GRCA FES

GRAND CANYON NATIONAL PARK

FIRE EFFECTS MONITORING PROGRAM 1994

PREPARED BY:
PRESCRIBED FIRE STAFF
NOVEMBER 1994

NATIONAL PARK SERVICE
BRANCH OF AVIATION & FIRE MGMT
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Grand Canyon National Park
Aviation and Fire Management
Annual Summary
1994

PRESCRIBED FIRES

Prescribed Natural Fires (PNF)

	Name	Size (acres)	Location	Fuel Model	Ignition Date
	Powell	0.1	Inner Canyon	2	7/01/94
	Cave Canyon	68.5	Inner Canyon	2	7/19/94
	Thumb	6.0	South Rim	2	7/20/94
	Sinyala	0.1	Inner Canyon	2	7/19/94
	Saddle Canyon	0.1	Inner Canyon	6	7/22/94
	Great Thumb	10.0	South Rim	2	7/22/94
	Pasture	0.1	South Rim	2	7/23/94
	Nankoweap	0.1	Inner Canyon	8	8/31/94
	Guinevere	0.1	Inner Canyon	6	9/08/94
	Steamboat	0.3	Inner Canyon	2	9/19/94
*	Honan Point	3.8	North Rim	9	8/07/94

PNF Acres: 89.2

* Acres burned in PNF status before conversion to wildfire due to national preparedness level V.

Management Ignited Prescribed Fires (MIPF) as of 11/17/94

Picnic	220	South Rim	2,9	6/23/94
Watson	318	South Rim	2,9	9/24/94
Tiyo I	25	North Rim	9	10/6/94

MIPF Acres: 563

WILDFIRES

	#	Acres
Lightning-caused	63	104.4
Human-caused	59	108.4

Wildfire acres: 212.8

OTHER

Support actions/mutual aid	54
False alarms	5

GRAND CANYON NATIONAL PARK
FIRE EFFECTS MONITORING PROGRAM - 1994 ANNUAL REPORT

INTRODUCTION

The 1994 prescribed fire field season at Grand Canyon National Park saw many accomplishments in the fire monitoring program. Despite this seasons national and regional wildfire severity and its consequential need for every available firefighter, the prescribed fire staff achieved several program goals. All plot rereads were accomplished on schedule. A commendable and successful effort in the identification of nearly all outstanding voucher specimens is near completion. In addition, the prescribed fire staff initiated a fuel moisture and weather monitoring network throughout the park. Extensive sampling of live and dead fuel moistures coupled with a comprehensive on-site weather monitoring matrix, provided program managers with site specific burning parameters. This intent is to better facilitate and document the desired fire effects and achievments of specific and quantifyable burn objectives.

A national preparedness level of 5 for nearly 9 weeks combined with high fire danger ratings for much of the remaining 94 season, prohibited the completion of many planned management ignited prescribed fires. As a result the post-burn plot workload was low. In addition, as a result of not being able to burn, some plots that were read in 1992 did not get burned this year and some 1993 plots may not be burned by 1995. Appendix B provides a listing of the affected plots. Another problem that arises from postponed schedules is the increased uncertainty of project locations and completion dates in the FPIEN1D10 vegetation monitoring type.

PLOT NETWORK INFORMATION

TABLE 1. Plot installation by plot type.

The FPIED1D02, FPIPO1D09, and FPIPN1D09 monitoring types have extensive plot networks needing few new plot installs to meet the minimum plot calculations for a 80% precision level. The FPIEN1D10 vegetation monitoring plot installations were low, do in part of the uncertainty of future ignition dates as they apply to the rescheduling of pending approved burn plans. In following, Grand Canyons Branch of Aviation and Fire Management hosted an interagency task force in September to examine the forest ecosystems, associated fuel accumulations, and fire behavior potential on the North Rim. The findings of the task force will provide the framework for a strategic plan to manage these ecosystems, and undoubtedly will provide support in the completion of the Boreal/Mixed Conifer monitoring plot network. In the coming years better progress can be anticipated as the Grand Canyon prescribed fire program continues to expand.

Number of Plots Installed Previous Years	*Number of Plots Installed 1994*	*Total Number Plots Installed*
47	4	51

TABLE 2. Plot rereads by plot type for 1994 and 1995.

Table 2 gives the total plots reread in 1994 and the yr01 and yr02 plot rereads for 1995 plus the projected number of post burn rereads.

Total Plots Reread 1994	*Total Plots to Reread 1995*
30	35

TABLE 3. Three-year projected number of plot rereads by year.

Number of Plots		
1995	1996	1997
35	23	28

TABLE 4. Projected plot installation.

It is probably a little optimistic to assume that the PIEN plot network will be brought up a total of 15 plots in 1995. Fifteen PIEN plots is an estimate of the total number required to meet statistical validity. Rate of completion of this plot network is difficult to predict at this time.

Plots to be Installed 1995				*Projected Total*			
PIED	PIPO	PIPN	PIEN	PIED	PIPO	PIPN	PIEN
0	0	0	12	15	14	19	15

TABLE 5. Number of plots that have burned.

Table 5 reflects the difficulty in completing management ignited prescribed fires in the busy 1994 wildfire season.

Total Plots Burned 1994	*Total Plots Burned to Date*
6	30

TABLE 6. Postburn plot summary.

All scheduled plot rereads were successfully completed and are listed in Table 6.

	FPIED1D02	FPIPO1D09	FPIPN1D09	TOTAL
Immediate Postburn	2	4	0	6
1 Year Postburn	6	4	2	12
2 Year Postburn	5	5	2	12
5 Year Postburn	x	x	x	0

TABLE 7. Number of plots installed by monitoring type in 1994.

Two new FPIEN1D10 plots were installed in the South Bear burn unit (see Appendix C). One previously installed plot in this monitoring type was rejected under the revised FMH-4 rejection criteria. Three monitoring plot origin stakes were installed in this vegetation monitoring type. This will save the time in finding suitable plot locations by the time the determination is made that the plot will burn within the following two years. The policy of conducting the installation of FPIEN1D10 plot origin stakes will expedite the completion of plot installs for this vegetation monitoring type.

Monitoring Type Code	*Monitoring Type Name*	*Number of Plots Installed in 1994*	*Total Number of Plots Installed*
FPIPO1D09	Cold Temperature Ponderosa Pine/Mixed Conifer Forest	1	14
FPIEN1D10	Rocky Mountain Subalpine Conifer Forest	2	3
FPIPN1D09	Boreal/Cold Temperature Mixed Conifer Forest	0	19
FPIED1D02	Great Basin Conifer Woodland	1	15

TABLE 8. Results of minimum plot calculations by monitoring type and monitoring type variable. Minimum plot calculations for overstory are listed by species.

		Primary Monitoring Type Variable (overstory)		*Secondary Monitoring Type Variable (fuel loading)*	
		20	25	20	25
FPIPO1D09	PIPO	28	18	20	13
FPIPN1D09	PIPO	22	14	18	12
FPIED1D02	PIED	5	3	10	6
	JUOS	12	8		
FPIEN1D10	ABCO	9	6	40	26
	PIEN	69	44		

PROGRAM INFORMATION

Staff Participants

	GRADE	*FUNDING SOURCE*	*POSITION TITLE*
Jim Schroeder	GS-0462-6 GS-0462-7 (5/15-7/31)	Effects	Forestry Technician
James Silverstone	GS-0404-5	Effects	Biological Science Technician
Carl Helquist	GS-0404-5 GS-0404-6 (as of 9/18)	PNF	Biological Science Technician
Roland Foss	GS-0462-5	Hazard Fuel	Forestry Technician
Sandy Rosas	GS-0404-5	PNF	Biological Science Technician
Glenn Bartter	GS-0462-5	Hazard Fuel	Forestry Technician
Robin Patton	AD-2	Effects	SCA
Kelly Corbett	AD-2	Effects	SCA

Length of Season

TABLE 9. Number of pay periods in field season devoted to fire effects.

