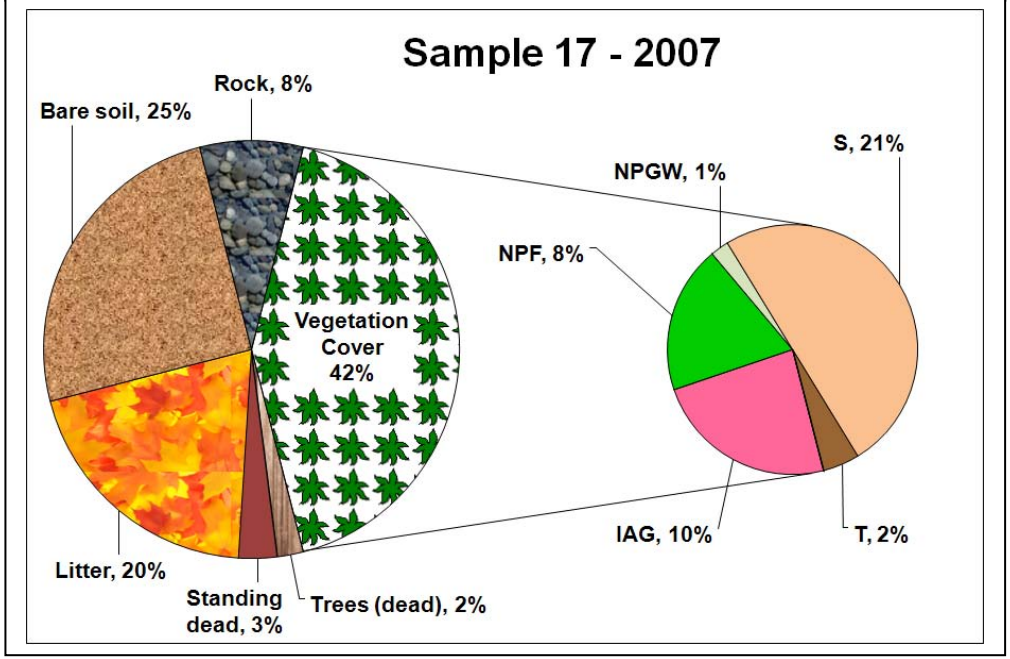
Sample 15 - Severe burn, no treatment – Group D. Start and end points could not be found. New points were installed near the original points using GPS coordinates. Bare soil has decreased greatly and many of the dead standing trees have fallen. Vegetation cover has increased, and buckbrush has increased, but cheatgrass is abundant. Species density has changed from 57 to 32 species/100 sq.m.



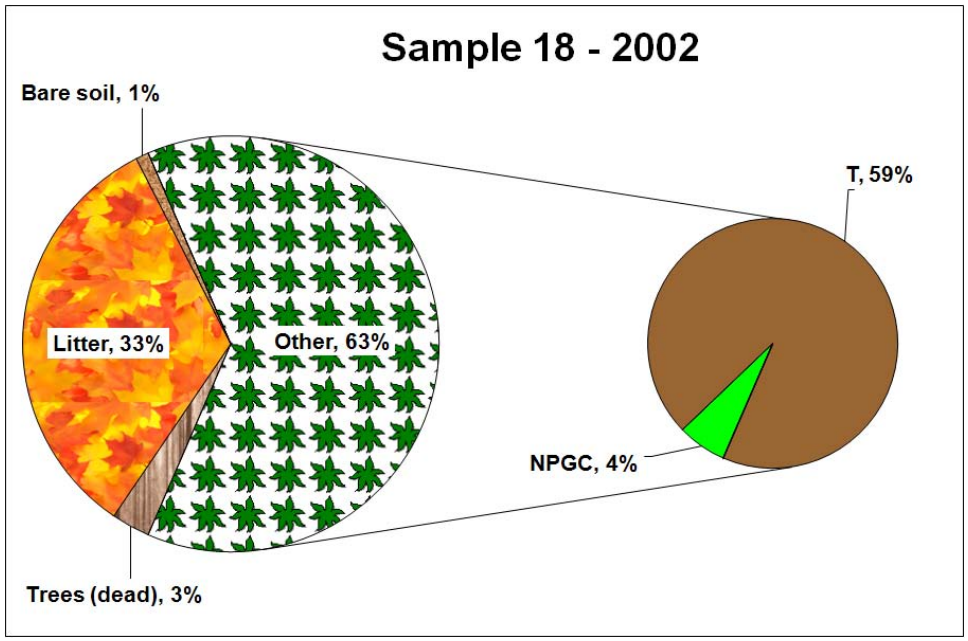


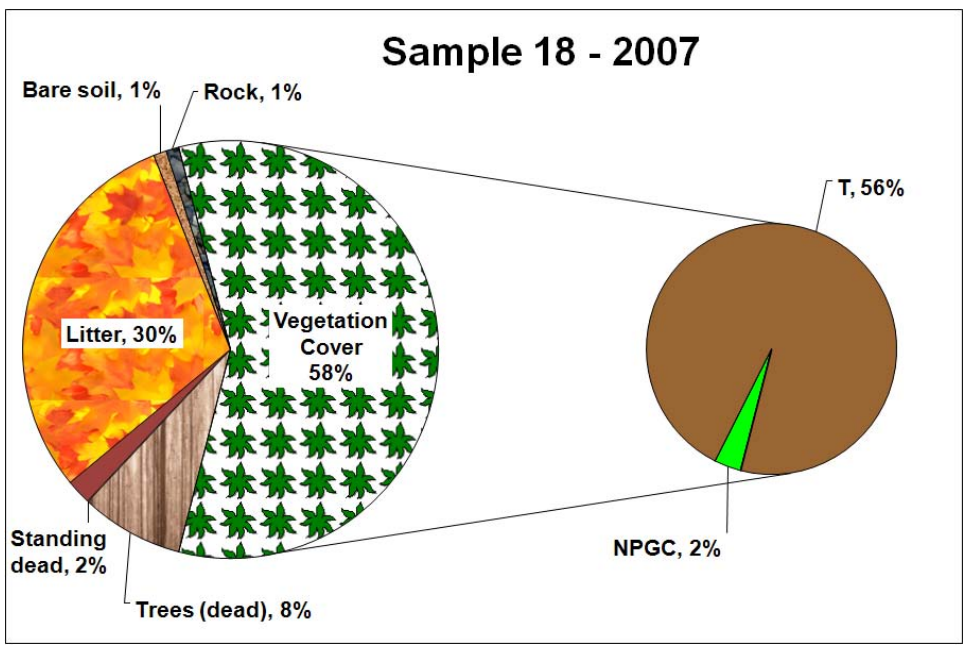
Sample 16 - Severe burn, no treatment – Group B. Bare soil has decreased greatly and litter has increased and many of the dead standing trees have fallen. The vegetation cover was dominated by varileaf scorpionweed (*Phacelia heterophila*) in 2002 but is now dominated by fringed sage and cheatgrass. Buckbrush is becoming established. Species density has changed from 40 to 37 species/100 sq.m.





Sample 17 - No burn, no treatment – Group D. This site wasn't burned and is located near a hiking trail. Bare soil and litter have decreased and vegetation cover have increased. Native grasses have reduced but native shrubs have increased. Cheatgrass was present at less than 1% in 2002 but is now present with 10% cover. Species density has changed from 39 to 36 species/100 sq.m.





Sample 18 - No Burn, no treatment – Group E. This unburned site has remained stable. Species density has changed from 24 to 35 species/100 sq.m. The new species were only present in trace amounts.

Climatic Factors

Although this report does not discuss the historical disturbances or climatic factors that have resulted in the pre-fire plant associations, climatic data for the last 110 years (1894 – 2006) that may be used for that purpose can be found at http://www.myxyz.org/phmurphy/Download/THRN2006.pdf. These data for 1894-2007 will be posted in February 2007. The average annual precipitation as well as monthly temperature, precipitation and potential evapotranspiration can provide great insight into the timing and severity of disturbance conditions that existed in the past.

The Figure 14 is the annual precipitation for Boulder from 1894 to October 2007. The mean and +/- one standard deviation is also indicated on the graph as well as polynomial smoothing of the precipitation

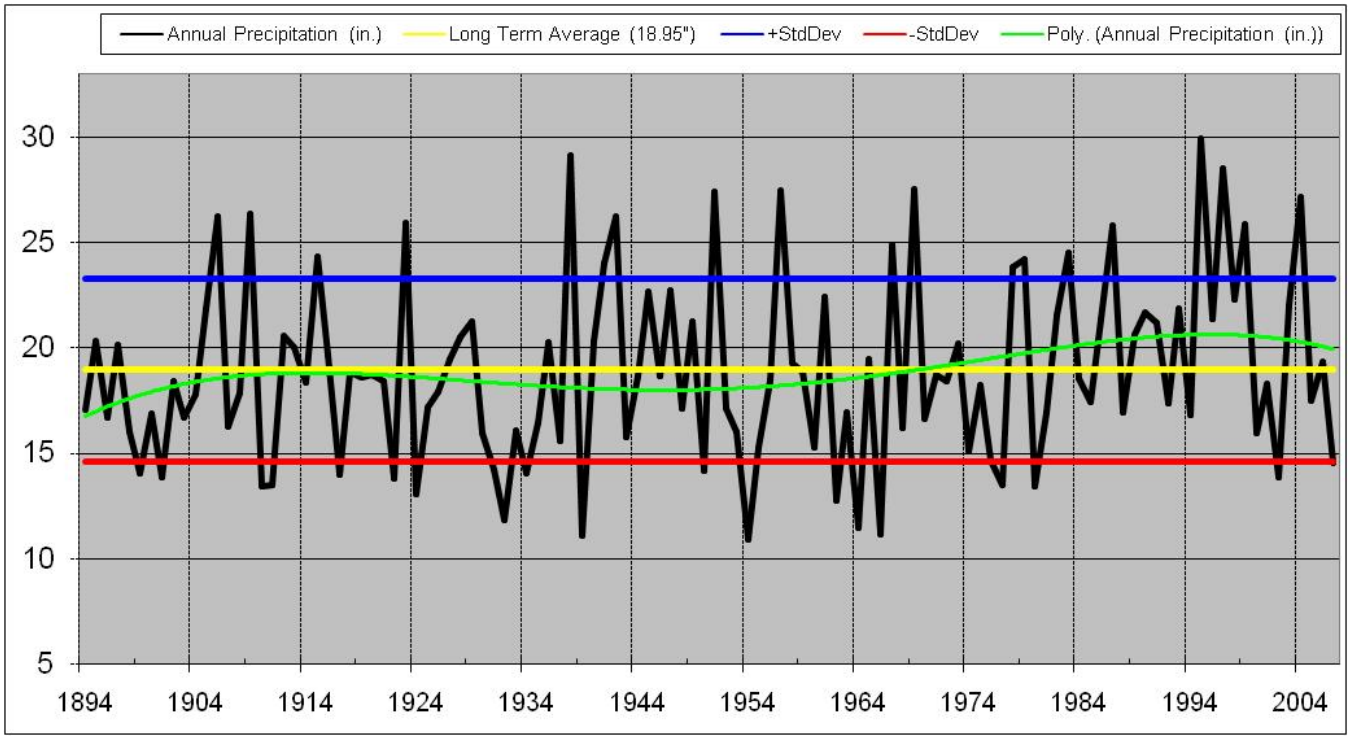


Figure 14. Boulder Annual Precipitation 1893-October 2007.

It can be seen from Figure 14 that the precipitation was significantly above normal from 1995 to 1999. Table 5 shows that this was followed by below average precipitation in the year of the fire (2000) followed by a year of close to average precipitation in 2001, a very dry year in 2002, followed by above average wet years in 2003 and 2004, with a very wet year in 2004, a below average year in 2005 and a close to average year in 2006. The climate diagram for 2007 found in Figure 15 shows that the January to July period for 2007 was much drier than normal.

Table 5. Precipitation deviation from the mean 2000 to 2006.

Year	Precip.	Mean	Deviation
2000	15.96	18.94	(2.98)
2001	18.28	18.94	(0.66)
2002	13.88	18.94	(5.06)
2003	22.02	18.94	3.08
2004	27.17	18.94	8.23
2005	17.52	18.94	(1.42)
2006	19.31	18.94	0.37

The Thornthwaite climate diagrams for the years 2000 to October 2007 are shown in Figure 15. These diagrams show the time and relative intensity of drought periods over time. The periods of potential soil drought occur when potential evapotranspiration (ET) exceeds precipitation. The potential evapotranspiration was calculated according to a modified Thornthwaite formula (Dunne & Leopold 1978) that includes a latitude correction.

When the combined effects of temperature and precipitation for the period of April-May-June are considered, the year 2000 was the 7th warmest and driest Spring in the last 110 years, 2001 was the 46th (relatively average), and 2002 was the 5th warmest and driest Spring. When this same type of comparison is made for the period of April to September; 2000 was the 15th warmest and driest Spring/Summer, 2001 was the 36^{th,} and 2002 was the 3rd warmest and driest in the last 110 years. What this implies is that the year of the reclamation actions (2001) was relatively average, but the second year of growth (2002) was one of the warmest and driest ever. This could have had a significant effect on the subsequent growth responses; however the following two years (2003-2004) were well above average, followed by 2005 that was below average and 2006 that was close to average.

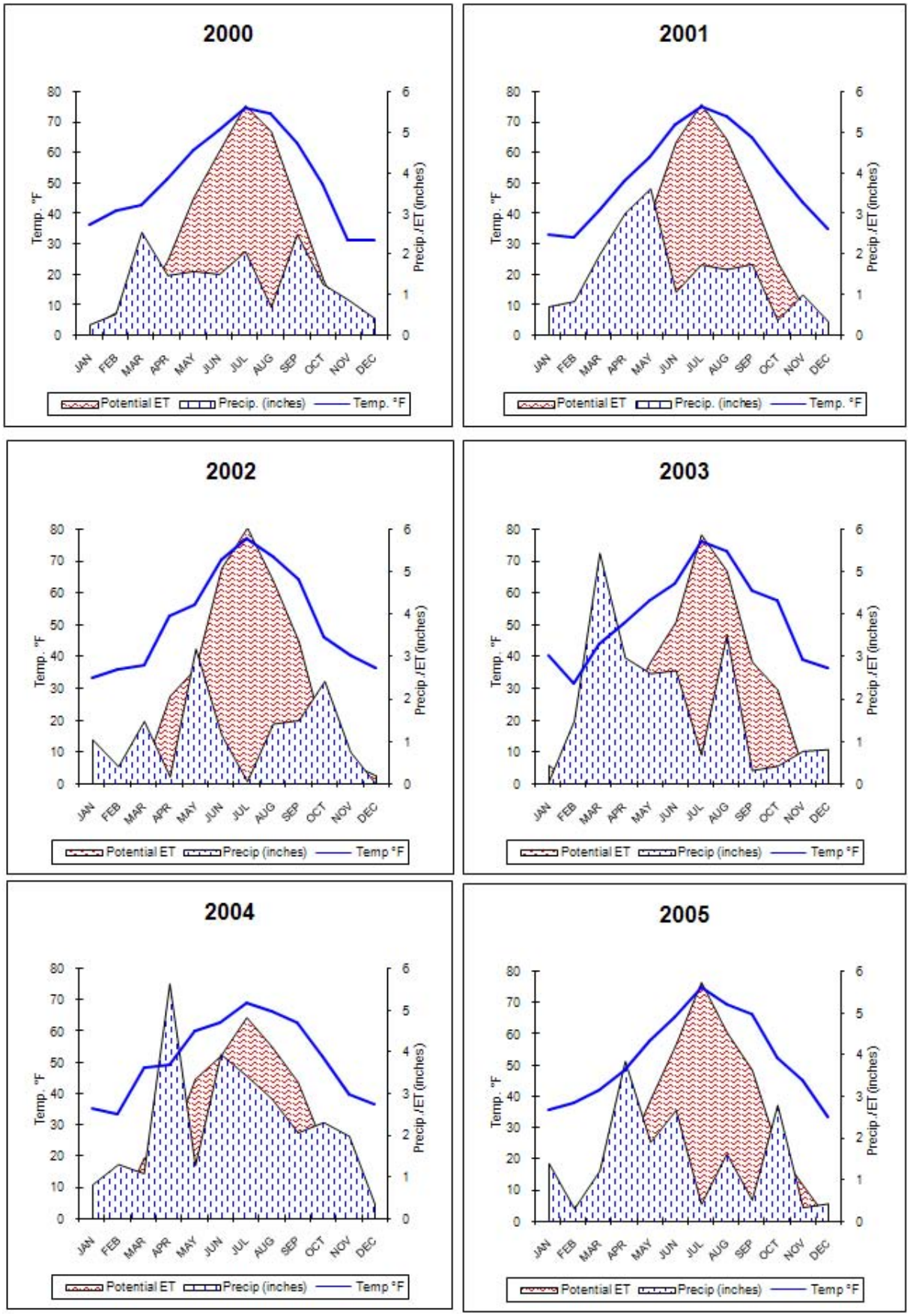
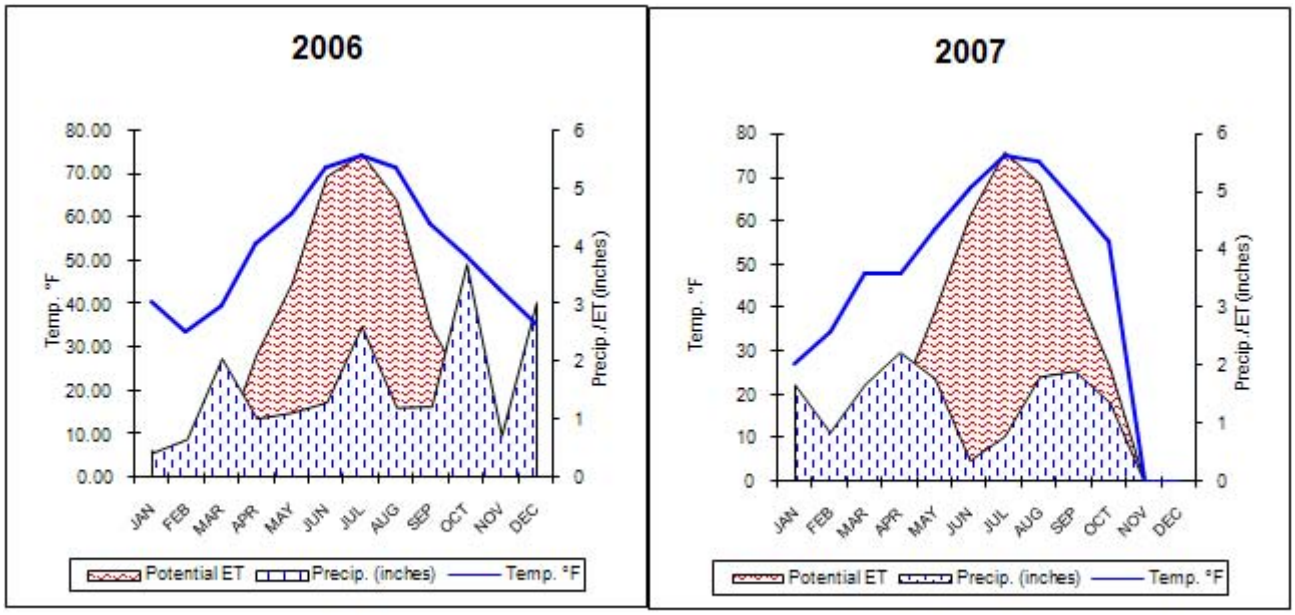


Figure 15. Boulder Climate Diagrams for 2000 – October 2007. (continued next page)



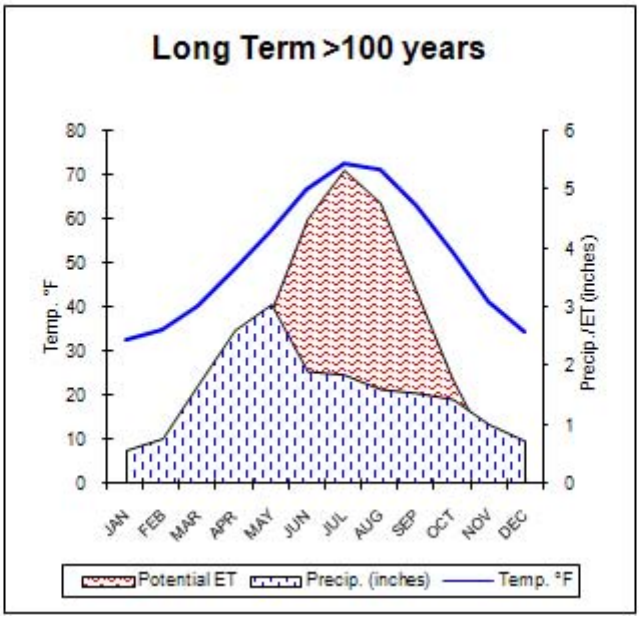


Figure 15. Boulder Climate Diagrams for 2000 – October 2007. (concluded)

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Appendices

Appendix 1. Cover Data Tables

Combined 2002
Combined 2007
Groups A, B, C, D 2007

Eldorado Fire at Walker Ranch Combined Data for All Sites – 2002.

Walker Ranch 2002
Sampling dates - July 16, 17, 18 ,19
PLANT SPECIES

Scientific Name	Synonym	Common Name	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER ALL (%)	RELATIVE VEGETATION COVER ALL (%)
NATIVE ANNUAL & BIENNIAL FORBS							
Acrolasia dispersa	MENTZELIA		0.06 (0.11)	33.33	0.17 (0.36)	0.11	0.24
Androsace septentrionalis		PYGMYFLOWER ROCKJASMINE	0.06	38.89	0.17	0.06	0.12
Bahia dissecta		CUTLEAF	0.00	5.56	0.00	0.00	0.00
Boechera fendleri	ARABIS FENDLERI	FENDLER'S FALSE ARABIS	0.00	5.56	0.00	0.00	0.00
Chenopodium leptophyllum		NARROWLEAF GOOSEFOOT	0.33 (0.39)	77.78	1.04 (1.24)	0.39	0.83
Chenopodium simplex	CHENOPODIUM GIGANTOSPERMUM,C. HYBRIDUM VAR. SIMPLEX	MAPLELEAF GOOSEFOOT	1.00 (1.22)	77.78	3.13 (3.91)	1.33	2.84
Collinsia parviflora		BABY BLUE-EYES	0.00	5.56	0.00	0.00	0.00
Collomia linearis		LINEARLEAF COLLOMIA	0.00	11.11	0.00	0.00	0.00
Draba spp.		WHITLOWWORT	0.00	5.56	0.00	0.00	0.00
Dracocephalum parviflorum	MOLDAVICA PARVIFLORA	DRAGONHEAD	0.11	16.67	0.35	0.22	0.47
Epilobium brachycarpum	EPILOBIUM PANICULATUM	BIGFRUIT WILLOWHERB	0.28	66.67	0.87	0.33	0.71
Frasera speciosa		GREEN GENTIAN	0.00	11.11	0.00	0.00	0.00
Gaura mollis	GAURA PARVIFLORA	BUTTERFLY WEED	0.00	11.11	0.00	0.00	0.00
Grindelia squarrosa		GUMWEED	0.50	44.44	1.56	0.61	1.30
Helianthus annuus		COMMON SUNFLOWER	0.11	22.22	0.35	0.11	0.24
Machaeranthera bigelovii		BIGELOW ASTER	0.06	5.56	0.17	0.06	0.12
Oreocarya virgata	CRYPTANTHA VIRGATA	MINER'S CANDLE	0.00	5.56	0.00	0.00	0.00
Polygonum douglasii	POLYGONUM SAWATCHENSE,POLYGONUM MONTANUM	DOUGLAS KNOTWEED	0.00	27.78	0.00	0.00	0.00
Pterogonum alatum	ERIOGONUM ALATUM	WINGED BUCKWHEAT	0.00	5.56	0.00	0.00	0.00
Silene antirrhina		SLEEPY CATCHFLY	0.11 (0.17)	55.56	0.35 (0.53)	0.17	0.35
TOTAL NATIVE ANN. & BIEN. FORBS			**2.6 (3.0)**	**100.0**	**8.2 (9.6)**	**3.4**	**9.0**
INTRODUCED ANNUAL & BIENNIAL FORBS							
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED	0.00	11.11	0.00	0.00	0.00
Alyssum minus		ALYSSUM	0.33 (0.39)	27.78	1.04 (1.24)	0.44	0.95
Bassia sieversiana	KOCHIA SCOPARIA,K. SIEVERSIANA	BURNING BUSH	0.00 (0.06)	27.78	0.00 (0.18)	0.06	0.12
Camelina microcarpa		LITTLEPOD FALSEFLAX	0.00	11.11	0.00	0.00	0.00
Carduus nutans ssp. macrolepis		MUSK THISTLE	0.06	38.89	0.17	0.11	0.24
Chenopodium foliosum		LEAFY GOOSEFOOT	0.00	5.56	0.00	0.00	0.00
Cirsium vulgare		BULL THISTLE	0.06	5.56	0.17	0.06	0.12
Conyza canadensis		HORSEWEED	0.00	16.67	0.00	0.00	0.00
Lactuca serriola		PRICKLY LETTUCE	0.06 (0.17)	66.67	0.17 (0.53)	0.22	0.47
Lappula redowskii		EARLY STICKSEED	0.06	16.67	0.17	0.06	0.12
Lepidium densiflorum		DENSEFLOWER PEPPERWEED	0.00	5.56	0.00	0.00	0.00
Melilotus albus	MELILOTUS ALBA	WHITE SWEET-CLOVER	0.00	5.56	0.00	0.00	0.00
Melilotus officinale	MELILOTUS OFFICINALIS	YELLOW SWEETCLOVER	0.00	5.56	0.00	0.00	0.00
Nicotiana attenuata		TOBACCO	0.00	16.67	0.00	0.00	0.00
Noccaea montana	THLASPI MONTANA	MOUNTAIN CANDYTUFT	0.00	5.56	0.00	0.00	0.00
Podospermum laciniatum	SCORZONERA LACINIATUM	FALSE SALSIFY	0.00	5.56	0.00	0.00	0.00
Sisymbrium altissimum		JIM HILL MUSTARD	1.50 (1.72)	61.11	4.69 (5.51)	1.72	3.66
Solanum spp.		NIGHTSHADE	0.00	5.56	0.00	0.00	0.00
Solanum triflorum		NIGHTSHADE	0.00	5.56	0.00	0.00	0.00
Teloxys botrys	CHENOPODIUM BOTRYS	WORMSEED,JERUSALEM OAK	0.00	5.56	0.00	0.00	0.00
Tithymalus peplus		SPURGE	0.00	5.56	0.00	0.00	0.00
Tragopogon dubius ssp. major		YELLOW SALSIFY	0.00	16.67	0.00	0.00	0.00
Verbascum thapsus		MULLEIN	1.28	94.44	3.99	1.44	3.07
TOTAL INTRO. ANN. & BIEN. FORBS			**3.3 (3.8)**	**94.4**	**10.4 (12.1)**	**4.1**	**10.9**
INTRODUCED ANNUAL GRASSES							
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	1.00 (1.06)	72.22	3.13 (3.37)	1.28	2.72
Bromus japonicus		JAPANESE BROME	0.00	11.11	0.00	0.00	0.00
Cylindropyrum cylindricum	AEGILOPS CYLINDRICA	GOAT GRASS	0.00	11.11	0.00	0.00	0.00
Triticum aestivum		WHEAT	0.00	5.56	0.00	0.00	0.00
TOTAL INTRO. ANN. GRASSES			**1.0 (1.1)**	**72.2**	**3.1 (3.4)**	**1.3**	**3.4**
NATIVE PERENNIAL FORBS							
Achillea lanulosa		WESTERN YARROW	0.06	61.11	0.17	0.06	0.12
Aletes acaulis		STEMLESS INDIAN PARSLEY	0.11	38.89	0.35	0.11	0.24
Allium cernuum		NODDING ONION	0.00	16.67	0.00	0.00	0.00
Amerosedum lanceolatum	SEDUM LANCEOLATUM	YELLOW STONECROP	0.00	11.11	0.00	0.00	0.00
Antennaria rosea		ROSE PUSSYTOES	0.00	5.56	0.00	0.00	0.00
Apocynum androsaemifolium		SPREADING DOGBANE	1.00	22.22	3.13	1.06	2.25
Arnica fulgens		ARNICA	0.00	11.11	0.00	0.00	0.00
Artemisia frigida		FRINGED SAGE	0.61	50.00	1.91	0.67	1.42
Artemisia ludoviciana		PASTURE SAGE	0.50	72.22	1.56	0.67	1.42
Asclepias stenophylla		SLIMLEAF MILKWEED	0.00	5.56	0.00	0.00	0.00
Asclepias viridiflora		MILKWEED	0.00	5.56	0.00	0.00	0.00
Aster porteri		PORTER'S ASTER	0.11	61.11	0.35	0.11	0.24
Astragalus agrestis		FIELD MILKVETCH	0.06	11.11	0.17	0.06	0.12
Astragalus drummondii		DRUMMOND MILKVETCH	0.00	5.56	0.00	0.00	0.00
Astragalus laxmannii	ASTRAGALUS ADSURGENS VAR.ROBUSTIER	LAXMANN'S MILKVETCH	0.11	38.89	0.35	0.11	0.24
Astragalus miser var. oblongifolius		WEEDY MILKVETCH	0.28	72.22	0.87	0.28	0.59
Astragalus shortianus		MILK VETCH	0.00	16.67	0.00	0.00	0.00
Astragalus spp.		MILK VETCH	0.00	11.11	0.00	0.00	0.00
Campanula rotundifolia		HAREBELL	0.33	77.78	1.04	0.39	0.83
Cerastium strictum	CERASTIUM ARVENSE	MOUSE-EAR	0.00	11.11	0.00	0.00	0.00
Cirsium ochrocentrum	CIRSIUM MEGACEPHALUM	THISTLE	0.06	16.67	0.17	0.11	0.24
Corydalis aurea		GOLDEN SMOKE	0.61	55.56	1.91	0.67	1.42
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0.11	66.67	0.35	0.11	0.24
Erigeron speciosus		SHOWY FLEABANE	0.00	5.56	0.00	0.00	0.00
Eriogonum umbellatum var. umbellatum		WILD BUCKWHEAT	0.00	38.89	0.00	0.00	0.00
Erysimum capitatum		COAST WALLFLOWER	0.17	66.67	0.52	0.17	0.35
Euphorbia spp.		WILLOWHERB	0.00	11.11	0.00	0.00	0.00
Gaillardia aristata		BLANKET-FLOWER	0.11	50.00	0.35	0.17	0.35
Galium septentrionale	GALIUM BOREALE	NORTHERN BEDSTRAW	0.00	16.67	0.00	0.00	0.00
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.56	77.78	1.74	0.61	1.30
Harbouria trachypleura		WHISKBROOM PARSLEY	0.06	33.33	0.17	0.06	0.12
Helianthus pumilus		SUNFLOWER	0.39	66.67	1.22	0.39	0.83
Heterotheca foliosa		GOLDENASTER	0.28	27.78	0.87	0.28	0.59
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	0.33	50.00	1.04	0.33	0.71
Heuchera spp.		ALUM ROOT	0.00	5.56	0.00	0.00	0.00
Lesquerella montana		BLADDERPOD	0.00	16.67	0.00	0.00	0.00
Liatris punctata		GAYFEATHER	0.06	16.67	0.17	0.06	0.12
Lupinus argenteus		SILVER LUPINE	0.00	11.11	0.00	0.00	0.00
Maianthemum stellatum	SMILACINA STELLATA	FEW-FLOWERED FALSE SOLOMON'S SEAL	0.00	5.56	0.00	0.00	0.00
Mertensia lanceolata		LANCELEAF BLUEBELLS	0.00	50.00	0.00	0.00	0.00
Monarda fistulosa var. menthifolia		HORSEMINT	0.00	11.11	0.00	0.06	0.12
Oenothera caespitosa ssp. caespitosa		EVENING PRIMROSE	0.11	38.89	0.35	0.11	0.24
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON	0.00	5.56	0.00	0.00	0.00
Oxybaphus hirsutus	MIRABILIS HIRSUTA	UMBRELLAWORT	0.00	5.56	0.00	0.00	0.00
Oxytropis lambertii		LOCOWEED	0.06	11.11	0.17	0.06	0.12
Packera fendleri	SENECIO FENDLERI	FENDLER'S RAGWORT	0.00	16.67	0.00	0.00	0.00
Paronychia jamesii		NAILWORT	0.00	5.56	0.00	0.00	0.00
Penstemon glaber	PENSTEMON ALPINUS	BEARD TONGUE	0.00	16.67	0.00	0.00	0.00
Penstemon spp.		BEARD-TONGUE	0.00	5.56	0.00	0.00	0.00
Penstemon virens		GREEN BEARD-TONGUE	0.61	88.89	1.91	0.67	1.42
Phacelia heterophylla		VARILEAF SCORPIONWEED	2.33 (2.39)	77.78	7.29 (7.64)	2.56	5.44
Physaria vitulifera		DOUBLE BLADDERPOD	0.00	11.11	0.00	0.00	0.00
Potentilla hippiana		HORSE CINQUEFOIL	0.00	16.67	0.00	0.00	0.00
Pulsatilla ludoviciana	P. PATENS SSP. MULTIFIDA	PASQUEFLOWER	0.06	50.00	0.17	0.06	0.12
Rumex triangulivalvis	RUMEX SALICIFOLIUS	WILLOW DOCK	0.00	5.56	0.00	0.00	0.00
Scutellaria brittonii		SKULLCAP	0.00 (0.06)	50.00	0.00 (0.18)	0.06	0.12
Senecio integerrimus		LAMBSTONGUE GROUNDSEL	0.00	5.56	0.00	0.00	0.00
Solidago missouriensis		MISSOURI GOLDENROD	0.00	5.56	0.00	0.00	0.00
Solidago simplex var. simplex	SOLIDAGO SPATHULATA VAR. NEOMEXICANA	MT. ALBERT GOLDENROD	0.22	50.00	0.69	0.28	0.59
Unknown forb		UNKNOWN FORB	0.00	5.56	0.00	0.00	0.00
Urtica gracilis ssp. gracilis	URTICA DIOICA	STINGING NETTLE	0.00	5.56	0.00	0.00	0.00
Vaccinium myrtillus ssp. oreophilum		BLUEBERRY	0.00	5.56	0.00	0.00	0.00
TOTAL NATIVE PERENNIAL FORBS			**9.3 (9.4)**	**100.0**	**29.0 (30.0)**	**10.3**	**27.2**
INTRODUCED PERENNIAL FORBS							
Arabis hirsuta		HAIRY ROCKCRESS	0.00	5.56	0.00	0.00	0.00
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0.56	38.89	1.74	0.61	1.30
Taraxacum officinale		COMMON DANDELION	0.00 (0.06)	38.89	0.00 (0.18)	0.06	0.12
Verbena bracteata		VERVAIN	0.06	11.11	0.17	0.06	0.12
TOTAL INTRO. PERENNIAL FORBS			**0.6 (0.7)**	**61.1**	**1.9 (2.1)**	**0.7**	**1.9**

Scientific Name	01D	01DWU	01U	02D	02DWU	02U	03D	03DWU	03U	04D	04DWU	04U	05D	05DWU	05U	06D	06DWU	06U
NATIVE ANNUAL & BIENNIAL FORBS																		
Acrolasia dispersa				P														
Androsace septentrionalis	P															1		
Bahia dissecta										P								
Boechera fendleri																		
Chenopodium leptophyllum				1			P			1			P					
Chenopodium simplex	P						P			P			P			P		
Collinsia parviflora																		
Collomia linearis																		
Draba spp.																		
Dracocephalum parviflorum																		
Epilobium brachycarpum				P						1			P			P		
Frasera speciosa	P																	
Gaura mollis	P																	
Grindelia squarrosa				1			1											
Helianthus annuus	P																	
Machaeranthera bigelovii																		
Oreocarya virgata				P														
Polygonum douglasii	P									P			P					
Pterogonum alatum																		
Silene antirrhina	P			P			P						P					
TOTAL NATIVE ANN. & BIEN. FORBS	**P**	---	---	**2**	---	---	**1**	---	---	**2**	---	---	**P**	---	---	**1**	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																		
Acosta diffusa																		
Alyssum minus				P			P			5(1)								
Bassia sieversiana				P				1		P			P			P		
Camelina microcarpa				P														
Carduus nutans ssp. macrolepis	P																	
Chenopodium foliosum																		
Cirsium vulgare																		
Conyza canadensis																P		
Lactuca serriola	P						P			P			P			P		
Lappula redowskii				P						1								
Lepidium densiflorum																		
Melilotus albus																		
Melilotus officinale	P																	
Nicotiana attenuata										P			P					
Noccaea montana																		
Podospermum laciniatum	P																	
Sisymbrium altissimum	2			1			P			3			16	4		P		
Solanum spp.																		
Solanum triflorum																		
Teloxys botrys													P					
Tithymalus peplus																		
Tragopogon dubius ssp. major	P						P											
Verbascum thapsus	2			P			8(1)			P			P			1		
TOTAL INTRO. ANN. & BIEN. FORBS	**4**	---	---	**1**	---	---	**8(1)**	**1**	---	**9(1)**	---	---	**16**	**4**	---	**1**	---	---
INTRODUCED ANNUAL GRASSES																		
Anisantha tectorum	1			1			P			7			6	(1)			1	
Bromus japonicus																		
Cylindropyrum cylindricum				P									P					
Triticum aestivum																P		
TOTAL INTRO. ANN. GRASSES	**1**	---	---	**1**	---	---	**P**	---	---	**7**	---	---	**6**	**(1)**	---	**P**	**1**	---
NATIVE PERENNIAL FORBS																		
Achillea lanulosa	P						P			1			P					
Aletes acaulis													P					
Allium cernuum							P											
Amerosedum lanceolatum																		
Antennaria rosea																		
Apocynum androsaemifolium													P			P		
Arnica fulgens																		
Artemisia frigida	P			7			P			P								
Artemisia ludoviciana				1			P			P			1(1)			P		
Asclepias stenophylla																		
Asclepias viridiflora																		
Aster porteri	P			P			P			1			P			P		
Astragalus agrestis																		
Astragalus drummondii																		
Astragalus laxmannii	1															P		
Astragalus miser var. oblongifolius	P			1			P											
Astragalus shortianus							P											
Astragalus spp.																		
Campanula rotundifolia	P			P			P						P					
Cerastium strictum																		
Cirsium ochrocentrum				P			1											
Corydalis aurea	P									1						2		
Drymocallis fissa	P			P						P						P		
Erigeron speciosus																		
Eriogonum umbellatum var. umbellatum				P						P								
Erysimum capitatum				P			P			P						P		
Euphorbia spp.				P														
Gaillardia aristata				1			P			P			P					
Galium septentrionale	P																	
Geranium caespitosum ssp. caespitosum	P			4			P			P			P			P		
Harbouria trachypleura							P						1					
Helianthus pumilus				P			P									P		
Heterotheca foliosa										5								
Heterotheca villosa	P			3			P			1								
Heuchera spp.																		
Lesquerella montana							P											
Liatris punctata				1														
Lupinus argenteus																		
Maianthemum stellatum																		
Mertensia lanceolata	P			P			P						P					
Monarda fistulosa var. menthifolia																		
Oenothera caespitosa ssp. caespitosa	P			1			P			P								
Oligosporus dracunculus ssp. glaucus	P																	
Oxybaphus hirsutus										P								
Oxytropis lambertii				1														
Packera fendleri																		
Paronychia jamesii																		
Penstemon glaber	P																	
Penstemon spp.																		
Penstemon virens	P						P			P			P			1		
Phacelia heterophylla				P			1	(1)		P			1			7		
Physaria vitulifera																		
Potentilla hippiana																P		
Pulsatilla ludoviciana	P						P			P			P			P		
Rumex triangulivalvis																		
Scutellaria brittonii				P						P			P					
Senecio integerrimus																		
Solidago missouriensis																		
Solidago simplex var. simplex	P									(1)			3			P		
Unknown forb																		
Urtica gracilis ssp. gracilis																P		
Vaccinium myrtillus ssp. oreophilum																		
TOTAL NATIVE PERENNIAL FORBS	**1**	---	---	**20**	---	---	**2**	**(1)**	---	**9(1)**	---	---	**6(1)**	---	---	**10**	---	---
INTRODUCED PERENNIAL FORBS																		
Arabis hirsuta																		
Breea arvensis							6									1		
Taraxacum officinale	P	1					P											
Verbena bracteata	P																	
TOTAL INTRO. PERENNIAL FORBS	**P**	**1**	---	---	---	---	**6**	---	---	---	---	---	---	---	---	**1**	---	---

