

PS8802-FR

**VEGETATION INVENTORY, CLASSIFICATION AND MONITORING AT
WALNUT CANYON NATIONAL MONUMENT**

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August 15, 1991

Prepared for:

PX-8601-8-0096
PX-8601-8-0096, Amendment #1
PX-8601-6-0052, Amendment #1

United States Department of Interior
National Park Service
Southern Arizona Group Office
202 East Earll Drive, Suite 115
Phoenix, Arizona 85012

1. Report No. PS8802-FR	2.	3. Recipient's Accession No.
4. Title and Subtitle VEGETATION INVENTORY, CLASSIFICATION, AND MONITORING AT WALNUT CANYON NATIONAL MONUMENT		5. Report Date Submitted: February 28, 1991 Revised: August 15, 1991
6. Author(s) Philip Jenkins, Frank Reichenbacher, Kristen Johnson, Anne Gondor	7. Purchase Order No. PX-8601-8-0096, PX-8601-8-0096 Amend. #1 PX-8601-6-0052 Amend. #1	
8. Performing Organization Southwestern Field Biologists 8230 East Broadway Blvd., Suite W6 Tucson, Arizona 85710-4002 (602) 886-4303 FAX: 886-4392	9. Type of Report Final Report	
10. Sponsoring Organization U.S. Department of the Interior National Park Service Southern Arizona Group 202 East Earll, Suite 115 Phoenix, Arizona 85012	11.	
12. Supplementary Notes		
13. Abstract This report presents the results of studies of the vegetation and flora of Walnut Canyon National Monument, Coconino Co., Arizona. Tasks for the project included: (1) classify plant communities of the Monument according to the Brown, Lowe, and Pase system to the subassociation level; (2) map the plant communities of the Monument; (3) list the native and alien floras; (4) establish a minimum of ten permanent vegetation monitoring plots and obtain a spring and summer reading for each; (5) report on the geology, soils, and human history of the Monument; and (6) locate and rephotograph at least five historic photographs that illustrate possible changes in the vegetation and other natural features. A total of five plant subassociations were described and mapped: two Rocky Mtn. Montane Conifer Forest communities, two Great Basin Conifer Woodland communities, and one Rocky Mtn. Riparian Deciduous Forest community. Ponderosa pine forests dominate the rims on the west side of the Monument, while the drier eastern parts are dominated by piñon-juniper woodland. The canyon slopes are dominated on the cooler sites by Douglas fir and Gambel oak, and on the drier sites by banana yucca and piñon-juniper. The canyon bottom is characterized by patches of deciduous trees and open areas. Ten permanent vegetation monitoring plots were established that ranged in size from 10 m x 20 m to 25 m x 25 m. The spring and summer readings indicated relatively minor differences in species composition between the two seasons. The native flora consists of 285 vascular plant species in 62 families, of which the Sunflower Family is the most represented, and the alien flora consists of 21 species in 12 families, with the Grass Family the largest. The historic photographs show that the density of some trees, especially Douglas fir, has increased dramatically in the past four to six decades. This is attributed to a drastic alteration in the pre-settlement fire regime. Management recommendations include: (1) studies of the role of fires in the natural ecology of Walnut Canyon; (2) study of the feasibility of removal of some of the alien plant species; (3) the monitoring plots should not be revisited more than once every five to ten years; (4) sample only woody and herbaceous perennial plants in the monitoring plots and only take one reading in May; (5) pressed scientific plant collections should be housed at an easily accessed regional herbarium.		
		15. No. Pages 74

TABLE OF CONTENTS

	Page
INTRODUCTION	1
STUDY AREA	2
Location and Topography	2
Climate	2
Geology and Soils	2
Human Influences on Vegetation	3
METHODS	5
Vegetation Classification and Mapping	5
Permanent Vegetation Monitoring Plots	7
Native Flora and Alien Flora Lists	10
Historic Photograph Rematching	10
RESULTS AND DISCUSSION	12
Vegetation Classification and Mapping	12
Permanent Vegetation Monitoring Plots	12
Native and Alien Flora Lists	14
Historic Photograph Rematching	16
MANAGEMENT RECOMMENDATIONS	23
LITERATURE CITED	24
Appendix A. Descriptions of the vegetation types of Walnut Canyon National Monument	26
Appendix B. Data from ten permanent vegetation monitoring plots in Walnut Canyon National Monument	36
Appendix C. Native Flora of Walnut Canyon National Monument	51
Appendix D. Alien Flora of Walnut Canyon National Monument	70
Appendix E. List of acronyms of Walnut Canyon plants shown on Figure 2 ..	72

LIST OF TABLES

	Page
Table 1. Code system used to score plant species found in relevé plot sampling at Walnut Canyon National Monument.	5
Table 2. Checklist of Biotic Communities of Walnut Canyon National Monument	13
Table 3. Summary of results of permanent vegetation monitoring plot sampling	15

LIST OF FIGURES

	Page
Figure 1. Example of relevé plot scorecard used to describe and classify the vegetation of Walnut Canyon	6
Figure 2. Map of the biotic communities of Walnut Canyon National Monument	(pocket)
Figures 3. Designs of permanent monitoring plots used at Walnut Canyon National Monument	9
Figures 4a-4b. 4a= Maurer, 1897, 4b= Reichenbacher, Nov. 17, 1989. View up Walnut Canyon from immediately northeast of the Island neck.	17
Figures 5a-5b. 5a= Fauber, 1904 or 1905, 5b= Reichenbacher, Nov. 17, 1989. View of the southwest-facing slopes of Walnut Canyon up canyon from the neck, taken from nearly the same spot as Figs. 4a-4b.	18
Figures 6a-6b. 6a= Beaubien, 1940, 6b= Reichenbacher, Nov. 17, 1989. View of a balancing rock looking east from the east side of the Island.	19
Figures 7a-7b. 7a= Beaubien, 1941, 7b= Reichenbacher, Nov. 17, 1989. View from the Island Trail looking down Walnut Canyon west of the Island.	21
Figures 8a-8b. 8a= Beaubien, 1941, 8b= Reichenbacher, Nov. 17, 1989. View from the east side of the Island neck, looking south.	22

INTRODUCTION

Walnut Canyon was established in 1915 for the preservation and protection of prehistoric archeological sites left by the Sinagua culture. It is management policy of the United States Department of Interior, National Park Service, to perpetuate the total natural environment within the Monument. The need was identified for a study to inventory and classify the vegetation and to establish a monitoring system to identify changes in vegetation that may occur.

Southwestern Field Biologists entered into a contract to survey and describe the existing vegetation and flora of Walnut Canyon National Monument, review existing literature on geology and recent history that may have influenced botanical resources, and, with historic photograph rematching, investigate changes in the vegetation of the Monument. The objectives of the study include the following:

1. Classify the plant communities using the Brown system as published in Desert Plants (Brown 1982) "Biotic Communities of the American Southwest", to the fourth decimal place or subassociation level.
2. Produce a map of the biotic communities of the Monument according to the classification above, inventoried trees, and the permanent vegetation monitoring plots at scale 2.54 cm = 152 m (1 inch = 500 feet).
3. List the native flora of Walnut Canyon including scientific name, common name, if one is available, and notes about vegetation types subassociations and habitats where the plant is found.
4. List the alien flora of Walnut Canyon, with information as described above for the native flora.
5. Establish a minimum of ten permanent marked vegetation monitoring plots in representative areas to document occurrence, abundance, cover and density of perennial herbs, shrubs, and trees.
6. Report on the geology and soils of the Monument using information from existing literature.
7. Report on the human history of the Monument as it may have affected vegetation, using information from existing sources on livestock grazing, developments and fire occurrences.
8. Obtain and rephotograph historic photographs to illustrate changes in structure and composition of vegetation, if any.

STUDY AREA

Location and Topography

Walnut Canyon National Monument includes 777 ha in the Township 21 North, Range 8 East of the Gila and Salt Baseline and Meridian in Coconino County, Arizona. It is about 11 km southeast of Flagstaff. The elevation range is 1914 m, where the canyon exits the Monument to the east, to 2082 m near the southwest corner. The canyon is about 107 m deep from the rim to the bottom. Archeological sites are located beneath overhangs in the canyon and on the rim of the canyon. The land around the Monument is administered by the United States Department of Agriculture Forest Service, Coconino National Forest.

Climate

The climate is cold-temperate and semi-arid. Thirty-two years of precipitation for the Monument (1930-1982) showed an annual average precipitation of 448 mm. An average of 240 mm fell from October through March, much of which was snow. The average annual snowfall is 132 cm. A late spring drought is frequent and is followed by episodes of convectional thunderstorms in July, August, and September. July and August are the wettest months. Although temperature data are not available for the Monument, Flagstaff Airport experiences average January minimum and maximum temperatures of -9.4°C and 5.4°C, respectively. In July the average minimum and maximum temperatures are 10.3°C and 27.5°C, respectively. During the 32-years of record temperature extremes ranged from -30.6°C to 36.1°C. The average number of days with freezing temperatures is 208 per year (Sellers et al. 1985).

Geology and Soils

The Colorado Plateau geological province is a series of sedimentary layers of usually broad extent. Two of these layers, Coconino Sandstone and the Kaibab Limestone formations, are exposed at Walnut Canyon. Both are believed to have formed in the mid and late Permian age between 225 and 250 million years before present (Vandiver 1936).

The Coconino Sandstone is older than Kaibab Limestone formation and lies below it. The light buff-colored and crossbedded sandstone is readily distinguishable from the gray limestone while standing in the canyon bottom. Examination of fossils found in the sandstone has shown only trails of reptiles or amphibians and annelid worms. Sand grains are the main component and pebbles are generally absent. The composition, fossils, and crossbedding indicate that the formation is of eolian (wind deposited) and streambed origin. It is easily eroded into sand and accounts for the large amounts of deposits in the canyon bottom, a situation that may have allowed pools of water to collect just under the surface. It is suggested by Vandiver (1936) that the native population excavated these sand pockets for water in times of drought.

Kaibab Limestone is a marine deposit which caps the Coconino Sandstone over a large part of Northern Arizona and is the highest formation at Walnut Canyon. Horizontal contact and little evidence of significant erosion on the Coconino suggests that a shallow sea rapidly advanced over the land. The formation has been

divided into three members (Pattison 1946). The gamma layer is the oldest and lowest and is thought to have formed as the sea advanced. The beta layer formed when the sea was at its deepest but still shallow, and the alpha marks the time when the sea was retreating.

Small north-south faults have probably been responsible for the present course of the stream. As the land was uplifted from sea level to its present altitude the stream followed a path of least resistance and cut north and eastward into the sandstone and limestone formations. Some layers of the Kaibab Limestone were less resistant to erosion by the stream action than the layers above and below, and stream erosion with subsequent weathering created the overhangs that provided shelter for the Sinagua.

Soil survey work in the area is currently being conducted by the Forest Service on their land around the Monument but is not yet ready for presentation (personal communication with Coconino National Forest Service). Within two years, this information should be available. Soils throughout the Monument are sandy. There are deep deposits in the canyon bottom derived from Coconino Sandstone. Since the damming of the canyon to form Lake Mary up the canyon from the Monument, periodic scouring of the canyon during floods has been moderated and these soils have become deeper. Sandy soil derived from the Kaibab Limestone occurs on the rim of the canyon and in depositional pockets on the canyon walls.

Human Influences on Vegetation

Evidence of historical human influence began with the Sinagua culture who created microenvironments at construction sites (Clark 1968). The trees in the area were probably used as fuelwood and the condition of the forest may have been significantly altered by the end of the occupation. It has been suggested that the area adjacent to and east of the entrance road, where the archeological site concentration is high, may have been denuded of ponderosa pine (*Pinus ponderosa*) for fuelwood. That area today is a piñon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland. The oldest trees in the piñon-juniper woodland are thought to be at least 400 years old, and the stand density has increased within the last 200 years (Despain and Mosley 1990) indicating a possible invasion of piñon or juniper trees.

Fire occurrence studies of the piñon-juniper woodland (Despain and Mosley 1990) and the ponderosa pine forest (Swetnam et al. 1990) show a high frequency of fires until the time of European settlement in the late nineteenth century. Fires occurred in ponderosa pine every one to five years suggesting that fine fuels such as grasses and pine needles were the principle materials burning. Since that time fire occurrence dropped dramatically due to fire suppression and removal of the grass fuels by cattle.

The Monument was established initially in 1915 but was limited to the area around the principal archaeological sites. While it was administered by the U.S. Forest Service, cattle grazing and some selective logging continued. The rest of the area of the present Monument was added in 1938. In 1971 an error led to the selective logging of about 16.2 h on the south rim of the canyon on the Monument, directly south of the Visitors center. This led to the construction of the boundary fence in 1973 and logging and grazing ceased. The two-track roads that led onto the Monument were maintained as fire roads and occasional trespass by firewood cutters occurred. In 1984 the Park Service worked to obliterate these roads and they are in little evidence today (Tom Farrell, Walnut Canyon N.M., pers. com., 1990).

Damming of the stream in Walnut Canyon to form Lake Mary above the Monument has decreased streamflows. The consequent absence of periodic floods that would scour the streambed may have contributed to an increase of vegetation in the canyon bottom over the last forty years (Brian 1985). Also, the reservoir created by the Santa Fe dam just downstream of the eastern Monument boundary has filled with alluvium which extends into the Monument and supports an extensive annual disclimax weed-dominated plant community (Phillips 1990).

A large area northeast of the Monument has been chained to reduce the piñon-juniper woodland and encourage the growth of grasses for cattle. The process usually involves attaching a large ship anchor chain between two bulldozers to drag the trees out of the ground. They are then piled and often burned. Present composition of this area and its influence on the Monument could be a matter for study.

European settlement resulted in invasions by several alien plant species. Although a few of these are now abundant in some areas, they have not significantly changed the character of the native plant communities.

METHODS

The field studies began late in 1988 and continued through 1990. The permanent plots were established in 1988 and 1989 and sampled in the spring and summer to establish seasonal changes. Voucher collections of plant species were made concurrently with field studies to develop the vegetation classification and while establishing and reading the permanent monitoring plots.

Vegetation Classification and Mapping

The methods used to produce the vegetation map were field observations, and studies of aerial photographs. The field observations were recorded on a standardized form for relevé plots (Figure 1) at sixty-one plot sites scattered evenly throughout the monument. Data on the field observations include a complete list of perennial species seen from the plot point. Each species is listed as a four lettered acronym of the scientific name; for example, *Pinus ponderosa* becomes Pipo. The prominence, height and cover of each species was visually estimated and assigned appropriate codes as shown in Table 1.

After the field observations were completed the relevé plot forms were divided into groups that had similar composition of dominant and co-dominant species. Frequency for each species was determined by dividing the number of plots where it occurred by the total number of plots. If it occurred in all plots then the frequency was 1.00, and if it was found in half of the plots the frequency was 0.50. The prominence ranges were the low to high numbers assigned to the species on the set of plots where it occurred (non-occurrence is not included). The prominence mean was the sum of the prominence numbers assigned divided by the number of plots where it was recorded. The species were then listed in order of 1) frequency and 2) prominence. Cover class codes were used as "tie-breakers". The most frequent and prominent species were called characteristic species, and those commonly encountered were called associated species. Occasional species were ones encountered only once or twice in the vegetation type.

Table 1. Code system used to score plant species found in relevé plot sampling at Walnut Canyon National Monument. Cover class codes were also used in permanent monitoring plot sampling.

Prominence	Height	Percent Cover
1....1 or 2 plants	A.... < 15 cm	0.... < 1%
2....scattered	B....15 cm - 40 cm	1....1 - 5%
3....characteristic	C....41 cm - 1.5 m	2....6 - 20%
4....co-dominant	D....1.6 m - 3.0 m	3....21 - 40%
5....dominant	E....3.1 m - 5.0 m	4....41 - 60%
	F.... > 5.0 m	5....61 - 80%
		6....81 - 95%
		7....96 - 100%

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION _____ JOB CODE _____ NAME _____ DATE _____
 PHOTO NO. _____

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl fldpl	Val fl intfl sdsl	lowl midsl ridge	upsl	Plat intfl sdsl	Rock terr cliff	Cind Talus	ELEV.	
													DISSECT.
				SLOPE									
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS	FORMATION				% GRAVEL				
					TEXTURE				% ROCK				
NOTES													
FIELD CLASS.												FINAL CLASS.	

Figure 1. Example of relevé plot scorecard used to describe and classify the vegetation of Walnut Canyon National Monument. Adapted from Warren et al. (1982).

The most frequent and prominent three to five species were matched to categories outlined in the Digitized Classification System for Biotic Communities of North America as published in Desert Plants (Brown 1982). An eight digit number was assigned to each subassociation to be mapped (the first "1" four digits to the left of the decimal, representing the Nearctic Realm or North America approximately north of the Tropic of Cancer, was omitted). The climatic zone, regional formation, series, and association were given in the list of the biotic communities before the subassociations. The subassociation designations and descriptions followed that used by Warren et al. (1982).

Field notes and aerial photographs were studied to determine the boundaries of the subassociations, and to map the locations of relevé and permanent plots. This information was plotted on United States Geological Survey topographic map at a scale of 2.5 cm = 152 m. The relevé plots locations are mapped in Figure 2 (pocket).

Permanent Vegetation Monitoring Plots

Ten vegetation study plots were established at representative sites at Walnut Canyon National Monument. The monitoring plot sites were selected on the basis of the results of the relevé plot sampling discussed above and on practical considerations of management. The locations of the permanent monitoring plots are shown on Figure 2. One permanent monitoring plot was located in each of two of the subassociations while the remaining three subassociations were represented by two or three of the plots mapped in Figure 2 as follows:

Deciduous Riparian Woodland

Plot WC2 *Acer negundo* - *Artemisia ludoviciana* - *Rosa arizonica* -
Robinia neomexicana [Boxelder - Wormwood - Arizona
Rose - New Mexican Locust]

Rocky Mountain Montane Conifer Forest

Plots WC8, WC10 *Pinus ponderosa* - *Quercus gambelii* [Ponderosa Pine -
Gambel oak]

Plots WC7, WC5, WC9 *Pseudotsuga menziesii* - *Quercus gambelii* - *Poa fendleriana* [Douglas fir - Gambel Oak - Muttongrass]

Great Basin Conifer Woodland

Plots WC1, WC3, WC6 *Pinus edulis* - *Juniperus monosperma* - *Bouteloua gracilis* [Piñon Pine - One-seed Juniper - Blue Grama]

Great Basin Shrub-Grassland

Plot WC4 *Yucca baccata* - *Pinus edulis* - *Bouteloua gracilis* [Banana
Yucca - Piñon Pine - Blue Grama]

No attempt was made to randomly locate the plots. Instead each plot was carefully located in order to represent at least one of each of the subassociations mapped in Figure 2. This was considered to be the minimum sampling requirement

at Walnut Canyon National Monument. The dimensions of each of the ten permanent monitoring plots and sampling subplots within them are shown in Figures 3a-3e.

The first permanent monitoring plots were established in August, 1988 (WC1 and WC2). Plot WC1 was established in homogeneous piñon-juniper woodland habitat on the north rim and was square in outline, 25 m x 25 m (625 m², .06 ha). It was decided shortly afterwards that 25 m x 25 m was far too large to sample in a reasonable period of time in most habitats, but that the larger plot would be useful in sampling very open communities. Plot WC2, established in the Walnut Canyon bottom, was 15 m x 20 m (300 m², .03 ha), while plots WC3, WC4, WC5, WC6, WC7, and WC9 were 10 m x 20 m (200 m², .02 ha). Plots WC8 and WC10, sampling much more open communities than most of the others, were laid out at 24 m x 24 m (576 m², .58 ha) and 20 m x 16 m (320 m², .032 ha), respectively. In most cases the plots were placed with the long axis parallel to the slope contour, but at WC2 the long axis was parallel to the streambed. The corners of most plots were marked with a length of rebar hammered into the ground, leaving 20 cm to 30 cm above the surface. In many locations, corners happened to fall on solid rock outcrops where it was frequently necessary to move the point a few centimeters, or as much as a half meter in some cases, and use a 25 cm heavy nail in place of rebar. A circular aluminum tag stamped with the plot number given above was wired to the rebar at each corner.

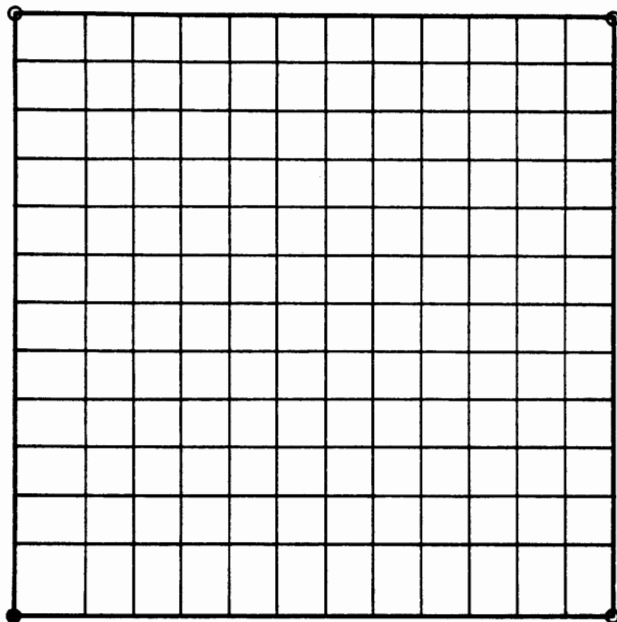
Sampling included all trees, shrubs, and perennial herbs (including ferns and fern-like plants) and grasses. The data taken at each plot included, 1) species count (the numbers of individuals of each species in a plot), and 2) cover (the area covered by each species). Using the area of the plot (.06 ha, .058 ha, .032 ha, .03 ha, and .02 ha) it was possible to extrapolate an estimated density (the number of plants of each species, per hectare of habitat) from the species count data.

The plots were delineated on the ground with a 100 m rope chain stretched around the plot perimeter. In the 10 m x 20 m plots, extra lengths of rope chain and meter rulers were then used to mark off 4 m² subplots. Some of the plots necessitated alternative arrangements of subplots, especially in the larger plots where high densities of forbs and grasses precluded sampling the entire plot. At plot WC5, on a highly unstable, steep bank of weathered Coconino sandstone only five 2 m x 2 m (4 m²) subplots were established, one at each corner and one in the center. This was necessary to protect the unstable soil from the effects of trampling by the samplers. Such an approach might be desirable at several other plots on steep slopes (e.g., WC4, WC7, WC9). At WC8 a large subplot measuring 4 m x 16 m was subdivided into 16, 2 m x 2 m (4 m²) subplots in the plot center, while at the corners, 4, 4 m x 8 m subplots were subdivided into 8, 2 m x 2 m (4 m²) subplots. This design was necessary to reduce the amount of data on small plants, which occur in high densities at that site.

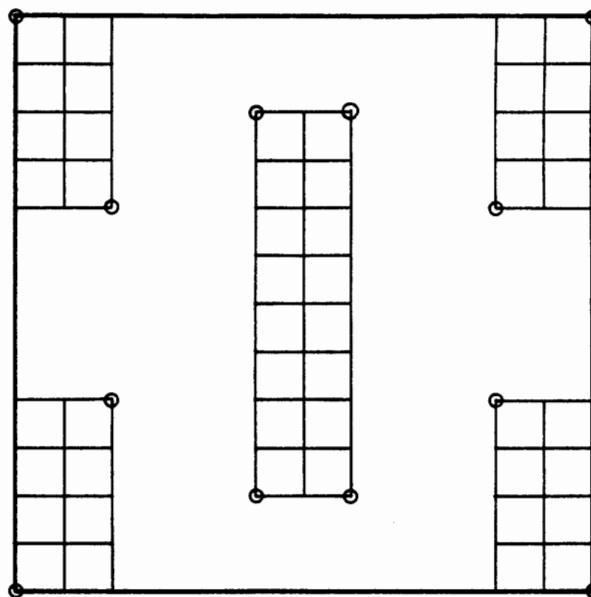
The species counts were made subplot-by-subplot, then summed over the whole plot. Cover for each individual plant was defined as the largest diameter circle connecting to outermost points of the plant canopy projected down to the ground surface (Grieg-Smith 1964). Cover was visually estimated for each species, also subplot-by-subplot, according to the scale presented in Table 1 (p. 5). The cover class estimate for each species was averaged over the whole plot.

Defining individual plants was very difficult for many species of forbs and grasses at Walnut Canyon. This was especially true for blue grama (*Bouteloua gracilis*), toadflax beardtongue (*Penstemon linarioides*), poison ivy (*Toxicodendron rydbergii*), and hairy goldaster (*Heterotheca villosa*). At WC2 all perennial grasses were counted and cover was estimated as usual in the summer survey (August 1988). However, for the spring survey (May 1989) it was decided to not attempt to count

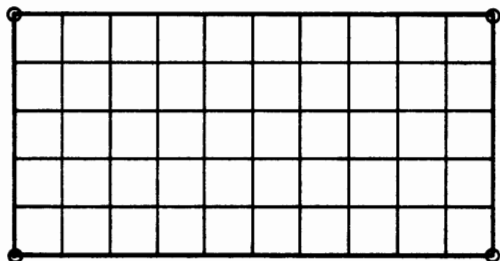
PLOT WC1



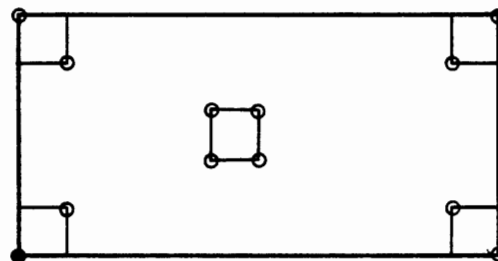
PLOT WC8



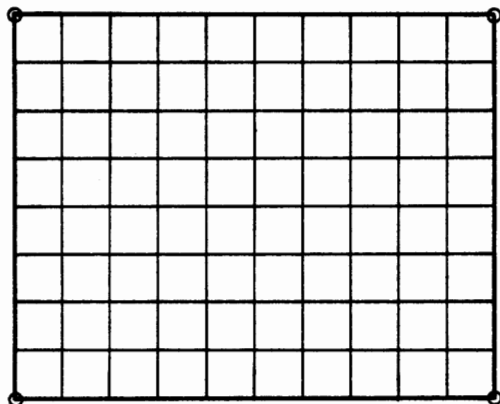
PLOTS WC3, WC4, WC6, WC7, WC9



PLOT WC5



PLOT WC10



PLOT WC2

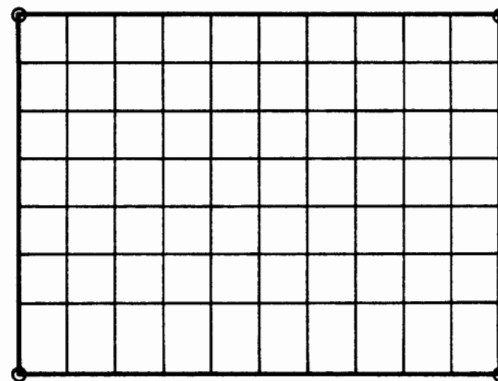


Figure 3. Designs of permanent monitoring plots used at Walnut Canyon National Monument. Plot dimensions: WC1=25 m x 25 m; WC3, WC4, WC6, WC7, WC9=10 m x 20 m; WC10=16 m x 20 m; WC8=24 m x 24 m; WC5=10 m x 20 m; WC2=15 m x 20 m (1 cm = 3.2 m). The small circles represent rebar markers or 25 cm long nails. Thick lines mark plot boundaries, thin lines represent the temporary subplot boundaries. Subplots are all 2 m x 2 m, except at WC1 and WC2, where subplots on one or two edges were 1 m x 3 m.

individuals of green muhly (*Muhlenbergia racemosa*), hairy brome (*Bromus ciliatus*), wild rye (*Elymus canadensis*), and deergrass (*Muhlenbergia rigens*), which were very dense in and adjacent to the streambed. It was not considered useful to attempt to distinguish individuals. Other grasses, including blue grama, sweet grass (*Hierochloa odorata*), and Indian rice grass (*Oryzopsis hymenoides*) were counted as were the other plants. Cover was estimated for these species as usual.

Trees with larger than 2 cm DBH (diameter-at-breast height) and shrubs with canopies larger than 1 m² were counted in the whole plot. Cover for these groups was also estimated with respect to the whole plot. When interpreting the cover estimates presented in Appendix B it is important to note that cover of large plants was estimated with respect to the whole plot, while cover of the smaller plants was estimated with respect to the much smaller subplots.

It was necessary to subdivide the plots because of the difficulty of keeping an accurate count of some of the more numerous species within larger areas and because it would be impossible to accurately estimate cover of each species in a large area. The subplots could be arranged in any convenient manner, so long as roughly the same size of subplot was used during each monitoring period.

The permanent plot data acquisition was planned to sample summer and spring growing seasons. Monitoring plots WC1-WC7 were sampled August-September, 1988, and in May, 1989, while plots WC8-WC10 were sampled in May, 1989, and September, 1989. All trees, shrubs, perennial herbs (including ferns and fern-like plants), and grasses were sampled during the first sampling period for each plot, but only the herbaceous species were during the second visit.

Native Flora and Alien Flora Lists

The species lists were compiled from existing publications (Arnberger 1947; Spangle 1953; Joyce 1976; Phillips 1990), a search of the Monument herbarium, and during relevé and permanent plot sampling. Collections were made of plants for documentation and identification when they could not be identified in the field. These were taken to the herbarium at the University of Arizona (ARIZ) in Tucson for positive identification. The scope of work did not allow for confirmation of identifications of collections already housed at the Monument. The list included all of the plants known to grow on the Monument without cultivation. The list was arranged alphabetically by families, and then alphabetically by genus within the family. If possible, the vegetation subassociations in which the species is found was gleaned from these sources also. A separate list was made of alien, or exotic species. Arizona Flora and Supplement (Kearney and Peebles 1960) was used as a reference for this list. A Catalogue of Arizona Flora (Lehr 1978), with Supplement I (Lehr and Pinkava 1980) and Supplement II (Lehr and Pinkava 1982) were used for most nomenclature of the taxa. In addition, an effort was made to bring the list into line with publications and manuscripts and publications provided to us by contributors to the upcoming revised Arizona Flora. In every case the synonym in the Catalogue was given if it existed.

Historic Photograph Rematching

On November 16, 1990, Walnut Canyon National Monument files were searched for the oldest available photographs that might be re-photographed and used to illustrate any changes that might have occurred in the structure or composi-

tion of the vegetation of the Monument. Seven photographs were chosen ranging in date from 1929 to 1964. We then re-photographed the scene of each photograph on November 17, 1990, matching, as closely as possible, the scale and framing.

Unfortunately no historic views of non-canyon environments could be located. It would have been highly desirable to locate views of the ponderosa pine and piñon-juniper (*Juniperus* spp.) associations that dominate the plateaus.

RESULTS AND DISCUSSION

Vegetation Classification and Mapping

Table 2 lists the five plant communities found on Walnut Canyon National Monument, classified according to Warren et al. (1982) and Brown (1982). Appendix A lists all the species located in each subassociation, with mean prominence, height range, and mean frequency for all of the common species. The subassociations are mapped in Figure 2 and Appendix E lists all the full scientific names for the acronyms used in the map.

Ponderosa pine forest covers the largest area and, in an undisturbed state, is characterized by well-spaced trees of various ages and a ground cover of perennial grasses and herbs. Elevations on the Monument approach the lower limit of distribution of ponderosa pine forest (Brown 1982), a factor that makes the forest susceptible to disturbance and invasion by the piñon-juniper woodland that dominates the remainder of the Monument outside the canyon.

Piñon-juniper vegetation covers large areas of the cold-temperate and arid to semiarid climates of the Great Basin and Southwest. Perennial grasses often dominate the ground between trees, but are often crowded out in dense stands. Piñon and junipers have increased in density and have invaded a large area of the Southwest in this century (Humphrey 1962).

The three remaining subassociations are within the canyon. The south facing slopes that experience the most drying and heating support a modified piñon-juniper woodland that is characterized by stands of banana bucca (*Yucca baccata*). The more mesic north facing slopes support a Douglas fir (*Pseudotsuga menziesii*) forest. Gambel oak (*Quercus gambelii*) is common in many situations on the Monument but reaches its maximum development on north facing slopes, where it forms extensive, multi-trunked clones.

The bottom of the canyon alternates between riparian woodland and open areas. Boxelder (*Acer negundo*), Arizona walnut (*Juglans major*), narrowleaf cottonwood (*Populus angustifolia*) and aspen (*Populus tremuloides*) are some of the more obvious trees and grow only in the canyon bottom. Phillips (1990) submitted a detailed work of the canyon bottom vegetation that described changes in the riparian vegetation at different points in the canyon within the Monument.

The sinuous meanders of the canyon support a mosaic of all the vegetation types found on the Monument. Interesting patterns in vegetation distribution are apparently the product of local anomalies in wind, rainfall, and humidity. This is very noticeable at the so-called "Island", immediately south of the Monument Visitor's Center, where the west-facing slope supports a cool-moist plant community, while the east-facing slope supports plants more characteristic of warm-dry exposures.

Permanent Vegetation Monitoring Plots

The monitoring plot data are summarized in Table 3 and the plot data are given in detail in Appendix B. In the Appendix, cover data should be interpreted using the cover class scale in Table 1 because the "Mean % Cover" figures listed in the tables are really averaged cover class scores. These means will be useful in comparing cover estimates between plots and from year-to-year and from season-to-season, but should not be used to make statistical inferences since the subplots are

Table 2. Checklist of Biotic Communities of Walnut Canyon National Monument.
Following Brown (1982) and Warren et al. (1982).