Monitor	*Starting Date*	*Ending Date*	*# of Pay Periods*
Jim Schroeder	3/21/94	11/12/94	3.5
James Silverstone	4/17/94	8/05/95	7.0
Carl Helquist	4/19/94	11/04/94	6.5
Roland Foss	4/19/94	10/15/94	6.0
Sandy Rosas	4/24/94	9/03/94	7.0
Glenn Bartter	4/18/94	10/28/94	3.0
Robin Patton	6/07/94	10/28/94	2.0
Kelly Corbett	6/07/94	10/28/94	5.5

Changes in Protocol

There were a couple of changes in protocol involving South Rim monitoring plot types FPIED1D02 and FPIPO1D09 that were burned prior to 1993. Previously these plots had 50 foot 1000hr Browns transects. These transects were extended to 100 feet to more accurately depict 1000hr. fuel loadings. This was initiated after analyzing data which reflected a sparcity of 3+s and 3+r intercepts, (<75% of all 50' transects without a 3+ inch hit).

As mentioned in Grand Canyons 1993 Fire Effects Monitoring Report, it was recommended while conducting all post-burn interval monitoring, that monitors should complete FMH-17 (50 METER TRANSECT DATA SHEET). This data can provide managers and program researchers with a more comprehensive look of fire behavior, herbaceous plant mortalities and regeneration rates, and an opprotunity to review overall fire spread in and around the plot. Although this has been an optional variable to monitor, Grand Canyon has enacted this as an element of the Immediate Post-burn MAS (Minimum Acceptable Standards). Conducting Immediate Post-burn 50 Meter Transect rereads is applicable to all 4 vegetation monitoring types at Grand Canyon.

Recommended Changes in Protocol

The incorporation of GPS (Global Positioning System) technology in plotting monitoring plot locations has been initiated at Grand Canyon National Park. This data can only aid future monitors and managers in accurately mapping plot locations. In addition the sharing of GIS (Geographic Information System) software and resource specialists managing control plot networks will find this information very useful. Therefore it is recommended that parks with active monitoring programs begin to incorporate this technology to streamline and reduce the potential for misinterpretations of the FMH - 5 (Index Plot Location Data Sheet).

As stated in the introduction, Grand Canyon has expanded their weather and fuels monitoring plan. Appendix E shows our current operating network of stations. The inherent dynamic nature in the implementation and execution of management ignited prescribed fires will steer the positioning and desired level of the weather/fuels monitoring. In short, managers should utilize to their maximum extent possible the expansion of their weather/fuels monitoring and its applications with burn plan objectives, desired fire effects and provide a glimpse of possible trends developing with these coorelations between on-site weather and fuel moistures.

Lastly, Grand Canyon monitors continue to recommend the monitoring of pole-sized trees during the post-burn surveys. As stated in the parks 1993 monitoring report, overstory tree crown scorch and bark charring, can in part or soley be the result of the torching of close proximity pole-sized trees resulting in overstory canopy scorching and/or bark charring. In short, to better understand overstory crown scorch, pole-sized trees should require char height, crown scorch heights and canopy scorch percentage sampling.

Equipment Information

All equipment and supplies (e.g., tags, forms, tapes, etc.) are located and stored at the Fire Support Office, South Rim, Grand Canyon. Files containing raw data and FMH software generated copies are also located at the Fire Support Office. Copies of all database files have been duplicated, one set at Fire Support and the other at Ranger Operations, South Rim, Grand Canyon.

FMH equipment suppliers list:

Band and Tag Co.
721 York St., P.O. Box 430
Newport, KY 41072-0430

Patricia Ledley Bookseller Inc.
1 Bean Rd., P.O. Box 90
Buckfield, ME 04220

Trimble Navigation
2105 Donely Dr.
Austin, TX 78758

National Wildfire Coordinating Group
1849 C Street
Washington, DC 20240

Ben Meadows Company
3589 Broad Street
Atlanta, Georgia 30341

Forestry Suppliers, Inc.
P.O. Box 8397
Jackson, MS 39284-8397

Monitoring Type Information

No changes were made to FMH-4's during the 1994 season. The 1993 changes made to the PFIEN1D10 monitoring type description were field tested with the installation of two complete plots and two plot origins. The new type description and rejection criteria eliminated some confusion about what was a suitable plot location. One previously installed FPIEN plot in the Nankoweap burn unit was rejected under the new monitoring type description. One plot origin on the Nankoweap (complete plot not installed yet) fit the new type description. FPIEN1D1001 located in the Nankoweap burn unit, needs to be revisited to determine if it meets the new selection criteria.

APPENDIX A.

TABLE 10. Transects/plots classified by burn unit and monitoring type.

Burn Unit	*Monitoring Type*			
	FPIED1D02	FPIPO1D09	FPIEN1D10	FPIPN1D09
Atchison I	---	9	---	---
Entrance	1,3,4,5	1,7	---	---
Santa Fe	---	2	---	---
Topeka	6,8	---	---	---
Village	---	8	---	---
Atchison II	13,14,15	13,14	---	---
Quarry	9,10,11	6,10	---	---
Picnic	7,2	4,5,11,12	---	---
Hance	---	15	---	---
Northwest I	---	---	---	1,2
Northwest III	---	---	---	9,12
Northwest V	---	---	---	11,14,19
Tiyo I	---	---	---	3,7,8,18
Tiyo II	---	---	---	13,16
Vista IV	---	---	---	5,6,10,15
Widforss	---	---	---	4,17
Nankoweap	---	---	1,(3)*	---
South Bear	---	---	2,4,(5,6)*	---

* PIEN plots 3, 5 and 6 have only their plot origin stakes installed.

APPENDIX B

Listing of plots in danger of exceeding two year limit on pre-burn data.

Preburn data needs to be read within two years of the burn date. Many North Rim projects scheduled for 1994 did not get burned. Some of these projects had plots with preburn data taken in 1992. If these plots are not burned in 1994 they will need to be reread before burning in 1995. The same situation will exist for preburn plots read in 1993 that will not be burned by 1995.