Scientific Name	07D	07DWU	07U	08D	08DWU	08U	09D	09DWU	09U	10D	10DWU	10U	11D	11DWU	11U	12D	12DWU	12U
NATIVE ANNUAL & BIENNIAL FORBS																		
Acrolasia dispersa										P								
Androsace septentrionalis				P			P									P		
Bahia dissecta																		
Boechera fendleri				P														
Chenopodium leptophyllum	P			P			P			1			P				1	
Chenopodium simplex				P			1			2			1			4(1)	1	
Collinsia parviflora																		
Collomia linearis																P		
Draba spp.																		
Dracocephalum parviflorum							P									2(2)		
Epilobium brachycarpum				P			P			P						P		
Frasera speciosa				P														
Gaura mollis																		
Grindelia squarrosa	3												3(1)			P		
Helianthus annuus				1			P											
Machaeranthera bigelovii																		
Oreocarya virgata																		
Polygonum douglasii																		
Pterogonum alatum																		
Silene antirrhina				P						P						P		
TOTAL NATIVE ANN. & BIEN. FORBS	**3**	---	---	**1**	---	---	**1**	---	---	**3**	---	---	**4(1)**	---	---	**6(3)**	**2**	---
INTRODUCED ANNUAL & BIENNIAL FORBS																		
Acosta diffusa							P						P					
Alyssum minus				P									1	1				
Bassia sieversiana																		
Camelina microcarpa													P					
Carduus nutans ssp. macrolepis				P			P						P					
Chenopodium foliosum																		
Cirsium vulgare																		
Conyza canadensis				P												P		
Lactuca serriola				P			P									1(1)	1	
Lappula redowskii	P																	
Lepidium densiflorum																		
Melilotus albus																		
Melilotus officinale																		
Nicotiana attenuata																		
Noccaea montana				P														
Podospermum laciniatum																		
Sisymbrium altissimum										P			1			1		
Solanum spp.																		
Solanum triflorum																		
Teloxys botrys																		
Tithymalus peplus										P								
Tragopogon dubius ssp. major																		
Verbascum thapsus	P			P			P			P			2			2		
TOTAL INTRO. ANN. & BIEN. FORBS	**P**	---	---	**P**	---	---	**P**	---	---	**P**	---	---	**4**	**1**	---	**4(1)**	**1**	---
INTRODUCED ANNUAL GRASSES																		
Anisantha tectorum	P			P									P					
Bromus japonicus													P					
Cylindropyrum cylindricum																		
Triticum aestivum																		
TOTAL INTRO. ANN. GRASSES	**P**	---	---	**P**	---	---	---	---	---	---	---	---	**P**	---	---	---	---	---
NATIVE PERENNIAL FORBS																		
Achillea lanulosa	P			P						P						P		
Aletes acaulis				P			1											
Allium cernuum																		
Amerosedum lanceolatum																		
Antennaria rosea																		
Apocynum androsaemifolium																7(1)		
Arnica fulgens																P		
Artemisia frigida	4(1)															P		
Artemisia ludoviciana	1			1			P						P					
Asclepias stenophylla																		
Asclepias viridiflora																		
Aster porteri	1									P								
Astragalus agrestis	1																	
Astragalus drummondii																		
Astragalus laxmannii	1			P														
Astragalus miser var. oblongifolius	P			P			P			1			P			P		
Astragalus shortianus	P																	
Astragalus spp.							P											
Campanula rotundifolia	1			P			P			1						1		
Cerastium strictum																		
Cirsium ochrocentrum													(1)					
Corydalis aurea				P			2(1)			1						1		
Drymocallis fissa	P						P			1			P					
Erigeron speciosus																		
Eriogonum umbellatum var. umbellatum	P			P									P					
Erysimum capitatum	1			P			P			P			P					
Euphorbia spp.	P																	
Gaillardia aristata	P									P			P					
Galium septentrionale																		
Geranium caespitosum ssp. caespitosum	3						P			P			P					
Harbouria trachypleura	P			P						P			P					
Helianthus pumilus	1			P			P						P			1		
Heterotheca foliosa	P						P											
Heterotheca villosa	1									P			1					
Heuchera spp.																		
Lesquerella montana																		
Liatris punctata																		
Lupinus argenteus																		
Maianthemum stellatum																		
Mertensia lanceolata	P			P						P								
Monarda fistulosa var. menthifolia													P					
Oenothera caespitosa ssp. caespitosa	P												P					
Oligosporus dracunculus ssp. glaucus																		
Oxybaphus hirsutus																		
Oxytropis lambertii													P					
Packera fendleri	P																	
Paronychia jamesii																		
Penstemon glaber																P		
Penstemon spp.																		
Penstemon virens	P			2			2			1			1			P		
Phacelia heterophylla	2			2			7						P					
Physaria vitulifera																		
Potentilla hippiana							P											
Pulsatilla ludoviciana							P			P								
Rumex triangulivalvis													P					
Scutellaria brittonii		1								P			P					
Senecio integerrimus				P														
Solidago missouriensis																		
Solidago simplex var. simplex				P			P											
Unknown forb																		
Urtica gracilis ssp. gracilis																		
Vaccinium myrtillus ssp. oreophilum																		
TOTAL NATIVE PERENNIAL FORBS	**17(1)**	**1**	---	**5**	---	---	**12(1)**	---	---	**5**	---	---	**2(1)**	---	---	**10(1)**	---	---
INTRODUCED PERENNIAL FORBS																		
Arabis hirsuta																		
Breea arvensis				P						P			P			3(1)		
Taraxacum officinale				P												P		
Verbena bracteata													1					
TOTAL INTRO. PERENNIAL FORBS	---	---	---	**P**	---	---	---	---	---	**P**	---	---	**1**	---	---	**3(1)**	---	---

Scientific Name	13D	13DWU	13U	14D	14DWU	14U	15D	15DWU	15U	16D	16DWU	16U	17D	17DWU	17U	18D	18DWU	18U
NATIVE ANNUAL & BIENNIAL FORBS																		
Acrolasia dispersa				1	1		P			P			P					
Androsace septentrionalis	P									P								
Bahia dissecta																		
Boechera fendleri																		
Chenopodium leptophyllum	P			3			P			P								
Chenopodium simplex	2	1(1)		8	2		P						P					
Collinsia parviflora				P														
Collomia linearis				P														
Draba spp.																P		
Dracocephalum parviflorum	P																	
Epilobium brachycarpum	P			P			P			4(1)								
Frasera speciosa																		
Gaura mollis							P											
Grindelia squarrosa				P						(1)			1					
Helianthus annuus				1														
Machaeranthera bigelovii													1					
Oreocarya virgata																		
Polygonum douglasii				P			P											
Pterogonum alatum										P								
Silene antirrhina				2			P	1								P		
TOTAL NATIVE ANN. & BIEN. FORBS	**2**	**1(1)**	---	**15**	**3**	---	**P**	**1**	---	**4(2)**	---	---	**2**	---	---	**P**	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																		
Acosta diffusa																		
Alyssum minus																		
Bassia sieversiana																		
Camelina microcarpa																		
Carduus nutans ssp. macrolepis				P			1			(1)								
Chenopodium foliosum				P														
Cirsium vulgare							1											
Conyza canadensis																		
Lactuca serriola	P			P	1		P			P								
Lappula redowskii																		
Lepidium densiflorum				P														
Melilotus albus				P														
Melilotus officinale																		
Nicotiana attenuata	P																	
Noccaea montana																		
Podospermum laciniatum																		
Sisymbrium altissimum	P			3														
Solanum spp.							P											
Solanum triflorum										P								
Teloxys botrys																		
Tithymalus peplus																		
Tragopogon dubius ssp. major							P											
Verbascum thapsus	P			P			7(2)			P			1					
TOTAL INTRO. ANN. & BIEN. FORBS	**P**	---	---	**3**	**1**	---	**9(2)**	---	---	**(1)**	---	---	**1**	---	---	---	---	---
INTRODUCED ANNUAL GRASSES																		
Anisantha tectorum				3(3)			P			P			P					
Bromus japonicus							P											
Cylindropyrum cylindricum																		
Triticum aestivum																		
TOTAL INTRO. ANN. GRASSES	---	---	---	**3(3)**	---	---	**P**	---	---	**P**	---	---	**P**	---	---	---	---	---
NATIVE PERENNIAL FORBS																		
Achillea lanulosa							P			P						P		
Aletes acaulis	P									1			P			P		
Allium cernuum										P			P					
Amerosedum lanceolatum													P			P		
Antennaria rosea																P		
Apocynum androsaemifolium	11																	
Arnica fulgens	P																	
Artemisia frigida							P			P						P		
Artemisia ludoviciana				P			P			2(2)			3					
Asclepias stenophylla							P											
Asclepias viridiflora							P											
Aster porteri							P			P			P					
Astragalus agrestis										P								
Astragalus drummondii							P											
Astragalus laxmannii	P			P									P					
Astragalus miser var. oblongifolius	2						P			1						P		
Astragalus shortianus													P					
Astragalus spp.										P								
Campanula rotundifolia	P			(1)			1			2						P		
Cerastium strictum				P			P											
Cirsium ochrocentrum																		
Corydalis aurea	4			P			P											
Drymocallis fissa	1						P			P						P		
Erigeron speciosus							P											
Eriogonum umbellatum var. umbellatum										P			P					
Erysimum capitatum							P			1			1					
Euphorbia spp.																		
Gaillardia aristata				1(1)			P											
Galium septentrionale	P			P														
Geranium caespitosum ssp. caespitosum				3(1)			P			P			P					
Harbouria trachypleura																		
Helianthus pumilus	P			1			4						P					
Heterotheca foliosa	P												P					
Heterotheca villosa							P									P		
Heuchera spp.							P											
Lesquerella montana							P						P					
Liatris punctata										P			P					
Lupinus argenteus	P			P														
Maianthemum stellatum																P		
Mertensia lanceolata							P			P								
Monarda fistulosa var. menthifolia				(1)														
Oenothera caespitosa ssp. caespitosa				1														
Oligosporus dracunculus ssp. glaucus																		
Oxybaphus hirsutus																		
Oxytropis lambertii																		
Packera fendleri										P			P					
Paronychia jamesii													P					
Penstemon glaber	P																	
Penstemon spp.													P					
Penstemon virens				P			P			2			2(1)			P		
Phacelia heterophylla	3			2(1)	(1)		5	1		12			P					
Physaria vitulifera							P						P					
Potentilla hippiana							P											
Pulsatilla ludoviciana							1			P								
Rumex triangulivalvis																		
Scutellaria brittonii				P			P						P					
Senecio integerrimus																		
Solidago missouriensis				P														
Solidago simplex var. simplex				P			1									P		
Unknown forb																P		
Urtica gracilis ssp. gracilis																		
Vaccinium myrtillus ssp. oreophilum				P														
TOTAL NATIVE PERENNIAL FORBS	**21**	---	---	**8(5)**	**(1)**	---	**12**	**1**	---	**21(2)**	---	---	**6(1)**	---	---	**P**	---	---
INTRODUCED PERENNIAL FORBS																		
Arabis hirsuta																P		
Breea arvensis				P														
Taraxacum officinale	P			P			P											
Verbena bracteata																		
TOTAL INTRO. PERENNIAL FORBS	**P**	---	---	**P**	---	---	**P**	---	---	---	---	---	---	---	---	**P**	---	---

Eldorado Fire at Walker Ranch Combined Data for All Sites - 2002 (concluded).

NATIVE PERENNIAL GRASSES (cool)																																		
Achnatherum nelsonii	STIPA NELSONII	NELSON NEEDLEGRASS	0.00	5.56	0.00	0.00	0.00																											
Agrostis scabra		TICKLEGRASS	0.00	5.56	0.00	0.00	0.00	P																										
Bromopsis lanatipes	BROMUS LANATIPES	WOOLY BROME	0.00	11.11	0.00	0.00	0.00							P																				
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	2.61 (2.89)	77.78	8.16 (9.24)	3.17	6.74				4	1(1)		5			10			1			1			6			1			P		
Carex sp. 1		SEDGE	0.00	5.56	0.00	0.00	0.00																									P		
Carex spp.		SEDGE	0.33 (0.67)	50.00	1.04 (2.13)	0.83	1.77	1(1)			P																							
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	0.22	44.44	0.69	0.22	0.47	2			P			1			P									1								
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.33	38.89	1.04	0.33	0.71				P			1						1						3			P					
Elymus spp.			0.00	5.56	0.00	0.00	0.00																											
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	1.89 (2.11)	33.33	5.90 (6.75)	2.17	4.61	11	2														5	1					8(1)			3		
Elymus virginicus		VIRGINIA WILDRYE	0.00	5.56	0.00	0.00	0.00																						P					
Festuca brachyphylla ssp. coloradensis	FESTUCA OVINA VAR. BRACHYPHYLLA	SHEEP FESCUE	0.00	5.56	0.00	0.06	0.12																											
Hesperostipa comata	STIPA COMATA	NEEDLE AND THREAD GRASS	0.06	22.22	0.17	0.06	0.12							P			P																	
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.00	33.33	0.00	0.00	0.00	P						P			P						P			P								
Leucopoa kingii		SPIKE FESCUE	0.33	66.67	1.04	0.33	0.71	P						P			P			P			P			1			P					
Poa agassizensis		AGASSIZ BLUEGRASS	0.06	27.78	0.17	0.06	0.12	1						P																				
Poa fendleriana		MUTTON BLUEGRASS	0.00	5.56	0.00	0.00	0.00																											
Schedonnardus paniculatus		TUMBLEGRASS	0.00	5.56	0.00	0.00	0.00																						P					
TOTAL NATIVE PERENNIAL GRASSES (c)			**5.8 (6.7)**	**100.0**	**18.2 (21.3)**	**7.2**	**19.1**	**15(1)**	**2**	---	**4**	**1(1)**	---	**7**	---	---	**10**	---	---	**2**	---	---	**6**	**1**	---	**11**	---	---	**9(1)**	---	---	**3**	---	---
INTRODUCED PERENNIAL GRASSES (cool)																																		
Ceratochloa carinata	CERATOCHLOA MARGINATA,BROMUS MARGINATUS	MOUNTAIN BROME	1.83 (1.94)	33.33	5.73 (6.22)	2.06	4.37	7	1(1)														P						10(1)			7		
Dactylis glomerata		ORCHARDGRASS	0.00	5.56	0.00	0.00	0.00																											
Poa compressa		CANADA BLUEGRASS	0.11	11.11	0.35	0.11	0.24	1																		1								
Triticum aestivum x elytrigia elongata		REGREEN	0.39	61.11	1.22	0.44	0.95	1(1)			P			P			P			1			3			P			P			P		
TOTAL INTRO. PERENNIAL GRASSES (c)			**2.3 (2.4)**	**61.1**	**7.3 (7.8)**	**2.6**	**6.9**	**9(1)**	**1(1)**	---	**P**	---	---	**P**	---	---	**P**	---	---	**1**	---	---	**3**	---	---	**1**	---	---	**10(1)**	---	---	**7**	---	---
NATIVE PERENNIAL GRASSES (warm)																																		
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	0.39	44.44	1.22 (1.24)	0.50	1.06	2	(1)								P						P						3			P		
Muhlenbergia montana		MOUNTAIN MUHLY	0.17	11.11	0.52	0.17	0.35										P																	
Schizachyrium scoparium	ANDROPOGON SCOPARIUM	LITTLE BLUESTEM	0.00	5.56	0.00	0.00	0.00																											
Sporobolus cryptandrus		SAND DROPSEED	0.00	11.11	0.00	0.00	0.00													P									P					
TOTAL NATIVE PERENNIAL GRASSES (w)			**0.6**	**55.6**	**1.7**	**0.7**	**1.8**	**2**	**(1)**	---	---	---	---	---	---	---	**P**	---	---	**P**	---	---	**P**	---	---	---	---	---	**3**	---	---	**P**	---	---
NATIVE SHRUBS																																		
Acer glabrum		ROCKY MOUNTAIN MAPLE	0.00	11.11	0.00	0.00	0.00																											
Arctostaphylos uva-ursi		KINNIKINNICK	0.06	16.67	0.17	0.06	0.12	1																										
Ceanothus fendleri		BUCKBRUSH	1.39 (1.61)	94.44	4.34 (5.15)	2.11	4.49	P			1			2(1)	1(1)		1			P			P			1(1)			P			P		
Cercocarpus montanus		BIRCHLEAF MOUNTAIN MAHOGANY	0.22	22.22	0.69	0.20	0.59										P			P														
Chrysothamnus parryi		PARRY RABBITBRUSH	0.00	5.56	0.00	0.00	0.00																											
Oreobatus deliciosus	RUBUS DELICIOSUS	BOULDER RASPBERRY	0.00	22.22	0.00	0.00	0.00										P															P		
Padus virginiana ssp. melanocarpa	PRUNUS VIRGINIANA SSP. MELANOCARPA	CHOKECHERRY	0.00	5.56	0.00	0.00	0.00																											
Physocarpus monogynus		NINEBARK	0.28	44.44	0.87	0.39	0.83							P			P						P			P						P		
Ribes cereum		WAX CURRANT	0.11	66.67	0.35	0.11	0.24	P			P			P															1			P		
Rosa arkansana		ARKANSAS ROSE	0.17	33.33	0.52	0.17	0.35				P									P												1		
Rosa woodsii		WOOD'S ROSE	0.00	11.11	0.00	0.00	0.00																											
Rubus idaeus ssp. melanolasius		AMERICAN RED RASPBERRY	0.17	55.56	0.52	0.17	0.35				P			P			P						P						P			P		
Symphoricarpos rotundifolius	SYMPHORICARPOS OREOPHILUS	MOUNTAIN SNOWBERRY	0.06	16.67	0.17	0.06	0.12																											
Yucca glauca		SPANISH BAYONET	0.00	5.56	0.00	0.00	0.00																											
TOTAL NATIVE SHRUBS			**2.4 (2.7)**	**100.0**	**7.6 (0.5)**	**3.3**	**8.8**	**1**	---	---	**1**	---	---	**2(1)**	**1(1)**	---	**1**	---	---	**P**	---	---	**P**	---	---	**1(1)**	---	---	**1**	---	---	**1**	---	---
NATIVE TREES																																		
Pinus ponderosa ssp. scopulorum (dead)		PONDEROSA PINE (DEAD)	5.39 (0.22)	66.67	16.84 (0.71)	5.61	11.94			[1]			[12]			[5]						[7]		[1]	[8]			[6]		[2]	[8]			[9]
Populus tremuloides	POPULUS TREMULA	QUAKING ASPEN	0.72 (0.78)	22.22	2.26 (2.49)	0.83	1.77																									1		
Populus tremuloides (dead)		ASPEN (DEAD)	0.11 (0.06)	11.11		0.11	0.24																											[1]
Pseudotsuga menziesii		DOUGLAS-FIR	3.28 (0.17)	5.56	10.24	3.28	6.97																											
Pseudotsuga menziesii (dead)		DOUGLAS FIR	2.78 (0.11)	55.56	8.68 (0.36)	2.89	6.15			[8]															[2]									
Sabina scopulorum (dead)	JUNIPERUS SCOPULORUM	ROCKY MOUNTAIN JUNIPER	0.50 (0.06)	22.22	1.56 (0.18)	0.56	1.18												[1]	P														
TOTAL NATIVE TREES			**4.0 (0.9)**	**27.8**	**12.5 (3.0)**	**4.1**	**10.9**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**1**	---	---
FERNS																																		
Cystopteris fragilis		BRITTLEFERN	0.00	5.56	0.00	0.00	0.00										P																	
TOTAL FERNS			**0.0**	**5.6**	**0.0**	**0.0**	**0.0**	---	---	---	---	---	---	---	---	---	**P**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MOSS																																		
Moss		MOSS	0.00 (0.11)	5.56	0.00 (0.36)	0.11	0.24																											
TOTAL MOSS			**0.0 (0.1)**	**5.6**	**0.0 (0.4)**	**0.1**	**0.3**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Standing dead		STANDING DEAD	1.11 (0.00)	55.56		1.22		1	1		1			4			2			3												1		
Litter		LITTER	20.67 (24.17)	100.00		24.17		41	2		18	1		30			26			30			19			20			15	1		16	1	
Bare soil		BARE SOIL	34.22 (39.06)	100.00		39.06		16	2		39	10		34	3		28	1		29	2		43	6		38	5		39	5		44	7	
Rock		ROCK	3.28 (3.09)	77.78		3.89					1			1			5				1		6	1		3			9			4	2	
TOTALS			91.3 (98.0)			115.3		91			88			95			99			93			90			94			92			90		
TOTALS (LAYER)								91	9	0	88	12	0	95	5	0	99	1	0	93	7	0	90	9	0	94	6	0	92	6	0	90	10	0
TOTAL VEGETATION COVER (LAYER)								33(2)	4(2)	0	29	1(1)	0	26(2)	2(2)	0	38(2)	0	0	31(1)	4(1)	0	22	2	0	33(2)	1	0	29(2)	0	0	25(1)	0	0
TOTAL VEGETATION COVER			32.0 (31.7)		100.0 (101.4)	47.0 (s=12.3)	100.0	33(8)			29(2)			26(6)			38(2)			31(6)			22(2)			33(3)			29(2)			25(1)		
			Std.Dev.= 9.7																															
GROUND COVER (Litter+Rock+Veg+St.Dead)			57.1 (60.6)			76.3 (64.4)		75(2)	7(2)	0	49	2(1)	0	61(2)	2(2)	0	71(2)	0	0	64(1)	5(1)	0	47	3	0	56(2)	1	0	53(2)	1	0	46(1)	3	0
SPECIES DENSITY (# of species/100 sq m.)								49			43			47			46			36			36			39			46			39		
(AVERAGE= 40.7 Std.Dev.= 7.7)																																		
SPECIES DENSITY (LAYER)								49	4	0	43	1	0	46	3	0	46	0	0	36	2	0	35	2	0	38	1	0	46	0	0	39	0	0

NATIVE PERENNIAL GRASSES (cool)																											
Achnatherum nelsonii																			P								
Agrostis scabra																											
Bromopsis lanatipes																						P					
Carex pensylvanica ssp. heliophila				4(2)	1								P			11(2)			P			2			2	3	
Carex sp. 1																											
Carex spp.	P			1			(1)			1(1)	1		2			P									1	5	
Elymus elymoides				P												P			P								
Elymus lanceolatus fm. albicans																P						1					
Elymus spp.	P																										
Elymus trachycaulus	5			2	1																						
Elymus virginicus																											
Festuca brachyphylla ssp. coloradensis										(1)																	
Hesperostipa comata				P												1											
Koeleria macrantha																			P								
Leucopoa kingii				P												1			P			3			1		
Poa agassizensis	P						P												P								
Poa fendleriana							P																				
Schedonnardus paniculatus																											
TOTAL NATIVE PERENNIAL GRASSES (c)	**5**	---	---	**7(2)**	**2**	---	**(1)**	---	---	**1(2)**	**1**	---	**2**	---	---	**13(2)**	---	---	**P**	---	---	**6**	---	---	**4**	**8**	---
INTRODUCED PERENNIAL GRASSES (cool)																											
Ceratochloa carinata	8			1	1																						
Dactylis glomerata	P																										
Poa compressa																											
Triticum aestivum x elytrigia elongata	2			P																							
TOTAL INTRO. PERENNIAL GRASSES (c)	**10**	---	---	**1**	**1**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
NATIVE PERENNIAL GRASSES (warm)																											
Chondrosum gracile	(1)			1												1											
Muhlenbergia montana																						3					
Schizachyrium scoparium																						P					
Sporobolus cryptandrus																											
TOTAL NATIVE PERENNIAL GRASSES (w)	**(1)**	---	---	**1**	---	---	---	---	---	---	---	---	---	---	---	**1**	---	---	---	---	---	**3**	---	---	---	---	---
NATIVE SHRUBS																											
Acer glabrum										P						P											
Arctostaphylos uva-ursi	P												P														
Ceanothus fendleri	2			1(1)			2(2)	1(1)		9	2		(1)			4			P			2(1)					
Cercocarpus montanus				(1)																		4					
Chrysothamnus parryi																									P		
Oreobatus deliciosus																P						P					
Padus virginiana ssp. melanocarpa													P														
Physocarpus monogynus							4(2)									P						1					
Ribes cereum	P			P									P			P			P			1			P		
Rosa arkansana				P						2						P											
Rosa woodsii													P												P		
Rubus idaeus ssp. melanolasius							3			P			P						P								
Symphoricarpos rotundifolius							P						1												P		
Yucca glauca																						P					
TOTAL NATIVE SHRUBS	**2**	---	---	**1(2)**	---	---	**9(4)**	**1(1)**	---	**11**	**2**	---	**1(1)**	---	---	**4**	---	---	**P**	---	---	**8(1)**	---	---	**P**	---	---
NATIVE TREES																											
Pinus ponderosa ssp. scopulorum (dead)					[1]	[28]												[7]			[3]						[3]
Populus tremuloides							3			2(1)	1		7														
Populus tremuloides (dead)							[1]																				
Pseudotsuga menziesii																									3		56
Pseudotsuga menziesii (dead)			[4]						[9]			[9]			[7]			[4]			[6]			[1]		[2]	
Sabina scopulorum (dead)															[4]		[1]	[4]									
TOTAL NATIVE TREES	---	---	---	---	---	---	**3**	---	---	**2(1)**	**1**	---	**7**	---	---	---	---	---	---	---	---	---	---	---	**3**	---	**56**
FERNS																											
Cystopteris fragilis																											
TOTAL FERNS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MOSS																											
Moss																										2	
TOTAL MOSS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**2**	---
Standing dead	3						1									2	1					2					
Litter	14	1		18	1		12	1		8	1		14	1		13	3		17	3		28	1		33	46	
Bare soil	54	3		33	22		35	2		40	2		35	6		27	4		48	6		33			1	1	
Rock							8	2		6	1		1			4	4		1			10					
TOTALS	96			72			91			91			89			85			91			99			97		
TOTALS (LAYER)	96	4	0	72	27	0	91	9	0	91	9	0	89	11	0	85	14	0	91	9	0	99	1	0	41	57	56
TOTAL VEGETATION COVER (LAYER)	25(1)	0	0	21(6)	4	0	35(11)	4(1)	0	37(3)	5(1)	0	39(9)	4(1)	0	39(4)	2	0	25(5)	0	0	26(2)	0	0	7	10	56
TOTAL VEGETATION COVER	25(1)			21(10)			35(16)			37(9)			39(14)			39(6)			25(5)			26(2)			63(10)		
GROUND COVER (Litter+Rock+Veg+St.Dead)	42(1)	1	0	39(6)	5	0	56(11)	7(1)	0	51(3)	7(1)	0	54(9)	5(1)	0	58(4)	10	0	43(5)	3	0	66(2)	1	0	40	56	56
SPECIES DENSITY (# of species/100 sq m.)	35			44			32			31			48			57			40			39			25		
(AVERAGE= 40.7 Std.Dev.= 7.7)																											
SPECIES DENSITY (LAYER)	35	0	0	44	4	0	31	4	0	31	4	0	48	4	0	57	2	0	40	0	0	39	0	0	24	3	1

(#) = second hit
[#] = dead value not included in live vegetation totals
{#} = cover value if tree canopy is excluded

Eldorado Fire at Walker Ranch Combined Data for All Sites - 2007

Walker Ranch 2007 Sample dates July 21, 22, 23, 24.			AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	01D	02D	03D	04D	05D	05DWU	05U	06D	06DWU	06U	07D	08D	08DWU	08U	09D	09DWU	09U	10D	11D	11DWU	11U	12D	12DWU	12U	13D	13DWU	13U	14D	14DWU	14U	15D	15DWU	15U	16D	16DWU	16U	17D	17DWU	17U	18D	18DWU	18U
SCIENTIFIC NAME	SYNONYM	COMMON																																													
NATIVE ANNUAL & BIENNIAL FORBS																																															
Acrolasia dispersa	MENTZELIA	BUSHY BLAZINGSTAR	0.00	5.56	0.00	0.00	0.00																													P										
Androsace septentrionalis		PYGMYFLOWER ROCKJASMINE	0.00	22.22	0.00	0.00	0.00	P							P													P																	P		
Bahia dissecta		CUTLEAF	0.11	16.67	0.25	0.11	0.21				2	P			P																					P											
Chenopodium leptophyllum		NARROWLEAF GOOSEFOOT	0.00	16.67	0.00	0.00	0.00			P																									P											
Chenopodium simplex	CHENOPODIUM GIGANTOSPERMUM,C. HYBRIDUM VAR. SIMPLEX	MAPLELEAF GOOSEFOOT	0.00	11.11	0.00	0.00	0.00															P																							P		
Collinsia parviflora		BABY BLUE-EYES	0.00	33.33	0.00	0.00	0.00	P														P														P			P			P			P		
Epilobium brachycarpum	EPILOBIUM PANICULATUM	BIGFRUIT WILLOWHERB	0.00	44.44	0.00	0.00	0.00	P							P							P			P			P			P			P			P								
Erigeron divergens		SPREADING FLEABANE	0.00	16.67	0.00	0.00	0.00								P				P																P											
Frasera speciosa		GREEN GENTIAN	0.00	5.56	0.00	0.00	0.00																							P																
Grindelia squarrosa		GUMWEED	0.06	66.67	0.12	0.06	0.10	P			P	P			P			P							P	P			P			P			P				1			P					
Machaeranthera bigelovii		BIGELOW ASTER	0.33	61.11	0.74	0.33	0.62	P				P							P			1			P				4			P			P			P			1			P				
Oenothera villosa ssp. strigosa	OENOTHERA STRIGOSA	HAIRY EVENINGPRIMROSE	0.00	5.56	0.00	0.00	0.00	P																																						
Polygonum douglasii	POLYGONUM SAVATCHENSE,POLYGONUM MONTANUM	DOUGLAS KNOTWEED	0.00	11.11	0.00	0.00	0.00								P																P																
Pterogonum alatum	ERIOGONUM ALATUM	WINGED BUCKWHEAT	0.00	27.78	0.00	0.00	0.00		P	P															P	P														P							
Silene antirrhina		SLEEPY CATCHFLY	0.00	22.22	0.00	0.00	0.00	P	P																P																					P		
TOTAL NATIVE ANN. & BIEN. FORBS			0.5	100.0	1.1	0.5	1.0	P	P	P	2	P	---	---	P	---	---	P	P	---	---	1	---	---	P	P	---	---	4	---	---	P	---	---	P	---	---	P	---	---	2	---	---	P	---	---	P	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																																															
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED	0.50 {0.56}	11.11	1.11 {1.29}	0.56	1.03															P				9	1																				
Alyssum minus		ALYSSUM	0.28	55.56	0.62	0.28	0.52		P	1	1							P	P			P			P	3					P										P						
Camelina microcarpa		LITTLEPOD FALSEFLAX	0.00	16.67	0.00	0.00	0.00		P									P								P																					
Carduus nutans ssp. macrolepis		MUSK THISTLE	0.00	11.11	0.00	0.00	0.00	P																											P												
Conyza canadensis		HORSEWEED	0.00	22.22	0.00	0.00	0.00								P							P			P												P										
Cynoglossum officinale		HOUND'S TONGUE	0.00	11.11	0.00	0.00	0.00																		P										P												
Descurainia sophia		FLIXWEED TANSYMUSTARD	0.00	5.56	0.00	0.00	0.00																														P										
Lactuca serriola		PRICKLY LETTUCE	0.06	55.56	0.12	0.06	0.10	P	P	P					P										P	P									1			P			P			P				
Lappula redowskii		EARLY STICKSEED	0.00	5.56	0.00	0.00	0.00		P																																						
Sisymbrium altissimum		JIM HILL MUSTARD	0.11	27.78	0.25	0.11	0.21		P	2												P				P									P												
Tragopogon dubius ssp. major		YELLOW SALSIFY	0.06	72.22	0.12	0.06	0.10	P	P	P	P				P			P	P			1			P	P			P			P																
Turritis glabra	ARABIS GLABRA	TOWER MUSTARD	0.00	27.78	0.00	0.00	0.00	P											P			P																					P				
Verbascum thapsus		MULLEIN	0.83	77.78	1.85 {1.93}	1.22	2.27	P		1	4	1			P			1							P	P			2	(7)		1			3			1			1			P				
TOTAL INTRO. ANN. & BIEN. FORBS			1.8 {1.9}	100.0	4.1 {4.4}	2.3	4.4	P	P	4	5	1	---	---	P	---	---	1	P	---	---	1	---	---	P	12	1	---	2	(7)	---	1	---	---	4	---	---	1	---	---	1	---	---	P	---	---	P	---	---
INTRODUCED ANNUAL GRASSES																																															
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	9.94 {10.00}	77.78	22.07 {23.17}	10.72	19.90		19	25(2)	22(1)	20			2			13(1)							1	13(2)						6			8(1)			31(2)	1		9(3)			10(1)			P		
Bromus japonicus		JAPANESE BROME	0.00	11.11	0.00	0.00	0.00															P				P																					
Cylindropyrum cylindricum	AEGILOPS CYLINDRICA	GOAT GRASS	0.00	5.56	0.00	0.00	0.00		P																																						
Triticum aestivum		WHEAT	0.00	5.56	0.00	0.00	0.00																																								P		
TOTAL INTRO. ANN. GRASSES			9.9 {10.0}	83.3	22.1 {23.2}	10.7	20.9	---	19	25(2)	22(1)	20	---	---	2	---	---	13(1)	---	---	---	P	---	---	1	13(2)	---	---	---	---	---	6	---	---	8(1)	---	---	31(2)	1	---	9(3)	---	---	10(1)	---	---	P	---	---
NATIVE PERENNIAL FORBS																																															
Achillea lanulosa		WESTERN YARROW	1.22	77.78	2.71	1.39	2.58	1		P	P	P			1				1(1)			1			8	1			P			P			9(2)			P								P		
Aletes acaulis		STEMLESS INDIAN PARSLEY	0.06	33.33	0.12	0.06	0.10												1										P			P									P			P			P		
Allium cernuum		NODDING ONION	0.00	16.67	0.00	0.00	0.00			P																															P			P				
Amerosedum lanceolatum	SEDUM LANCEOLATUM	YELLOW STONECROP	0.00	11.11	0.00	0.00	0.00																																			P			P		
Antennaria rosea		ROSE PUSSYTOES	0.00	11.11	0.00	0.00	0.00																																		P						P		
Apocynum androsaemifolium		SPREADING DOGBANE	0.06	22.22	0.12	0.06	0.10					P			P													P			1																
Artemisia frigida		FRINGED SAGE	2.72 {2.83}	66.67	6.04 {6.56}	3.17	5.88		11	4		14(1)	1		2			5(3)							2	P			2			2						P			7(1)	1			(1)				
Artemisia ludoviciana		PASTURE SAGE	1.17	88.89	2.59	1.61	2.99	P		P	1	3(4)			5		(1)	1	3			4			1	P						1(1)			P			(1)			1			1(1)			P		
Aster porteri		PORTER'S ASTER	0.22 {0.28}	94.44	0.49 {0.64}	0.28	0.52	1	P	P	P	P			P	1		P	P			P			1				1			P			P			P			P			1			P		
Astragalus drummondii		DRUMMOND MILKVETCH	0.00	5.56	0.00	0.00	0.00																																			P							
Astragalus laxmannii	ASTRAGALUS ADSURGENS VAR.ROBUSTIER	LAXMANN'S MILKVETCH	0.00	27.78	0.00	0.00	0.00	P										P				P			P										P												
Astragalus miser var. oblongifolius		VEEDY MILKVETCH	0.00	11.11	0.00	0.00	0.00																								P														P		
Campanula rotundifolia		HAREBELL	0.22	66.67	0.49	0.22	0.41	1		P		P							P			P			1				2			P			P			P			P						P		
Cerastium strictum	CERASTIUM ARVENSE	MOUSE-EAR	0.17	22.22	0.37	0.17	0.31	P											P										P									3									
Cirsium ochrocentrum	CIRSIUM MEGACEPHALUM	THISTLE	0.00	11.11	0.00	0.00	0.00		P																	P																					
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0.06	50.00	0.12	0.06	0.10	P	P		P				P										P	P						P			P				1								
Erigeron compositus		FLEABANE	0.00	11.11	0.00	0.00	0.00												P																							P					
Erigeron pinnatisectus		PINNATE-LEAVED DAISY	0.00	5.56	0.00	0.00	0.00								P																																
Erigeron speciosus	ERIGERON MACRANTHUS	SHOWY FLEABANE	0.00	5.56	0.00	0.00	0.00								P																																
Eriogonum umbellatum var. umbellatum		WILD BUCKWHEAT	0.39	38.89	0.86	0.39	0.72				4	P			P				P							P														P			3					
NATIVE PERENNIAL FORBS (concluded)																																															
Erysimum capitatum		COAST WALLFLOWER	0.06	27.78	0.12	0.06	0.10				P								1						P													P						P				
Gaillardia aristata		BLANKETFLOWER	0.00	38.89	0.00	0.00	0.00		P			P						P				P				P									P									P				
Galium septentrionale	GALIUM BOREALE	NORTHERN BEDSTRAW	0.06	16.67	0.12	0.06	0.10	P																							P				1												
Gastrolychnis drummondii	MELANDRIUM DRUMMONDILLYCHNIS DRUMMONDII	DRUMMOND CAMPION	0.00	5.56	0.00	0.00	0.00																																					P				
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.33	66.67	0.74	0.39	0.72	P	3	P	(1)							1				1			P	P			P						P						P			1					
Harbouria trachypleura		WHISKBROOM PARSLEY	0.00	44.44	0.00	0.00	0.00	P				P						P							P				P						P						P			P				
Helianthus pumilus		SUNFLOWER	0.22	50.00	0.49	0.28	0.52		(1)	1								P								1			P			P			1			1						P				
Heliomeris multiflora	GYMNOLOMIA MULTIFLORA	SHOWY GOLDENEYE	0.00	11.11	0.00	0.00	0.00	P																					P																		
Heterotheca foliosa		GOLDENASTER	2.94 {3.00}	66.67	6.54 {6.95}	3.11	5.77		7	9(1)		P			2			11	1			3				9(1)						7	1					1			3			P				
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	0.94 {1.00}	44.44	2.10 {2.32}	1.06	1.96	4			2	P													1(1)				1			7	1		2									P				
Lesquerella montana		BLADDERPOD	0.00	5.56	0.00	0.00	0.00																																					P				
Lupinus argenteus		SILVER LUPINE	0.00	11.11	0.00	0.00	0.00																																					P				
Maianthemum stellatum	SMILACINA STELLATA	FEW-FLOWERED FALSE SOLOMON'S SEAL	0.00	5.56	0.00	0.00	0.00																																							P		
Mertensia lanceolata	MERTENSIA VIRIDIS, M. BAKERI	LANCELEAF BLUEBELLS	0.00	22.22	0.00	0.00	0.00																		P	P														P						P		
Microseris nutans		MICROSERIS	0.06	5.56	0.12	0.06	0.10																																					1				
Monarda fistulosa var. menthifolia		HORSEMINT	0.00	5.56	0.00	0.06	0.10																																						(1)				
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON	0.00	5.56	0.00	0.06	0.10	(1)																																								
Packera fendleri	SENECIO FENDLERI	FENDLER'S RAGWORT	0.00	27.78	0.00	0.00	0.00												P			P			P																		P			P		
Paronychia jamesii		NAILWORT	0.00	5.56	0.00	0.00	0.00																																							P		
Penstemon glaber	PENSTEMON ALPINUS	BEARD TONGUE	0.00	5.56	0.00	0.00	0.00																									P																
Penstemon spp.		BEARD-TONGUE	0.00	5.56	0.00	0.00	0.00																						P																			
Penstemon strictus		ROCKY MOUNTAIN PENSTEMON	0.00	11.11	0.00	0.00	0.00	P																											P												
Penstemon virens		GREEN BEARD-TONGUE	0.94 {1.06}	83.33	2.10 {2.45}	1.06	1.96	P	P			P			6			2	2			P			2	1			P						P			P			2			2	1			1	
Phacelia heterophylla		VARILEAF SCORPIONWEED	0.22 {0.28}	55.56	0.49 {0.64}	0.28	0.52	P		P	P	P			P				1			1							P						2	1		P									
Physalis heterophylla		CLAMMY GROUND-CHERRY	0.00	5.56	0.00	0.00	0.00																		P																						
Potentilla hippiana		HORSE CINQUEFOIL	0.00	11.11	0.00	0.00	0.00								P				P																													
Pulsatilla ludoviciana	P. PATENS SSP. MULTIFIDA	PASQUEFLOWER	0.00	22.22	0.00	0.00	0.00					P			P										P																P							
Rumex triangulivalvis	RUMEX SALICIFOLIUS	WILLOW DOCK	0.00	5.56	0.00	0.00	0.00																			P																					
Scrophularia lanceolata		FIGWORT	0.00	5.56	0.00	0.00	0.00																												P												
Scutellaria brittonii		SKULLCAP	0.00	11.11	0.00	0.00	0.00																		P																		P				
Senecio spartioides		BROOM GROUNDSEL	0.00	5.56	0.00	0.00	0.00								P																																
Solidago missouriensis		MISSOURI GOLDENROD	0.00	5.56	0.00	0.00	0.00																												P												
Solidago simplex var. simplex	SOLIDAGO SPATHULATA VAR. NEOMEXICANA	MT. ALBERT GOLDENROD	1.17 {1.22}	61.11	2.59 {2.83}	1.39	2.58	3			1	5(1)			P				3			8(2)	1		P				1			P			P									P				
Viola spp.		VIOLET	0.00	5.56	0.00	0.00	0.00																																							P		
TOTAL NATIVE PERENNIAL FORBS			13.2 {13.7}	100.0	29.3 {31.8}	15.2	29.7	10(1)	21(1)	14(1)	8(1)	22(6)	1	---	16	1	(1)	20(3)	13(1)	---	---	18(2)	1	---	16(1)	12(1)	---	---	7	---	---	18(1)	2	---	15(2)	1(1)	---	6(1)	---	---	14(1)	1	---	8(1)	1(1)	---	P	1	---

Eldorado Fire at Walker Ranch Combined Data for All Sites - 2007 (concluded).

