RARE PLANTS OF BRYCE CANYON NATIONAL PARK, UTAH

FINAL REPORT

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ABSTRACT

THE OBJECTIVES OF THIS PROJECT ARE:

1) TO PRODUCE A LIST OF CATEGORY 2 PLANT TAXA FOR BRYCE CANYON NATIONAL PARK,

2) TO LOCATE CATEGORY 2 PLANT TAXA THAT ARE CURRENTLY LISTED IN THE FEDERAL REGISTER,

3) TO DETERMINE THE DISTRIBUTION AND ABUNDANCE OF CATEGORY 2 PLANT TAXA WITH EMPHASIS ON AREAS WITH HIGH POTENTIAL FOR HUMAN IMPACT,

4) TO CHARACTERIZE HABITAT PARAMETERS OF CATEGORY 2 PLANT TAXA,

5) TO DEVELOP A LONG-TERM MONITORING PROGRAM FOR CATEGORY 2 PLANT POPULATIONS.

CURRENTLY THERE ARE FIVE BRYCE CANYON TAXA LISTED IN THE FEDERAL REGISTER AS CATEGORY 2 PLANTS. AT THE INCEPTION OF THIS STUDY AN ADDITIONAL SPECIES WAS LISTED IN CATEGORY 2 (FEDERAL REGISTER 1990) BUT HAS SINCE BEEN DOWNGRADED TO CATEGORY 3C (FEDERAL REGISTER 1993). CATEGORY 2 TAXA INCLUDE THOSE FOR WHICH THERE IS SOME EVIDENCE OF VULNERABILITY, BUT FOR WHICH THERE IS NOT ENOUGH DATA TO SUPPORT LISTING PROPOSALS (I.E. TO BE LISTED AS A CATEGORY 1 TAXON). CATEGORY 3C INCLUDES TAXA THAT HAVE PROVEN TO BE MORE ABUNDANT OR WIDESPREAD THAN PREVIOUSLY BELIEVED. PREVIOUS FLORISTIC RESEARCH INDICATES THAT AN ADDITIONAL 13 TAXA THAT HAD BEEN PROPOSED AS THREATENED AND ENDANGERED MAY OCCUR WITHIN THE BOUNDARIES OF BRYCE CANYON NATIONAL PARK; AND THAT AN ADDITIONAL 9 "RARE" TAXA HAVE BEEN LOCATED IN HABITAT TYPES SIMILAR TO THOSE FOUND WITHIN THE PARK BOUNDARIES.

DURING THIS PROJECT ALL SIX SPECIES FORMERLY OR CURRENTLY LISTED AS CATEGORY 2 PLANTS IN THE FEDERAL REGISTER AND KNOWN TO OCCUR WITHIN THE BOUNDARIES OF BRYCE CANYON NATIONAL PARK HAVE BEEN LOCATED WITHIN THE PARK. THEIR DISTRIBUTION IS INDICATED ON STANDARD 7.5 MINUTE TOPOGRAPHICAL MAPS, AND THEIR ABUNDANCE AND HABITAT PARAMETERS ARE RECORDED. PERMANENT PLOTS CONTAINING CATEGORY 2 PLANT POPULATIONS HAVE BEEN ESTABLISHED SO THAT LONG-TERM MONITORING MAY BE ACCOMPLISHED. PERMANENT PLOTS HAVE BEEN LOCATED USING A STANDARD GLOBAL POSITIONING SYSTEM (G.P.S.) APPARATUS. THIS INFORMATION HAS BEEN ENTERED INTO THE PARK'S GEOGRAPHICAL INFORMATION SYSTEM (G.I.S.).

SOME OF THE CATEGORY 2 TAXA ARE LOCATED NEAR, OR EVEN ON, HEAVILY USED TRAILS WHICH PRESENTS SOME MANAGEMENT CONSIDERATIONS. A SEPARATE REPORT (INCLUDED HERE) HAS BEEN MADE WITH REGARD TO THE IMPACT OF FIRE MANAGEMENT AND CATEGORY 2 PLANT POPULATIONS. IMPLICATIONS FOR TRESPASS GRAZING AND TRAIL USE PATTERNS ARE ALSO INDICATED.

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INTRODUCTION

THE OBJECTIVES OF THIS PROJECT ARE:

1) TO PRODUCE A LIST OF CATEGORY 2 PLANT TAXA FOR BRYCE CANYON NATIONAL PARK,

2) TO LOCATE CATEGORY 2 PLANT TAXA THAT ARE CURRENTLY LISTED IN THE FEDERAL REGISTER,

3) TO DETERMINE THE DISTRIBUTION AND ABUNDANCE OF CATEGORY 2 PLANT TAXA WITH EMPHASIS ON AREAS OF HIGH POTENTIAL FOR HUMAN IMPACT,

4) TO CHARACTERIZE HABITAT PARAMETERS OF CATEGORY 2 PLANT TAXA, AND

5) TO DEVELOP A LONG-TERM MONITORING PROGRAM FOR CATEGORY 2 PLANT POPULATIONS.

INCLUDED IN THIS REPORT ARE THE FOLLOWING:

1) A WRITTEN REPORT DETAILING THE METHODS, RESULTS AND DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS, AND BIBLIOGRAPHY.

2) A LIST OF CATEGORY 2 PLANTS FOUND OR POTENTIALLY FOUND IN BRYCE CANYON NATIONAL PARK.

3) 7.5 MINUTE TOPOGRAPHIC MAPS SHOWING THE LOCATIONS OF CATEGORY 2 PLANT POPULATIONS AND ALL 28 PERMANENT PLOTS.

4) FIELD PHOTOGRAPHS (2" BY 2" SLIDES) OF CATEGORY 2 PLANT POPULATIONS SHOWING HABITAT AND CLOSEUP VIEWS OF INDIVIDUAL PLANTS.

5) PHOTOCOPIES OF CATEGORY 2 PLANT HERBARIUM SPECIMENS.

METHODS

THE OBJECTIVES AND THE METHODS OF THIS PROJECT ARE:

1) PRODUCE A LIST OF CATEGORY 2 PLANT TAXA FOR BRYCE CANYON NATIONAL PARK

METHODS USED TO FORMULATE A LIST OF CATEGORY 2 PLANT TAXA FOR BRYCE CANYON NATIONAL PARK INVOLVE REVIEW OF THE FEDERAL REGISTER (1990 AND 1993), BOTANICAL LITERATURE, AND HERBARIUM RECORDS, AND PERSONAL CONSULTATION WITH DR. STANLEY L. WELSH, PROFESSOR OF BOTANY AT BRIGHAM YOUNG UNIVERSITY, WELL KNOWN IN THE BOTANICAL COMMUNITY FOR HIS RESEARCH IN UTAH FLORISTICS AND RARE AND ENDANGERED PLANTS OF THE GREAT BASIN.

2) LOCATE CATEGORY 2 PLANT TAXA THAT ARE CURRENTLY LISTED IN THE FEDERAL REGISTER (1990 AND 1993).

THE SMALL HERBARIUM MAINTAINED BY THE PARK WAS CONSULTED TO OBTAIN FIELD LOCATION DATA FOR CATEGORY 2 PLANT TAXA. THE HERBARIUM AT BRIGHAM YOUNG UNIVERSITY WAS CONSULTED TO OBTAIN LOCATION DATA FOR CATEGORY 2 PLANT TAXA. AT THE BEGINNING OF EACH FIELD SEASON PARK PERSONNEL WERE CONSULTED WITH REGARD TO LOCATIONS OF PLANT POPULATIONS. PARK PERSONNEL PROVIDED TOPOGRAPHIC MAPS AND LITERATURE THAT INDICATED KNOWN POPULATIONS OF PLANTS. RESEARCHERS ATTEMPTED TO LOCATE KNOWN POPULATIONS OF PLANTS AND TO SEARCH IN OTHER SIMILAR AREAS FOR NEW POPULATIONS. ALL CATEGORY 2 PLANT POPULATIONS WERE MAPPED IN THE FIELD BY MEANS OF VISUAL RECONNAISSANCE AND BY USING A GLOBAL POSITIONING SYSTEM (G.P.S.) SUPPLIED BY THE PARK MANAGEMENT.

3) DETERMINE THE DISTRIBUTION AND ABUNDANCE OF CATEGORY 2 PLANT TAXA WITH EMPHASIS ON AREAS OF HIGH POTENTIAL FOR HUMAN IMPACT.

WHEN CATEGORY 2 PLANT POPULATIONS WERE FOUND, RESEARCHERS DETERMINED THE DISTRIBUTION PATTERN BY LOCATING IN THE FIELD THE GEOGRAPHICAL EXTENT OF THE POPULATION AND NOTING THIS ON TOPOGRAPHIC MAPS. PLANT ABUNDANCE WAS MEASURED BY ESTABLISHING PERMANENT PLOTS. METAL STAKES WITH ALUMINUM IDENTIFICATION TAGS HAVE BEEN PLACED TO MARK THE PLOT. AT EACH STAKE LOCATION A RECTANGULAR PLOT HAS BEEN DESCRIBED USING METER TAPES AND COMPASS HEADINGS. THE PLOTS VARIED IN SIZE SO THAT APPROXIMATELY 100 CATEGORY 2 WOULD BE INCLUDED IN

THE PLOT. THE MAJOR EXCEPTION TO THIS IS IN THE CASE OF PEDIOMELUM PARIENSE. THIS SPECIES EXHIBITS A SOBOLIFORM GROWTH HABIT AND CHARACTERISTICALLY PRODUCES UNDERGROUND BRANCHING WITH PLANTLETS AT THE TERMINI OF THE BRANCHES. WITHOUT SIGNIFICANT DISTURBANCE OF THE PLANTS AND HABITAT, THE PRECISE COUNTING OF REAL INDIVIDUALS CAN ONLY BE ESTIMATED. IN THESE PLOTS ONLY LARGER, MATURE PLANTS WERE FLAGGED AND THE NUMBER OF SMALLER PLANTS IN THE PLOT WAS ESTIMATED. THE NUMBER OF PLANTS OF EACH CATEGORY 2 TAXON OCCURRING WITHIN THE PLOT WAS COUNTED. NOTATION WAS MADE OF THE GENERAL CONDITION OF RARE PLANTS, I.E. IF THEY WERE JUVENILE, FLOWERING, FRUITING, OR DESICCATED.

4) CHARACTERIZE HABITAT PARAMETERS OF CATEGORY 2 PLANT TAXA.

FIELD NOTATIONS WERE MADE ON EACH CATEGORY 2 PLANT POPULATION TO DETERMINE EDAPHIC, TOPOGRAPHIC, AND BIOTIC COMPONENTS. PHENOLOGY, SOIL PARENT MATERIAL, ROOT SUBSTRATE MATERIAL, ASPECT OF SLOPE, PERCENT OF SLOPE, AND ASSOCIATED SPECIES WERE NOTED FOR EACH RARE PLANT POPULATION.

5) DEVELOP A LONG-TERM MONITORING PROGRAM FOR CATEGORY 2 PLANT POPULATIONS.

PERMANENT PLOTS HAVE BEEN ESTABLISHED FOR EACH CATEGORY 2 PLANT POPULATION. THE RELATIVE ABUNDANCE OF PLANTS IN EACH PLOT HAS BEEN MEASURED. A SIMPLE PROTOCOL HAS BEEN DEVELOPED THAT WILL ENABLE PARK PERSONNEL TO MONITOR THE RELATIVE ABUNDANCE AND HEALTH OF INDIVIDUAL CATEGORY 2 PLANT POPULATIONS THROUGH TIME.

RESULTS AND DISCUSSION

1) Produce a list of Category 2 plant taxa for Bryce Canyon National Park.

Currently (Federal Register 1993) there are five plant taxa that are listed in the Federal Register as Category 2 plants, and one plant taxon that is listed as a Category 3C under the provisions of the Endangered Species Act (Table 1).

A survey of the literature indicates that there are thirteen additional plant species that were proposed as threatened and/or endangered for Bryce Canyon National Park (Welsh and Thorne 1979, Table 2). Currently these plant taxa are not listed in the Federal Register, but they should be monitored to determine if they might decline to the point where they should receive some degree of protection. References to pertinent literature are included in Appendix 1.

Dr. Stan Welsh of the Botany and Range Science Department of Brigham Young University, Provo, Utah, was contacted personally during each field season. His experience in the region has provided a list of nine additional species (Table 3) that are considered "rare" for the state of Utah and occur in habitats similar to those found within the boundaries of the National Park. It is possible that these additional "rare" species may occur in remote areas of the park. More intensive reconnaissance will be needed to determine if they actually do occur in the park. None of these species were found during this study in the areas of the park that were surveyed.

2) Locate plant taxa that are currently listed in Category 2 in the Federal Register.

Plant records of the small herbarium in the park were consulted. Notation was made of the location and date of collection of each Category 2 plant specimen so that they might be verified in the field. Table 4 provides a listing of the name of the taxon and the number of specimens deposited for each taxon.

Plant records of the research herbarium at Brigham Young University were consulted and notation was made of the

LOCATION AND DATE OF COLLECTION OF EACH RARE PLANT SPECIMEN. TABLE 5 PROVIDES A LISTING OF THE NAME OF THE TAXON AND THE TOTAL NUMBER OF SPECIMENS DEPOSITED FOR EACH TAXON. ALSO INDICATED IS THE NUMBER OF SPECIMENS FOR EACH TAXON THAT WERE COLLECTED IN BRYCE CANYON NATIONAL PARK. SPECIAL ARRANGEMENTS HAVE BEEN MADE WITH THE CURATOR (KAY THORNE) TO OBTAIN LARGE FORMAT PHOTOCOPIES OF EACH HERBARIUM SHEET FOR FUTURE REFERENCE. LABEL DATA FROM THESE ARE INCLUDED WITH THIS FINAL REPORT IN APPENDIX 2; AND THE PHOTOCOPIES ARE ATTACHED TO THE REPORT IN APPENDIX 6. HISTORICAL DISTRIBUTIONS ARE INDICATED BY THE LOCALITY DATA RECORDED ON VOUCHER SPECIMENS DEPOSITED IN THE HERBARIA AT BRYCE CANYON NATIONAL PARK AND AT BRIGHAM YOUNG UNIVERSITY IN PROVO, UTAH.