Project Name	Plots Read in 1992	Plots Read in 1993
Northwest V		PIPN 11,14,19
Tiyo I	PIPN 3	PIPN 3,7,8,18
Tiyo II		PIPN 13,16
Vista IV		PIPN 5,6,10,15
Widforss		PIPN 4,17

GRAND CANYON NATIONAL PARK
BRANCH OF AVIATION AND FIRE MANAGEMENT
MANAGEMENT IGNITED PRESCRIBED FIRE
PROPOSED THREE YEAR SCHEDULE
1995 - 1997

Project	Year	Acres	Location	Multi-Project
Tiyo I	1995	800	NRIM	PNFX
Vista IV	1995	300	NRIM	
NW IV	1995	285	NRIM	NWBD
Tiyo II	1995	400	NRIM	PNFX
CC Hill	1995	40	NRIM	NRUI
Transcept I	1995	10	NRIM	NRUI
Widforss I/II	1995	500	NRIM	PNFX
South Bear	1995	230	NRIM	
Hospital	1995	40	SRIM	
Watson II	1995	900	SRIM	ERBD
Hance	1995	700	SRIM	ERBD
Grapevine	1995	500	SRIM	ERBD
Lonetree	1996	860	SRIM	ERBD
Long Jim	1996	980	SRIM	
Watson III	1996	800	SRIM	ERBD
Owen	1996	160	NRIM	NRUI
Uncle Jim	1996	310	NRIM	NRUI
Widforss III	1996	200	NIRM	PNFX
Walla Valley	1997	250	NRIM	PNFX
Kanabownits	1997	200	NRIM	PNFX
South Bear II	1997	200	NRIM	
Long Jim II	1997	700	SRIM	
Lyell	1997	900	SRIM	ERBD

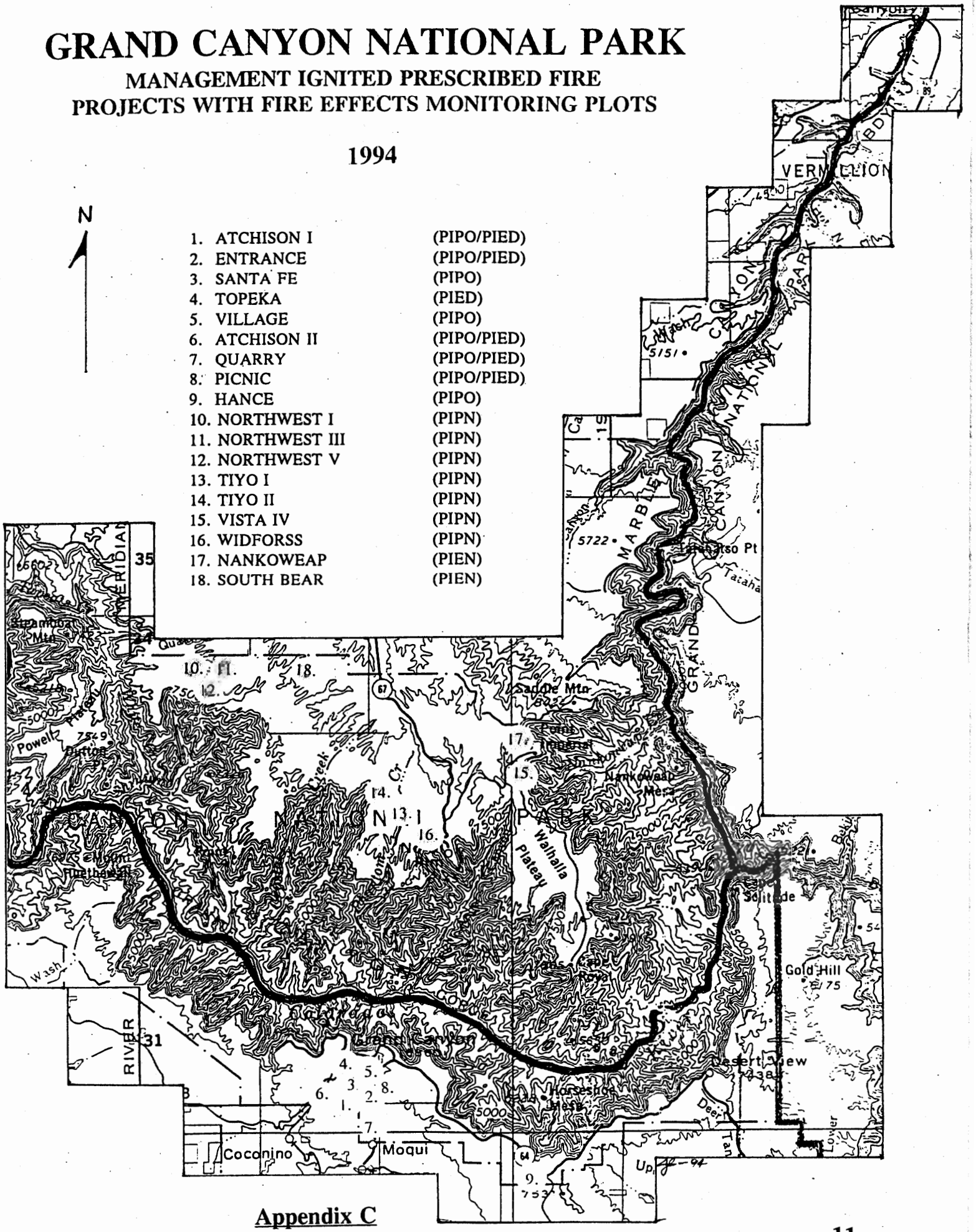
Multi-project planning (NPS-WILDLAND FIRE MANGEMENT COMPUTER SYSTEM; HAZARD FUEL REDUCTION) definition for project code:

NWBD Northwest Boundary
NRUI North Rim Urban/Interface
SMBD Saddle Mountain Boundary
NEBD North Entrance Boundary
ERBD East Rim Boundary
PNFX North Rim PNF Zone Expansion