122 Cold Temperate Forests and Woodlands

122.3 Rocky Mountain (Petran) Montane Conifer Forests

122.31 Douglas fir - White Fir Series

122.311 *Pseudotsuga menziesii* Association

122.3111 *Pseudotsuga menziesii* - *Quercus gambelii* - *Poa fendleriana*
[Douglas Fir - Gambel Oak - Muttongrass]

122.32 Pine Series

122.323 *Pinus ponderosa* - *Quercus gambelii* Association

122.3231 *Pinus ponderosa* - *Poa fendleriana* - *Quercus gambelii* [Ponderosa
Pine - Muttongrass - Gambel Oak]

122.4 Great Basin Conifer Woodland

122.41 Piñon - Juniper Series

122.414 *Pinus edulis* - *Juniperus monosperma* Association

122.41412 *Pinus edulis* - *Juniperus monosperma* - *Bouteloua gracilis*
[Piñon Pine - One-seed Juniper - Blue Grama]

122.41413 *Yucca baccata* - *Pinus edulis* - *Bouteloua gracilis* [Banana
Yucca - Piñon Pine - Blue Grama]

222 Cold Temperate Swamp and Riparian Forests

222.3 Rocky Mountain Riparian Deciduous Forest

222.32 Mixed Broadleaf Series

222.321 *Acer negundo* - *Populus angustifolia* - Mixed Deciduous Association

222.3211 *Acer negundo* - *Artemisia ludoviciana* - *Rosa arizonica* - *Robinia
neomexicana* [Box elder - Wormwood - Arizona Rose - New Mexi-
can Locust]

not independent samples. Use of the plot data in comparing statistical properties is also inappropriate because the plots were not randomly located. Each plot represents a single sample from a single statistical population. At least two and preferably more plots should be established in each subassociation to allow for statistical comparisons.

The most important plants (i.e., the most frequently encountered and those providing the most cover) were: blue grama and muttongrass (*Poa fendleriana*). Blue grama was most abundant on dry warm sites and muttongrass was most common in cooler moister areas. The two were often the most important species on a single plot, the former growing best in openings between shrubs and trees and the latter preferring shaded sites beneath tree and shrub canopies. Many of the plots represented very similar floras, and many species are shared by most of the plots. Tree species were poorly sampled by the plots used at Walnut Canyon. A more adequate sampling could have been accomplished with much larger plots -- on the order of 0.5 to 1 ha -- or with many more plots of the sizes used in this study.

The two vegetation sampling periods did not produce markedly differing results. This was, in part, due to below average precipitation in the spring of 1989. A few species were clearly representative of a spring flora, such as hairy beenuts (*Townsendia strigosa*), but by far the majority of Walnut Canyon plants arise or leaf out in the spring, reproduce in the summer, and go to seed in the fall.

The Deciduous Riparian Woodland plot (WC2) was located on the bottom of the Canyon. The streambed bisects the plot and some gravel and evidence of flowing water was present in the plot. Other sections of the canyon bottom that were choked with rubble show evidence of much more frequent streamflows. Much of the Walnut Canyon bottom is very sandy and there is no defined channel whatever.

Native and Alien Flora Lists

The list of native plants included 285 taxa in 62 families and is presented in Appendix C. The total may be expected to vary with different taxonomic opinions. As is frequent in the Southwest, Compositae (63 taxa), Gramineae (29 taxa) and Leguminosae (20 taxa) were the largest families. Pinaceae, which forms much of the vegetative character on the Monument, had only three species. A fourth, white fir (*Abies concolor*), may someday be found. No one genus had large numbers of species. The largest was the fleabanes (*Erigeron* sp.), with seven taxa. The canyon bottom, with over half the species on the Monument, had the greatest diversity of species.

The list of alien plants on the Monument, which is presented in Appendix D, includes much fewer species, including 21 taxa from 12 families. Gramineae, the largest family of aliens, had three species. While a few species, such as horehound (*Marrubium vulgare*), a common weedy perennial in the canyon bottom, have significant populations on the Monument, alien species in general, have not had a severe impact. They represent 6.5% of the species diversity.

Table 3. Summary of results of permanent vegetation monitoring plot sampling in May and June, 1989, and September, 1989. Importance values -- estimated density (plants per hectare) multiplied by the estimated cover (scored by cover class, see p. 15) -- for the most important species at each of the ten plots (using the spring, 1989, data only).

Species	WC1	WC2	WC3	WC4	WC5	WC6	WC7	WC8	WC9	WC10
<i>Achillea millefolia</i>		43491	962							
<i>Artemisia ludoviciana</i>		734	840			803	96	139	25143	
<i>Artemisia dracunculifolia</i>		290		3556		82				
<i>Bouteloua gracilis</i>	50008	4052	77763	59329		70135	3	54780		81530
<i>Chamaebatiaria millefolium</i>			25704							
<i>Elymus elymoides</i>	6		2	541		1	7328	6188	10	82
<i>Eriogonum racemosum</i>						6548		121		
<i>Eriogonum umbellatum</i>										
var. <i>cognatum</i>								19		1701
<i>Gutierrezia sarothrae</i>		1649						49		
<i>Heterotheca villosa</i>			1	31329				1		4
<i>Hymenopappus filifolius</i>										
var. <i>lugens</i>	249							2676		16490
<i>Ipomopsis multiflora</i>	2948		1264		4		202	1	404	601
<i>Juniperus scopulorum</i>		260								
<i>Lesquerella intermedia</i>	16831	2	1			9606				
<i>Parthenocissus vitacea</i>		805			608					
<i>Penstemon linarioides</i>	95			110				9461		31957
<i>Phlox austromontana</i>						14817				
<i>Pinus edulis</i>	1452							34	50	2892
<i>Poa fendleriana</i>	1088	5	42351	3688		128251	164970	18419		35258
<i>Pseudotsuga menziesii</i>						616	1200		300	
<i>Quercus gambelii</i>		1134		5		3	21434	60	20367	1104
<i>Senecio nemorensis</i>		63410						5	9	6
<i>Solidago sparsiflora</i>		90149								
<i>Symphoricarpos parishii</i>		372			900		39100		18	
<i>Verbesina</i> sp.		252166			49900					
<i>Viguiera multiflora</i>								65		884
<i>Yucca baccata</i>	59	59	86	67	50	910	28		30	

Historic Photograph Rematching

The rematched historic photographs (Figures 4-8) suggested one important observation: the density of some trees, especially Douglas fir, has increased dramatically in the past four to six decades. We attribute this to a drastic alteration in the pre-settlement fire regime since the turn of the century. The visible consequence of this has been the proliferation of Douglas fir and probably other tree species. Whether other elements of the flora have been similarly encouraged, perhaps at the expense of other species, cannot be determined from these photos.

Figure 4a, and to a lesser extent Figure 5a, which illustrate the Walnut Canyon bottom in 1897 and 1941, respectively, show what may be a recent increase in shrub density and cover. The canyon bottom, which of course rarely experiences a scouring flood, has been invaded by numerous shrubs in these segments of the stream. The other three photos suggest also an increase in cover, if not in density, of shrubs on the slopes as well, but it is very difficult to determine if these are real differences, or only due to lighting and shading effects.

Figure 4a-4b: J.A. Maurer, 1897

Figure 4a is a view up Walnut Canyon from the top of the Coconino Sandstone cliff immediately northeast of the Island neck. In the old view the canyon bottom is visible, only partially obscured by shrubs; trees are restricted to the edges of the floodplains. Today (Figure 4b), the canyon bottom is almost totally obscured by dense stands of Boxelder and Rocky Mountain juniper. It appears that shrubs and trees on the canyon slopes, both northeast- and southwest-facing slope, are thicker and perhaps taller, on average, now than a hundred years ago.

Figure 5a-5b: J.J. Fauber, 1904 or 1905

This view of the southwest-facing slopes of Walnut Canyon overlapped the view shown on the right side of Figure 4a-4b and was taken from nearly the same spot. To the far right edge of both photos the branches of a Douglas fir are barely visible. A Douglas fir, less than a meter tall nine decades ago, has grown to a sizeable tree on a crack in the Coconino Sandstone in the lower left of the view. It is difficult to tell whether the trees -- mostly piñon, Utah juniper, and one-seed juniper (*J. monosperma*) -- and shrubs in this view are more abundant now than in the earlier view, or are simply bushier.

Figure 6a-6b: P. Beaubien, Dec. 5, 1940, or May 12, 1940

This view was taken from the east-facing slope of the Island, a few meters below the Island Trail looking east. The trees on the opposite slope have hardly changed in abundance and size, but the smaller shrubs, including Skunkbush (*Rhus aromatica*), and barberry (*Berberis fremontii*), seem to have increased. Note the shrub in front of the door of the cliff dwelling ruin.

Figure 4a

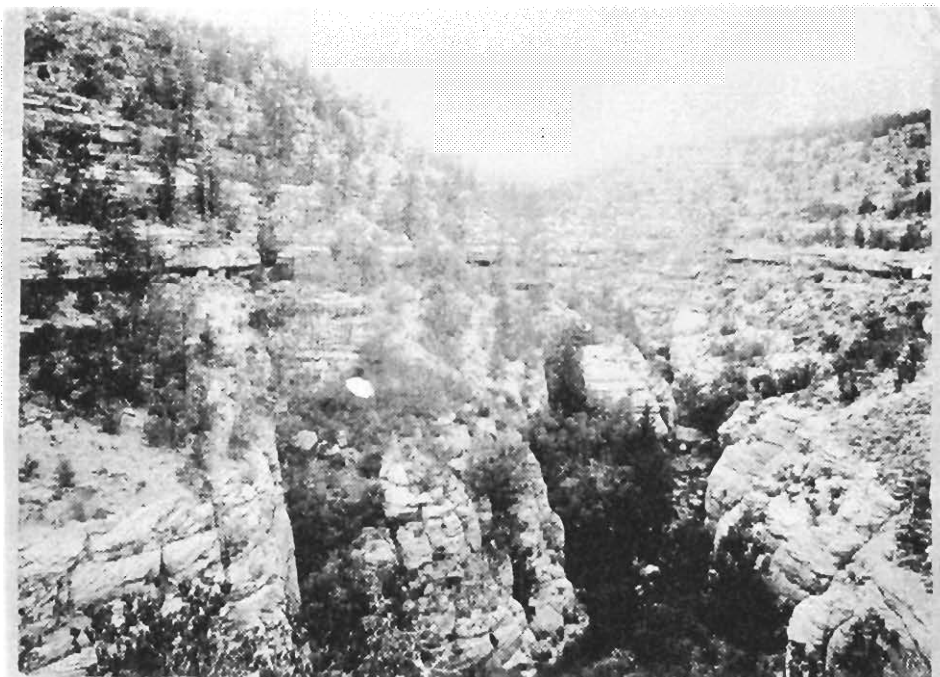
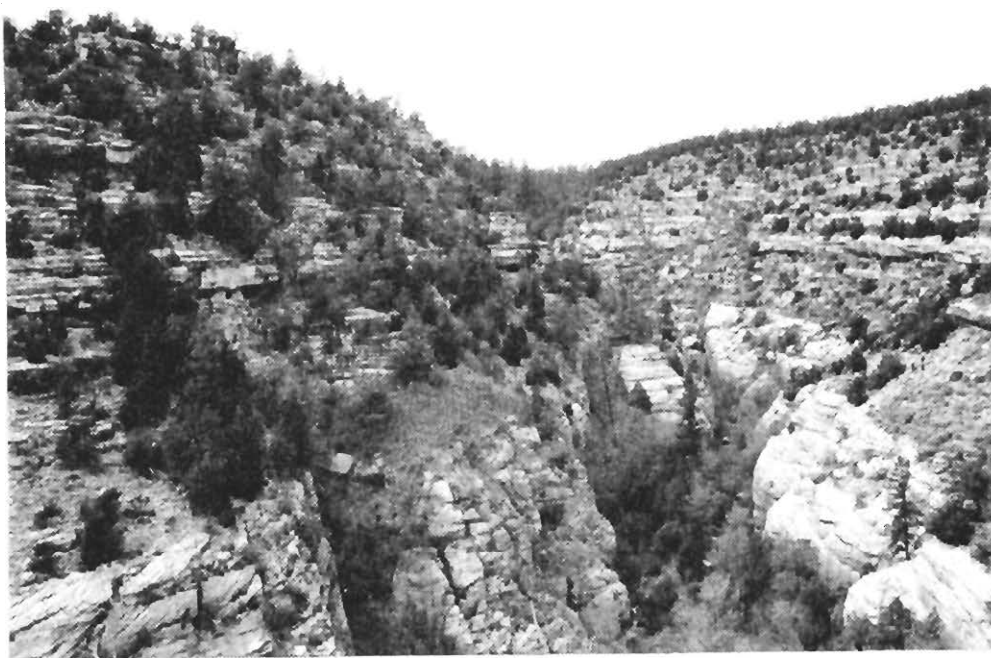


Figure 4b



Figures 4a-4b. 4a=Maurer, 1897, 4b=Reichenbacher, Nov. 17, 1989. View up Walnut Canyon from immediately northeast of the Island neck.

Figure 5a

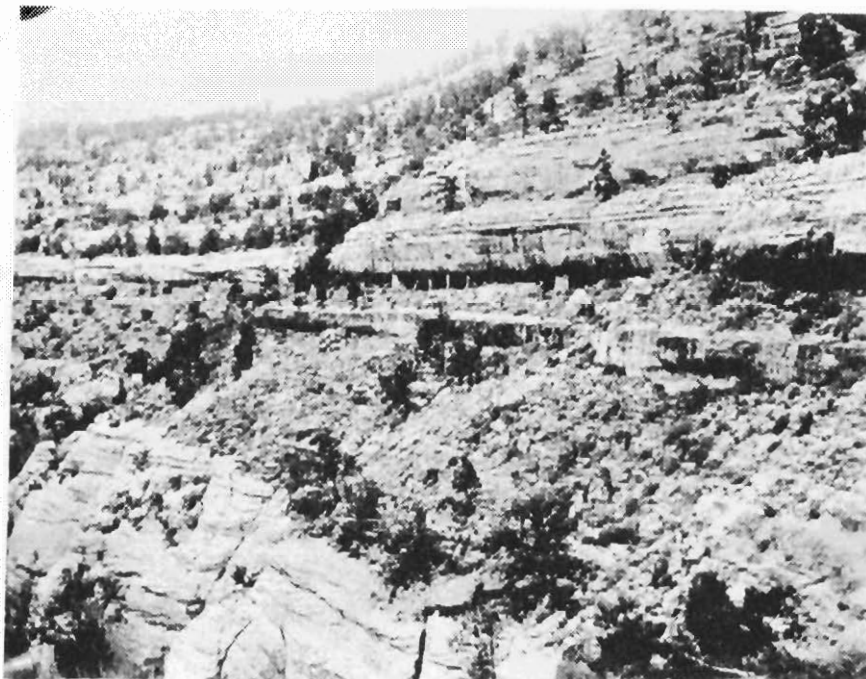


Figure 5b



Figures 5a-5b. 5a = Fauber, 1904 or 1905, 5b = Reichenbacher, Nov. 17, 1989. View of the southwest-facing slopes of Walnut Canyon up canyon from the neck, taken from nearly the same spot as Figs. 4a-4b.

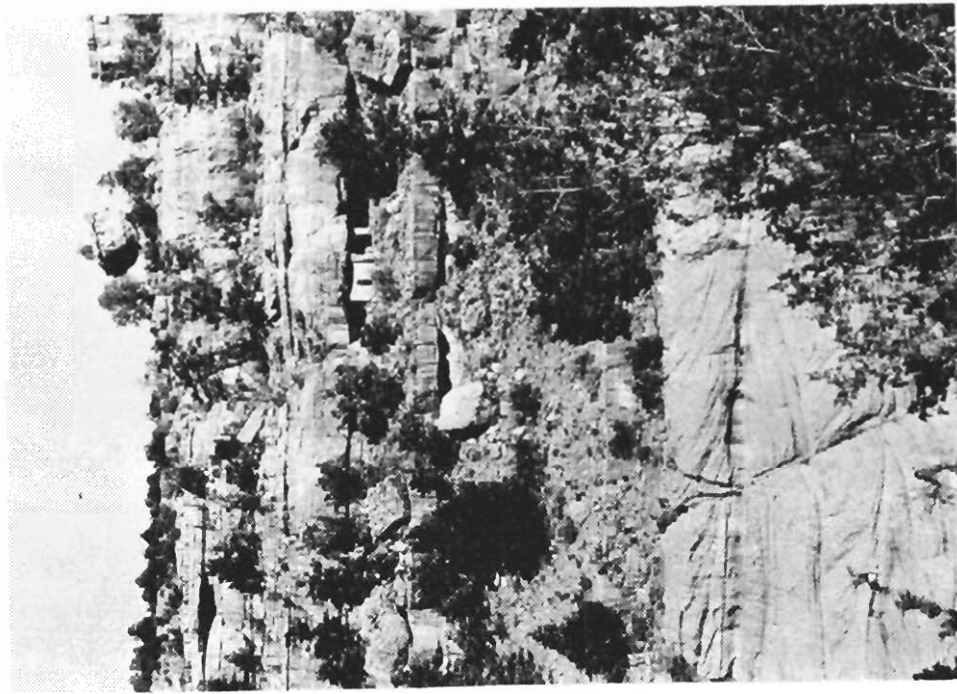


Figure 6a

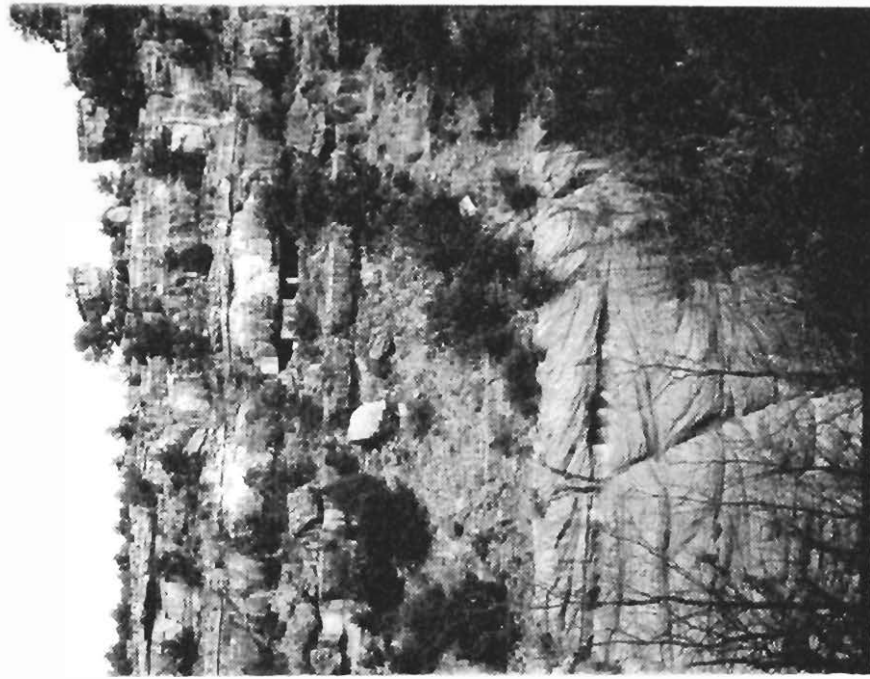


Figure 6b

Figures 6a-6b. 6a = Beaubien, 1940, 6b = Reichenbacher, Nov. 17, 1989. View of a balancing rock looking east from the east side of the Island.

Figure 7a-7b: P. Beaubien, 1941

This view was taken from the Island Trail looking down Walnut Canyon west of the Island. It was probably taken during the same excursion that produced Figure 8a. On the opposite slope above the Coconino Sandstone are several shrubs and trees, mostly piñon and Douglas fir, that appear not to have changed at all in five decades. The Walnut Canyon bottom is now choked with dense stands of shrubs such as red-osier dogwood (*Cornus stolonifera*).

Figure 8a-8b: P. Beaubien, 1941

This view was taken from the east side of the Island neck, looking south. Figure 8a shows the canyon bottom clearly full of water sixty years ago. Today the canyon bottom is nearly always dry and shows little evidence of waterflows. Shrubs have slightly increased on the canyon bottom. The restriction of waterflow in this section of the stream does not appear to have effected the trees growing along the stream; many are still easily identifiable. The most striking feature of this photo pair is the obvious dramatic recent increase in the density of Douglas fir on the north- and northwest-facing slopes of the canyon.

Figure 7a

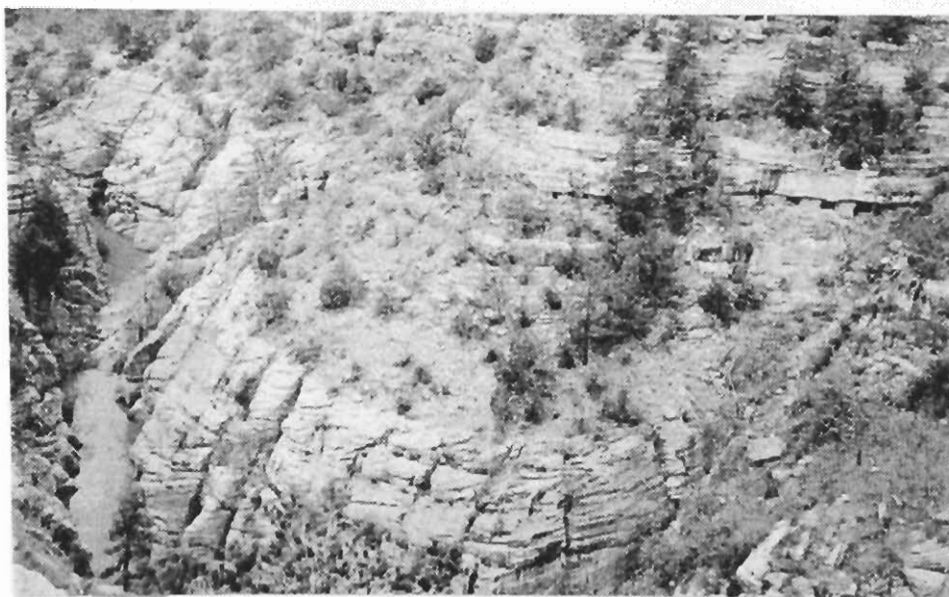
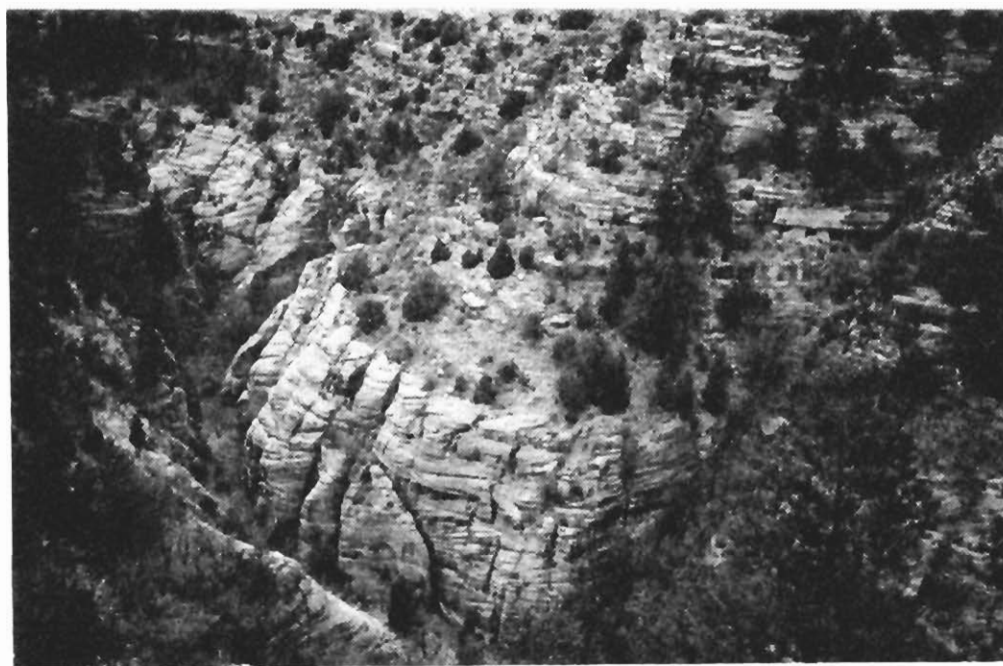


Figure 7b



Figures 7a-7b. 7a=Beaubien, 1941, 7b=Reichenbacher, Nov. 17, 1989. View from the Island Trail looking down Walnut Canyon west of the Island.



Figure 8a

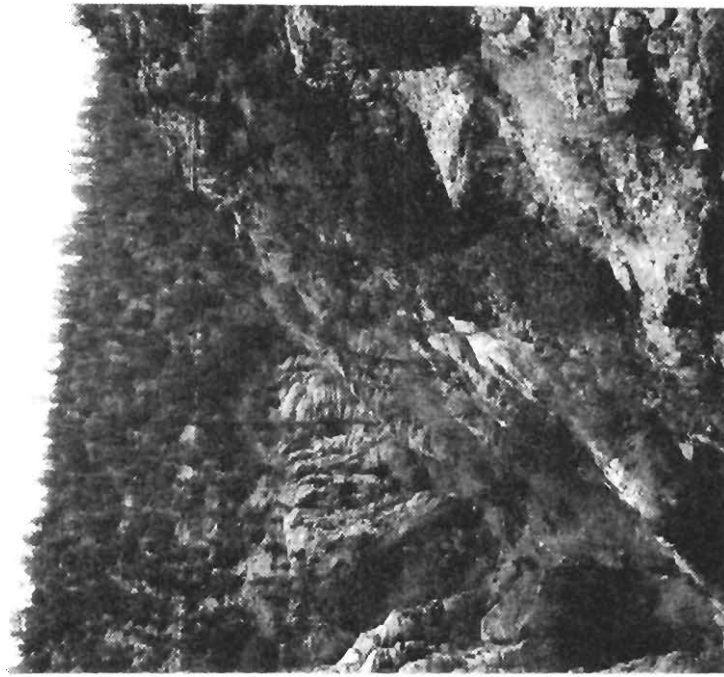


Figure 8b

Figures 8a-8b. 8a = Beaubien, 1941, 8b = Reichenbacher, Nov. 17, 1989. View from the east side of the Island neck, looking south.

MANAGEMENT RECOMMENDATIONS

Studies of fire history Walnut Canyon suggest that vegetation changes in ponderosa pine and Douglas fir forests have taken place since the marked reduction in fire frequency late in the last century. These changes could be considered as a destabilization of the natural systems. A prescribed fire program would be of value in areas that have increased woody plant densities and dangerous fuel accumulations.

If recovery measures are contemplated after fire or disturbances only native plants and seed of very local origin should be used.

Where feasible, action is recommended to reduce or eradicate alien species, but care must be taken to prevent a greater disturbance than the presence of the alien species. For several reasons, it would be highly unlikely that these species could ever be eliminated from the Monument. These species are widely distributed or even abundant throughout the surrounding regions, ensuring ample seed sources for reinvasion of any small areas that could be cleared. In addition, much of the Monument is extremely remote, it would be impractical to attempt to eradicate alien plants from most of the area.

Because of possible disturbance the monitoring plots should not be visited for five to ten years. Certain plots could be modified by future samplers such that only selected subplots are measured for herbaceous cover.

At present, pressed plant collections from Walnut Canyon and other National Monuments are kept at their respective headquarters. As National Parks and Monuments are scattered and remote, the cost and time involved in reaching the specimens is often prohibitive to those who may find them valuable for research. One solution would be to deposit these collections at herbaria of nearby colleges and universities. Another would be to establish a central, regional herbarium administered by the Park Service where researchers could have easier access to specimens and related literature. In this way, the collections could better aid in administration and management of National Park lands. It should be pointed out that instructive and "show and tell" collections are of a different nature than herbarium specimens and are invaluable at Park and Monument headquarters.

LITERATURE CITED

- Arnberger L.P.
1947 Flowering plants and ferns of Walnut Canyon. Plateau 20:29-36.
- Beatley, J.C.
1973 Russian-Thistle (*Salsola*) species in Western United States. Journal of Range Management 26(3):225-226.
- Brian, Nancy
1985 Historical view of water flow and riparian vegetation at Walnut Canyon National Monument, Arizona. Report to USDI, Nat'l. Park Serv., Southern Ariz. Group, Phoenix, Arizona.
- Brown, D.E., ed.
1982 Biotic communities of the American Southwest-United States and Mexico. Desert Plants, Special issue. 4(1-4):1-342.
- Clark, A.B.
1968 Vegetation on archaeological sites compared with non-site locations at Walnut Canyon, Flagstaff, Arizona. Plateau 40(3):77-90.
- Chronic, H.
1983 Roadside geology of Arizona. Mountain Press, Missoula, 314 pp.
- Despain, Del W., J. Mosley
1990 Fire history and stand structure of a piñon-juniper woodland at Walnut Canyon National Monument, Arizona. Report to USDI, Nat'l. Park Serv., Southern Arizona Group Off., Phoenix, Arizona, 28 pp.
- Humphrey, R.R.
1962 Range ecology. Ronald Press, New York. 234 pp.
- Joyce, J.F.
1976 Vegetation analysis of Walnut Canyon, Arizona. J. Ariz. Acad. Sci. 11:127-133.
- Kearney, T.H. and R.H. Peebles
1960 Arizona flora. Univ. Calif. Press, Berkeley. 1,085 pp.
- Lehr, J.H.
1978. A catalogue of the flora of Arizona. Desert Bot. Gard., Phoenix, 203 pp.
- Lehr, J.H. and D.J. Pinkava
1980 A catalogue of the flora of Arizona. Supplement I. J. Ariz.-Nev. Acad. Sci. 15:17-32.
- Lehr, J.H. and D.J. Pinkava
1982 A catalogue of the flora of Arizona. Supplement II. J. Ariz.-Nev. Acad. Sci. 17:19-26.

- Nesom, G.L.
1990a Taxonomy of the *Erigeron pringlei* group (Asteraceae: Astereae). *Phytologia* 69:227-235.
- Nesom, G.L.
1990b Taxonomy of the genus *Laennecia* (Asteraceae: Astereae). *Phytologia* 68:229-233.
- Pattison, Halka
1946 The Kaibab formation at Walnut Canyon. Outline of a seminar talk at the Museum of Northern Arizona. Walnut Canyon Nat'l. Mon. files, 7 pp.
- Phillips, B.G.
1990 Riparian inventory of Walnut Canyon National Monument. Report to Southwest Parks and Monuments Assoc., Tucson, unpaginated.
- Reeder, C.G.
1985 The genus *Lycurus* (Gramineae) in North America. *Phytologia* 57:283-291.
- Sellers, W.D.
1985 Arizona climate: the first one hundred years. Univ. Ariz., Tucson, 143 pp.
- Spangle, P.F.
1953 A revised checklist of the flora of Walnut Canyon National Monument. Plateau 26:86-88.
- Swetnam, T.W., W. Wright, A. Caprio, P. Brown, C. Baisan.
1990 Fire scar dates from Walnut Canyon National Monument, Arizona. Report to USDI, Nat'l. Park Serv., Southern Arizona Group Off., Phoenix, 16 pp.
- Vandiver, V.W.
1936 Walnut Canyon geological report, Southwestern Monuments special report no. 7. Southwestern Monuments Assoc. supplement for June, pp. 492-498.
- Warren, P.L., K.L. Reichhardt, D.A. Mouat, B.T. Brown, and R.R. Johnson
1982 Vegetation of Grand Canyon National Park. USDI, Nat'l. Park Serv., Cooperative National Park Resources Studies Unit, Tech. Rep. no. 9, Univ. Ariz., Tucson, 140 pp.

Appendix A. Descriptions of the vegetation types of Walnut Canyon National Monument.

122.3111

Name: *Pseudotsuga menziesii* - *Quercus gambelii* - *Poa fendleriana*
(Douglas fir - Gambel Oak - Muttongrass)

Distribution:

This type is on the south side (north-facing aspect) of the drainages that flow into the canyon from the south. There are isolated pockets of this type on the north canyon wall where the aspect is west-northwest. It is generally absent from the south wall where the aspect is south or southeast. Elevation range is 1910 m to 2465 m.

Floristics:

Characteristic Species	Prominence		Frequency
	Range	Mean	
<i>Pseudotsuga menziesii</i>	4-5	4.60	0.83
<i>Quercus gambelii</i>	2-5	3.92	1.00
<i>Poa fendleriana</i>	2-5	3.45	0.92
<i>Juniperus scopulorum</i>	2-5	3.60	0.83
<i>Symphoricarpos parishii</i>	2-5	3.50	0.83
<i>Yucca baccata</i>	1-3	2.00	0.58
<i>Penstemon barbatus</i>	1-3	2.17	0.50
<i>Pinus ponderosa</i>	2-5	3.80	0.42
<i>Pinus edulis</i>	2-5	3.00	0.42
<i>Artemisia ludoviciana</i>	2-3	2.80	0.42

Associated Species

<i>Ptelea trifoliata</i>	2-3	2.60	0.42
<i>Amelanchier utahensis</i>	1-4	2.60	0.42
<i>Robinia neomexicana</i>	1-3	2.40	0.42
<i>Valeriana arizonica</i>	3	3.00	0.33
<i>Chamaebatiaria millefolium</i>	1-2	1.50	0.25
<i>Berberis repens</i>	2-3	2.67	0.25
<i>Lithospermum multiflorum</i>	1-2	1.33	0.25
<i>Phlox austromontana</i>	3-4	3.50	0.17
<i>Juniperus osteosperma</i>	2-3	2.50	0.17
<i>Brickellia californica</i>	1-3	2.00	0.17
<i>Petrophytum caespitosum</i>	2-2	1.50	0.17
<i>Eriogonum umbellatum</i>	2	2.00	0.17
<i>Juniperus monosperma</i>	1-2	1.50	0.17
<i>Chrysothamnus depressus</i>	1-2	1.50	0.17

Occasional Species:

Juglans major, *Artemisia dracunculus*, *Bouteloua gracilis*, *Cercocarpus montanus*, *Smilacina stellata*, *Vitis arizonica*, *Heuchera versicolor*, *Sambucus glauca*, *Astragalus lentiginosus*, *Viola* sp., *Thalictrum fendleri*, *Ribes cereum*, *Acer negundo*, *Clematis ligusticifolia*, *Bromus diandrus*, *Galium wrightii*, *Echinocereus triglochidiatus*, *Arabis perennans*, *Ephedra viridis*, *Achillea millefolium*, *Hymenoxys acaulis*,

Eriogonum alatum, *Purshia stansburiana*, *Senecio neomexicanus*, *Cirsium arizonicum*, *Solidago sparsiflora*, *Viguiera multiflora*, *Gutierrezia sarothrae*, *Cheilanthes fendleri*, *Astragalus humistratus*, *Lonicera arizonica*, *Pericome caudata*, *Thlaspi montanum*, *Senecio arizonicus*, *Brickellia grandiflora*, *Berberis fremontii*, *Parthenocissus inserta*, *Ribes *pinetorum*, *Rosa arizonica*, *Penstemon bridgesii*, *Elymus elymoides*, *Muhlenbergia montana*.