KNOWN LOCATIONS OF CATEGORY 2 PLANT POPULATIONS WERE VISITED IN THE PARK DURING THE FIELD WORK PHASE OF THE PROJECT, WHICH INCLUDED THE GROWING SEASONS OF 1991, 1992, AND 1993. SINCE THESE CATEGORY 2 SPECIES APPEAR TO EXHIBIT ANTHESIS IN THE SPRING AND EARLY SUMMER, IT WAS DETERMINED THAT THE BEST TIME TO BE ABLE TO IDENTIFY THE POPULATIONS WAS DURING THE MONTH OF JUNE AND THE FIRST PART OF JULY. ALL SIX SPECIES PREVIOUSLY LISTED AS CATEGORY 2 (FEDERAL REGISTER 1990) (TABLE 1) WERE FOUND IN THE PARK, SOME AT NUMEROUS LOCATIONS. TABLE 7 GIVES THE LEGAL DESCRIPTIONS (TOWNSHIP, RANGE, AND SECTION) AND THE GLOBAL POSITIONING SYSTEM (G.P.S.) COORDINATES FOR EACH OF THESE PLOTS.

PLANT TAXA THAT ARE LISTED AS CATEGORY 2 OR 3C FOR UTAH (FEDERAL REGISTER 1990, 1993) AND ARE FOUND IN HABITATS SIMILAR TO THOSE OCCURRING WITHIN THE BOUNDARIES OF BRYCE CANYON NATIONAL PARK ARE LISTED IN TABLE 6.

3) DETERMINE THE DISTRIBUTION AND ABUNDANCE OF CATEGORY 2 PLANT TAXA WITH EMPHASIS ON AREAS WITH HIGH POTENTIAL FOR HUMAN IMPACT.

TWENTY EIGHT (28) PERMANENT PLOTS CONTAINING CATEGORY 2 PLANT TAXA HAVE BEEN ESTABLISHED (TABLE 7). RELATIVE ABUNDANCE VALUES OF EACH OF THE FIVE RARE SPECIES FOUND INDICATES THAT SOME ARE MORE RARE THAN OTHERS.

THE GEOGRAPHIC LOCATION OF POPULATIONS OF EACH OF THE FIVE CATEGORY 2 SPECIES FOUND (TABLE 7 AND FIGURE 2) INDICATES THAT THEY ARE VERY CLOSELY CORRELATED WITH EDAPHIC FACTORS, PRIMARILY SUBSTRATE PARENT MATERIAL.

It is also noted that some of the species are commonly found along, and even on, heavily used trails. This will have some impact on management decisions relating to trail expansion and alternative trail usage patterns.

4) Characterize habitat parameters of rare plant taxa

Field notations were made on each Category 2 plant population (Table 8) to determine edaphic, topographic, and biotic components. Phenology, soil parent material, root substrate material, aspect of slope, percent of slope, and associated species were noted for each Category 2 plant population.

Four of the five Category 2 taxa (i.e. Castilleja parvula var. revealii, Cryptantha ochroleuca, Penstemon bracteatus, and Silene petersonii) appear to be closely associated with the more or less well defined badlands of the Claron formation, especially on the ridgeline dividing the drainages of Bryce Wash and Campbell Canyon. In these locations there is no soil development. The substrate is generally clay-limestone which is overlaid by gravels or larger particles. Elevations range from 2,200 to 2,400 meters above sea level. These areas are characterized by a lack of vegetation with the plant populations occupying bare, open slopes. The vegetation in surrounding areas consists of open stands of Pinus longaeva, P. ponderosa, and P. flexilis. Importance values, which take into account density and basal area, for these three tree species are 128.3, 8.6, and 44.9 respectively, and the ecological vegetation type has been called PILO (for Pinus longaeva) (Graybosch, R. A. and H. Buchanan 1983).

The fifth Category 2 taxon (Pediomelum pariense) is found in two habitat types: Pinus ponderosa/Arctostaphylos patula (PIPO/ARPA) and Abies concolor/Arctostaphylos patula (ABCO/ARPA). In the PIPO/ARPA habitat type where the Paria Breadroot is found, the total tree basal area is partitioned between Pinus ponderosa 71.3%, Pinus longaeva 18.1%, and Juniperus scopulorum 10.6%. In the ABCO/ARPA habitat type where the Paria Breadroot is found, the total tree basal area is partitioned between Pinus ponderosa 46.7%, Pseudotsuga menziesii 36.8%, Abies concolor 9%, and Juniperus scopulorum 7.5% (Hallsten, G. P. and D. W. Roberts).

REPORT FOR THE PERMANENT PLOTS. ANY CHANGE IN THE TRAIL UTILIZATION TYPE FOR THIS AREA (SUCH AS PERMITTING HORSEBACK RIDING OR TRAIL BIKE RIDING) SHOULD BE VERY STRONGLY DISCOURAGED.

IT IS RECOMMENDED THAT HIKERS BE MADE AWARE OF THE DANGER TO CATEGORY 2 PLANT POPULATIONS WHEN THEY CHOOSE TO WALK OFF OF THE ESTABLISHED TRAILS. OBVIOUSLY, INDIVIDUAL CATEGORY 2 PLANT POPULATIONS OR TAXA SHOULD NOT BE IDENTIFIED; BUT IT WOULD BE SUFFICIENT TO ISSUE A SIMPLE WARNING TO HIKERS THAT BRYCE CANYON NATIONAL PARK IS THE HOME OF A SIGNIFICANT NUMBER OF RARE PLANTS AND THAT HIKING ONLY ON THE TRAILS WILL HELP TO PRESERVE THESE PLANTS.

3) MANAGED BURNING WITHIN THE PARK SHOULD HAVE LITTLE EFFECT ON MOST CATEGORY 2 PLANT POPULATIONS (WITH THE EXCEPTION OF THE PARIA BREADROOT) SINCE THEY GROW IN "BREAKS" AREAS BELOW THE RIM OF THE PLATEAU OR IN HIGHER ELEVATION "KNOBS" ON THE TOP OF THE PLATEAU. BOTH OF THESE AREAS ARE CHARACTERIZED BY REDUCED VEGETATION COVER AND A LACK OF PLANT LITTER. IN THESE AREAS IT IS NOT UNCOMMON TO SEE A BARE GROUND PERCENTAGE OF OVER 80 PERCENT. BECAUSE OF THE LACK OF PLANT LITTER, THE BURNING OF THESE AREAS WOULD NOT PRODUCE TEMPERATURES OF SUFFICIENT HEAT TO KILL THE BELOW-GROUND PERENNATING ORGANS.

IT IS RECOMMENDED THAT BEFORE AND AFTER BURNING IN AREAS THAT ARE KNOWN TO CONTAIN PERMANENT PLOTS OF CATEGORY 2 PLANT POPULATIONS THAT THE POPULATIONS BE MEASURED USING THE PROTOCOL OUTLINED IN THIS REPORT. THIS WOULD PROVIDE A USEFUL TOOL TO EVALUATE THE OVERALL IMPACT OF BURNING ON THESE PLANT POPULATIONS WITHIN THE PARK. THE MEASUREMENT OF PERMANENT PLOTS AFTER CONTROLLED BURNING SHOULD BE DONE EACH YEAR FOR AT LEAST FIVE YEARS IN ORDER TO BE ABLE TO OBSERVE ANY TRENDS IN POPULATION SIZE AND HEALTH.

IT IS RECOMMENDED THAT PARTICULAR ATTENTION BE PAID TO POPULATIONS OF THE PARIA BREADROOT (PEDIOMELUM PARIENSE) IF AREAS CONTAINING THIS SPECIES ARE TO BE BURNED. UNLIKE THE OTHER TAXA OF CATEGORY 2 PLANTS THAT GROW IN MORE OR LESS OPEN AREAS, THIS SPECIES GROWS IN AREAS THAT HAVE A SIGNIFICANT AMOUNT OF PONDEROSA PINE AND MANZANITA. THESE ASSOCIATED SPECIES MAY HAVE PRODUCED A SIGNIFICANT AMOUNT OF FUEL LOAD CLOSE TO THE PLANT POPULATIONS. SUCH AREAS SHOULD BE CLOSELY MONITORED DURING BURNING IN ORDER TO PREVENT COMPLETE COVERAGE

TABLE 1. PLANT TAXA LISTED IN CATEGORY 2 (FEDERAL REGISTER 1993) AND KNOWN TO OCCUR IN BRYCE CANYON NATIONAL PARK.

TAXON	CATEGORY[1]
SILENE PETERSONII	2
CRYPTANTHA OCHROLEUCA	2
HETEROTHECA JONESII	3C*
PENSTEMON BRACTEATUS	2
PEDIOMELUM PARIENSE	2
CASTILLEJA PARVULA VAR. *REVEALII*	2

[1] CATEGORIES ARE AS FOLLOWS:

2 = TAXA FOR WHICH THERE IS SOME EVIDENCE OF VULNERABILITY, BUT FOR WHICH THERE ARE NOT ENOUGH DATA TO SUPPORT LISTING PROPOSALS AT THIS TIME.

* = *HETEROTHECA JONESII* WAS LISTED AS A CATEGORY 2 PLANT IN THE 1990 FEDERAL REGISTER. CATEGORY 3C TAXA ARE THOSE THAT HAVE PROVEN TO BE MORE ABUNDANT OR WIDESPREAD THAN PREVIOUSLY BELIEVED AND/OR THOSE THAT ARE NOT SUBJECT TO ANY IDENTIFIABLE THREAT.

TABLE 2. PROPOSED THREATENED OR ENDANGERED PLANT TAXA IN BRYCE CANYON NATIONAL PARK. (WELSH AND THORN 1979).

SCIENTIFIC NAME	COMMON NAME
ASTRAGALUS BARNEBYI	BARNEBY MILKVETCH
CASTILLEJA AQUARIENSIS	AQUARIUS PAINTBRUSH
CYMOPTERUS MINIMUS	CEDAR BREAKS BISCUITROOT
DRABA SUBALPINA	SUBALPINE WHITLOWGRASS
ERIOGONUM ARETOIDES	WIDTSOE BUCKWHEAT
ERIOGONUM CORYMBOSUM VAR. REVEALIANUM	REVEAL BUCKWHEAT
LESQUERELLA RUBICUNDULA	BRYCE BLADDERPOD
LESQUERELLA TUMULOSA	KODACHROME TWINPOD
PHLOX GLADIFORMIS	RED CANYON PHLOX
TOWNSENDIA MINIMA	LEAST TOWNSENDIA
PENSTEMON ATWOODII	ATWOOD BEARDTONGUE
PENSTEMON PARVUS	SMALL BEARDTONGUE
RANUNCULUS ACRIFORMIS VAR. AESTIVALIS	AUTUMN BUTTERCUP

TABLE 3. "RARE" PLANT TAXA POSSIBLY FOUND WITHIN BRYCE CANYON NATIONAL PARK (ACCORDING TO WELSH, S.L. PERSONAL COMMUNICATION).

SCIENTIFIC NAME
ASTRAGALUS LIMNOCHARIS VAR. TABULAEUS
CYMOPTERUS MINIMUS
ERIOGONUM ARETOIDES
ERIOGONUM PANGUICENSE VAR. PANGUICENSE
LEPIDIUM MONTANUM VAR. NEESEAE
OXYTROPIS OREOPHILA VAR. JONESII *
PHYSARIA CHAMBERSII VAR. SOBOLIFERA
RANUNCULUS ACRIS VAR. AESTIVALIS
SPIRANTHES DILUVIALIS

* OXYTROPIS OREOPHILA VAR. JONESII HAS BEEN LOCATED IN BRYCE CANYON NATIONAL PARK. SEE TABLE 7.

TABLE 4. CATEGORY 2 PLANT TAXA CONTAINED IN THE MUSEUM HERBARIUM AT BRYCE CANYON NATIONAL PARK.

TAXON	NO. OF SPECIMENS
CASTILLEJA PARVULA VAR. *REVEALII*	4
CRYPTANTHA OCHROLEUCA	4
HETEROTHECA JONESII	2
PEDIOMELUM PARIENSE	4
PENSTEMON BRACTEATUS	3
SILENE PETERSONII	3

TABLE 5. CATEGORY 2 AND OTHER "RARE" PLANT TAXA CONTAINED IN THE HERBARIUM AT BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.

TAXON	NO. OF SPECIMENS TOTAL	NO. OF SPECIMENS COLLECTED IN BRYCE
ASTRAGALUS LIMNOCHARIS VAR. TABULAEUS	2	0
CYMOPTERUS MINIMUS	23	0
LEPIDIUM MONTANUM	17	0
ERIOGONUM ARETOIDES	7	0
SPIRANTHES DILUVIALIS	9	0
RANUNCULUS ACRIS VAR. AESTIVALIS	5	0
SILENE PETERSONII	7	1
CRYPTANTHA OCHROLEUCA	10	0
HETEROTHECA JONESII	20	0
PENSTEMON BRACTEATUS	14	2
PEDIOMELUM PARIENSE	8	3
CASTILLEJA PARVULA VAR. REVEALII	6	1
PHYSARIA CHAMBERSII	4	0
LESQUERELLA RUBICUNDULA	26	3
LOMATIUM MINIMUM	23	5
TOWNSENDIA MONTANA VAR. MINIMA	23	2
OXYTROPIS OREOPHILA VAR. JONESII	21	0

TABLE 6. PLANT TAXA LISTED AS THREATENED OR ENDANGERED (FEDERAL REGISTER 1993) AND KNOWN TO OCCUR IN HABITATS SIMILAR TO THOSE FOUND IN BRYCE CANYON NATIONAL PARK.