GRAND CANYON NATIONAL PARK

MANAGEMENT IGNITED PRESCRIBED FIRE PROJECTS WITH FIRE EFFECTS MONITORING PLOTS

1994



Appendix C

Species Code List FMH Data - GRCA
Printed on 10/31/94 at 10:27:57 am

Code	Nat.	Perennial	Genus	Species	Subspecies	Variety	Common name
AASH1	--	--	*ASH				
ABCO1	Y	Y	Abies	concolor			White fir
ABLA1	Y	Y	Abies	lasiocarpa			Subalpine Fir
ACLA1	Y	Y	Achillea	lanulosa			Western Yarrow
ACMI1	Y	Y	Achillea	millefolium			
AGAR1	Y	Y	Agoseris	arizonica			Arizona Mountain dandelin
ALMA1	N	N	Aletes	macdougali			MacDougal's Aletes
ANAP1	Y	Y	Antennaria	parvafolia			Pussytoes
ANOC1	Y	N	Androsace	occidentalis			Western Rock Jasmine
ANPA1	Y	Y	Antennaria	parvifolia			Pussy-toes
ARAB1	Y	Y	Arenaria	aberrans			Sandwort
ARAC1	Y	Y	Arenaria	aculeata			Needleleaf sandwort
ARCA2	Y	Y	Artemisia	carruthii			
ARCO1	Y	Y	Arenaria	confusa			Sandwort
ARCO2	Y	Y	Arnica	cordifolia			Heartshaped Arnica
ARFE1	Y	Y	Arabis	fendleri			Fendler rock cress
ARGR1	Y	Y	Arabis	gracilipes			Slender Rock Cress
ARPO1	Y	Y	Argemone	pleicanthta			Prickle poppy
ARTR1	Y	Y	Artemisia	tridentata			Big sage
ARXX1	N	N	Arenaria	spp.			Sandwort
ASAS1	Y	Y	Asclepias	asperula	capricornu		Antelope Horns
ASCA1	Y	Y	Aster	canescens			Hoary Aster
ASHE1	--	--	*Ash				Ash
ASLE1	Y	Y	Astragalus	lentiginosus			Specklepod locoweed
ATCA1	Y	Y	Atriplex	canescens			Four-wing saltbush
BARE1	--	--	*Bare	ground			Bare Soil
BARK1	--	--	*Bark				Tree Bark
BAXX1	Y	N	Bahia	to verify			
BEFR1	Y	Y	Berberis	fremontii			Fremont barberry
BERE1	Y	Y	Berberis	repens			Creeping barberry
BOCU1	Y	Y	Bouteloua	curdpedula			
BOGR1	Y	Y	Bouteloua	gracilis			Blue gramma
BOLE1	--	--	*Bole of a	Tree			Tree Bole
BRAN1	Y	Y	Bromus	anomalus			Cheat grass
BRCI1	Y	Y	Bromus	ciliatus			
BRFR1	Y	Y	Bromus	frondosus			Brome, North Rim
BRTE1	N	N	Bromus	tectorum			Cheat grass
BRXX1	Y	N	Bromus	spp.			
CAAM1	Y	Y	Calachortus	ambiguus			Arizona Mariposa lily
CAFL1	Y	Y	Calochortus	flexuosus			Weakstem mariposa
CAIN1	Y	Y	Castilleja	integra			Southwestern paint brush
CALA1	Y	Y	Calylophus	lavandulifolius			Evening Primrose
CANU1	Y	Y	Calachortus	nuttallii			Sego lily
CARO1	Y	Y	Carex	rossii			Carex rossii
CASI1	Y	Y	Carex	siccatta			Sedge,grows individualy
CAUN1	N	N	Unkown				
CAXX1	Y	Y	Carex	spp.			Sedge
CEFE1	Y	Y	Ceanothus	fendleri			Fendler Buckbrush
CELE1	Y	Y	Cercocarpus	ledifolius			Curlleaf Mt.-mahogany
CFIN1	N	N	Unknown				
CHMI1	Y	Y	Chamaebatiaria	millefolium			Fernbrush
CHNA1	Y	Y	Chrysothamnus	nauseosus			Rabbitbrush
CHUM1	Y	N	Chimaphila	umbellata			
CIBU1	N	N	Cirsium	vulgare			Bull Thistle
CIUN1	Y	Y	Cirsium	undulatum			Wavyleaf Thistle
CIVU1	N	N	Cirsium	vulgare			Bull Thistle
CIWH1	Y	N	Cirsium	wheeleri			Thistle
CIXX1	N	N	Cirsium	spp.			
CLHI1	Y	Y	Clematis	hirutissima			Leather flower
CLSE1	Y	Y	Cleome	serrulata			Rocky Mountain Beeplant
COAR1	Y	Y	Convolvulus	arvensis			field bindweed

Continued

Species Code List FMH Data - GRCA
Printed on 10/31/94 at 10:27:57 am

Code	Nat.	Perennial	Genus	Species	Subspecies	Variety	Common name
COLI1	Y	N	Collomia-like	annual			Unnknown Forb
COME1	Y	Y	Cowania	mexicana			Cliffrose
COMP1	N	N	Compositae	?	?		changed to Asteraceae
CONE1	--	--					
COPA1	Y	N	Colinsia	parvifolia			Blue-eyed Mary
COVI1	Y	Y	Corypantha	vivpara		arizonica	Arizona Beehive
CRPT1	--	--					
CRSE1	Y	Y	Cryptantha	setosissima			
CRUS1	--	--					
CRXX1	--	--					
CRYP1	Y	Y	Cryptogammic	soil			
DENE1	Y	Y	Delphinium	nelsonii			Larkspur
DEPI1	Y	N	Descuraiana	pinnata			Yellow Tansy Mustard
DUFF1	--	--	*Duff				Duff
ERCI1	N	N	Erodium	cicutarium			Redstem storksbill
ERDI1	Y	Y	Erigeron	divergens			Spreading Fleabane
EREA1	Y	Y	Erigeron	eatoni			
ERFL1	Y	Y	Erigeron	flagellaris			Trailing Fleabane
ERFO1	Y	Y	Erigeron	formosissimus			
ERMO1	Y	Y	Erigeron	modestus			Plains daisy
ERRA1	Y	Y	Eriogonum	racemosum			Redroot buckwheat
ERXX1	Y	Y	Eriogonum	spp.			
EUFE1	Y	Y	Euphorbia	fendleri			Fendler spurge
FAPA1	Y	Y	Fallugia	paraqdoxa			Apache plume
FERN1	--	--					Bracken fern
FERU1	Y	Y	Fendlera	rupicola			False mockorange
FRAG1	--	--					
FROV1	Y	Y	Fragaria	ovalis			Strawberry
GANU1	--	--					
GAPH1	Y	Y	Gayophytum	spp.			
GAPI1	Y	Y	Gaillardia	pinnatifida			Blanketflower
GARA1	Y	N	Gayophytum	ramosissimum			
GERI1	Y	Y	Geranium	richardsonii			White Cranesbill
GIFL1	Y	N	Gilia	flavocincta		same as G.tenuiflora	
GIOP1	Y	N	Gilia	ophthalmoides			
GRAP1	Y	Y	Grindelia	aphanactis			Rayless gumweed
GRAS1	Y	Y	Unknown Grass	species monitored before 1993			
GRXX1	N	N	UNKNOWN	GRASS	PIPO15		
GUSA1	Y	Y	Gutierrezia	sarothrae			Broom snakeweed
HEVI1	Y	Y	Heterotheca	villosa			Hairy golden aster
HYAC1	Y	Y	Hymenoxys	acaulis			Bitterweed
HYFI1	Y	Y	Hymenopappus	filiflius			Fineleaf woolywhite
IPAG1	Y	Y	Ipomopsis	aggregata			Arizonia Gilia
IPMU1	Y	Y	Ipomopsis	multiflora			Many-flowered gilia
JUCO1	Y	Y	Juniperus	Communis			Common Juniper
JUOS1	Y	Y	Juniperus	osteosperma			Utah Juniper
KONE1	--	--					
KONI1	Y	Y	Koeleria	nitida		same as K.cristata	June grass
LAAR1	Y	Y	Lathyrus	arizonicus			Peavine
LAEU1	Y	Y	Lathyrus	brachycalyx	eucosmos		Pea
LALA1	Y	Y	Lathyrus	lanzwertii		arizonicus	peavine
LEAR1	Y	Y	Lesquerella	arizonica			Arizona bladderpod
LECA1	Y	Y	Leptodactylon	californicum			
LEER1	Y	Y	Leucelene	ericoides			White Aster
LEIN1	Y	Y	Lesquerella	intermedia			Bladderpod
LEPU1	Y	Y	Lesquerella	purpurea			Purple bladderpod
LICH1	Y	Y	Crustose	Lichen		flat, cling to rock	Crustose Lichen
LICH2	Y	Y	Foliose	Lichen		leafy, cabbagelike	Foliose Lichen
LICH3	Y	Y	Fruticose	Lichen		hanging, stringy	Fruitcose Lichen
LIIN1	Y	Y	Lithospermum	incisum			Narrowleaf gromwell
LILE1	Y	Y	Linum	lewisii			Blue flax
LIPO1	Y	Y	Ligusticum	porteri			