Physiognomy:

Evergreen conifer woodland with trees to 18 m with an understory of trees and shrubs. Perennial grasses dominate the woodland floor with frequent subshrubs and herbs. Much of the area is on steep rocky slopes or in narrow canyons. Rock outcrops make the stands irregularly spaced.

Notes:

Douglas fir (*Pseudotsuga menziesii*) is the dominant tree in this subassociation, while Gambel oak often forms extensive and very dense understory thickets. Although white fir (*Abies concolor*) has not been counted on the Monument a tree was found 80 m west of the Monument. If it is found to occur on the Monument it would likely be here on the mesic north facing slopes and canyons.

122.3231

Name: *Pinus ponderosa* - *Poa fendleriana* - *Quercus gambelii*
(Ponderosa Pine - Muttongrass - Gambel Oak)

Distribution:

Ponderosa pine forests are extensive on the plateaus surrounding the canyon. It is replaced by Douglas fir-dominated forests on more humid and cooler north and east-facing slopes, and by piñon - juniper woodlands on exposed ridges and south and west facing warmer and drier slopes. Elevations range from 1960 m to 2085 m, the highest point on the Monument.

Floristics:

Characteristic Species	Prominence		Frequency
	Range	Mean	
<i>Pinus ponderosa</i>	4-5	4.40	1.00
<i>Poa fendleriana</i>	1-5	3.50	1.00
<i>Quercus gambelii</i>	3-5	3.67	.90
<i>Hymenopappus filiformis</i>	1-3	2.50	.80
<i>Bouteloua gracilis</i>	3-4	3.29	.70
<i>Juniperus scopulorum</i>	1-4	2.57	.70
<i>Penstemon linarioides</i>	1-3	2.43	.70

Associated Species

<i>Cirsium arizonicum</i>	2-3	2.67	.60
<i>Gutierrezia sarothrae</i>	2-3	2.17	.60
<i>Pinus edulis</i>	2-5	4.00	.50
<i>Elymus elymoides</i>	3-4	3.80	.50
<i>Juniperus osteosperma</i>	3-5	3.40	.50
<i>Eriogonum alatum</i>	2-3	2.80	.50
<i>Juniperus monosperma</i>	3	3.00	.40
<i>Chrysothamnus depressus</i>	3	3.00	.40
<i>Juniperus deppeana</i>	2-3	2.75	.40
<i>Artemisia ludoviciana</i>	2-3	2.75	.40
<i>Heterotheca villosa</i>	2-3	2.50	.40
<i>Muhlenbergia montana</i>	2-4	3.00	.30
<i>Purshia stansburiana</i>	2-3	2.67	.30
<i>Lotus wrightii</i>	2-3	2.33	.30
<i>Ceratoides lanata</i>	1-2	1.67	.30
<i>Berberis repens</i>	3	3.00	.20
<i>Brickellia californica</i>	1-3	2.50	.20
<i>Yucca baccata</i>	1-3	2.50	.20
<i>Oxytropis lambertiana</i>	1-3	2.00	.20
<i>Eriogonum jonesii</i>	2	2.00	.20

Occasional Species

Cryptantha cinerea, *Cercocarpus betuloides*, *Chamaebatiaria millefolium*, *Eriogonum racemosum*, *Opuntia macrorhiza*, *Castilleja integra*, *Blepharoneuron tricholepis*, *Robinia neomexicana*, *Ipomopsis aggregata*, *Phlox austromontana*, *Leucelene ericoides*, *Asclepias asperula*, *Eriogonum umbelliferum*, *Phoradendron juniperinum*, *Erigeron divergens*, *Rhus aromatica*, *Lithospermum multiflorum*, *Cheilanthes feei*,

Machaeranthera canescens, *Brickellia grandiflora*, *Chrysothamnus depressus*, *Erigeron divergens*, *Erigeron flagellaris*, *Erigeron concinnus*, *Arabis fendleri*, *Hieracium fendleri*, *Thlaspi montanum*, *Senecio arizonicus*, *Bahia dissecta*, *Euphorbia lurida*, *Euphorbia fendleri*, *Antennaria parvifolia*, *Arabis perennans*, *Aristida purpurea*, *Coryphantha vivipara*, *Desmanthus cooleyi*, *Koeleria pyramidata*, *Lesquerella intermedia*, *Linaria dalmatica*, *Senecio neomexicanus*, *Townsendia exscapa*, *Viguiera multiflora*, *Opuntia fragilis*, *Machaeranthera grindelioides*, *Ipomopsis multiflora*.

Physiognomy:

Uneven-aged stands of evergreen conifers to 20 m tall are usually well spaced. The understory is comprised of scattered deciduous and evergreen trees and shrubs, and the groundcover is characterized by a usually open forest floor of pine needles and perennial grasses. The slope is not steep through most parts of this type, but is varied in aspect. This type dominates the heads of small canyons on moderately steep slopes where the diversity and density of plants may increase.

Notes:

Widely scattered tree stumps were observed in much of the area dominated by ponderosa pine. Light logging occurred on the rim historically, but has been discontinued in recent years.

122.41412

Name: *Pinus edulis* - *Juniperus monosperma* - *Bouteloua gracilis*
(Piñon Pine - One-seed Juniper - Blue Grama)

Distribution:

Predominant on the south and east slopes in the northwest part of the Monument, especially east of the entrance road. It extends down south-facing slopes to the bottom of the canyon in many places. South of the canyon this type occupies south and east facing slopes. Elevations range from 1915 m to 2070 m.

Floristics:

Characteristic Species	Prominence		Frequency
	Range	Mean	
<i>Pinus edulis</i>	4-5	4.89	1.00
<i>Juniperus monosperma</i>	2-5	3.25	0.89
<i>Bouteloua gracilis</i>	3-5	4.00	0.83
<i>Poa fendleriana</i>	2-4	3.53	0.83
<i>Yucca baccata</i>	1-4	2.21	0.78
<i>Juniperus osteosperma</i>	3-5	4.00	0.72
<i>Lesquerella intermedia</i>	1-3	2.18	0.61
<i>Quercus gambelii</i>	1-4	2.20	0.56
<i>Penstemon linarioides</i>	1-4	2.89	0.50
<i>Gutierrezia sarothrae</i>	1-4	2.22	0.50
Associated Species			
<i>Opuntia macrorhiza</i>	1-3	1.50	0.44
<i>Purshia stansburiana</i>	1-5	2.57	0.39
<i>Penstemon barbatus</i>	2-3	2.43	0.39
<i>Heterotheca villosa</i>	2-3	2.83	0.33
<i>Cercocarpus betuloides</i>	1-3	2.17	0.33
<i>Berberis fremontii</i>	2	2.00	0.33
<i>Erigeron flagellaris</i>	1-3	1.83	0.33
<i>Senecio neomexicanus</i>	1-2	1.33	0.33
<i>Juniperus scopulorum</i>	1-5	3.20	0.28
<i>Pinus ponderosa</i>	1-5	2.40	0.28
<i>Hymenopappus filifolius</i>	1-3	2.20	0.28
<i>Hymenoxys acaulis</i>	1-3	2.50	0.22
<i>Cryptantha cinerea</i>	1-3	2.25	0.22
<i>Chamaebatiaria millefolium</i>	1	1.00	0.22
<i>Rhus aromatica</i>	1	1.00	0.22
<i>Artemisia ludoviciana</i>	3	3.00	0.17
<i>Oxytropis lambertiana</i>	2-3	2.67	0.17
<i>Coryphantha vivipara</i>	2-3	2.67	0.17
<i>Ipomopsis aggregata</i>	2-3	2.67	0.17
<i>Phoradendron juniperinum</i>	1-3	2.50	0.17
<i>Brickellia californica</i>	2-3	2.33	0.17
<i>Phlox austromontana</i>	2-3	2.33	0.17
<i>Elymus elymoides</i>	1-3	2.00	0.17
<i>Galium wrightii</i>	1-2	1.33	0.17
<i>Hedeoma oblongifolium</i>	1-2	1.33	0.17

Occasional Species:

Arabis perennans, *Bromus rigidus*, *Penstemon bridgesii*, *Petrophytum caespitosum*, *Symphoricarpos parishii*, *Chrysothamnus depressus*, *Aristida fendleriana*, *Juniperus deppeana*, *Brickellia chlorolepis*, *Eriogonum jonesii*, *Astragalus lentiginosus*, *Ephedra viridis*, *Robinia neomexicana*, *Valeriana arizonica*, *Berberis repens*, *Sporobolus cryptandrus*, *Thalictrum fendleri*, *Pediomelum epipsilum*, *Echinocereus triglochidiatus*, *Artemisia dracunculus*, *Artemisia frigida*, *Chrysothamnus nauseosus*, *Erigeron divergens*, *Hymenoxys acaulis*, *Antennaria parvifolia*, *Cercocarpus montanus*, *Ipomopsis multiflora*, *Lotus wrightii*, *Achillea millefolium*, *Asclepias asperula*, *Bahia dissecta*, *Castilleja integra*, *Coryphantha vivipara*, *Erigeron concinnus*, *Eriogonum umbellatum*, *Leucelene ericoides*, *Lithospermum multiflorum*, *Oxybaphus linearis*, *Townsendia strigosa*, *Ageratina herbacea*, *Allionia incarnata*, *Cryptantha jamesii*.

Physiognomy:

Scattered evergreen conifer woodland with trees to 10 m separated by much open ground and bare soil. Deciduous shrubs are present and usually spaced apart and the ground cover is comprised of perennial grasses and herbs.

Notes:

In much of the area the slope is gentle with varied aspects, but where this type enters Walnut Canyon the ground is steep and rocky with limestone bluffs. There is often a broad transition zone between this type and ponderosa pine forest.

122.41413

Name: *Yucca baccata* - *Bouteloua gracilis* - *Gutierrezia sarothrae* - *Pinus edulis*
(Banana Yucca - Blue Grama - Snakeweed - Piñon Pine)

Distribution:

On the Monument this type is limited to about 75% of the south-facing lower canyon walls of Walnut Canyon, where it occurs in interrupted strips and patches on dry sites. The elevation range is from 1915 m to 2040 m.

Floristics:

Characteristic Species	Prominence		Frequency
	Range	Mean	
<i>Yucca baccata</i>	3-5	3.44	1.00
<i>Bouteloua gracilis</i>	2-4	3.63	0.89
<i>Gutierrezia sarothrae</i>	1-3	2.25	0.89
<i>Pinus edulis</i>	2-5	3.86	0.78
<i>Cercocarpus betuloides</i>	2-3	2.29	0.78
<i>Poa fendleriana</i>	2-4	3.50	0.67
<i>Brickellia californica</i>	2-3	2.76	0.67
<i>Berberis fremontii</i>	1-4	1.83	0.67
<i>Juniperus monosperma</i>	2-5	3.63	0.56
<i>Artemisia pacifica</i>	3-5	3.40	0.56

Associated Species

<i>Chamaebatiaria millefolium</i>	2-3	2.40	0.56
<i>Juniperus osteosperma</i>	2-5	3.50	0.44
<i>Heterotheca villosa</i>	3-4	3.50	0.44
<i>Eriogonum jonesii</i>	2-3	2.80	0.44
<i>Astragalus humistratus</i>	1-3	2.25	0.44
<i>Juniperus scopulorum</i>	2-4	3.33	0.33
<i>Ephedra viridis</i>	2-3	2.67	0.33
<i>Sphaeralcea</i> sp.	2-3	2.67	0.33
<i>Echinocereus triglochidiatus</i>	1-3	2.00	0.33
<i>Atriplex canescens</i>	1-3	1.67	0.33
<i>Lesquerella intermedia</i>	1-2	1.67	0.33
<i>Senecio neomexicanus</i>	1-2	1.33	0.33
<i>Ceratoides lanata</i>	4	4.00	0.22

Occasional Species:

Artemisia frigida, *Artemisia ludoviciana*, *Penstemon linarioides*, *Opuntia phaeacantha*, *Elymus elymoides*, *Penstemon barbatus*, *Petrophytum caespitosum*, *Cryptantha cinerea*, *Purshia stansburiana*, *Pinus ponderosa*, *Symphoricarpos parishii*, *Hedeoma oblongifolia*, *Opuntia macrorhiza*, *Bouteloua curtipendula*, *Eriogonum jonesii*, *Astragalus lentiginosus*, *Lycium pallidum*, *Quercus gambelii*, *Muhlenbergia pauciflora*, *Thalictrum fendleri*, *Ribes* sp., *Cheilanthes feei*, *Phlox austromontanus*, *Allionia incarnata*, *Arabis perennans*, *Artemisia dracunculus*, *Castilleja integra*, *Lycurus setosus*, *Mirabilis bigelovii*, *Penstemon bridgesii*, *Rhus aromatica*, *Sphaeralcea grossularifolia*.

Physiognomy:

Evergreen conifer trees are usually scattered and less than 10 m tall. Banana yucca plants are less than 2 m tall except when in bloom. They are common and sometimes occur in extensive stands. Small deciduous trees and shrubs are scattered and the area is largely open. Occasional trees from adjacent types invade here so that taller conifer and deciduous broadleaf trees may occur. The slope is steep and very rocky and cliffs and bluffs are frequent, supplying a habitat for rock dwelling plants.

Notes:

This area is a dry and warm section of the adjacent Piñon - Juniper Woodland, although it is similar in species composition to Plains Grassland (142.1).

222.3211

Name: *Acer negundo* - *Artemisia ludoviciana* - *Rosa arizonica* - *Robinia neomexicana*
(Box Elder - Wormwood - Arizona Rose - New Mexican Locust)

Distribution:

This type is largely restricted to the bottom of Walnut Canyon and short stretches of the principal side canyons. Elevations range from 1915 m at the east boundary of the Monument to 1940 m the west boundary.

Floristics:

Characteristic Species	Prominence		Frequency
	Range	Mean	
<i>Acer negundo</i>	2-5	3.64	0.92
<i>Artemisia ludoviciana</i>	1-5	3.11	0.75
<i>Rosa arizonica</i>	3-4	3.29	0.58
<i>Robinia neomexicana</i>	2-4	3.33	0.50
<i>Elymus canadensis</i>	2-5	3.33	0.50
<i>Symphoricarpos parishii</i>	1-5	2.67	0.50
<i>Ptelea angustifolia</i>	2-3	2.33	0.50
<i>Rubus arizonensis</i>	1-3	2.00	0.50
<i>Thalictrum fendleri</i>	1-3	2.00	0.50
<i>Populus species</i>	4-5	4.60	0.42
(1. <i>Populus angustifolia</i>)	4-5	4.67	0.25)
(2. <i>Populus tremuloides</i>)	4-5	4.50	0.17)
<i>Quercus gambelii</i>	3-5	3.60	0.42
Associated Species			
<i>Cornus stolonifera</i>	4-5	4.50	0.33
<i>Vitis arizonica</i>	2-4	3.25	0.33
<i>Juglans major</i>	2-4	2.75	0.33
<i>Juniperus scopulorum</i>	1-4	2.25	0.33
<i>Artemisia dracunculus</i>	1-3	2.00	0.33
<i>Clematis ligusticifolia</i>	3	3.00	0.25
<i>Achillea millefolium</i>	3	3.00	0.25
<i>Poa fendleriana</i>	2-3	2.67	0.25
<i>Parthenocissus inserta</i>	2-3	2.33	0.25
<i>Elymus glaucus</i>	1-4	2.00	0.25
<i>Ribes cereum</i>	3-4	3.50	0.17
<i>Smilacina stellata</i>	2-4	3.00	0.17
<i>Senecio neomexicanus</i>	2-3	2.50	0.17
<i>Apocynum cannabinum</i>	2-3	2.50	0.17
<i>Iris missouriensis</i>	2-3	2.50	0.17
<i>Selaginella underwoodii</i>	2-3	2.50	0.17
<i>Sambucus glauca</i>	1-3	2.00	0.17
<i>Pseudotsuga menziesii</i>	1-3	2.00	0.17
<i>Pinus ponderosa</i>	1-3	2.00	0.17
<i>Sphaeralcea fendleri</i>	1-3	2.00	0.17
<i>Toxicodendron rydbergii</i>	1-2	1.50	0.17
<i>Smilacina racemosa</i>	1-2	1.50	0.17

Occasional Species:

Chamaebatiaria millefolium, *Juniperus osteosperma*, *Phacelia magellanica*, *Rumex crispus*, *Erigeron saxatilis*, *Aquilegia desertorum*, *Wyethia arizonica*, *Bothriochloa saccharoides*, *Solidago sparsiflora*, *Sporobolus cryptandrus*, *Marrubium vulgare*, *Yucca baccata*, *Berberis fremontii*, *Eriogonum jonesii*, *Brickellia californica*, *Petrophytum caespitosum*, *Carex deweyana*, *Elymus canadensis*, *Muhlenbergia curtifolia*, *Cirsium arizonicum*, *Moldavica parviflora*, *Bromus carinatus*, *Penstemon bridgesii*, *Heuchera versicolor*, *Bouteloua gracilis*, *Astragalus tephrodes*, *Lycium pallidum*, *Heterotheca villosa*, *Geranium caespitosum*, *Lesquerella intermedia*, *Elymus trachycaulus*, *Salix lasiolepis*, *Lesquerella intermedia*, *Machaeranthera canescens*, *Schizachyrium cirratum*, *Schizachyrium scoparium*, *Senecio spartoides*, *Sedum cockerellii*, *Ribes pinetorum*, *Brickellia grandiflora*, *Eragrostis mexicana*, *Tragia ramosa*, *Draba cuneifolia*, *Muhlenbergia pauciflora*, *Muhlenbergia racemosa*, *Muhlenbergia rigens*, *Artemisia dracuncululus*, *Fallugia paradoxa*, *Hierochloa odorata*, *Hymenopappus fillifolius*, *Linaria dalmatica*, *Oryzopsis hymenoides*, *Ptelea angustifolia*.

Physiognomy:

The streamsides and floodplains within Walnut Canyon are characterized by groves of deciduous trees to 15 m tall with understories of smaller deciduous and evergreen trees and shrubs plus herbaceous species and grasses as ground cover. These groves are interspaced with shrubby or grassy open areas and streambeds. The open areas are more extensive toward the east where the Old Santa Fe Dam reservoir has filled with deposits.

Notes:

The two *Populus* species in the canyon are combined to give one set of data and then broken in two because each forms groves from clones, a single plant comprised of multiple trunks, which exclude the other species. These groves together form a habitat that is a characteristic element of the riparian vegetation of the canyon floor.

Appendix B. Data from ten permanent vegetation monitoring plots in Walnut Canyon National Monument.

Plot Features

WC1	25 m x 25 m (625 m ² , .06 ha), sampled in 144, 4 m ² subplots.
WC2	15 m x 20 m (300 m ² , .03 ha), sampled in 70, 4 m ² subplots.
WC3, WC4, WC6, WC7, WC9	10 m x 20 m (200 m ² , .02 ha), sampled in 50, 4 m ² subplots.
WC5	10 m x 20 m (200 m ² , .02 ha), trees and shrubs sampled in whole plot; grasses and forbs sampled in 5, 4 m ² subplots.
WC8	24 m x 24 m (576 m ² , .058 ha), sampled in 5 groups of 48, 4 m ² subplots.
WC10	20 m x 16 m (320 m ² , .03 ha), sampled in 80, 4 m ² subplots.

1. Trees, shrubs, and perennial herbs and grasses were counted and the frequency data used to estimate density (number of individuals of each species per hectare).
2. Mean percent cover represents the averaged cover class scores of each species visually estimated in each of the subplots. The cover classes are listed in Table 1.
3. Groundcover was visually estimated for each subplot using the cover class scale shown in Table 1. These data were taken only once.
4. Counts of individual plants were not taken for perennial grasses at WC2, and counts given for certain other species of grasses and forbs at all of the plots should be viewed with caution due to the difficulty of distinguishing individuals.

Walnut Canyon Monitoring Plot #1 (WC1)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Berberis fremontii</i>	1	16	.17
<i>Juniperus monosperma</i>	8	128	.67
<i>Juniperus osteosperma</i>	4	64	.67
<i>Pinus edulis</i>	34	544	2.67

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Antennaria parvifolia</i>	3	48	.01	4	64	.01
<i>Arabis perennans</i>	86	1376	.09	69	1104	.08
<i>Berberis fremontii</i>	5	80		5	80	.02
<i>Brickellia californica</i>	2	32		1	16	.01
<i>Bouteloua gracilis</i>	2220	35520	1.01	2894	46304	1.08
<i>Cercocarpus montanus</i>	1	16		2	32	.01
<i>Elymus elymoides</i>				10	160	.04
<i>Erigeron flagellaris</i>	8	128	.02	2	32	.01
<i>Gutierrezia sarothrae</i>	2	32		2	32	.01
<i>Hymenopappus filifolius</i> var. <i>lugens</i>	78	1248	.22	82	1312	.19
<i>Hymenoxys acaulis</i>	100	1600	.12	122	1952	.14
<i>Ipomopsis multiflora</i>	562	8992	.50	376	6016	.49
<i>Juniperus osteosperma</i>	18	288		6	96	.05
<i>Lesquerella intermedia</i>	1412	22592	.66	1547	24752	.68
<i>Lotus wrightii</i>	1	16	.01	1	16	.01
<i>Opuntia macrorhiza</i>	7	112		4	64	.03
<i>Penstemon linarioides</i>	47	752	.19	35	560	.17
<i>Pinus edulis</i>	154	2464				
<i>Poa fendleriana</i>				170	2720	.40
<i>Purshia stansburiana</i>	16	256		10	160	.07
<i>Quercus gambelii</i>	3	48		5	80	.01
<i>Senecio neomexicanus</i>	75	1200	.21	12	192	.08
<i>Yucca baccata</i>	32	512		23	368	.16

Groundcover

	Mean Cover
Rock	0.47
Bare Ground	1.43
Litter	4.40
Wood	1.07

Walnut Canyon Monitoring Plot #2 (WC2)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Acer negundo</i>	2	62	2.0
<i>Juniperus scopulorum</i>	4	124	2.0
<i>Quercus gambelii</i>	14	434	1.0
<i>Pinus ponderosa</i>	1	31	1.0
<i>Rhus trilobata</i>	1	31	1.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Acer negundo</i>	8	248		2	62	.01
<i>Achillea millefolium</i>	146	4526	.66	1822	56482	.77
<i>Apocynum cannabinum</i>	122	3782	.76	122	3782	.71
<i>Artemisia dracunculus</i>	429	13299	.30	47	1452	.20
<i>Artemisia ludoviciana</i>	911	28241	1.00	148	4588	.16
<i>Astragalus</i> sp.	1	31	.01	2	62	.01
<i>Bouteloua gracilis</i>	0			344	10664	.38
<i>Clematis ligusticifolia</i>	6	186	.10	20	620	.17
<i>Fallugia paradoxa</i>	37	1147				
<i>Hierochloe odorata</i>				11	341	.06
<i>Hymenopappus fillifolius</i> var. <i>lugens</i>				1	31	.01
<i>Iris missouriensis</i>	30	930	.15	42	1302	.16
<i>Juniperus scopulorum</i>				4	124	.10
<i>Lesquerella intermedia</i>				2	62	.03
<i>Linaria dalmatica</i>	23	713	.11	5	155	.01
<i>Machaeranthera</i> sp.	27	837	.08			
<i>Oryzopsis hymenoides</i>	98	3038	.21			
<i>Parthenocissus inserta</i>	26	806	.48	113	3503	.23
<i>Phacelia magellanica</i>	8	248				
<i>Pinus ponderosa</i>				1	31	.06
<i>Poa fendleriana</i>				4	124	.04
<i>Ptelea angustifolia</i>				6	186	.03
<i>Quercus gambelii</i>				118	3658	.31
<i>Robinia neomexicana</i>	4	124	.08	3	93	.08
<i>Rosa arizonica</i>	129	3999	.48	158	4898	.60
<i>Senecio neomexicanus</i>	156	4836		1663	51553	1.23
<i>Sphaeralcea fendleri</i>	373	11563	.41			
<i>Solidago sparsiflora</i>	1671	51801	.70	2540	78740	1.07
<i>Symphoricarpos parishii</i>	54	1674	.65	24	744	.50
<i>Toxicodendron rydbergii</i>	76	2356	.33	370	11470	.24
<i>Verbesina</i> sp.	48	1488	.20	5084	157604	1.60
<i>Vitis arizonica</i>	10	310	.15	57	1767	.37
<i>Yucca baccata</i>	32	512		23	368	.16
Perennial grasses				-	-	3.10

Groundcover

	<u>Mean Cover</u>
Rock	1.47
Bare Ground	2.09
Litter	5.00
Wood	.69

Walnut Canyon Monitoring Plot #3 (WC3)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Berberis fremontii</i>	1	50	1.0
<i>Juniperus deppeana</i>	1	50	1.0
<i>Juniperus monosperma</i>	1	50	1.0
<i>Pinus edulis</i>	6	300	3.0
<i>Purshia stansburiana</i>	1	50	1.0
<i>Yucca baccata</i>	1	50	1.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Achillea millefolium</i>	77	3850	.25			
<i>Artemisia ludoviciana</i>	105	5250	.16	64	3200	.24
<i>Astragalus</i> sp.	11	550	.11	4	200	.08
<i>Asclepias asperula</i>	1	50	.01	1	50	.02
<i>Bahia dissecta</i>				69	3450	.36
<i>Berberis fremontii</i>	1	50	.01			
<i>Bouteloua gracilis</i>	1127	56350	1.38	765	38250	2.98
<i>Brickellia chlorolepis</i>	6	300	.03			
<i>Castilleja integra</i>				1	50	.02
<i>Coryphantha vivipara</i>						
var. <i>arizonica</i>	4	200	.04			
<i>Cryptantha jamesii</i>				2	100	.04
<i>Elymus elymoides</i>	3	150	.01	2	100	.04
<i>Erigeron flagellaris</i>	52	2600	.10	79	3950	.14
<i>Erigeron concinnus</i>	5	250	.03			
<i>Eriogonum jamesii</i>	8	400	.07			
<i>Eriogonum umbellatum</i>						
var. <i>cognatum</i>				1	50	.02
<i>Gutierrezia sarothrae</i>	97	4850	.34			
<i>Heterotheca villosa</i>	1	50	.01	1	50	.02
<i>Ipomopsis multiflora</i>	79	3950	.32	46	2300	.48
<i>Juniperus deppeana</i>	1	50	.03			
<i>Juniperus monosperma</i>	1	50	.01			
<i>Lesquerella intermedia</i>				222	11100	.82
<i>Leucelene ericoides</i>	33	1650	.09			
<i>Lithospermum multiflorum</i>				1	50	.02
<i>Lotus wrightii</i>				2	100	.04
<i>Opuntia macrorhiza</i>	11	550	.11			
<i>Oxybaphus linearis</i>	8	400	.05			
<i>Penstemon linarioides</i>	22	1100	.10	11	550	.10
<i>Pinus edulis</i>	31	1550	.19			
<i>Poa fendleriana</i>	743	37150	1.14			
<i>Purshia stansburiana</i>	22	1100	.23			
<i>Quercus gambelii</i>	4	200	.04			

**Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy)
and Perennial Herbs and Grasses**

Species	<u>Summer 1988</u>			<u>Spring 1989</u>		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Rhus aromatica</i>	2	100	.03			
<i>Senecio neomexicanus</i>	8	400	.07	9	450	.14
<i>Townsendia strigosa</i>				9	450	.08
Unknown forb	2	100	.02			
<i>Yucca baccata</i>	8	400	.09			

Groundcover

	<u>Mean Cover</u>
Rock	0
Bare Ground	0
Litter	0
Wood	0

Walnut Canyon Monitoring Plot #4 (WC4)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Berberis fremontii</i>	1	50	1.0
<i>Cercocarpus montanus</i>	8	448	2.0
<i>Chamaebatiaria millefolium</i>	3	168	1.0
<i>Ephedra viridis</i>	2	112	1.0
<i>Opuntia phaeacantha</i>	3	168	1.0
<i>Pinus edulis</i>	2	112	1.0
<i>Yucca baccata</i>	1	50	1.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Allionia incarnata</i>	3	168	.02			
<i>Arabis perennans</i>				17	952	.04
<i>Artemisia dracunculoides</i>	127	7112	.50	72	4032	.46
<i>Astragalus lentiginosus</i>						
var. <i>palens</i>	34	1904	.22	18	1008	.30
<i>Berberis fremontii</i>	11	616	.10			
<i>Bouteloua gracilis</i>	779	43624	1.36	537	30072	1.76
<i>Brickellia californica</i>	37	2072	.31			
<i>Castilleja integra</i>	1	56	.01			
<i>Cercocarpus montanus</i>	6	336	.09			
<i>Chamaebatiaria millefolia</i>	17	952	.27			
<i>Echinocereus triglochidiatus</i>	18	1008	.24			
<i>Elymus elymoides</i>	46	2576	.21	37	20072	.40
<i>Ephedra viridis</i>	49	2744	.30			
<i>Eriogonum jonesii</i>	29	1624	.16			
<i>Gutierrezia sarothrae</i>	31	1736	.22			
<i>Heterotheca villosa</i>	504	28224	1.11	307	17192	1.28
<i>Lycurus setosus</i>	3	168	.10			
<i>Mirabilis bigelovii</i>				2	112	.02
<i>Muhlenbergia pauciflora</i>	35	1960	.12	17	952	.18
<i>Opuntia macrorhiza</i>	2	112	.02			
<i>Opuntia phaeacantha</i>	3	168	.04			
<i>Penstemon bridgesii</i>	27	1512	.04	6	336	.12
<i>Penstemon barbatus</i>	8	448	.05			
<i>Poa fendleriana</i>	89	4984	.74			
<i>Quercus gambelii</i>	3	168	.03			
<i>Rhus aromatica</i>	1	56	.01			
<i>Sphaeralcea grossularifolia</i>	8	448	.05	13	728	.10
<i>Yucca baccata</i>	10	560	.12			

Groundcover

	Mean Cover
Rock	3.52
Bare Ground	1.56
Litter	2.80
Wood	.10

Walnut Canyon Monitoring Plot #5 (WC5)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	<u>Summer 1988</u>					
	Count	Density per ha	Mean % Cover			
<i>Acer negundo</i>	9	450	.31			
<i>Amelanchier utahensis</i>	4	200	.08			
<i>Berberis fremontii</i>	2	100	.08			
<i>Clematis ligusticifolia</i>	2	100	.08			
<i>Juniperus scopulorum</i>	1	50	.08			
<i>Parthenocissus inserta</i>	32	1600	.38			
<i>Pseudotsuga menziesii</i>	16	800	.77			
<i>Ptelea angustifolia</i>	18	900	.46			
<i>Quercus gambelii</i>	70	3500	3.23			
<i>Ribes pinetorum</i>	7	350	.31			
<i>Robinia neomexicana</i>	12	750	.23			
<i>Rosa arizonica</i>	5	250	.15			
<i>Sambucus glauca</i>	2	100	.15			
<i>Symphoricarpos parishii</i>	371	18550	2.69			
<i>Vitis arizonica</i>				23	1150	.69
<i>Yucca baccata</i>	1	50	1.0			

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	<u>Summer 1988</u>			<u>Spring 1989</u>		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Carex deweyana</i>				7	3350	.20
<i>Poa fendleriana</i>				30	1500	.60
<i>Solidago sparsiflorus</i>	45	2250	.40			
<i>Thalictrum fendleri</i>				8	400	.40
<i>Vicia americana</i>	2	100	.20			
<i>Viola</i> sp.	2	100	.20			

Groundcover

	<u>Mean Cover</u>
Rock	1.8
Bare Ground	.40
Litter	5.80
Wood	1.20

Walnut Canyon Monitoring Plot #6 (WC6)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Berberis fremontii</i>	4	204	1.0
<i>Cercocarpus montanus</i>	2	102	1.0
<i>Juniperus osteosperma</i>	3	153	3.0
<i>Pinus edulis</i>	10	510	3.0
<i>Yucca baccata</i>	1	50	1.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Ageratina herbacea</i>	4	204	.04			
<i>Allionia incarnata</i>	2	102	.02			
<i>Arabis perennans</i>	21	1071	.10	12	612	.10
<i>Artemisia dracunculus</i>	32	1632	.05	4	204	.06
<i>Artemisia ludoviciana</i>	105	5355	.15	36	1836	.12
<i>Artemisia frigida</i>	74	3774	.40	57	2907	.40
<i>Astragalus lentiginosus</i>	41	2091	.18	10	510	.10
<i>Berberis fremontii</i>	2	102	.02			
<i>Bouteloua gracilis</i>	1146	58446	1.20	1154	58854	1.30
<i>Castilleja integra</i>	6	306	.05	1	51	.02
<i>Cercocarpus montanus</i>	13	663	.20			
<i>Cryptantha jamesii</i>	134	6834	.49	98	4998	.66
<i>Echinocereus triglochidiatus</i>	3	153	.03			
<i>Elymus elymoides</i>	1	51	.01			
<i>Ephedra viridis</i>	20	1020	.10			
<i>Juniperus osteosperma</i>	3	153	.07			
<i>Lesquerella intermedia</i>	277	14127	.68	226	11526	.84
<i>Penstemon barbatus</i>	18	918	.15	7	357	.16
<i>Penstemon bridgesii</i>	12	612	.09			
<i>Phlox austromontanus</i>	538	27438	.54	269	13719	.52
<i>Pinus edulis</i>	19	969	.31			
<i>Poa fendleriana</i>	1488	75888	1.69	2405	122655	1.76
<i>Quercus gambelii</i>	3	153	.02			
<i>Yucca baccata</i>	35	1785	.51			