TAXON	CATEGORY[1]	STATUS TREND[2]
ASTRAGALUS LIMNOCHARIS VAR. *TABULAEUS*	2	U
CYMOPTERUS MINIMUS	2	U
ERIOGONUM ARETOIDES	2	U
LEPIDIUM MONTANUM VAR. *STELLAE*	PE	U

[1] CATEGORIES ARE AS FOLLOWS:

2 = TAXA FOR WHICH THERE IS SOME EVIDENCE OF VULNERABILITY, BUT FOR WHICH THERE ARE NOT ENOUGH DATA TO SUPPORT LISTING PROPOSALS AT THIS TIME.

PE = TAXA ALREADY PROPOSED TO BE LISTED AS ENDANGERED.

[2] STATUS TREND IS AS FOLLOWS:

U = UNKNOWN.

Table 7. Permanent Plots.

Plot No.	Legal Description UTM-East UTM-North	X Axis Bearing °	X Axis Length m	Y Axis Bearing °	Y Axis Length m	Area m^2	Rare Taxa	No. of Plants	Rel. Density m2/plant
1	T36S, R3W, Sec 31, NE 1/4 398270.22 4165808.75	37	22.0	127	29.0	638	CAPA PEBR	133 33	4.79 22.91
2	T36S, R3W, Sec 31, NE 1/4 398235.38 4165794.00	55	10.0	145	8.0	80	CAPA PEBR CROC	11 11 1	0.14 0.14 0.01
3	T37S, R4W, Sec 12, SE 1/4 396520.50 4161401.25	110	9.0	200	6.0	54	PEPA	67	1.24
4	T37S, R4W, Sec 12, SW 1/4 396390.28 4161403.25	90	2.8	180	3.2	9	PEPA	21	2.34
5	T37S, R4W, Sec 12, SW 1/4 396192.12 4161339.25	90	12.4	180	9.2	114	PEPA	400	3.51
6	T37S, R4W, Sec 13, NW 1/4 396151.81 4161246.00	140	12.4	230	22.8	283	PEPA	1000	3.54
7	T37S, R4W, Sec 13, NW 1/4 396237.28 4161349.25	350	8.4	260	12.3	103	PEPA	500	4.84
8	T37S, R3W, Sec 6, SW 1/4 397806.19 4163471.50	280	30.0	180	27.9	837	PEBR	300	0.36
9	T37S, R3W, Sec 6, SW 1/4 397770.25 4163407.25	360	18.0	90	10.0	180	PEBR	350	1.94
10	T36S, R3W, Sec 31, NE 1/4 no data available[1]	150	17.0	240	7.8	133	TOMO	90	0.68

[1] Sites with no G.P.S. data represent sites at which the pin and tag were not found.

Table 7. Permanent Plots (Continued).

Plot No.	Legal Description UTM-East UTM-North	X Axis Bearing °	X Axis Length m	Y Axis Bearing °	Y Axis Length m	Area m^2	Rare Taxa	No. of Plants	Rel. Density m2/plant
11	T36S, R3W, Sec 30, SE 1/4 398161.41 4166643.50	290	17.4	200	7.4	129	TOMO OXJO	300 250	2.33 1.94
12	T36S, R3W, Sec 30, SW 1/4 397310.91 4166265.25	340	19.2	70	12.1	232	OXJO	53	0.23
13	T37S, R4W, Sec 13, NW 1/4 396064.50 4161184.75	60	5.3	150	3.0	16	PEPA	90	5.66
14	T37S, R4W, Sec 13, NW 1/4 396308.16 4160480.00	70	10.0	160	6.4	64	PEPA CAPA	90 19	1.41 0.30
15	T37S, R4W, Sec 18, NE 1/4 396457.41 4159729.50	90	7.0	180	1.3	9	PEPA	90	9.89
16	T36S, R4W, Sec 36, NW 1/4 396045.47 4165730.25	270	7.0	180	2.7	19	TOMO	90	4.76
17	T37S, R4W, Sec 1, SW 1/4 396500.00 4163037.25	70	12.6	340	4.3	54	TOMO	90	1.66
18	T37S, R4W, Sec 1, SW 1/4 396685.72 4162895.75	320	30.0	50	20.0	600	CAPA CROC	90 120	0.15 0.46
19	T37S, R4W, Sec 29, SE 1/4 no data available[1]	360	3.2	270	1.8	6	TOMO	90	15.63
20	T36S, R3W, Sec 31, NE 1/4 no data available[1]	200	6.0	290	4.3	26	SIPE	13	0.50
21	T36S, R3W, Sec 31, NE 1/4 398177.44 4165806.00	220	10.7	310	4.3	46	SIPE	100	2.17

[1] Sites with no G.P.S. data represent sites at which the pin and tag were not found.

Table 7. Permanent Plots (Continued).

Plot No.	Legal Description UTM-East UTM-North	X Axis Bearing °	X Axis Length m	Y Axis Bearing °	Y Axis Length m	Area m^2	Rare Taxa	No. of Plants	Rel. Density m2/plant
22/24[2]	T36S, R3W, Sec 31, NE 1/4 no data available[1]	330	12.0	60	5.0	60	SIPE	50	0.83
23	T36S, R3W, Sec 31, NE 1/4 no data available[1]	360	7.0	270	14.5	102	SIPE	44	0.43
24/22[2]	T36S, R3W, Sec 31, NE 1/4 398269.84 4165798.25	150	12.0	240	5.0	60	SIPE	50	0.83
25	T38S, R4W, Sec 5, NE 1/4 390676.41 4154783.50	12	10.0	102	10.0	100	HEJO	50	0.50
26	T38S, R4W, Sec. 5, NE 1/4 390636.62 4154815.00	360	10.0	90	10.0	100	HEJO	30	0.30
27	T37S, R4W, Sec 12, NE 1/4 396649.34 4162850.75	170	10.0	80	10.0	100	CAPA	25	0.25
28	T37S, R4W, Sec 12, NE 1/4 396603.34 4162821.25	350	10.0	80	10.0	100	CAPA	35	0.35

[1] Sites with no G.P.S. data represent sites at which the pin and tag were not found.
[2] Site Number 22 was vandalized and was reestablished by relocating the pin and renumbering it No. 24.

Table 8. Habitat Parameters for Permanent Plots.

Plot No.	Habitat Parameters
1	Aspect: 127° Slope: 16% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Gravely wash Associated species: Pinus ponderosa, Linum kingii, Hymenoxis acaulis.
2	Aspect: 145° Slope: 28% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Phlox diffusa, Hymenoxis aculis, Linum kingii, Aquilegia pseudoalpina.
3	Aspect: 110° Slope: 73% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Talus slopes in loose sand and gravel. Associated species: Arctostaphylos patula, Juniperus osteosperma, Pinus ponderosa, Cercocarpus ledifolius, Pseudotsuga menzesii.
4	Aspect: Flat ridge top. Slope: 0% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Juniperus osteosperma, Pinus ponderosa.
5	Aspect: 90° Slope: 51% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Juniperus osteosperma, Pinus ponderosa.
6	Aspect: 140° Slope: 37% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Gravely slopes. Associated species: Purshia tridentata, Arctostaphylos patula.

Table 8. Habitat Parameters for Permanent Plots (Continued).

Plot No.	Habitat Parameters
7	Aspect: 350° Slope: 30% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil in shallow wash. Associated species: Arctostaphylos patula, Pinus ponderosa, Gilia aggregata, Cryptantha capitata.
8	Aspect: 90° Slope: 60% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely talus slope. Associated species: Arctostaphylos patula, Pinus edulis.
9	Aspect: 90° Slope: 72% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Highly erodible cobble underlaid with sand. Associated species: Agropyron, Oenothera, Physaria.
10	Aspect: 360° Slope: 50% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Pinus flexilis, Pinus ponderosa.
11	Aspect: flat rim top. Slope: 0% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Pinus ponderosa, Arctostaphylos patula, Juniperus osteosperma.
12	Aspect: 270° Slope: 42% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Pinus longaeva, Pinus ponderosa, Pinus flexilis, Juniperus communis, Hymenoxis acaulis, Arctostaphylos patula.

Table 8. Habitat Parameters for Permanent Plots (Continued).

Plot No.	Habitat Parameters
13	Aspect: 60° Slope: 27% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Pseudotsuga menzesii, Abies concolor, Arctostaphylos patula, Juniperus communis, Pinus ponderosa.
14	Aspect: 70° Slope: 31% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Pinus ponderosa, Pseudotsuga menzesii, Juniperus osteosperma, Linum lewisii.
15	Aspect: Flat rim top. Slope: 0% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil. Associated species: Arctostaphylos patula, Pinus ponderosa, Pinus edulis, Pseudotsuga menzesii, Hymenoxis acaulis.
16	Aspect: 270° Slope: 30% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy loam scattered with cobble. Associated species: Pseudotsuga menzesii, Arctostaphylos patula, Purshia tridentata.
17	Aspect: 340° Slope: 35% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy loam scattered with cobble. Associated species: Arctostaphylos patula, Purshia tridentata, Pinus ponderosa, Circium pulchellum.
18	Aspect: 150° Slope: 27% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, gravely soil with some humus. Associated species: Pinus longaeva, Psuudotsuga menzesii, Arctostaphylos patula, Pinus ponderosa, Linum kingii.

Table 8. Habitat Parameters for Permanent Plots (Continued).

Plot No.	Habitat Parameters
19	Aspect: 360° Slope: 16% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Sandy, cobbley loam. Associated species: Arctostaphylos patula, Pinus ponderosa.
20	Aspect: 320° Slope: 65% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Bare sandy gravel. Associated species: Pinus longaeva.
21	Aspect: 130° Slope: 60% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Bare sandy, gravely soil. Associated species: Pinus longaeva.
22	Aspect: 60° Slope: 75% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Bare sandy, gravely soil. Associated species: Pinus longaeva.
23	Aspect: 180° Slope: 45% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Bare sandy, gravely soil. Associated species: Pinus longaeva.
24	Aspect: 60° Slope: 75% Parent material: Pink and tan, fine-grained limestone, Claron Formation. Soil texture: Bare sandy, gravely soil. Associated species: Pinus longaeva.

Table 8. Habitat Parameters for Permanent Plots (Continued).

Plot No.	Habitat Parameters
25	Aspect: 50° Slope: 40% Parent material: White sand of the Claron Formation. Soil texture: White, loose, sandy soil. Associated species: Arctostaphylos patula & Pinus ponderosa
26	Aspect: 90° Slope: 40% Parent material: White sand of the Claron Formation. Soil texture: White, loose, sandy soil. Associated species: Arctostaphylos patula & Pinus ponderosa
27	Aspect: 180° Slope: 20% Parent material: White and tan, fine-grained limestone, Claron Formation. Soil texture: Sand and cobble soil with moderate organic matter. Associated species: Arctostaphylos patula, Pinus ponderosa
28	Aspect: 20° Slope: 20% Parent material: White and tan, fine-grained limestone, Claron Formation. Soil texture: Sand and cobble soil with moderate organic matter. Associated species: Arctostaphylos patula, Pinus ponderosa

Table 9. Summary of Habitat Parameters of Category 2 Plant Taxa.

Taxon	Survey Sites	Habitat Parameter Summary
SIPE	20, 21, 22, 23, 24	Aspect: Generally North, East, and Southeast facing slopes. Slope: 45 through 75 percent slopes. Parent Material: Pink and tan, fine-grained limestone of the Claron Formation. Soil Texture: Bare, sandy to gravely soil. Associated Species: *Pinus longaeva*
CAPA	1, 2, 14, 18, 27, 28	Aspect: Generally North, East, and Southeast facing slopes. Slope: 16 through 31 percent slopes. Parent Material: Pink and tan, fine-grained limestone of the Claron Formation. Soil Texture: Sandy-gravely washes or on upland areas where a moderate amount of organic matter accumulates. Associated Species: *Pinus ponderosa, Linum kingii, Hymenoxis acaulis, Arctostaphylos patula, Phlox diffusa, Aquilegia pseudoalpina, Pseudotsuga menzesii, Juniperus osteosperma, Linum lewisii, Pinus longaeva.*
PEBR	1, 2, 8, 9	Aspect: Generally North, East, and Southeast facing slopes. Slope: 16 through 73 percent slopes. Parent Material: Pink and tan, fine-grained limestone of the Claron Formation. Soil Texture: Sandy, gravely soils, sometimes in low relief washes, sometimes on highly erodible cobble slopes underlaid with sand. Associated Species: *Pinus ponderosa, Linum kingii, Hymenoxis acaulis, Arctostaphylos patula, Phlox diffusa, Aquilegia pseudoalpina, Pinus edulis, Agropyron sp., Oenothera sp., Physaria chambersii, Linum lewisii.*

Table 9. Summary of Habitat Parameters of Category 2 Plant Taxa (Continued).

Taxon	Survey Sites	Habitat Parameter Summary
PEPA	3, 4, 5, 6, 7, 13, 14, 15	Aspect: Generally North, East, and Southeast facing slopes. Slope: 0 through 73 percent slopes. Parent Material: Pink and tan, fine-grained limestone of the Claron Formation. Soil Texture: Sandy, gravely soils, sometimes in shallow washes that spill off the rim of the plateau. Associated Species: *Arctostaphylos patula, Juniperus osteosperma, Pinus ponderosa, Cercocarpus ledifolius, Pseudotsuga menzesii, Purshia tridentata, Gilia aggregata, Cryptantha capitata, Abies concolor, Linus lewisii, Hymenoxis acaulis.*
CROC	2, 18	Aspect: Generally Southeast facing slopes. Slope: 28 percent slopes. Parent Material: Pink and tan, fine-grained limestone of the Claron Formation. Soil Texture: Sandy, gravely soils with some humus accumulation. Associated Species: *Arctostaphylos patula, Phlox diffusa, Hymenoxis acaulis, Linum kingii, Aquilegia pseudoalpina, Pinus longaeva, Pseudotsuga menzesii, Pinus ponderosa.*
HEJO	25, 26	Aspect: Generally East to Northeast facing slopes. Slope: 40 percent slopes. Parent Material: White sand of the Claron Formation. Soil Texture: Sandy, gravely soils with some humus accumulation. Associated Species: *Arctostaphylos patula and Pinus ponderosa.*

Figure 1. Regional Map for Bryce Canyon National Park.