Continued

Species Code List FMH Data - GRCA
Printed on 10/31/94 at 10:27:57 am

Code	Nat.	Perennial	Genus	Species	Subspecies	Variety	Common name
LITE1	Y	Y	Lithophragma	tenellum			Woodland star
LITT1	--	--	*Litter				
LOFO1	Y	Y	Lomatium	foenicuaceum	macdougalii		
LOLE1	Y	Y	Lomatium	bicolor	leptocarpum		Biscuit root
LOMA1	Y	Y	Lomatium	foenicuaceum	macdougalii		
LOUT1	Y	Y	Lotus	utahensis			Utah deervetch
LUHI1	Y	Y	Lupinus	hillii			Lupine
LUKI1	Y	N	Lupinus	kingii			
LUPA1	Y	Y	Lupinus	palmeri			Palmer Lupine
LUPU1	Y	Y	Lupinus	pusillus			Dwarf lupine
MAVU1	N	Y	Marrubium	vulgare			Horehound
MEOFI	N	N	Melilotus	officinalis			Yellow sweet clover
MIGR1	Y	N	Microsteris	gracilis			Little White Phlox
MOLO1	N	N	Unknown				
MOSS1	Y	Y	Star-like	Moss			
NITR1	Y	Y	Nicotiana	trigonophylla			Desert tobacco
NONE1	N	N	No	Brush			Brush not present
OECA1	Y	N	Oenothera	caespitosa		marginata	White-tufted evening prie
OPBA1	N	N	Opuntia	basilaria			
OPSPP1	N	N	Opuntia	spp.			
ORHY1	Y	Y	Oryzopsis	hymenoides			
ORPU1	Y	N	Orhtocarpus	purpureo-albus			Purple owl cover
PAMY1	Y	Y	Pachystima	myrsinites			Mountain Lover
PECE1	Y	Y	Pedicularis	centranthera			Wood Betony
PEEA1	Y	Y	Penstemon	eatonii			Eaton's Firecracker
PELI1	Y	N	Penstemon	linarioides			Toadflax Penstemon
PEPA1	Y	Y	Penstemon	pachyphyllus			Thickleaf Penstemon
PHAU1	Y	N	Phlox	austromontana			Desert Mountain Phlox
PHDI1	Y	N	Phlox	diffusa			Spreading Phlox
PHLO1	Y	N	Phlox	longifolia			Longleaf Phlox
PIED1	Y	Y	Pinus	edulis			Pinyon Pine
PIEN1	Y	Y	Picea	engelmanni			Engelman Spruce
PIPN1	Y	Y	Pinus	ponderosa			N. Rim veg. designator
PIPO1	Y	Y	Pinus	ponderosa			Ponderosa Pine
POAR1	Y	Y	Potentilla	arguta			Cinquefoil
POFE1	Y	Y	Poa	fendleriana			Mutton grass
POPR1	Y	Y	Poa	pratensis			
POTR1	Y	Y	Populus	tremuloides			Quaking Aspen
POXX1	N	Y	Poa	spp.			
PSME1	Y	Y	Pseudotsuga	menziesii			Douglas fir
PTAQ1	Y	Y	Pteridium	aquilinum			bracken fern
PYPI1	Y	Y	Pyrola	picta			wintergreen
QUGA1	Y	Y	Quercus	gambelii			Gambel oak
RHTR1	Y	Y	Rhus	trilobata			Squawbrush
RICE1	Y	Y	Ribes	cereum			Wax currant
RIIN1	Y	Y	Ribes	inebrian			Wax currant
ROAR1	Y	Y	Rosa	Arizonica			Arizona Rose
ROCK1	--	--	*Rock				Rock
RONE1	Y	Y	Robinia	neomexicana			New Mexican locust
SAAE1	Y	Y	Salvia	aethiopsis			African sage
SARH1	Y	Y	Saxifragia	rhomboidea			
SCAT1	--	--	*Scat				Scat
SEDO1	Y	Y	Senecio	douglasii		monoensis	Groundsel
SEFE1	Y	Y	Senecio	fendleri			Fendler's butterweed
SEMU1	Y	Y	Senecio	multilobatus			Butterweed
SETO1	N	N	Unknown				
SEWE1	Y	Y	Senicio	Werneriaefolius			
SIHY1	Y	Y	Sitanion	hystrix			Squirreltail
SOCA1	Y	N	Solidago	canadensis			
SOSP1	Y	Y	Solidago	sparsiflora			
SOXX1	Y	Y	Solidago	sp			
SPFE1	Y	Y	Sphaeralcia	fendleri			Fendler Globe Mallow