Groundcover

	Mean Cover
Rock	2.48
Bare Ground	2.38
Litter	3.06
Wood	1.13

Walnut Canyon Monitoring Plot #7 (WC7)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Cercocarpus montanus</i>	1	50	1.0
<i>Chamaebatiaria millefolium</i>	1	50	1.0
<i>Juniperus scopulorum</i>	2	100	2.0
<i>Quercus gambelii</i>	12	600	2.0
<i>Pseudotsuga menziesii</i>	4	200	2.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Artemisia ludoviciana</i>	24	1200	.08	14	700	.08
<i>Berberis repens</i>				2	100	.02
<i>Brickellia californica</i>	3	150	.03			
<i>Brickellia grandiflora</i>	30	4000	.37			
<i>Chamaebatiaria millefolium</i>	2	100	.03			
<i>Elymus elymoides</i>	229	11450	.64	38	1900	.34
<i>Galium wrightii</i>	26	1300	.10	7	350	.08
<i>Heuchera versicolor</i>	3	150	.03	1	50	.02
<i>Juniperus scopulorum</i>	2	100	.02			
<i>Lithospermum multiflorum</i>	3	150	.02	3	150	.06
<i>Penstemon barbatus</i>	14	700	.05	2	100	.04
<i>Penstemon bridgesii</i>	5	250	.03	15	750	.06
<i>Poa fendleriana</i>	1833	91650	1.80	2505	125250	2.12
<i>Pseudotsuga menziesii</i>	5	250	.14			
<i>Quercus gambelii</i>	263	13150	1.63			
<i>Senecio neomexicanus</i>	13	650	.09	1	50	.02
<i>Symphoricarpos parishii</i>	34	1700	.23			
<i>Valeriana arizonica</i>	157	7850	.54	144	7200	.60
<i>Yucca baccata</i>	5	250	.11			

Groundcover

	Mean Cover
Rock	2.32
Bare Ground	1.38
Litter	4.42
Wood	1.18

Walnut Canyon Monitoring Plot #8 (WC8)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Juniperus deppeana</i>	1	17	1.0
<i>Quercus gambelii</i>	9	153	1.0
<i>Pinus edulis</i>	2	34	1.0
<i>Pinus ponderosa</i>	12	204	3.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Antennaria parvifolia</i>	26	442	.02	14	238	.02
<i>Arabis perennans</i>	1	17	.02	6	102	.02
<i>Aristida purpurea</i>						
var. <i>fendleriana</i>	90	1530	.27	115	1955	.37
<i>Artemisia ludoviciana</i>	40	680	.19	51	867	.16
<i>Asclepias asperula</i>	5	85	.10	1	17	.02
<i>Bouteloua gracilis</i>	1371	23307	1.50	1661	28237	1.94
<i>Chrysothamnus depressus</i>				162	2754	.79
<i>Chrysothamnus</i> sp.				1	17	.02
<i>Cirsium arizonicum</i>	119	2022	.38	177	3009	.54
<i>Coryphantha vivipara</i>				3	51	.06
<i>Desmanthus cooleyi</i>	13	221	.08	8	136	.04
<i>Elymus elymoides</i>	272	4624	1.00	350	5950	1.04
<i>Erigeron concinnus</i>	1	17	.02			
<i>Erigeron divergens</i>	119	2023	.15	768	13056	.12
<i>Eriogonum racemosum</i>	509	8653	.96	428	7276	.90
<i>Eriogonum umbellatum</i>						
var. <i>cognatum</i>	9	153	.08	11	187	.10
<i>Gutierrezia sarothrae</i>				16	272	.18
<i>Heterotheca villosa</i>				3	50	.02
<i>Hieracium fendleri</i>				1	17	.02
<i>Hymenopappus filifolius</i>						
var. <i>lugens</i>	196	2332	.62	246	4182	.64
<i>Hymenoxys</i> sp.	1	17	.02	8	136	.14
<i>Juniperus scopulorum</i>				1	17	.06
<i>Koeleria pyramidata</i>				1	17	.02
<i>Lesquerella intermedia</i>	1	17	.02	1	17	.02
<i>Linaria dalmatica</i>	6	102	.04	4	68	.04
<i>Lotus wrightii</i>	5	85	.06	8	136	.06
<i>Muhlenbergia montana</i>				1	17	.02
<i>Penstemon linarioides</i>	523	8891	1.23	525	8925	1.06
<i>Pinus edulis</i>				1	17	.02
<i>Pinus ponderosa</i>				2	34	.04
<i>Poa fendleriana</i>	753	12801	1.48	985	16745	1.10
<i>Psoralea</i> sp.				3	51	.02
<i>Purshia stansburiana</i>				1	17	.02
<i>Quercus gambelii</i>				16	272	.22

**Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy)
and Perennial Herbs and Grasses**

Species	<u>Summer 1988</u>			<u>Spring 1989</u>		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Senecio neomexicanus</i>	3	51	.06	5	85	.06
<i>Townsendia exscapa</i>	35	595	.12	54	918	.16
Unknown forb #3				3	51	.04
<i>Viguiera multiflora</i>	18	306	.23	16	272	.24

Groundcover

	<u>Mean Cover</u>
Rock	.92
Bare Ground	1.25
Litter	5.79

Walnut Canyon Monitoring Plot #9 (WC9)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	<u>Summer 1988</u>		
	Count	Density per ha	Mean % Cover
<i>Juniperus scopulorum</i>	4	200	2.0
<i>Quercus gambelii</i>	6	300	1.0
<i>Pinus edulis</i>	1	50	1.0
<i>Pseudotsuga menziesii</i>	3	150	2.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	<u>Summer 1988</u>			<u>Spring 1989</u>		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Arabis perennans</i>	30	1500	.26	12	600	.18
<i>Artemisia ludoviciana</i>	551	27550	.64	867	43350	.58
<i>Berberis repens</i>	38	1900	.12	37	1850	.16
<i>Elymus elymoides</i>				2	100	.10
<i>Galium wrightii</i>	20	1000	.12	17	850	.08
<i>Juniperus scopulorum</i>				1	50	.08
<i>Muhlenbergia montana</i>	8	400	.14	7	350	.08
<i>Penstemon barbatus</i>	7	350	.10	7	350	.12
<i>Petrophytum caespitosum</i>	8	400	.18	8	400	.12
<i>Pinus edulis</i>				5	250	.10
<i>Quercus gambelii</i>				219	10950	1.86
<i>Ribes</i> sp.				1	50	.04
<i>Senecio neomexicanus</i>	9	450	.06	3	150	.06
<i>Symphoricarpos parishii</i>				6	300	.06
<i>Yucca baccata</i>				5	250	.12

Groundcover

	<u>Mean Cover</u>
Rock	3.30
Bare Ground	1.08
Litter	3.44
Wood	1.62

Walnut Canyon Monitoring Plot #10 (WC10)

Trees (> 2.5 cm DBH, or > 1 m canopy)

Species	Summer 1988		
	Count	Density per ha	Mean % Cover
<i>Juniperus osteosperma</i>	7	217	2.0
<i>Quercus gambelii</i>	4	124	1.0
<i>Pinus edulis</i>	15	465	3.0
<i>Pinus ponderosa</i>	2	62	1.0

Trees and Shrubs (< 2.5 cm DBH, or < 1 m canopy) and Perennial Herbs and Grasses

Species	Summer 1988			Spring 1989		
	Count	Density per ha	Mean % Cover	Count	Density per ha	Mean % Cover
<i>Arabis perennans</i>	36	1116	.17	26	806	.12
<i>Bouteloua gracilis</i>	2613	81003	1.26	2104	65224	1.25
<i>Coryphantha vivipara</i>				3	93	.03
<i>Elymus elymoides</i>	45	1895	.07	38	1178	.07
<i>Erigeron divergens</i>				1	17	.01
<i>Eriogonum alatum</i>	44	1364	.20	46	1426	.19
<i>Eriogonum racemosum</i>	21	651	.09	26	806	.15
<i>Eriogonum umbellatum</i>						
var. <i>cognatum</i>	186	5766	.36	177	5487	.31
<i>Euphorbia fendleri</i>	49	1519	.23			
<i>Gutierrezia sarothrae</i>				1	31	.01
<i>Heterotheca villosa</i>				4	124	.03
<i>Hymenopappus filifolius</i>						
var. <i>lugens</i>	455	1405	.49	488	15128	1.09
<i>Ipomopsis multiflora</i>	26	866	.20	57	1767	.34
<i>Juniperus osteosperma</i>				2	62	.04
<i>Lotus wrightii</i>	33	1023	.26	20	620	.15
<i>Machaeranthera canescens</i>						
var. <i>ambigua</i>	1	31	.01			
<i>Machaeranthera grindelioides</i>	3	93	.03			
<i>Opuntia fragilis</i>				2	62	.01
<i>Opuntia macrorhiza</i>				2	62	.04
<i>Penstemon linarioides</i>	851	26381	.86	747	23157	1.38
<i>Phlox austromontanus</i>	141	4371	.33			
<i>Pinus edulis</i>				70	2170	.69
<i>Pinus ponderosa</i>				6	186	1.17
<i>Poa fendleriana</i>	1292	40052	1.21	989	30659	1.15
<i>Purshia stansburiana</i>				1	31	.01
<i>Quercus gambelii</i>				89	2759	.40
<i>Senecio neomexicanus</i>	9	279	.04	2	62	.10
<i>Viguiera multiflora</i>				95	2945	.30
Unknown forb #2				30	930	.16

Groundcover

	<u>Mean Cover</u>
Rock	.63
Bare Ground	1.81
Litter	5.34
Wood	1.09

Appendix C. Native Flora of Walnut Canyon National Monument. List of vascular plant species:
+ = observed, not collected; # = from other lists and collections; otherwise voucher specimen collected.
The accounts refer to the vegetation type where the plant has been found.

ACERACEAE Maple Family

#*Acer negundo* L. var. *interius* (Britt.) Sarg. Box Elder
Common in riparian area and occasionally with Douglas fir.

ADIANTACEAE [POLYPODIACEAE], Fern Family (in part)

Cheilanthes feei Moore. Slender Lip Fern

Grows on or at the base of rocks in the yucca-piñon subassociation. Occasional in piñon-juniper and ponderosa pine.

Cheilanthes fendleri Hook. Fendler's Lip Fern

Collected in the riparian area near the west boundary. Occasional in Douglas fir.

#*Pellaea atropurpurea* (L.) Link. Purple Cliff Brake

Collected on slope opposite the island by L. Arnberger, 1946.

AGAVACEAE, Agave Family

#*Yucca baccata* Torr. Banana Yucca

Dominant in places on the south-facing slopes of the canyon. Common in piñon-juniper, ponderosa pine and Douglas fir. Occasional on canyon bottom.

AMARANTHACEAE, Amaranth Family

#*Amaranthus graecizans* L. Prostrate Pigweed

Collected on the north side of the museum by H.F. Hastings, 1949.

ANACARDIACEAE, Sumac Family

#*Toxicodendron rydbergii* (Small ex Rydb.) Greene. [*Rhus radicans* L. var. *rydbergii* (Small) Rehder].
Poison Ivy

Common in the riparian area.

Rhus aromatica Aiton var. *trilobata* (Nutt.) A. Gray [*Rhus trilobata* Nutt. var. *quinata* Jeps.]. Common in piñon-juniper and occasional in ponderosa pine.

APOCYNACEAE, Dogbane Family

#*Apocynum cannabinum* L. Hemp Dogbane

Occasional in riparian area.

ASCLEPIADACEAE, Milkweed Family

#*Asclepias asperula* (Decne.) Woodson ssp. *capricornu* (Woodson) Woodson [*A. capricornu* Woodson].
Occasional in ponderosa pine.

#*Asclepias subverticillata* (Gray) Vail. Poison Milkweed

Collected on the island in residential road by H.F. Hastings, 1949.

ASPLENIACEAE [POLYPODIACEAE], Fern Family (in part)

Cystopteris fragilis (L.) Bernh.

Moist protected ledges in riparian area.

#*Woodsia mexicana* Fee.

Collected on slope opposite the island by L. Arnberger, 1946.

Woodsia oregana D.C. Eaton. Oregon Woodsia
Rare in riparian area.

BERBERIDACEAE, Barberry Family

#*Berberis fremontii* Torr. Desert Barberry

Common in piñon-juniper and yucca-piñon. Less common in ponderosa pine and in the riparian area.

Berberis repens Lindl. Creeping Barberry

Common in Douglas fir and ponderosa pine. Occasional in piñon-juniper.

BORAGINACEAE, Borage Family

#*Cryptantha cinerea* (Greene) Cronq. var. *cinerea* [*C. jamesii* (Torr.) Payson].

Common in piñon-juniper. Occasional in yucca-piñon and ponderosa pine.

#*Hackelia floribunda* (Lehm.) Johnst. Stickseed

Riparian area. Moist places (Phillips 1990).

#*Lappula redowskii* (Hornem.) Greene var. *desertorum* (Greene) Johnst.

Likes disturbed areas. Collected east of the trail by L. Arnberger, 1947.

#*Lithospermum incisum* Lehm.

Collected near ranger residence by P.F. Spangle, 1952.

Lithospermum multiflorum Torr.

Common in Douglas fir and occasional in ponderosa pine.

Macromeria viridiflora DC.

Not uncommon in riparian area and occasional in Douglas fir.

CACTACEAE, Cactus Family

Coryphantha vivipara (Nutt.) B. & R. var. *arizonica* (Engelm.) W.T. Marshall [*Mammillaria arizonica* Engelm.]. Beehive cactus

Common in piñon-juniper.

Echinocereus triglochidiatus Engelm. Hedgehog cactus

Occasional in Douglas fir and piñon-juniper. Grows in rock.

Opuntia fragilis Nutt. Little Prickly Pear

Uncommon in ponderosa pine.

Opuntia macrorhiza Engelm. [*O. plumbea* Rose]. Plains Prickly Pear

Common in piñon-juniper. Occasional in yucca-piñon and in ponderosa pine.

Opuntia cf. *phaeacantha* Engelm. Prickly Pear

Occasional in yucca-piñon.

CAPRIFOLIACEAE, Honeysuckle Family

Lonicera arizonica Rehd. Arizona Honeysuckle

Collected in Douglas fir near east boundary.

Sambucus glauca Nutt. Blueberry Elder

Common in riparian area and occasional in Douglas fir.

#*Symphoricarpos oreophilus* Gray. Snowberry

Collected along steps into museum by H.F. Hastings, 1949.

Symphoricarpos parishii Rydb. Snowberry
Very common in Douglas fir and occasional in the riparian area.

CHENOPODIACEAE, Goose Foot Family
#*Atriplex canescens* (Pursh) Nutt. Salt Bush
Common in the yucca-piñon.

#*Chenopodium berlandieri* Moq. Pitseed Goose Foot
Collected between parking area and restrooms by H.F. Hastings, 1949.

#*Chenopodium fremontii* Wats. Goose Foot
Collected just below trail to ruins by L. Arnberger, 1946 and between museum and parking area by H.F. Hastings, 1949.

#*Chenopodium graveolens* Willd.
Riparian area. Collected at the west base of the island in the canyon bottom by L. Arnberger, 1946.

#*Chenopodium leptophyllum* (Nutt. ex Moq.) S. Wats. Slimleaf Goosefoot
Collected along water line between log cabin and quarters and along trail from Superintendent's residence to museum by H.F. Hastings, 1949.

#*Chenopodium pratericola* Rydb. [*C. desiccatum* A. Nels. var. *leptophylloides* (Murr.) Wahl.].
Collected along trail from quarters to museum by H.F. Hastings, 1949.

+ *Ceratoides lanata* (Pursh.) J.T. Howell [*Eurotia lanata* (Pursh) Moq.]. Winter Fat
Common in ponderosa pine, piñon-juniper and yucca-piñon.

CLEOMACEAE, Cleome Family
#*Cleome serrulata* Pursh. Rocky Mountain Bee Plant
Collected north of Walnut Canyon by H.F. Hastings, 1949.

COMPOSITAE [ASTERACEAE], Sunflower Family
#*Achillea millefolium* L. var. *lanulosa* (Nutt.) Piper [*A. lanulosa* Nutt.]. Yarrow
Common in the riparian area and occasional in the Douglas fir.

Ageratina herbacea (Gray) King & Robins. [*Eupatorium herbaceum* (Gray) Greene].
Rare in the riparian area.

Antennaria marginata Greene. Pussy Toes
Occasional, widely scattered in ponderosa pine and piñon-juniper, often occurring with *A. parvifolia*

Antennaria parvifolia Nutt. Pussy Toes
Occasional, widely scattered in ponderosa pine and piñon-juniper, often occurring with *A. marginata*.

Artemisia dracunculus L. [*A. dracunculoides* Pursh and var. *dracunculina* (Wats.) Blake].
Abundant in the riparian area. Occasional in Douglas fir and piñon-juniper.

Artemisia frigida Willd. Prairie Sagewort
Occasional in piñon-juniper.

Artemisia ludoviciana Nutt.
Sometimes co-dominant in the riparian area. Common in piñon-juniper, ponderosa pine and yucca-piñon.

Artemisia pacifica Nutt.
Common in yucca-piñon.

#*Aster commutatus* (T. & G.) Gray var. *crassulus* (Rydb.) Blake.
Collected along the old road west of log cabin by P.F. Spangle, 1953 and near the west entrance gate by P. Beaubien, 1940.

Bahia dissecta (Gray) Britt. Yellow Ragweed
Occasional in ponderosa pine and piñon-juniper.

Brickellia californica (T. & G.) Gray. Pachaba
Common in Douglas fir and ponderosa pine. Occasional elsewhere.

Brickellia chlorolepis (Woot. & Standl.) Shinnars [*Kuhnia rosmarinifolia* Vent.].
Occasional in piñon-juniper.

Brickellia grandiflora (Hook.) Nutt. Large-flowered Thoroughwort
Occasional in Douglas fir and the riparian area. Collected along trail on the west side of the island by A. Clark, 1965 and on the trail just below the saddle by P.F. Spangle, 1952.

Chrysothamnus depressus Nutt. Rabbit Brush
Occasional in ponderosa pine and piñon-juniper. Collected on the trail east side by P.F. Spangle, 1952.

#*Chrysothamnus nauseosus* (Pall.) Britt. ssp. *consimilis* (Greene) Hall & Clem.
Collected in piñon-juniper along the rim trail by M. Salomonson, 1971.

#*Cirsium arizonicum* (Gray) Petrak. Arizona Thistle
Common in ponderosa pine. Occasional in Douglas fir and riparian area.

#*Cirsium wheeleri* (Gray) Petrak.
Collected near Monument entrance by L. Arnberger, 1946.

Conyza canadensis (L.) Cronq. [*Erigeron canadensis* L.]. Horseweed
Likes disturbed areas. Collected in riparian area.

#*Coreopsis tinctoria* Nutt. [*C. cardaminefolia* (DC.) T. & G.]. Golden Coreopsis
Collected on the canyon bottom east of the island by L. Arnberger, 1946 and at the bottom of the Canyon by P.F. Spangle, 1952.

#*Erigeron concinnus* (H. & A.) T. & G. Tidy Fleabane
Occasional in ponderosa pine and piñon-juniper. Collected along the south rim by A. Clark, 1965 and near the ranger cabin by A.F. Whiting, 1936.

Erigeron divergens T. & G. Spreading Fleabane
Occasional in ponderosa pine and piñon-juniper.

Erigeron flagellaris Gray. Running Fleabane
Uncommon in ponderosa pine forest. Collected at the head of the old trail by P.F. Spangle, 1952.

#*Erigeron modestus* A. Gray [*E. nudiflorus* Buckl.]
Collected on the south side, south of fire cache by P.F. Spangle, 1953 and north of Walnut Canyon by H.F. Hastings, 1949.

#*Erigeron neomexicanus* Gray.
Collected on the canyon bottom by L. Arnberger, 1946.

erigeron pringlei

#*Erigeron oreophilus* Greenm.

Collected across the canyon (west) from museum by P.F. Spangle 1952 and on the Canyon bottom east of the island by L. Arnberger, 1946.

#*Erigeron saxatilis* Nesom. [*Erigeron pringlei* Greene]; Nesom (1990a).

Shady moist ledges and cliff-faces.

#*Gaillardia pinnatifida* Torr. Blanket Flower

Collected near the log cabin on the east side by H.F. Hastings, 1949.

Gnaphalium leucocephalum Gray. White Cudweed

Uncommon in piñon-juniper and yucca-piñon.

#*Gnaphalium macounii* Greene. Clammy Cudweed

Riparian area. Collected on the canyon bottom below ruin trail by M. Salomonson, 1971 and on the canyon bottom east of the island by L. Arnberger, 1946.

#*Gutierrezia microcephala* (DC.) Gray. Three Leaf Snakeweed

Collected near the museum by P.F. Spangle, 1953 and below the rim, west of the trail by L. Arnberger, 1946.

Gutierrezia sarothrae (Pursh) Britt. & Rusby. Broom Snakeweed

Co-dominant in yucca-piñon. Very common in piñon-juniper. Common in ponderosa pine and occasional elsewhere.

#*Helianthella quinquenervis* (Hook.) Gray.

Collected in sand in the river bottom by A.F. Whiting, 1936.

#*Helianthus petiolaris* Nutt.

Collected between the office and houses by P.F. Spangle, 1952.

Heterotheca villosa (Pursh) Shinnars.

Common in ponderosa pine, piñon-juniper, and yucca-piñon.

Hieracium fendleri Schultz Bip.

Common in ponderosa pine.

Hymenopappus filifolius Hook. var. *lugens* (Greene) Jeps.

Common in piñon-juniper.

Hymenoxys acaulis (Pursh) K.F. Parker var. *arizonica* (Greene) K.F. Parker. Arizona Actinea

Occasional in piñon-juniper.

Hymenoxys bigelovii (Gray) K.F. Parker.

Occasional in ponderosa pine.

#*Lactuca pulchella* (Pursh) Riddell [*L. tatarica* (L.) C.A. Mey.]. Large Blue Lettuce

Collected at the canyon bottom east of area by P.F. Spangle, 1952.

Laennecia schiedeana (Less.) Nesom [*Conyza schiedeana* (Less.) Cronq.]; Nesom (1990b).

Collected in riparian area.

Leucelene ericoides (Torr.) Greene [*Aster hirtifolius* Blake, *A. arenosus* (Heller) Blake]. White Aster

Uncommon in piñon-juniper.

#*Machaeranthera aquifolia* Woot. & Standl. [*Aster aquifolia* (Woot. & Standl.) Blake].
Collected at the canyon bottom at the base of the island by L. Arnberger, 1946.

#*Machaeranthera bigelovii* (Gray) Greene [*Aster bigelovii* Gray].
Collected near the museum by P.F. Spangle, 1953 and along the trail to the custodians house by L. Arnberger, 1946. Collected by A. Clark along road to old cabin and on the trail, east side of the island, 1965.

#*Machaeranthera canescens* (Pursh) Gray [*Aster canescens* Pursh].
Common in ponderosa pine and occasional in riparian area. Collected near the parking area by S. H. Walters, 1952.

#*Machaeranthera gracilis* (Nutt.) Shinnars [*Haplopappus gracilis* (Nutt.) Gray].
"Near residence" P. Spangle, 1952.

#*Machaeranthera linearis* Greene [*Aster cichoriaceus* (Greene) Blake].
"Located throughout the Monument". Collected by P. Beaubien, 1940. Not seen during this study.

Pericome caudata Gray. Taperleaf Tailed Pericome
Collected in Douglas fir.

Senecio arizonicus Greene.
Occasional in Douglas fir and ponderosa pine.

#*Senecio multilobatus* T. & G. ex Gray (incl. *S. stygius* Greene.)
Collected near the office by P.F. Spangle, 1952.

Senecio neomexicanus Gray.
Common in piñon-juniper and riparian area. Occasional in ponderosa pine and Douglas fir.

#*Senecio spartioides* T. & G. Broom Groundsel
Riparian area. (B. Phillips, 1990). Collected at the septic tank by H.F. Hastings, 1951, near the Visitor Center by A. Clark, 1965 and between the office and houses by P.F. Spangle, 1952.

Senecio werneriaefolius Gray.
Collected in Douglas fir near west boundary.

Solidago sparsiflora Gray.
Occasional throughout the monument.

#*Stephanomeria tenuifolia* (Torr.) H.M. Hall.
Collected north of Walnut Canyon by H.F. Hastings, 1949.

#*Stephanomeria thurberi* Gray. Wire Lettuce
Collected near the residence by P.F. Spangle, 1952.

#*Taraxacum laevigatum* (Willd.) DC. Red-seeded Dandelion
Collected near the parking area by L. Arnberger, 1947.

#*Tetradymia canescens* DC. var. *inermis* (Nutt.) Gray. Gray Felt Thorn
Collected near the log cabin by P.F. Spangle, 1952.

Townsendia exscapa (Richards) Porter.
Occasional in ponderosa pine.

Townsendia incana Nutt. [*T. arizonica* Gray].
Uncommon in piñon-juniper.

#*Verbesina encelioides* (Cav.) Benth. & Hook.
Open disturbed areas in the riparian area (Phillips, 1990).

#*Viguiera annua* (Jones) Blake. Annual Goldeneye
Collected near the picnic grounds by S. H. Walters, 1952.

#*Viguiera multiflora* (Nutt.) Blake. Nevada Viguiera
Collected north of Walnut Canyon and on the east side of the log cabin by H.F. Hastings, 1951.

#*Xanthium strumarium* L. [*X. saccharatum* Wallr.]. Common Cocklebur
Collected at the canyon bottom just east of the island by L. Arnberger, 1946. Also at eastern end of the canyon (Phillips, 1990).

CORNACEAE, Dogwood Family
Cornus stolonifera Michx. Red Osier Dogwood
Very common in the riparian area.

CRASSULACEAE, Orpine Family
#*Sedum cockerellii* Britt.
Collected at the canyon bottom at the north base of the island by L. Arnberger, 1946.

CRUCIFERAE [BRASSICACEAE], Mustard Family
Arabis fendleri Greene.
Occasional in ponderosa pine.

#*Arabis perennans* Wats.
Occasional in piñon-juniper. Collected east of the island trail below the rim and on the east side of the island below the trail by L. Arnberger, 1947.

Descurainia obtusa (Greene) O.E. Shultz.
Collected in the riparian area.

Descurainia pinnata (Walt.) Britt. Yellow Tansy Mustard
Collected on the south side of the canyon, halfway down and by NA 312 by P. Beaubien, 1938 and 1941. Collected at Grasshopper Point under a rock overhang by C. Andrews, 1976.

#*Descurainia richardsonii* (Sweet) O.E. Schulz ssp. *incisa* (Engelm.) Detling.
Collected 50 yards east of the old ranger station by P. Beaubien, 1941. Riparian area. (Phillips, 1990.).

Draba cuneifolia Nutt. Whitlow Grass
Occasional in the riparian area.

#*Erysimum inconspicuum* (Wats.) MacMillan.
Collected on the road to the old cabin by A. Clark, 1965 and near the ranger cabin by A.F. Whiting, 1936.

Lepidium densiflorum Schrad.
Collected in the riparian area.

Lesquerella intermedia (Wats.) Heller.
Common in yucca-piñon and piñon-juniper.

#*Thelypodium wrightii* Gray.

Collected on the canyon floor east of area by P.F. Spangle, 1952 and along the east side of the island trail by A. Clark, 1965.

Thlaspi montanum L. Wild Candytuft

Occasional in Douglas fir, ponderosa pine and piñon-juniper.

Collected around cabin by P. Beaubien, 1941 and along Forest Road 246 (10 min. south off 89A) in litter of pine forest, 1976.

CUPRESSACEAE, Cypress Family

#*Juniperus deppeana* Steud. var. *pachyphlaea* (Torr.) Martinez. Alligator Juniper

Common in ponderosa pine and adjacent areas.

#*Juniperus monosperma* (Engelm.) Sarg. One-seed Juniper

Co-dominant in piñon-juniper. Common in yucca-piñon and ponderosa Pine. Occasional in Douglas fir.

#*Juniperus osteosperma* (Torr.) Little. Utah Juniper

Very common in piñon-juniper. Common in yucca-piñon and ponderosa pine and Douglas fir. Occasional in the riparian area.

Juniperus scopulorum Sarg. Rocky Mountain Juniper

Very common in Douglas fir and ponderosa pine. Common in piñon-juniper, yucca-piñon and the riparian area.

CYPERACEAE, Sedge Family

Carex deweyana Schwein.

Rare in the riparian area.

#*Carex lanuginosa* Michx. Wooly Sedge

Riparian area (Phillips, 1990).

#*Carex occidentalis* Bailey.

Under conifers in riparian area (Phillips, 1990).

EPHEDRACEAE, Joint Fir Family

#*Ephedra viridis* Cov. Mountain Joint-fir

Common in yucca-piñon.

EQUISETACEAE, Horsetail Family

Equisetum arvense L. Common Horsetail

Collected in riparian area west of the island.

#*Equisetum hiemale* L. Scouring-rush

Riparian area (Phillips, 1990). Collected in sand in the river bottom by A.F. Whiting, 1936.

#*Equisetum laevigatum* A. Braun. Smooth Scouring-rush

Riparian area (Phillips, 1990).

EUPHORBIACEAE, Spurge Family

Euphorbia fendleri T.& G. Fendler Spurge

Occasional in ponderosa pine and riparian area.

Euphorbia lurida Engelm.

Occasional in ponderosa pine.

#*Tragia nepetaefolia* Cav. Nose Burn
Collected southwest of the old ranger station by A. Carter, 1940.

Tragia ramosa Torr. [*T. stylaris* Muell. Arg.].
Collected in the riparian area.

FAGACEAE, Beech Family

#*Quercus undulata* Torr. Wavy Leaf Oak
Collected on the south side of the canyon near the fire cache by P.F. Spangle.

#*Quercus gambelii* Nutt. Gambel Oak
Co-dominant with Douglas fir. Very common in ponderosa pine, piñon-juniper and the riparian area.

FUMERACEAE, Fumitory Family

#*Corydalis aurea* Willd. Golden Corydalis
Collected on the canyon bottom just east of the island and west of the new trail by L. Arnberger, 1946 and 1947.

GERANIACEAE, Geranium Family

#*Geranium caespitosum* James.
Occasional in the riparian area. Collected on the canyon bottom at the base of sandstone cliffs by M. Salomonson, 1971.

Geranium eremophilum Woot. & Standl.
"Across from the good ruins" P. Spangle 1952. Custodians house, Arnberger 1958.

GRAMINEAE [POACEAE], Grass Family

#*Agropyron smithii* Rydb. Western Wheatgrass
"Museum terrace", P. Spangle, 1952. "Near museum" Walters, 1953.

Aristida purpurea Nutt. var. *fendleriana* (Steud.) Vasey [*A. fendleriana* Steud.]. Three-awn
Occasional to common in ponderosa pine.

Bothriochloa saccharoides (Swartz) Rydb. [*Andropogon saccharoides* Swartz]. Silver Beardgrass
Locally common on the canyon bottom among other dense grasses.

Bouteloua curtipendula (Michx.) Torr. Side Oats Grama
Common to uncommon in subassociations within the canyon.

Bouteloua gracilis (H.B.K.) Lag. ex Steud. Blue Grama
Very common in ponderosa pine, piñon-juniper and yucca-piñon. Occasional in the riparian area.

#*Bromus anomalus* Rupr. ex Fourn.
Collected on the trail from the log cabin by H.F. Hastings, 1949.

Bromus carinatus H. & A. California Brome
Collected in ponderosa pine.

Bromus ciliatus L. [incl. *B. richardsonii* Link].
Collected in the riparian area.

Elymus canadensis L. Canada Wild Rye
Very common in the riparian area.

Elymus elymoides (Raf.) Swezey [*Sitanion hystrix* (Nutt.) J.G. Smith]. Squirrel Tail
Common in ponderosa pine. Occasional in piñon-juniper, yucca-piñon and the riparian area.

Elymus trachycaulus (Link.) Gould ex Shinnars.
Collected in the riparian area.

Eragrostis mexicana (Hornem.) Link. Mexican Lovegrass
Collected in the riparian area.

#*Eragrostis pectinacea* (Michx.) Nees.
Open and disturbed areas in the riparian area (Phillips, 1990).

Hierochloa odorata (L.) Beauv. Sweet Grass
Collected in the riparian area.

#*Hordeum jubatum* L. Foxtail Barley
Riparian area (Phillips, 1990).

Koeleria pyramidata (Lam.) Beauv. [*K. cristata* (L.) Pers.]. June Grass
Collected in the riparian area.

Lycurus setosus (Nutt.) C. Reeder (Reeder 1985).
Collected in the riparian area.

Melica porteri Scribn.
Collected in the riparian area.

Muhlenbergia curtifolia Scribn.
Collected in the riparian area. A rare grass.

Muhlenbergia montana (Nutt.) Hitch. Mountain Muhly
Common in ponderosa pine. Also in the riparian area.

Muhlenbergia pauciflora Buckl. New Mexican Muhly
Collected in the riparian area.

Muhlenbergia racemosa (Michx.) B.S.P.
Collected in the riparian area.

Muhlenbergia rigens (Benth.) Hitch. Deer Grass
Collected in the riparian area.

#*Munroa squarrosa* (Nutt.) Torr. False Buffalo Grass
Riparian area (Phillips 1990).

Oryzopsis hymenoides (R. & S.) Ricker. Indian Ricegrass
Collected in the riparian area.

Panicum capillare L. Witch Grass
Riparian area (Phillips 1990).

Poa fendleriana (Steud.) Vasey (incl. *P. longiligula* Scribn. & Williams). Mutton Grass
Co-dominant in ponderosa pine. Very common in Douglas fir, piñon-juniper, yucca-piñon and common in riparian area.