Outline indicates the boundaries of the State of Utah. Asterisk (*) indicates the location of Salt Lake City. Rectangle indicates location of Bryce Canyon National Park.

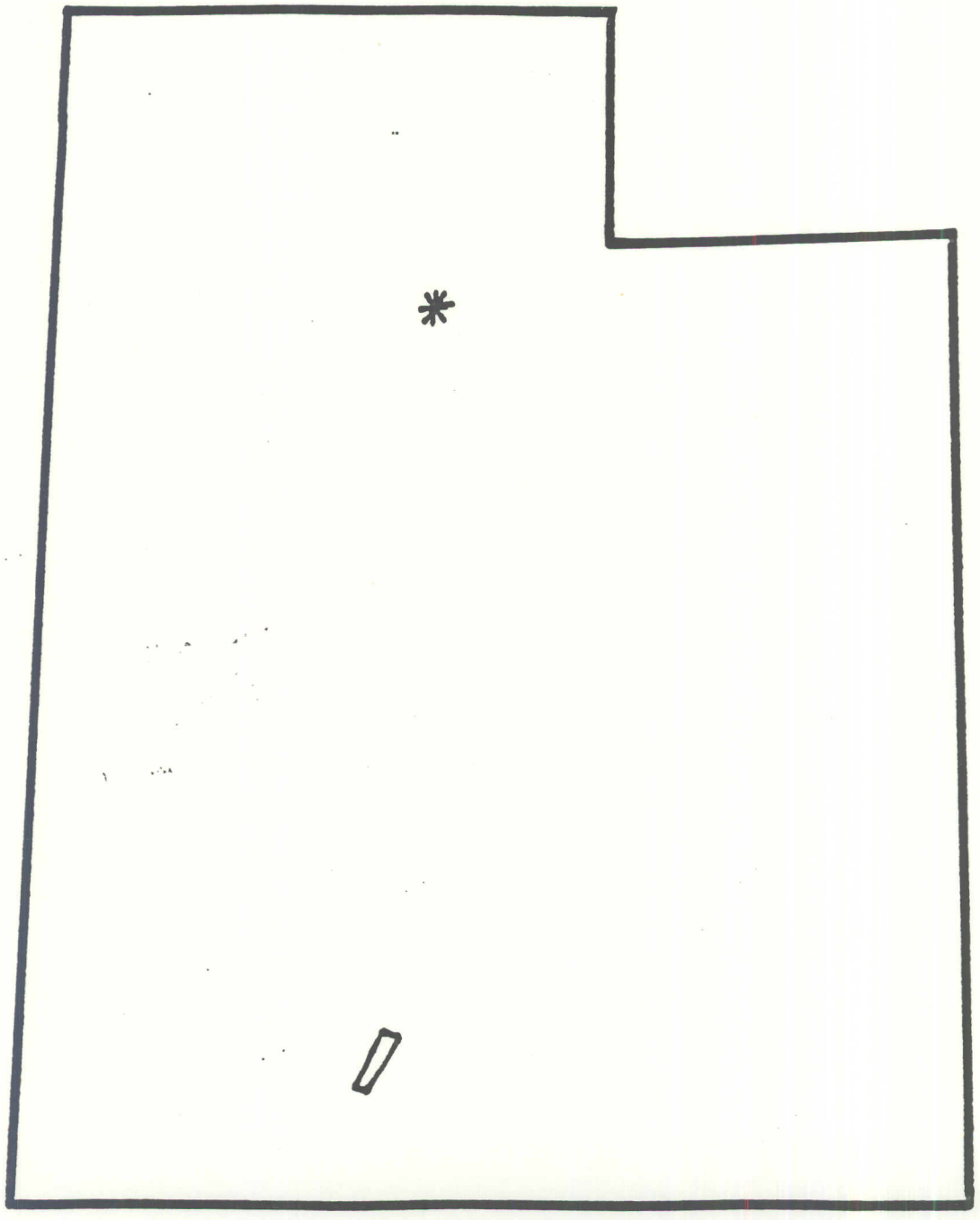
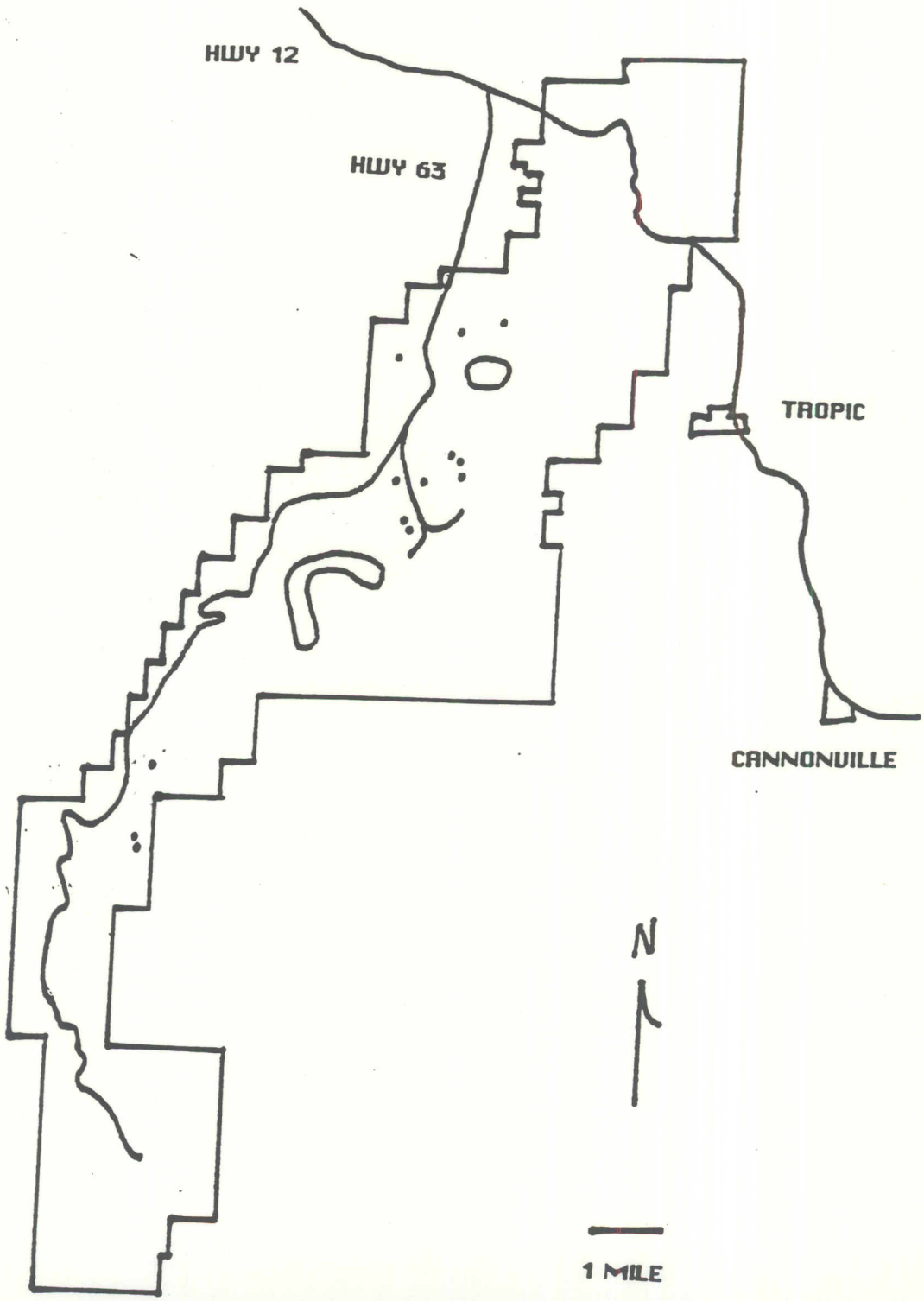


Figure 2. Local Map for Bryce Canyon National Park.

Outline indicates park boundaries.
Dots and outlined areas contain rare plant populations.



Appendix 1. Bibliography.

Bowers, W. E. 1991. Geologic map of Bryce Canyon National Park and Vicinity, Southwestern Utah. Department of the Interior, United States Geological Survey. Denver, Colorado.

Buchanan, H. 1960. The plant ecology of Bryce Canyon National Park. Unpublished dissertation, University of Utah, Salt Lake City.

Buchanan, H. and R. Graybosch. 1981. Revised checklist of the vascular plants of Bryce Canyon National Park, Utah. Great Basin Nat. 41(1): 109-120.

United States Fish and Wildlife Service. 1993. Proposed Plant Taxa for Listing. Federal Register, 30 Sep 1993: 51143-51190.

Graybosch, R. and H. Buchanan. 1983. Vegetative types and endemic plants of the Bryce Canyon breaks. Great Basin Nat. 43(4): 701-712.

Hallsten, G. P. and D. W. Roberts. 1989. Analysis of community composition and habitat of Pediomelum pariense (Fabaceae) in Bryce Canyon National Park. Unpublished manuscript.

Roberts, D. W., D. W. Wight, and G. P. Hallsten. 1989. Plant community distribution and dynamics in Bryce Canyon National Park. Unpublished manuscript.

United States Fish and Wildlife Service (USFWS). 1988. Endangered Species Act of 1973: As Amended through the 100th Congress.

Welsh, S. L. 1978. Endangered and threatened plants of Utah: A reevaluation. Great Basin Nat. 38(1): 1-17.

Welsh, S. L., N. D. Atwood, and J. L. Reveal. 1975. Endangered, threatened, extinct, endemic, and rare or restricted Utah vascular plants. Great Basin Nat. 35(4): 327-376.

Welsh, S. L. and L. M. Chatterley. 1985. Utah's rare plants revisited. Great Basin Nat. 45(2): 173-209.

Welsh, S. L. and K. H. Thorn. 1979. Illustrated manual of proposed endangered and threatened plants of Utah. United States Fish and Wildlife Service, Denver, Colorado.

Appendix 2. List of Label Data of Herbarium Sheets of Bryce Canyon Rare Plant Specimens Deposited in the Herbarium at Brigham Young University, Provo, Utah.

Taxon	Collection Location	Date	Collector No.	Accession No.
SIPE	Along Campbell Canyon Trail 1/2 mile west of Tower Bridge.	7 Jul 1980	Graybosch 933	222874
PEBR	1/2 Mile east of Sunset Point along small tributary to Bryce Wash.	19 Jun 1980	Graybosch 791b	222872
PEBR	Along road to Bryce Point, 1/2 mile from Inspiration Point turnoff	24 Jun 1965	Holmgren 2018	57246
CAPA	Along Campbell Canyon Trail 1/2 mile west of Tower Bridge.	7 Jul 1980	Graybosch 934	222879
PEPA	Open ponderosa pine woods	12 Jul 1975	Murdock s.n.	129482
PEPA	Open ponderosa pine woods	23 Jul 1975	Murdock s.n.	129481
PEPA	Open ponderosa pine woods	12 Jul 1975	Murdock s.n.	129483

SIPE = Silene petersonii var. minor
PEBR = Penstemon bracteatus
CAPA = Castilleja parvula var. revealii
PEPA = Pediomelum pariense

Appendix 3. Protocol For Monitoring Category 2 Plant Permanent Plots.

1. Identify from map and survey records the geographic locality and species that is to be surveyed. Using the global positioning system, make way to the permanent plot. Take a copy of the previous survey record with you in the field.

2. At the survey location locate the marker post. It is an eighteen inch piece of concrete reinforcement bar that has been driven into the ground. It will have an aluminum identification tag attached to the upper portion of the rod. The tag will have written on it: "Rare Plant Survey" followed by the site number and the name "F.J. Peabody" and the date that this site was surveyed.

3. The survey record indicates two compass bearings using the marker post as the origin. These compass bearings are magnetic readings that have been compensated for declination using the topographic maps that were included with this study.

4. Also indicated on the survey record are distances for each of the degree bearings.

5. Two fiberglass meter tapes are extended from the marker post for the specified distances at the specified degree bearings. These distances and their corresponding degree bearings delineate two sides of the permanent plot.

6. Imaginary lines parallel to the fiberglass tapes delineate the other two sides of the permanent plot. In order to visualize the sides of the permanent plot that are not marked by the measuring tape, lengths of rope can be used.

7. The plants falling within the study plot are to be counted. The best method for counting plants is to insert into the ground next to each plant a brightly-colored wire flag (the kind used by road crews). If you start out with 100 flags you can count the number of flags remaining and subtract to get an accurate count.

8. Sometimes it is difficult to decide what constitutes a single plant, since some of the species form a clump-type growth habit. It is best to try to identify individual clumps that protrude above the surface of the ground and treat them as a single plants. Do not excavate to see if plants are connected below ground.

Appendix 3. Protocol For Monitoring Rare Plant Permanent Plots (Continued)

9. Some populations contain plants that are dispersed widely, while others contain plants in dense clusters. In order to accommodate this variation, permanent plot dimensions and locations were configured such that about 100 plants would fall within the plot.

10. Sampling in subsequent years, using the same methods, may indicate population trends, i.e. increase or decrease in numbers of individuals in specific locations.

Appendix 4. Individual Plot Site Data.