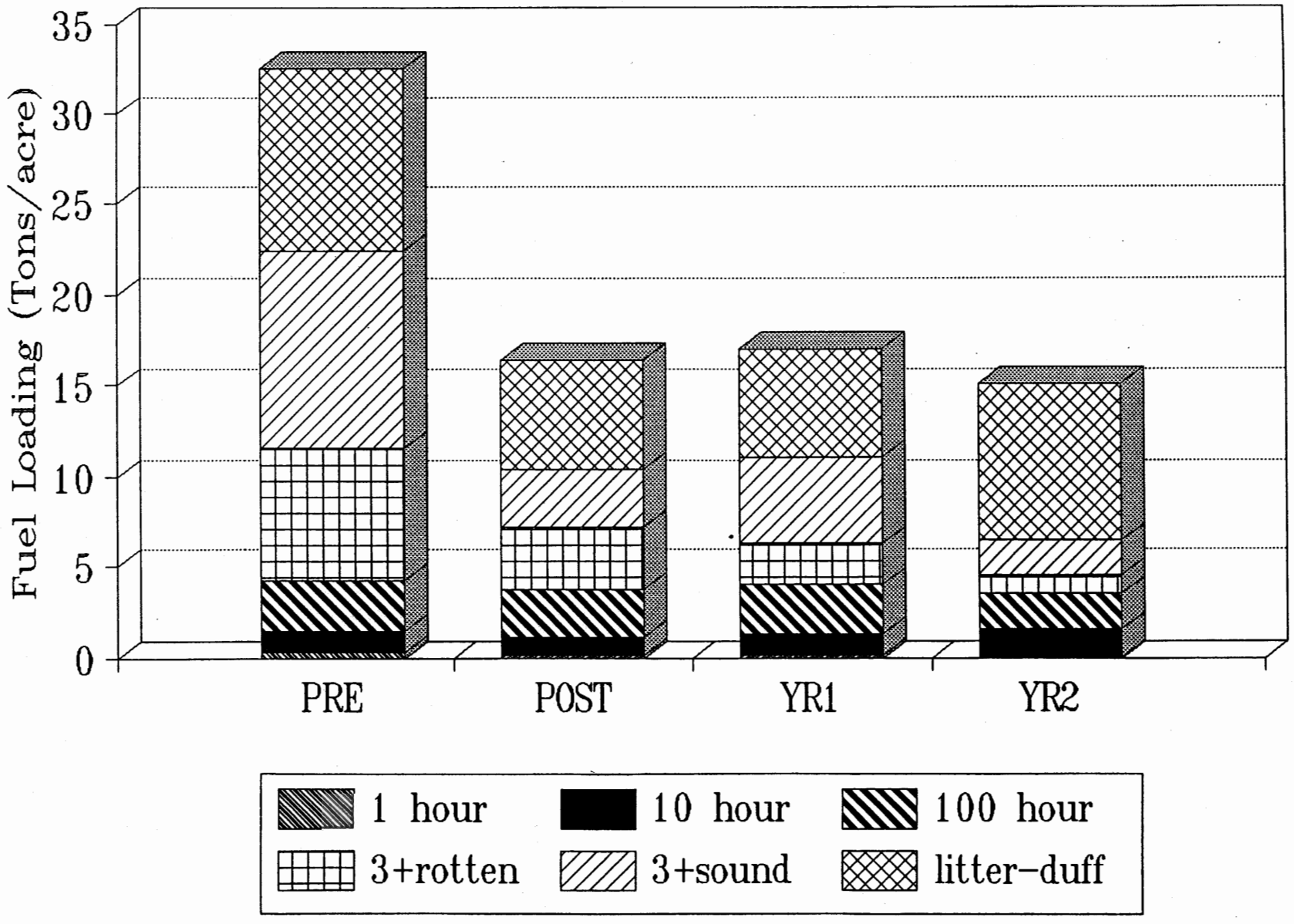
Continued

Species Code List FMH Data - GRCA
Printed on 10/31/94 at 10:27:57 am

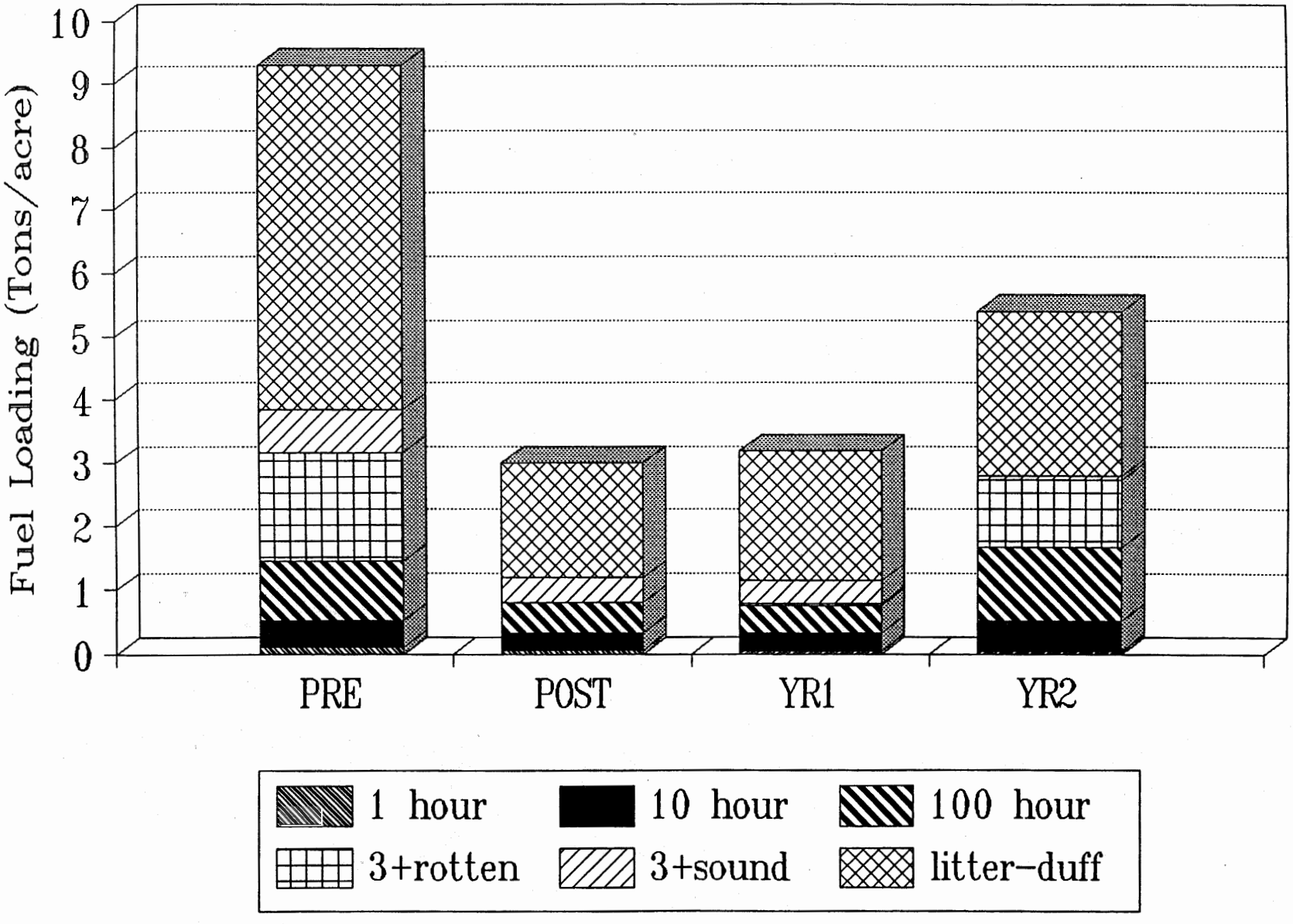
Code	Nat.	Perennial	Genus	Species	Subspecies	Variety	Common name
SPGR1	Y	Y	Sphaeralcea	grossulariaefolia			Gooseberryleaf globe malw
SPPA1	Y	Y	Spaeralcia	parvifolia			Littleleaf globe mallow
STGO1	Y	Y	Stellaria	gonomischa			Chickweed
STJA1	Y	Y	Stellaria	jamesiana			Tuber Starwort
STXX1	Y	Y	Stipa	spp.			Unknown Stipa
SWAL1	Y	Y	Swertia	albomarginata			Green gentian
SWRA1	Y	Y	Swertia	radiata			Deers Ears, Green Gentian
SYAC1	N	N	Unknown				
SYLO1	N	N	Unknown				
SYOR1	Y	Y	Symphoricarpos	oreophilus			
TAOF1	Y	N	Taraxacum	officinale			Common Dandelion
TECA1	Y	Y	Tetradyma	camescens			Spineless horsebrush
THFE1	Y	Y	Thlaspi	fendleri			Fendler's pennycress
THFE2	Y	Y	Thalictrum	fendleri			Meadow rue
THLI1	Y	N	Thelypodiopsis	linearfolia			
TOEX1	Y	N	Townsendia	exscapa			Stemless townsendia
TRBI1	Y	N	Trifolium	Bicolor			
TRDU1	Y	Y	Tragopogon	dubius			Goatsbeard or Salsify
TRGY1	Y	Y	Trifolium	gymnocarpon	gymnocarpon		Clover
UNCR1	N	N	Unknown	Crucifrae			
UNKN1	--	--	Unknown	Composite			PIED 09
EUAL1	Y	Y	Euphorbia	albomarginata			not 100% sure on species
VEMA1	Y	N	Verbena	macdougalii			Tall verbena
VETH1	Y	Y	Verbascum	thapsus			Wooly mullien
WOOD1	--	--	*Downed Woody	Litter			
YUAN1	Y	Y	Yucca	angustissima			Fine-leaf yucca
YUBA1	Y	Y	Yucca	bacatta			Bannana yucca