Schizachyrium cirratum Hack.) Woot. & Standl. [*Andropogon cirratus* Hack.]. Texas Beardgrass
Collected in the riparian area.

Schizachyrium scoparium (Michx.) Nash [*Andropogon scoparius* Michx.]. Little Bluestem
Collected in the riparian area.

#*Sporobolus cryptandrus* (Torr.) Gray. Sand Dropseed
Collected in the riparian area. Collected on the north side of the log cabin by H.F. Hastings, 1949.

GROSSULARIACEAE, Currant Family

Ribes cereum Dougl. Squaw Currant

Common in the riparian area and adjoining subassociations.

#*Ribes inebrians* Lindl. Whitestem Gooseberry

Collected along the old trail by A.F. Whiting, 1936 and on the canyon bottom west of the island by L. Arnberger, 1947.

Ribes pinetorum Greene. Orange Gooseberry

Occasional in the riparian area.

HYDROPHYLLACEAE, Water Leaf Family

Phacelia magellanica (Lam.) Cov.

Common in the riparian area.

IRIDACEAE, Iris Family

#*Iris missouriensis* Nutt. Rocky Mountain Iris

Common in the riparian area.

JUGLANDACEAE, Walnut Family

#*Juglans major* (Torr.) Heller. Arizona Walnut

Common tree in the riparian area.

LABIATAE [LAMIACEAE], Mint Family

#*Hedeoma nanum* (Torr.) Briq. ssp. *macrocalyx* Stewart.

Collected on the canyon bottom east of the island by L. Arnberger, 1946.

Hedeoma oblongifolium (Gray) Heller.

Occasional throughout the Monument.

Moldavica parviflora (Nutt.) Britt. Dragon Head

In the riparian area.

#*Monarda menthaefolia* Graham. Bee Balm

In the riparian area. Collected on the canyon floor by P.F. Spangle, 1952 and N. Ritchie, 1965.

#*Salvia reflexa* Hornem. Rocky Mountain Sage

Riparian area (Phillips, 1990). Collected below the rim west of the ruins trail by L. Arnberger, 1946.

LEGUMINOSAE, Pea Family, Mimosa Subfamily

Desmanthus cooleyi (Eaton) Trel.

Occasional in ponderosa pine.

LEGUMINOSAE, Pea Family, Bean Subfamily

#*Astragalus humistratus* Gray.

Common in yucca-piñon. Occasional in piñon-juniper and ponderosa pine. Collected near parking area by P.F. Spangle, 1952.

Astragalus lentiginosus Dougl.

Occasional in Douglas fir, ponderosa pine, piñon-juniper and the riparian area.

#*Astragalus lentiginosus* Dougl. var. *diphysus* (Gray) Jones.

Collected along the old trail by L. Arnberger, 1947.

#*Astragalus lentiginosus* Dougl. var. *palans* (Jones) Jones.

Collected on the canyon bottom at the base of the island and just east of the ruins trail by L. Arnberger, 1947.

Astragalus praelongus Sheldon.

F.W. Reichenbacher 2459, collected and identified, but the specimen was misplaced.

#*Astragalus tephrodes* Gray var. *brachylobus* (Gray) Barneby.

In the riparian area and adjacent slopes. Collected along the old trail by P.F. Spangle, 1952.

#*Lathyrus graminifolius* (Wats.) White.

Riparian area (Phillips, 1990). Collected along the old trail by P.F. Spangle, 1952.

#*Lotus wrightii* (Gray) Greene. Wright Lotus

Common in ponderosa pine. Less common in piñon-juniper. Collected near the ranger cabin by P.F. Spangle, 1953, P. Beaubien, 1941, and A.F. Whiting, 1936.

Lupinus argenteus Pursh.

Occasional in ponderosa pine.

Lupinus hillii Greene.

Collected in Cherry Canyon.

#*Lupinus kingii* Wats. Kings Lupine

Collected at the ruins near the picnic area by P.F. Spangle, 1952 the east boundary by A. Clark, 1965 and north of Walnut Canyon by H.F. Hastings, 1949.

Oxytropis lambertii Pursh. Lambert Locoweed.

Common in ponderosa pine and piñon-juniper. Occasional in riparian area.

Pediomelum epipsilum (Barneby) Welsh [*Psoralea epipsilum* Barneby].

Collected in piñon-juniper.

Phaseolus angustissimus Gray.

Collected in ponderosa pine.

Psoralea lanceolata Pursh. Lemon Weed

Occasional in ponderosa pine and piñon-juniper.

Robinia neomexicana Gray. New Mexican Locust

Very common in the riparian. Common in the Douglas fir. Occasional in ponderosa pine and piñon-juniper.

#*Thermopsis pinetorum* Greene. Golden Pea
Collected on the canyon floor by P.F. Spangle, 1952.

Trifolium subcaulescens Gray.
Collected in ponderosa pine.

#*Vicia americana* Muhl. American Vetch
In the riparian area. Collected on the canyon floor and the south rim by A. Clark, 1967 and on the canyon floor by P.F. Spangle, 1952.

LILIACEAE, Lily Family

#*Allium palmeri* Wats.

Collected at the ruins near the picnic grounds by P.F. Spangle, 1952.

#*Calochortus gunnisoni* Wats.

Collected near the office by S.H. Walters, 1952.

Smilacina racemosa (L.) Desf.

Occasional to common in the riparian area.

Smilacina stellata (L.) Desf. Starflower

Common in the riparian area.

#*Zigadenus elegans* Pursh. White Camas

Collected in Walnut Canyon by A.F. Whiting, 1935.

LINACEAE, Flax Family

Linum lewisii Pursh. Blue Flax

Rare, piñon-juniper.

#*Linum puberulum* (Engelm.) Heller. Plains Flax

Collected on the canyon bottom east of the island by L. Arnberger, 1946.

LOASACEAE, Stickleaf Family

#*Mentzelia albicaulis* Dougl. Small-flowered Blazing Star

Collected to the right of the old trail near room NA 310 by P.F. Spangle, 1952 and halfway down the north bank of the canyon by P. Beaubien, 1938.

MALVACEAE, Mallow Family

Sphaeralcea grossulariaefolia (H. & A.) Rydb.

Collected in the yucca-piñon.

#*Sphaeralcea fendleri* Gray. Fendler Globe Mallow

Common in the riparian area. Collected below the rim west of the ruins trail by L. Arnberger, 1946.

MORACEAE, Mulberry Family

Humulus americanus Nutt.

Riparian area (Phillips, 1990).

NYCTAGINACEAE, Four O'Clock Family

#*Mirabilis bigelovii* Gray.

Occasional in yucca-piñon. Collected just below the island trail by L. Arnberger, 1946.

Mirabilis linearis (Pursh) Heimerl. [*Oxybaphus linearis* (Pursh) Robbins.].

Collected in piñon-juniper.

POLEMONIACEAE, Phlox Family

#*Ipomopsis aggregata* (Pursh) V. Grant [*Gilia aggregata* (Pursh) Spreng.]. Sky Rocket
Occasional in all subassociations, apparently more common in riparian area. Collected on the canyon bottom at the base of the island by L. Arnberger, 1946 and by P.F. Spangle, 1952 near the shop and across the canyon from the good ruins. Collected in piñon-juniper along the rim trail by M. Salomonson, 1971.

#*Ipomopsis multiflora* (Nutt.) V. Grant [*Gilia multiflora* Nutt.].
Collected along water line between log cabin and residences by H.F. Hastings, 1949.

#*Ipomopsis polyantha* (Rydb.) V. Grant [*Gilia polyantha* Rydb.].
Collected at archaeological site NA-103 by A. Clark, 1965.

#*Phlox austromontana* Coville.
Common in Douglas fir. Occasional in ponderosa pine and piñon-juniper. Collected along the old trail by P.F. Spangle, 1952.

POLYGONACEAE, Buckwheat Family

#*Eriogonum alatum* Torr. Winged Eriogonum
Collected 100 feet west of the entrance gate by A. Clark, 1965 and between the office and houses by P.F. Spangle, 1952.

Eriogonum jamesii Benth.
Collected in piñon-juniper.

Eriogonum jonesii Wats.
Common in yucca-piñon. Occasional in piñon-juniper.

#*Eriogonum racemosum* Nutt. Red Root Buckwheat
Collected at the gate at Monument entrance by L. Arnberger, 1946, near the shop by P.F. Spangle, 1952, at archaeological site NA-103 by A. Clark, 1965 and among ponderosa pine near the sewer lagoon by M. Salomonson, 1971.

#*Eriogonum umbellatum* Torr. var. *cognatum* (Greene) Reveal [*E. cognatum* Greene].
Common in Douglas fir. Occasional in piñon-juniper, ponderosa pine and yucca-piñon. Collected near the picnic grounds by H.F. Hastings, 1949.

#*Polygonum coccineum* Muhl.
Aquatic plant collected in pool in streambed by H.F. Hastings, 1949.

PRIMULACEAE, Primrose Family

Androsace septentrionalis L. var. *puberulenta* (Rydb.) Knuth.
Collected in the riparian area.

RANUNCULACEAE, Crowfoot Family

Aquilegia desertorum (Jones) Ckll.
Occasional in the riparian area and in Douglas fir.

#*Aquilegia elegantula* Greene.
Collected on the south side of the canyon by P.F. Spangle, 1953.

Clematis ligusticifolia Nutt.
Common in the riparian area and occasional in Douglas fir.

#*Delphinium scaposum* Greene. Barestem Larkspur

Plant possibly of this species collected in the riparian area. Collected at the head of the new trail to cliff dwellings by E. Alberts, 1941 and near the old cabin by A. Clark, 1965.

Thalictrum fendleri Engelm.

Common in riparian area and in Douglas fir. Occasional in ponderosa pine and piñon-juniper.

ROSACEAE, Rose Family

#*Agrimonia gryposepala* Wallr.

Riparian area (Phillips, 1990).

#*Amelanchier utahensis* Koehne.

Common in Douglas fir. Occasional in riparian area. Collected along the ruins trail on the west side of the island by H.F. Hastings, 1949.

#*Cercocarpus betuloides* Nutt. Birch-leaf Mountain Mahogany

Collected on the east side of the island below the trail by L. Arnberger, 1946.

#*Cercocarpus montanus* Raf. Alder-leaf Mountain Mahogany

Found in yucca-piñon and occasionally in the riparian area and Douglas fir. Rocky soil at base of south-facing slope.

Chamaebatiaria millefolium (Torr.) Maxim.

Common in yucca-piñon, piñon-juniper and adjacent riparian area. Occasional in ponderosa pine.

#*Purshia stansburiana* (D. Don) Welsh.

Common in piñon-juniper and ponderosa pine. Occasional in yucca-piñon. Collected at the edge of the terrace south of the museum by H.F. Hastings, 1949 and on the rim near the old cabin by A. Clark, 1967.

#*Fallugia paradoxa* (D. Don) Endl. Ponil. Apache Plume

Riparian area (Phillips, 1990). Collected near the log cabin by P.F. Spangle, 1952.

Petrophytum caespitosum (Nutt.) Rydb. Rock Mat

Occasional to common in rocks in the canyon.

Rosa arizonica Rydb. Arizona Rose

Co-dominant in some places in the riparian area. Not uncommon in Douglas fir. Occasional in ponderosa pine.

#*Rosa neomexicana* Ckll.

Collected on the canyon floor by P.F. Spangle, 1952.

+ *Rubus neomexicanus* Gray. Arizona Dewberry

Occurs in and adjacent to the riparian area.

RUBIACEAE, Madder Family

Galium wrightii Gray.

Common in piñon-juniper. Occasional in ponderosa pine and Douglas fir.

Kelloggia galioides Torr.

Collected in the riparian area.

RUTACEAE, Rue Family

Ptelea trifoliata L. ssp. *angustifolia* (Benth.) V.L. Bailey [*P. angustifolia* Benth.]. Hop Tree
Common in places in the riparian area and Douglas fir.

SALICACEAE, Willow Family

Populus angustifolia James. Narrow-leaf Cottonwood
Common in the riparian area.

Populus tremuloides Michx. [incl. var. *aurea* (Tidestrom) Daniels]. Quaking Aspen
Common in small groves in the riparian area.

#*Salix bonplandiana* H.B.K. Bonpland Willow
Occasional in the riparian area.

Salix lasiolepis Benth. Arroyo Willow
Located in a few places in the riparian area.

SAXIFRAGACEAE, Saxifrage Family

Heuchera parvifolia Nutt.
Collected in the riparian area.

Heuchera versicolor Greene.
Common in the riparian area and occasional in the Douglas fir.

SCROPHULARIACEAE, Figwort Family

Castilleja integra Gray.
Occasional in piñon-juniper and yucca-piñon.

#*Cordylanthus wrightii* Gray.
Collected at archaeological site NA-103 by A. Clark, 1965 and north of Walnut Canyon by H.F. Hastings, 1949.

#*Mimulus rubellus* Gray. Red-stemmed Mimulus
Collected halfway down the north wall of the canyon by P. Beaubien, 1938.

#*Orthocarpus purpureo-albus* Gray.
Collected near the picnic grounds by S. H. Walters, 1952.

#*Penstemon barbatus* (Cav.) Roth.
Occasional to common in Douglas fir. Occasional in ponderosa pine, piñon-juniper and the riparian area.

Penstemon bridgesii Gray.
Occasional throughout the Monument.

#*Penstemon jamesii* Benth. ssp. *ophianthus* (Pennell) Keck.
Collected north of the old ranger station by A. Carter, 1940.

Penstemon linarioides Gray.
Not uncommon in ponderosa pine and piñon-juniper.

#*Penstemon linarioides* Gray ssp. *compactifolius* Keck.
Collected along the old trail by A.F. Whiting, 1936 and north of the old ranger station by A. Carter, 1940.

#*Penstemon thompsoniae* (Gray) Rydb. Thompson Penstemon
Collected at the east end of the Monument along the north rim by P.F. Spangle, 1952.

#*Penstemon virgatus* Gray.
Collected near the residences by P.F. Spangle, 1952 and P. Beaubien, 1940.

SELAGINELLACEAE, Selaginella Family
Selaginella underwoodii Hieron.
Rock ledges in the riparian area.

SOLANACEAE, Nightshade Family
#*Datura meteloides* DC. Sacred Datura
Riparian area (Phillips, 1990).

#*Lycium pallidum* Miers. Rabbit Thorn
Riparian area. (Phillips, 1990) Collected on old trail above stabilized rooms by P.F. Spangle, 1952 and below the trail on the east side of the island by L. Arnberger, 1946.

#*Nicotiana attenuata* Torr.
Riparian area (Phillips, 1990). Collected along residence road area by A. Clark, 1965 and P. Beaubien, 1940.

#*Solanum jamesii* Torr. Wild Potato
Collected in the riparian area. Collected along stream bed in the canyon bottom by P.F. Spangle, 1952 and H.F. Hastings, 1949.

#*Solanum triflorum* Nutt. Cutleaf Nightshade
Collected on the road to the houses by P.F. Spangle, 1952.

UMBELLIFERAE, Parsley Family
#*Cymopterus purpurascens* Gray.
Collected north of the observation point by P. Beaubien, 1938.

#*Lomatium foeniculaceum* (Nutt.) Coult. & Rose ssp. *macdougali* (Coult. & Rose) Cronq. [*L. macdougali* Coult. & Rose].
Collected on the north rim of the canyon near the Superintendent's residence by P.F. Spangle, 1952.

VALERIANACEAE, Valerian Family
Valeriana arizonica Gray.
Collected in the riparian area.

VERBENACEAE, Vervain Family
#*Verbena bracteata* Lag. & Rodr. Prostrate Vervain
Collected near the ranger residence by P.F. Spangle, 1952 and north of Walnut Canyon by H.F. Hastings, 1949.

Verbena macdougali Heller. New Mexican Vervain
Collected in the riparian area.

VIOLACEAE, Violet Family
Viola sp.
One plant seen in Douglas fir.

VISCACEAE, Mistletoe Family

Phoradendron juniperinum Engelm. Juniper Mistletoe
Parasitic on juniper trees.

VITACEAE, Grape Family

Parthenocissus vitacea (Kern.) Hitchc. [*P. inserta* (Kerner) K. Fritsch.]. Virginia Creeper
Common in the riparian area.

Vitis arizonica Engelm. Canyon Grape
Common in the riparian area.

Appendix D. Alien Flora of Walnut Canyon National Monument. List of non-native vascular plant species: + = observed, not collected; # = from other lists and collections; otherwise voucher specimen collected.

CHENOPODIACEAE, Goose Foot Family

Chenopodium album L. Common Lambs Quarters
Collected on a southeast-facing slope.

#*Salsola iberica* Sennen & Pau [*S. kali* L. var. *tenuifolia* (Tausch.) Aellen]; Beatley (1973). Russian Thistle
Annual native of Eurasia. Invades disturbed areas.

COMPOSITAE [ASTERACEAE], Sunflower Family

#*Lactuca serriola* L. Prickly Lettuce
Native of Europe. Collected in the bottom of the canyon west of Second Fort by P.F. Spangle, 1952.

#*Tragopogon dubius* Scop. Goats Beard
Collected near the old restrooms by A. Clark, 1965 and at the head of the trail from parking area to museum by H.F. Hastings, 1949.

CRUCIFERAE [BRASSICACEAE], Mustard Family

#*Erysimum repandum* L. Wallflower
Annual or biennial from Europe.

Sisymbrium altissimum L. Tumble Mustard
Annual or biennial from Europe. A few plants along the island trail.

GERANIACEAE, Geranium Family

#*Erodium cicutarium* (L.) L'Her. Filaree
Annual native of Europe. Likes disturbed areas.

GRAMINEAE [POACEAE], Grass Family

Bromus diandrus Roth. [*B. rigidus* Roth.]. Ripgut Grass
Annual from Europe. Occasional in piñon-juniper and Douglas fir woods.

Bromus tectorum L. Downy Chess
Annual from Europe. Sometimes abundant spring annual.

Poa pratensis L. Kentucky Bluegrass
Native of Europe. Collected in the riparian area.

LABIATAE [LAMIACEAE], Mint Family

Leonurus cardiaca L. Motherwort
Annual native of Eurasia. Collected in the riparian area.

#*Marrubium vulgare* L. Horehound
Native of Europe. In disturbed areas around roads, trails and houses. Also in the riparian area.

LEGUMINOSAE, Pea Family, Bean Subfamily

#*Melilotus albus* Desr. White Sweet Clover
Annual or biennial from Eurasia. Collected on the canyon bottom at the east base of the island by L. Arnberger, 1946.

PLANTAGINACEAE, Plantain Family

#*Plantago lanceolata* L. Buckhorn Plantain

Native from Europe. Collected on the west side of the Superintendent's office by H.F. Hastings, 1949.

POLYGONACEAE, Buckwheat Family

#*Polygonum coccineum* Muhl. [*P. aviculare* L.].

Annual native of Eurasia. Collected on the east side of residence number one by H.F. Hastings, 1949.

#*Rumex crispus* L. Curly Dock

Native of Eurasia. Riparian area. (Phillips, 1990)

ROSACEAE, Rose Family

#*Malus pumilla* Mill

Collected at the ravine west of the entrance.

#*Potentilla norvegica* L. Rough Cinquefoil

Probably introduced from Europe. Collected on the Canyon bottom by P.F. Spangle, 1952 and at the east base of the island in the Canyon bottom by L. Arnberger, 1946.

RUBIACEAE, Madder Family

#*Galium aparine* L.

Annual native from Europe. Most common in the riparian area.

SCROPHULARIACEAE, Figwort Family

Linaria dalmatica Miller.

Native from Eurasia. Locally abundant in Ponderosa Pine.

#*Verbascum thapsus* L. Common mullein

Native from Europe. Common in the riparian area.

Appendix E. List of acronyms of Walnut Canyon plants shown on Figure 2 (pocket).

Acronym	Species
Acne	<i>Acer negundo</i>
Arlu	<i>Artemisia ludoviciana</i>
Bogr	<i>Bouteloua gracilis</i>
Jumo	<i>Juniperus monosperma</i>
Quga	<i>Quercus gambelii</i>
Pied	<i>Pinus edulis</i>
Pipo	<i>Pinus ponderosa</i>
Pofe	<i>Poa fendleriana</i>
Psme	<i>Pseudotsuga menziesii</i>
Roar	<i>Rosa arizonica</i>
Rone	<i>Robinia neomexicana</i>
Yuba	<i>Yucca baccata</i>

LOCATION RP-1, NE 1/4 Sec. 36, about 50 m from bdr fence DATE 5/8/89
 PHOTO NO. 24 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind
Pied	5	5	3								
Pipo	2	5	1		fldpl	sds1			sds1	cliff	Talus
Juos	5	5	2								
Jumo	2	4	1								
Bogr	5	2	3								
Pofe	3	2	2								
Peli	3	2	2								
~~Secy~~	1	2	1								
*Hym sp.	1	2	1								
*Arpend	1	2	1								

SLOPE				DISSECT.				ELEV.			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION <u>Kaiab Limestone</u> ~5 % GRAVEL										
	TEXTURE <u>Mostly silty</u> ~5 % ROCK										

NOTES Heavy elk use. Most junipers tall (>10 m) & single trunked some shorter (<6m) and multitrunked

FIELD CLASS. FINAL CLASS.

Arpend = *Arabis pendulina*

LOCATION RP-2 DATE 5/8/89
 PHOTO NO. 25 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind
Juos	5	5	3								
Pied	5	5	3		fldpl	sds1			sds1	cliff	Talus
Yuba	2	2	1								
Pust	2	3	1								
~~Secy~~	2	3	1								
Peli	2	2	1								
Bogr	4	2	3								
~~Secy~~	1	2	1								
Gusa	1	2	1								
Pofe	2	2	1								
Lein	2	2	2								
Jumo	2	4	1								

SLOPE				DISSECT.				ELEV.			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION <u></u> 45 % GRAVEL										
	TEXTURE <u>silt/rock</u> 60 % ROCK										

NOTES Heavy browsing of rosaceous shrubs

FIELD CLASS. FINAL CLASS.

LOCATION RP-3 Walnut Canyon NW 1/4 of ~~S~~ postland Sec. 31 ca 200 m S of bdy fence DATE 5/9/89
 PHOTO NO. 26 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pipo	5	5	3								Talus		
Pied	5	5	3		fldpl	sds1			sds1	cliff			
Juos	5	5	2										
Peli	3	1	2	SLOPE				DISSECT.			ELEV. 6665		
Lein	2	1	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Eriogsp	1	2	1	LITHOL									
Bogr	3	2	1	SOILS	FORMATION					% GRAVEL			
Arfe	2	2	1		TEXTURE <i>sandy rocky sandstone</i>					% ROCK			
Opmac	1	2	1	NOTES <i>Heavy elk use</i>									
Pofe	2	2	1										
Quga	1	2	1										
Arpend	1	2	1	FIELD CLASS.									FINAL CLASS.

LOCATION RP-4 WCNM, side canyon just inside NW cor. of priv. land DATE 5/9/89
 PHOTO NO. 27 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pofe	5	2	4								Talus		
Pipo	5	5	2		fldpl	sds1			sds1	cliff			
Pied	5	5	3	SLOPE				DISSECT.			ELEV. 6580		
Juos	5	5	2	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Jumo	3	5	1	LITHOL									
Yuba	3	2	2	SOILS	FORMATION					% GRAVEL			
Bricsp.	2	2	1		TEXTURE <i>rocky, limestone</i>					% ROCK			
Ch mi	1	2	1	NOTES									
Arln	3	1	2										
Arperen	1	2	1										
Pensp.1	1	2	1	FIELD CLASS.									FINAL CLASS.
Chr vil	2	2	1										
Peli	2	2	1										
Thal sp.	1	2	1										
Cas ch	1	2	1										
Quga	3	3	1										
Les int	1	2	1										
Pensp.2	1	2	1										
Bogr	2	2	1										
P. 4	2	2	1										

LOCATION RP-7 WCNM Canyon bottom ca 400m above dam DATE 5/9/89
 PHOTO NO. 30/dam just around corner JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind	
Arbu	5	2	3		chnl						Talus	
Cheno sp.							midsl	ridge				
Ver th	2	2	1		fldpl	sds			sds	cliff		
Unk grass	4	2	2									
Elg	4	2	2									
-Elg can												
				SLOPE				DISSECT.				ELEV. 6270
ASPECT				SW	S	W	SE	LEV	NW	E	N	(NE)
LITHOL												
SOILS				FORMATION						0% GRAVEL		
				TEXTURE deep sand & organic matter						0% ROCK (occasional boulder)		
NOTES Cattle present. Salsola common												
P. ...												
FIELD CLASS.						FINAL CLASS.						

LOCATION RP-8 - north-facing slope near dam DATE 5/9/89
 PHOTO NO. 31 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind	
Quge	5	4	6		chnl						Talus	
Ptan	2	3	2				midsl	ridge				
Sym sp.	2	2	1		fldpl	sds			sds	cliff		
Po fe	1	2	1									
Ber rep	3	2	1									
Rone	1	3	1									
				SLOPE				DISSECT.				ELEV. 6350
ASPECT				SW	S	W	SE	LEV	NW	E	(N)	NE
LITHOL												
SOILS				FORMATION						% GRAVEL		
				TEXTURE Rocky limestone						% ROCK		
NOTES Many trees & shrubs hard hit by caterpillars												

LOCATION UCNM RP-5 DATE 5/9/89
 PHOTO NO. 25 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Juno	5	5	2		chnl	intfl			intfl	terr	
Pied	5	5	2		fldpl	sds	midsl	ridge	sds	cliff	Talus
Yuba	3	3	2								
Chmi	2	3	1								
Pole	4	2	3								
Sym sp.	2	2									
Eriog sp.	2	2	1								
Bogr	2	2	1								
Gusa	3	2	2								
Berhae	1	3	1								
Bric sp.	2	3	1								
Cer bet	2	3	1								
Ar lu	3	2	2								
Chr vil	3	2	2								
Op mac	2	2	1								
Son ~~sp~~	1	2	1								
Ech tri	1	2	1								
Boc u	1	2	1								
Pet caes	1	2	1								
Lesint	1	2	1								

SLOPE				DISSECT.				ELEV. 6500			
ASPECT	SW	S	W	SE	LEV	NW	(E)	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <i>Rocky limestone</i>								% ROCK		
NOTES											
FIELD CLASS.						FINAL CLASS.					

LOCATION RP-6 UCNM Side Canyon from N just above dam DATE 5/9/89
 PHOTO NO. 29 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Sam neo	1	3	1		chnl	intfl			intfl	terr	
Yuba	3	2	1		fldpl	sds	midsl	ridge	sds	cliff	Talus
Sym sp.	5	2	3								
Chmi	4	3	1								
Eriog sp.	3	2	1								
Ar lu	3	2	3								
Pt ang	2	3	1								
Ribes sp.	3	3	2								
Pet caes	2	1	1								
Sph sp.	1	2	1								
Bric sp.	3	2	2								
Acne	4	5	1								
Behae	3	3	2								

SLOPE				DISSECT.				ELEV. 6440			
ASPECT	SW	S	W	(SE)	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <i>rocky, some gravel in wash bed</i>								% ROCK		
NOTES <i>Bro Tec LLC</i>											
FIELD CLASS.						FINAL CLASS.					

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl	lowsl	ups1	Plat	Rock	Cind	
Juno	4	4	2		chnl	intfl			intfl	terr		
Pied	5	4	3		fldpl	sds1	midsl	ridge	sds1	cliff	Talus	
Gusa	3	2	1									
Pote	4	2	3	SLOPE				DISSECT.			ELEV. 6500	
Secy	2	2	1	ASPECT	SW	S	W	SE	LEV	NW	E	
Yuba	1	2	1	LITHOL								
Ory sp.	1	2	1	SOILS	FORMATION						% GRAVEL	
Cry jam	1	2	1		TEXTURE <i>Rocky limestone</i>						% ROCK	
Eriog sp.	1	2	1	NOTES								
Pen sp. 2	2	2	1									
Phl aus	2	2	1									
Tetra? sp.	2	2	2									
Les int	1	2	1									
Pen sp. 1	2	2	1									
Gal sp.	1	2	1									
Petcae	2	2	1									
Sym sp.	2	2	1									
Art sp.	1	2	1									
Rhtr	1	2	1	FIELD CLASS.				FINAL CLASS.				
Ch mi	1	2	1									
Rone	1	2	1									

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl	lowsl	ups1	Plat	Rock	Cind	
Pied	5	4	3		chnl	intfl			intfl	terr		
Juno	2	4	1		fldpl	sds1	midsl	ridge	sds1	cliff	Talus	
Sym sp.	4	2	3									
Bere	3	1	2	SLOPE				DISSECT.			ELEV.	
Valer sp.	3	1	2	ASPECT	SW	S	W	SE	LEV	NW	E	
Pote	4	2	3	LITHOL								
Gal sp.	2	2	1	SOILS	FORMATION						% GRAVEL	
Arhl	3	2	2		TEXTURE <i>rocky limestone</i>						% ROCK	
Pen sp. 1	2	2	1	NOTES								
Tetra? sp.	2	2	1									
Rhtr	1	2	1									
Quga	1	3	1									
Phan	2	1	2									
Brom sp.	2	2	1									
Hem sp.	1	2	1									
Yuba	1	2	1									
Cir sp.	1	2	1									
Secy	1	2	1									
Gusa	1	2	1	FIELD CLASS.				FINAL CLASS.				

LOCATION RP-11 above s-rim DATE 5/9/89
 PHOTO NO. 34 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind	
Pied	5	4	3									
Juno	4	4	2									
Past	5	3	3		fldpl	sds		ridge	sds	cliff	Talus	
Gusa	4	4	2									
Bog	4	2	2									
Lesint	2	1	1									
Yuma	1	1	1									
Gusa	1	2	1									
				SLOPE			DISSECT.			ELEV. 6630		
ASPECT				SW	S	W	SE	LEV	NW	E	N	NE
LITHOL												
SOILS				FORMATION						% GRAVEL		
				TEXTURE <i>about even between sand-gravel-rolls</i>						% ROCK		
NOTES <i>Heavy elk & deer use, Past severely browsed</i>												
FIELD CLASS.						FINAL CLASS.						

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LOCATION RP-12 NE-facing slope head of small side canyon DATE 5/9/89
 PHOTO NO. 35 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind	
Psme	5	5	2									
Pied	5	5	3									
Joss	3	5	2		fldpl	sds		ridge	sds	cliff	Talus	
Sym sp.	5	2	3									
Guga	3	4	2									
Pofe	5	2	3									
Ptan	3	3	1									
Arlu	3	2	2									
Ame sp.	4	3	2									
Eriog. sp.	2	2	1									
Pet cae	2	1	1									
Chmi	1	3	1									
Yuba	1	3	1									
Bene	2	1	1									
				SLOPE			DISSECT.			ELEV. 6560		
ASPECT				SW	S	W	SE	LEV	NW	E	N	NE
LITHOL												
SOILS				FORMATION						% GRAVEL		
				TEXTURE <i>Rocky limestone</i>						% ROCK		
NOTES												
FIELD CLASS.						FINAL CLASS.						

LOCATION RP-13 N-facing slope of S-rim DATE 5/9/89
 PHOTO NO. 36 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Psmc	5	5	4										
Jusc	2	4	1										
Qua	3	4	2		fldpl	sds			sds	cliff	Talus		
Sym sp.	4	2	3	SLOPE				DISSECT.			ELEV. 6500		
Ery sp.	2	2	1	ASPECT	SW	S	W	SE	LEV	NW	E	(N)	NE
Chmi	2	2	1	LITHOL									
Ame sp.	3	3	2	FORMATION				% GRAVEL					
Juma	2	4	1	TEXTURE <u>Rocky limestone</u>				% ROCK					
Val sp.	3	1	2	NOTES									
Arta	3	2	1										
Ptan	3	3	2										
Tetra sp.	2	2	1										
Pied	2	4	1	FIELD CLASS.								FINAL CLASS.	

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LOCATION RP-14, canyon bottom but against the north slope DATE 5/9/89
 PHOTO NO. 3 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Qua	4	5	2										
Acra	5	5	3		(fldpl)	sds			sds	cliff	Talus		
Juma	4	5	1	SLOPE				DISSECT.			ELEV. 6300		
Ptan	3	3	2	ASPECT	SW	S	W	SE	LEV	NW	E	(N)	NE
Bromia	—	—	—	LITHOL									
Elgl	1	2	1	FORMATION				% GRAVEL					
Arta	3	2	2	TEXTURE <u>Occasional boulders, but mostly deep silty sand</u>				% ROCK					
Refus sp.	2	2	1	NOTES <u>Covers only the belt of rip wall adjacent to the drainage channel</u>									
Salsola	—	—	—										
Brotia	—	—	—										
Ve th	—	—	—										
Tox	1	3	1	FIELD CLASS.								FINAL CLASS.	
Thfen	—	—	—										
Elg can	3	2	2										

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Poan	5	5	4		(chnl)								
Elcan	5	3	4				midsl	ridge			Talus		
Rubus sp.	3	2	2		(fldpl)	sds1			sds1	cliff			
Ar lu	4	2	2	SLOPE				DISSECT.			ELEV.		
Thasp				ASPECT	SW	S	W	SE	LEV	(NW)	E	N	NE
Acne	3	4	2	LITHOL									
				SOILS	FORMATION					% GRAVEL			
					TEXTURE <u>deep sand</u>					% ROCK			
NOTES <u>Poan dominant in lower floodpl adj. to channel</u> <u>Acne dominant in upper floodpl. adj. to canyon slope</u>													
FIELD CLASS.						FINAL CLASS.							