PLOT No. 1

Dates Sampled: 07 Jun 1991, 12 Jun 1992, 10 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: PEBR, CAPA
X Axis Bearing & Length: 37°, 22 m
Y Axis Bearing & Length: 127° 29 m
Number of Category 2 Plants: CAPA 133, PEBR 33
Notes: Most plants are in flowering condition.

PLOT No. 2

Dates Sampled: 07 Jun 1991, 12 Jun 1992, 10 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: PEBR, CAPA, CROC
X Axis Bearing & Length: 55° 10 m
Y Axis Bearing & Length: 145° 8 m
Number of Category 2 Plants: CAPA 11, PEBR 11, CROC 1
Notes: Most plants are in flowering condition.

PLOT No. 3

Dates Sampled: 08 Jun 1991, 14 Jun 1992, 12 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R3W, Sec 12, SE 1/4
Common Description: About .1 mi. west of Paria View, sheer cliff
Vegetation Notes: Plants growing on cliff margins.
Category 2 Plants: PEPA
X Axis Bearing & Length: 110° 9 m
Y Axis Bearing & Length: 200° 6 m
Number of Category 2 Plants: PEPA 67
Notes: Two plants in flower, remaining vegetative.

Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 7

Dates Sampled: 08 Jun 1991, 14 Jun 1992, 12 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R3W, Sec 13, NW 1/4
Common Description: About .4 mi. west of Paria View, plateau top
Vegetation Notes: Plants growing under manzanita shrubs
Category 2 Plants: PEPA
X Axis Bearing & Length: 350° 8.4 m
Y Axis Bearing & Length: 260° 12.3 m
Number of Category 2 Plants: PEPA 500
Notes: Many plants along canyon rim, mostly vegetative

PLOT NO. 8

Dates Sampled: 10 Jun 1991, 20 Jun 1992, 15 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R3W, Sec 6, SW 1/4
Common Description: East section of Peekaboo Loop Trail, about .7 mi. north of Bryce Point, near arches
Vegetation Notes: Sparsely vegetated talus slope
Category 2 Plants: PEBR
X Axis Bearing & Length: 280° 30 m
Y Axis Bearing & Length: 180° 27.9 m
Number of Category 2 Plants: PEBR 300
Notes: Plants growing in lines down highly erodible slope

PLOT NO. 9

Dates Sampled: 10 Jun 1991, 20 Jun 1992, 15 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R3W, Sec 6, SW 1/4
Common Description: East section of Peekaboo Loop Trail, about .7 mi. north of Bryce Point, near arches
Vegetation Notes: Sparsely vegetated talus slope
Category 2 Plants: PEBR
X Axis Bearing & Length: 360° 18 m
Y Axis Bearing & Length: 90° 10 m
Number of Category 2 Plants: PEPA 350
Notes: Plants growing in lines down highly erodible slope

Appendix 4. Individual Plot Site Data (Continued).

PLOT No. 13

Dates Sampled: 19 Jun 1991, 17 Jun 1992, 17 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R4W, Sec 13, NW 1/4
Common Description: .3 mi. southwest of Paria View
Vegetation Notes: Openings in ponderosa, manzanita forest
Category 2 Plants: PEPA
X Axis Bearing & Length: 60° 5.3 m
Y Axis Bearing & Length: 150° 3 m
Number of Category 2 Plants: PEPA 90
Notes: Mostly juvenile plants, only 5% in flower

PLOT No. 14

Dates Sampled: 19 Jun 1991, 17 Jun 1992, 17 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R4W, Sec 13, NW 1/4
Common Description: .5 mi. southwest of Paria View
Vegetation Notes: Openings in ponderosa, manzanita forest
Category 2 Plants: PEPA, CAPA
X Axis Bearing & Length: 70° 10 m
Y Axis Bearing & Length: 160° 6.4 m
Number of Category 2 Plants: PEPA 90, CAPA 19
Notes: Mostly juvenile plants, only 5% in flower

PLOT No. 15

Dates Sampled: 19 Jun 1991, 17 Jun 1992, 17 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T37S, R4W, Sec 18, NE 1/4
Common Description: .9 mi. south-southwest of Paria View
Vegetation Notes: Openings in bristlecone, manzanita forest
Category 2 Plants: PEPA
X Axis Bearing & Length: 90° 7 m
Y Axis Bearing & Length: 180° 1.3 m
Number of Category 2 Plants: PEPA 90
Notes: Many plants in full sun on plateau top, 5% flowering

Appendix 4. Individual Plot Site Data (Continued).

PLOT No. 16

Dates Sampled: 20 Jun 1991, 19 Jun 1992
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R4W, Sec 36, NW 1/4
Common Description: .6 mi. southwest of Visitors' Center
Vegetation Notes: Douglas fir, manzanita forest
Category 2 Plants: none (*Townsendia montana* var. *minima*)
X Axis Bearing & Length: 270° 7 m
Y Axis Bearing & Length: 180° 2.7 m
Number of "Rare" Plants: TOMO 90
Notes: Plants restricted to gravely limestone

PLOT No. 17

Dates Sampled: 25 Jun 1991, 19 Jun 1992
Researchers: Peabody & Peabody
Legal Description: T37S, R4W, Sec 1, SW 1/4
Common Description: .3 mi. southwest of Inspiration Point
Vegetation Notes: Ponderosa, manzanita forest openings
Category 2 Plants: none (*Townsendia montana* var. *minima*)
X Axis Bearing & Length: 70° 12.6 m
Y Axis Bearing & Length: 340° 4.3 m
Number of "Rare" Plants: TOMO 90
Notes: Northwest facing slopes of road cut, ca. 5% in fruit

PLOT No. 18

Dates Sampled: 25 Jun 1991, 19 Jun 1992, 23 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T37S, R4W, Sec 1, SW 1/4
Common Description: .2 mi. southwest of Inspiration Point
Vegetation Notes: Ponderosa, manzanita forest openings
Category 2 Plants: CAPA, CROC
X Axis Bearing & Length: 320° 30 m
Y Axis Bearing & Length: 50° 20 m
Number of Category 2 Plants: CAPA 90, CROC 120
Notes: Southeast facing slopes of roadcut, ca. 90% in flower

Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 19

Dates Sampled: 25 Jun 1991, 20 Jun 1992
Researchers: Peabody & Peabody
Legal Description: T37S, R4W, Sec 29, SE 1/4
Common Description: .5 mi. north of Fairview in picnic area
Vegetation Notes: Ponderosa, manzanita forest openings
Category 2 Plants: none (*Townsendia montana* var. *minima*)
X Axis Bearing & Length: 360° 3.2 m
Y Axis Bearing & Length: 270° 1.8 m
Number of "Rare" Plants: TOMO 90
Notes: Dense coverage of plants, ca. 50% with fruit

PLOT NO. 20

Dates Sampled: 17 Aug 1991, 13 Jun 1992, 11 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: SIPE
X Axis Bearing & Length: 200° 6 m
Y Axis Bearing & Length: 290° 4.3 m
Number of "Rare" Plants: SIPE 13
Notes: Small population near trail in white gravely limestone

PLOT NO. 21

Dates Sampled: 17 Aug 1991, 13 Jun 1992, 11 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: SIPE
X Axis Bearing & Length: 220° 10.7 m
Y Axis Bearing & Length: 310° 4.3 m
Number of "Rare" Plants: SIPE 100
Notes: Larger population near trail & cliff face & below cliff

Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 22

Dates Sampled: 17 Aug 1991, 13 Jun 1992, 11 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: SIPE
X Axis Bearing & Length: 330° 12 m
Y Axis Bearing & Length: 60° 5 m
Number of "Rare" Plants: SIPE 50
Notes: Larger population just below trail to lower switchback

PLOT NO. 23

Dates Sampled: 17 Aug 1991, 13 Jun 1992, 11 Jun 1993
Researchers: Peabody & Livingston, Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: SIPE
X Axis Bearing & Length: 360° 7 m
Y Axis Bearing & Length: 270° 14.5 m
Number of "Rare" Plants: SIPE 44
Notes: Plants scattered on slopes within 5 m below trail
Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 24

Dates Sampled: 11 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T36S, R3W, Sec 31, NE 1/4
Common Description: Chinese Wall, Fairyland Loop Trail
Vegetation Notes: Sparse vegetation in breaks area
Category 2 Plants: SIPE
X Axis Bearing & Length: 150° 12 m
Y Axis Bearing & Length: 240° 5 m
Number of "Rare" Plants: SIPE 50
Notes: Reestablishment of plot number 22

Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 25

Date Sampled: 18 Jun 1992, 24 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T38S, R4W, Sec 5, NE 1/4
Common Description: Under-the-Rim Trail .2 mi. south of Garfield County line
Vegetation Notes: Manzanita & sage shrubs in open ponderosa woodland
Category 2 Plants: HEJO
X Axis Bearing & Length: 12° 10 m
Y Axis Bearing & Length: 102° 10 m
Number of "Rare" Plants: HEJO 50
Notes: About 50 clumps of plants ranging in size from 6 to 30 cm

PLOT NO. 26

Dates Sampled: 18 Jun 1992, 24 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T38S, R4W, Sec 5, NE 1/4
Common Description: Under-the-Rim Trail .2 mi. south of Garfield County line
Vegetation Notes: Manzanita & sage shrubs in open ponderosa woodland
Category 2 Plants: HEJO
X Axis Bearing & Length: 360° 10 m
Y Axis Bearing & Length: 90° 10 m
Number of "Rare" Plants: HEJO 30
Notes: About 30 clumps of plants ranging in size from 2 to 25 cm

PLOT NO. 27

Dates Sampled: 24 Jun 1992, 26 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T37S, R4W, Sec 12, NE 1/4
Common Description: .9 mi. west of Bryce Point
Vegetation Notes: Ponderosa, manzanita forest openings
Category 2 Plants: CAPA
X Axis Bearing & Length: 170° 10 m
Y Axis Bearing & Length: 80° 10 m
Number of "Rare" Plants: CAPA 25
Notes: Scattered plants along shallow wash, ca. 70% flowering

Appendix 4. Individual Plot Site Data (Continued).

PLOT NO. 28

Dates Sampled: 24 Jun 1992, 26 Jun 1993
Researchers: Peabody & Peabody
Legal Description: T37S, R4W, Sec 12, NE 1/4
Common Description: .9 mi. west of Bryce Point
Vegetation Notes: Ponderosa, manzanita forest openings
Category 2 Plants: CAPA
X Axis Bearing & Length: 350° 10 m
Y Axis Bearing & Length: 80° 10 m
Number of "Rare" Plants: CAPA 35
Notes: Scattered plants along shallow wash, ca. 70% flowering

Appendix 5. Field Survey Forms for Permanent Plots.

FIELD SURVEY FORM

RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 1

DATES SAMPLED 07 JUN 1991 12 JUN 1992 10 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3 W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION ALONG FAIRYLAND TRAIL EAST OF NORTH CAMPGROUND, NEAR CHINESE WALL

SITE VEGETATION NOTES SPARSE VEGETATION IN BREAKS AREA WITH PINUS PONDEROSA, AGROPYRON SP., LINUM KINGII, HYMENOXIS ACAULIS.

SITE SOIL TYPE NOTES GRAVELY WASH AREA IN PINK AND TAN FINE-GRAINED LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 37 ° X AXIS LENGTH 27 m

Y AXIS BEARING 127 ° Y AXIS LENGTH 29 m

ASPECT 127 ° SLOPE 16 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
CAPA	133	MANY PLANTS FLOWERING
PEBR	33	MANY PLANTS FLOWERING

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 2

DATES SAMPLED 07 JUN 1991 12 JUN 1992 10 JUN 1993

RESEARCHERS PEABODY, F LIVINGSTON, M PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3 W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION ALONG FAIRYLAND TRAIL EAST OF NORTH CAMPGROUND, NEAR CHINESE WALL

SITE VEGETATION NOTES SPARSE VEGETATION IN BREAKS AREA WITH ARCTOSTAPHYLOS PATULA, PHLOX DIFFUSA, HYMENOXIS ACAULIS, LINUM KINGII, AQUILEGIA PSEUDOALPINA

SITE SOIL TYPE NOTES GRAVELY SOIL IN PINK AND TAN FINE-GRAINED LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 55 ° X AXIS LENGTH 10 m

Y AXIS BEARING 145 ° Y AXIS LENGTH 8 m

ASPECT 145 ° SLOPE 28 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
CAPA	11	MOST PLANTS IN FLOWERING CONDITION
PEBR	11	MOST PLANTS IN FLOWERING CONDITION
CROC	1	FLOWERING

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 3

DATES SAMPLED 08 JUN 1991 14 JUN 1992 12 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37 S R 3 W SEC 12 QSEC SE 1/4

COMMON DESCRIPTION RIM OF SHEER CLIFF ABOUT 0.1 MILES WEST OF PARIA VIEW

SITE VEGETATION NOTES RARE PLANTS NOT FOUND IN SHADE OF OVERSTORY TREES, BUT ON CLIFF MARGINS, OFTEN AMONG ARCTOSTAPHYLOS PATULA SHRUBS. OTHER SPECIES PRESENT - JUNIPERUS OSTEOSPERMA PINUS PONDEROSA, CERCOCARPUS LEDIFOLIUS PSEUDOTSUGA MENZIESII, AGROPYRON

SITE SOIL TYPE NOTES TALUS SLOPES IN LOOSE SAND AND GRAVEL IN PINK AND TAN LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 110 ° X AXIS LENGTH 9 m

Y AXIS BEARING 200 ° Y AXIS LENGTH 6 m

ASPECT 110 ° SLOPE 73 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	67	2 PLANTS IN FLOWER - REMAINING ARE SMALLER AND VEGETATIVE ONLY.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 4

DATES SAMPLED 08 JUN 1991 | 14 JUN 1992 | 12 JUN 1993

RESEARCHERS PEABODY, F. | LIVINGSTON, M. | PEABODY, M.