Walker Ranch 2007 Sample dates July 21, 22, 23, 24. SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	01D	02D	03D	04D	05D	05DWU	05U	06D	06DWU	06U	07D	08D	08DWU	08U	09D	09DWU	09U	10D	11D	11DWU	11U	12D	12DWU	12U	13D	13DWU	13U	14D	14DWU	14U	15D	15DWU	15U	16D	16DWU	16U	17D	17DWU	17U	18D	18DWU	18U
INTRODUCED PERENNIAL FORBS																																																	
Arabis hirsuta		HAIRY ROCKCRESS	0.00	11.11	0.00	0.00	0.00																																									P		
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0.11	50.00	0.25	0.11	0.21	P	P	P					P				P			P			P				1			P			1													
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX	0.00	5.56	0.00	0.00	0.00																		P																							
Taraxacum officinale		COMMON DANDELION	0.06 {0.11}	27.78	0.12 {0.26}	0.11	0.21	1											P						P				P																		1		
TOTAL INTRO. PERENNIAL FORBS			0.2 {0.2}	61.1	0.4 {0.5}	0.2	0.4	1	P	P	---	---	---	---	P	---	---	---	P	---	---	P	---	---	P	---	---	---	1	---	---	P	---	---	1	---	---	---	---	---	---	---	---	---	---	P	1	---
NATIVE PERENNIAL GRASSES (cool)																																																
Achnatherum lettermanii	STIPA LETTERMANII	LETTERMAN NEEDLEGRASS	0.00	11.11	0.00	0.00	0.00												P																												P		
Agrostis scabra		TICKLEGRASS	0.00	5.56	0.00	0.00	0.00	P																																									
Bromopsis lanatipes	BROMUS LANATIPES	WOOLY BROME	0.06	27.78	0.12	0.06	0.10			P		P																														1			P			P		
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	1.39	77.78	3.08 {3.22}	1.72	3.20	2	2(1)	2	2	P			3	(1)		1(1)	1			3			1	3(2)			4			P			1			3(1)			1			P			P		
Carex spp.		SEDGE	0.61 {0.78}	27.78	1.36 {1.80}	0.78	1.44	2																		1			4			3			P											2	3	
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	0.56	66.67	1.23	0.61	1.13	P	P	8(1)		P						P							1				1			P			P								P			P		
Elymus lanceolatus	AGROPYRON LANCEOLATUM,A. DASYSTACHYM,A. ALBICANS,A. RIP	THICKSPIKE WHEATGRASS	1.17	33.33	2.59	1.28	2.37	8(1)							3(1)										8							P			2											P		
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.33	38.89	0.74	0.33	0.62			2		P			P			4														P									P			P				
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	0.83 {0.89}	16.67	1.85 {2.06}	1.00	1.86												7(1)	1		3(1)				5																							
Elymus virginicus		VIRGINIA WILDRYE	0.11	5.56	0.25	0.11	0.21												2																														
Festuca arizonica		ARIZONA FESCUE	0.06	11.11	0.12	0.06	0.10																															1			P								
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS	0.17	27.78	0.37	0.17	0.31		1	P	1							P							1																								
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.17	61.11	0.37	0.17	0.31	P	P	1	P				P			P	P			1				P			P												1								
Leucopoa kingii		SPIKE FESCUE	0.28	66.67	0.62	0.28	0.52	P		1		P			P			P	P							P			1									1			2			P			P		
Poa agassizensis		AGASSIZ BLUEGRASS	0.67	44.44	1.48 {1.54}	1.11	2.06	(1)	P			P																	2			P			10(5)	(2)					P						P		
TOTAL NATIVE PERENNIAL GRASSES (c)			6.4 {6.6}	100.0	14.2 {15.3}	7.7	15.0	12(2)	3(1)	14(1)	3	P	---	---	6(1)	(1)	---	5(1)	10(1)	1	---	7(1)	---	---	9	10(2)	---	---	8	---	---	3	---	---	13(5)	(2)	---	5(1)	---	---	5	---	---	P	---	---	2	3	---
INTRODUCED PERENNIAL GRASSES (cool)																																																
Ceratochloa carinata	CERATOCHLOA MARGINATA,BROMUS MARGINATUS,B.POLYANTHUS	MOUNTAIN BROME	0.00	22.22	0.00	0.00	0.00								P							P			P	P																						
Dactylis glomerata		ORCHARD GRASS	0.06	5.56	0.12	0.06	0.10																		1																								
Poa compressa		CANADA BLUEGRASS	0.06	27.78	0.12	0.06	0.10	P				P										P							P						1														
TOTAL INTRO. PERENNIAL GRASSES (c)			0.1	44.4	0.2	0.1	0.2	P	---	---	---	P	---	---	P	---	---	---	---	---	---	P	---	---	1	P	---	---	P	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
NATIVE PERENNIAL GRASSES (warm)																																																
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	0.11	38.89	0.25	0.17	0.31	P	P		(1)				P			P	P						2																								
Muhlenbergia montana		MOUNTAIN MUHLY	0.33	33.33	0.74	0.33	0.62		P		1								3	P																		1						1					
TOTAL NATIVE PERENNIAL GRASSES (w)			0.4	50.0	1.0	0.5	1.0	P	P	---	1(1)	---	---	---	P	---	---	3	P	---	---	---	---	---	2	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	1	---	---	---	---	---
NATIVE SHRUBS																																																
Amelanchier alnifolia		SASKATOON SERVICEBERRY	0.00	5.56	0.00	0.00	0.00																																								P		
Arctostaphylos uva-ursi		KINNIKINNICK	0.06	16.67	0.12	0.11	0.21	1(1)														P			P																								
Ceanothus fendleri		BUCKBRUSH	6.17 {6.39}	100.00	13.69 {14.80}	7.17	13.30	3	2	3(1)	6	P			4			4	8			1	1		11	2			22(2)	2		17(4)			4(1)			14(2)			3(2)	(1)		7(1)	1		P		
Cercocarpus montanus		BIRCHLEAF MOUNTAIN MAHOGANY	1.11	33.33	2.47	1.22	2.27				2	P		(1)												1												4									13(1)			P		
Padus virginiana ssp. melanocarpa	PRUNUS VIRGINIANA SSP. MELANOCARPA	CHOKECHERRY	0.06	16.67	0.12	0.06	0.10																			1									P			P											
Physocarpus monogynus		NINEBARK	0.28	22.22	0.62	0.33	0.62				1											P							4(1)									P											
Ribes aureum		GOLDEN CURRANT	0.00	5.56	0.00	0.00	0.00																																								P		
Ribes cereum		WAX CURRANT	0.22 {0.28}	77.78	0.49 {0.64}	0.28	0.52	P	P	P	P				2				P			P			P	P						1						P			P			1				1		
Rosa arkansana		ARKANSAS ROSE	0.17	27.78	0.37	0.17	0.31		P			P										1				1						1																	
Rosa woodsii		WOOD'S ROSE	0.06	11.11	0.12	0.06	0.10															P													1														
Rubus idaeus ssp. melanolasius		AMERICAN RED RASPBERRY	0.33	50.00	0.74	0.39	0.72	1	1			P			1							P							1			2(1)			P						P							
Symphoricarpos rotundifolius	SYMPHORICARPOS OREOPHILUS	MOUNTAIN SNOWBERRY	0.11	11.11	0.25	0.11	0.21																												2										P			
Yucca glauca		SPANISH BAYONET	0.00	5.56	0.00	0.00	0.00																																							P			
TOTAL NATIVE SHRUBS			8.6 {8.8}	100.0	19.0 {20.5}	9.9	19.3	5(1)	3	3(1)	9	P	---	(1)	7	---	---	4	8	---	---	2	1	---	11	4	---	---	28(3)	2	---	21(5)	---	---	7(1)	---	---	18(2)	---	---	3(2)	(1)	---	21(2)	1	---	P	1	---
NATIVE TREES																																																
Pinus ponderosa ssp. scopulorum		PONDEROSA PINE	0.06 {0.00}	5.56	0.12	0.06	0.10																																							1			
Pinus ponderosa ssp. scopulorum [dead]		PONDEROSA PINE (DEAD)	0.50 {0.06}	11.11	1.11 {0.13}	0.61	1.13						[1]	[2]																																			[7](1)
Populus tremuloides	POPULUS TREMULA	QUAKING ASPEN	0.67 {0.56}	22.22	1.48 {1.29}	0.78	1.44															P							P			2			6	2	4												
Pseudotsuga menziesii		DOUGLAS-FIR	3.17 {0.28}	11.11	7.03 {0.64}	3.33	6.19																																								1	2	3	54
Pseudotsuga menziesii [dead]		DOUGLAS FIR	1.72 {0.44}	55.56	3.82 {1.03}	1.83	3.40	[4]							[1]		[1]			[1]	[6]		[1]	[6]						[2]	[1]		[2]			[2]					[3]			[2]				[1]
Sabina scopulorum [dead]	JUNIPERUS SCOPULORUM	ROCKY MOUNTAIN JUNIPER	0.17 {0.11}	5.56		0.17	0.31																																[2]		[1]								
TOTAL NATIVE TREES			3.9 {0.8}	33.3	8.6 {1.9}	4.2	8.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	P	---	---	---	---	---	P	---	---	2	---	---	6	2	4	---	---	---	---	---	---	---	---	2	2	3	54
Standing dead		STANDING DEAD	5.11 {0.00}	88.89		5.39		5	1			9			1			9	5			13	1		3	10		1	6			5			7	1		2			10	1		3			2	2	
Litter		LITTER	28.83 {32.17}	100.00		32.22		59	25	29	33	29			28			23	38	4		27	1		36	26			25			22			27	2		17			25(1)	1		20	1		30	51	
Bare soil		BARE SOIL	15.39 {15.50}	100.00		15.50		4	28	8	15	13			31			21	18			21	1		21	12			8			13			3			10			25			25	1		1		
Rock		ROCK	3.22	77.78		3.22				3	2	4			7			1	2			4							9			6			2			6			3			8			1		
TOTALS			97.6 {94.7}			110.2		96[4]	100	100	100	98[2]			98[2]			100	94[6]			94[6]			100	100			98[2]			97[3]			98[2]			97[3]			97[3]			98[2]			92[8]		
TOTALS (LAYER)								96	100	100	100	98	1[1]	0[2]	98[1]	1	0[1]	100	94	5[1]	0[6]	94	5[1]	0[6]	100	99	1	1	98	2	0[2]	97[1]	2	0[2]	94	6	4[2]	97[2]	1	0[1]	97	3	0[3]	96	4	2[2]	38	62	54[8]
TOTAL VEGETATION COVER (LAYER)								28(4)	46(2)	60(5)	50(3)	43(6)	1	0(1)	31(1)	1(1)	0(1)	46(5)	31(2)	1	0	29(3)	2	0	40(1)	51(5)	1	0	50(3)	2(7)	0	51(6)	2	0	55(9)	3(3)	4	62(6)	1	0	34(6)	1(1)	0	40(4)	2(1)	2	4	9	54
TOTAL VEGETATION COVER			45.1 {43.8}		100.0 {101.4}	53.9 (s=13.1)	100.0	28(4)	46(2)	60(5)	50(3)	43(8)			31(4)			46(5)	31(3)			29(5)			40(1)	51(6)			50(12)			51(8)			59(15)			62(7)			34(8)			42(7)			58(9)		
			Std.Dev.= 11.1																																															
GROUND COVER (Litter+Rock+Veg+St.Dead)			82.2 {83.9}			94.7 { 89.2}		92(4)	72(2)	92(5)	85(3)	85(6)	1	0(1)	67(1)	1(1)	0(1)	79(5)	76(2)	5	0	73(3)	4	0	79(1)	87(5)	1	1	90(3)	2(7)	0	84(6)	2	0	91(9)	6(3)	4	87(6)	1	0	72(7)	3(1)	0	71(4)	3(1)	2	37	62	54
SPECIES DENSITY (# of species/100 sq.m.)								45	31	28	25	31			38			25	32			37			40	34			34			39			41			32			37			39			38		
(AVERAGE= 34.8 Std.Dev.= 5.5)																																																
SPECIES DENSITY (LAYER)								45	31	28	25	31	1	1	38	2	1	25	32	1	0	37	2	0	40	34	1	0	34	2	0	39	2	0	40	4	1	32	1	0	37	2	0	36	3	2	35	5	1

(#) = second hit
{#} = cover value if tree canopy is excluded
[#] = hit on standing dead tree species

DATA FROM FILE Group A - 2007

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	12D	12DWU	12U	13D	13DWU	13U	14D	14DWU	14U
NATIVE ANNUAL & BIENNIAL FORBS																
Androsace septentrionalis		PYGMYFLOWER ROCKJASMINE	0.00	33.33	0.00	0.00	0.00	P								
Epilobium brachycarpum	EPILOBIUM PANICULATUM	BIGFRUIT WILLOWHERB	0.00	66.67	0.00	0.00	0.00	P			P					
Frasera speciosa		GREEN GENTIAN	0.00	33.33	0.00	0.00	0.00				P					
Grindelia squarrosa		GUMWEED	0.00	100.00	0.00	0.00	0.00	P			P			P		
Machaeranthera bigelovii		BIGELOW ASTER	1.33	100.00	2.50	1.33	2.03	4			P			P		
Polygonum douglasii	POLYGONUM SAWATCHENSE,POLYGONUM MONTANUM	DOUGLAS KNOTWEED	0.00	33.33	0.00	0.00	0.00				P					
TOTAL NATIVE ANN. & BIEN. FORBS			1.3	100.0	2.5	1.3	2.1	4	---	---	P	---	---	P	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																
Alyssum minus		ALYSSUM	0.00	33.33	0.00	0.00	0.00				P					
Carduus nutans ssp. macrolepis		MUSK THISTLE	0.00	33.33	0.00	0.00	0.00							P		
Cynoglossum officinale		HOUND'S TONGUE	0.00	33.33	0.00	0.00	0.00							P		
Lactuca serriola		PRICKLY LETTUCE	0.33	33.33	0.63	0.33	0.51							1		
Sisymbrium altissimum		JIM HILL MUSTARD	0.00	33.33	0.00	0.00	0.00							P		
Tragopogon dubius ssp. major		YELLOW SALSIFY	0.00	66.67	0.00	0.00	0.00	P			P					
Verbascum thapsus		MULLEIN	2.00	100.00	3.75 (3.68)	2.67	4.06	2	(2)		1			3		
TOTAL INTRO. ANN. & BIEN. FORBS			2.3	100.0	4.4	3.0	4.7	2	(2)	---	1	---	---	4	---	---
INTRODUCED ANNUAL GRASSES																
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	4.67	66.67	8.75	5.00	7.61				6			8(1)		
TOTAL INTRO. ANN. GRASSES			4.7	66.7	8.8	5.0	7.9	---	---	---	6	---	---	8(1)	---	---
NATIVE PERENNIAL FORBS																
Achillea lanulosa		WESTERN YARROW	3.00	100.00	5.63	3.67	5.58	P			P			9(2)		
Aletes acaulis		STEMLESS INDIAN PARSLEY	0.00	66.67	0.00	0.00	0.00	P			P					
Apocynum androsaemifolium		SPREADING DOGBANE	0.33	66.67	0.63	0.33	0.51	P			1					
Artemisia frigida		FRINGED SAGE	1.33	66.67	2.50	1.33	2.03	2			2					
Artemisia ludoviciana		PASTURE SAGE	0.33	66.67	0.63	0.67	1.02				1(1)			P		
Aster porteri		PORTER'S ASTER	0.33	100.00	0.63	0.33	0.51	1			P			P		
Astragalus laxmannii	ASTRAGALUS ADSURGENS VAR.ROBUSTIER	LAXMANN'S MILKVETCH	0.00	33.33	0.00	0.00	0.00							P		
Astragalus miser var. oblongifolius		WEEDY MILKVETCH	0.00	33.33	0.00	0.00	0.00				P					
Campanula rotundifolia		HAREBELL	0.67	100.00	1.25	0.67	1.02	2			P			P		
Cerastium strictum	CERASTIUM ARVENSE	MOUSE-EAR	0.00	33.33	0.00	0.00	0.00	P								
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0.00	66.67	0.00	0.00	0.00				P			P		
Gaillardia aristata		BLANKETFLOWER	0.00	33.33	0.00	0.00	0.00							P		
Galium septentrionale	GALIUM BOREALE	NORTHERN BEDSTRAW	0.33	66.67	0.63	0.33	0.51				P			1		
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.00	66.67	0.00	0.00	0.00	P						P		
Harbouria trachypleura		WHISKBROOM PARSLEY	0.00	66.67	0.00	0.00	0.00	P						P		
Helianthus pumilus		SUNFLOWER	0.33	100.00	0.63	0.33	0.51	P			P			1		
Heliomeris multiflora	GYMNOLOMIA MULTIFLORA	SHOWY GOLDENEYE	0.00	33.33	0.00	0.00	0.00				P					
Heterotheca foliosa		GOLDENASTER	2.33 (2.67)	33.33	4.38 (4.91)	2.67	4.06				7	1				
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	3.33 (3.67)	100.00	6.25 (6.75)	3.67	5.58	1			7	1		2		
Lupinus argenteus		SILVER LUPINE	0.00	66.67	0.00	0.00	0.00				P			P		
Monarda fistulosa var. menthifolia		HORSEMINT	0.00	33.33	0.00	0.33	0.51								(1)	
Penstemon glaber	PENSTEMON ALPINUS	BEARD TONGUE	0.00	33.33	0.00	0.00	0.00				P					
Penstemon spp.		BEARD-TONGUE	0.00	33.33	0.00	0.00	0.00	P								
Penstemon strictus		ROCKY MOUNTAIN PENSTEMON	0.00	33.33	0.00	0.00	0.00							P		
Penstemon virens		GREEN BEARD-TONGUE	0.00	66.67	0.00	0.00	0.00	P						P		
Phacelia heterophylla		VARILEAF SCORPIONWEED	0.67 (1.00)	66.67	1.25 (1.84)	1.00	1.52	P						2	1	
Scrophularia lanceolata		FIGWORT	0.00	33.33	0.00	0.00	0.00							P		
Solidago missouriensis		MISSOURI GOLDENROD	0.00	33.33	0.00	0.00	0.00							P		
Solidago simplex var. simplex	SOLIDAGO SPATHULATA VAR. NEOMEXICANA	MT. ALBERT GOLDENROD	0.33	100.00	0.63	0.33	0.51	1			P			P		
TOTAL NATIVE PERENNIAL FORBS			13.3 (14.3)	100.0	25.0 (26.4)	15.7	24.7	7	---	---	18(1)	2	---	15(2)	1(1)	---
INTRODUCED PERENNIAL FORBS																
Arabis hirsuta		HAIRY ROCKCRESS	0.00	33.33	0.00	0.00	0.00				P					
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0.67	100.00	1.25	0.67	1.02	1			P			1		
Taraxacum officinale		COMMON DANDELION	0.00	33.33	0.00	0.00	0.00	P								
TOTAL INTRO. PERENNIAL FORBS			0.7	100.0	1.3	0.7	1.1	1	---	---	P	---	---	1	---	---
NATIVE PERENNIAL GRASSES (cool)																
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	0.33	33.33	0.63	0.33	0.51							1		
Carex spp.		SEDGE	2.33	100.00	4.38	2.33	3.55	4			3			P		
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	0.33	100.00	0.63	0.33	0.51	1			P			P		
Elymus lanceolatus	AGROPYRON LANCEOLATUM,A. DASYSTACHYM,A. ALBICANS,A. RIP	THICKSPIKE WHEATGRASS	0.67	66.67	1.25	0.67	1.02				P			2		
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.00	33.33	0.00	0.00	0.00				P					
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.00	66.67	0.00	0.00	0.00	P			P					
Leucopoa kingii		SPIKE FESCUE	0.33	33.33	0.63	0.33	0.51	1								
Poa agassizensis		AGASSIZ BLUEGRASS	4.00	100.00	7.50 (7.36)	6.33	9.64	2			P			10(5)	(2)	
TOTAL NATIVE PERENNIAL GRASSES (c)			8.0	100.0	15.0	10.3	16.3	8	---	---	3	---	---	13(5)	(2)	---

DATA FROM FILE Group A - 2007

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	12D	12DWU	12U	13D	13DWU	13U	14D	14DWU	14U
INTRODUCED PERENNIAL GRASSES (cool)																
Poa compressa		CANADA BLUEGRASS	0.33	66.67	0.63	0.33	0.51	P						1		
TOTAL INTRO. PERENNIAL GRASSES (c)			0.3	66.7	0.6	0.3	0.5	P	---	---	---	---	---	1	---	---
NATIVE SHRUBS																
Ceanothus fendleri		BUCKBRUSH	14.33 {15.00}	100.00	26.88 {27.61}	17.33	26.40	22(2)	2		17(4)			4(1)		
Padus virginiana ssp. melanocarpa	PRUNUS VIRGINIANA SSP. MELANOCARPA	CHOKECHERRY	0.33	66.67	0.63	0.33	0.51	1						P		
Physocarpus monogynus		NINEBARK	1.33	33.33	2.50	1.67	2.54	4(1)								
Ribes cereum		WAX CURRANT	0.33	33.33	0.63	0.33	0.51				1					
Rosa arkansana		ARKANSAS ROSE	0.33	33.33	0.63	0.33	0.51				1					
Rosa woodsii		WOOD'S ROSE	0.33	33.33	0.63	0.33	0.51							1		
Rubus idaeus ssp. melanolasius		AMERICAN RED RASPBERRY	1.00	100.00	1.88	1.33	2.03	1			2(1)			P		
Symphoricarpos rotundifolius	SYMPHORICARPOS OREOPHILUS	MOUNTAIN SNOWBERRY	0.67	33.33	1.25	0.67	1.02							2		
TOTAL NATIVE SHRUBS			18.7 {19.3}	100.0	35.0 {35.6}	22.3	35.3	28(3)	2	---	21(5)	---	---	7(1)	---	---
NATIVE TREES																
Populus tremuloides	POPULUS TREMULA	QUAKING ASPEN	4.00 {3.33}	100.00	7.50 {6.13}	4.67	7.11	P			2			6	2	4
Pseudotsuga menziesii [dead]		DOUGLAS FIR	2.33 {0.33}	100.00		2.33	3.55			[2]	[1]		[2]			[2]
TOTAL NATIVE TREES			4.0 {3.3}	100.0	7.5 {6.1}	4.7	7.4	P	---	---	2	---	---	6	2	4
Standing dead		STANDING [dead]	6.00 {0.00}	100.00		6.33		[6]			[5]			[7]	[1]	
Litter		LITTER	24.67 {25.33}	100.00		25.33		25			22			27	2	
Bare soil		BARE SOIL	8.00	100.00		8.00		8			13			3		
Rock		ROCK	5.67	100.00		5.67		9			6			2		
TOTALS			97.7 {93.7}			111.0		92			92			91		
TOTALS (LAYER)								92	2	0	92	2	0	87	5	4
TOTAL VEGETATION COVER (LAYER)								50(3)	2(2)	0	51(6)	2	0	55(9)	3(3)	4
TOTAL VEGETATION COVER			53.3 {54.7} Std.Dev.= 4.9		100.0 {100.6}	65.7 (s=0.0)	100.0	50(7)			51(8)			59(15)		
GROUND COVER (Litter+Rock+Veg+St.Dead)			83.7 {85.3}			103.0 { 99.7}		84(3)	2(2)	0	79(6)	2	0	84(9)	5(3)	4
SPECIES DENSITY (# of species/100 sq.m.) (AVERAGE= 38.0 Std.Dev.= 3.6)								34			39			41		
SPECIES DENSITY (LAYER)								34	2	0	39	2	0	40	4	1

(#) = second hit
{#} = cover value if tree canopy is excluded
[#] = hit on standing dead tree species

DATA FROM FILE Group B

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	01D	06D	06DWU	06U	08D	08DWU	08U	09D	09DWU	09U	10D	16D	16DWU	16U
NATIVE ANNUAL & BIENNIAL FORBS																					
Androsace septentrionalis		PYGMYFLOWER ROCKJASMINE	0.00	33.33	0.00	0.00	0.00	P	P									P			
Bahia dissecta		CUTLEAF	0.00	16.67	0.00	0.00	0.00		P												
Chenopodium leptophyllum		NARROWLEAF GOOSEFOOT	0.00	16.67	0.00	0.00	0.00												P		
Chenopodium simplex	CHENOPODIUM GIGANTOSPERMUM,C. HYBRIDUM VAR. SIMPLEX	MAPLELEAF GOOSEFOOT	0.00	16.67	0.00	0.00	0.00								P						
Collinsia parviflora		BABY BLUE-EYES	0.00	50.00	0.00	0.00	0.00	P							P				P		
Epilobium brachycarpum	EPILOBIUM PANICULATUM	BIGFRUIT WILLOWHERB	0.00	83.33	0.00	0.00	0.00	P	P						P			P	P		
Erigeron divergens		SPREADING FLEABANE	0.00	33.33	0.00	0.00	0.00		P			P									
Grindelia squarrosa		GUMWEED	0.17	66.67	0.52	0.17	0.41	P	P									P	1		
Machaeranthera bigelovii		BIGELOW ASTER	0.33	83.33	1.04	0.33	0.83	P				P			1			P	1		
Oenothera villosa ssp. strigosa	OENOTHERA STRIGOSA	HAIRY EVENINGPRIMROSE	0.00	16.67	0.00	0.00	0.00	P													
Polygonum douglasii	POLYGONUM SAWATCHENSE,POLYGONUM MONTANUM	DOUGLAS KNOTWEED	0.00	16.67	0.00	0.00	0.00		P												
Pterogonum alatum	ERIOGONUM ALATUM	WINGED BUCKWHEAT	0.00	16.67	0.00	0.00	0.00											P			
Silene antirrhina		SLEEPY CATCHFLY	0.00	33.33	0.00	0.00	0.00	P										P			
TOTAL NATIVE ANN. & BIEN. FORBS			0.5	100.0	1.6	0.5	1.4	P	P	---	---	P	---	---	1	---	---	P	2	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																					
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED	0.00	16.67	0.00	0.00	0.00								P						
Alyssum minus		ALYSSUM	0.00	50.00	0.00	0.00	0.00					P			P			P			
Carduus nutans ssp. macrolepis		MUSK THISTLE	0.00	16.67	0.00	0.00	0.00	P													
Conyza canadensis		HORSEWEED	0.00	50.00	0.00	0.00	0.00		P						P			P			
Cynoglossum officinale		HOUND'S TONGUE	0.00	16.67	0.00	0.00	0.00											P			
Lactuca serriola		PRICKLY LETTUCE	0.00	66.67	0.00	0.00	0.00	P	P									P	P		
Sisymbrium altissimum		JIM HILL MUSTARD	0.00	16.67	0.00	0.00	0.00								P						
Tragopogon dubius ssp. major		YELLOW SALSIFY	0.17	83.33	0.52	0.17	0.41	P	P			P			1			P			
Turritis glabra	ARABIS GLABRA	TOWER MUSTARD	0.00	50.00	0.00	0.00	0.00	P				P			P						
Verbascum thapsus		MULLEIN	0.17	66.67	0.52	0.17	0.41	P	P									P	1		
TOTAL INTRO. ANN. & BIEN. FORBS			0.3	100.0	1.0	0.3	0.9	P	P	---	---	P	---	---	1	---	---	P	1	---	---
INTRODUCED ANNUAL GRASSES																					
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	2.00	50.00	6.22	2.50	6.22		2									1	9(3)		
Bromus japonicus		JAPANESE BROME	0.00	16.67	0.00	0.00	0.00								P						
TOTAL INTRO. ANN. GRASSES			2.0	66.7	6.2	2.5	6.9	---	2	---	---	---	---	---	P	---	---	1	9(3)	---	---
NATIVE PERENNIAL FORBS																					
Achillea lanulosa		WESTERN YARROW	2.00	83.33	6.22	2.17	5.39	1	1			1(1)			1			8			
Aletes acaulis		STEMLESS INDIAN PARSLEY	0.17	33.33	0.52	0.17	0.41					1							P		
Allium cernuum		NODDING ONION	0.00	16.67	0.00	0.00	0.00												P		
Antennaria rosea		ROSE PUSSYTOES	0.00	16.67	0.00	0.00	0.00												P		
Apocynum androsaemifolium		SPREADING DOGBANE	0.00	16.67	0.00	0.00	0.00		P												
Artemisia frigida		FRINGED SAGE	1.83 (2.00)	50.00	5.70 (6.06)	2.17	5.39		2									2	7(1)	1	
Artemisia ludoviciana		PASTURE SAGE	2.33	100.00	7.25	2.50	6.22	P	5		(1)	3			4			1	1		
Aster porteri		PORTER'S ASTER	0.33 (0.50)	100.00	1.04 (1.52)	0.50	1.24	1	P	1		P			P			1	P		
Astragalus drummondii		DRUMMOND MILKVETCH	0.00	16.67	0.00	0.00	0.00												P		
Astragalus laxmannii	ASTRAGALUS ADSURGENS VAR.ROBUSTIER	LAXMANN'S MILKVETCH	0.00	50.00	0.00	0.00	0.00	P							P			P			
Campanula rotundifolia		HAREBELL	0.33	83.33	1.04	0.33	0.83	1				P			P			1	P		
Cerastium strictum	CERASTIUM ARVENSE	MOUSE-EAR	0.00	33.33	0.00	0.00	0.00	P				P									
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0.17	66.67	0.52	0.17	0.41	P	P									P	1		
Erigeron compositus		FLEABANE	0.00	16.67	0.00	0.00	0.00					P									
Erigeron pinnatisectus		PINNATE-LEAVED DAISY	0.00	16.67	0.00	0.00	0.00		P												
Erigeron speciosus	ERIGERON MACRANTHUS	SHOWY FLEABANE	0.00	16.67	0.00	0.00	0.00		P												
Eriogonum umbellatum var. umbellatum		WILD BUCKWHEAT	0.00	50.00	0.00	0.00	0.00		P			P							P		
Erysimum capitatum		COAST WALLFLOWER	0.17	33.33	0.52	0.17	0.41					1						P			
Gaillardia aristata		BLANKETFLOWER	0.00	16.67	0.00	0.00	0.00								P						
Galium septentrionale	GALIUM BOREALE	NORTHERN BEDSTRAW	0.00	16.67	0.00	0.00	0.00	P													
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.17	66.67	0.52	0.17	0.41	P							1			P	P		
Harbouria trachypleura		WHISKBROOM PARSLEY	0.00	50.00	0.00	0.00	0.00	P										P	P		
Heliomeris multiflora	GYMNOLOMIA MULTIFLORA	SHOWY GOLDENEYE	0.00	16.67	0.00	0.00	0.00	P													
NATIVE PERENNIAL FORBS (concluded)																					
Heterotheca foliosa		GOLDENASTER	1.50	66.67	4.66	1.50	3.73		2			1			3				3		
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	0.83	33.33	2.59	1.00	2.49	4										1(1)			
Mertensia lanceolata	MERTENSIA VIRIDIS, M. BAKERI	LANCELEAF BLUEBELLS	0.00	33.33	0.00	0.00	0.00											P	P		
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON	0.00	16.67	0.00	0.17	0.41	(1)													
Packera fendleri	SENECIO FENDLERI	FENDLER'S RAGWORT	0.00	66.67	0.00	0.00	0.00					P			P			P	P		
Penstemon strictus		ROCKY MOUNTAIN PENSTEMON	0.00	16.67	0.00	0.00	0.00	P													
Penstemon virens		GREEN BEARD- TONGUE	2.00	100.00	6.22	2.00	4.98	P	6			2			P			2	2		
Phacelia heterophylla		VARILEAF SCORPIONWEED	0.33	83.33	1.04	0.33	0.83	P	P			1			1				P		
Physalis heterophylla		CLAMMY GROUND-CHERRY	0.00	16.67	0.00	0.00	0.00											P			
Potentilla hippiana		HORSE CINQUEFOIL	0.00	33.33	0.00	0.00	0.00		P			P									
Pulsatilla ludoviciana	P. PATENS SSP. MULTIFIDA	PASQUEFLOWER	0.00	50.00	0.00	0.00	0.00		P									P	P		
Scutellaria brittonii		SKULLCAP	0.00	16.67	0.00	0.00	0.00											P			
Senecio spartioides		BROOM GROUNDSEL	0.00	16.67	0.00	0.00	0.00		P												
Solidago simplex var. simplex	SOLIDAGO SPATHULATA VAR. NEOMEXICANA	MT. ALBERT GOLDENROD	2.33 (2.50)	83.33	7.25 (7.58)	2.83	7.05	3	P			3			8(2)	1		P			
TOTAL NATIVE PERENNIAL FORBS			14.5 (15.0)	100.0	45.1 (45.5)	16.2	44.5	10(1)	16	1	(1)	13(1)	---	---	18(2)	1	---	16(1)	14(1)	1	---