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Puga	5	5	5										
Th fl					(fldpl)	sds1	midsl	ridge	sds1	cliff	Talus		
Bro rig.				SLOPE				DISSECT.			ELEV.		
Juma	2	4	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Ros sp.	4	3	5	LITHOL									
Carex sp.	2	2	1	SOILS	FORMATION					% GRAVEL			
Jusc	2	4	1		TEXTURE <u>some rock but mostly sand</u>					% ROCK			
Acne	2	4	1	NOTES									
rsme	2	4	1										
Cle lig	3	3	2										
Sum sp.	2	3	1										
Acne	2	3	1										
Pipo	1	5	1										
Vic sp.													
Achm													

LOCATION RP-17, Walnut Canyon Bottom DATE 5/9/89
 PHOTO NO. JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pean	5	5	3		chnl	intfl			intfl		
Acne	4	4	2				midsl	ridge			Talus
Cost	5	3	5		fldpl	sds1			sds1	cliff	
Rom	4	3	2								
Viar	4	3	2								
Quag	3	4	1								
Jusc	1	3	1								
Clelig	3	3	2								
Vic sp.	—	—	—								
Rosa sp.	3	3	1								
Ptan	2	3	1								
Juma	2	4	1								
Th fe	—	—	—								
Arbu	1	2	1								
Rub sp.	1	2	1								

SLOPE				DISSECT.				ELEV.			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											

SOILS	FORMATION	% GRAVEL
	TEXTURE	% ROCK

NOTES

FIELD CLASS. FINAL CLASS.

LOCATION RP-18 SSW-facing slope midway DATE 5/9/89
 PHOTO NO. JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Yuba	5	2	2		chnl	intfl			intfl		
Art sp.	5	2	3				midsl	ridge			Talus
Gusa	3	2	2		fldpl	sds1			sds1	cliff	
Brte	—	—	—								
Chvi	4	2	3								
Cela	4	2	3								
Sph sp.	3	2	2								
Alea	3	3	2								
Ectr	2	2	1								
Bogr	4	2	2								
Sing	3	2	1								
Berhae	1	3	1								
Astr sp.	2	2	1								

SLOPE				DISSECT.				ELEV. 6480			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											

SOILS	FORMATION	% GRAVEL
	TEXTURE <u>Rocky limestone</u>	% ROCK

NOTES

FIELD CLASS. FINAL CLASS.

LOCATION RP-19 Sec. 36 NW 1/4 of NW 1/4, above & ~ 200m from N rim DATE 5/10/89
 PHOTO NO. 9 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	5	2		chnl	intfl							
Juos	3	4	1				midsl	ridge			Talus		
Jumo	4	4	2		fldpl	sdsl			sdsl	cliff			
Bogr	4	2	2	SLOPE				DISSECT.			ELEV. 6630		
Peli	4	2	2	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Jusc	1	4	1	LITHOL									
Yuba	2	2	1	SOILS	FORMATION						% GRAVEL		
Oxla	2	2	1		TEXTURE Sandy, w/ some gravel & rock						% ROCK		
Opma	1	2	1	NOTES <i>Very heavy elk use</i>									
Pofe	3	2	1										

FIELD CLASS.

FINAL CLASS.

LOCATION RP-20 DATE 5/10/89
 PHOTO NO. 10 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	4	3		chnl	intfl							
Jumo	5	4	3				midsl	ridge			Talus		
Yuba	3	2	1		fldpl	sdsl			sdsl	cliff			
Bogr	4	2	2	SLOPE				DISSECT.			ELEV.		
Chri	3	2	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Cerbet	2	3	1	LITHOL									
Pofe	4	2	2	SOILS	FORMATION						% GRAVEL		
Gusa	2	2	1		TEXTURE <i>Rocky limestone</i>						% ROCK		
Bri sp.	2	2	1	NOTES									
Hed sp.	1	2	1										
Ectr	2	2	1										
Chmi	1	3	1										
Les int	1	2	1										
Phojun	1	1	1										

FIELD CLASS.

FINAL CLASS.

LOCATION RP-21DATE 5/10/89PHOTO NO. 11JOB CODE PS8802NAME FWP

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pied	5	4	3										
Juma	4	4	2								Talus		
Cebe	3	3	2		fldpl	sds1			sds1	cliff			
Gusa	2	2	1	SLOPE						DISSECT.		ELEV. 6380	
Yuba	3	2	2	ASPECT	(SW)	S	W	SE	LEV	NW	E	N	NE
Erio sp.	3	2	1	LITHOL									
Atca	1	3	1	SOILS	FORMATION						% GRAVEL		
Pote	3	2	1		TEXTURE <u>Rocky limestone</u>						% ROCK		
Bogr	4	2	2	NOTES									
Beha	1	3	1										
Cryjam	1	2	1										
FIELD CLASS.				FINAL CLASS.									

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LOCATION RP-22 - WC bottom very small Pote groveDATE 5/10/89PHOTO NO. 14JOB CODE PS8802NAME FWP

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Potr	4	5	2										
Co'st	5	3	5								Talus		
Sam sp.	3	3	2		fldpl	sds1			sds1	cliff			
Ptan	3	3	2	SLOPE						DISSECT.		ELEV. 6300	
Sym sp.	4	3	2	ASPECT	SW	S	W	SE	LEV	NW	E	N	(NE)
Ribes sp.	4	3	2	LITHOL									
Smic sp.	4	2	1	SOILS	FORMATION						% GRAVEL		
Jhfe	3	2	1		TEXTURE <u>Boulders & dead silty sand</u>						% ROCK		
Arln	3	2	1	NOTES									
Cle lig	3	3	2										
Rosa y	3	3	2										
Acne	3	3	2										
Jusc	2	4	1										
Sel. sp.	2	1	1										
Agtr	1	2	1										
Rus sp.	1	2	1										
Rone	3	3	1										
Pote	3	2	2										
Veth	3	2	1										
Apo sp.	2	2	1										
Ach mi	1	2	1										

LOCATION RP-23, NW facing slope of ravine DATE 5/10/89
 PHOTO NO. 15 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Psmc	5	5	3								
Quga	3	4	2				midsl	ridge			Talus
Pofc	4	2	3		fldpl	sds			sds	cliff	
Pipo	2	5	1								
Jusc	3	4	2								
Phlaug	4	1	2								
Bogr	3	2	1								
Gal sp.	2	1	1								
Arhu	3	2	2								
Eriola	3	2	1								
Sencyn	2	2	1								
Petr sp.	1	2	1								
Pensp. 1	3	2	1								
Ara per	3	2	1								
Ach mil	2	2	1								

SLOPE				DISSECT.				ELEV. 6450			
ASPECT	SW	S	W	SE	LEV	(NW)	E	N	NE		
LITHOL											

SOILS	FORMATION	% GRAVEL
	TEXTURE <u>Rocky limestone</u>	% ROCK

NOTES

FIELD CLASS.	FINAL CLASS.

LOCATION RP-25, south rim, ridgetop between two Wc side canyons DATE 5/10/89
 PHOTO NO. 17 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	4	5	2								
Pied	5	4	3				midsl	ridge			Talus
Juos	3	4	2		fldpl	sds			sds	cliff	
Quga	3	4	2								
Pofc	4	2	2								
Phojun	3	-	1								
Jumo	3	4	2								
Peli	3	2	1								
Bogr	3	2	2								
Hym lug	3	2	1								
Gusa	2	2	1								
Chrys sp.	2	3	1								
Prst	2	3	1								
Eriola	2	2	1								
Jusc	2	4	1								
Dxy lan	1	2	1								
Cony vivi	1	2	1								
Cela	1	2	1								
Ari fen	1	2	1								

SLOPE				DISSECT.				ELEV. 6690			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											

SOILS	FORMATION	% GRAVEL
	TEXTURE <u>Sandy, some rock, limestone</u>	% ROCK

NOTES

FIELD CLASS.	FINAL CLASS.

LOCATION RP-26DATE 5/10/89PHOTO NO. 18JOB CODE PS880ZNAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pipo	4	5	2										
Pied	4	4	3				midsl	ridge			Talus		
Jamo	3	4	2		fldpl	sds			sds	cliff			
Quga	3	4	2	SLOPE				DISSECT.			ELEV.		
Bogr	4	2	2	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Pust	3	2	2	LITHOL									
Gusa	3	2	1	SOILS	FORMATION						% GRAVEL		
Cebe	2	3	1		TEXTURE <i>Sandy, with limestone</i>						% ROCK		
Hym lug	3	2	1	NOTES									
Les int	3	2	1										
Erio ala	3	2	1										
Hym acan	3	2	1										
Pofe	1	2	1										
Cry jam	1	2	1										
Eris div	1	2	1										
Peli	2	2	1										
Pen sp. 1	3	2	1										
Cer lan	2	2	1										
Phl ans	2	2	1	FIELD CLASS.									
Cas int	1	2	1	FINAL CLASS.									

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LOCATION RP-24DATE 5/10/89PHOTO NO. 16JOB CODE PS880ZNAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pipo	5	5	3										
Quga	5	4	3				midsl	ridge			Talus		
Pofe	4	2	2		fldpl	sds			sds	cliff			
Bere	3	1	1	SLOPE				DISSECT.			ELEV. 6600		
Yuba	2	2	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Jusc	2	4	1	LITHOL									
Cela	2	2	1	SOILS	FORMATION						% GRAVEL		
Arln	3	2	2		TEXTURE						% ROCK		
Cirs sp.	2	2	1	NOTES									
Phl ans	2	1	1										
Hym lug	3	2	1										
Ast sp. 1	3	1	1										
Soli cf. spar	3	2	1	Ast. sp. 1 = small astr. w/ many leaflets, flrs. purplish									
Ast. sp. 2	1	1	1	Ast. sp. 2 = smaller astr. w/ few ^{acuminate} leaflets & all herbage senescent flrs. yellowish									
				FIELD CLASS.									
				FINAL CLASS.									

LOCATION RP-27 - W-facing slope DATE 5/10/89
 PHOTO NO. 19 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	4	4										
Juos	4	4	2				midsl	ridge			Talus		
Jusc	4	4	3		fldpl	sdsl			sdsl	cliff			
Bogr	4	2	2	SLOPE				DISSECT.			ELEV.		
Pensp. 1	3	2	1	ASPECT	SW	S	(W)	SE	LEV	NW	E	N	NE
Phlans	3	2	2	LITHOL									
Yuba	3	2	1	SOILS	FORMATION						% GRAVEL		
Pofe	4	2	3		TEXTURE <u>Rocky limestone</u>						% ROCK		
Pet. cae	2	1	1	NOTES									
Bri sp.	2	2	1										
Ch mi	1	3	1										
Pipo	2	5	1										
Les int	2	1	1										
Hed sp.	1	2	1										
Cebel	2	3	1	FIELD CLASS.									
Cry jan	2	2	1	FINAL CLASS.									
Rhtr	1	3	1										

LOCATION RP-28, side canyon bottom DATE 5/10/89
 PHOTO NO. 20 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pome	4	5	2										
Pipo	4	5	3				midsl	ridge			Talus		
Pied	2	4	1		fldpl	sdsl			sdsl	cliff			
Jusc	4	4	3	SLOPE				DISSECT.			ELEV. <u>6500</u>		
Rome	3	3	2	ASPECT	SW	S	W	SE	LEV	NW	E	(N)	NE
Quga	4	4	2	LITHOL									
Pofe	4	2	3	SOILS	FORMATION						% GRAVEL		
Cle lig	3	2	1		TEXTURE <u>Rocky limestone</u>						% ROCK		
Tha feu	1	3	1	NOTES									
Litho sp.	2	2	1										
Yuba	1	3	1										
Sym sp.	2	3	1										
Arhu	2	2	1										
Geran sp.	2	2	1										
Valer sp.	3	2	2	FIELD CLASS.									
Smil sp.	3	2	1	FINAL CLASS.									
rand sp.	1	3	1										
Ast sp. 2	2	2	1										

LOCATION RP-29 DATE 5/10/89
 PHOTO NO. 21 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind Talus	
Psmc	5	5	4									
Pip0	5	5	3									
Jusc	5	4	3		fldpl	sds1			sds1	cliff		
Qusa	5	4	4									
Rone	3	3	2									
Sym sp.	3	2	2									
Pensp. 1	1	2	1									
Ptan	2	3	1									
Par ins	2	3	1									
Tha fem	-	-	-									
Pofe	2	2	1									
Ch mi	2	3	1									
				SLOPE		DISSECT.				ELEV. <u>6440</u>		
ASPECT				SW	S	W	SE	LEV	NW	E	N	(NE)
LITHOL												
SOILS				FORMATION						% GRAVEL		
				TEXTURE <u>Rocky limestone</u>						% ROCK		
NOTES												
FIELD CLASS.						FINAL CLASS.						

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LOCATION RP-30 DATE 5/10/89
 PHOTO NO. 22 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind Talus	
Qusa	5	4	6									
Jusc	4	4	3									
Juos	2	4	1		fldpl	sds1			sds1	cliff		
Pofe	3	2	2									
Pensp. 1	3	2	1									
Bri sp.	3	2	1									
Vig. sp.	2	2	1									
Yaba	2	2	1									
Sym sp.	3	2	3									
				SLOPE		DISSECT.				ELEV. <u>6390</u>		
ASPECT				SW	S	W	SE	LEV	NW	(E)	N	NE
LITHOL												
SOILS				FORMATION						% GRAVEL		
				TEXTURE <u>Rocky limestone</u>						% ROCK		
NOTES												
FIELD CLASS.						FINAL CLASS.						

LOCATION RP-31 DATE 5/10/89
 PHOTO NO. 23 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind Talus
Ache	4	5	2		chnl	intfl					
Guga	3	4	1								
Arln	5	2	4		fldpl	sds1			sds1	cliff	
Ardr	3	2	2								
Rub sp.	3	2	2								
Ely can	3	2	2								
Acni	3	2	1								
Brotes	-	-	-								
Sph sp.	3	2	1								
Sisy sp.	-	-	-								
Lypa	2	2	1								
Iri mis	2	2	1								
Mar vul	3	2	1								
Ast sp.	2	2	1								
Ros sp.	3	3	1								
Sym sp.	1	3	1								
Ven tha	-	-	-								
Ptan	2	3	1								
Urtica sp.	1	2	1								
Els1	1	2	1								

SLOPE				DISSECT.				ELEV.			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION						% GRAVEL				
	TEXTURE						% ROCK				
NOTES											
FIELD CLASS.											
FINAL CLASS.											

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-33 & WCB → Must be WCB not WC2 DATE 5/10/89
 PHOTO NO. 25 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind Talus
Pied	4	4	2		chnl	intfl					
Juos	2	4	1								
Jusc	2	4	1		fldpl	sds1			sds1	cliff	
Yuba	3	2	2								
Ep vi	3	2	1								
Erio sp.	3	2	2								
Arln	3	2	2								
Les int	2	2	1								
Art sp.	3	2	2								
Gusa	2	2	1								
Cebe	2	3	1								
Ery jan	2	2	1								
Bogr	4	2	2								
Guga	1	3	1								
Behae	1	3	1								
Ast sp.	1	2	1								
Phlans	2	1	1								
Pofe	4	2	2								
Bri sp.	2	2	1								
Si hy	1	2	1								

SLOPE				DISSECT.				ELEV. 6450			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION						% GRAVEL				
	TEXTURE Rocky limestone						% ROCK				
NOTES											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP-34 ca 500m ENR of IC Parking area DATE 5/15/89
 PHOTO NO. 26 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	E	3										
Jumbo	2	E	1				midsl	ridge			Talus		
Juos	4	E	2		fldpl	sds1			sds1	cliff			
Bogr	4	A	2										
Euph. sp	2	A	1										
Peli	3	A	1										
Hymnus	3	A	1										
Opma	1	A	1										
Quga	1	A	1										
Pust	2	B	1										
Pen sp. 1	2	A	1										
				SLOPE		DISSECT.				ELEV.			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS	FORMATION <u>Limestone</u>					% GRAVEL			
					TEXTURE <u>Sand, gravel, rock</u>					% ROCK			
				NOTES <u>Some light cinders on soil surface & doubtless mixed sparsely below</u>									
				FIELD CLASS.				FINAL CLASS.					

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LOCATION RP-35 ca 200m NE of VC Parking Area DATE 5/15/89
 PHOTO NO. 27 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pipo	2	F	2										
Pied	5	E	4				midsl	ridge			Talus		
Juos	5	E	3		fldpl	sds1			sds1	cliff			
Quga	2	D	1										
Bogr	4	A	2										
Peli	3	A	1										
Pofe	4	A	2										
Opma	1	A	1										
Eriog. sp	3	A	1										
Pust	2	A	1										
				SLOPE		DISSECT.				ELEV. <u>6710</u>			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS	FORMATION <u>Limestone</u>					% GRAVEL			
					TEXTURE <u>Predom. sand, but lot of rock & gravel, some cinder</u>					% ROCK			
				NOTES									
				FIELD CLASS.				FINAL CLASS.					

LOCATION RP-36 DATE 5/15/89
 PHOTO NO. 28 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	E	3										
Jumbo	3	E	1										
Cebe	3	C	1		fldpl	sds1	midsl	ridge	sds1	cliff	Talus		
Yuba	3	C	2										
Cor viv	3	A	1										
Pofe	3	A	2										
Bogr	4	A	2										
Les int	3	A	1										
Gusa	3	A	1										
Hym hy.	3	A	1										
Hym aca	3	A	1										
Pust	3	B	2										
Gil ass	3	A	1										
Qusa	1	A	1										
Chr vil	3	A	1										
Sen cgn	2	A	1										
Pho jun	3	-	1										
Juos	4	E	2										
				SLOPE		DISSECT.				ELEV. 6650			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS	FORMATION						% GRAVEL		
				TEXTURE <i>light dusting of cinders</i>						% ROCK			
				NOTES									
				FIELD CLASS.						FINAL CLASS.			

 LOCATION RP-37 in ravine bottom DATE 5/15/89
 PHOTO NO. 29 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Jusc	5	E	5										
Pied	4	E	2										
Qusa	4	E	3		fldpl	sds1	midsl	ridge	sds1	cliff	Talus		
Yuba	3	B	1										
Thafen	-	-	-										
Broris	-	-	-										
Pens p.2	3	A	1										
Pofe	4	A	2										
Juos	3	E	2										
Peli	2	A	1										
Ar lu	3	A	1										
Pha may	2	A	1										
Ber hae	2	C	1										
Cha mil	2	C	1										
Bri sp.	3	B	1										
Chr vil	3	A	2										
Les int	3	A	1										
Erios sp.	2	B	1										
Ech tri	1	A	1										
Ier tha	1	A	1										
Pso sp.	1	A	1										
				SLOPE		DISSECT.				ELEV. 6550			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS	FORMATION						% GRAVEL		
				TEXTURE <i>Rocky, gravelly limestone</i>						% ROCK			
				NOTES									
				FIELD CLASS.						FINAL CLASS.			

LOCATION RP-38 DATE 5/15/89
 PHOTO NO. 30 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pied	5	E	4										
Juno	5	E	3								Talus		
Bogr	4	A	2		fldpl	sds1			sds1	cliff			
Hymaca	3	A	1	SLOPE				DISSECT.			ELEV. 6500		
Gusa	2	A	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Pofe	4	A	2	LITHOL									
Yuba	3	B	1	SOILS				FORMATION			% GRAVEL		
Bri sp.	3	B	2					Rocky					
Ber hae	2	B	1					TEXTURE			% ROCK		
Pensp. 1	3	A	1					limestone					
Hym lug	2	A	1	NOTES									
Hed sp.	2	A	1										
Quga	3	B	1										
Arku	3	A	1										
Cha mil	1	C	1										
Ara pend	1	A	1										
Les int	2	A	1	FIELD CLASS.								FINAL CLASS.	

LOCATION RP-39 @ WC1 DATE 5/15/89
 PHOTO NO. 31 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pied	5	E	4										
Bogr	5	A	2								Talus		
Les int	3	A	1		fldpl	sds1			sds1	cliff			
Peli	3	A	1	SLOPE				DISSECT.			ELEV. 6640		
Hym lug	3	A	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Yuba	3	B	1	LITHOL									
Ber hae	2	C	1	SOILS				FORMATION			% GRAVEL		
Juno	3	E	1					Rocky					
Pofe	3	A	1					TEXTURE			% ROCK		
Eriog sp.	2	A	1					limestone w/ sand & gravel					
Sihy	1	A	1	NOTES									
Pust	1	A	1										
Hymaca	1	A	1										
FIELD CLASS.				FINAL CLASS.									

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LOCATION RP-40 DATE 5/15/89
 PHOTO NO. 32 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pied	5	E	3		chnl	intfl			intfl	terr	Talus		
Juno	4	E	2		fldpl	sds	midsl	ridge	sds	cliff			
Qua	2	D	1										
Pote	3	A	1										
Bogr	4	A	2										
Peli	4	A	2										
Opma	3	A	1										
Op sp.	1	A	1										
Oxylan	3	A	1										
Erios sp.	2	A	1										
Sen sun	1	A	1										
Ast. sp.	1	A	1										
				SLOPE		DISSECT.				ELEV.			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS		FORMATION				% GRAVEL			
						TEXTURE <i>Sandy gravelly, w/ some rock</i>				% ROCK			
				NOTES									
				FIELD CLASS.					FINAL CLASS.				

Little one

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-42, S-facing slope The Island DATE 5/14/89
 PHOTO NO. 1 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Berha	4	D	2		chnl	intfl			intfl	terr	Talus		
Cela	4	B	3		fldpl	sds	midsl	ridge	sds	cliff			
Bogr	4	A	2										
Ar dri	3	B	2										
Yuba	4	B	2										
Ep vi	3	B	2										
Art sp.	3	B	1										
Bri sp.	3	B	1										
Erio sp.	3	B	1										
Ast. sp.	3	A	1										
Ch le	2	A	1										
Ch mi	3	D	1										
Ech Tri	2	A	1										
Pet cae	2	A	1										
Sph sp.	2	A	1										
At ca	1	C	1										
				SLOPE		DISSECT.				ELEV. 6440			
				ASPECT	SW	(S)	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS		FORMATION				% GRAVEL			
						TEXTURE <i>Rocky limestone</i>				% ROCK			
				NOTES									
				<i>cut - lanata.</i>									
				FIELD CLASS.					FINAL CLASS.				

LOCATION RP-43 DATE 5/16/89
 PHOTO NO. 2 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Jusc	4	E	2										
Pied	2	E	1								Talus		
Yuba	4	B	2		fldpl	sds			sds	cliff			
Bogr	4	A	3	SLOPE				DISSECT.			ELEV. 6500		
Op ph	3	B	1	ASPECT	SW	S	W	SE	LEV	NW	(E)	N	NE
Ast. sp.	3	A	1	LITHOL									
Bri sp.	3	A	1	SOILS	FORMATION						% GRAVEL		
Erio sp.	3	A	1		TEXTURE <i>Rocky limestone</i>						% ROCK		
Pen sp. 1	2	A	1	NOTES									
Chr vil	3	A	1										
Art sp.	3	A	1										
Gusa	3	B	1										
Tha fen	1	-	1										
Cebe	2	C	1										
Juos	4	P	2										
Ber hau	3	C	1										
Rib sp.	2	C	1	FIELD CLASS. FINAL CLASS.									
Ep vi	2	B	1										
Cha mil	2	C	1										

*the big one * point-toothed*

LOCATION RP-44 DATE 5/18/89
 PHOTO NO. 0 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pied	4	E	2										
Jumo	2	E	1								Talus		
Jusc	4	E	2		fldpl	sds			sds	cliff			
Be fr	3	C	1	SLOPE				DISSECT.			ELEV. 6550		
Gusa	4	B	2	ASPECT	(SW)	S	W	SE	LEV	NW	E	N	NE
Cebe	3	C	1	LITHOL									
Art sp.	3	C	1	SOILS	FORMATION						% GRAVEL		
Gal sp.	1	A	1		TEXTURE <i>Rocky limestone</i>						% ROCK		
Pen sp. 1	3	A	2	NOTES									
Eri jon	4	B	2										
Eri flav	3	A	1										
Bogr	4	A	2										
Chr vil	3	A	1										
Cry jam	3	A	1										
Ast len	3	A	1										
Eph vir	4	B	2										
Sihy	3	A	1										
Yuba	4	B	2										
Ech Tri	1	A	1										
Ph ju	1	-	1										
Spo cry	1	B	1										
Bro rig	-	-	-										
Bro tee	-	-	-										

LOCATION RP-45 Walnut Canyon bottom DATE 5/18/89
 PHOTO NO. 1 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terr	Cind
Poan	4	F	3								
Acne	4	F	2								Talus
Rone	4	D	2		fldpl	sds			sds	cliff	
Viad	4	C	3								
Rosa sp.	4	D	3								
Cost	4	D	3								
Pain	2	C	1								
Pote	2	A	1								
Elca	2	B	1								
Heve	2	A	1								
VeTh	3	A	1								
Vicame	1	-	-								
Brorig	1	-	-								
Agel	3	A	1								
Set sp.	3	A	1								
Erig. sp.	3	A	1								
Mult sp.	2	A	1								
Arhu	2	A	1								
Ardr	1	B	1								
Smi rac	1	A	1								
Pensp. 2	2	A	1								

SLOPE				DISSECT.				ELEV. 6370			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION Sandstone & limestone								% GRAVEL		
	TEXTURE boulders with deep sandy soil between								% ROCK		
NOTES											
* Only on sandstone cliffs											
Δ The canyon bottom bunchgrass & the rock ledge grass											
FIELD CLASS.						FINAL CLASS.					

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-32 & WC DATE 5/10/89
 PHOTO NO. 24 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terr	Cind
Jusc	4	4	2								
Acne	3	4	1								Talus
Pipo	3	5	1		fldpl	sds			sds	cliff	
Rone	3	3	2								
Psme	2	4	1								
Quga	3	4	1								
Juos	2	4	1								
Spo con	5	2	3								
Iri mis	3	2	1								
Sen. sp.	3	2	1								
Sym sp.	2	3	1								
Viad	2	3	1								
Ptan	2	3	1								
Solid sp.	3	2	2								
Ros sp.	3	2	2								
Gerat sp.	1	2	1								
Indro saler	3	2	1								
Acni	3	2	1								
Ast sp. 2	1	2	1								
Apoc sp.	3	2	2								
Vegeth sp.	3	2	1								
Smi sp.	2	2	1								
Par mis	2	3	1								
ic sp.	1	1	1								
Arhu	2	2	1								
Ardr	2	2	1								
Ven thal	2	2	1								
Bogo	2	2	1								

SLOPE				DISSECT.				ELEV. 6300			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE Sand, rock, boulders								% ROCK		
NOTES											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP-41 Island Trail NNW-facing slope ca 30' above Loc. sandstone DATE 5/16/89
 PHOTO NO. 0 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind
Psme	5	F	2								
Quag	5	D	3								
Pied	3	E	1								
Pote	4	A	3								
~~Psme~~											
Vuba	3	B	2								
Sym sp.	4	B	3								
Pet cae	3	A	1								
Jusc	5	F	2								
Pen sp. 1	3	~~A~~	1								
Che fen	2	A	1								

SLOPE				DISSECT.				ELEV. 6500			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION <u>Rocky limestone</u>							% GRAVEL			
	TEXTURE							% ROCK			
NOTES											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP-46 - WC bottom aspen grove DATE _____
 PHOTO NO. _____ JOB CODE _____ NAME _____

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind
Potr	5	F	4								
Acne	4	E	2								
Juna	3	E	2								
Rone	4	D	2								
Cost	4	C	3								
Rosasp.	3	C	1								
Ascl. sp.	4	D	2								
Vian	3	C	1								
Sym sp.	2	B	1								
Sun rac	2	B	1								
Bro rig	3	B	1								
El ca	3	B	1								
Rub sp.	2	B	1								
Sen sp.	1	A	1								
Tha fen	1	A	1								
Vertha	1	A	1								

SLOPE				DISSECT.				ELEV. 6360			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION <u>A few limestone & sandstone</u>							% GRAVEL			
	TEXTURE <u>boulders, otherwise mostly deep sand with a thick cover of duff</u>							% ROCK			
NOTES											
* seems to be a lot of saplings											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP-47 Canyon bottom DATE 5/18/89
 PHOTO NO. 3 JOB CODE 158802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind
Acne	4	E	2								
Ardr	2	C	1								
Phoma	4	B	2		fldpl	sds1			sds1	cliff	Talus
Brotec	5	B	5								
Sensp.	2	B	1								
Pofe	3	B	1								
Tha fen	3	B	1								
Runcr	4	A	2								
Cirs sp.	2	B	1								
Elca	2	B	1								
Bro sp.	2	B	1								
Amb sp.	3	B	1								
Certica sp.	3	B	2								
Mentha sp.	2	B	1								
Vertha	2	A	1								

SLOPE				DISSECT.				ELEV. <u>6340</u>			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	Occasional boulders but										
	TEXTURE mostly deep sand with patches								% ROCK		
	of thick litter										
NOTES											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP48 & WCS DATE 5/18/89
 PHOTO NO. JOB CODE 158802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrcl	Cind
Psme	~~5~~ 5	F	3								
Qua	5	F	4								
Juma	2	D	1								
Jusc	2	D	1								
Sym sp.	5	C	4								
Yuba	3	B	1								
Pofe	3	A	2								
Ptan	3	D	1								
Sol of spa	3	A	1								
Acne	3	B	1								
Viar	3	B	1								
Viola sp.	2	A	1								
Ame uta	2	C	1								
Rone	2	C	1								
PRibas sp.	2	D	1								

SLOPE				DISSECT.				ELEV. <u>6330</u>			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	Rocky limestone with about equal										
	TEXTURE dead humus filled soil								% ROCK		
NOTES											
FIELD CLASS.											
FINAL CLASS.											

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-49 a few ft below Sinagua dwelling "NA 335" on wooden stake DATE 5/18/89
 PHOTO NO. 5 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Psme	4	F	2								Talus		
Jusc	4	E	3		fldpl	sds1			sds1	cliff			
Pied	3	D	1										
Jumo	1	E	1										
Sym sp.	4	B	3										
Yuba	3	B	1										
Pote	4	A	4										
Eph vir	3	B	1										
Arku	3	A	1										
Art dra	2	A	1										
Pen. sp. 1	2	A	1										
Chamil	1	B	1										
Bri sp.	1	B	1										
Bogr	2	A	1										
Pega	2	C	1										
Anneuta	1	C	1										
Bro rig	1	-	-										
Ech Tri	1	A	1										
				SLOPE		DISSECT.				ELEV. 6480			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS		FORMATION				% GRAVEL			
						TEXTURE <i>Rocky limestone</i>				% ROCK			
NOTES													
FIELD CLASS.													
FINAL CLASS.													

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-50 DATE 5/18/89
 PHOTO NO. 6 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl midsl	upsl ridge	Plat intfl	Rock terrc	Cind		
Pied	5	E	3								Talus		
Jumo	4	E	2										
Quga	3	D	1		fldpl	sds1			sds1	cliff			
Yuba	3	C	1										
Pote	4	A	4										
Bog	3	A	1										
Oxla	3	A	1										
Cor vir	3	A	1										
Opma	2	A	1										
Cebe	2	C	1										
Cry jam	3	A	1										
Hymaca	3	A	1										
Bri cal	1	B	1										
Operi? pha?	3	B	1										
Jusc	2	D	1										
Chrvil	3	A	1										
Hym ky	1	A	1										
Art dra	2	B	1										
Gusa	2	B	1										
Les int	2	A	1										
Pur sta	2	B	1										
				SLOPE		DISSECT.				ELEV. 6700			
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOILS		FORMATION				% GRAVEL			
						TEXTURE <i>Rocky limestone</i>				% ROCK			
NOTES													
FIELD CLASS.													
FINAL CLASS.													

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-51; at Sec. markers, 1/4 sec. bdy. between Secs. 26 & 35DATE 5/18/89PHOTO NO. 7 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	4	F	3						intfl		
Pied	4	E	2				midsl	ridge			Talus
Pote	4	A	3		fldpl	sds1			sds1	cliff	
Jumo	3	E	2								
Chry sp.	3	B	2								
Cube	2	C	1								
Bogr	3	A	2								
*Jude	2	A	1								
Chr vil	3	A	1								
Ox la	3	A	1								
Gil agg	2	A	1								
Hym lug	2	A	1								
Leucodermis sp.	1	A	1								
Cry jant	2	A	1								
Ericogonum	1	A	1								
Ph ju	3	-	1								
Jusc	3	E	2								

SLOPE				DISSECT.				ELEV. 6730			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE								% ROCK		
NOTES											

*no doubt about it

FIELD CLASS. FINAL CLASS.

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-52DATE 5/18/89PHOTO NO. 8 JOB CODE P58802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	5	F	4						intfl		
Quge	3	E	2				midsl	ridge			Talus
Pote	4	A	2		fldpl	sds1			sds1	cliff	
Ju05	3	E	1								
Jude	3	E	1								
Gusa	2	B	1								
Peli	3	A	1								
Eral	3	A	1								
Eris sp.	3	A	1								
Sihy	4	A	3								
Hylu	3	A	1								
Cirs sp.	3	A	1								
Ar lu	3	A	1								

SLOPE				DISSECT.				ELEV. 6750			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE								% ROCK		
NOTES											

LOCATION RP-53 at extreme SW corner at highest elev. in Park DATE 5/18/89
 PHOTO NO. 9 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
T. sp.	3	A	1								
Pipo	4	F	2								Talus
Quag	4	E	2		fldpl	sds1		ridge	sds1	cliff	
Jus	3	E	1								
Pote	4	A	2								
Sihy	4	A	2								
Hyming	3	A	1								
Peli	3	A	1								
Car int	3	A	1								
Eriolat	3	A	1								
Cirs sp.	2	A	1								
Hymenoxys	1	B	1								
Gusa	2	B	1								
Bogr	3	A	2								
Lot sp.	3	A	1								
Jusc	4	E	2								
Rone	2	C	1								
Cor viv	1	A	1								
Muh mon	2	A	1								
blep Tric	4	A	3								

SLOPE				DISSECT.				ELEV. 6830			
ASPECT	SW	S	W	SE	LEV	NW	E	(N)	NE		
LITHOL											
SOILS	FORMATION							% GRAVEL			
	TEXTURE <i>Deep sand with some rock & gravel</i>							% ROCK			
NOTES											
FIELD CLASS.					FINAL CLASS.						