LEGAL DESCRIPTION T 37S R 3W SEC 12 QSEC SW 1/4

COMMON DESCRIPTION PLATEAU TOP ABOUT 0.2 MILES WEST OF PARIA VIEW

SITE VEGETATION NOTES PLANTS GROWING IN AND BETWEEN ARCTOSTAPHYLOS PATULA SHRUBS. OTHER SPECIES PRESENT — JUNIPERUS OSTEOSPERMA, PINUS PONDEROSA

SITE SOIL TYPE NOTES SANDY AND GRAVELY SOIL OF LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 90 ° X AXIS LENGTH 2.8 m

Y AXIS BEARING 180 ° Y AXIS LENGTH 3.2 m

ASPECT FLAT ° SLOPE 0 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	21	2 PLANTS BEAR FLOWER BUDS,
		REMAINING PLANTS ARE SMALLER
		AND VEGETATIVE

FIELD SURVEY FORM

RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 5

DATES SAMPLED 08 JUN 1991 14 JUN 1992 12 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37 S R 3 W SEC 12 QSEC SW 1/4

COMMON DESCRIPTION PLATEAU TOP ABOUT 0.4 MILES WEST OF PARIA VIEW

SITE VEGETATION NOTES PLANTS GROWING AMONG MANZANITA SHRUBS. OTHER SPECIES PRESENT – PINUS PONDEROSA, JUNIPERUS OSTEOSPERMA

SITE SOIL TYPE NOTES SANDY-GRAVELY SOIL OF LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 90 ° X AXIS LENGTH 12.4 m

Y AXIS BEARING 180 ° Y AXIS LENGTH 9.2 m

ASPECT 90 ° SLOPE 51 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	400	MANY PLANTS AT THIS LOCATION.
		GROWING IN AND BETWEEN MANZANITA
		SHRUBS.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 6

DATES SAMPLED 08 JUN 1941 14 JUN 1992 12 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37S R 3W SEC 13 QSEC NW 1/4

COMMON DESCRIPTION PLATEAU TOP ABOUT 0.4 MILES WEST OF PARIA VIEW.

SITE VEGETATION NOTES PLANTS GROWING IN FULL SUN BETWEEN ARCTOSTAPHYLOS PATULA SHRUBS AND PURSHIA TRIDENTATA SHRUBS.

SITE SOIL TYPE NOTES GRAVELY SLOPES OF LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 140 ° X AXIS LENGTH 12.4 m

Y AXIS BEARING 230 ° Y AXIS LENGTH 22.8 m

ASPECT 140 ° SLOPE 37 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	1000	MANY, MANY PLANTS FOUND HERE.
		SAMPLING FLAGS PLACED AT POPULATION
		CLUMPS

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 7

DATES SAMPLED 08 JUN 1991 14 JUN 1992 12 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37S R 3W SEC 13 QSEC NW 1/4

COMMON DESCRIPTION PLATEAU TOP ABOUT 0.4 MILES WEST OF PARIA VIEW.

SITE VEGETATION NOTES PLANTS GROWING BETWEEN SHRUBS OF ARCTOSTAPHYLOS PATULA. OTHER SPECIES PRESENT — PINUS PONDEROSA, GILIA AGGREGATA, CRYPTANTHA CAPITATA

SITE SOIL TYPE NOTES SANDY, GRAVELY WASH ALONG CANYON RIM IN LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 350 ° X AXIS LENGTH 8.4 m

Y AXIS BEARING 260 ° Y AXIS LENGTH 12.3 m

ASPECT 350 ° SLOPE 30 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	500	MANY PLANTS FOUND AT THIS LOCATION. SAMPLE FLAGS PLACED AT POPULATION CLUMPS.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 8

DATES SAMPLED 10 JUN 1991 20 JUN 1992 15 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37 S R 3W SEC 6 QSEC SW 1/4

COMMON DESCRIPTION EAST SECTION OF THE PEEKABOO LOOP TRAIL ABOUT 0.7 MILES NORTH OF BRYCE POINT, NEAR NATURAL ARCHES

SITE VEGETATION NOTES SPARSELY VEGETATED SLOPE WITH ARCTOSTAPHYLOS PATULA AND PINUS EDULIS.

SITE SOIL TYPE NOTES SANDY, GRAVELY TALUS SLOPE OF LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 280 ° X AXIS LENGTH 30 m

Y AXIS BEARING 180 ° Y AXIS LENGTH 27.9 m

ASPECT 90 ° SLOPE 60 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEBR	300	MANY PLANTS AT THIS LOCATION GROWING IN LINES DOWN TALUS SLOPE JUST OFF TRAIL.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 9

DATES SAMPLED 10 JUN 1991 20 JUN 1992 15 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37S R 3W SEC 6 QSEC SW 1/4

COMMON DESCRIPTION EAST SECTION OF THE PEEKABOO LOOP TRAIL ABOUT 0.7 MILES NORTH OF BRYCE POINT, NEAR ARCHES OVER TRAIL.

SITE VEGETATION NOTES SPARSELY VEGETATED TALUS SLOPE WITH AGROPYRON SP., OENOTHERA SP., PAYSARIA SP.

SITE SOIL TYPE NOTES HIGHLY ERODIBLE COBBLE UNDERLAID WITH LIMESTONE SAND - CLARON FORMATION

X AXIS BEARING 360 ° X AXIS LENGTH 18 m

Y AXIS BEARING 90 ° Y AXIS LENGTH 10 m

ASPECT 90 ° SLOPE 72 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEBR	350	MANY PLANTS AT THIS LOCATION.
		MANY IN FLOWERING CONDITION

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 10

DATES SAMPLED 10 JUN 1991 20 JUN 1992 15 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3 W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION EAST SECTION OF THE PEEKABOO LOOP TRAIL ABOUT 0.8 MILES NORTH OF BRYCE POINT, NEAR ARCHES OVER TRAIL.

SITE VEGETATION NOTES SPARSE VEGETATION OF PINUS PONDEROSA, PINUS FLEXILIS, AND ARCTOSTAPHYLOS PATULA.

SITE SOIL TYPE NOTES SANDY, GRAVELY SOIL OF THE CLARON FORMATION.

X AXIS BEARING 150 ° X AXIS LENGTH 17 m

Y AXIS BEARING 240 ° Y AXIS LENGTH 7.8 m

ASPECT 360 ° SLOPE 50 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
TOMO	90	TOWNSENDIA MONTANA VAR. MINIMA.
		ONLY ABOUT 10-15 PLANTS IN FLOWER

FIELD SURVEY FORM

RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 11

DATES SAMPLED 11 JUN 1991 15 JUN 1992 22 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36S R 3W SEC 30 QSEC SE 1/4

COMMON DESCRIPTION CANYON RIM TRAIL ABOUT 0.6 MILES NORTH-EAST OF THE NORTH CAMPGROUND, BETWEEN FAIRYLAND OVERLOOK AND SUNRISE POINT.

SITE VEGETATION NOTES PLATEAU TOP WITH PINUS PONDEROSA AND ARCTOSTAPHYLOS PATULA.

SITE SOIL TYPE NOTES SANDY, GRAVELY SOIL ON FLAT, PROJECTING RIM NOSE IN LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 290 ° X AXIS LENGTH 17.4 m

Y AXIS BEARING 200 ° Y AXIS LENGTH 7.4 m

ASPECT FLAT ° SLOPE 0 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
TOMO	300	TOWNSENDIA MONTANA VAR. MINIMA 20% FLOWERING
OXJO	250	OXYTROPIS JONESII 10% FLOWERING.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 12

DATES SAMPLED 11 JUN 1991 15 JUN 1992 22 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3W SEC 30 QSEC SW 1/4

COMMON DESCRIPTION RIM TRAIL EAST OF NORTH CAMPGROUND

SITE VEGETATION NOTES FOREST OPENINGS WITH PINUS LONGAEVA, PINUS PONDEROSA, PINUS FLEXILIS, JUNIPERUS COMMUNIS, HYMENOXIS ACAULIS, ARCTOSTAPHYLOS PATULA.

SITE SOIL TYPE NOTES SANDY, GRAVELLY LIMESTONE OF THE CLARON FORMATION.

X AXIS BEARING 340 ° X AXIS LENGTH 19.2 m

Y AXIS BEARING 70 ° Y AXIS LENGTH 12.1 m

ASPECT 270 ° SLOPE 48 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
OXJO	53	OXYTROPIS JONESII 20% FLOWERING.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 14

DATES SAMPLED 19 JUN 1991 17 JUN 1992 17 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37S R 4W SEC 13 QSEC NW 1/4

COMMON DESCRIPTION ABOUT 0.5 MILES SOUTHWEST OF PARIA VIEW, PLATEAU TOP.

SITE VEGETATION NOTES OPENINGS IN PINUS PONDEROSA FOREST, GROWING AMONG ARCTOSTAPHYLOS PATULA SHRUBS. OTHER SPECIES PRESENT— PSEUDOTSUGA MENZESII, JUNIPERUS OSTEOSPERMA, LINUM LEWISII

SITE SOIL TYPE NOTES SANDY, GRAVELLY LIMESTONE SOIL OF THE CLARON FORMATION

X AXIS BEARING 70 ° X AXIS LENGTH 10 m

Y AXIS BEARING 160 ° Y AXIS LENGTH 6.4 m

ASPECT 70 ° SLOPE 31 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	90	ABOUT 5% IN FLOWER
CAPA	19	MOST PLANTS IN FLOWER

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 15

DATES SAMPLED 19 JUN 1941 17 JUN 1942 17 JUN 1943

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 37S R 4W SEC 18 QSEC NE 1/4

COMMON DESCRIPTION ABOUT 0.9 MILES SOUTH-SOUTHWEST OF PARIA VIEW, PLATEAU TOP.

SITE VEGETATION NOTES OPENINGS IN PINUS LONGAEVA, PINUS PONDEROSA FOREST WITH ARCTOSTAPHYLOS PATULA, PINUS EDULIS, PSEUDOTSUGA MENZESII, HYMENOXIS ACAULIS

SITE SOIL TYPE NOTES SANDY, GRAVELY LIMESTONE OF THE CLARON FORMATION.

X AXIS BEARING 90 ° X AXIS LENGTH 7 m

Y AXIS BEARING 180 ° Y AXIS LENGTH 1.3 m

ASPECT FLAT ° SLOPE 0 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
PEPA	90	MANY PLANTS IN FULL SUN ON PLATEAU TOP - 5% FLOWERING

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 16

DATES SAMPLED 20 JUN 1991 19 JUN 1992 _____

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 4W SEC 36 QSEC NW 1/4

COMMON DESCRIPTION 0.6 MILES SOUTHWEST OF VISITOR'S CENTER, ON WEST-FACING END OF RIDGE TOP SOUTH OF PARK EMPLOYEE RESIDENCE AREA

SITE VEGETATION NOTES FOREST OPENINGS WITH PSEUDOTSUGA MENZESII, ARCTOSTAPHYLOS PATULA, PURSHIA TRIDENTATA

SITE SOIL TYPE NOTES SANDY LOAM SCATTERED WITH COBBLE LIMESTONE OF THE CLARON FORMATION.

X AXIS BEARING 270 ° X AXIS LENGTH 7 m

Y AXIS BEARING 180 ° Y AXIS LENGTH 2.7 m

ASPECT 270 ° SLOPE 30 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
TOMO	90	PLANTS RESTRICTED TO GRAVELLY, RED LIMESTONE IN LOWER PORTION OF THE PLOT

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 18

DATES SAMPLED 25 JUN 1941 | 19 JUN 1942 | 23 JUN 1943

RESEARCHERS PEABODY, F. | PEABODY, M. |

LEGAL DESCRIPTION T 37 S R 4 W SEC 1 QSEC SW 1/4

COMMON DESCRIPTION ABOUT 0.2 MILES SOUTHWEST OF INSPIRATION POINT ALONG EMBANKMENT OF PARK ROAD - BACK-SIDE OF EMBANKMENT

SITE VEGETATION NOTES OPENINGS IN PINUS PONDEROSA FOREST WITH ARCTOSTAPHYLOS PATULA, PINUS CONCORTA, PSEUDOTSUGA MENZIESII, LINUM KINGII

SITE SOIL TYPE NOTES SANDY, GRAVELLY SOIL OF LIMESTONE OF THE CLARON FORMATION — SOME HUMUS PRESENT

X AXIS BEARING 320 ° X AXIS LENGTH 30 m

Y AXIS BEARING 50 ° Y AXIS LENGTH 20 m

ASPECT 150 ° SLOPE 27 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
CAPA	90	ABOUT 90% IN FLOWER
CROC	120	MANY PLANTS PAST FLOWERING - MOSTLY ON RIDGE TOP.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 19

DATES SAMPLED 25 JUN 1941 20 JUN 1992

RESEARCHERS PEABODY, F. PEABODY, M.

LEGAL DESCRIPTION T 37S R 4W SEC 29 QSEC SE 1/4

COMMON DESCRIPTION 0.5 MILES NORTH OF FAIRVIEW ALONG PARK ROAD IN PICNIC AREA

SITE VEGETATION NOTES FOREST OPENINGS IN PINUS PONDEROSA ARCTOSTAPHYLOS PATULA

SITE SOIL TYPE NOTES SANDY SOIL WITH LIMESTONE COBBLES OF THE CLARON FORMATION - SOME LOAM PRESENT.

X AXIS BEARING 360 ° X AXIS LENGTH 3.2 m

Y AXIS BEARING 270 ° Y AXIS LENGTH 1.8 m

ASPECT 360 ° SLOPE 16 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
TOMO	90	PLANTS VERY DENSE IN SOME AREAS
		ABOUT 50% SHOWING FRUITS -
		SOME WITH MULTIPLE FRUITING HEADS.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 20

DATES SAMPLED 17 AUG 1991 13 JUN 1992 11 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION TRAIL SWITCHBACK ALONG FAIRYLAND LOOP TRAIL NEAR CHINESE WALL - IMMEDIATELY ADJACENT TO TRAIL.