End of data

FPIPN1 D09 Fuel Loading



FPIP01 D09 Fuel Loading



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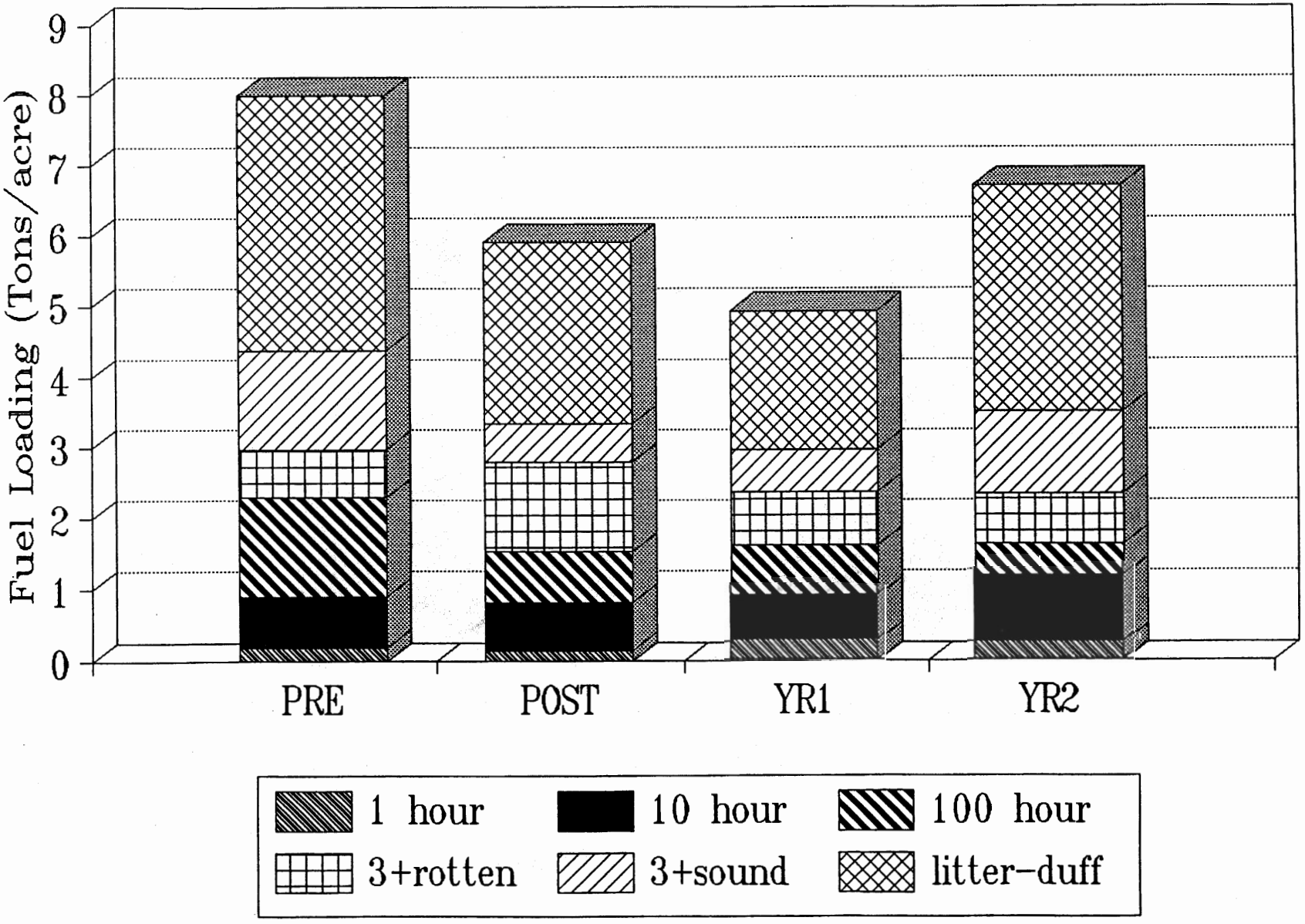
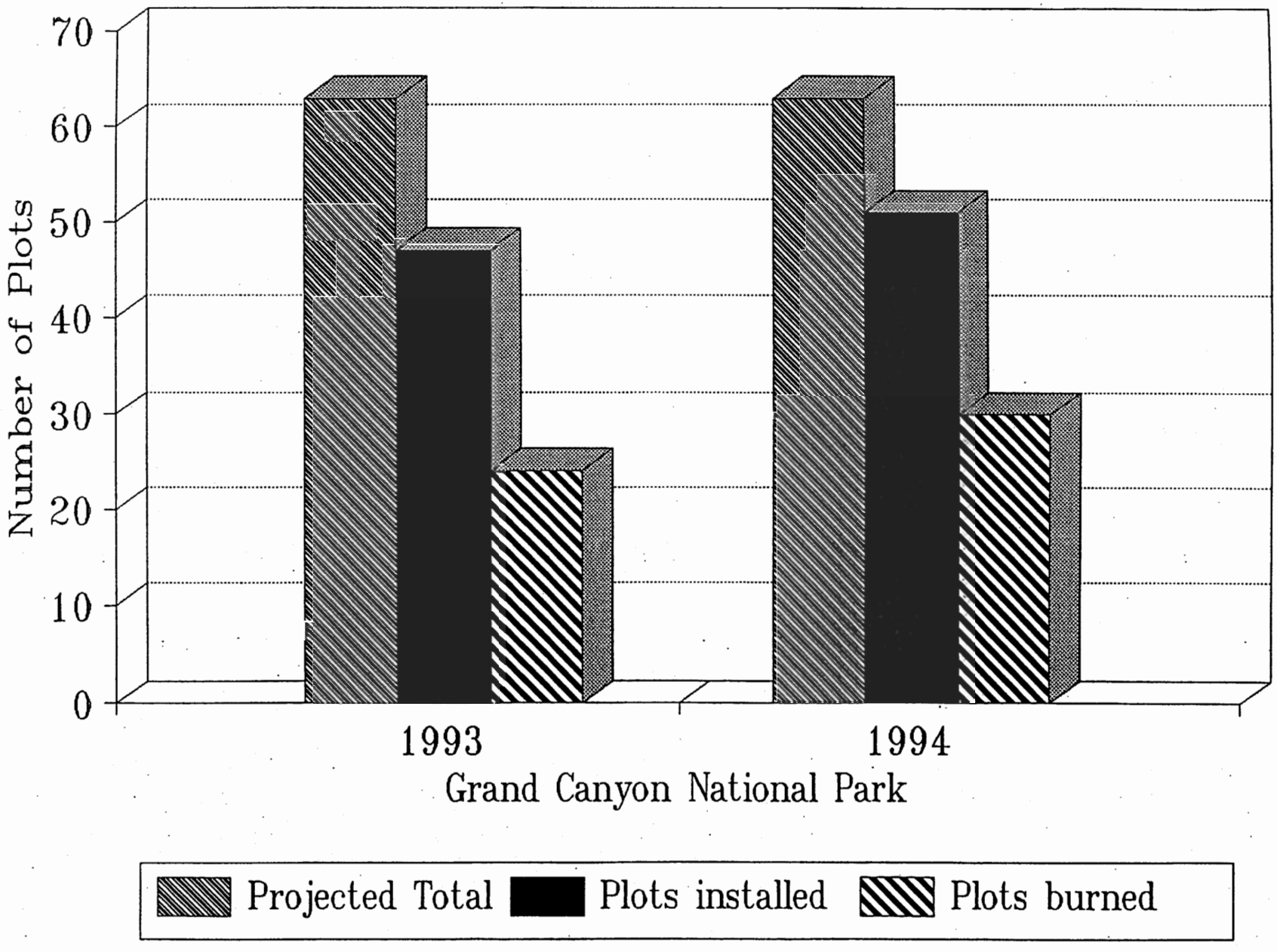
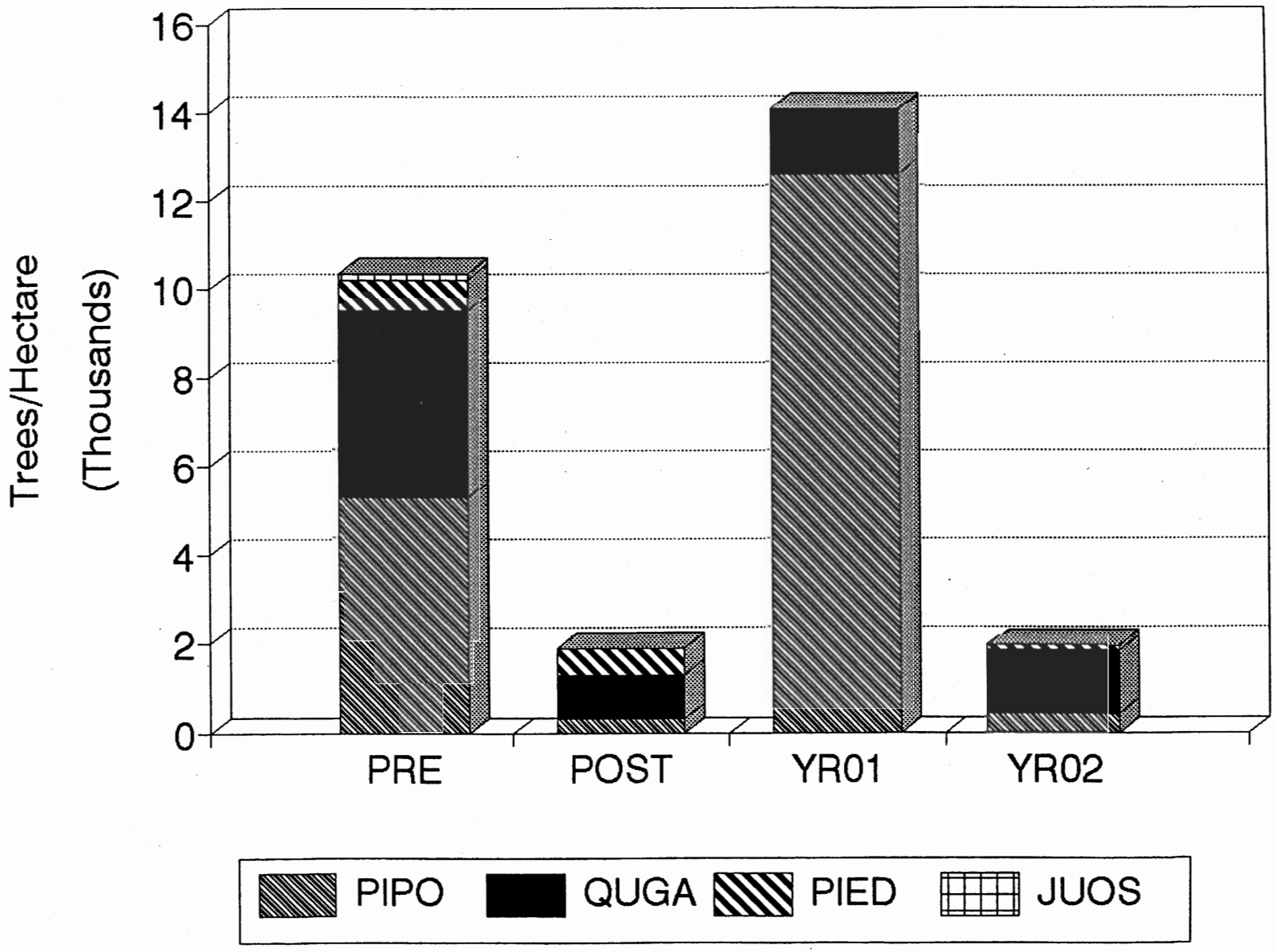