DATA FROM FILE Group B

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	01D	06D	06DWU	06U	08D	08DWU	08U	09D	09DWU	09U	10D	16D	16DWU	16U
INTRODUCED PERENNIAL FORBS																					
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0.00	66.67	0.00	0.00	0.00	P	P			P			P						
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX	0.00	16.67	0.00	0.00	0.00											P			
Taraxacum officinale		COMMON DANDELION	0.17	50.00	0.52	0.17	0.41	1				P						P			
TOTAL INTRO. PERENNIAL FORBS			0.2	83.3	0.5	0.2	0.5	1	P	---	---	P	---	---	P	---	---	P	---	---	---
NATIVE PERENNIAL GRASSES (cool)																					
Achnatherum lettermanii	STIPA LETTERMANII	LETTERMAN NEEDLEGRASS	0.00	16.67	0.00	0.00	0.00					P									
Agrostis scabra		TICKLEGRASS	0.00	16.67	0.00	0.00	0.00	P													
Bromopsis lanatipes	BROMUS LANATIPES	WOOLY BROME	0.17	16.67	0.52	0.17	0.41												1		
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	1.83	100.00	5.70 (5.56)	2.00	4.98	2	3	(1)		1			3			1	1		
Carex spp.		SEDGE	0.33	16.67	1.04	0.33	0.83	2													
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	0.00	33.33	0.00	0.00	0.00	P											P		
Elymus lanceolatus	AGROPYRON LANCEOLATUM,A. DASYSTACHYM,A. ALBICANS,A. RIP	THICKSPIKE WHEATGRASS	3.17	50.00	9.84	3.50	8.71	8(1)	3(1)									8			
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.00	33.33	0.00	0.00	0.00		P										P		
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	1.67 (1.83)	33.33	5.18 (5.56)	2.17	5.39					7(1)	1		3(1)						
Elymus virginicus		VIRGINIA WILDRYE	0.33	16.67	1.04	0.33	0.83					2									
Festuca arizonica		ARIZONA FESCUE	0.00	16.67	0.00	0.00	0.00												P		
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.33	83.33	1.04	0.33	0.83	P	P			P			1				1		
Leucopoa kingii		SPIKE FESCUE	0.33	66.67	1.04	0.33	0.83	P	P			P							2		
Poa agassizensis		AGASSIZ BLUEGRASS	0.00	33.33	0.00	0.17	0.41	(1)											P		
TOTAL NATIVE PERENNIAL GRASSES (c)			8.2 (8.3)	100.0	25.4 (25.3)	9.3	25.7	12(2)	6(1)	(1)	---	10(1)	1	---	7(1)	---	---	9	5	---	---
INTRODUCED PERENNIAL GRASSES (cool)																					
Ceratochloa carinata	CERATOCHLOA MARGINATA,BROMUS MARGINATUS,B.POLYANTHUS	MOUNTAIN BROME	0.00	50.00	0.00	0.00	0.00		P						P			P			
Dactylis glomerata		ORCHARD GRASS	0.17	16.67	0.52	0.17	0.41											1			
Poa compressa		CANADA BLUEGRASS	0.00	33.33	0.00	0.00	0.00	P							P						
TOTAL INTRO. PERENNIAL GRASSES (c)			0.2	66.7	0.5	0.2	0.5	P	P	---	---	---	---	---	P	---	---	1	---	---	---
NATIVE PERENNIAL GRASSES (warm)																					
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	0.33	66.67	1.04	0.33	0.83	P	P			P						2			
Muhlenbergia montana		MOUNTAIN MUHLY	0.00	16.67	0.00	0.00	0.00					P									
TOTAL NATIVE PERENNIAL GRASSES (w)			0.3	66.7	1.0	0.3	0.9	P	P	---	---	P	---	---	---	---	---	2	---	---	---
NATIVE SHRUBS																					
Arctostaphylos uva-ursi		KINNIKINNICK	0.17	50.00	0.52	0.33	0.83	1(1)							P			P			
Ceanothus fendleri		BUCKBRUSH	5.00 (5.17)	100.00	15.54 (15.66)	5.67	14.11	3	4			8			1	1		11	3(2)	(1)	
Physocarpus monogynus		NINEBARK	0.00	16.67	0.00	0.00	0.00								P						
Ribes cereum		WAX CURRANT	0.33	100.00	1.04	0.33	0.83	P	2			P			P			P	P		
Rosa arkansana		ARKANSAS ROSE	0.17	16.67	0.52	0.17	0.41								1						
Rosa woodsii		WOOD'S ROSE	0.00	16.67	0.00	0.00	0.00								P						
Rubus idaeus ssp. melanolasius		AMERICAN RED RASPBERRY	0.33	66.67	1.04	0.33	0.83	1	1						P				P		
TOTAL NATIVE SHRUBS			6.0 (6.2)	100.0	18.7 (18.7)	6.8	18.8	5(1)	7	---	---	8	---	---	2	1	---	11	3(2)	(1)	---
NATIVE TREES																					
Populus tremuloides	POPULUS TREMULA	QUAKING ASPEN	0.00	16.67	0.00	0.00	0.00								P						
Pseudotsuga menziesii deac		DOUGLAS FIR	3.50 (1.17)	83.33	10.88 (3.54)	3.83	9.54	[4]	[1]		[1]		[1]	[6]		[1]	[6]				[3]
TOTAL NATIVE TREES			0.0	16.7	0.0	0.0	0.0	---	---	---	---	---	---	---	P	---	---	---	---	---	---
Standing dead		STANDING DEAD	6.17 (0.00)	100.00		6.50		5	1			5			13	1		3	10	1	
Litter		LITTER	35.50 (36.50)	100.00		36.67		59	28			38	4		27	1		36	25(1)	1	
Bare soil		BARE SOIL	20.00 (20.17)	100.00		20.17		4	31			18			21	1		21	25		
Rock		ROCK	2.67	66.67		2.67			7			2			4				3		
TOTALS			96.5 (93.5)			106.2		96	98			94			94			100	97		
TOTALS (LAYER)								96	98	1	0	94	5	0	94	5	0	100	97	3	0
TOTAL VEGETATION COVER (LAYER)								28(4)	31(1)	1(1)	0(1)	31(2)	1	0	29(3)	2	0	40(1)	34(6)	1(1)	0
TOTAL VEGETATION COVER			32.2 (34.2) Std.Dev.= 4.4		100.0 (103.5)	40.2 (s=14.7)	100.0	28(4)	31(4)			31(3)			29(5)			40(1)	34(8)		
GROUND COVER (Litter+Rock+Veg+St.Dead)			76.5 (78.7)			86.0 (83.2)		92(4)	67(1)	1(1)	0(1)	76(2)	5	0	73(3)	4	0	79(1)	72(7)	3(1)	0
SPECIES DENSITY (# of species/100 sq.m.) (AVERAGE= 38.2 Std.Dev.= 4.3)								45	38			32			37			40	37		
SPECIES DENSITY (LAYER)								45	38	2	1	32	1	0	37	2	0	40	37	2	0

(#) = second hit
{#} = cover value if tree canopy is excluded
[#] = hit on standing dead tree species

DATA FROM FILE Group C

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	02D	04D	05D	05DWU	05U	07D	11D	11DWU	11U
NATIVE ANNUAL & BIENNIAL FORBS																
Bahia dissecta		CUTLEAF	0.40	40.00	0.85	0.40	0.76		2	P						
Grindelia squarrosa		GUMWEED	0.00	80.00	0.00	0.00	0.00		P	P			P	P		
Machaeranthera bigelovii		BIGELOW ASTER	0.00	20.00	0.00	0.00	0.00			P						
Pterogonum alatum	ERIOGONUM ALATUM	WINGED BUCKWHEAT	0.00	40.00	0.00	0.00	0.00	P						P		
Silene antirrhina		SLEEPY CATCHFLY	0.00	20.00	0.00	0.00	0.00	P								
TOTAL NATIVE ANN. & BIEN. FORBS			0.4	100.0	0.8	0.4	0.8	P	2	P	---	---	P	P	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS																
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED	1.80 {2.00}	20.00	3.81 {4.20}	2.00	3.80							9	1	
Alyssum minus		ALYSSUM	0.80	80.00	1.69	0.80	1.52	P	1				P	3		
Camelina microcarpa		LITTLEPOD FALSEFLAX	0.00	60.00	0.00	0.00	0.00	P					P	P		
Lactuca serriola		PRICKLY LETTUCE	0.00	40.00	0.00	0.00	0.00	P						P		
Lappula redowskii		EARLY STICKSEED	0.00	20.00	0.00	0.00	0.00	P								
Sisymbrium altissimum		JIM HILL MUSTARD	0.00	40.00	0.00	0.00	0.00	P						P		
Tragopogon dubius ssp. major		YELLOW SALSIFY	0.00	80.00	0.00	0.00	0.00	P	P				P	P		
Verbascum thapsus		MULLEIN	1.20	80.00	2.54	1.20	2.28		4	1			1	P		
TOTAL INTRO. ANN. & BIEN. FORBS			3.8 {4.0}	100.0	8.1 {8.4}	4.0	7.7	P	5	1	---	---	1	12	1	---
INTRODUCED ANNUAL GRASSES																
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	17.40	100.00	36.86	18.20	34.60	19	22(1)	20			13(1)	13(2)		
Bromus japonicus		JAPANESE BROME	0.00	20.00	0.00	0.00	0.00							P		
Cylindropyrum cylindricum	AEGILOPS CYLINDRICA	GOAT GRASS	0.00	20.00	0.00	0.00	0.00	P								
TOTAL INTRO. ANN. GRASSES			17.4	100.0	36.9	18.2	35.0	19	22(1)	20	---	---	13(1)	13(2)	---	---
NATIVE PERENNIAL FORBS																
Achillea lanulosa		WESTERN YARROW	0.20	60.00	0.42	0.20	0.38		P	P				1		
Apocynum androsaemifolium		SPREADING DOGBANE	0.00	20.00	0.00	0.00	0.00			P						
Artemisia frigida		FRINGED SAGE	6.00 {6.20}	80.00	12.71 {13.03}	7.00	13.31	11		14(1)	1		5(3)	P		
Artemisia ludoviciana		PASTURE SAGE	1.00	80.00	2.12	1.80	3.42		1	3(4)			1	P		
Aster porteri		PORTER'S ASTER	0.00	80.00	0.00	0.00	0.00	P	P	P			P			
Astragalus laxmannii	ASTRAGALUS ADSURGENS VAR.ROBUSTIER	LAXMANN'S MILKVETCH	0.00	20.00	0.00	0.00	0.00						P			
Campanula rotundifolia		HAREBELL	0.00	20.00	0.00	0.00	0.00			P						
Cirsium ochrocentrum	CIRSIUM MEGACEPHALUM	THISTLE	0.00	40.00	0.00	0.00	0.00	P						P		
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0.00	60.00	0.00	0.00	0.00	P	P					P		
Eriogonum umbellatum var. umbellatum		WILD BUCKWHEAT	0.80	60.00	1.69	0.80	1.52		4	P				P		
Erysimum capitatum		COAST WALLFLOWER	0.00	20.00	0.00	0.00	0.00		P							
Gaillardia aristata		BLANKETFLOWER	0.00	80.00	0.00	0.00	0.00	P		P			P	P		
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.80	80.00	1.69	1.00	1.90	3	(1)				1	P		
Harbouria trachypleura		WHISKBROOM PARSLEY	0.00	40.00	0.00	0.00	0.00			P			P			
Helianthus pumilus		SUNFLOWER	0.20	60.00	0.42	0.40	0.76	(1)					P	1		
Heterotheca foliosa		GOLDENASTER	5.40	80.00	11.44	5.60	10.65	7		P			11	9(1)		
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	0.40	40.00	0.85	0.40	0.76		2	P						
Mertensia lanceolata	MERTENSIA VIRIDIS, M. BAKERI	LANCELEAF BLUEBELLS	0.00	20.00	0.00	0.00	0.00							P		
Penstemon virens		GREEN BEARD-TONGUE	0.60	80.00	1.27	0.60	1.14	P		P			2	1		
Phacelia heterophylla		VARILEAF SCORPIONWEED	0.00	40.00	0.00	0.00	0.00		P	P						
Pulsatilla ludoviciana	P. PATENS SSP. MULTIFIDA	PASQUEFLOWER	0.00	20.00	0.00	0.00	0.00			P						
Rumex triangulivalvis	RUMEX SALICIFOLIUS	WILLOW DOCK	0.00	20.00	0.00	0.00	0.00							P		
Solidago simplex var. simplex	SOLIDAGO SPATHULATA VAR. NEOMEXICANA	MT. ALBERT GOLDENROD	1.20	40.00	2.54	1.40	2.66		1	5(1)						
TOTAL NATIVE PERENNIAL FORBS			16.6 {16.8}	100.0	35.2 {35.3}	19.2	36.9	21(1)	8(1)	22(6)	1	---	20(3)	12(1)	---	---
INTRODUCED PERENNIAL FORBS																
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0.00	20.00	0.00	0.00	0.00	P								
TOTAL INTRO. PERENNIAL FORBS			0.0	20.0	0.0	0.0	0.0	P	---	---	---	---	---	---	---	---
NATIVE PERENNIAL GRASSES (cool)																
Bromopsis lanatipes	BROMUS LANATIPES	WOOLY BROME	0.00	20.00	0.00	0.00	0.00			P						
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	1.60	100.00	3.39	2.40	4.56	2(1)	2	P			1(1)	3(2)		
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	0.20	80.00	0.42	0.20	0.38	P		P			P	1		
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.80	40.00	1.69	0.80	1.52			P			4			
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	1.00	20.00	2.12	1.00	1.90							5		
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS	0.60	80.00	1.27	0.60	1.14	1	1				P	1		
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.00	60.00	0.00	0.00	0.00	P	P				P			
Leucopoa kingii		SPIKE FESCUE	0.00	60.00	0.00	0.00	0.00			P			P	P		
Poa agassizensis		AGASSIZ BLUEGRASS	0.00	40.00	0.00	0.00	0.00	P		P						
TOTAL NATIVE PERENNIAL GRASSES (c)			4.2	100.0	8.9	5.0	9.6	3(1)	3	P	---	---	5(1)	10(2)	---	---

DATA FROM FILE Group C

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	02D	04D	05D	05DWU	05U	07D	11D	11DWU	11U
INTRODUCED PERENNIAL GRASSES (cool)																
Ceratochloa carinata	CERATOCHLOA MARGINATA,BROMUS MARGINATUS,B.POLYANTHUS	MOUNTAIN BROME	0.00	20.00	0.00	0.00	0.00							P		
Poa compressa		CANADA BLUEGRASS	0.00	20.00	0.00	0.00	0.00			P						
TOTAL INTRO. PERENNIAL GRASSES (c)			0.0	40.0	0.0	0.0	0.0	---	---	P	---	---	---	P	---	---
NATIVE PERENNIAL GRASSES (warm)																
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	0.00	60.00	0.00	0.20	0.38	P	(1)				P			
Muhlenbergia montana		MOUNTAIN MUHLY	0.80	60.00	1.69	0.80	1.52	P	1				3			
TOTAL NATIVE PERENNIAL GRASSES (w)			0.8	60.0	1.7	1.0	1.9	P	1(1)	---	---	---	3	---	---	---
NATIVE SHRUBS																
Ceanothus fendleri		BUCKBRUSH	2.80	100.00	5.93	2.80	5.32	2	6	P			4	2		
Cercocarpus montanus		BIRCHLEAF MOUNTAIN MAHOGANY	0.60	60.00	1.27	0.80	1.52		2	P		(1)		1		
Physocarpus monogynus		NINEBARK	0.20	20.00	0.42	0.20	0.38		1							
Ribes cereum		WAX CURRANT	0.00	60.00	0.00	0.00	0.00	P	P					P		
Rosa arkansana		ARKANSAS ROSE	0.20	60.00	0.42	0.20	0.38	P		P				1		
Rubus idaeus ssp. melanolasius		AMERICAN RED RASPBERRY	0.20	40.00	0.42	0.20	0.38	1		P						
TOTAL NATIVE SHRUBS			4.0	100.0	8.5	4.2	8.1	3	9	P	---	(1)	4	4	---	---
NATIVE TREES																
Pinus ponderosa ssp. scopulorum (dead)		PONDEROSA PINE (DEAD)	0.40 {0.20}	20.00	0.85 {0.42}	0.60	1.14				[1]	[2]				
TOTAL NATIVE TREES			0.0		0.0	0.0	0.0									
Standing dead		STANDING DEAD	6.00 {0.00}	80.00		6.00		1		9			9	10		1
Litter		LITTER	27.20	100.00		27.20		25	33	29			23	26		
Bare soil		BARE SOIL	17.80	100.00		17.80		28	15	13			21	12		
Rock		ROCK	1.40	60.00		1.40			2	4			1			
TOTALS			99.6 {94.2}			105.0		100	100	98			100	100		
TOTALS (LAYER)								100	100	98	1	0	100	99	1	1
TOTAL VEGETATION COVER (LAYER)								46(2)	50(3)	43(6)	1	0(1)	46(5)	51(5)	1	0
TOTAL VEGETATION COVER			47.2 {47.8} Std.Dev.= 3.3		100.0 {100.4}	52.6 (s=22.8)	100.0	46(2)	50(3)	43(8)			46(5)	51(6)		
GROUND COVER (Litter+Rock+Veg+St.Dead)			81.8 {82.0}			87.2 { 86.4}		72(2)	85(3)	85(6)	1	0(1)	79(5)	87(5)	1	1
SPECIES DENSITY (# of species/100 sq.m.) (AVERAGE= 29.2 Std.Dev.= 4.0)								31	25	31			25	34		
SPECIES DENSITY (LAYER)								31	25	31	1	1	25	34	1	0

(#) = second hit
{#} = cover value if tree canopy is excluded
[#] = hit on standing dead tree species

DATA FROM FILE Group D

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	03D	15D	15DWU	15U	17D	17DWU	17U
NATIVE ANNUAL & BIENNIAL FORBS														
Acrolasia dispersa	MENTZELIA	BUSHY BLAZINGSTAR	0	33.33	0	0	0		P					
Chenopodium leptophyllum		NARROWLEAF GOOSEFOOT	0	66.67	0	0	0	P	P					
Collinsia parviflora		BABY BLUE-EYES	0	66.67	0	0	0		P			P		
Epilobium brachycarpum	EPILOBIUM PANICULATUM	BIGFRUIT WILLOWHERB	0	33.33	0	0	0		P					
Erigeron divergens		SPREADING FLEABANE	0	33.33	0	0	0		P					
Grindelia squarrosa		GUMWEED	0	33.33	0	0	0					P		
Machaeranthera bigelovii		BIGELOW ASTER	0	66.67	0	0	0		P			P		
Pterogonum alatum	ERIOGONUM ALATUM	WINGED BUCKWHEAT	0	66.67	0	0	0	P				P		
TOTAL NATIVE ANN. & BIEN. FORBS			0	100	0	0	0	P	P	---	---	P	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS														
Alyssum minus		ALYSSUM	0	67	1	0	1	1				P		
Conyza canadensis		HORSEWEED	0	33.33	0	0	0		P					
Descurainia sophia		FLIXWEED TANSYMUSTARD	0	33.33	0	0	0		P					
Lactuca serriola		PRICKLY LETTUCE	0	66.67	0	0	0	P	P					
Sisymbrium altissimum		JIM HILL MUSTARD	0.67	33.33	1.22	0.67	1.06	2						
Tragopogon dubius ssp. major		YELLOW SALSIFY	0	66.67	0	0	0	P	P					
Turritis glabra	ARABIS GLABRA	TOWER MUSTARD	0	33.33	0	0	0					P		
Verbascum thapsus		MULLEIN	0.67	100	1.22	0.67	1.06	1	1			P		
TOTAL INTRO. ANN. & BIEN. FORBS			2	100	3	2	3	4	1	---	---	P	---	---
INTRODUCED ANNUAL GRASSES														
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	22.00 {22.33}	100	40.24 {40.61}	24	38	25(2)	31(2)	1		10(1)		
TOTAL INTRO. ANN. GRASSES			22.0 {22.3}	100	40.2 {40.6}	24	39	25(2)	31(2)	1	---	10(1)	---	---
NATIVE PERENNIAL FORBS														
Achillea lanulosa		WESTERN YARROW	0	67	0	0	0	P	P					
Aletes acaulis		STEMLESS INDIAN PARSLEY	0	33.33	0	0	0					P		
Allium cernuum		NODDING ONION	0	66.67	0	0	0	P				P		
Amerosedum lanceolatum	SEDUM LANCEOLATUM	YELLOW STONECROP	0	33.33	0	0	0					P		
Artemisia frigida		FRINGED SAGE	1.33	100	2.44 {2.42}	1.67	2.66	4	P				(1)	
Artemisia ludoviciana		PASTURE SAGE	0.33	100	0.61	1	1.6	P	(1)			1(1)		
Aster porteri		PORTER'S ASTER	0.33	100	0.61	0.33	0.53	P	P			1		
Campanula rotundifolia		HAREBELL	0	66.67	0	0	0	P	P					
Cerastium strictum	CERASTIUM ARVENSE	MOUSE-EAR	1	33.33	1.83	1	1.6		3					
Erigeron compositus		FLEABANE	0	33.33	0	0	0					P		
Eriogonum umbellatum var. umbellatum		WILD BUCKWHEAT	1	33.33	1.83	1	1.6					3		
Erysimum capitatum		COAST WALLFLOWER	0	66.67	0	0	0		P			P		
Gaillardia aristata		BLANKETFLOWER	0	33.33	0	0	0					P		
Gastrolychnis drummondii	MELANDRIUM DRUMMONDII,LYCHNIS DRUMMONDII	DRUMMOND CAMPION	0	33.33	0	0	0					P		
Geranium caespitosum ssp. caespitosum		SMALL-LEAF WILD GERANIUM	0.33	66.67	0.61	0.33	0.53	P				1		
Harbouria trachypleura		WHISKBROOM PARSLEY	0	33.33	0	0	0					P		
Helianthus pumilus		SUNFLOWER	0.67	100	1.22	0.67	1.06	1	1			P		
Heterotheca foliosa		GOLDENASTER	3.33	100	6.1	3.67	5.85	9(1)	1			P		
Lesquerella montana		BLADDERPOD	0	33.33	0	0	0					P		
Microseris nutans		MICROSERIS	0.33	33.33	0.61	0.33	0.53		1					
Packera fendleri	SENECIO FENDLERI	FENDLER'S RAGWORT	0	33.33	0	0	0					P		
Paronychia jamesii		NAILWORT	0	33.33	0	0	0					P		
Penstemon virens		GREEN BEARD-TONGUE	0.67 {1.00}	66.67	1.22 {1.82}	1	1.6		P			2	1	
Phacelia heterophylla		VARILEAF SCORPIONWEED	0	33.33	0	0	0	P						
Scutellaria brittonii		SKULLCAP	0	33.33	0	0	0					P		
TOTAL NATIVE PERENNIAL FORBS			9.3 {9.7}	100	17.1 {17.6}	11	18	14(1)	6(1)	---	---	8(1)	1(1)	---
INTRODUCED PERENNIAL FORBS														
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0	33	0	0	0	P						
TOTAL INTRO. PERENNIAL FORBS			0	33	0	0	0	P	---	---	---	---	---	---
NATIVE PERENNIAL GRASSES (cool)														
Bromopsis lanatipes	BROMUS LANATIPES	WOOLY BROME	0	67	0	0	0	P				P		
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	1.67	66.67	3.05	2	3.19	2	3(1)					
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	2.67	66.67	4.88	3	4.79	8(1)				P		
Elymus lanceolatus fm. albicans	AGROPYRON DASYSTACHYUM,A. ALBICANS,AGROPYRON RIPARIUM	MONTANA WHEATGRASS	0.67	66.67	1.22	0.67	1.06	2				P		
Festuca arizonica		ARIZONA FESCUE	0.33	33.33	0.61	0.33	0.53		1					
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS	0	33.33	0	0	0	P						
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0.33	33.33	0.61	0.33	0.53	1						
Leucopoa kingii		SPIKE FESCUE	0.67	100	1.22	0.67	1.06	1	1			P		
TOTAL NATIVE PERENNIAL GRASSES (c)			6	100	12	7	12	14(1)	5(1)	---	---	P	---	---

DATA FROM FILE Group D

SCIENTIFIC NAME	SYNONYM	COMMON	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	03D	15D	15DWU	15U	17D	17DWU	17U
NATIVE PERENNIAL GRASSES (warm)														
Muhlenbergia montana		MOUNTAIN MUHLY	1	67	1	1	1		1			1		
TOTAL NATIVE PERENNIAL GRASSES (w)			1	67	1	1	1	---	1	---	---	1	---	---
NATIVE SHRUBS														
Ceanothus fendleri		BUCKBRUSH	8.00 {8.33}	100	14.63 {15.15}	10	15	3(1)	14(2)			7(1)	1	
Cercocarpus montanus		BIRCHLEAF MOUNTAIN MAHOGANY	5.67	66.67	10.37	6	9.57		4			13(1)		
Padus virginiana ssp. melanocarpa	PRUNUS VIRGINIANA SSP. MELANOCARPA	CHOKECHERRY	0	33.33	0	0	0		P					
Physocarpus monogynus		NINEBARK	0	33.33	0	0	0		P					
Ribes cereum		WAX CURRANT	0.33	100	0.61	0.33	0.53	P	P			1		
Yucca glauca		SPANISH BAYONET	0	33.33	0	0	0					P		
TOTAL NATIVE SHRUBS			14.0 {14.3}	100	25.6 {26.1}	16	26	3(1)	18(2)	---	---	21(2)	1	---
NATIVE TREES														
Pinus ponderosa ssp. scopulorum		PONDEROSA PINE	0.33 {0.00}	33	1	0	1							1
Pseudotsuga menziesii		DOUGLAS-FIR	0.33 {0.00}	33.33	0.61	0.33	0.53							1
Pseudotsuga menziesii dead		DOUGLAS FIR	0.67 {0.00}	33.33		0.67	1.06							[2]
Sabina scopulorum dead	JUNIPERUS SCOPULORUM	ROCKY MOUNTAIN JUNIPER	1.00 {0.67}	33.33		1	1.6		[2]		[1]			
TOTAL NATIVE TREES			0.7 {0.0}	33	1	1	1	---	---	---	---	---	---	2
Standing dead		STANDING DEAD	1.67 {0.00}	66.67		1.67			2			3		
Litter		LITTER	22.00 {22.33}	100		22.33		29	17			20	1	
Bare soil		BARE SOIL	14.33 {14.67}	100		14.67		8	10			25	1	
Rock		ROCK	5.67	100		5.67		3	6			8		
TOTALS			98.3 {98.3}			107		100	97			98		
TOTALS (LAYER)								100	97	1	0	96	4	2
TOTAL VEGETATION COVER (LAYER)								60(5)	62(6)	1	0	40(4)	2(1)	2
TOTAL VEGETATION COVER			54.7 {55.7} Std.Dev.= 11.0		100.0 {101.2}	62.7 (s=37.5)	100	60(5)	62(7)			42(7)		
GROUND COVER (Litter+Rock+Veg+St.Dead)			84.0 {84.7}			92.3 {90.7}		92(5)	87(6)	1	0	71(4)	3(1)	2
SPECIES DENSITY (# of species/100 sq.m.) (AVERAGE= 33.0 Std.Dev.= 5.6)								28	32			39		
SPECIES DENSITY (LAYER)								28	32	1	0	36	3	2

(#) = second hit
{#} = cover value if tree canopy is excluded
[#] = hit on standing dead tree species

Appendix 2. Species Importance in 2002 and 2007 based on 18 samples.

Scientific Name	Relative Importance (%)	Constancy (%)	Average Cover All Hits (%)
Pinus ponderosa ssp. scopulorum (dead)	100.000	66.67	5.61
****Carex pensylvanica ssp. heliophila*	65.923	77.78	3.17
Ceanothus fendleri	53.278	94.44	2.11
Phacelia heterophylla	53.237	77.78	2.56
Pseudotsuga menziesii (dead)	42.931	55.56	2.89
Verbascum thapsus	36.360	94.44	1.44
Sisymbrium altissimum	28.103	61.11	1.72
Chenopodium simplex	27.658	77.78	1.33
****Anisantha tectorum*	24.716	72.22	1.28
Elymus trachycaulus	19.338	33.33	2.17
*****Ceratochloa carinata*	18.357	33.33	2.06
Penstemon virens	15.923	88.89	0.67
Artemisia ludoviciana	12.937	72.22	0.67
Geranium caespitosum ssp. caespitosum	12.685	77.78	0.61
Carex spp.	11.096	50.00	0.83
Corydalis aurea	9.953	55.56	0.67
Artemisia frigida	8.957	50.00	0.67
Campanula rotundifolia	8.110	77.78	0.39
Chenopodium leptophyllum	8.110	77.78	0.39
Grindelia squarrosa	7.248	44.44	0.61
Triticum aestivum x Elytrigia elongata	7.189	61.11	0.44
Helianthus pumilus	6.952	66.67	0.39
Breea arvensis	6.343	38.89	0.61
Apocynum androsaemifolium	6.297	22.22	1.06
Chondrosum gracile	5.941	44.44	0.50
Epilobium brachycarpum	5.882	66.67	0.33
Leucopoa kingii	5.882	66.67	0.33
Astragalus miser var. oblongifolius	5.407	72.22	0.28
****Populus tremuloides*	4.931	22.22	0.83
Pseudotsuga menziesii	4.876	5.56	3.28
Physocarpus monogynus	4.634	44.44	0.39
Heterotheca villosa	4.412	50.00	0.33
Lactuca serriola	3.922	66.67	0.22
Solidago simplex var. simplex	3.743	50.00	0.28
Elymus lanceolatus fm. albicans	3.431	38.89	0.33
Sabina scopulorum (dead)	3.327	22.22	0.56
Alyssum minus	3.268	27.78	0.44
Erysimum capitatum	3.030	66.67	0.17
Elymus elymoides	2.614	44.44	0.22
Rubus idaeus ssp. melanolasius	2.525	55.56	0.17
Silene antirrhina	2.525	55.56	0.17
Gaillardia aristata	2.273	50.00	0.17
Heterotheca foliosa	2.080	27.78	0.28
Drymocallis fissa	1.961	66.67	0.11
Ribes cereum	1.961	66.67	0.11
Aster porteri	1.797	61.11	0.11
Cercocarpus montanus	1.663	22.22	0.28
Rosa arkansana	1.515	33.33	0.17
Aletes acaulis	1.144	38.89	0.11
Astragalus laxmannii	1.144	38.89	0.11
Carduus nutans ssp. macrolepis	1.144	38.89	0.11
Oenothera caespitosa ssp. caespitosa	1.144	38.89	0.11
Dracocephalum parviflorum	0.981	16.67	0.22
Achillea lanulosa	0.980	61.11	0.06
Acrolasia dispersa	0.980	33.33	0.11
Pulsatilla ludoviciana	0.802	50.00	0.06
Scutellaria brittonii	0.802	50.00	0.06
Helianthus annuus	0.653	22.22	0.11
****Androsace septentrionalis*	0.624	38.89	0.06
Taraxacum officinale	0.624	38.89	0.06
Harbouria trachypleura	0.535	33.33	0.06
Muhlenbergia montana	0.505	11.11	0.17
Cirsium ochrocentrum	0.490	16.67	0.11
Bassia sieversiana	0.446	27.78	0.06
Poa agassizensis	0.446	27.78	0.06
Hesperostipa comata	0.356	22.22	0.06
Poa compressa	0.327	11.11	0.11
Populus tremuloides (dead)	0.327	11.11	0.11
Arctostaphylos uva-ursi	0.267	16.67	0.06
Lappula redowskii	0.267	16.67	0.06
Liatris punctata	0.267	16.67	0.06
Symphoricarpos rotundifolius	0.267	16.67	0.06
Astragalus agrestis	0.178	11.11	0.06
Monarda fistulosa var. menthifolia	0.178	11.11	0.06
Oxytropis lambertii	0.178	11.11	0.06
Verbena bracteata	0.178	11.11	0.06
Moss	0.164	5.56	0.11
Mertensia lanceolata	0.134	50.00	0.01
Eriogonum umbellatum var. umbellatum	0.104	38.89	0.01
Cirsium vulgare	0.089	5.56	0.06

Festuca brachyphylla ssp. coloradensis	0.089	5.56	0.06
Machaeranthera bigelovii	0.089	5.56	0.06
Koeleria macrantha	0.089	33.33	0.01
Polygonum douglasii	0.074	27.78	0.01
Oreobatus deliciosus	0.059	22.22	0.01
Allium cernuum	0.045	16.67	0.01
Astragalus shortianus	0.045	16.67	0.01
Conyza canadensis	0.045	16.67	0.01
Galium septentrionale	0.045	16.67	0.01
****Lesquerella montana*	0.045	16.67	0.01
Nicotiana attenuata	0.045	16.67	0.01
Packera fendleri	0.045	16.67	0.01
Penstemon glaber	0.045	16.67	0.01
Potentilla hippiana	0.045	16.67	0.01
Tragopogon dubius ssp. major	0.045	16.67	0.01
Acer glabrum	0.030	11.11	0.01
Acosta diffusa	0.030	11.11	0.01
Amerosedum lanceolatum	0.030	11.11	0.01
Arnica fulgens	0.030	11.11	0.01
Astragalus spp.	0.030	11.11	0.01
Bromopsis lanatipes	0.030	11.11	0.01
Bromus japonicus	0.030	11.11	0.01
Camelina microcarpa	0.030	11.11	0.01
Cerastium strictum	0.030	11.11	0.01
Collomia linearis	0.030	11.11	0.01
Cylindropyrum cylindricum	0.030	11.11	0.01
Euphorbia spp.	0.030	11.11	0.01
Frasera speciosa	0.030	11.11	0.01
Gaura mollis	0.030	11.11	0.01
Lupinus argenteus	0.030	11.11	0.01
Physaria vitulifera	0.030	11.11	0.01
Rosa woodsii	0.030	11.11	0.01
Sporobolus cryptandrus	0.030	11.11	0.01
Achnatherum nelsonii	0.015	5.56	0.01
Agrostis scabra	0.015	5.56	0.01
Antennaria rosea	0.015	5.56	0.01
Arabis hirsuta	0.015	5.56	0.01
Asclepias stenophylla	0.015	5.56	0.01
Asclepias viridiflora	0.015	5.56	0.01
Astragalus drummondii	0.015	5.56	0.01
Bahia dissecta	0.015	5.56	0.01
Boechera fendleri	0.015	5.56	0.01
Carex sp. 1	0.015	5.56	0.01
Chenopodium foliosum	0.015	5.56	0.01
Chrysothamnus parryi	0.015	5.56	0.01
Collinsia parviflora	0.015	5.56	0.01
Cystopteris fragilis	0.015	5.56	0.01
Dactylis glomerata	0.015	5.56	0.01
Draba spp.	0.015	5.56	0.01
Elymus spp.	0.015	5.56	0.01
Elymus virginicus	0.015	5.56	0.01
Erigeron speciosus	0.015	5.56	0.01
Heuchera spp.	0.015	5.56	0.01
Lepidium densiflorum	0.015	5.56	0.01
Maianthemum stellatum	0.015	5.56	0.01
Melilotus albus	0.015	5.56	0.01
Melilotus officinale	0.015	5.56	0.01
Noccaea montana	0.015	5.56	0.01
Oligosporus dracunculus ssp. glaucus	0.015	5.56	0.01
Oreocarya virgata	0.015	5.56	0.01
Oxybaphus hirsutus	0.015	5.56	0.01
Padus virginiana ssp. melanocarpa	0.015	5.56	0.01
Paronychia jamesii	0.015	5.56	0.01
Penstemon spp.	0.015	5.56	0.01
Poa fendleriana	0.015	5.56	0.01
Podospermum laciniatum	0.015	5.56	0.01
Pterogonum alatum	0.015	5.56	0.01
Rumex triangulivalvis	0.015	5.56	0.01
Schedonnardus paniculatus	0.015	5.56	0.01
Schizachyrium scoparium	0.015	5.56	0.01
Senecio integerrimus	0.015	5.56	0.01
Solanum spp.	0.015	5.56	0.01
Solanum triflorum	0.015	5.56	0.01
Solidago missouriensis	0.015	5.56	0.01
Teloxys botrys	0.015	5.56	0.01
Tithymalus peplus	0.015	5.56	0.01
Triticum aestivum	0.015	5.56	0.01
Unknown forb	0.015	5.56	0.01
Urtica gracilis ssp. gracilis	0.015	5.56	0.01
Vaccinium myrtillus ssp. oreophilum	0.015	5.56	0.01
Yucca glauca	0.015	5.56	0.01

*Relative Importance = Importance/ Maximum Importance Value in Data Set, Importance = Constancy X Average Cover-All

**Average Cover-All = Sum of first and additional hits.

***Indicator Species in TWINSPAN Classification

The species with the greatest increase or decrease in importance in 2007.