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-54 DATE 5/18/89
 PHOTO NO. 10 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	4	F	3								
Psme	4	F	3								Talus
Jusc	4	E	3		fldpl	sds1		ridge	sds1	cliff	
Quag	3	D	2								
Pote	4	A	3								
Pen sp. 1	1	A	1								
Hymaea	3	A	1								
Pursta	1	C	1								
Phlaus	3	A	2								
Cirs sp.	3	A	1								
Yuba	1	A	1								
Soli Spar	2	A	1								
Litho sp.	1	A	1								
Ame uta	3	C	1								
San min	2	A	1								
Gusa	1	B	1								
Astr sp. (little one)	1	A	1								

SLOPE				DISSECT.				ELEV. 6700			
ASPECT	SW	S	(W)	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION							% GRAVEL			
	TEXTURE <i>Reddy limestone</i>							% ROCK			
NOTES											
FIELD CLASS.					FINAL CLASS.						

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pip	4	F	3								
Psme	4	F	3								
Quga	4	E	3		fldpl	sds1	midsl	ridge	sds1	cliff	Talus
Pofe	4	A	2								
Sym sp.	3	B	2								
Jusc	3	E	2								
Rone	3	D	1								
Valer sp.	3	A	2								
Hem sp.	2	A	1								
Cebe	1	C	1								
Ber rep	3	A	1								
Lith sp.	1	A	1								

SLOPE				DISSECT.				ELEV. 6550			
ASPECT	SW	S	W	SE	LEV	NW	E	(N)	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <i>Rocky limestone</i>								% ROCK		
NOTES											
FIELD CLASS.											
FINAL CLASS.											

* yellow flrs.

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	5	F	3								
Quga	4	E	2								
Jude	3	E	1		fldpl	sds1	midsl	ridge	sds1	cliff	Talus
Juos	3	E	1								
Jusc	1	E	1								
Bogr	4	A	3								
Peli	3	A	2								
Gusa	2	B	1								
Eriosp.	3	A	1								
Eriosp. ala	3	A	1								
Sihy	4	A	2								
Cirs sp.	3	A	1								
Opma	1	A	1								
Muhl cf mon	3	A	1								
Asclapri	1	A	1								
Pofe	3	A	1								

SLOPE				DISSECT.				ELEV. 6800			
ASPECT	SW	S	W	SE	(LEV)	NW	E	N	(NE)		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <i>Sandy with some rock & gravel; limestone</i>								% ROCK		
NOTES <i>Obvious evidence of a cool-burning ground fire through here ca 2-5 yrs ago. Fire involved few, if any, standing trees</i>											
FIELD CLASS.											
FINAL CLASS.											

LOCATION RP-57 DATE 5/19/89
 PHOTO NO. 13 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pipo	4	F	3								
Quaga	4	E	2								
Jude	3	E	1		fldpl	sds1	midsl	ridge	sds1	cliff	Talus
Pied	2	E	1								
Jusc	2	E	1								
Bogr	4	A	2								
Pofe	3	A	1								
Sihy	4	A	2								
Peli	3	A	1								
Eri rac	3	A	1								
Tet can	3	A	1								
Muhl of mon	4	A	2								
Pust	3	B	1								
Gusa	2	B	1								
Erios sp	2	A	1								
Cirs. sp.	3	A	1								
Hy m liz	2	A	1								
Chr vil	3	A	1								
Eri ala	1	A	1								
Cor viv	1	A	1								

SLOPE				DISSECT.				ELEV. <u>6760</u>			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <u>Sandy with some gravel & rocky limestone</u>								% ROCK		
NOTES <u>No evidence of a recent fire in here</u>											
<u>Note: all Eri ala of previous RPs should be changed to Eri rac</u>											
FIELD CLASS.					FINAL CLASS.						

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-58 DATE 5/19/89
 PHOTO NO. 14 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pied	4	E	2								
Jusc	4	E	2								
Cebe	2	C	1		fldpl	sds1	midsl	ridge	sds1	cliff	Talus
Yuba	3	B	2								
Berfre	3	C	1								
Gusa	2	B	1								
Pofe	4	A	3								
Bogr	3	A	1								
Jumo	2	E	1								
Chmi	2	C	1								
Bri sp.	3	C	1								
Pipo	1	D	1								
Sen cyn	2	A	1								
Peli	2	A	1								
Hed sp.	1	A	1								
Pen sp.1	1	A	1								

SLOPE				DISSECT.				ELEV. <u>6600</u>			
ASPECT	SW	S	W	SE	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <u>Rocky limestone</u>								% ROCK		
NOTES											
FIELD CLASS.					FINAL CLASS.						

LOCATION RP-59 also NC4 DATE 5/19/89
 PHOTO NO. 15 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pied	2	E	1								
Juos	3	E	2								
Yusa	4	B	3		fldpl	sds1		ridge	sds1	cliff	Talus
Epri	3	C	1								
Opph	1	C	1								
Cebe	3	C	2								
Pofe	4	A	2								
Bogr	4	A	2								
Art fri	4	B	2								
Chr vil	4	B	2								
Ectr	3	A	1								
Bri sp.	3	B	1								
Eri jon	3	B	1								
Art sp.	3	B	1								
Sph sp.	3	B	1								
Gusa	2	B	1								
Chmi	3	C	1								
Ber fre	3	D	1								
Ast len	1	A	1								
Lypa	1	C	1								
Muhl efmon	3	A	1								

SLOPE				DISSECT.				ELEV. <u>6550</u>			
ASPECT	SW	S	W	(SE)	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <u>Rocky limestone</u> <u>bedrock</u>								% ROCK		
NOTES											
<i>Judging by Toyce (1976) its possible that everything I have called Art dro is actually Art fri; will make the change from now on</i>											
FIELD CLASS.					FINAL CLASS.						

F.W. REICHENBACHER & ASSOCIATES -- U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION RP-60 & WC3 DATE 5/19/89
 PHOTO NO. 16 JOB CODE PS8802 NAME FWR

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind
Pied	5	E	3								
Juos	4	E	2								
Yusa	2	B	1		fldpl	sds1		ridge	sds1	cliff	Talus
Cebe	1	C	1								
Pust	3	C	2								
Tawstr	2	A	1								
Ericogum	1	A	1								
Gusa	2	B	1								
Bogr	4	A	2								
Pofe	4	A	3								
Cor vir	2	A	1								
Gilass	2	A	1								
Sily	2	A	1								
Opma	2	A	1								
Les int	3	A	1								
Sen cyn	1	A	1								
Jude	2	E	1								
Pipo	1	E	1								
Chail	2	A	1								
Ber fre	2	C	1								
Hyming	2	A	1								
Rhtn	1	C	1								
Peli	1	A	1								

SLOPE				DISSECT.				ELEV. <u>6710</u>			
ASPECT	SW	S	W	(SE)	LEV	NW	E	N	NE		
LITHOL											
SOILS	FORMATION								% GRAVEL		
	TEXTURE <u>Rocky limestone</u> <u>cobbles</u>								% ROCK		
NOTES											
FIELD CLASS.					FINAL CLASS.						

LOCATION R7-61DATE 5/19/89PHOTO NO. 17JOB CODE P58802NAME Fwr

SPECIES	PROM	HT	COVER	LAND FORM	Drn chnl	Val fl intfl	lowsl	upsl	Plat intfl	Rock terrc	Cind		
Pipo	4	F	3										
Quaga	4	D	3				midsl	ridge			Talus		
Jusc	4	E	2		fldpl	sds1			sds1	cliff			
Berrep	3	A	1										
Bri sp.	3	B	1	SLOPE			DISSECT.				ELEV. 6730		
Pot sp.	3	A	1	ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
Chry sp.	3	B	1	LITHOL									
Bo fe	3	A	2										
Cir sp.	3	A	1										
Toli spar	3	A	1										
Sihy	3	A	1	SOILS									
Lith mult	2	A	1										
Arku	2	A	1										
Hymnug	1	A	1										
Peh	1	A	1										
Rhtr	1	B	1										
Lot sp.	2	A	1										
She feci	1	A	1										
Chr vil	2	A	1										
				NOTES									
				FIELD CLASS.	FINAL CLASS.								

FORMATION

% GRAVEL

TEXTURE

Rocky limestone, deep

pine litter & more barren patches

ROCK

Walnut Canyon 1

WC1
May 24, 1989
0 c

(over classes
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 33	SP 34	SP 35	SP 36	SP 37	SP 38	SP 39
Bo	54	65	43					2	59	57	13		2
Hg	1	1	1					1	1	1		1	1
IP	1	5	3					24	7	11	15	16	6
Le	22	35	24					1	38	49	1	1	1
Ar	4	1	1							1			
Ru	1	1	1										
Re	1	1	1										
Jo	1			3		19	2	1	2		3	2	5
Ri	1			1		4	1	1	1		1	1	1
Tu	1					1	1	1	1		1	3	1
Ya	1					1							
Ce	1					1							
Be	1					1							
Pa	1					1							
Lo	1					1							
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Whitcomb Canyon
WC1
May 24, 1989

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

	SP 53	SP 54	SP 55	SP 56	SP 57	SP 58	SP 59	SP 60	SP 61	SP 62	SP 63	SP 64	SP 65
Bo	2	3	5	26	85	4	2	1	3	1	1	73	55
Lo	1	1	1	1	3	1	1	1	1	1	1	3	3
Po	22	3	2	9	8		2			7		24	24
Yp		1		1	1		1			1		1	
Ym			2	1		1	1			2			
Yb			4	1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
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Lb				1									
IP				1									
Po				1									
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Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
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IP				1									
Po				1									
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Yp				1									
Ym				1									
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Ed				1									
Lp				1									
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IP				1									
Po				1									
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Ym				1									
Yb				1									
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Lb				1									
IP				1									
Po				1									
Lo				1									
Yp				1									
Ym				1									
Yb				1									
Ed				1									
Lp				1									
Lm				1									
Lb				1									
IP				1									

Level	Class
1	0-5
2	5-20
3	20-40
4	40-60
	60-80
	80-95
	95-100

60-80
80-95
95-100

[illegible]

Walnut Canyon
WCI
May 24, 1989

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

	SP131	SP132	SP133	SP134	SP135	SP136	SP137	SP138	SP139	SP140	SP141	SP142	SP143
Bo	31	56	19	44	37	28	3	1	3				
IP	2	6	1	9	1	1	1						
Le	13	27	6	21	8	6	3						
Pe	1			1	1								
Re	1												
Pi													
Bo													
Bri													
Yu													
Se													
Qu													
Si													
Hq													
Bo	8												
Le	2												
IP	2												
Pi	1												

SP144

42

71

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1 1

Ground cover

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$N - W - \dots - Y - O - H$, $|| - || - W - N - S - H - W - || - || - Y$

[illegible]

WCI
Walnut Canyon
May 21, 1989

Ground cover

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

125
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R ---
BG 2 4 M M Y N - M M Y -
L 5 M Y 5 M Y - 5 M Y 5 M Y 5 M Y
3 - - - - - 1 - - - - - N - - -

98-1
11-2
2-3
1-11
2-13
3-2
4-1
5-1

[illegible]

WE #1 - from the fence in the dirt road (see map), walk ~~west~~ to the park boundary fence. A yellow flag is tied to the fence support — the ~~area~~ area (follow yellow flagging) is plot (Stake #1, flagged with yellow/blue & orange flagging) Blue

WLC 2
W21 W24 (2 copies)
M21, 25, 1009

Cover Classes

5
60-80
80-95
95-100

	D	C	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13
W1	4	1	8	1	8	1	8	1	6	2	9	2	13	1	1
W2	34	1	8	1	8	1	6	1	29	1	13	1	25	1	6
W3	17	1	6	4	2	6	2	9	7	2	25	1	12	7	3
W4	2	1	3	1	1	1	1	3	1	1	1	1	1	1	1
W5	1	1	3	1	1	1	1	3	1	1	1	1	1	1	1
W6	6	1	3	1	2	2	2	3	1	1	1	1	1	1	1
W7	11	1	3	1	1	1	1	1	1	1	1	1	1	1	1
W8	6	1	3	1	1	1	1	1	1	1	1	1	1	1	1
W9	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1
W10	3	1	3	1	1	1	1	1	1	1	1	1	1	1	1
W11	5	3	5	3	6	5	3	4	1	1	1	1	1	1	1
W12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
W20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Linaria delavayana

W18 100

2 3 3 2

-2 -3 -3 -4 -4

13 2 4 1 1 8 2 5 3

1 2 8 2

43 1 123 3 25 2 21 1

SP 12

60-80

80-95

95-100

W18 = Roanoke - herb w/ glaucous wh. leaf leaves & yellow flowers = Linaria delavayana

W18 = Roanoke - herb w/ glaucous wh. leaf leaves & yellow flowers = Linaria delavayana

W18 = Roanoke - herb w/ glaucous wh. leaf leaves & yellow flowers = Linaria delavayana

D C
SP 14 | SP 15 SP 16 D C
D C p and 2b c D C
SP 17 SP 18 D C
SP 19 SP 20 D C
SP 21 | SP 22 4g-6g
SP 23 SP 24 D C
SP 25 SP 26

21	1	6	1	16	1	7	1	4	1	43	1	6	1	1	16	1	6	1	20	1	31	1	1	1	
				64	2	112	3	132	2	72	1			23	1	17	1	28	1	152	3	264	4	29	1

[illegible][illegible]

8 1 4 1 1 3 2 1 0 0 1 4 1

[illegible]

1 1
1 4
2 3
5
1
2
2

decided to follow in head and by
at least three in the end

WC² Comp
M27 26, 1989

Comp classes

5 60-80
6 80-95
7 95-100

✓ V6	SP	201	3	50	1	81	1	15	1	21	1	6	1	4	1	16	1	29	1	50	1	76	2	13	1	63	1
✓ S3	SP	27	1	4	1	11	1	11	1	10	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Tr	SP	28	1	28	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Tr	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ AP	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ VSe	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Grisses	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Td	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Ar	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Le	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ P3	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ P3	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Ni	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Ar	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Qu	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ Cl	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1
✓ V6	SP	29	1	30	1	11	1	4	1	13	1	16	1	4	1	17	1	14	1	5	1	33	1	11	1	41	1

Cover classes

560-80
80-95
95-100

	SP40	SP41	SP42	SP43	SP44	SP45	SP46	SP47	SP48	SP49	SP50	SP51	SP52
SP40	3	75	23	101	76	192	102	9	3	54		13	46
SP41	1	2	2	79	8	57	10	1	1	3		1	2
SP42	3	2	2	2	1	4	6	2	3	1		1	1
SP43	1	2	1	3	3	2	1	1	1	1		1	1
SP44	1	2	1	1	1	1	1	1	1	1		1	1
SP45	1	2	1	1	1	1	1	1	1	1		1	1
SP46	1	2	1	1	1	1	1	1	1	1		1	1
SP47	1	2	1	1	1	1	1	1	1	1		1	1
SP48	1	2	1	1	1	1	1	1	1	1		1	1
SP49	1	2	1	1	1	1	1	1	1	1		1	1
SP50	1	2	1	1	1	1	1	1	1	1		1	1
SP51	1	2	1	1	1	1	1	1	1	1		1	1
SP52	1	2	1	1	1	1	1	1	1	1		1	1

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2075-2080
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[illegible]

Ground cover

1-37

Conor classes

1	6-5	5	60-80
2	5-20	6	80-95
3	20-40	7	95-100
4	40-60		

And sub plots

WC #2 Aug. 1988

# 25	# 24	# 23	# 22	
LH 1	LH 1	LH 1	LH 1	Rosa
XX LH 1	XX LH 1	XX LH 1	XX LH 1	monda
LH 1	LH 1	LH 1	LH 1	Bidos
XXXX	XXXX	XXXX	XXXX	Art. Ind
LH 1	LH 1	LH 1	LH 1	Art. drac.
LH 1	LH 1	LH 1	LH 1	Rhus dr.
LH 1	LH 1	LH 1	LH 1	Apocynum
LH 1	LH 1	LH 1	LH 1	Vicia
LH 1	LH 1	LH 1	LH 1	Rhusph
LH 1	LH 1	LH 1	LH 1	Achillea
LH 1	LH 1	LH 1	LH 1	Senecio #3
LH 1	LH 1	LH 1	LH 1	V. creper
LH 1	LH 1	LH 1	LH 1	Arizona group
LH 1	LH 1	LH 1	LH 1	Iris
LH 1	LH 1	LH 1	LH 1	Synphora
LH 1	LH 1	LH 1	LH 1	Falsaria
LH 1	LH 1	LH 1	LH 1	Oleaster
LH 1	LH 1	LH 1	LH 1	Desyden
LH 1	LH 1	LH 1	LH 1	Phacelia
LH 1	LH 1	LH 1	LH 1	Eug. divar
LH 1	LH 1	LH 1	LH 1	Cent. radio

W/C #2 Aug. 1983

#11

#12

#13

#14

#15

#16

Pass

Mounds

S. Ridge

Art. Loc

Art. Area

Atterh.

Geo. Spikes (see XX)

Pass

Program

Phacelia

Acacia

Acacia *

Citrus

Vicia

Senecio #2

Chus v. g. b.

Adiantum

Senecio #3

Thalictrum

Trachymedus

Trachymedus

Trachymedus

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Michael Cupron

DC 1113 Aug 22 1989

Cover Class
1=0-5 4 40-60 7 75
2 5-20 5 60-80
3 20-40 6 80-95

	SP14	SP15	SP16	SP17	SP18	SP19	SP20	SP21	SP22	SP23	SP24	SP25	SP26
br	7	5	14	19	24	23	21	13	20	20	14	11	2
sp	1	1	3	6	9	15	9	4	4	2	1	2	1
le													
Ar													
Fi													
Co													
Hg													
Se													

21

18

165

30-000000

4460

80-95

25.11.20

[illegible]

Waldman Livingston - WLS
7/24/88

D = Density
C = Cover Class

Cover Classes

1 = 0-5%
2 = 5-20%
3 = 20-40%
4 = 40-60%
5 = 60-80%
6 = 80-95%
7 = 95-100%

SP1 SP2 SP3 SP4 SP5 SP6

SP10 SP9 SP8 SP11 SP12

D C D C D C D C

D C D C D C D C

1 3 1 1 1 1

2 3 10 1 9 1 11 1

1 3 1 1 1 1

1 1 1 1 1 1 1 1

8 6 10 25 30%

1 1 1 1 1 1 1 1

1 3 1 1 1 1

1 1 1 1 1 1 1 1

1 3 1 1 1 1

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1 3 1 1 1 1

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1 3 1 1 1 1

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1 3 1 1 1 1

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1 3 1 1 1 1

1 1 1 1 1 1 1 1

1 3 1 1 1 1

1 1 1 1 1 1 1 1

1 3 1 1 1 1

1 1 1 1 1 1 1 1

1 3 1 1 1 1

1 1 1 1 1 1 1 1

Quadrat WC3 7/24-25/85

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Boa Teloua gracilis Erigeron species - white Ipomopsis sp. Gutierrezia microcephala Achillea millefolium Artemisia ludoviciana Eriogonum cf. ovalifolium Erigeron cf. divergens - white Quercus gambelii Pinus edulis Penstemon laevis - dark blue Parrya stanleyana Opuntia macrochiza Yucca baccata Coryphantha vivipara Berberis haenkeana - dark berry Gnaphalium sp. Juniperus monosperma Draba sp. Rhus trilobata																																																																																																			
Asclepias species Erigeron flagellaris																																																																																																			
Tree 4 Shrub data (2' x 1m & 1m D canopy) Whole Quad																																																																																																			
Pl 11 - looking NE at NW, HQ, NE side stream bed ground Pl 12 - looking SW at down E boundary WC3 Pl 13 - looking SW at Plot WC3 Pl 14 - same direction along subplot 50																																																																																																			
Trees with larger than 1' D at 1m excluded from subplots; shrubs with canopies 1m diam in any direction also excluded from subplots.																																																																																																			
1 = 0-5% 2 = 5-20% 3 = 20-40% 4 = 40-60%																																																																																																			
5 = 60-80% 6 = 80-95% 7 = 95-100%																																																																																																			

SP 64 25 100

WC-3

(COVER CLASS)

1: 0-5%

2: 5-20%

3: 20-40%

4 = 40-60%

5 = 60-80%

6 = 80-95%

7 = 95-100%

	SP 64	SP 66	SP 67	SP 75	SP 74	SP 73	SP 76	SP 77	SP 85	SP 84	SP 86	SP 87
SP 64	1	1	1	1	1	1	1	1	1	1	1	1
SP 66	1	1	1	1	1	1	1	1	1	1	1	1
SP 67	1	1	1	1	1	1	1	1	1	1	1	1
SP 75	1	1	1	1	1	1	1	1	1	1	1	1
SP 74	1	1	1	1	1	1	1	1	1	1	1	1
SP 73	1	1	1	1	1	1	1	1	1	1	1	1
SP 76	1	1	1	1	1	1	1	1	1	1	1	1
SP 77	1	1	1	1	1	1	1	1	1	1	1	1
SP 85	1	1	1	1	1	1	1	1	1	1	1	1
SP 84	1	1	1	1	1	1	1	1	1	1	1	1
SP 86	1	1	1	1	1	1	1	1	1	1	1	1
SP 87	1	1	1	1	1	1	1	1	1	1	1	1

	SP 95	SP 94	SP 96	SP 97
SP 95	1	1	1	1
SP 94	1	1	1	1
SP 96	1	1	1	1
SP 97	1	1	1	1

3/27-28/88

[illegible]

WIC 4
W21m + (comp)
M21 23, 1959

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

60-80
50-75
40-50

[illegible]

MC 4
W21st Camden
Mar 23, 1969

Over classes

1	= 0 - 5
2	= 5 - 20
3	= 20 - 40
4	= 40 - 60

505
11 11 11
95-08
56-95
08-00

[illegible]

cover classes

1: 0-5	5: 60-80
2: 5-20	6: 80-95
3: 20-40	7: 95-100
4: 40-60	

	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 33	SP 34	SP 35	SP 36	SP 37	SP 38	SP 39				
b) 9f	21	3	12	2	3	1	1	1	1	1	2	25	3	4	1	12	3
Po 9f	4	1	4	1	4	1	1	1	1	1	1	1	1	2	1	8	2
Ch vi	4	1	7	1	3	1	7	1	1	1	1	1	1	3	1	8	2
Poa sp. 41																	
Av-1 sp.		4	1	3	1									1	1		
Si. hq		2	1			4	1	3	1	1	1	2	1			4	1
Ar dr	3	1	4	1				7	1	2	1	3	1	1	1		
As le	1	1	1			1	1		1	1	1	1	1				
Mu mo							2	1		1	1	1	1			2	1

WC 4
Wilmington
Mar 23, 1929

(over classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-120

	SP 40	SP 41	SP 42	SP 43	SP 44	SP 45	SP 46	SP 47	SP 48	SP 49	SP 50
Bo Gr	6	23	6	7	18	17	3	32	20	10	28
Ch vi	1	3	2	1	3	2	1	2	1	1	4
Po fe		2	1		1	1			1		
Mu mo		1			2	2	1		1	3	4
Mu sp			1							1	
As il					1	1					
Ar dr							2				
len sp #1							1			1	
Si hy								1	1		

A n. spicata = 1 n sp

9/24-25/88

3
2
1

$$\begin{aligned} 0-5 &= 1 \\ 5-10 &= 2 \\ 10-15 &= 3 \\ 15-20 &= 4 \end{aligned}$$

EC-80-2

sp. 5
~~sp 5~~
~~sp 6~~
sp 6
sp 7
sp 8
sp 15
~~sp 15~~
sp 13
sp 16
sp-17
18
25

[illegible]

Year	Value	%
1960	0 - 5	5 - 60 - 80%
1961	5 - 20	60 - 80 - 90%
1962	20 - 40	70 - 95 - 100%
1963	40 - 60	
1964		

[illegible]

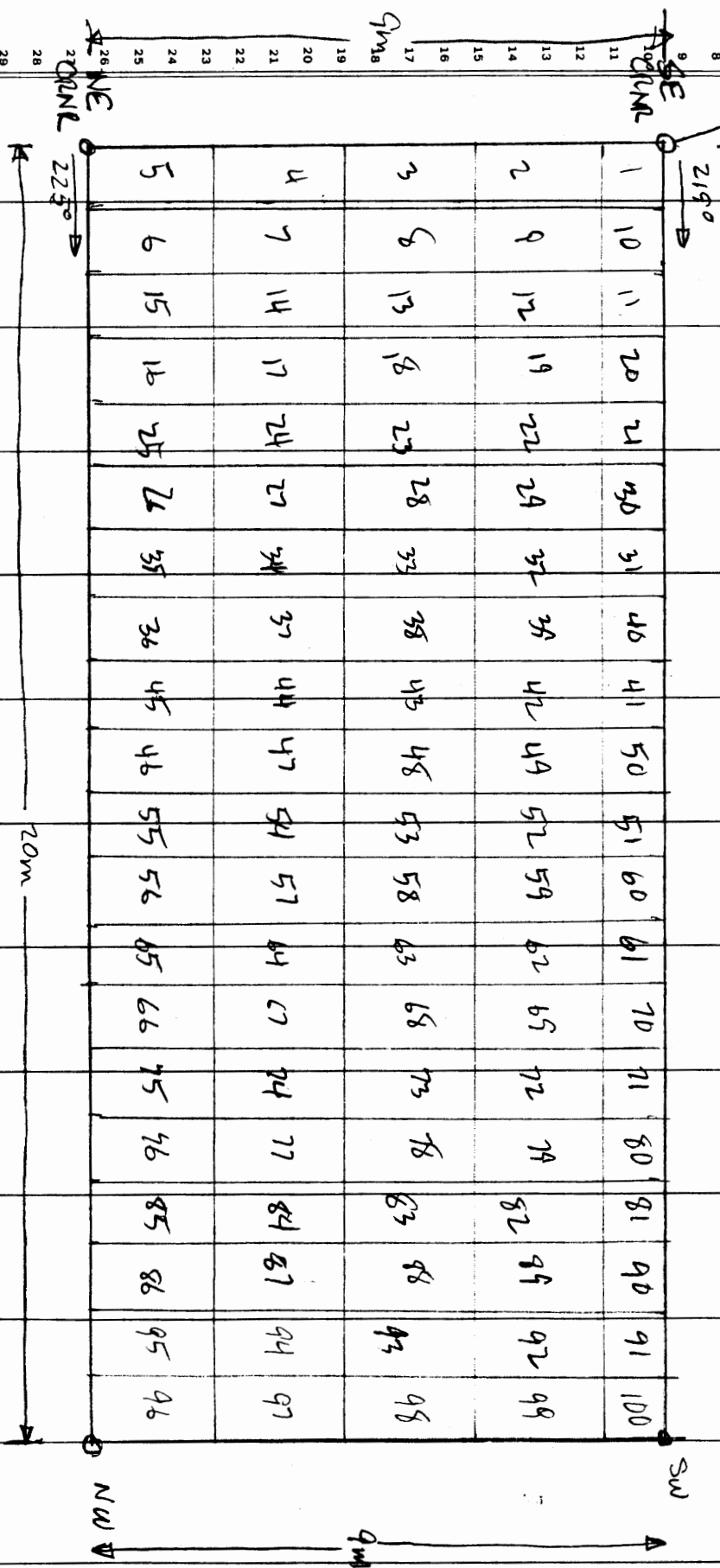
004 Walnut Canyon

September 25, 1986

2115.0

01210
29

Slope 40-55%
Very rocky; this results in very rough measurement on plot boundaries, could not make this plot 20x10m, no place to pound in stake at SW corner had to move back 1m to find a place. SW corner stake wedged between rock and Yucca baccata. Although we made the measurements come out right, the many bends in rope drain belie their accuracy.



1
2
3
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9
10
11
12
13
14
15
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17
18
19
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21
22
23
24
25
26
27
28
29
30
31

DC4

Pesp = *Cercocarpus montanus*
 Ceruo = *Astragalus* sp.
 Assp = *Ephedra* sp.
 Alin = *Allionia incarnata*

Tree & Shrub Density & Cover (>1" @ 1m & >1m diam. canopy)

	D	C
Ceruo	8	2
Beha	1	1
Ch sp.	3	1
Pied	1	1
Yuba	8	1
Ep sp	3	1
Ep sp	2	1

Species list with acronyms cont'd
 Chsp = *Chamaelirium* sp.
 Chsp = *Chrysochloa villosa* —
 Hqua = *Habenaria* sp.
 Eriosp = *Eriogonum* sp.
 Brisp = *Baccharis* sp.
 Posp 1 = *Penstemon* sp.
 Posp 2 = *Penstemon* sp.
 Brisp = *Baccharis* sp.
 Ceruo = *Cercocarpus montanus*
 Assp = *Astragalus* sp.
 Alin = *Allionia incarnata*

Species list with acronyms cont'd
 Sihy = *Sitonia hystrix*
 Opida = lot on this quadrat, refer to Opidi-like prickly-pear with large roundish to pear-shaped pads
 Yuba = *Yucca baccata*
 Beha = *Berberis humicola*
 Ep sp = *Ephedra* sp.
 Sp sp = *Sphaeralcea* sp.
 Quiga = *Quercus gambelii*
 Chel grass = *Blechnum tricholepis*
 Cosp = *Castilleja* sp.
 Rht = *Rhus trilobata*
 Alin = *Allionia incarnata*

Toda several plates, all from SE CRNE rebar

WC 5
Wetland Oregon
May 22, 1984

	SP 1	SP 2	SP 3	SP 4	SP 5
P ₃ fa	12	2		16	1
SP	22	1		16	1
TL			4	4	1
Ca				2	2
Vi					
SP					

no grasses
are no forbs

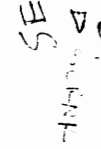
Rock	2	1	2	3	1
bare ground	6	6	6	5	6
litter	1				
wood					

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

C2 SP = Carex sp.
Vi SP = Viola sp.

[Faint handwritten notes]

$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$



286.50

20 Boys (26m)

11/5

2/20/2020

2/20/2020

CS
sp1 sp2 sp3 sp4 sp5 sp6 sp7 sp8 sp9 sp10 sp11 sp12 sp13

16 1 3 1
52 3
23 1
19 2
8 1
22 1

22 3 12 5 7 2 1 1 38 3 14 3 7 7 4 4 9 2 23 2 31 2 4 1 3 31

3 4 1 3 4 1 4 2 1 15 6 5 6 3 2 20 6 7 4 10
2 1 5 3 1 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1

W.C. 60 + Carbon
M21 25, 1979

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
P ₁₀	1	3	7	2	1	1	6	1	13	1	16	1	23
P ₀	43	49	24	36	42	69	39	46	65	60	36	40	65
Le	3	2	8	6	1	1	3	1	3	4	1	1	1
Ar	4	1	10	1	1	1	1	1	1	3	1	1	4
Ph	1	1	1	1	1	1	1	1	1	1	1	1	1
Ar	1	1	1	1	1	1	1	1	1	1	1	1	1
Se	1	1	1	1	1	1	1	1	1	1	1	1	1
As	1	1	1	1	1	1	1	1	1	1	1	1	1

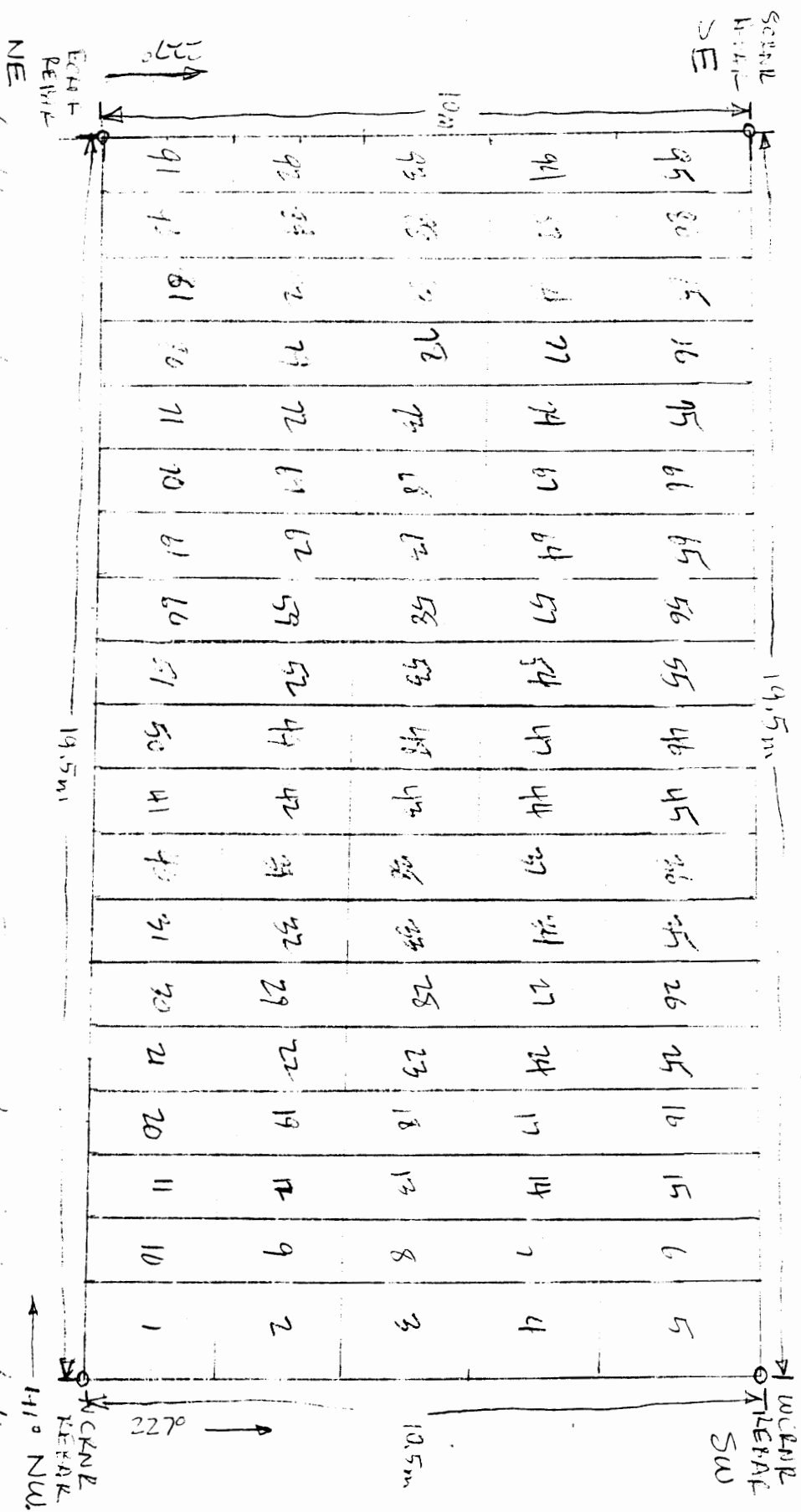
5

5
6
7
60-80
80-95
95-100

	SP40	SP41	SP42	SP43	SP44	SP45	SP46	SP47	SP48	SP49	SP50
bo	32	69	23	20	16	29	1	4	1	27	51
gr	2	2	1	1	1	1	1	2	1	1	2
fo	25	26	63	95	56	28	18	44	64	70	32
le	7	1	2	3	5	1	1	1	2	1	1
ar	5	1			3			1	4		
at	2	2			1						
ph				1	6	2		4	1	3	1
cr			1	10	2	2		1	5	1	1
ga				1	1	1		1			9
ar						10	1				1
ar						2	3				
pe						1	1		1		

50-100% slope

Walrus Canyon - WCG - 9/26/88



Could not find point 100. It was found to be 10m instead of 10. problem with WCGNE when caused the W-N edge to be 10.5m instead of 10.