SITE VEGETATION NOTES SPARSE VEGETATION IN BREAKS AREA WITH PINUS LONGAEVA

SITE SOIL TYPE NOTES BARE, SANDY, WHITE, GRAVELLY LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 200 ° X AXIS LENGTH 6 m

Y AXIS BEARING 290 ° Y AXIS LENGTH 4.3 m

ASPECT 320 ° SLOPE 65 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
SIPE	13	A SMALL POPULATION RIGHT NEXT TO THE TRAIL. ADDITIONAL PLANTS LOCATED DOWN-SLOPE

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 21

DATES SAMPLED 17 AUG 1991 13 JUN 1992 11 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36S R 3W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION TRAIL SWITCHBACK ALONG FAIRYLAND LOOP TRAIL NEAR CHINESE WALL - SOUTH-SOUTH-EAST FACING SLOPE IN THE SHELTER OF LARGE WALL BOULDERS.

SITE VEGETATION NOTES SPARSE VEGETATION IN BREAKS AREA WITH PINUS LONGAEVA.

SITE SOIL TYPE NOTES BARE, SANDY, WHITE, GRAVELLY LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 220 ° X AXIS LENGTH 10.7 m

Y AXIS BEARING 310 ° Y AXIS LENGTH 4.3 m

ASPECT 130 ° SLOPE 60 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
SIPE	100	LARGER POPULATION NEAR TRAIL AND CLIFF FACE - AND JUST BELOW TRAIL - WITHIN 3 METERS OF THE FOOT PATH.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 22

DATES SAMPLED 17 AUG 1991 13 JUN 1992 11 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3 W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION TRAIL SWITCHBACK ALONG FAIRYLAND LOOP TRAIL NEAR CHINESE WALL

SITE VEGETATION NOTES BARE SOIL SITE WITH SOME PINUS LONGAEVA NEARBY.

SITE SOIL TYPE NOTES SANDY, GRAVELY LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 330 ° X AXIS LENGTH 12 m

Y AXIS BEARING 60 ° Y AXIS LENGTH 5 m

ASPECT 60 ° SLOPE 75 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
SIPE	50	MEDIUM TO LARGE POPULATION NEAR TRAIL FOOT PATH AND EXTENDING DOWN-SLOPE

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 23

DATES SAMPLED 17 AUG 1991 13 JUN 1992 11 JUN 1993

RESEARCHERS PEABODY, F. LIVINGSTON, M. PEABODY, M.

LEGAL DESCRIPTION T 36 S R 3 W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION TRAIL SWITCHBACK ALONG FAIRYLAND LOOP TRAIL NEAR CHINESE WALL

SITE VEGETATION NOTES BARE SOIL SITE WITH SOME PINUS LONGAEVA NEARBY.

SITE SOIL TYPE NOTES SANDY, GRAVELY LIMESTONE OF THE CLARON FORMATION

X AXIS BEARING 360 ° X AXIS LENGTH 7 m

Y AXIS BEARING 270 ° Y AXIS LENGTH 14.5 m

ASPECT 180 ° SLOPE 45 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
SIPE	44	PLANTS SCATTERED ON SLOPES JUST BELOW TRAIL - WITHIN 5 METERS OF TRAIL

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 24

DATES SAMPLED 11 JUN 1993

RESEARCHERS PEABODY, F. PEABODY, M.

LEGAL DESCRIPTION T 36S R 3W SEC 31 QSEC NE 1/4

COMMON DESCRIPTION TRAIL SWITCHBACK ALONG FAIRYLAND LOOP TRAIL NEAR CHINESE WALL

SITE VEGETATION NOTES BARE SOIL SITE WITH SOME PINUS LONGAEVA NEARBY.

SITE SOIL TYPE NOTES SANDY, GRAVELY LIMESTONE OF THE CLAREN FORMATION.

X AXIS BEARING 150 ° X AXIS LENGTH 12 m

Y AXIS BEARING 240 ° Y AXIS LENGTH 5 m

ASPECT 60 ° SLOPE 75 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
SIPE	50	REESTABLISHMENT OF PLOT N°. 22. IT WAS DISCOVERED THAT THE PLOT STAKE WAS REMOVED AND MISSING. THE RE-ESTABLISHED PLOT STAKE WAS PLACED FURTHER AWAY FROM THE TRAIL FOOT PATH, I.E. FURTHER DOWN-SLOPE.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 25

DATES SAMPLED 18 JUN 1992 24 JUN 1993 _____

RESEARCHERS PEABODY, F. PEABODY, M. _____

LEGAL DESCRIPTION T 38 S R 4 W SEC 5 QSEC NE 1/4

COMMON DESCRIPTION UNDER-THE-RIM TRAIL ABOUT 0.2 MILES SOUTH OF THE KANE-GARFIELD COUNTY LINE

SITE VEGETATION NOTES PINUS PONDEROSA FOREST OPENINGS WITH ARCTOSTAPHYLOS PATULA, ARTEMISSIA SP.

SITE SOIL TYPE NOTES LOOSE, WHITE, SANDY SOIL OF THE CLARON FORMATION

X AXIS BEARING 12 ° X AXIS LENGTH 10 m

Y AXIS BEARING 102 ° Y AXIS LENGTH 10 m

ASPECT 50 ° SLOPE 40 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
HEJO	50	PLOT FLAGS PLACED AT INDIVIDUAL CLUMPS OF PLANTS. CLUMPS RANGE IN SIZE FROM 6 TO 30 CENTIMETERS ACROSS.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 26

DATES SAMPLED 18 JUN 1992 24 JUN 1993 _____

RESEARCHERS PEABODY, F. PEABODY, M. _____

LEGAL DESCRIPTION T 38S R 4W SEC 5 QSEC NE 1/4

COMMON DESCRIPTION UNDER-THE-RIM TRAIL ABOUT 0.2 MILES SOUTH OF THE KANE-GARFIELD COUNTY LINE.

SITE VEGETATION NOTES PINUS PONDEROSA FOREST OPENINGS WITH ARCTOSTAPHYLOS PATULA, ARTEMISSIA SP.

SITE SOIL TYPE NOTES LOOSE, WHITE, SANDY SOIL OF THE CLARON FORMATION

X AXIS BEARING 360 ° X AXIS LENGTH 10 m

Y AXIS BEARING 90 ° Y AXIS LENGTH 10 m

ASPECT 90 ° SLOPE 40 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
HEJO	30	SCATTERED CLUMPS OF PLANTS RANGING FROM 2-25 CENTIMETERS ACROSS.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 27

DATES SAMPLED 24 JUN 1992 26 JUN 1993 _____

RESEARCHERS PEABODY, F. PEABODY, M. _____

LEGAL DESCRIPTION T 37S R 4W SEC 12 QSEC NE 1/4

COMMON DESCRIPTION ABOUT 0.9 MILES WEST OF BRYCE POINT ALONG PARK ROAD.

SITE VEGETATION NOTES PINUS PONDEROSA FOREST OPENINGS WITH ARCTOSTAPHYLOS PATULA.

SITE SOIL TYPE NOTES WHITE AND TAN, FINE-GRAINED LIMESTONE OF THE CLARON FORMATION - SAND AND COBBLE WITH SOME HUMUS

X AXIS BEARING 170 ° X AXIS LENGTH 10 m

Y AXIS BEARING 80 ° Y AXIS LENGTH 10 m

ASPECT 180 ° SLOPE 20 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
CAPA	25	PLANTS SCATTERED ON BOTH SIDES OF A SHALLOW WASH.
		ABOUT 70% FLOWERING.

FIELD SURVEY FORM
RARE PLANT SURVEY
BRYCE CANYON NATIONAL PARK

SITE NO. 28

DATES SAMPLED 24 JUN 1992 26 JUN 1993

RESEARCHERS PEABODY, F. PEABODY, M.

LEGAL DESCRIPTION T 37S R 4W SEC 12 QSEC NE 1/4

COMMON DESCRIPTION ABOUT 0.9 MILES WEST OF BRYCE POINT ALONG PARK ROAD.

SITE VEGETATION NOTES PINUS PONDEROSA FOREST OPENINGS WITH ARCTOSTAPHYLOS PATULA.

SITE SOIL TYPE NOTES WHITE AND TAN, FINE-GRAINED LIMESTONE OF THE CLARON FORMATION - SOME HUMUS PRESENT

X AXIS BEARING 350 ° X AXIS LENGTH 10 m

Y AXIS BEARING 80 ° Y AXIS LENGTH 10 m

ASPECT 20 ° SLOPE 20 %

RARE SPECIES ENCOUNTERED AT SITE

NAME	NUMBER	NOTES
CAPA	35	PLANTS SCATTERED ON BOTH SIDES OF A SHALLOW WASH.
		ABOUT 20% FLOWERING.

Appendix 6. Photocopies of Herbarium Sheets of Bryce Canyon Rare Plant Specimens Deposited in the Herbarium at Brigham Young University, Provo, Utah.

BRIGHAM
YOUNG
129483
UNIVERSITY







THE UNIVERSITY OF TEXAS AT AUSTIN

Pediomelum pariense (Welsh & Atwood) J. Grimes

Det. James Grimes, 1987

GARFIELD CO., UTAH, U

Psoralea pariensis Welsh & Atwood

Open ponderosa pine woods, at ca 8,000 feet elevati
Bryce Canyon National Park.

J. R. Murdock s. n. 12 July 1975

HERBARIUM OF BRIGHAM YOUNG UNIVERSITY

BRIGHAM
YOUNG
123481
UNIVERSITY



= Orbiculina pariensis

GARFIELD CO., UTAH,

Psoralea pariensis Welsh & Atwood

Open ponderosa pine woods, at ca 8,000 feet elevat
Bryce Canyon National Park.

J. R. Murdock s. n. 23 July 197

THE UNIVERSITY OF TEXAS AT AUSTIN

Pediomelum pariense (Welsh & Atwood) J. Grimes

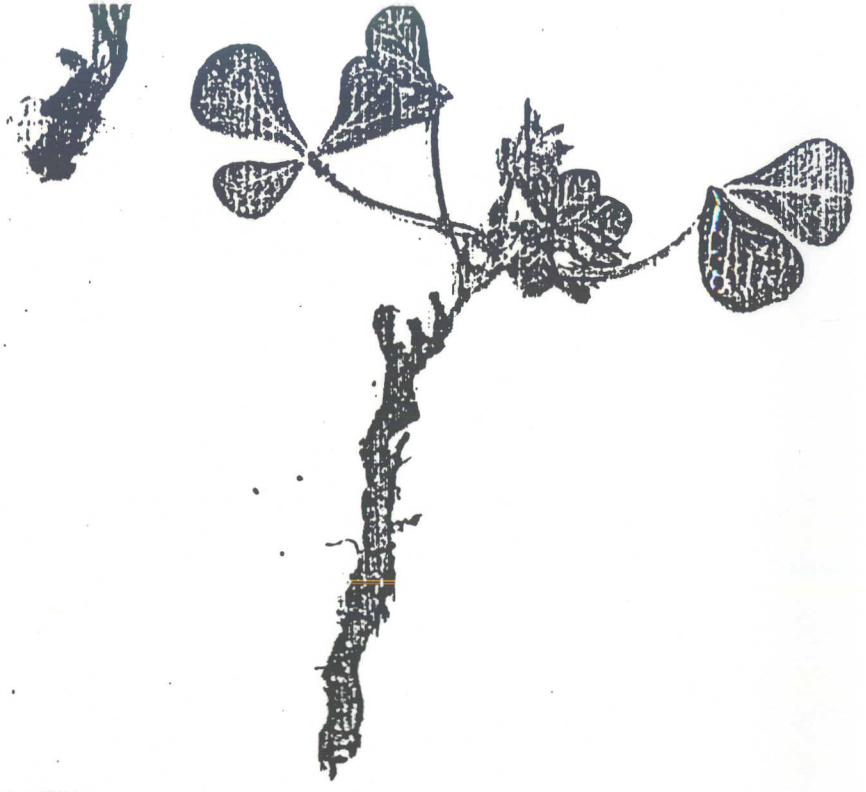
Det. James Grimes, 1987

Herbarium of Brigham Young University
Provo, Utah

BRIGHAM
YOUNG
129482
UNIVERSITY







THE UNIVERSITY OF TEXAS AT AUSTIN

Pediomelum pariense (Welsh & Atwood) J. Grimes

Det. James Grimes, 1987

GARFIELD CO., UTAH, U

Psoralea pariensis Welsh & Atwood

Open ponderosa pine woods, at ca 8,000 feet elevati
Bryce Canyon National Park.