Increasers	2007 Relative Importance	2002 Relative Importance	Change
Litter	100.00	61.88	38.12
TOTAL INTRO. ANN. GRASSES	27.66	2.40	25.26
Anisantha tectorum	25.88	2.37	23.51
TOTAL NATIVE SHRUBS	30.73	8.45	22.28
TOTAL NATIVE PERENNIAL FORBS	47.18	26.37	20.81
Ceanothus fendleri	22.25	5.10	17.15
Standing dead	14.87	1.74	13.13
Heterotheca foliosa	6.44	0.20	6.24
Artemisia frigida	6.56	0.86	5.70
Achillea lanulosa	3.36	0.09	3.26
Artemisia ludoviciana	4.44	1.24	3.20
Solidago simplex var. simplex	2.64	0.36	2.28
Poa agassizensis	1.53	0.04	1.49
TOTAL NATIVE TREES	4.34	2.92	1.42
Penstemon virens	2.74	1.52	1.22
Cercocarpus montanus	1.26	0.16	1.10
Heterotheca villosa	1.46	0.42	1.04
Elymus elymoides	1.26	0.25	1.01
Pseudotsuga menziesii	1.15	0.47	0.68
Aster porteri	0.82	0.17	0.65
Machaeranthera bigelovii	0.63	0.01	0.62
Ribes cereum	0.68	0.19	0.49
Eriogonum umbellatum var. umbellatum	0.47	0.01	0.46
Rubus idaeus ssp. melanolasius	0.61	0.24	0.36
Koeleria macrantha	0.32	0.01	0.31
Muhlenbergia montana	0.34	0.05	0.29
Acosta diffusa	0.19	0.00	0.19
Alyssum minus	0.48	0.31	0.17
Tragopogon dubius ssp. major	0.13	0.00	0.13
Cerastium strictum	0.12	0.00	0.11
Hesperostipa comata	0.15	0.03	0.11
TOTAL NATIVE PERENNIAL GRASSES (c)	23.90	23.81	0.09
Elymus lanceolatus fm. albicans	0.40	0.33	0.07
Populus tremuloides	0.54	0.47	0.07
Bahia dissecta	0.06	0.00	0.06
Bromopsis lanatipes	0.05	0.00	0.05

Decreasers	Relative Importance	Relative Importance	Change
Bare soil	48.11	100.00	-51.89
Pinus ponderosa ssp. scopulorum [dead]	0.21	9.58	-9.37
TOTAL NATIVE ANN. & BIEN. FORBS	1.55	8.70	-7.15
Phacelia heterophylla	0.48	5.10	-4.61
TOTAL INTRO. ANN. & BIEN. FORBS	7.14	9.91	-2.77
Chenopodium simplex	0.00	2.65	-2.65
Sisymbrium altissimum	0.09	2.69	-2.60
Carex pensylvanica ssp. heliophila	4.15	6.31	-2.16
Ceratochloa carinata	0.00	1.76	-1.76
Elymus trachycaulus	0.52	1.85	-1.33
Pseudotsuga menziesii [dead]	3.16	4.11	-0.96
TOTAL INTRO. PERENNIAL GRASSES (c)	0.14	0.94	-0.80
Chenopodium leptophyllum	0.00	0.78	-0.78
TOTAL INTRO. PERENNIAL FORBS	0.38	1.09	-0.72
Grindelia squarrosa	0.12	0.69	-0.57
Epilobium brachycarpum	0.00	0.56	-0.56
Apocynum androsaemifolium	0.04	0.60	-0.56
Verbascum thapsus	2.95	3.48	-0.54
Astragalus miser var. oblongifolius	0.00	0.52	-0.52
Breea arvensis	0.17	0.61	-0.44
Geranium caespitosum ssp. caespitosum	0.81	1.21	-0.41
Carex spp.	0.67	1.06	-0.39
Chondrosum gracile	0.21	0.57	-0.36
Campanula rotundifolia	0.46	0.78	-0.32
Sabina scopulorum [dead]	0.03	0.32	-0.29
Lactuca serriola	0.10	0.38	-0.27
Silene antirrhina	0.00	0.24	-0.24
Erysimum capitatum	0.05	0.29	-0.24
Helianthus pumilus	0.43	0.67	-0.23
TOTAL NATIVE PERENNIAL GRASSES (w)	0.78	1.00	-0.22
Gaillardia aristata	0.00	0.22	-0.22
Physocarpus monogynus	0.23	0.44	-0.22
Carduus nutans ssp. macrolepis	0.00	0.11	-0.11
Astragalus laxmannii	0.00	0.11	-0.11
Drymocallis fissa	0.09	0.19	-0.09
Acrolasia dispersa	0.00	0.09	-0.09
Pulsatilla ludoviciana	0.00	0.08	-0.08
Scutellaria brittonii	0.00	0.08	-0.08
Androsace septentrionalis	0.00	0.06	-0.06

Newly observed, or no longer observed in 2007 transects.

NEW SPECIES in 2007

Elymus lanceolatus
Festuca arizonica
Microseris nutans
Pinus ponderosa ssp. scopulorum
Erigeron divergens
Oenothera villosa ssp. strigosa
Cynoglossum officinale
Descurainia sophia
Turritis glabra
Erigeron compositus
Erigeron pinnatisectus
Gastrolychnis drummondii
Heliomeris multiflora
Lesquerella montana
Penstemon strictus
Physalis heterophylla
Scrophularia lanceolata
Senecio spartioides
Viola spp.
Linaria genistifolia ssp. dalmatica
Achnatherum lettermanii
Amelanchier alnifolia
Ribes aureum

SPECIES OBSERVED IN TRANSECTS IN 2002 BUT NOT OBSERVED IN 2007

Corydalis aurea
Triticum aestivum x elytrigia elongata
Oenothera caespitosa ssp. caespitosa
Dracocephalum parviflorum
Helianthus annuus
Bassia sieversiana
Populus tremuloides [dead]
Liatris punctata
Astragalus agrestis
Oxytropis lambertii
Verbena bracteata
Moss
Cirsium vulgare
Festuca brachyphylla ssp. coloradensis
Oreobatus deliciosus
Astragalus shortianus
Nicotiana attenuata
Acer glabrum
Arnica fulgens
Astragalus spp.
Collomia linearis
Euphorbia spp.
Gaura mollis
Physaria vitulifera
Sporobolus cryptandrus
Achnatherum nelsonii
Asclepias stenophylla
Asclepias viridiflora
Boechera fendleri
Carex sp. 1
Chenopodium foliosum
Chrysothamnus parryi
Cystopteris fragilis
Draba spp.
Elymus spp.
Heuchera spp.
Lepidium densiflorum
Melilotus albus
Melilotus officinale
Noccaea montana
Oreocarya virgata
Oxybaphus hirsutus
Poa fendleriana
Podospermum laciniatum
Schedonnardus paniculatus
Schizachyrium scoparium
Senecio integerrimus
Solanum spp.
Solanum triflorum
Teloxys botrys
Tithymalus peplus
Urtica gracilis ssp. gracilis
Vaccinium myrtillus ssp. oreophilum

Photographs
Walker Ranch
Boulder County
July, 2007

Sample start point

Sample end point

Sample Site 1

Sample start point

Sample end point

Sample Site 2

Sample start point

Sample end point

Sample Site 3

Sample start point

Sample end point

Sample Site 4

Sample start point

Sample end point

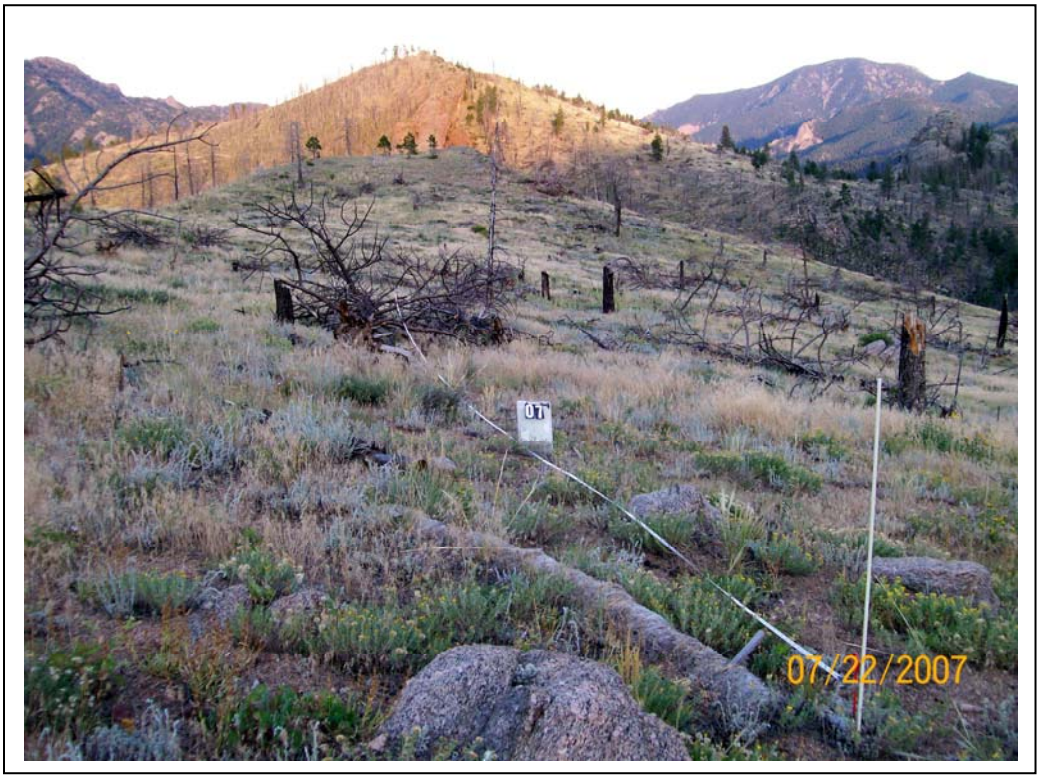
Sample Site 5

Sample start point

Sample end point

Sample Site 6

Sample start point



Sample end point

Sample Site 7

Sample start point

Sample end point

Sample Site 8

Sample start point

Sample end point

Sample Site 9

Sample start point

Sample end point

Sample Site 10

Sample start point

Sample end point

Sample Site 11

Sample start point

Sample end point

Sample Site 12

Sample start point

Sample end point

Sample Site 13

Sample start point

Sample end point

Sample Site 14

Sample start point

Sample end point

Sample Site 15

Sample start point

Sample end point

Sample Site 16

Sample start point

Sample end point

Sample Site 17

Sample start point

Sample end point

Sample Site 18

Appendix 4. Eldorado Fire, Walker Ranch TWINSPAN 2-Way Table with Sample and Species Classification for 2002 Data.

Vertical lines define Sample groups and horizontal lines define species groups.

Sample Classification Groups E D C B A

* This symbol identifies the indicator species defined by TWINSPAN

```
                    111  1      11111
                    87537124596810 6423
 143 Sisy alti      ---1-2249-1-31-421  00000
  74 Gail aris      --1111211----1-3--  000010
 102 Nico atte      -------11--------1  000010
  78 Grin squa      -2-2452--------211-  000011
  83 Hete foli      -1--1--5-1--------1  000011
 104 Oeno caes      ---11121----1--2--  000011
 159 Verb thap      -2771311112131131   0001
* 10 Amer lanc      11----------------  001000
  27 Astr shor      -1-11-------------  001000
  33 Brom lana      -1-1--------------  001000
  34 Brom japo      --1--1------------  001000
  44 Cerc mont      -5---2-11---------  001000
  82 Hesp coma      --21-1-1----------  001000
* 90 Lesq mont      -111--------------  001000
 101 Muhl mont      -4-----1----------  001000
   9 Alys minu      ---1-316---1------  001001
  35 Came micr      ----11-----------   001001
* 38 Care pens      539566682122--11--  001001
  50 Cirs ochr      ---2-21-----------  001001
  63 Elym lanc      -2124-1-2--1------  001001
  84 Hete vill      1-112242----11----  001001
  88 Lapp redo      ----1-12----------  001001
 100 Moss           3-----------------  001001
 109 Oxyt lamb      -----12-----------  001001
 128 Pseu menz      9-----------------  001001
   8 Alli cern      -1-1----------1---  001010
  22 Aste port      -1112-121-1-111---  001010
  23 Astr agre      ----2---------1---  001010
  30 Bass siev      ---2--111-1-------  001010
  62 Elym elym      --122111----3-1---  001010
  69 Erio umbe      -1--1111---1--1---  001010
  79 Harb trac      ---111--2--1-1----  001010
  91 Leuc king      242121-11-111-1---  001010
  92 Liat punc      -1-----2----------  001010
 106 Oreo deli      -11----1-1--------  001010
 110 Pack fend      -1--1-----------1---  001010
 153 Trag dubi      --11-------1------  001010
 160 Verb brac      -----2-----1------  001010
  18 Arte frig      1-115-61----1-1-1-  001011
 140 Scut brit      -11-21111----1-1--  001011
  70 Erys capi      -2112111-111-12---  001100
  86 Koel macr      ---11--1--1-1-1---  001100
  98 Mert lanc      --111-1-1--1111---  001100
 119 Pinu ponD      4-65699-67782-4---  001100
 131 Puls ludo      --21---1111-111---  001100
   4 Acos diff      ----1---1---------  001101
 121 Poa  comp      ---2-------2------  001101
 127 Pote hipp      --1------11-------  001101
 155 Trit xely      ---1111114133-----  001101
   2 Achi lanu      1-111--21--1111-1-  001110
 132 Ribe cere      1211-11--1-21111--  001110
 147 Soli simp      1-2----241111--1--  001110
  19 Arte ludo      -41121213112--51--  001111
  28 Astr spp       ----------1----1---  010000
  43 Cera cari      -----3---61877----  010010
  65 Elym trac      -----4---46795----  010010
* 48 Chon grac      --2--2-1-11442----  010011
 115 Pens vire      141112-1132312311-  01010
  37 Card nuta      --2--1---1-11-21--  010110
 120 Poa  agas      ---1----------211-1-  010111
 116 Phac hete      -16331112663--95-4  011000
  25 Astr laxm      -1--2-----112--1-1  011001
  26 Astr mise      1-11112--1-1122-13  011001
  61 Drym fiss      1-1-1111-11-121--2  011001
   7 Alet acau      11------12-1--2--1  011010
  67 Epil brac      --1---121111-15111  011011
 124 Poly doug      --1----11---1--1--  01110
* 12 Anis tect      -11111266-212-16--  011110
  77 Gera caes      -1114151111-1115--  011111
  81 Heli pumi      -151211--111---221  100000
   1 Acer glab      --1-----------1--1  100001
  41 Cean fend      -4553322111113 1268  100001
 133 Rosa arka      --1--11-12-------3  100001
 118 Phys mono      -2111--1-11-----5-  100010
 137 Sabi scop      --5----21------5--  100010
  32 Bree arve      ---6-1----21-1-15-  100011
 142 Sile anti      1-21--1-1--111-31-  10010
  46 Chen lept      --11112211-1-21421  10011
  17 Arni fulg      ----------------11  101001
  60 Drac parv      ---------1------51  101001
  99 Mona fist      -----1----------2--  101001
*125 Popu trem      ----------2-----645  101001
 149 Symp rotu      1---------------21-  101001
  14 Apoc andr      --------1-1-----78  101010
  75 Gali sept      ---------1--1-1-1  101011
 113 Pens glab      ---------1---11  101011
   5 Acro disp      -11---1-----113--  101100
  40 Care spp       6-1--21-----31-324  101101
  47 Chen simp      -111-2-1121113-865  10111
 135 Rubu idae      ---1--11-111--1141  110000
  87 Lact serr      --11---111111-1241  110001
 150 Tara offi      --11-------12--111  110010
 129 Pseu menD      325------3-756677  110011
  36 Camp rotu      1-212-1-11-1123221  1101
  54 Cony cana      ---------11---1-  111000
  80 Heli annu      ---------1-21--2--  111001
 126 Popu treD      ---------2------2-  111001
  55 Cory aure      --1----2-43112-125  11101
* 11 Andr sept      ---------1211-1-11  11110
  16 Arct ouva      ---------1---21-1--  11111
                    0000000000000000111
                    0000000001111111001
                    0111111110000010 1
                     000111110001 1
                     001000110110
                      01  0010
```

Sample Classification Groups E D C B A

Appendix 5. 2002 Species & Site Attribute Data

Attribute Data for Species and Sites Walker Ranch Boulder County July, 2002

List of Figures for Appendix 5

Attribute Figures for 2002

The attribute figures present the cover values for selected species at each sample site. This has been superimposed on the environmental vectors to represent the environmental centers of species distributions. The position of the circles indicates the sample site location in the ordination, and the size of the symbol is proportional to the actual cover value for the selected species. The species that were selected were the 31 most important species based on cover and frequency. Species that were identified as indicator species are noted as such in the Figure title. The species are presented in the same order as found in the Table 2. Douglas fir (*Pseudotsuga menziesii*) was included in the Table 2 list, but occurred only in Sample 18 with a cover value of 59%. Sample 18 was the unburned site outside of the burn perimeter and was so different from all of the other samples that it had to be excluded from the ordination, and is not presented below.

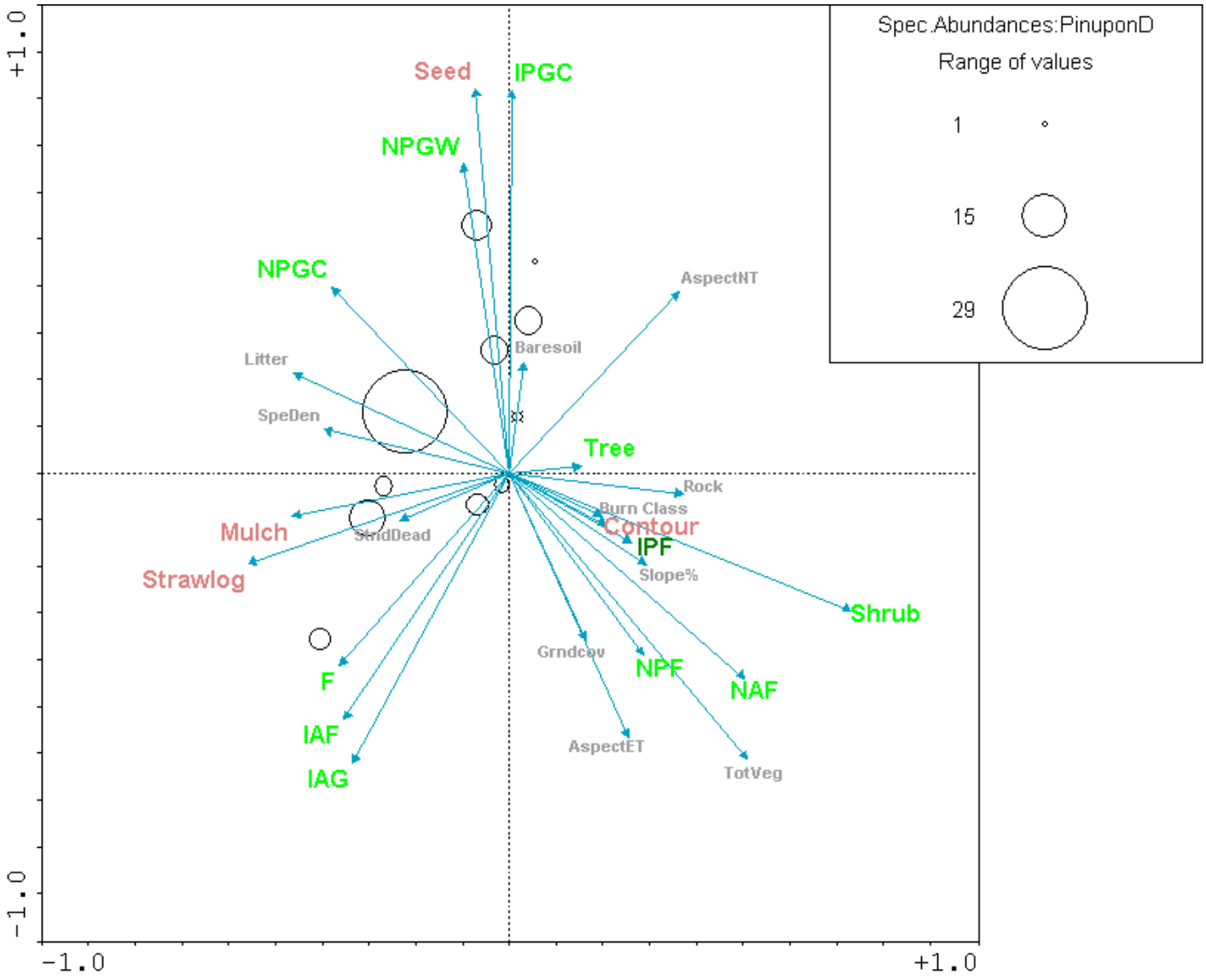


Figure 1. Pinus ponderosa ssp. scopulorum (dead) Cover Distribution (2002).

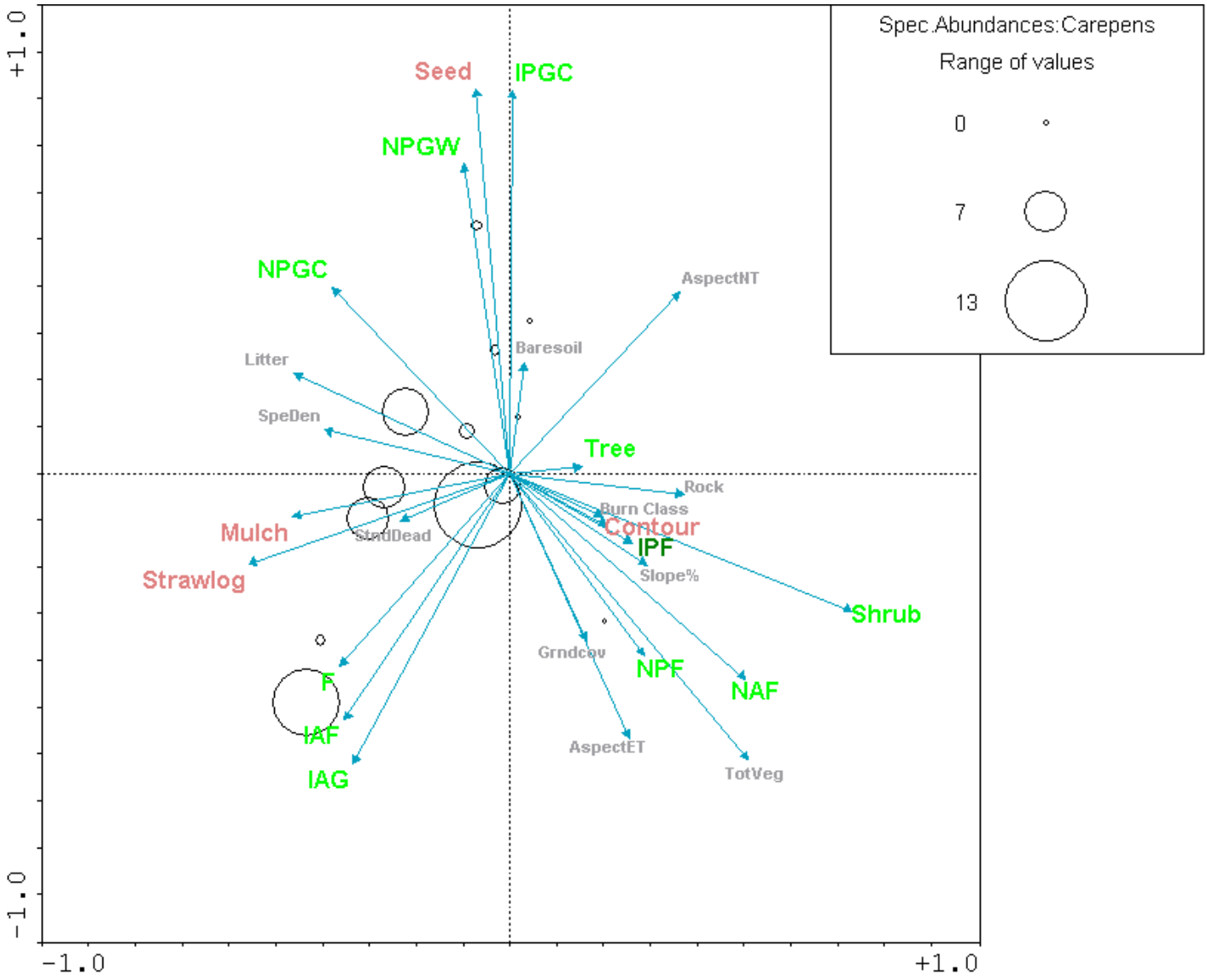


Figure 2. Carex pensylvanica ssp. heliophila Cover Distribution (2002) [Indicator for Groups C, D, & E].

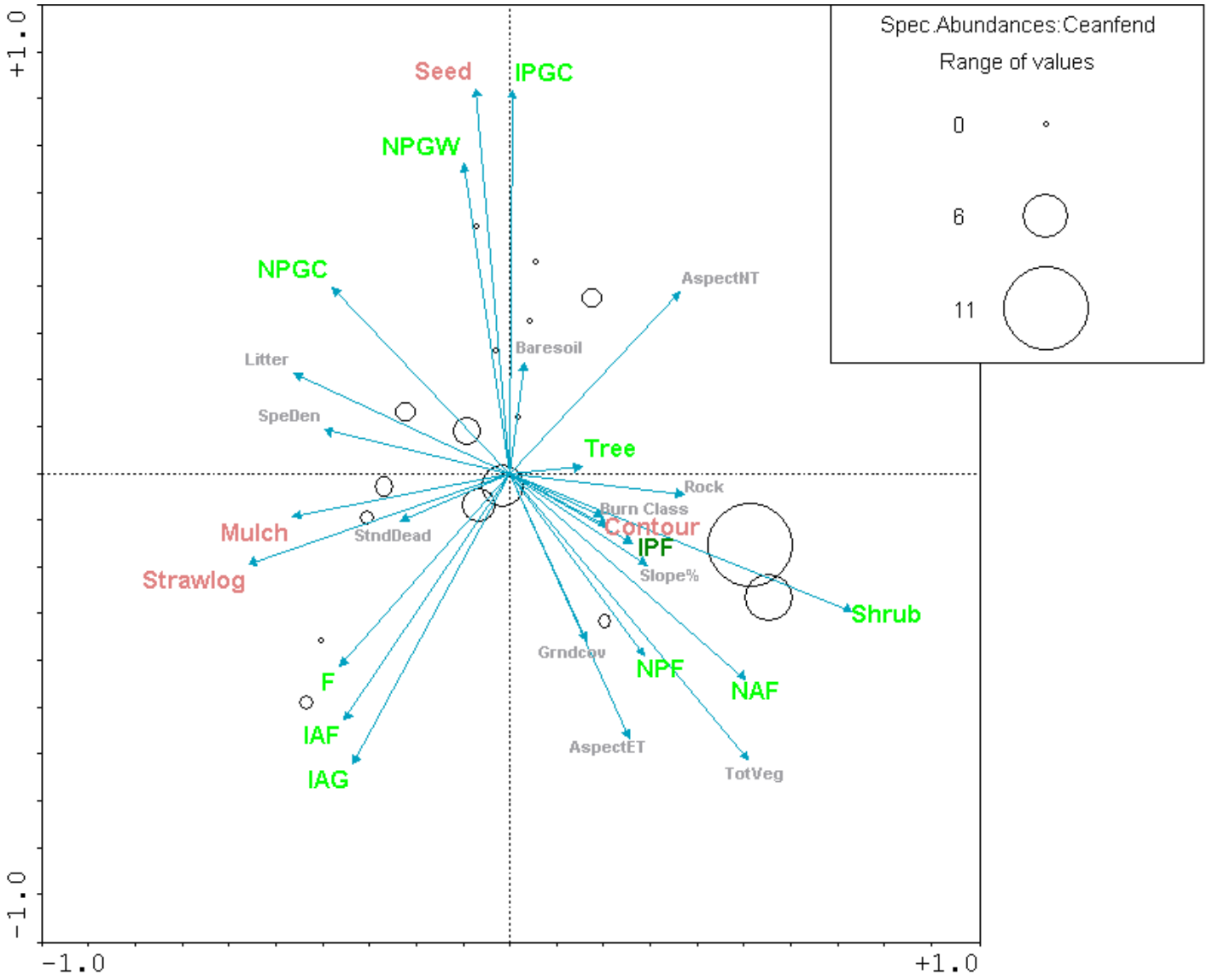


Figure 3. Ceanothus fendleri Cover Distribution (2002) – a non-preferential species.

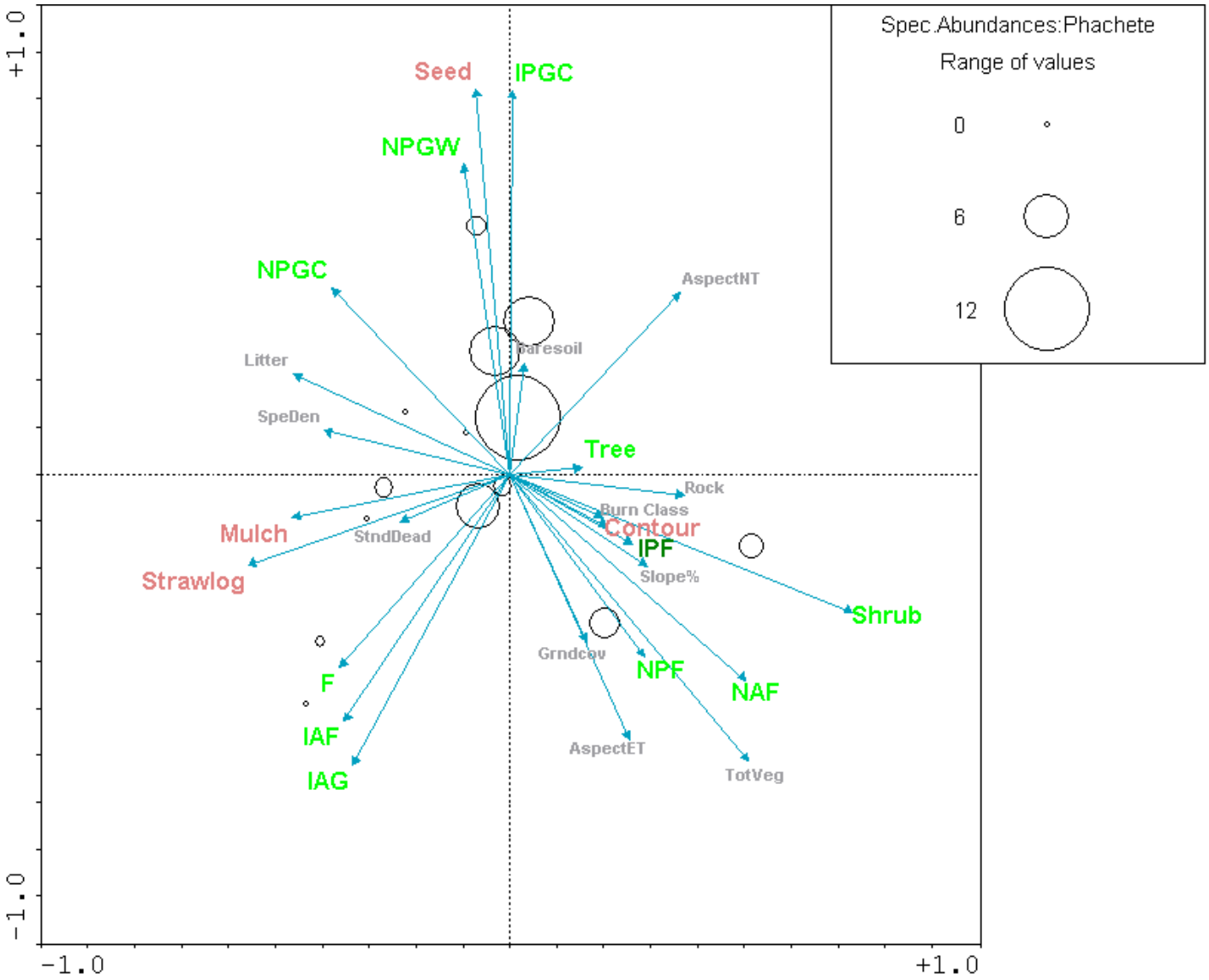


Figure 4. Phacelia heterophylla Cover Distribution (2002) – a non-preferential species.

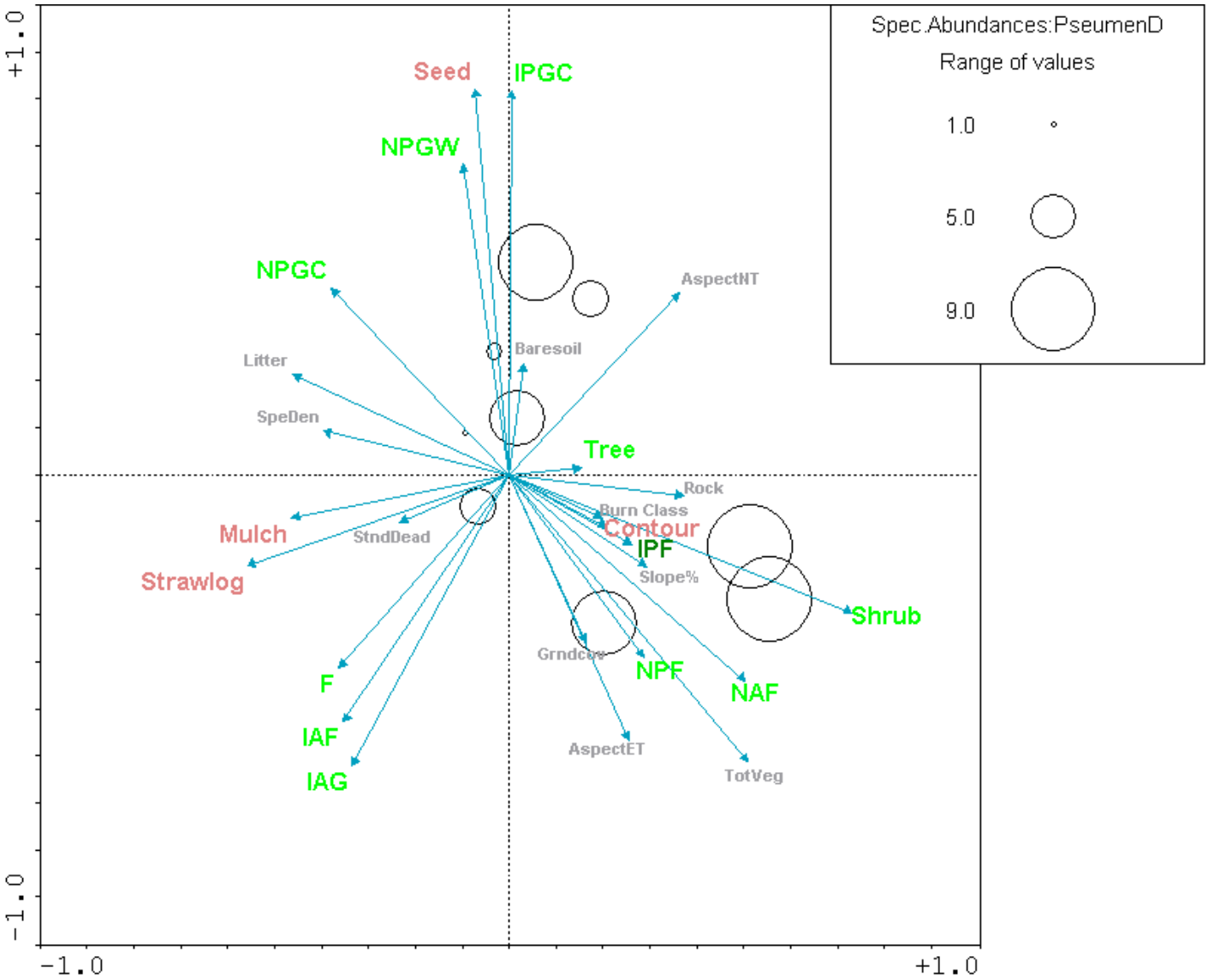


Figure 5. Pseudotsuga menziesii (dead) Cover Distribution (2002).

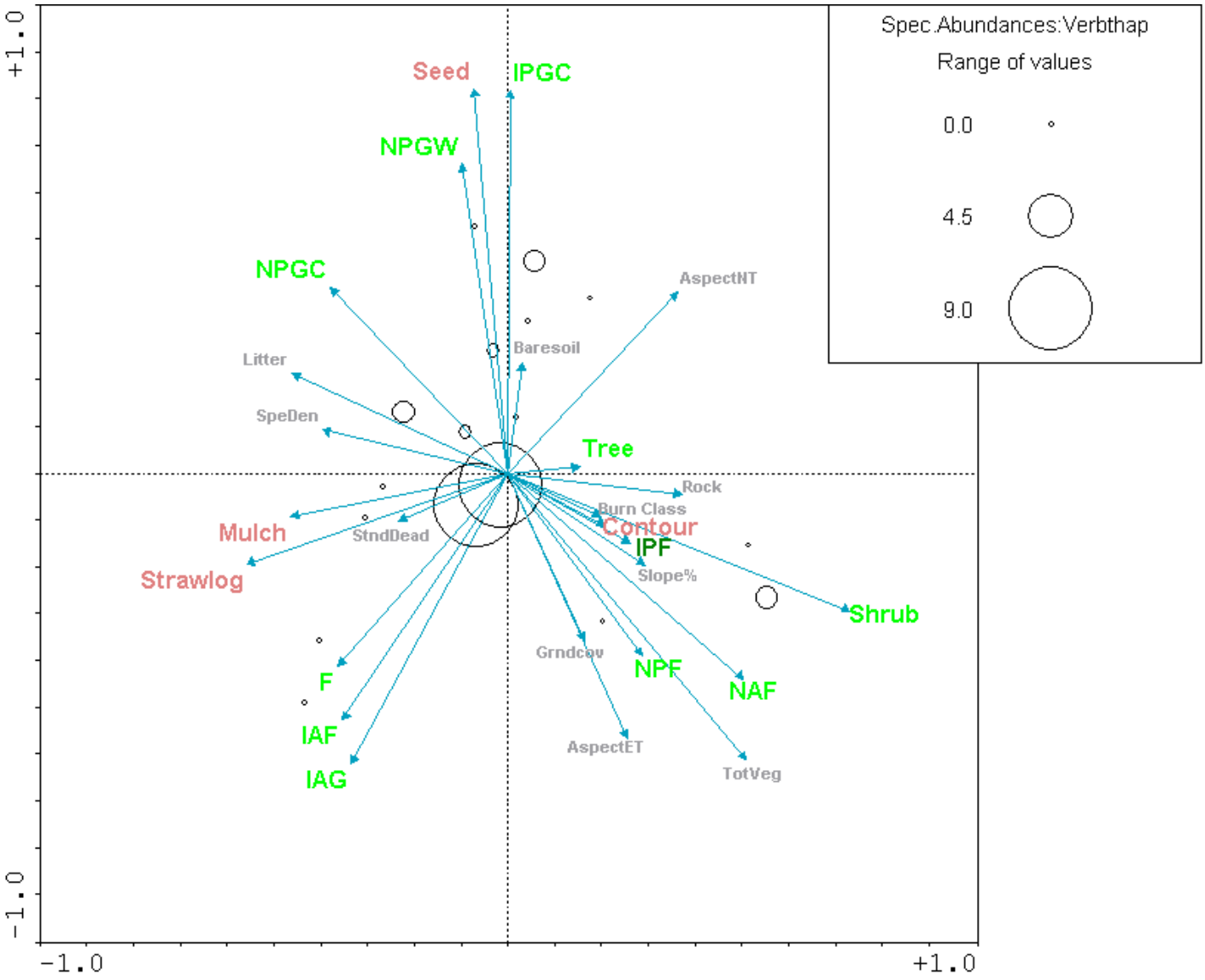


Figure 6. Verbascum thapsus Cover Distribution (2002) – non-preferential species.