Tree & shrub: D/C (>1" (10m & 21m canopy)

Mid T#M

10 3

3

Tree II

2 1

1

Tree III

14 4

4

WCG
P1 7-13

9-28-88

WC 6

Rein class

1 = 0 5 1/6
2 = 5-20 2/6
3 = 20-40 2/6
4 = 40 60 2/6
5 = 60-80 2/6
6 = 80-100 2/6
7 = 100-120 2/6

	SP 5	SP 4	SP 3	SP 6	SP 7	SP 14	SP 14	SP 16	SP 17	SP 25	SP 24	SP 26	SP 27
SP 1	1	1	3	1	1	1	1	1	4	1	1	1	
SP 2	2	1	1	1	1	1	1	1	1	1	1	1	
SP 3													
SP 4													
SP 5													
SP 6													
SP 7													
SP 14													
SP 16													
SP 17													
SP 25													
SP 24													
SP 26													
SP 27													
SP 28													
SP 29													
SP 30													
SP 31													
SP 32													
SP 33													
SP 34													
SP 35													
SP 36													
SP 37													
SP 38													
SP 39													
SP 40													
SP 41													
SP 42													
SP 43													
SP 44													
SP 45													
SP 46													
SP 47													
SP 48													
SP 49													
SP 50													
SP 51													
SP 52													
SP 53													
SP 54													
SP 55													
SP 56													
SP 57													
SP 58													
SP 59													
SP 60													
SP 61													
SP 62													
SP 63													
SP 64													
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SP 66													
SP 67													
SP 68													
SP 69													
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SP 73													
SP 74													
SP 75													
SP 76													
SP 77													
SP 78													
SP 79													
SP 80													
SP 81													
SP 82													
SP 83													
SP 84													
SP 85													
SP 86													
SP 87													
SP 88													
SP 89													
SP 90													
SP 91													
SP 92													
SP 93													
SP 94													
SP 95													
SP 96													
SP 97													
SP 98													
SP 99													
SP 100													

Ga Sp. ppt

[illegible]

sp 1
sp 2
sp 10
sp 6
sp 8
sp 11
sp 12
sp 13
~~sp 14~~
~~sp 15~~
sp 19
sp 18
sp 21
22
22

[illegible]

2.

CCNY CLASS

CENTS	CLASS
1 - 0 - 0 $\frac{1}{16}$	3 - 60 - 20 $\frac{1}{16}$
2 - 5 - 20 $\frac{1}{16}$	6 - 80 - 95 $\frac{1}{16}$
3 - 20 - 40 $\frac{1}{16}$	7 - 95 - 100 $\frac{1}{16}$

[illegible]

sp 93 sp 91 sp 88 sp 89 sp 40 sp 3

1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3
5	5	5	5	5	5	5	5
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30
31	31	31	31	31	31	31	31
32	32	32	32	32	32	32	32
33	33	33	33	33	33	33	33
34	34	34	34	34	34	34	34
35	35	35	35	35	35	35	35
36	36	36	36	36	36	36	36
37	37	37	37	37	37	37	37
38	38	38	38	38	38	38	38
39	39	39	39	39	39	39	39
40	40	40	40	40	40	40	40
41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47
48	48	48	48	48	48	48	48
49	49	49	49	49	49	49	49
50	50	50	50	50	50	50	50
51	51	51	51	51	51	51	51
52	52	52	52	52	52	52	52
53	53	53	53	53	53	53	53
54	54	54	54	54	54	54	54
55	55	55	55	55	55	55	55
56	56	56	56	56	56	56	56
57	57	57	57	57	57	57	57
58	58	58	58	58	58	58	58
59	59	59	59	59	59	59	59
60	60	60	60	60	60	60	60
61	61	61	61	61	61	61	61
62	62	62	62	62	62	62	62
63	63	63	63	63	63	63	63
64	64	64	64	64	64	64	64
65	65	65	65	65	65	65	65
66	66	66	66	66	66	66	66
67	67	67	67	67	67	67	67
68	68	68	68	68	68	68	68
69	69	69	69	69	69	69	69
70	70	70	70	70	70	70	70
71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72
73	73	73	73	73	73	73	73
74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76
77	77	77	77	77	77	77	77
78	78	78	78	78	78	78	78
79	79	79	79	79	79	79	79
80	80	80	80	80	80	80	80
81	81	81	81	81	81	81	81
82	82	82	82	82	82	82	82
83	83	83	83	83	83	83	83
84	84	84	84	84	84	84	84
85	85	85	85	85	85	85	85
86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87
88	88	88	88	88	88	88	88
89	89	89	89	89	89	89	89
90	90	90	90	90	90	90	90
91	91	91	91	91	91	91	91
92	92	92	92	92	92	92	92
93	93	93	93	93	93	93	93

sp 93 sp 91 sp 88 sp 89 sp 40 sp 3

9-26-88

W.C. G

	SP 86	SP 87	SP 95	SP 94		
Ar dr	13	1	1			
OP me	2					
Er og sp	5	2	2	1		
Wk Grass	7	7	4	5	2	
Ar lu	7	5	1	13		
Gu mi	1					
Pl. sp.	1					
Pe sp.	1					
Bo gr	4	1		1		
Ar ho	3	2				
Ju ha	1	3				
Pi ha sp	7	1				
Se sp	5	1				
Be sp	1	1				
Pi ed	1	1				
Be ha	1		3			
Cr sp			1		2	
Ga sp			3			
			4			

60-80
80-95
95-100

SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13
41 1	63 2	35 1	37 2	70 3	93 3	65 3	57 2	73 3	66 3	43 2	77 3	26 2
	6 1							3 1			5 1	
			4 1	1 1		2 1	3 1	4 2	1 1	2 1	4 6	
			1 2					1 1		16	2	

5 60-80
6 80-95
7 95-100

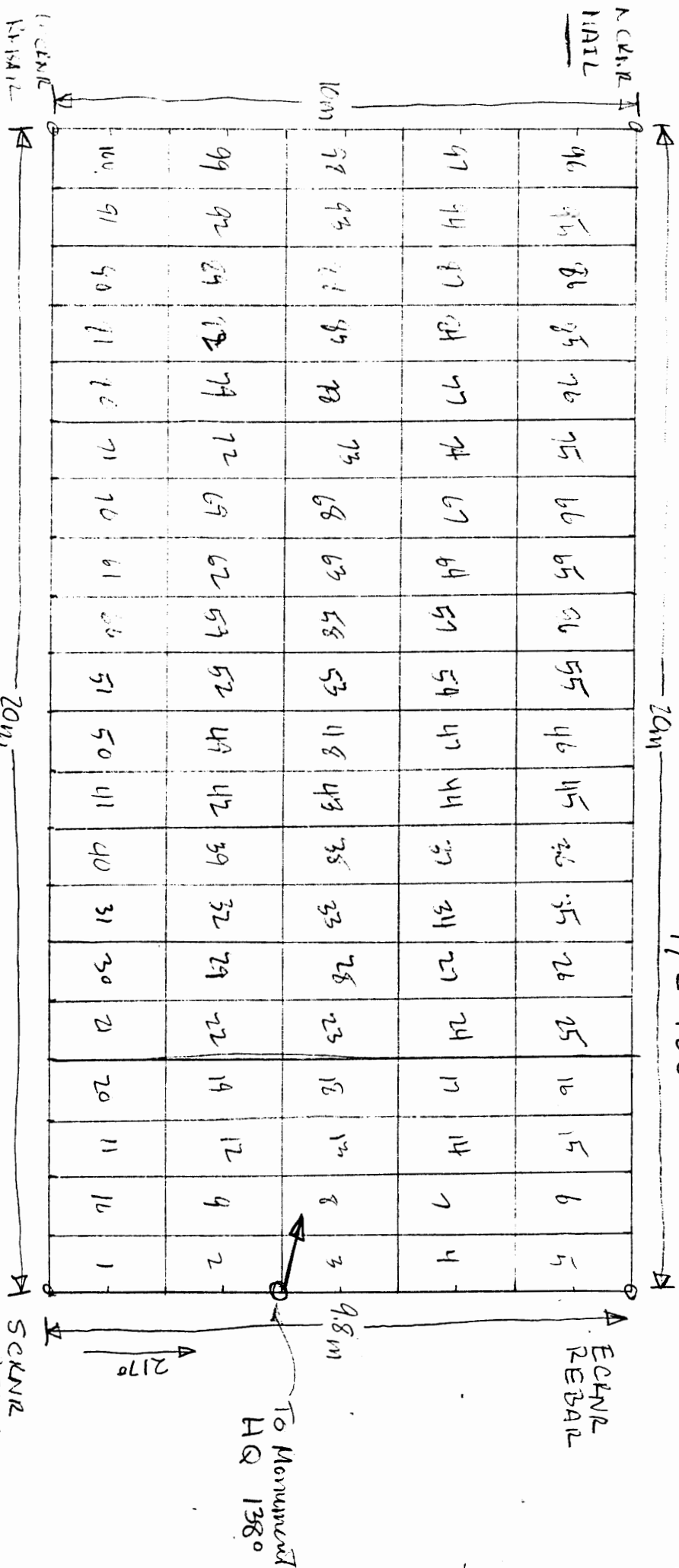
	SP14	SP15	SP16	SP17	SP18	SP19	SP20	SP21	SP22	SP23	SP24	SP25	SP26
Po	63	260	263	82	57	299	41	227	40	38	262	63	52
Fe	2	2	3	3	2	3	2	1	2	2	3	3	
Si					2	5			3	1			
hy					1	1			1	1			
sp.					1								
re	4	1		8	11	13	26	8	16	232	3	1	
be		2	1	1	2								
lu													
Ar					3					2			

over classes	
1 0-5	5
2 5-20	6
3 20-40	7
4 40-60	9
	5
	60-80
	80-95
	95-100

[illegible]

ca. 80% slope

Walnut Canyon
WC7
9/27/88



Very steep slope - subplot dimensions only
approximate for the west part.

Tree # shrub D & C (>1" diam @ 1m & >1m diam canopy)

Comp. class

Notes

Ph18 looking at west edge from below

Ph17 looking at mid N corner

Ph16 Plot from S-E edge

Ph15 Plot from S-E edge

Ph14 S corner rebar

PSMC

Tree

Shrub

1000

PSMC

Tree

Shrub

1000

PSMC

Tree

Shrub

MC 7

4. 40-60%

2-5-20

7-95-100%

[illegible]

412188

[illegible]

MC7

[illegible]

Walnut Canyon
WC8
Sept. 6, 1989

SP25-32 from SW corner

Cover Class
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

SP 1-8 from SE corner

	SP 25	SP 26	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 1	SP 2	SP 3	SP 4	SP 5
H-y lu	2	1	1			2	1		13	5	11	4	3
Er ra	14	19	1	20	23	15	13	16	12	22	13	24	23
Ar lu	8	5			1								
Cl ap	8	1		11	4		3	10	1				
Se ne	1												
Unk Comp #1	2		1		1		1			2			
Po fe	72	39	3	31	30	30	32	50				7	2
Si hy	10	12	2	17	9	13	4	3	5				
Pe li		5		4	1				1	10	17	26	23
Ch de		1		1	1				2	4	4	4	10
* Unk forb #1		1	2										
As ca						1							
Bo gr									81	84	79	75	105
Ar fe									5	8	2	2	
Er um									2				
Er di									26				
Le in												1	

May-June 1989

** Was Pl ep. and Unk Forb #1 May/June 1989

Walnut Canyon

WC 8

Sept. 6, 1989

Cover Class

1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

SP1-8 from SE Corner

SP9-16 from NE Corner

SP17-24 from NW Corner

	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13	SP 14	SP 15	SP 16	SP 17	SP 18
Hy lu	4	1	2	6	3	9	1	7	11	4	1	1	1
Er ra	19	1	20	1	1	1	2	1	1	1	1	1	1
Pe li	12	2	9	14	8	11	11	9	8	9	9	1	1
* Ch de	4	1	3	33	29	24	34	38	25	20	13	33	2
Bo gr	93	3	76	70	3	101	48	30	68	67	51	3	1
Ar fe	3	1	20	3	75	4	3	2	3	3	3	1	1
Unk Comp #7		1			2	1	2	1	1	1			
Er um		2	3		1	1	1	1	2	1	2		
* Gu sp.			1								1		
Er di			90										
Ci sp			1			2			6	8	3	1	
Si hy				1		1			1	1	1	1	1
To sp				15	2	3	2	2	1	3	1	4	16
Po fe					1			1	1	1	1	2	2
Hy sp.						1						18	2
As cs							1						
Ca in								4					
Se ne								1		1			
Er al											1		
Ar te											7	1	1

* Ch de & Gu sp. - No more count ie woody species

WC-8

Sept. 6, 1989

SP17-24 from NW corner

Cover	Class
1 0-5	5 60-80
2 5-20	6 80-95
3 20-40	7 95-100
4 40-60	

SP 33-48 in Center Begin at NE Corner

	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 40	SP 39	SP 38	SP 37	SP 36	SP 35	SP 34
Hy lu	1				1	21	1	9	5	5	12		
Er r9	1			2	1	10	1	4	1	8	1	1	2
Pe 11	8		3	1	1	3	3	1	1	3	1	1	
Bo gr	3			11	7	26	3	10	8	7	10		
Po fe	11	1	19	2	36	13	52	27	2	1	1	18	5
Si hy	5	1	10	11	3	11	2	15	34	31	16	2	9
Er ap.	1			2	1	4	1	3	5	10	13		2
Ci ap.				1		1		1	1	5			
Lo ap.					1	2			1	1	2		
Ar lu					1	1	2				1		
Ar pe						1	1						2
Ar fe							6	6					
As ca							1	1					
Er di						3	1						
Li da						5	1						
De ca						4	1			3			
An ap.						26	1			1			

Walnut Canyon

W C 8
Sept. 6, 1989

SP 33-48 in Center Begin at NE Corner

Cover Class
1 0-5 5 60-80
2 5-20 6 80-95
3 20-40 7 95-100
4 40-60

	SP 33	SP 48	SP 47	SP 46	SP 45	SP 44	SP 43	SP 42	SP 41
Fr r	3	10	3	5	2	14	12	16	5
Ar l	4	1	1	1	1	1	1	9	3
Se ne	1							1	1
Po fe	17	20	10	2	11	21	20	21	12
Si hy	5	13	7	2	9	8	14	10	2
Ci ap.		14	1			6	16	12	1
Sp ap.			1			1	1	1	
Bo gr				7	10	4	2	11	40
Unk forb #1				1	1	1	1	1	3
Hy li					2	6	2	19	37
As ca					1	1	1	14	15
De co								1	1
Arte								1	5
Li da								11	2

(SP 17-on)
June 1, 1989

SP 17-24 = larger Plot #3

cover classes

1	0-5
2	5-20
3	20-40
4	40-60

5 60-80
6 80-95
7 95-100

Plot #1 = SP25-3

[illegible]

cover classes

1	0-5	5	60-80
2	5-20	6	80-95
3	20-40	7	95-100
4	40-60		

Plot # 5 = SP 33 -

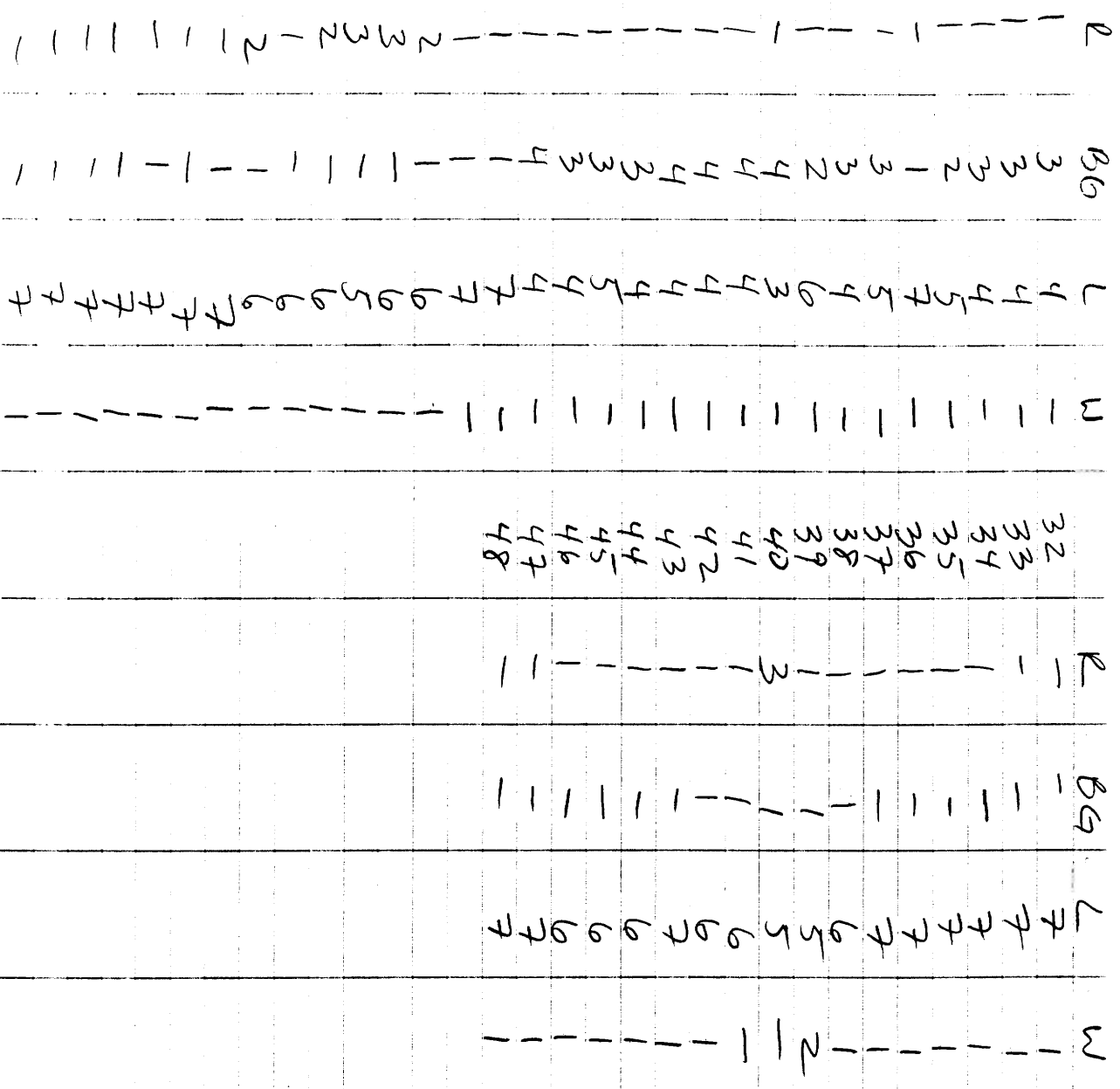
	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 33	SP 34	SP 35	SP 36	SP 37	SP 38	SP 39
Fe	36	22	27	49	44	30	22	5	19	27	40	35	34
Gr	1	2	3	3	3	3	2	1	1	2	2	1	32
Hy	7	16	6	13	8	7	3	8	3	17	17	42	7
Er	14	9	23	17	14	18	1	2	2	11	9	7	4
Unk	16	1	4	36	63	42	2	1	19	13	14	19	16
Hy	2	1	1	2	2	2	1	2	1	3	4	9	1
Fe	1	2	1	1	1	1	1	1	1	1	1	1	1
Te		1	1							1	5	11	13
Ca		1	1					1	1	1	1	12	13
Si		9	4	1		15			1	1	4	4	3
Co				2									
Ar				1									
Hy							5	3		1			
Mn										1			
Gu										1			
Hi										1			
Ar										1			

5 60-80
6 80-95
7 95-100

[illegible]

Helmut Camp-
WC 8
May 31, 1989 and June 1, 1989

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100



COVER CLASSES	
1	0-5
2	5-20
3	20-40
4	40-60
5	60-80
6	80-95
7	95-100

[illegible]

cover classes

1	0-5	5	60-80
2	5-20	6	80-95
3	20-40	7	95-100
4	40-60		

	Po	At	Qu	Au	Ar	Pe	Bon	Be
SP34	58	34	19	1	5	9	4	18
SP33	27	2	4	18	6	35	3	6
SP32	3	3	1	12	3	17	2	87
SP40	6	1	8	2	18	1	3	2
SP39	33	3	5					
SP38	25	2	6				3	2
SP37	26	2	5				1	1
SP36	25	2	2				1	1
SP45	19	2					1	1
SP44	10	2						
SP43	20	2						
SP42	31	2						

WC9
Wright Canyon
Jan-01, 1989

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

Mo
Yu
Qu
Bo
Ar
Ki
Ro
fe
sp
in
ed
re
ge
ha
ce
mo

SP41	SP50	SP49	SP48	SP47	SP46	SP26	SP27	SP28	SP29	SP30
24	23	28	33	26	29	23	21	12	28	38
3	2	2	2	2	3	2	1	1	2	3
2	61	5								5
1	1	1								1
2	1	17								1
	6	4								1
	2	1								1
	9	2								1
	6	1								1
	12	1								1
	6	2								1
	3	1								1
	1	5								1
	3	5								1
	5	4								1
	17	4								1
	6	25								6

Walnut Canyon

WC 9
Sept. 6, 1989

SP 1-50

Begin

at

SW

Corner

Cover

Class

1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

Page 1

Pe
Ar
Ar
Se
up.

SP 1 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 3 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 4 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 5 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 6 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 7 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 8 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 9 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 10 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 11 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 12 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 13 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 14 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 15 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 16 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

SP 17 26 2 21 2 26 3 50 3 23 1 49 4 43 2 26 6 3 43 4 34 2 37 2 29 2 32 3 33 2 23 2

* Senecio cf hartianus

Cover	Class
1 0-5	5 60-80
2 5-20	6 80-95
3 20-40	7 95-100
4 40-60	

SP1-50 Begin at SW Corner

	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
Po fe	36	32	47	50	26	21	22	18	23	31	50	21	28
Gd ap	2	3	3	2	9	3	2	2	1	2	2	3	2
Ar pe		1			1	1	1			1			
Ar ly			14		1	40	2	83	11	5			
Se ap.			2			2	77	3		1			
Si hy			1										
Mn ap.			2										
Re ca			1			3	2	2	1	1			
Se ne							2	2	1	1	6		

Walnut Canyon
W C 9
Sept. 6, 1989

Cover Class
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

Page 3

SP 1-50 Begin at SW Corner

SP	27	SP	28	SP	29	SP	30	SP	31	SP	32	SP	33	SP	34	SP	35	SP	36	SP	37	SP	38	SP	39				
Po	fe	35	2	20	2	25	3	26	3	20	2	2	3	44	3	27	2	24	2	20	2	17	2	22	2	21	2	22	2
Pe	ca			1						1																			
Ar	lu									3																			
Mu	sp.									1																			
Ar	pe									1																			
Pe	sp.									1																			
*	Pe	sp.																											

* Pe sp. 2 - Little one with red flowers

Walnut Canyon

WC 9

Sept. 6, 1989

SP1-50

Begin at SW Corner

Cover Class

- 1 0-5
- 2 5-20
- 3 20-40
- 4 40-60
- 5 60-80
- 6 80-95
- 7 95-100

	SP 40	SP 41	SP 42	SP 43	SP 44	SP 45	SP 46	SP 47	SP 48	SP 49	SP 50											
Po fo	20	2	25	3	28	3	18	2	16	2	17	1	30	3	30	3	31	2	20	2	19	3
Ar lu	35	2			15	1											4	1	7	1	5	1
Ar pe	3	1																				
Be re			14	1	1	1	1	1					3	1	1	1			17	1	2	1
Be #2																						
Be sp. 2							1	1														

over classes	
1	0-5
2	5-20
3	20-40
4	40-60
5	60-80
6	80-95
7	95-100

	SP	SP12	SP1
Ba SR	5	1	
Ra i:	1		
Jnk fur 1st			
Jnk fur 1st #2			
Au pe	3	1	
Ar in	1		
Le in	3	1	
Lo sp.			
Pri ed	1	2	
Er um			
Ga sa			
Ju sp.			
IP sp.	1	1	
OP me			
Hq lv			

WC 10
Walmart Canyon
June 2, 1984

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60

5 60-80
6 80-95
7 95-100

	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
PO	5	6	2	1	1	35	1	9	1	86	86	61	91
Re	12	32	24	8	1	4	13	3	1	2	21	5	2
Le	1	1	1	1									
Ev	3	2	1										
Pi	3	1	1										
Unk		4		7	2	3	1	1	5				
Qu		1		1	1	2	1	1	2				
Ar		1											
Unk		5		1	1		1						
Ju				1									
Ju				3									
CH									1				
TH									1				
IP													
Er													
OP													
OP													
Lo													

UC 10
Walnut Camp-
June 2, 1889

Cover classes
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 33	SP 34	SP 35	SP 36	SP 37	SP 38	SP 39
Bo	15	1						12	16	13	5	53	87
Le	5	4	50	57	23	7	1	16	26	24	1	1	3
IF	2	1		1	2	1	2	1		2	1	1	2
Hi	3	1	3	1	1	1	1	1	38	1	1	1	1
Pe	4	3	3	6	1	1	4	12	2	18	5	1	23
Unk			17	8	1	1	1	3	2	11	3		
Unk			1	4	1			1		1	1		
Ar				1	3	1	3	1					
Er													
Si						1							
Qu													
Er													
Un													
Co													
Lu													
La													
Er													

gr
fe
in
sp.
lu
ed
i.
#1
forb
#2
forb
#2
sp.
st
vi
st
sp.
st

	60-80
1	0-5
2	5-20
3	20-40
4	40-60

SP	40	SP41	SP42	SP43	SP44	SP45	SP46	SP47	SP48	SP49	SP50	SP51	SP52
Do gr	51	2	47	53	76	52	69	62	16	7	40	28	33
Le in	7	1	6	2	3	1	2	2	1	1		11	8
Hq lu	17	1	19	29	4	5		1	1				9
Tr sf	2	1	2	1	1	1							
Er sf	7	1	2	1									
Ch vi		1	2	4	1		2	4	8	3		7	4
Re li		1	3	1				1	1	1		1	1
Ga ga				1				2	20	22	37	25	12
Lo sf				1				40	1	2	2	1	
Ri ed				2		2	34	2	1				
Ar um				1		1	2	1	1	16	14	3	9
Er pe				1			11	1	1	1	1	1	2
Unk fo							1	25	20			7	2
Ar fe							1	1	1		2	1	4
Er di							1	1	1			2	1
Er ra							1	1	1				1
Se cy									2				
Ri po									1		1	1	2

over classes

1	0-5	5	60-80
2	5-20	6	80-95
3	20-40	7	95-100
4	40-60		

[illegible]

W.C. 12
W. 12
June 2, 1989

Green and cover

Classes

1	0-5
2	5-20
3	20-40
4	40-60
5	60-80
6	80-95
7	95-100

	SP79	SA80
Bo gr	14	43
Po re	61	10
Le in	2	5
Pe li	11	28
Unk f ₁ , #1	5	4
Unk f ₂ , #2	1	1
Ev um	2	1
Er ra	1	1
Le sp.	6	2
Pi po	2	1
Pi ed	1	1
Tu sp.	1	1
Qu sp.	1	1
Hly in	1	3
Air pe	1	1
IP sp.	1	1

Walnut Canyon

WC 10
7 Sept., 1987

SP1-80 Begin at SW Corner

Cover Class

1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

Page 1

	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13
Po fe	5	20	12	2	1	1	1	5	2	1	1	1	1
Be gr	16	12	12	1	1	3	9	13	1	6	2	8	1
Pe ji	15	16	17	2	2	1	2	1	1	2	10	1	1
Ph ap.	13	2	2	2	1	1	1	1	1	1	1	1	1
Ar pe	8	3	1	1	1	1	1	1	1	1	1	1	1
Er um	1	1	2	1	1	1	1	1	1	1	1	1	1
Le in		1	4	1	1	25	1	34	1	14	1	35	1
Lo ap.		2	2	1	10	1	47	1	1	1	1	1	1
Se ne		1	2	1				1					
Er al			1					1					
As ad			1					1					
Eu fe								1					
Hy lu								1					
IP								1					

Walnut Canyon

WC10
7 Sept. 1989

SP 1-80 Begin at SW Corner

Cover Class
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

Page 2

	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
Po fe	13	26	35	2	15	49	2	54	2	40	2		
Bo gr	3	1	3	1	5	1	2	1	10	1	2	1	5
Pe li	14	35	6	1	1	2	1	2	1	89	2	117	3
Ph sp.	1	7	1	1	1	2	1	2	1		3	105	3
Lo sp.	3	1	2	1		1	1				1	1	3
Er um	4	1	1			2	1				1	4	1
Le in	1	1							3	1	30	1	10
Ar pe	1	3	1								1	2	1
Er ra #1		2	1									1	18
Unk Comp					2	1			1	1	25	1	2
Hy lu									6	1	1	30	1
Er al									1	1		2	1
Eu fe										3	1	1	3
IP												1	1

Nothing

Cover	Class
1 0-5	5 60-80
2 5-20	6 80-95
3 20-40	7 95-100
4 40-60	

	SP 27	SP 28	SP 29	SP 30	SP 31	SP 32	SP 33	SP 34	SP 35	SP 36	SP 37	SP 38	SP 39
Po fe	4	6	41	2	2	1	62	2	2	1	3	4	1
Bo gr	15	1	2	66	37	6	1	16	25	1	13	76	2
Le in	13	1	9	1	1	1	1	1	1	1	1	1	139
Hy lu	4	1	1	1	1	1	1	1	4	1	5	7	10
pe li	1	1	3	1	1	1	7	1	20	1	7	2	1
ph ap.			21	1	1		1	11	12	1	1	1	
Er um			5	1	1		1	2	1	1			
Ar pe			6	1	1		3	4	1				
Si hy			2	1	1		1	2					
Er ra						5	1	1					
Er al						1	3	1					
Eu fe						4	1	1			1	1	
Lo ap.							1					1	

Walnut Canyon
we 10
7 Sept, 1989

Cover Class
1 0-5 5 60-80
2 5-20 6 80-95
3 20-40 7 95-100
4 40-60

SP 1-80 Begin at SW Corner

	SP 53	SP 54	SP 55	SP 56	SP 57	SP 58	SP 59	SP 60	SP 61	SP 62	SP 63	SP 64	SP 65					
Po fe	11	2	1	13	1	1	1	24	31	2	14	1	24	2	17	1	12	1
Bo gr	13	1	37	2	7	1												
Pe li	20	2	14	1														
Hy li	17	1	42	2	32	2	1	1	12	1	4	1	15	1	38	2	23	2
Le in	2	1	14	1	8	1												
Er al	8	1	4	1														
Lo ag.	1	1	1	1														
Eu fe	2	1	5	1	3	1												
IP mu																		
Ar pe																		
Se ne																		
Er r9																		
Ph ap.																		
Er vm																		

2 1
9 1

Walnut Canyon
WC 10
7 Sept., 1989

Cover Class
1 0-5
2 5-20
3 20-40
4 40-60
5 60-80
6 80-95
7 95-100

SP 1-80 Begin at SW Corner

	SP 66	SP 67	SP 68	SP 69	SP 70	SP 71	SP 72	SP 73	SP 74	SP 75	SP 76	SP 77	SP 78
Po fe	22	238	366	25	5	11	1	49	2	18	53	78	43
Bo gr	22	2	3	12	1	33	2	23	1	1	15	5	1
Pe li	23	1	19	25	19	2	56	2		1	17	3	3
Er um	5	1	1							1	1	1	1
Er ra	3	3	1									2	1
Lo ap.	2	1	1									2	2
Se ne		2	1		1	1						1	1
Ke in			8	14	11	23	11	5			17	8	1
Ph ap.			1	1	1	1	1	1			6	2	1
Hy ly				2	11	9	29	13		2	1		
Er al				1	1	1	1	1		1			
Si hy				2	2	5	3	6	12	4			
IP mu				1	1	1	1	1		1			
Eu fe				4	1	14	2	3					

Walnut Canyon
WC 10
7 Sept, 1989

SP 1-80

Begin at SW Corner

Cover	Class
1 0-5	5 60-80
2 5-20	6 80-95
3 20-40	7 95-100
4 40-60	

	SP 79	SP 80
Po fe	89	4
Bo gr	12	1
Pe ji	25	1
Le in	3	1
Er ra	9	1
Er um	2	1
Hy lu	2	1
Ar pe	1	1
IP m4	1	1
Lo ap.	2	1
Ph ap.	4	1