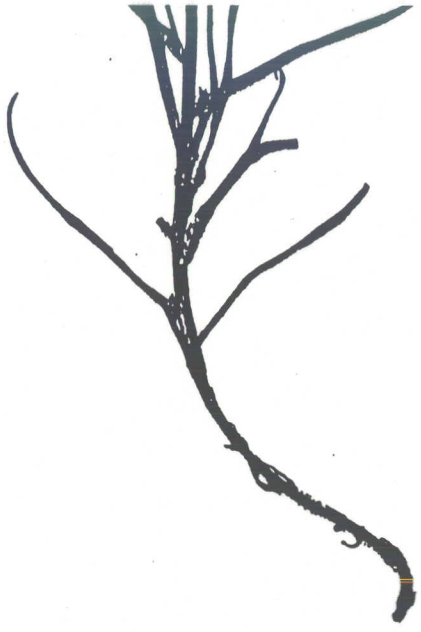
J. R. Murdock s. n. 12 July 19

Herbarium of Brigham Young University

222879

IGHAM YOUNG UNIVERSITY
HERBARIUM
PROVO, UTAH





PLANTS OF Utah

County or Province Garfield

Castilleja revealii N. Holmgren

Bryce Canyon National Park, along Campbell Canyon T
½ mile west of Tower Bridge. Wasatch Formation, Pi
limestone member. Associates: Pinus ponderosa, Ar
staphylos, Juniperus scopulorum, J. communis, Berb

Date July 7, 1980 Elevation 7500 Fe

Collector R. Kaufmann 234

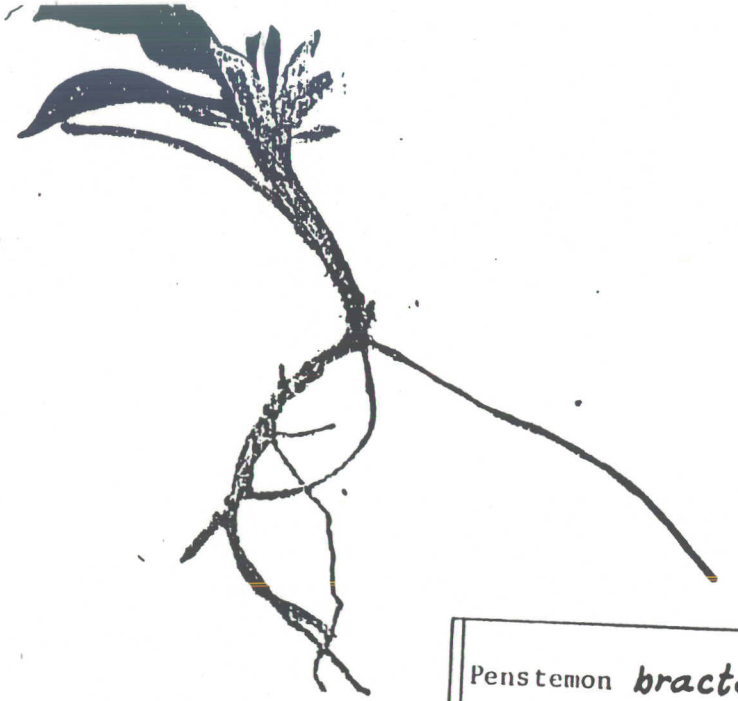
Determined by [illegible]

DEAVER HERBARIUM (D
Northern Arizona Univer
Flagstaff



57246
BRIGHAM YOUNG UNIVERSITY
HERBARIUM





Penstemon *bracteatus Keck*

det. by
F.S.Crosswhite, 1970

HERBARIUM OF
THE NEW YORK BOTANICAL GARDEN

Plants of UTAH

Penstemon bracteatus Keck

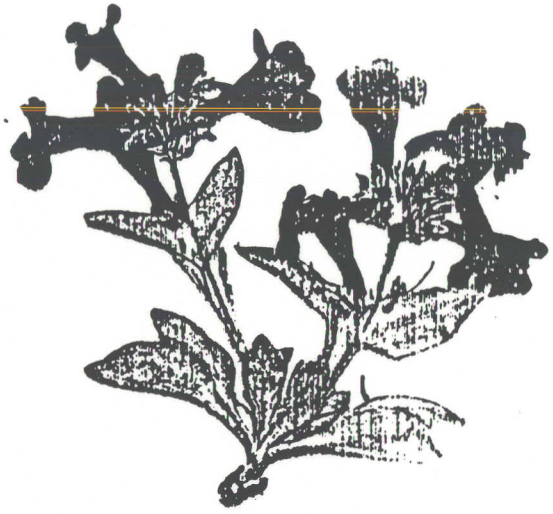
GARFIELD CO.: Bryce Canyon National Park, along road to Bryce Point, 1/2 mile from Inspiration Point turn off. T.37 S., R.4 W., Sec. 1. Elevation 8,000 feet.

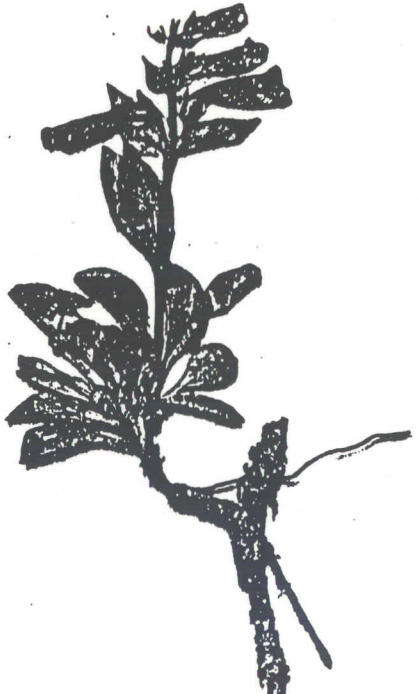
Infrequent on gravelly soil in Ponderosa woodland.

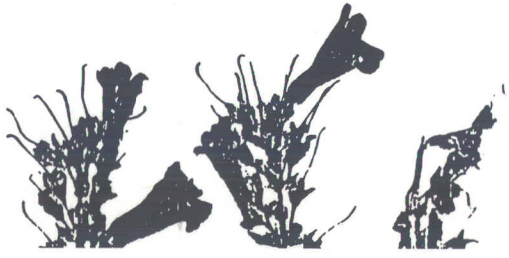
Noel H. Holmgren 2018 June 24, 1965
James L. Reveal
Charles La France

222872

GHAM YOUNG UNIVERSITY
HERBARIUM
PROVO, UTAH









PLANTS OF Utah

County or Province Garfield

Penstemon bracteatus Keck

Bryce Canyon National Park, ½ mile east of Sunset Poi
small tributary to Bryce Wash, Wasatch Formation, Pir
limestone member. Associates: Pinus ponderosa, Poter
tilla fruticosa, Arctostaphylos spp.

Date June 12, 1980

Elevation 7300 feet

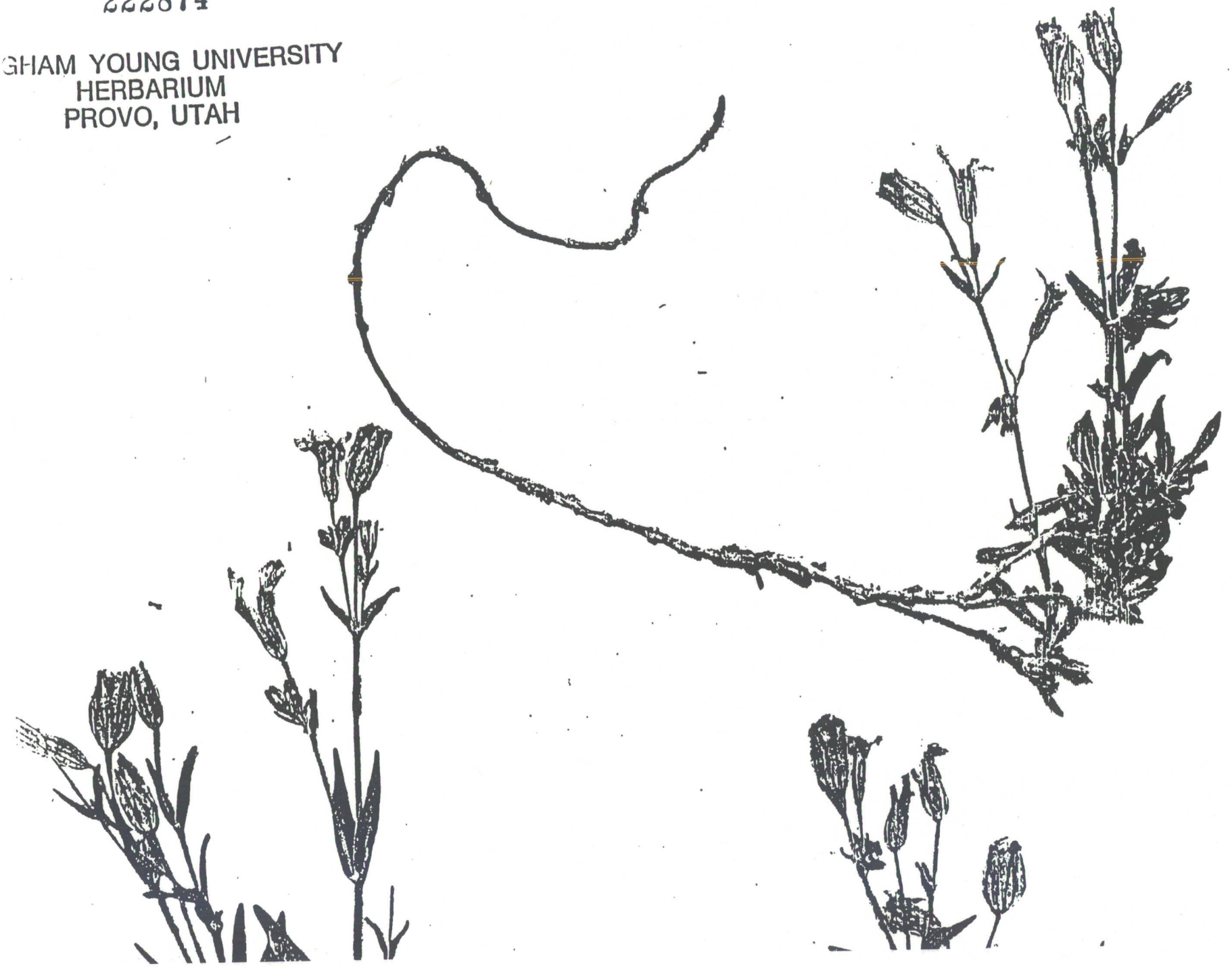
Collector R. Graybosch 721 b

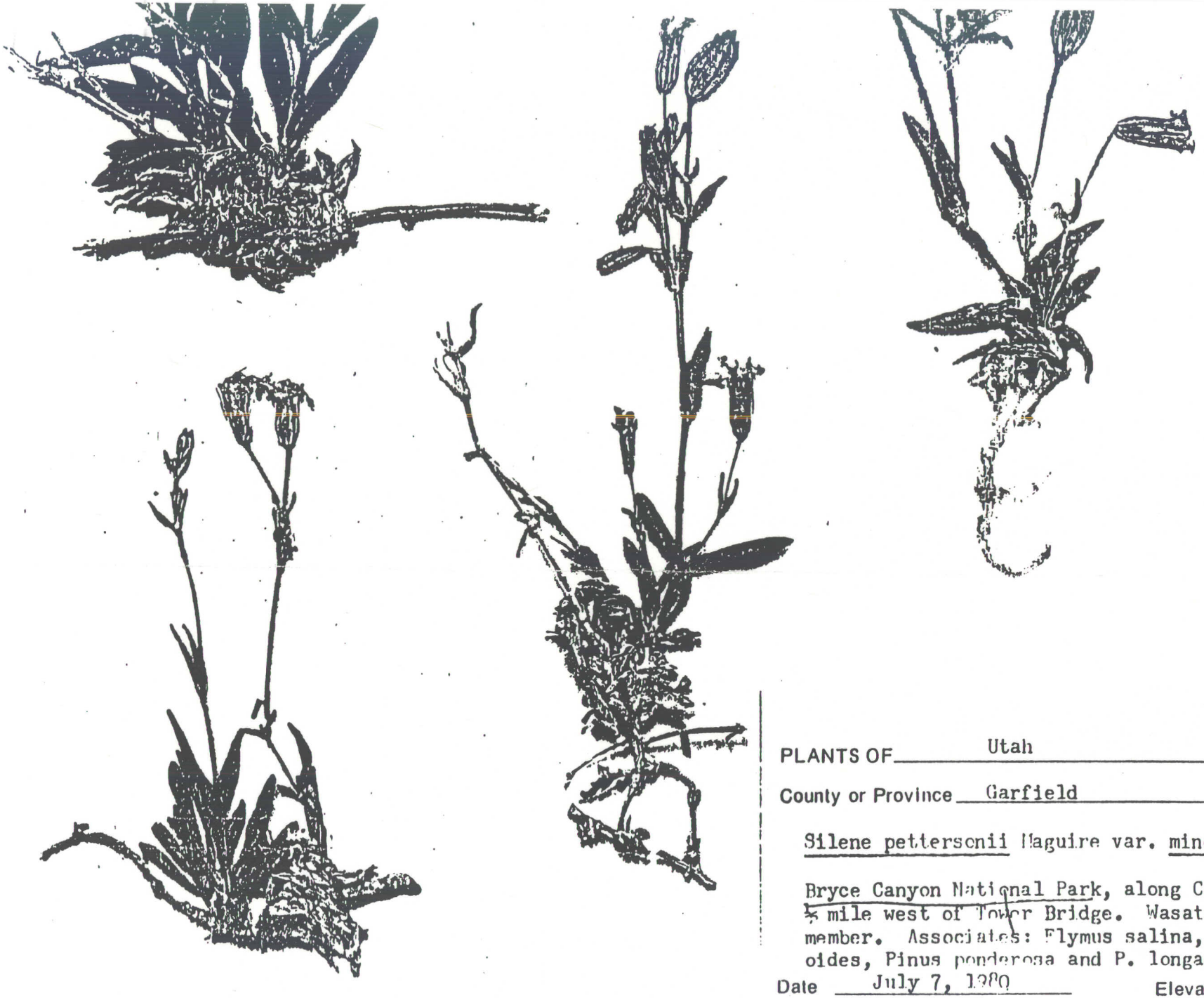
Determined by RG

DEAVER HERBARIUM (DH
Northern Arizona University
Flagstaff

222874

GHAM YOUNG UNIVERSITY
HERBARIUM
PROVO, UTAH





PLANTS OF Utah

County or Province Garfield

Silene pettersonii Maguire var. minor Hitchc. & Mag

Bryce Canyon National Park, along Campbell Canyon T
½ mile west of Tower Bridge. Wasatch Formation, Pi
member. Associates: Elymus salina, Haplopappus arm
oides, Pinus ponderosa and P. longaeva.

Date July 7, 1980 Elevation 7500 feet

Collector R. Graybosch 223

Determined by

DEAVER HERBARIUM (D
Northern Arizona Universi
Flagstaff