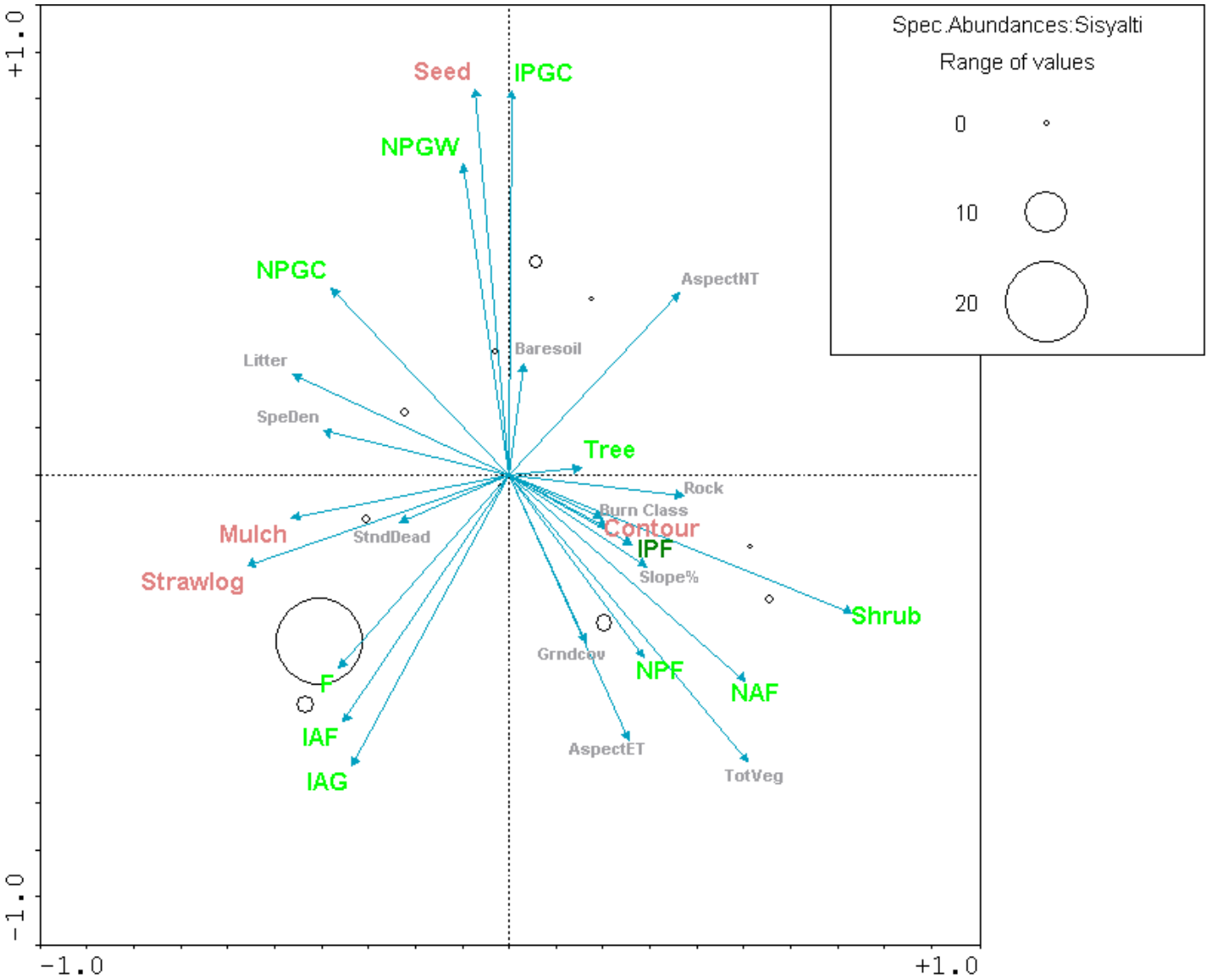


Figure 7. Sisymbrium altissimum Cover Distribution (2002).

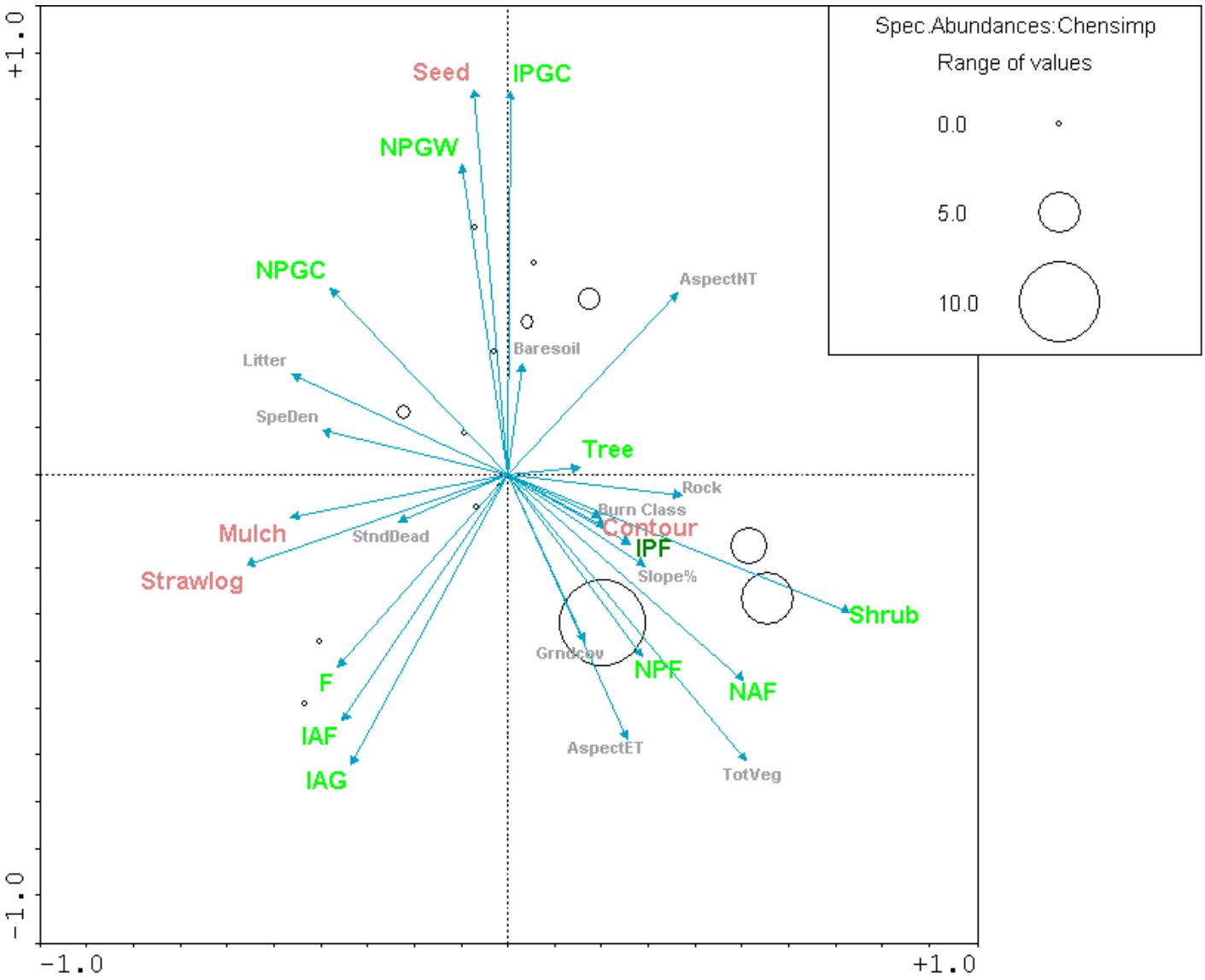


Figure 8. Chenopodium simplex Cover Distribution (2002) – non-preferential species.

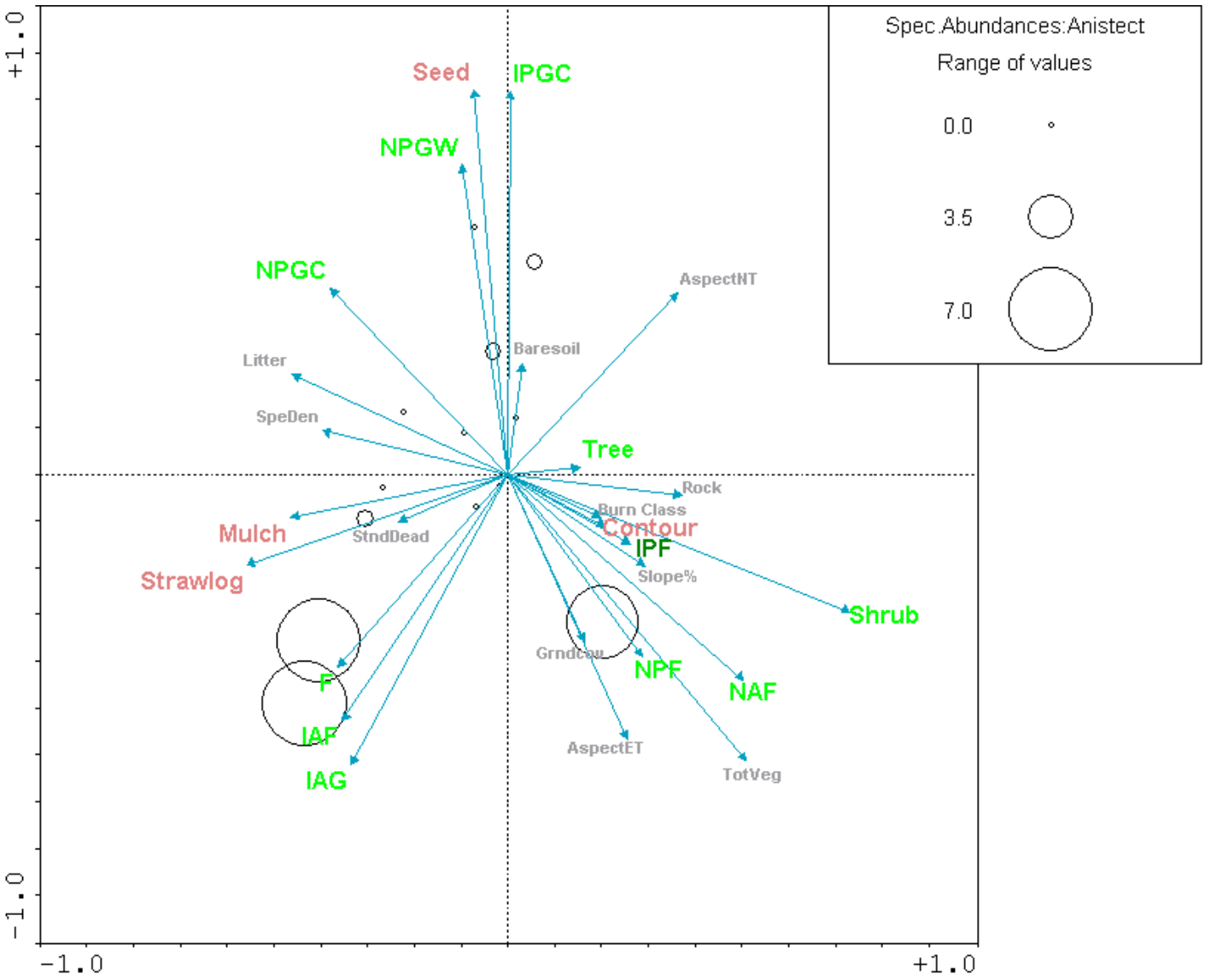


Figure 9. Anisantha tectorum Cover Distribution (2002) – an indicator for Groups C & D.

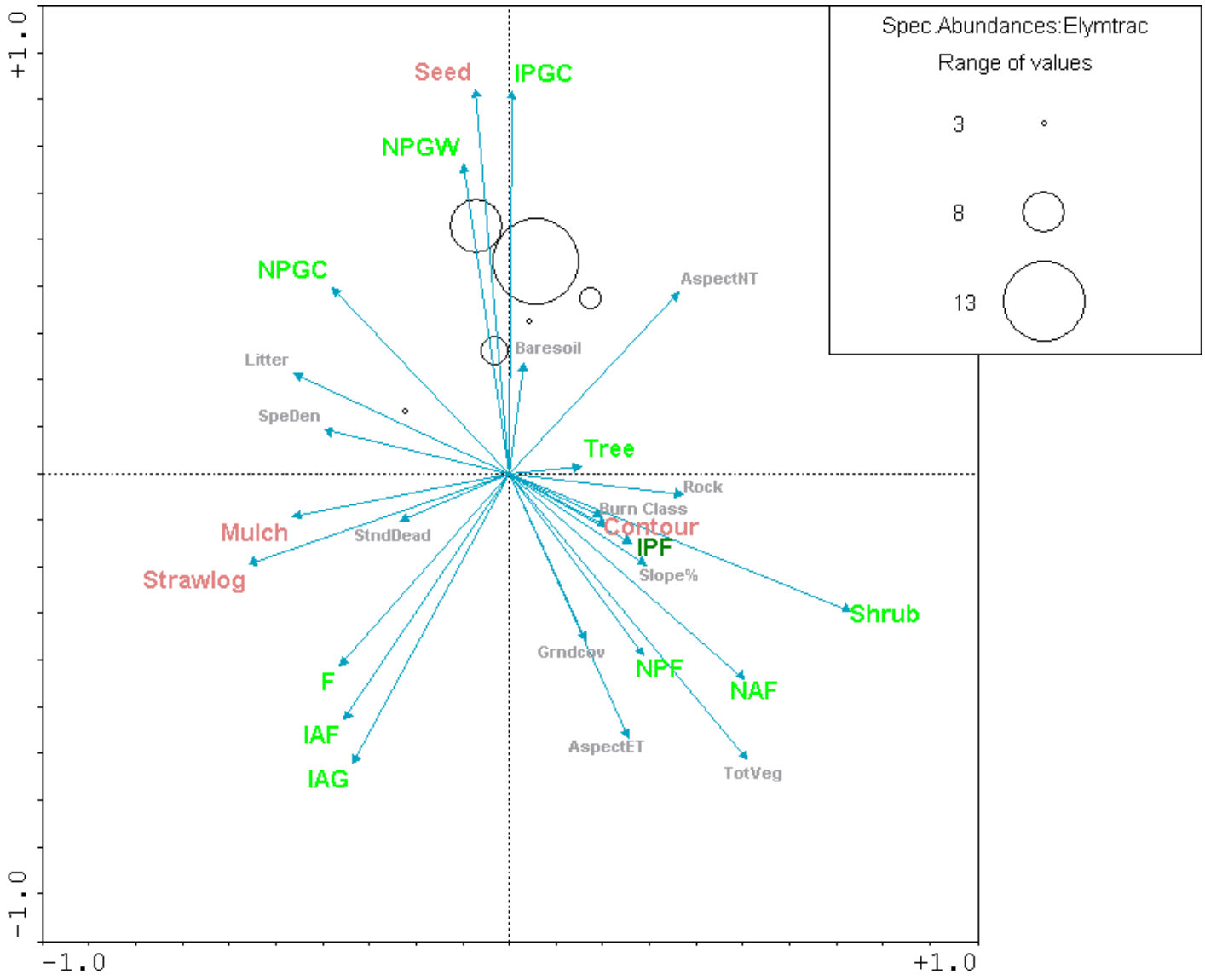


Figure 10. Elymus trachycaulus Cover Distribution (2002).

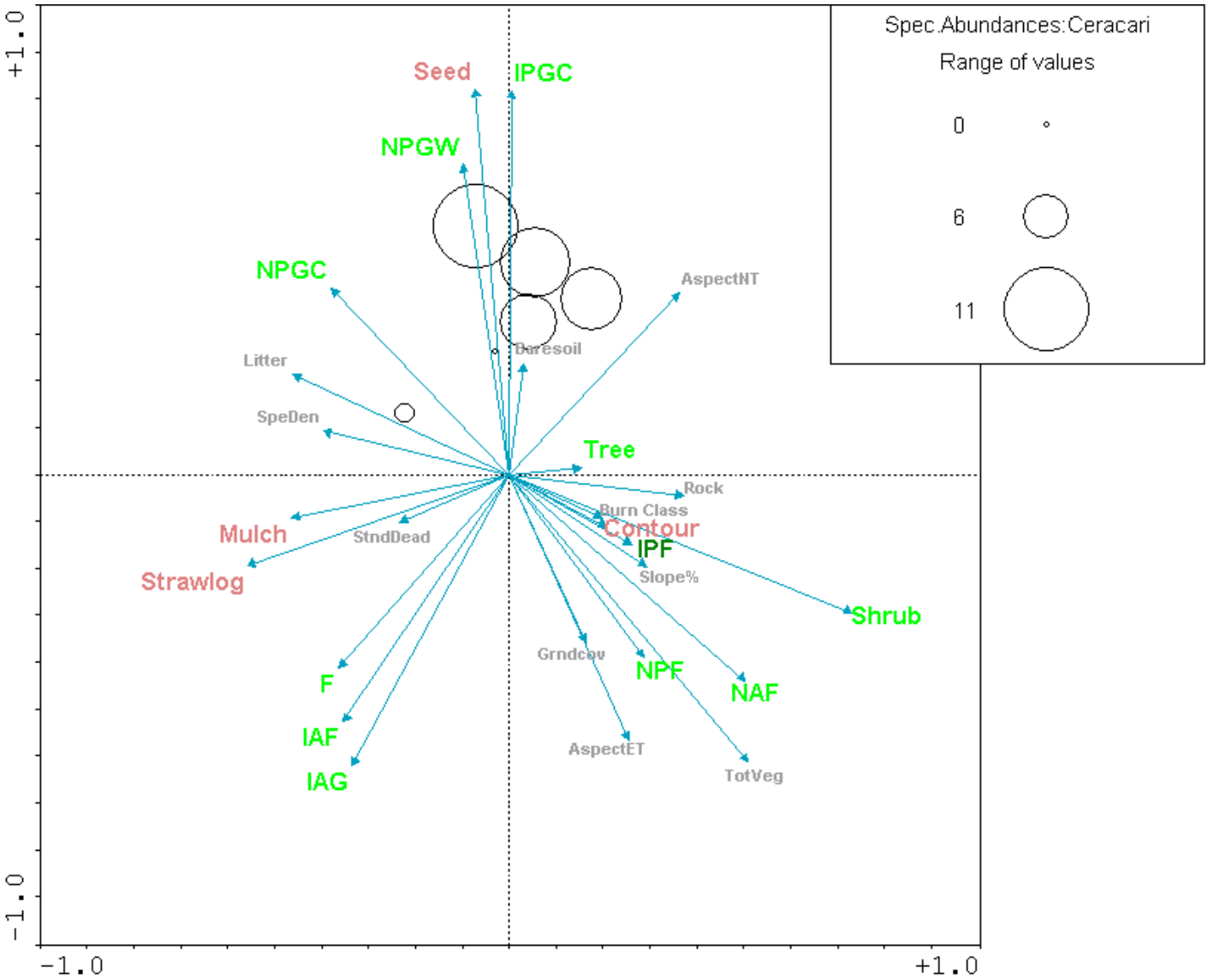


Figure 11. Ceratochloa carinata Cover Distribution (2002) indicator species for Group B.

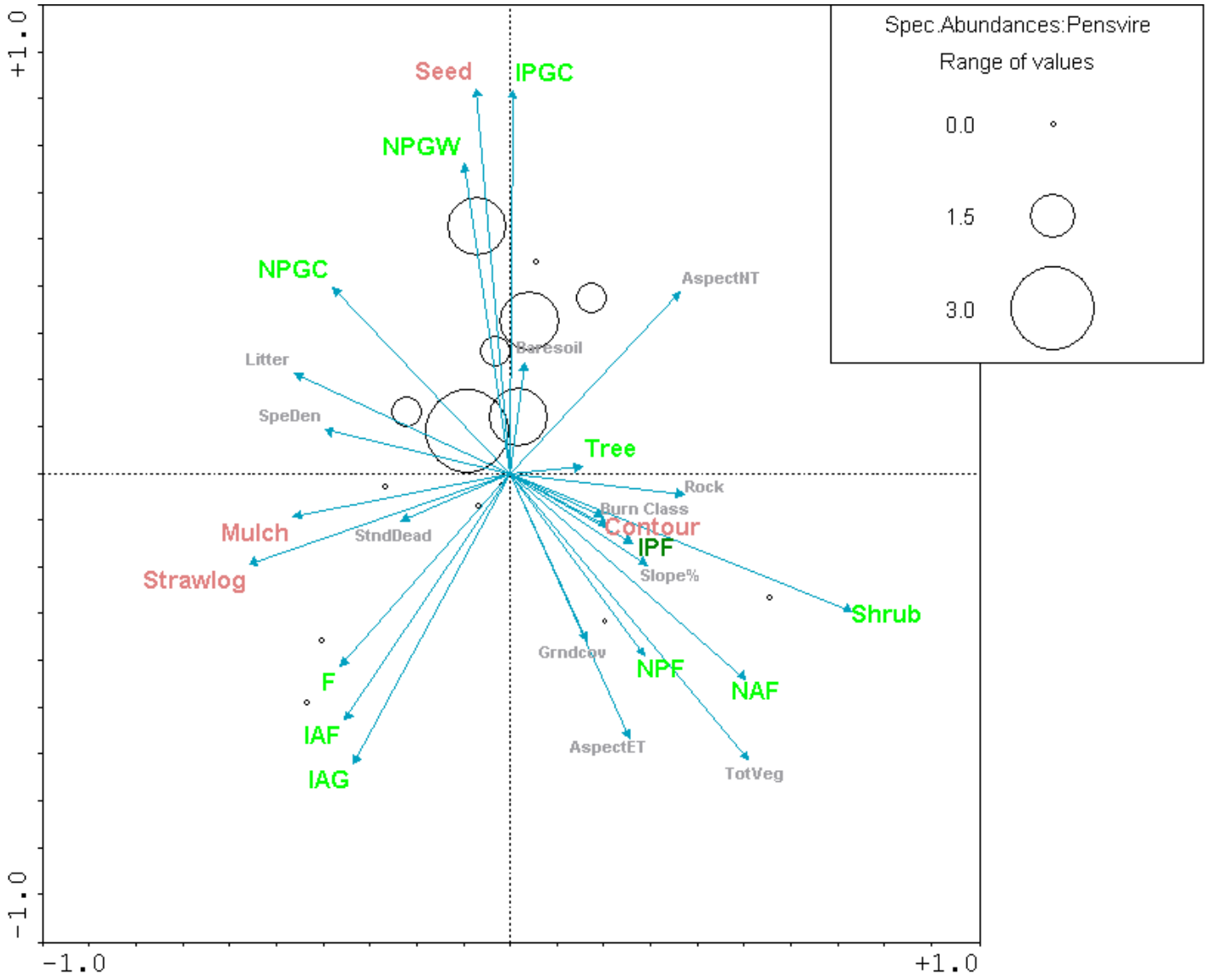


Figure 12. Penstemon virens Cover Distribution (2002) – non-preferential species.

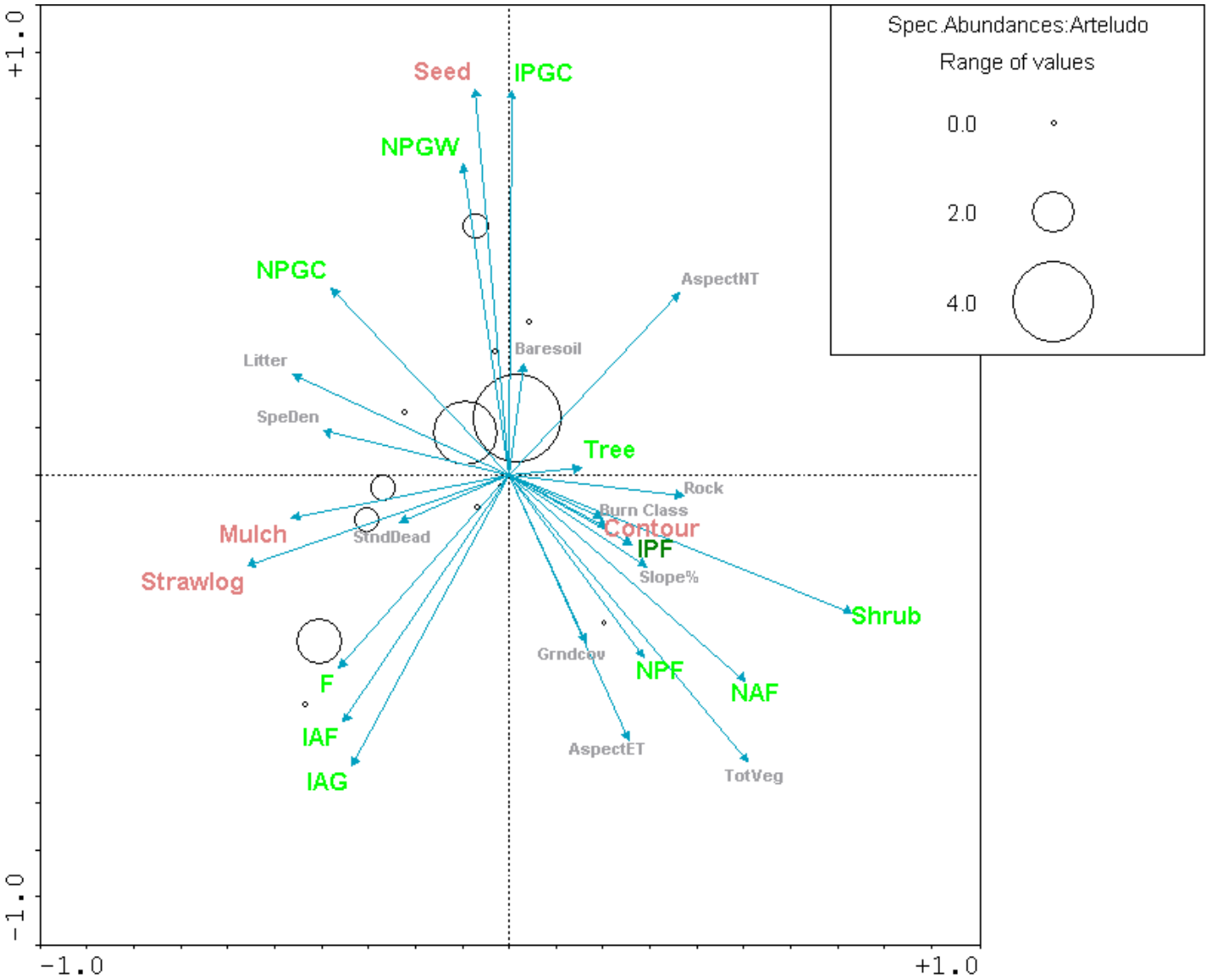


Figure 13. Artemisia ludovisciana Cover Distribution (2002).

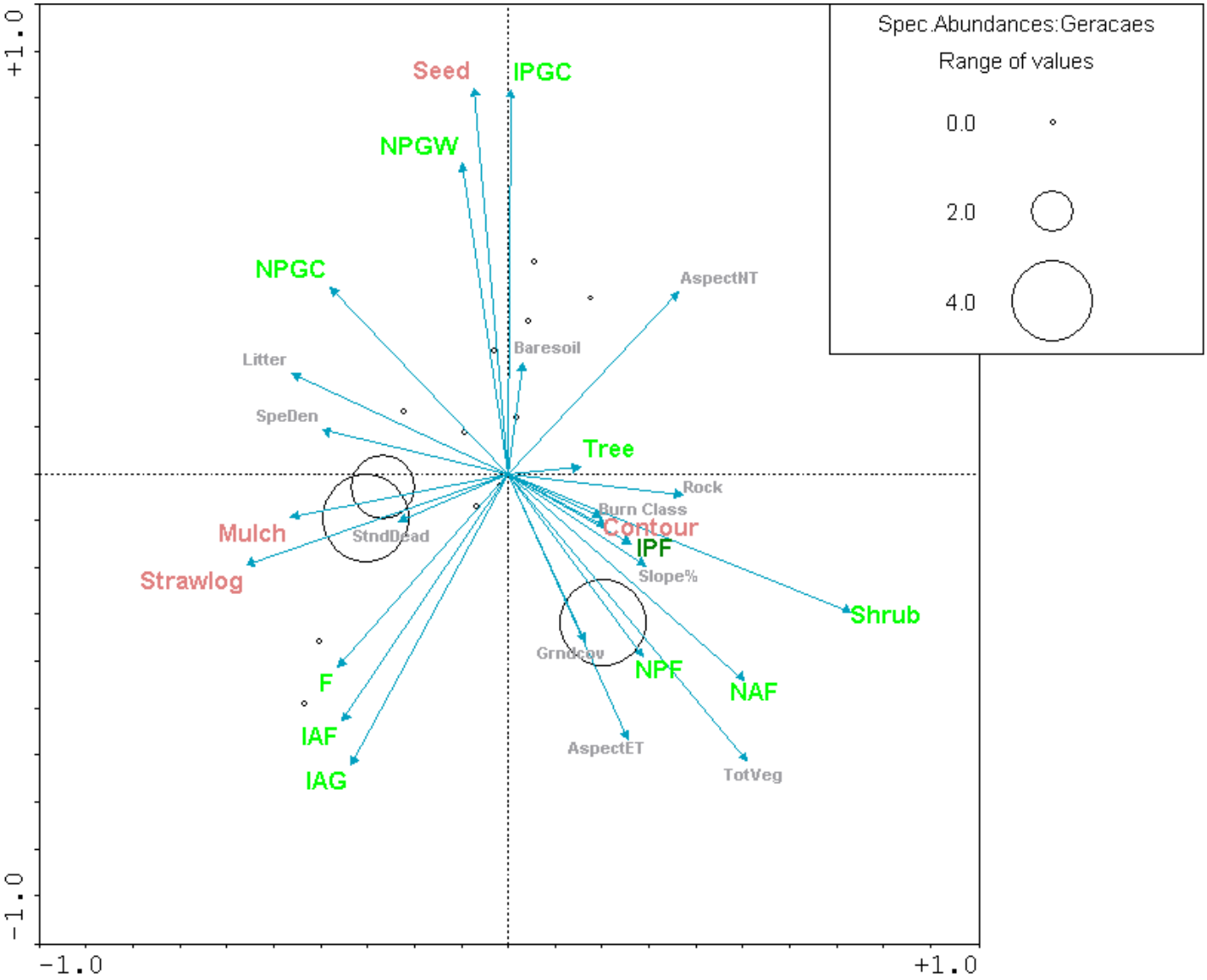


Figure 14. Geranium caespitosum ssp. caespitosum Cover Distribution (2002).

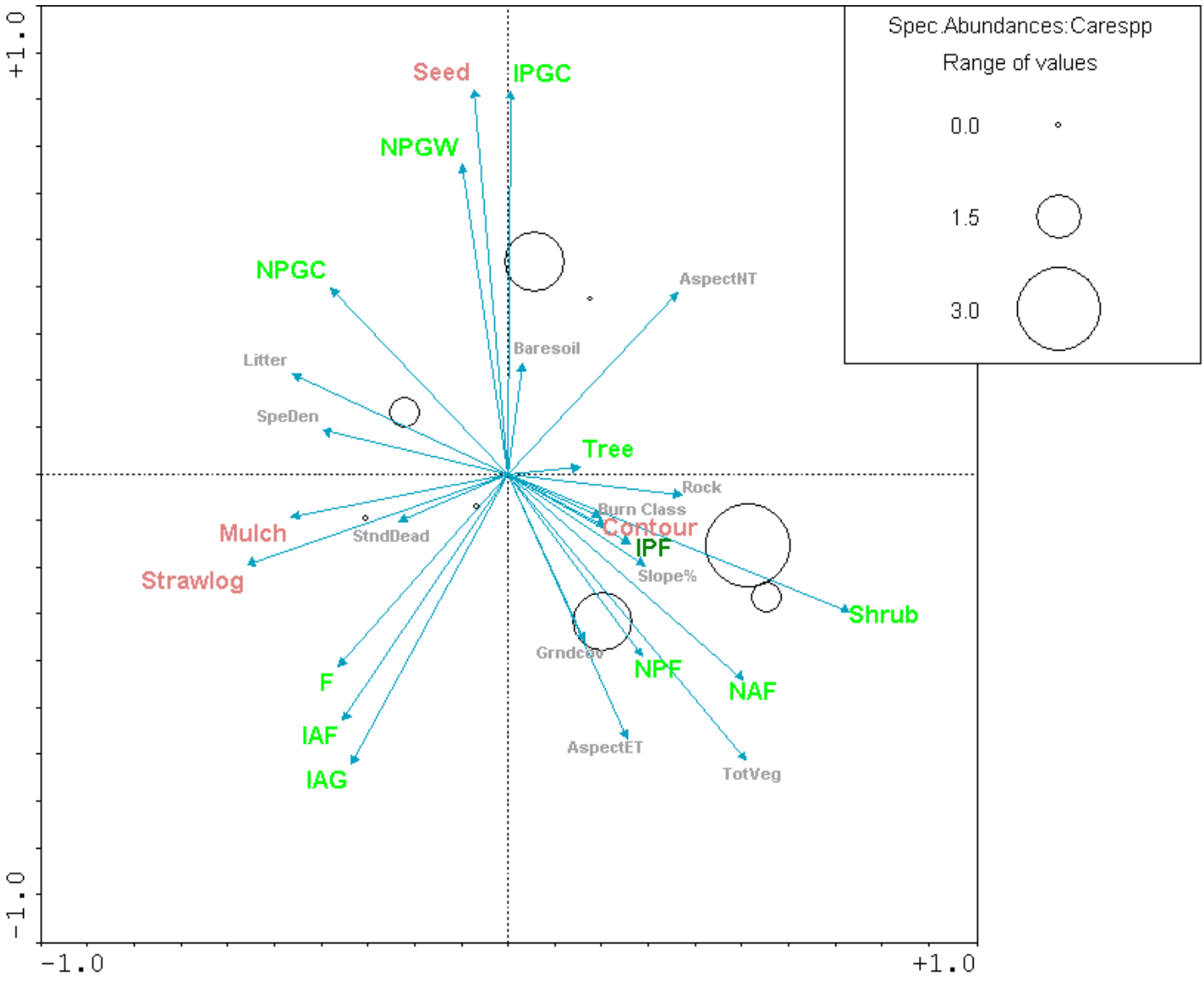


Figure 15. Carex spp. Cover Distribution (2002).

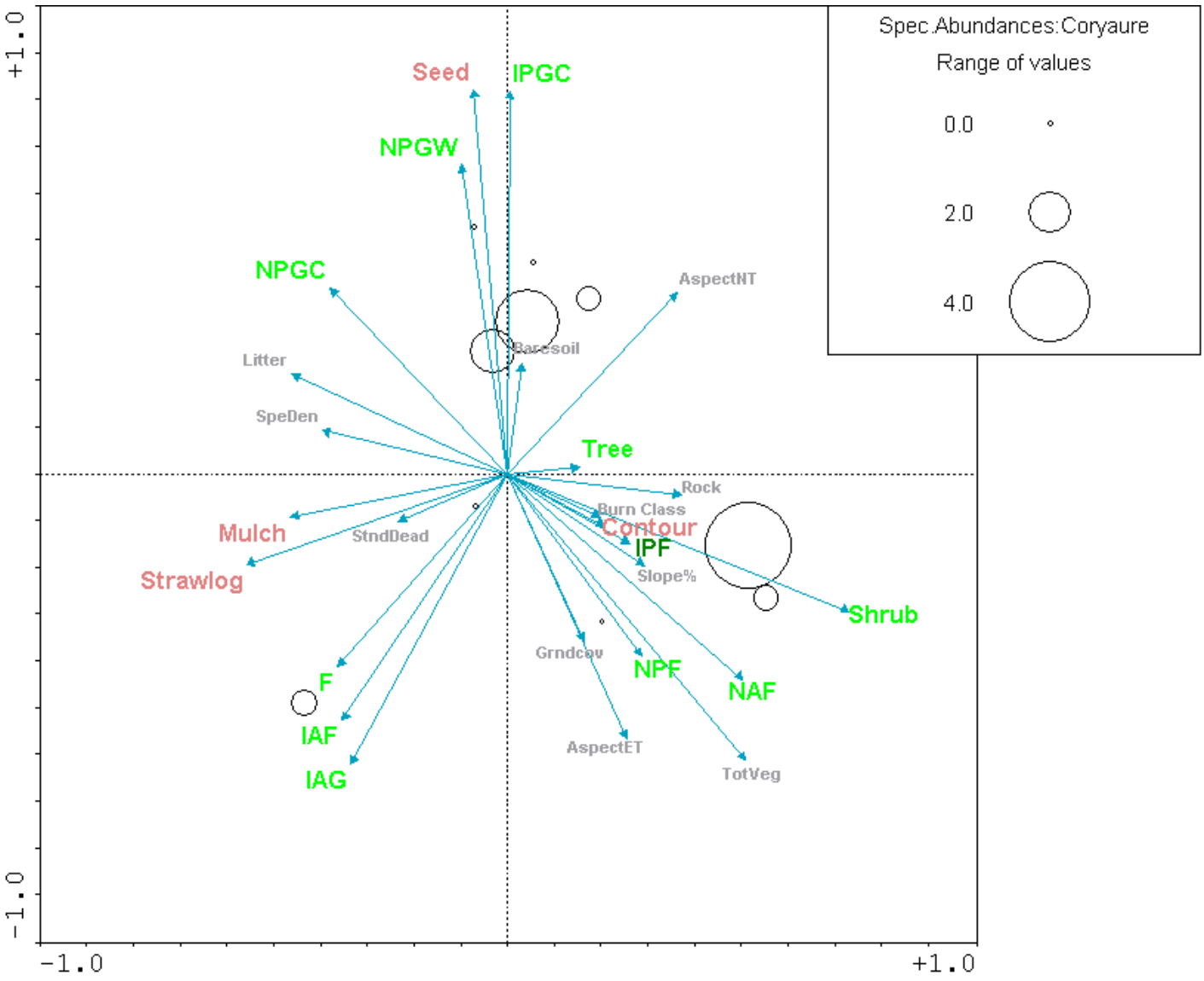


Figure 16. Corydalis aurea Cover Distribution (2002).

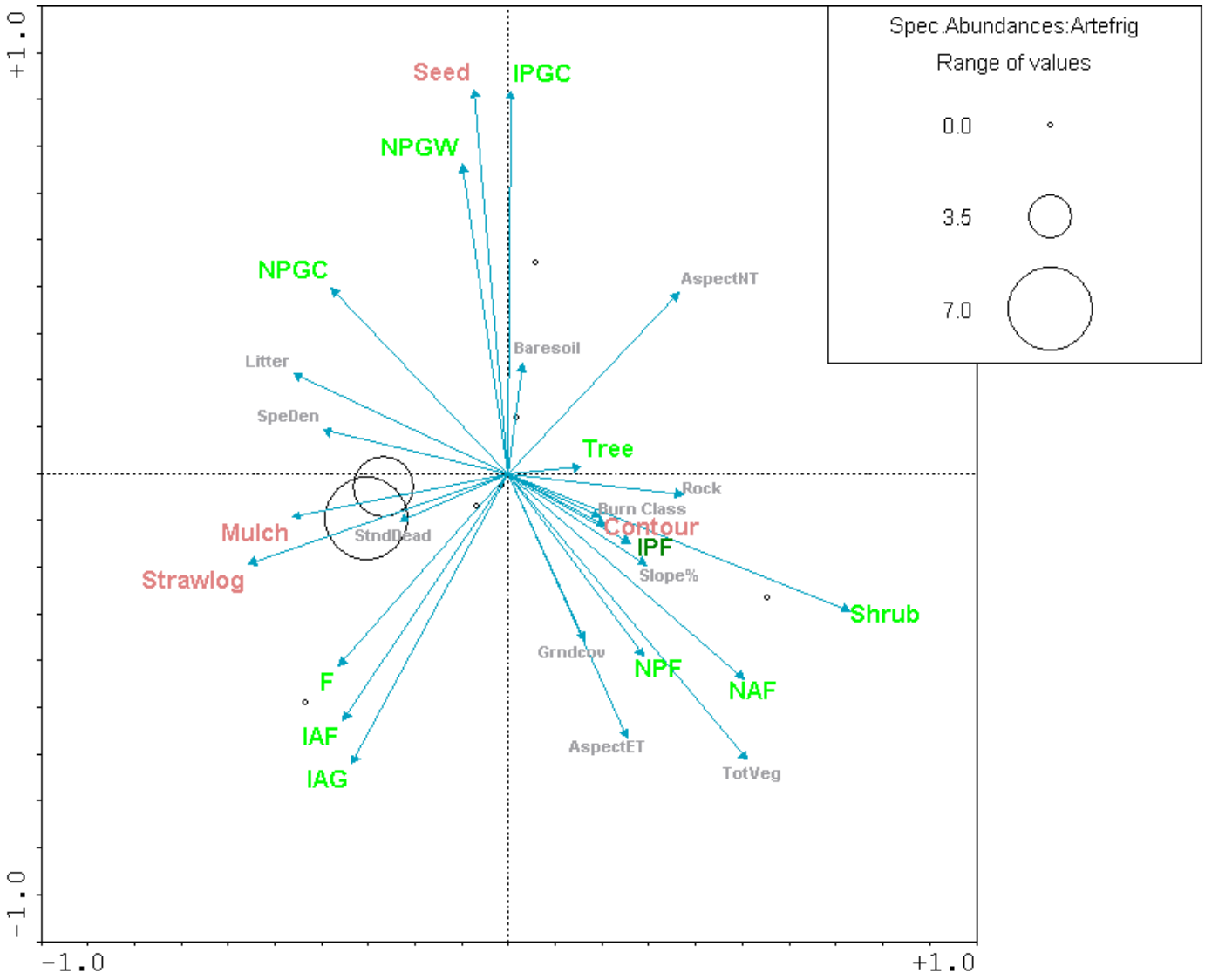


Figure 17. Artemisia frigida Cover Distribution (2002).

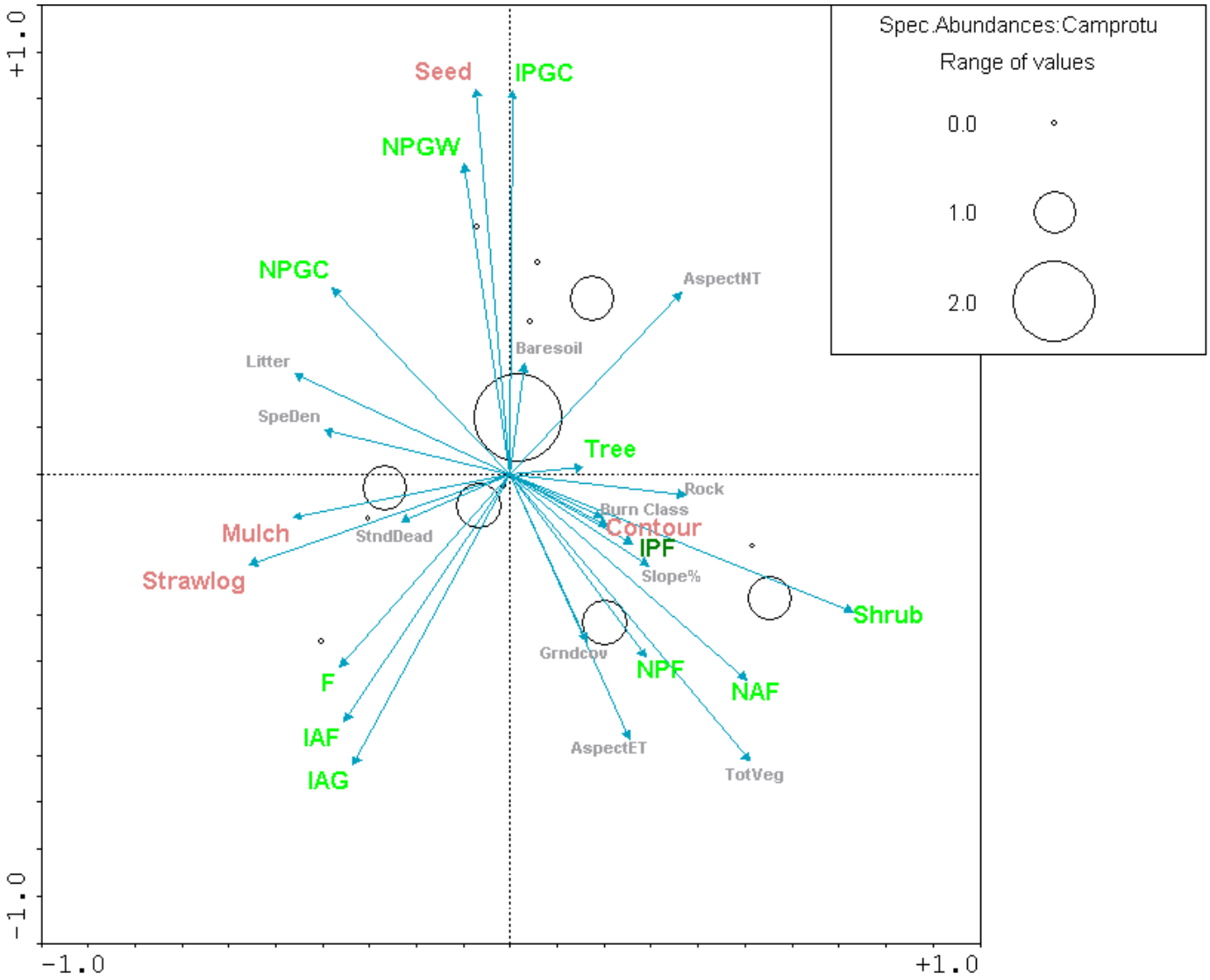


Figure 18. Campanula rotundifolia Cover Distribution (2002) – non-preferential species.

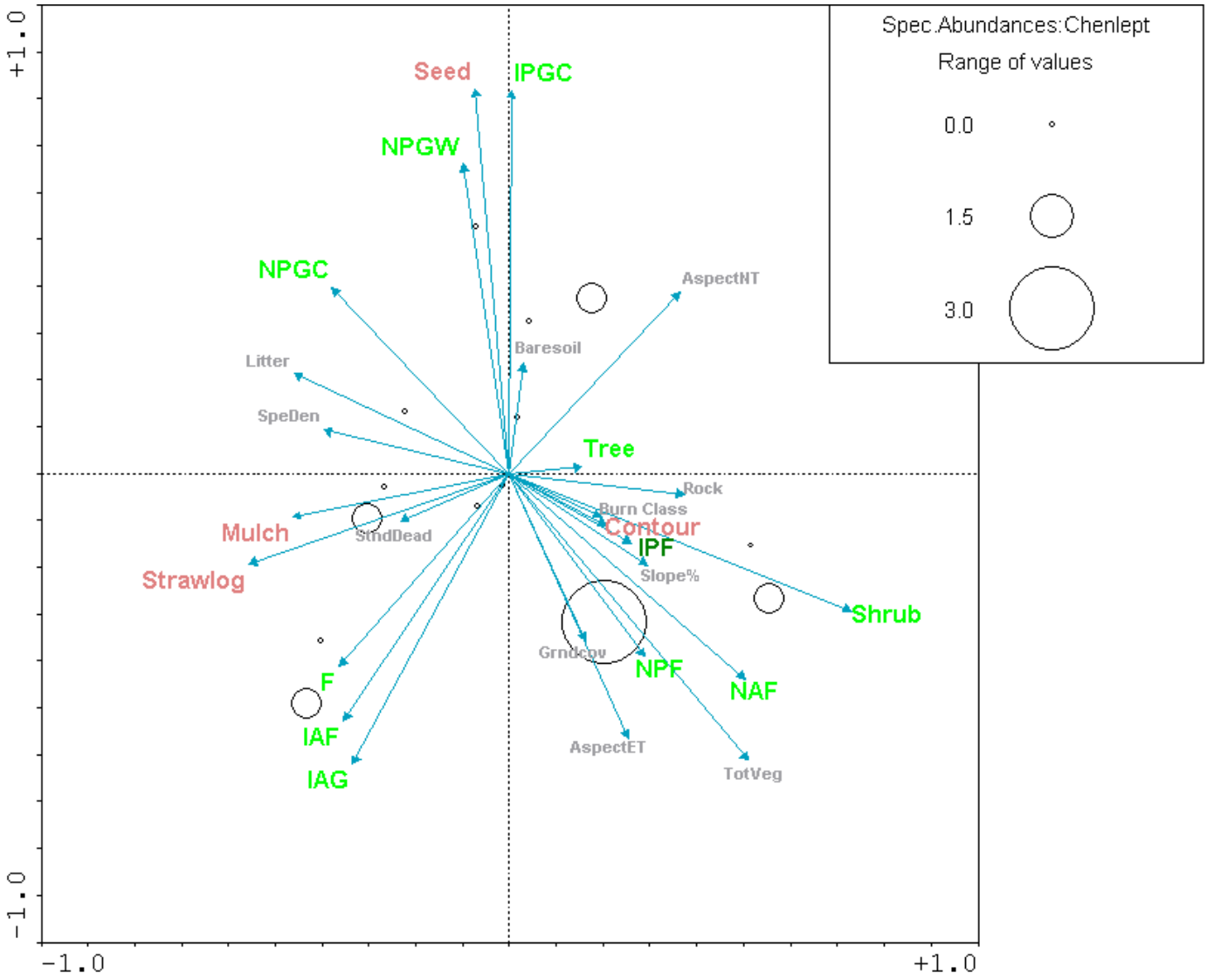


Figure 19. Chenopodium leptophyllum Cover Distribution (2002) – non-preferential species.

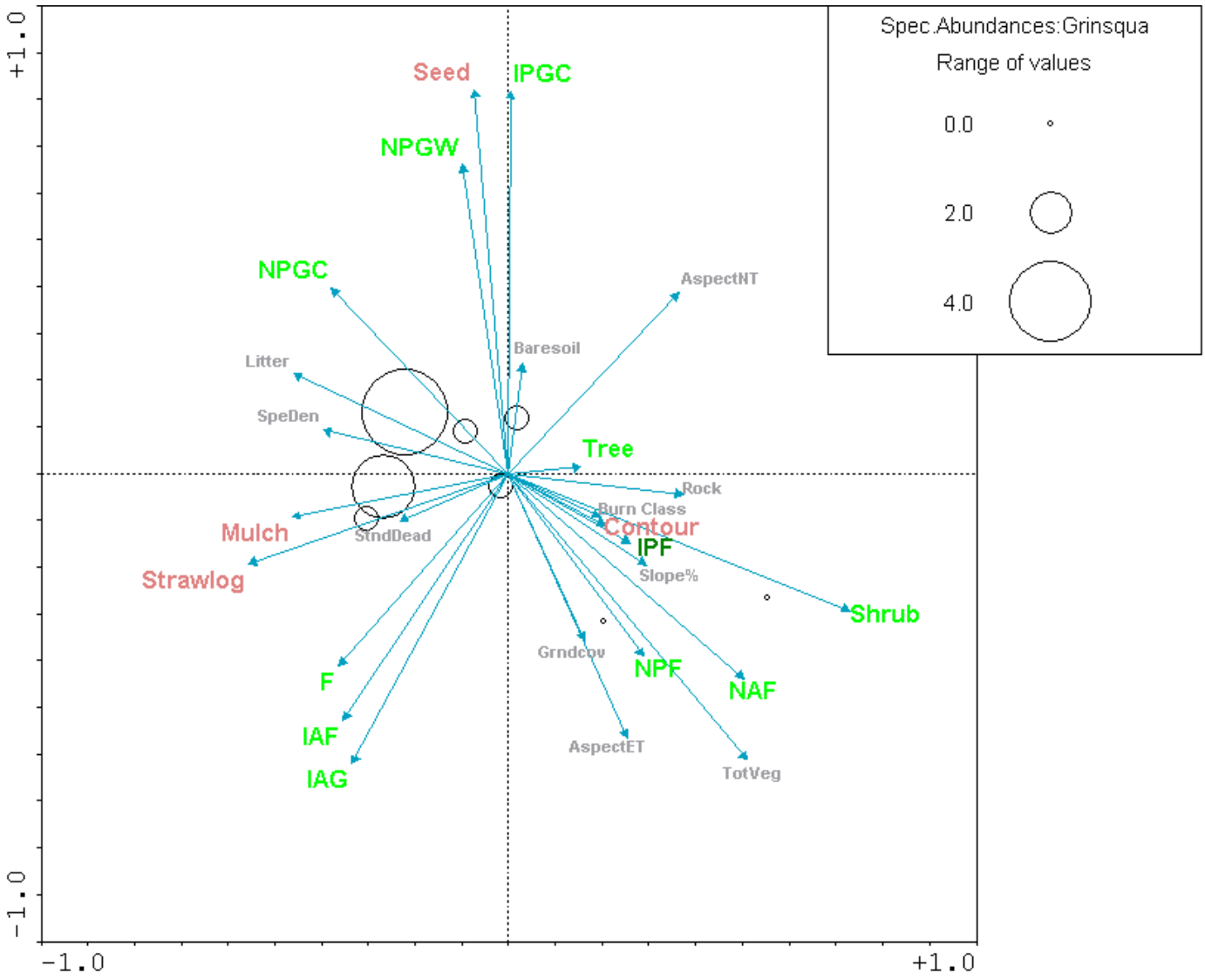


Figure 20. Grindelia squarrosa Cover Distribution (2002).

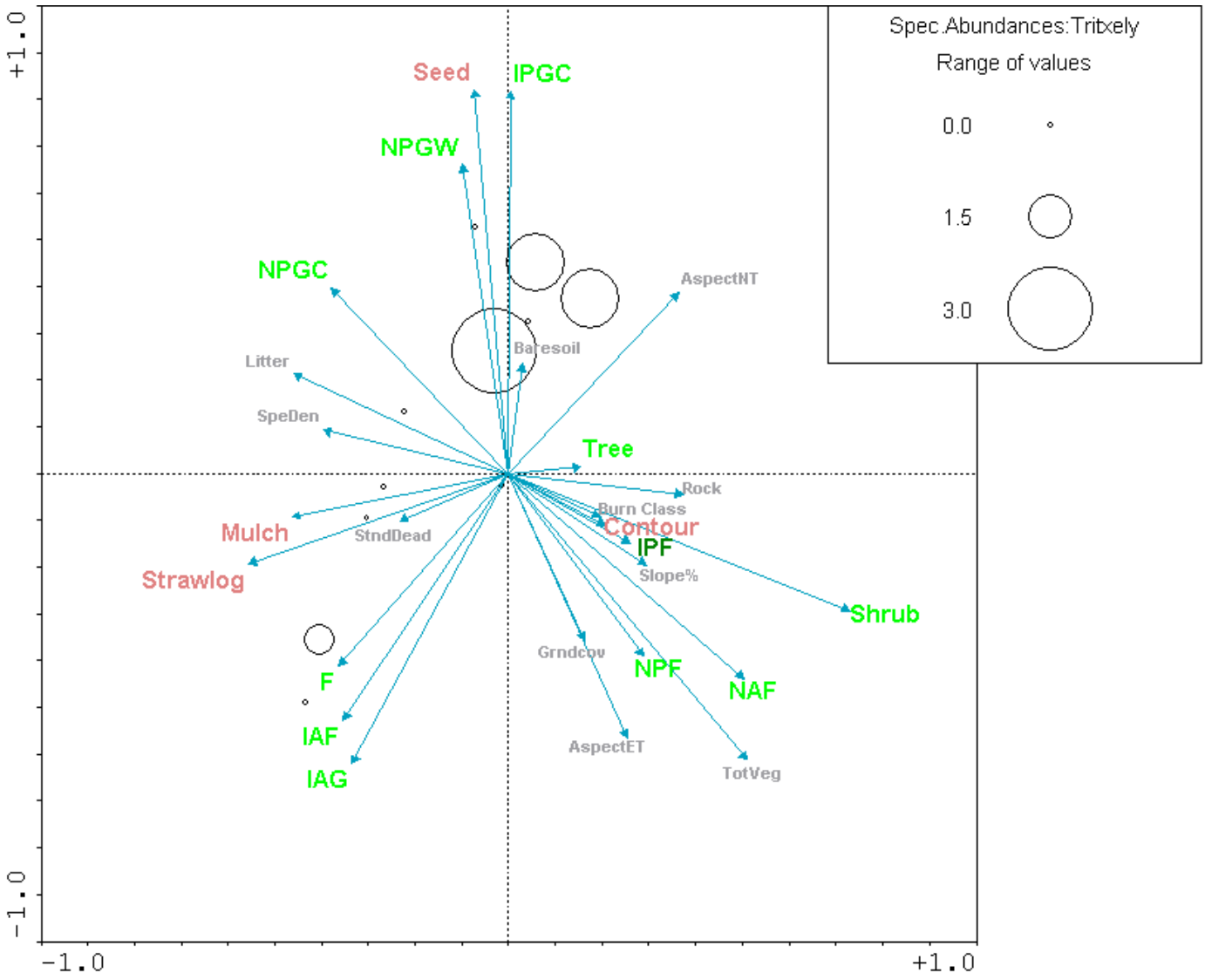


Figure 21. Triticum aestivum x Elytrigia elongata Cover Distribution (2002).

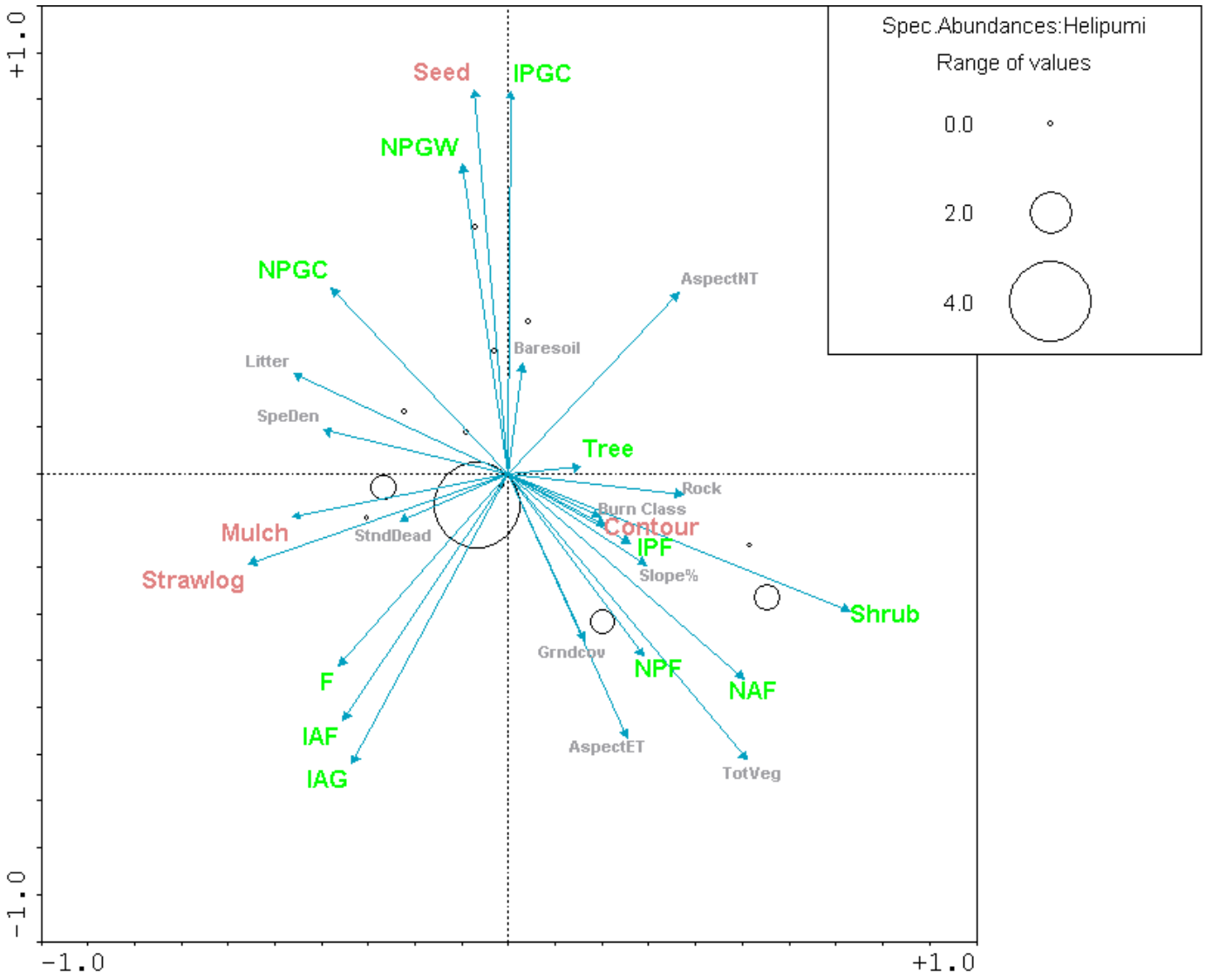


Figure 22. Helianthus pumilus Cover Distribution (2002).

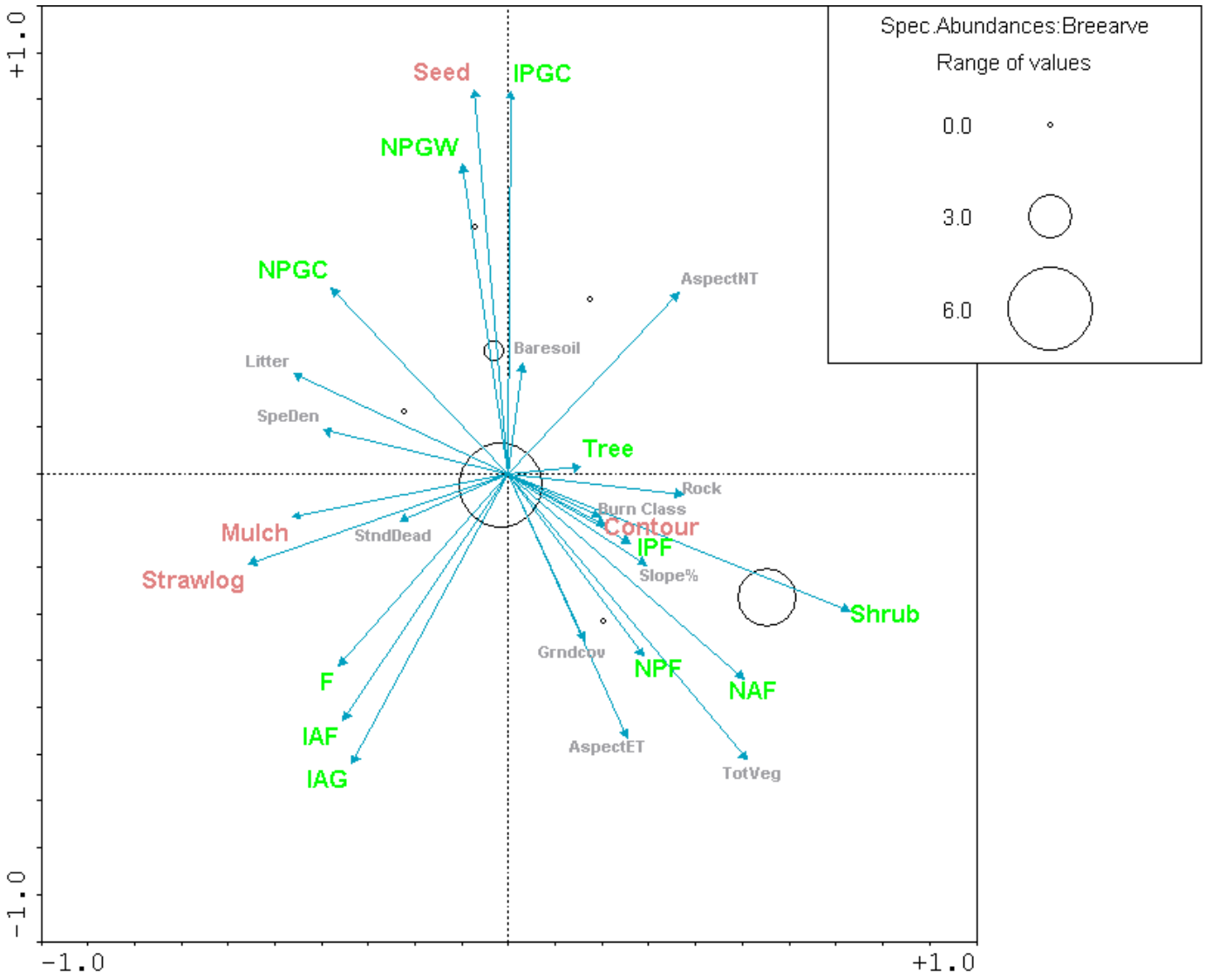


Figure 23. Breea arvensis Cover Distribution (2002).

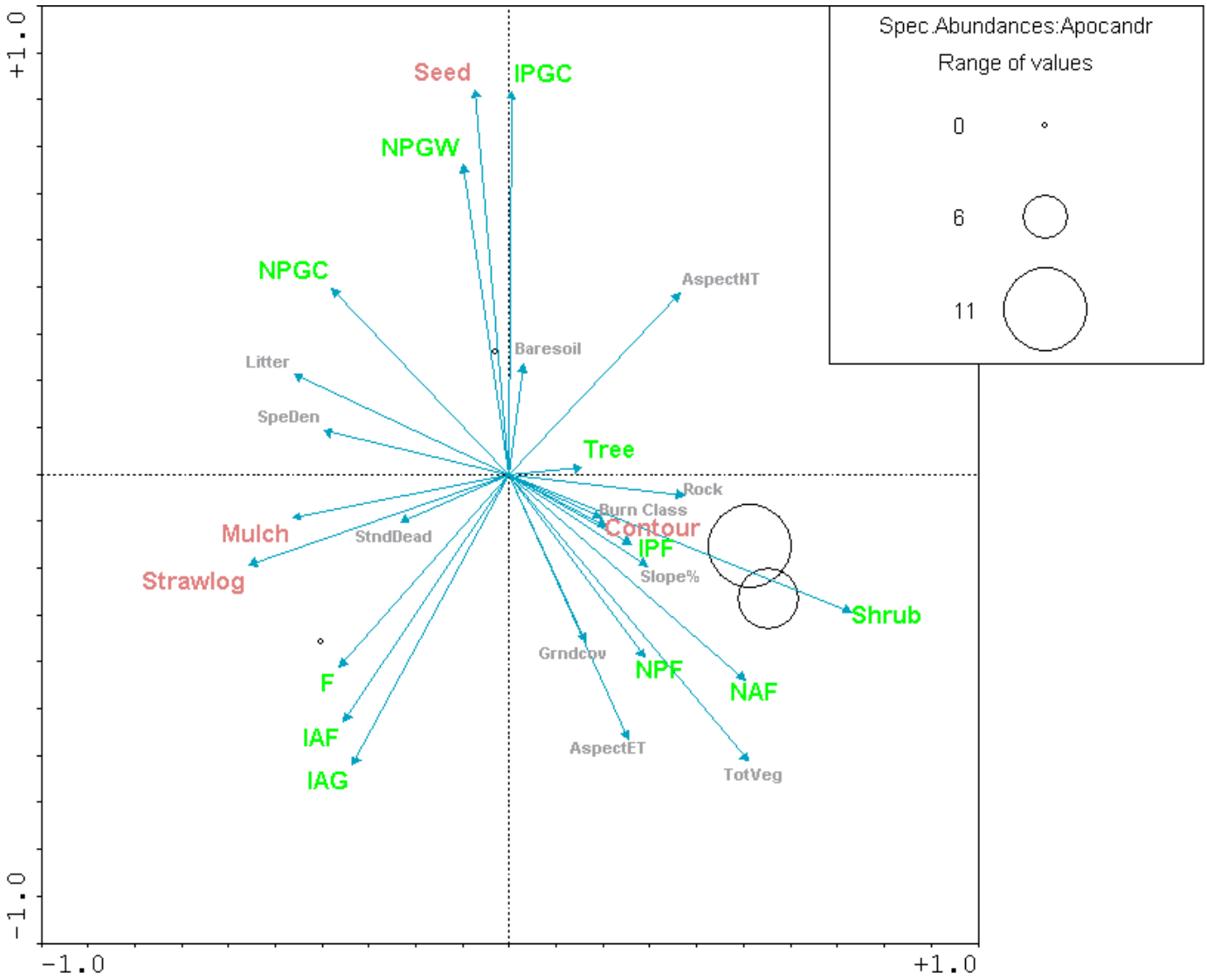


Figure 24. Apocynum androsaemifolium Cover Distribution (2002).

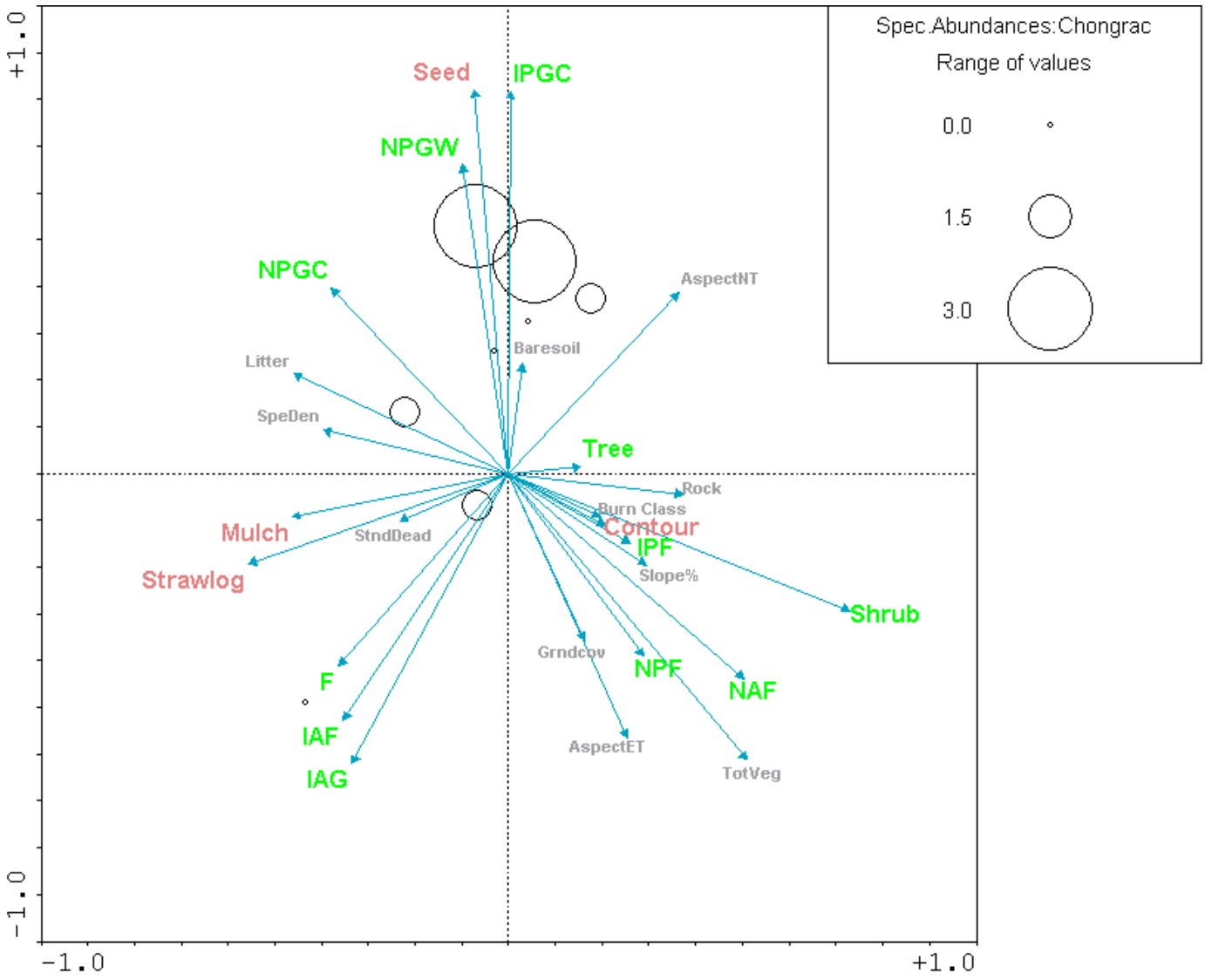


Figure 25. Chondrosum gracile Cover Distribution (2002).

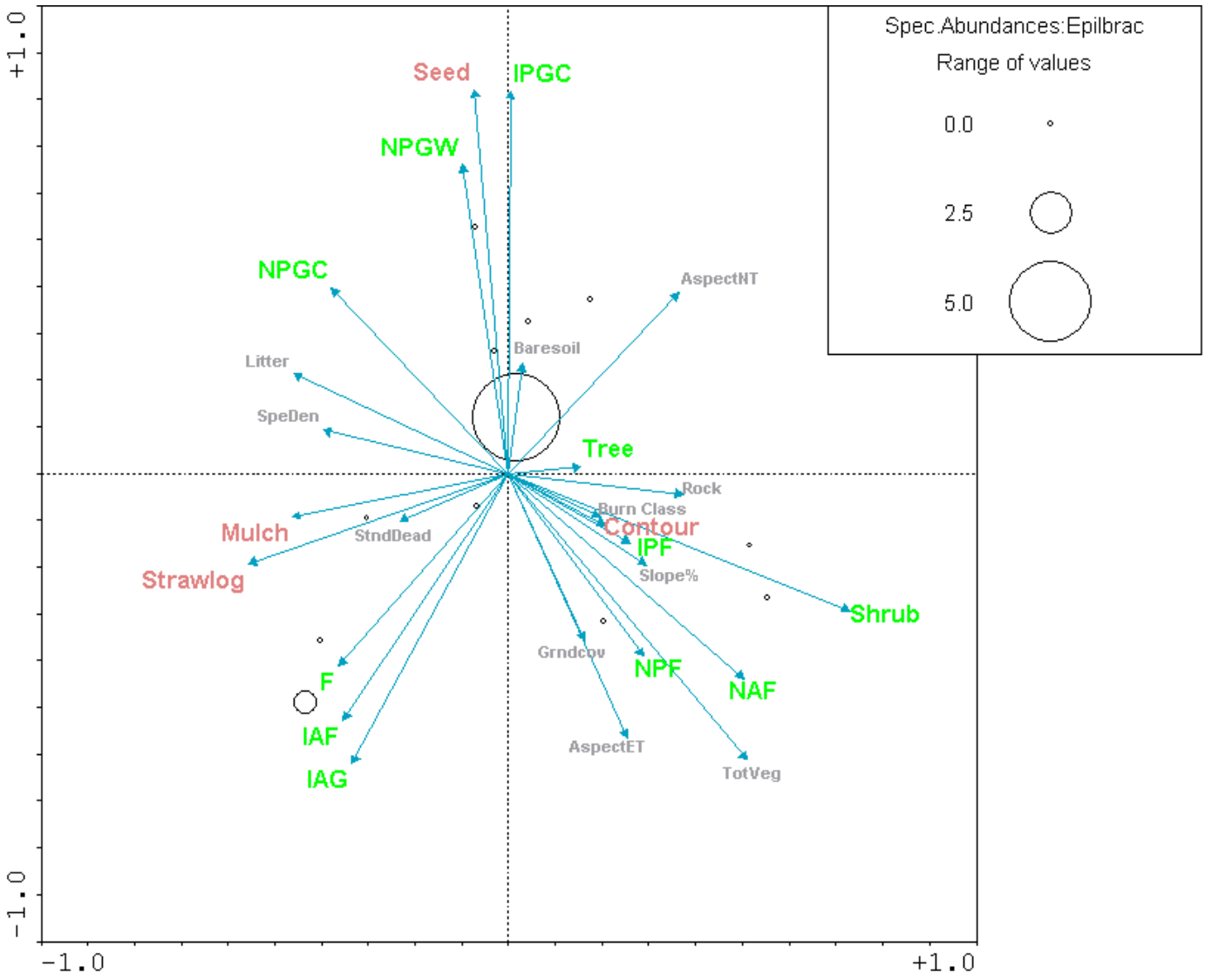


Figure 26. Epilobium brachycarpum Cover Distribution (2002).

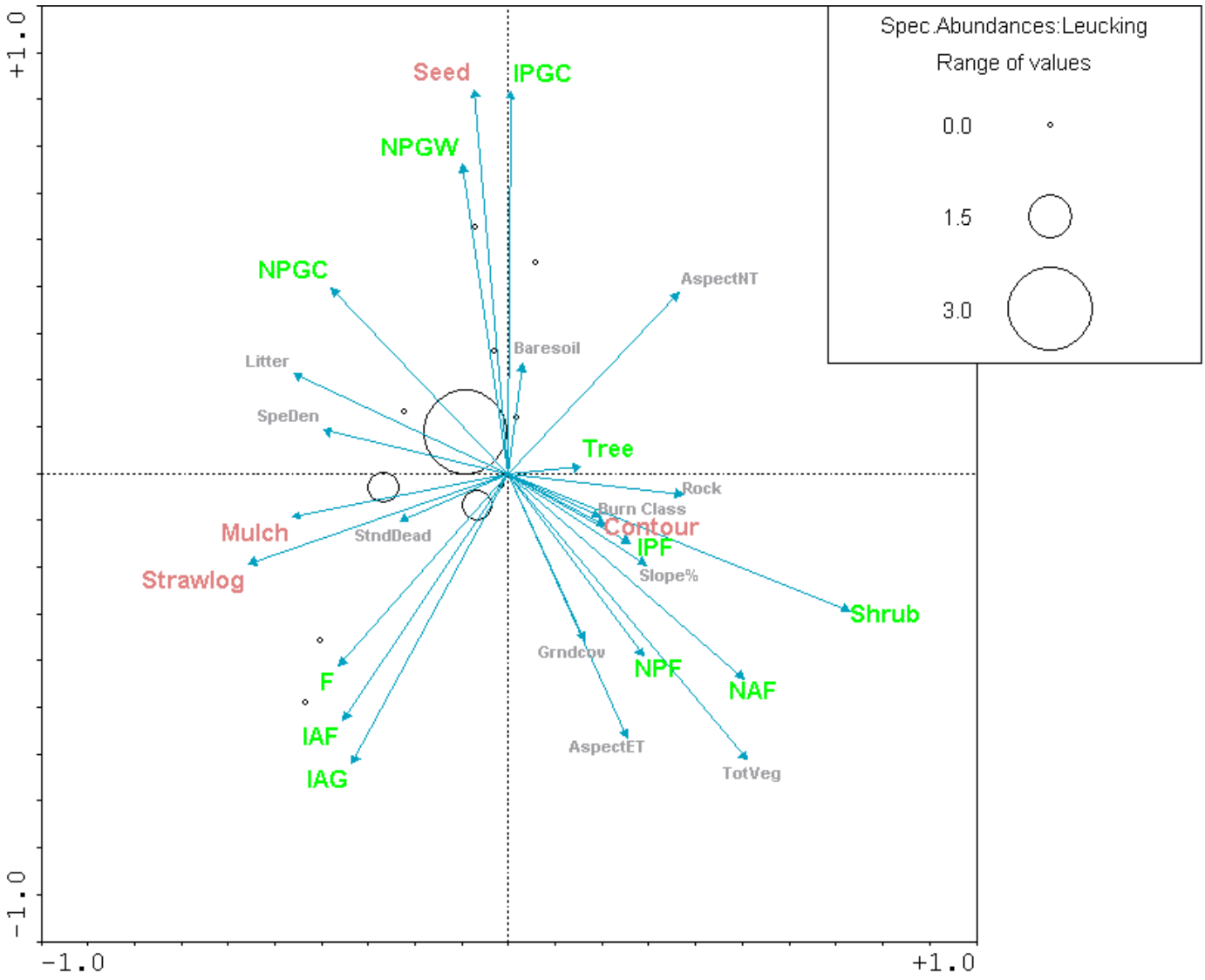


Figure 27. Leucopoa kingii Cover Distribution (2002).

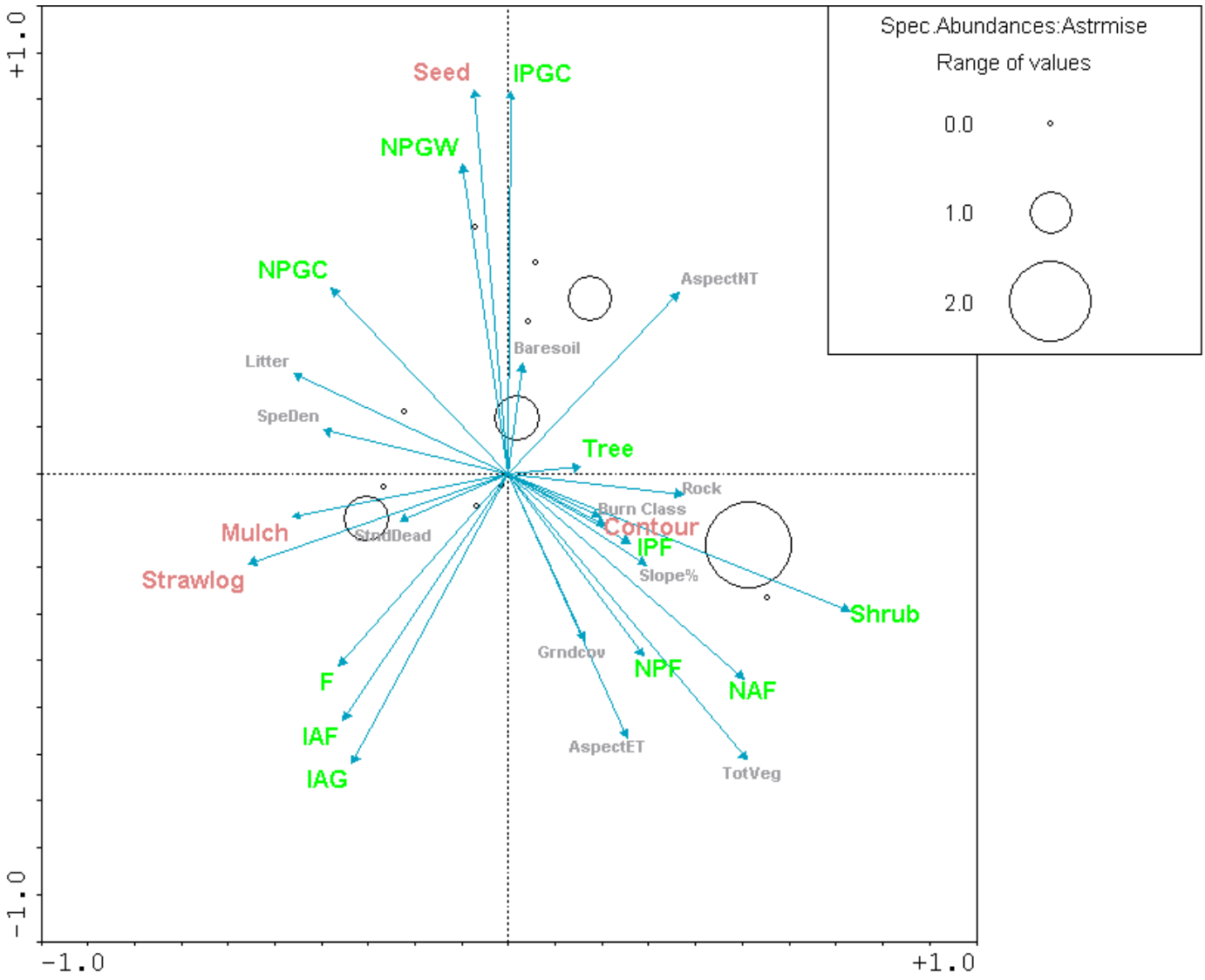


Figure 28. Astragalus miser var. oblongifolius Cover Distribution (2002) – non-preferential species.

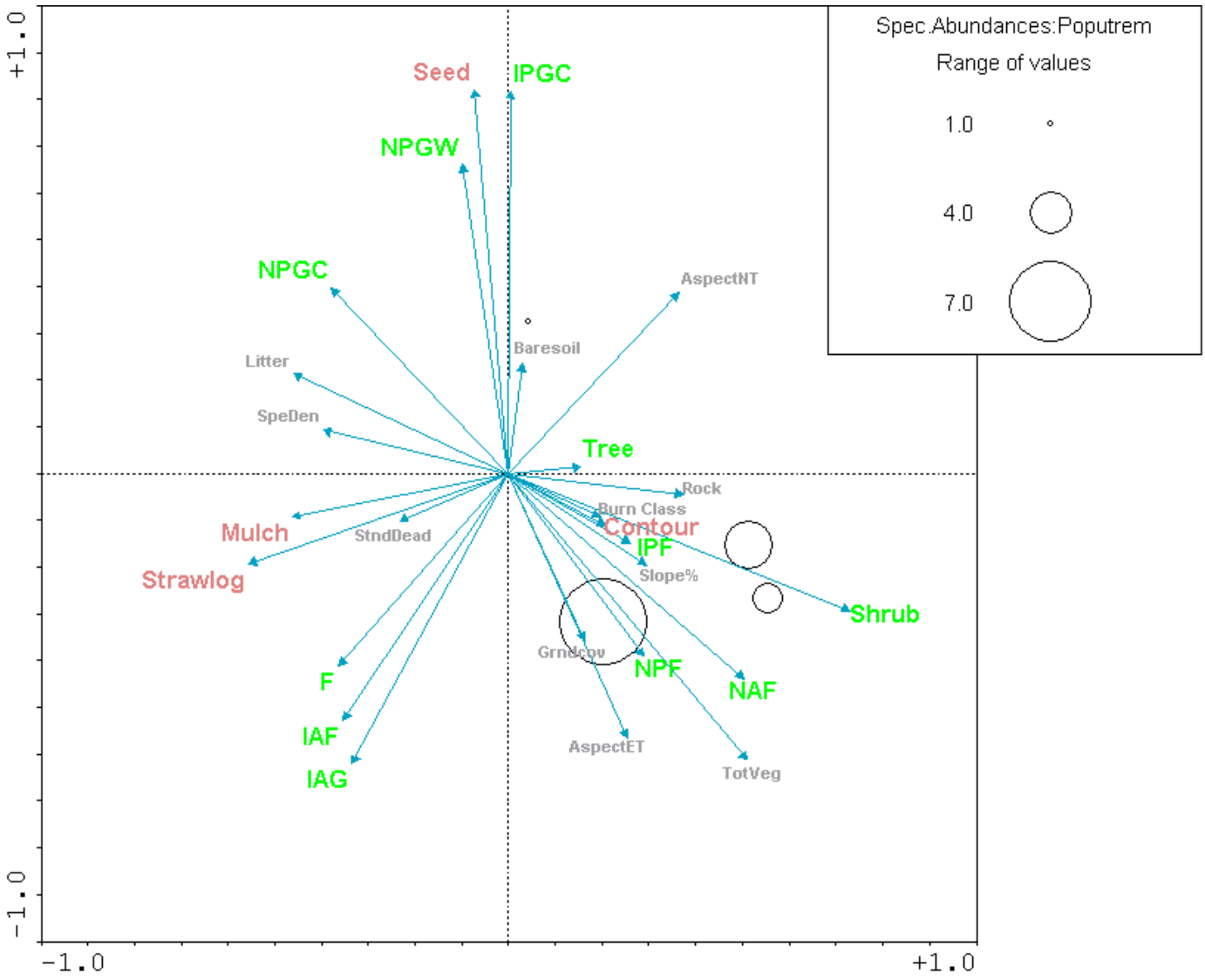


Figure 29. Populus tremuloides Cover Distribution (2002) – indicator species for Group A.

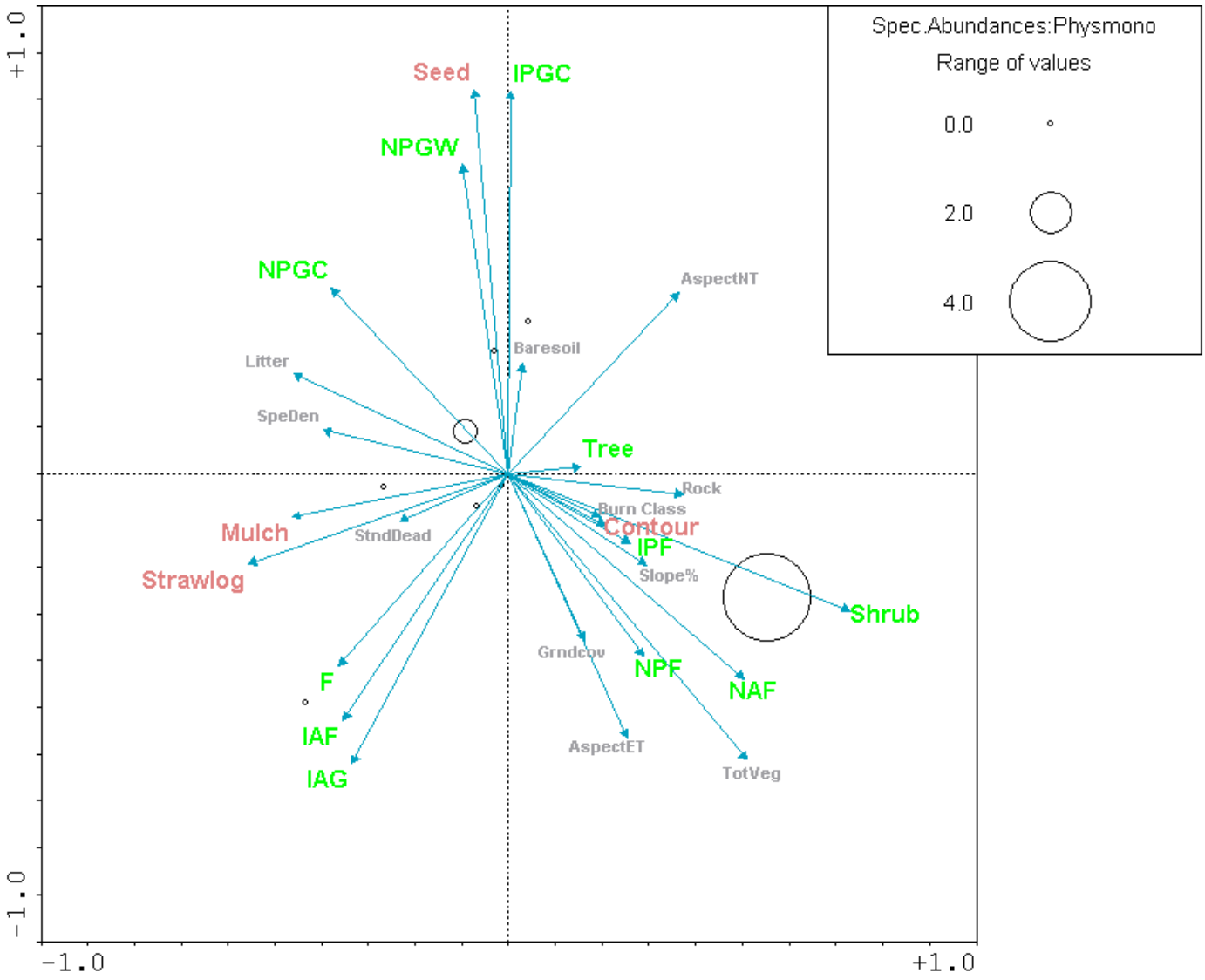


Figure 30. Physocarpus monogynus Cover Distribution (2002).

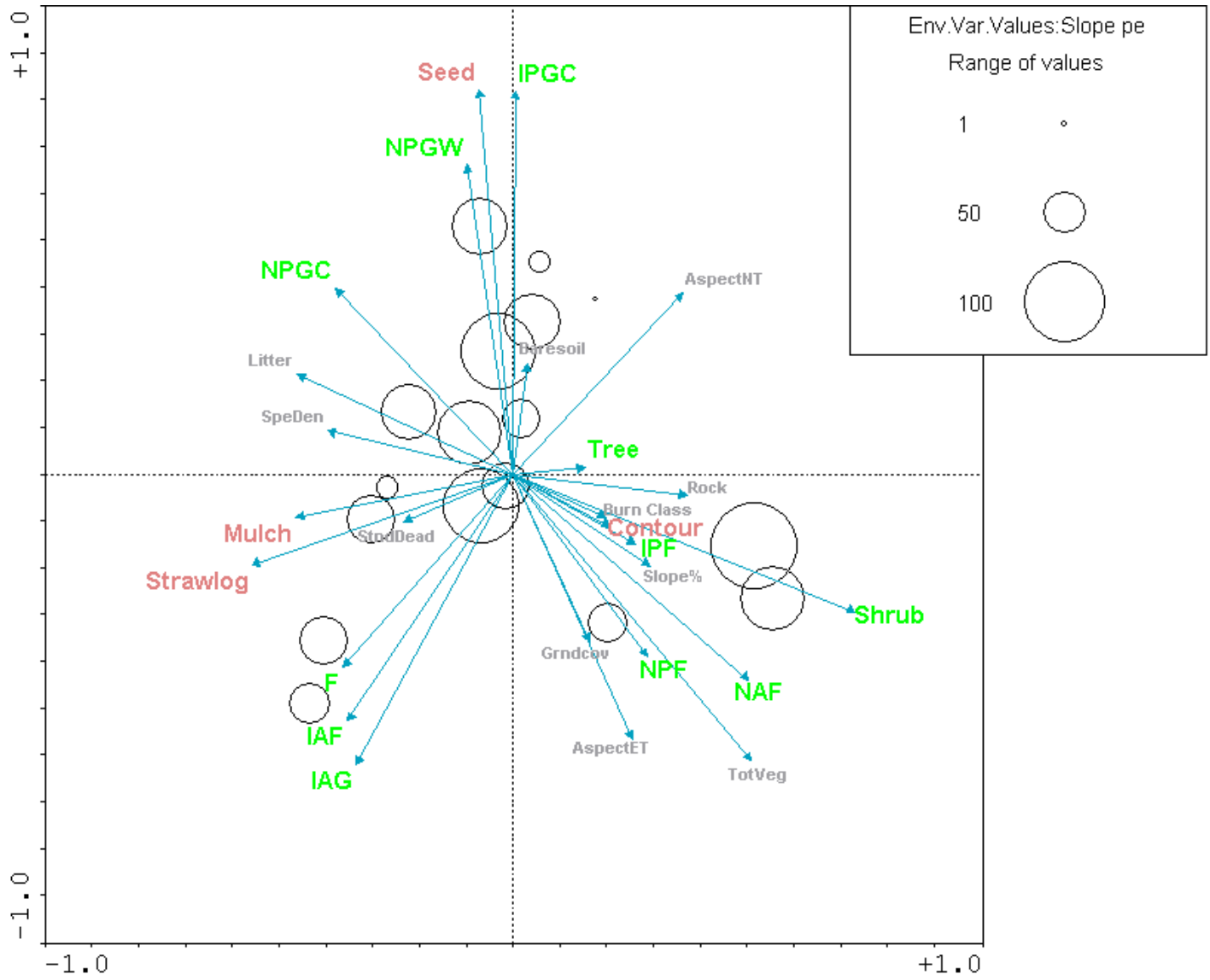


Figure 31. Distribution of Slope % of samples scaled from 100 to 0.

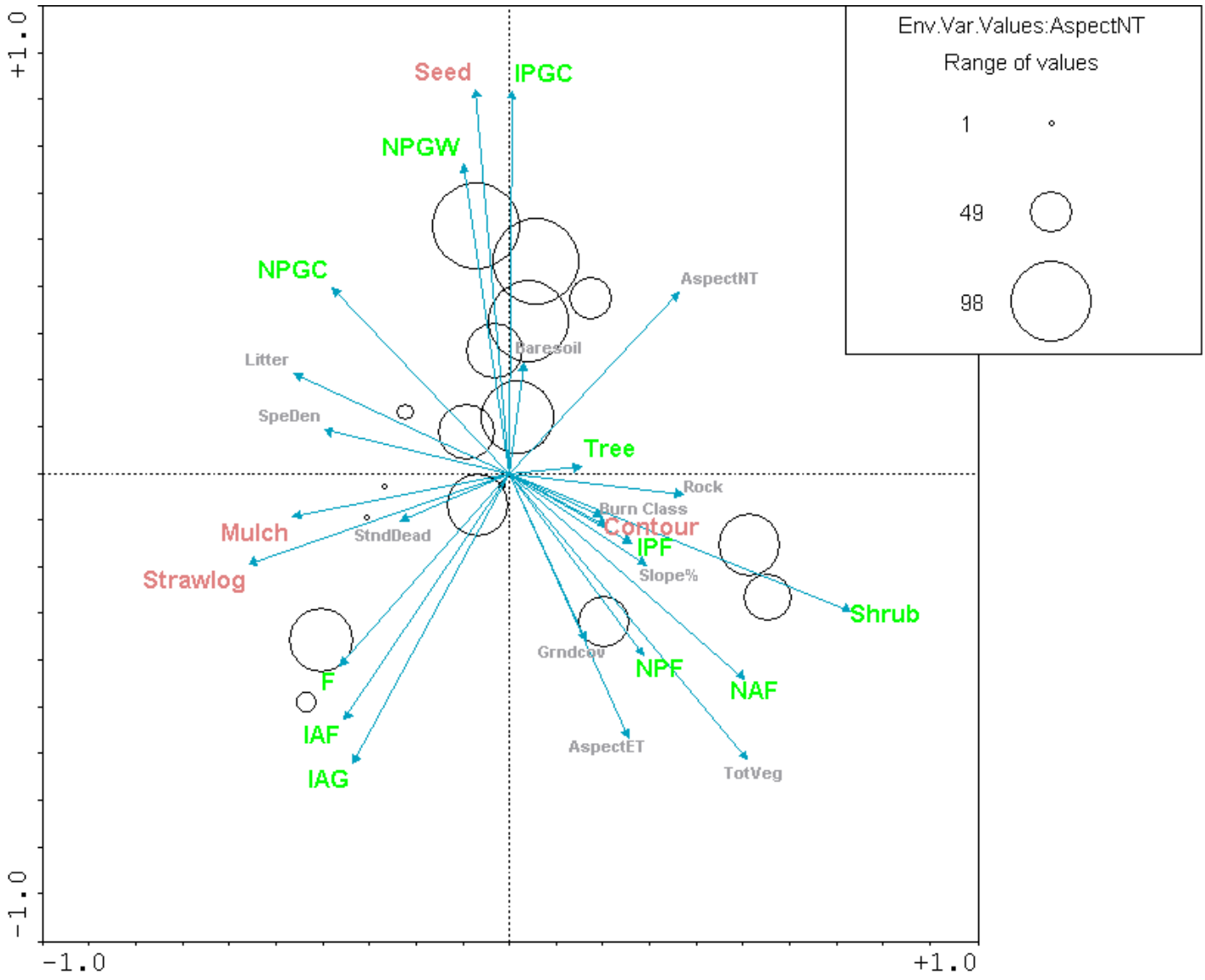


Figure 32. Distribution of "Northerly" Aspect scaled from 100 to 0.

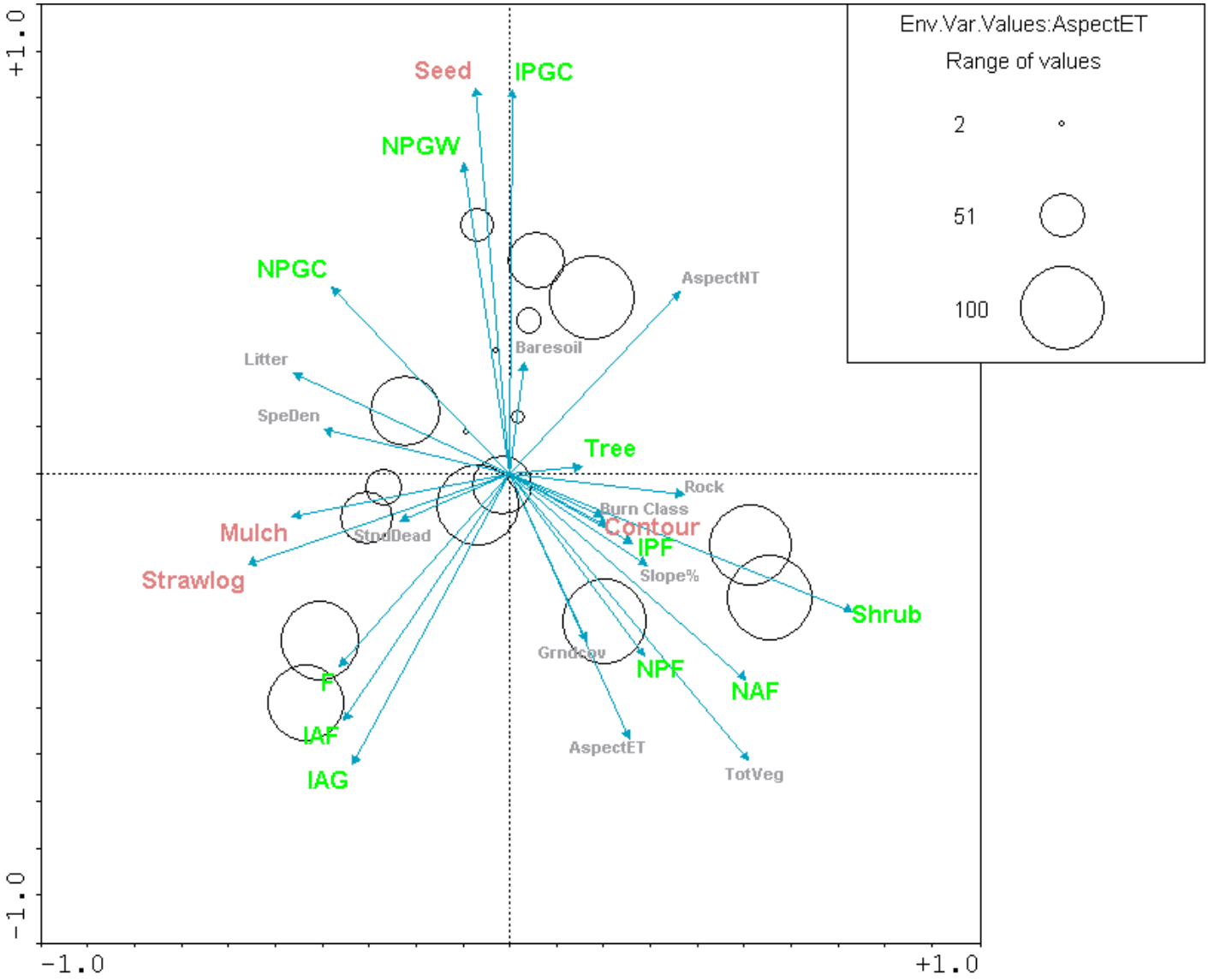


Figure 33. Distribution of "Easterly" Aspect scaled from 100 to 0.

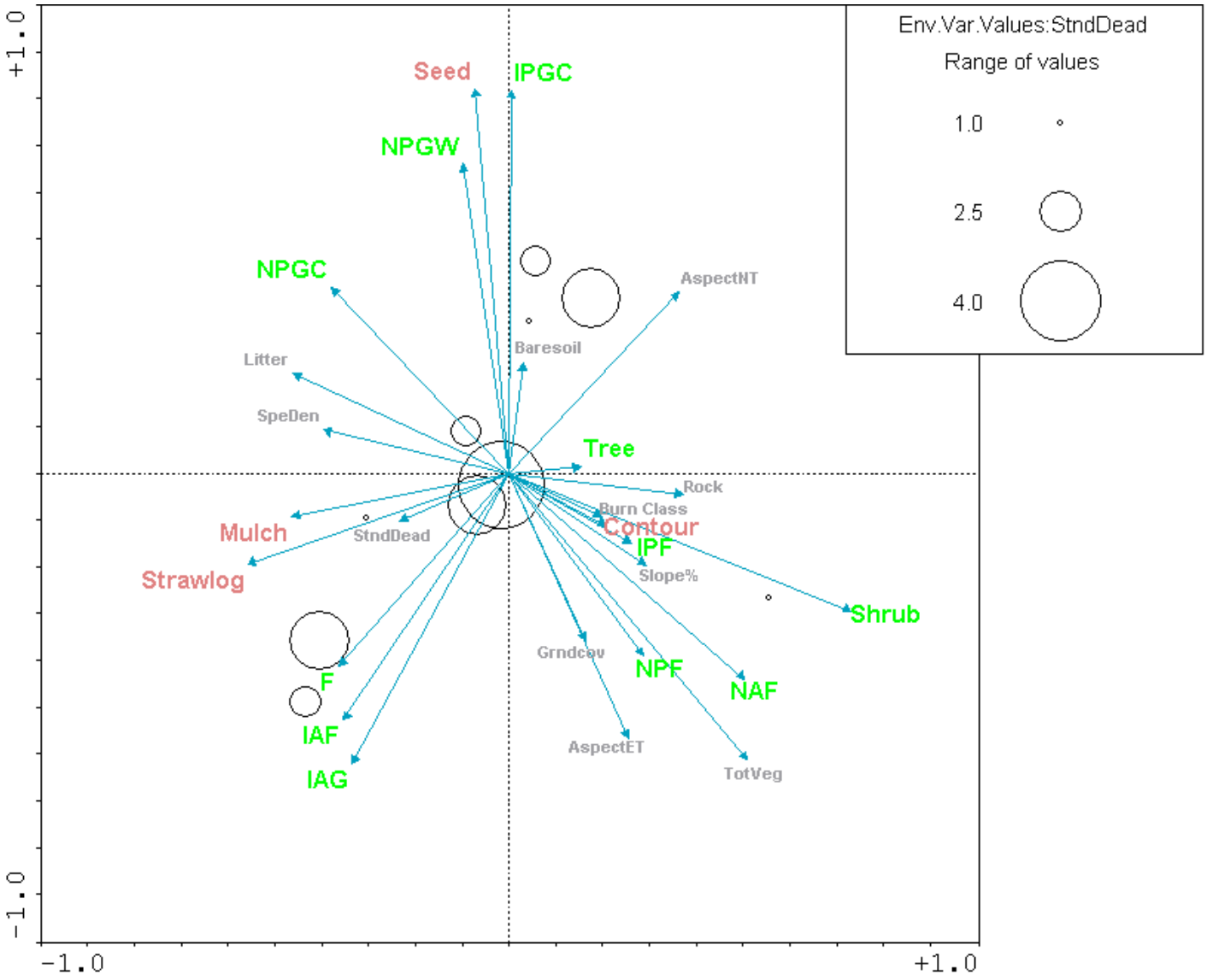


Figure 34. Distribution of Standing Dead Percent Cover (2002).

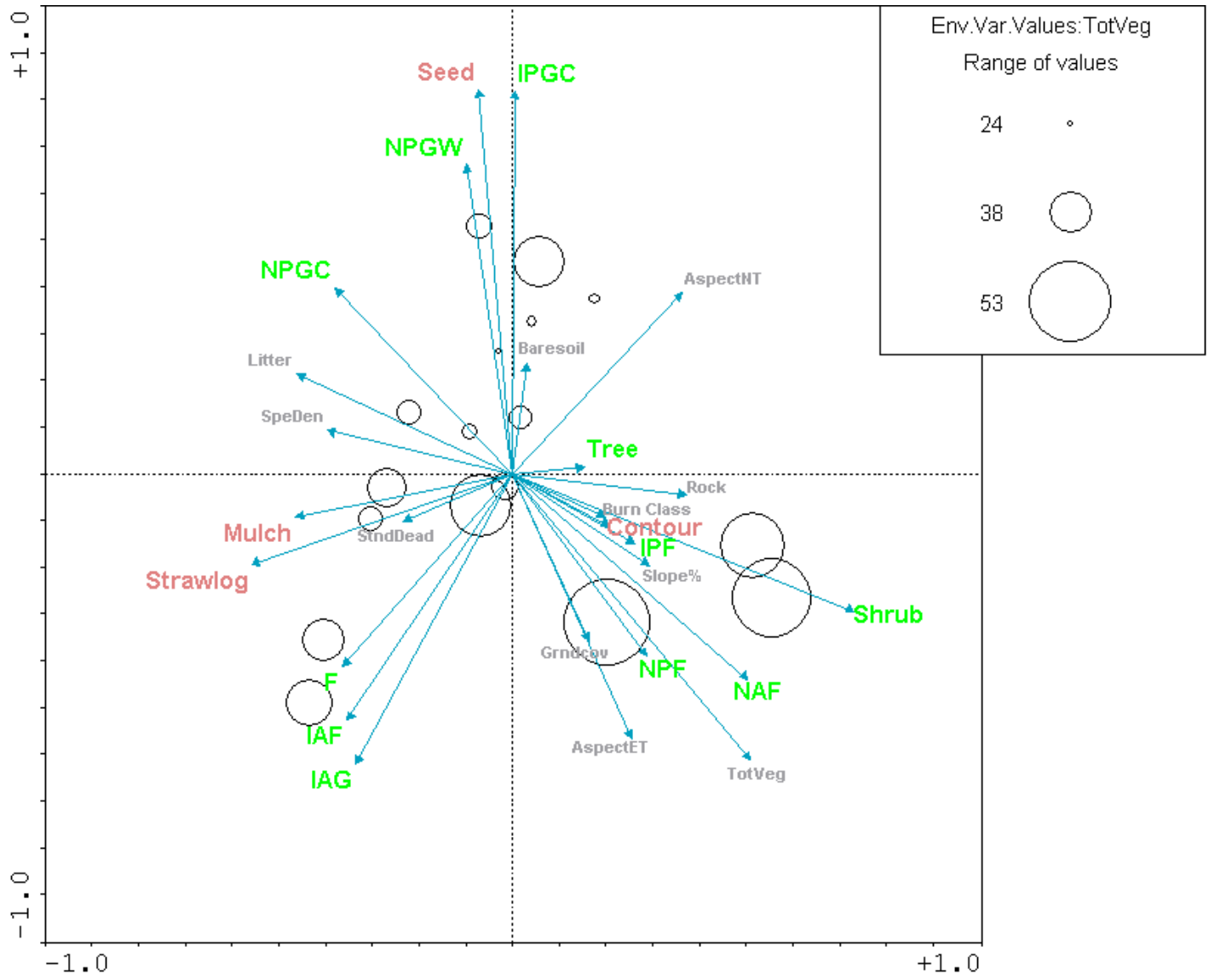


Figure 35. Distribution of Total Vegetation Percent Cover (2002).

Appendix 6. Computer files and GPS Sample Coordinates

File inventory:

All of the project related files have been included in a CD. The directory structure is as follows:

The following is an explanation of the contents of the subdirectories:

AutoCAD – Contains files that were used to construct the report graphics that included sample locations and treatment and burn areas. The CADimages subdirectory includes the aerial photography and USGS images that were used in the AutoCAD files.

Classification&Ordination – Contains input and output files from TWINSPAN and CANOCO. The subdirectory Descrim contains the input and output files from DESCRIM.

FieldData – Contains the original vegetation and site data and summary information in EXCEL tables. There are two subdirectories for the years 2002 and 2007. The site data are included as worksheets in the Excel spreadsheets.

FinalReport - The final reports for both 2002 and 2007 are included as both a Microsoft Word 2003 documents (WalkerRept200X.doc) and as an Adobe .pdf file (WalkerRept200X.pdf).

Photographs – Contains all of the photographs for the sample sites. There are two subdirectories for the years 2002 and 2007.

Ecotone - 2002/2007

BCOS Walker Ranch Sample Coordinates in UTM NAD 27 meters.

b = endpoint location

Sample	Easting	Northing	Elevation meters	Elevation feet	Sampler	Orientation	Aspect	Slope°	Slope%	2007 Sample DATE	2002 Sample DATE	COMMENT 2007
01W	469,880.84	4,422,661.00	2,291.7	7,516.9	PM	290	4	10	17.60	7/23/2007	7/18/2002	
01Wb	469,841.83	4,422,693.79	2,284.0	7,491.6								
02W	470,317.47	4,422,385.03	2,221.0	7,284.8	PM	35	154	16	28.70	7/21/2007	7/17/2002	
02Wb	470,354.33	4,422,416.80	2,223.6	7,293.4								
03W	470,581.10	4,422,307.06	2,191.1	7,186.8	PM	175	144	16	28.7	7/22/2007	7/17/2002	
03Wb	470,575.50	4,422,259.17	2,181.3	7,154.7								
04W	470,487.83	4,421,647.76	2,187.5	7,175.2	PM	210	114	15	26.8	7/21/2007	7/18/2002	
04Wb	470,456.64	4,421,609.97	2,189.9	7,183.0								
05W	470,584.96	4,421,466.51	2,192.2	7,190.3	PM	228	48	16	28.7	7/22/2007	7/18/2002	
05Wb	470,545.09	4,421,439.67	2,208.8	7,244.8								
06W	470,616.60	4,422,709.63	2,193.8	7,195.8	PM	360	274	22	40.4	7/21/2007	7/19/2002	White fiberglass at start point
06Wb	470,627.83	4,422,758.68	2,198.8	7,212.1								Carsonite post at end point
07W	470,416.57	4,422,424.97	2,222.4	7,289.6	PM	278	178	10	17.6	7/22/2007	7/17/2002	
07Wb	470,368.43	4,422,440.47	2,221.6	7,286.8								
08W	470,983.61	4,422,261.87	2,254.5	7,394.7	PM	360	330	18	32.5	7/24/2007	7/16/2002	
08Wb	470,982.53	4,422,307.95	2,234.3	7,328.4								
09W	470986.76 (47096)	4422349.39 (4422356)	2,215.1	7,265.7	PM	240	320	18	32.5	7/24/2007	7/16/2002	Start was moved about 3m east due to new trail. Transect crosses trail at meter 2.5-7.5. Took new GPS at start and end.
09Wb	470,938.64	4,422,341.08	2,210.8	7,251.3								
10W	470,376.61	4,422,757.10	2,227.1	7,304.7	PM	30	80	6	10.5	7/23/2007	7/18/2002	The old GPS coordinates were off, tried to get new data
10Wb	470,408.97	4,422,792.93	2,222.5	7,289.7								
11W	471,153.67	4,422,071.15	2,204.4	7,230.3	PM	25	124	18	32.5	7/24/2007	7/19/2002	
11Wb	471,177.92	4,422,113.92	2,210.8	7,251.3								
12W	470,050.63	4,422,210.84	2,306.2	7,564.3	PM	147	72	20	36.4	7/21/2007	7/17/2002	Could not find end point, placed new white fiberglass pole
12Wb	470,067.78	4,422,165.66	2,320.7	7,611.8								
13W	470,261.88	4,422,259.07	2,222.5	7,289.7	PM	158	52	24	44.5	7/21/2007	7/17/2002	Could not find end point, placed new white fiberglass pole.
13Wb	470,274.09	4,422,214.13	2,241.5	7,352.1								
14W	470,293.31	4,422,682.78	2,227.9	7,307.4	PM	248	70	14	24.9	7/21/2007	7/18/2002	
14Wb	470,242.65	4,422,681.22	2,236.1	7,334.5								
15W	472,036.59	4,421,527.00	2,120.5	6,955.2	PM	124	54	22	40.4	7/23/2007	7/19/2002	Could not find start or end markers. Set new white fiberglass poles and GPS'd the new locations.
15Wb	472,071.82	4,421,492.05	2,108.8	6,916.7								
16W	471,447.06	4,421,997.79	2,256.4	7,400.8	PM	252	298	14	24.9	7/23/2007	7/16/2002	
16Wb	471,400.66	4,421,996.49	2,257.0	7,402.9								
17W	471,402.22	4,421,877.77	2,250.8	7,382.5	PM	200	274	20	36.4	7/24/2007	7/19/2002	Transect crosses trail at meters 36-43.
17Wb	471,375.28	4,421,833.91	2,242.9	7,356.8								
18W	471,595.57	4,422,000.41	2,256.7	7,402.1	PM	315	30	18	32.5	7/21/2007	7/19/2002	GPS data were off. Recollected GPS
18Wb	471,578.28	4,422,047.33	2,247.7	7,372.5								