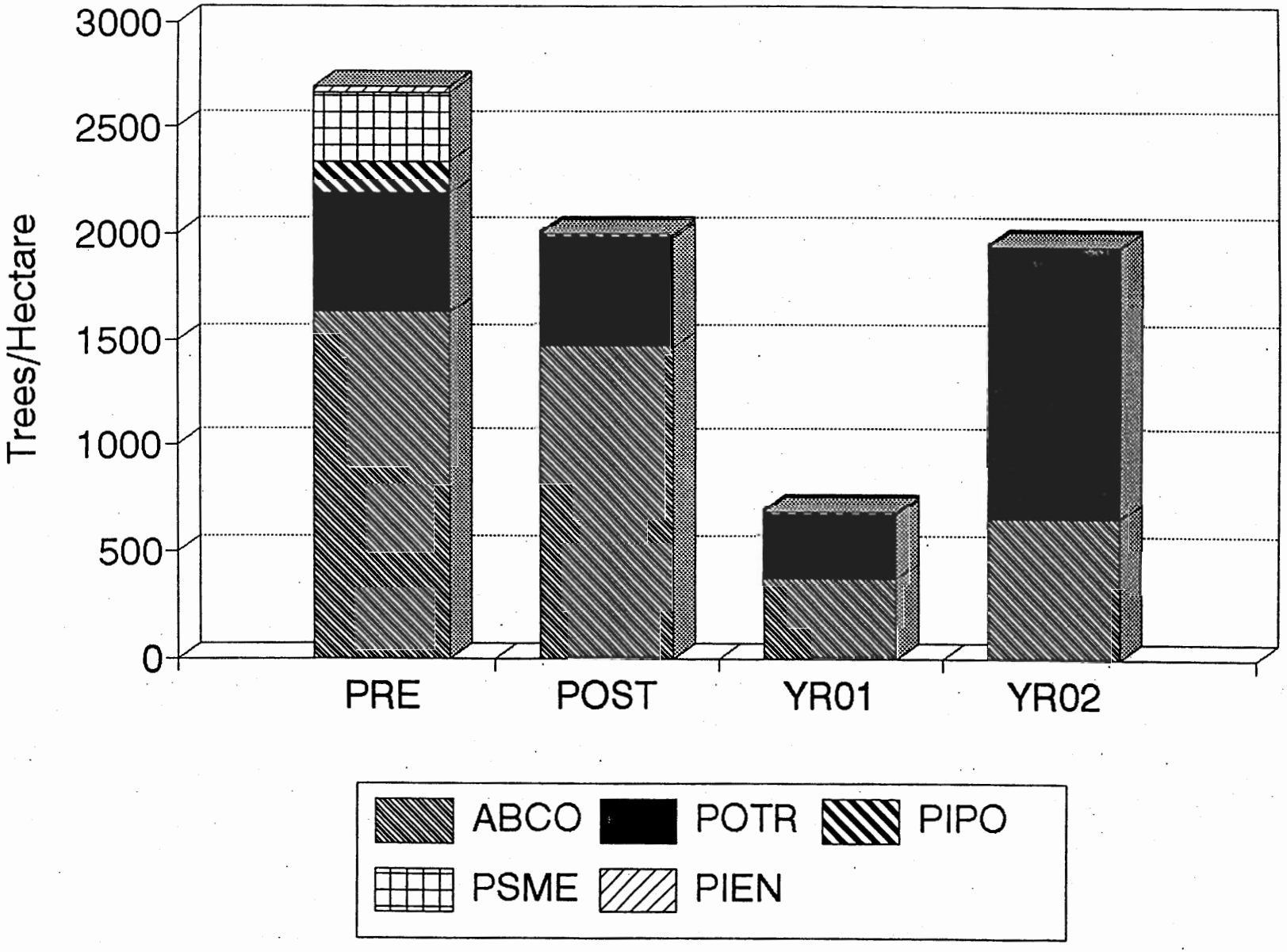
Installed and Burned Forest Plots



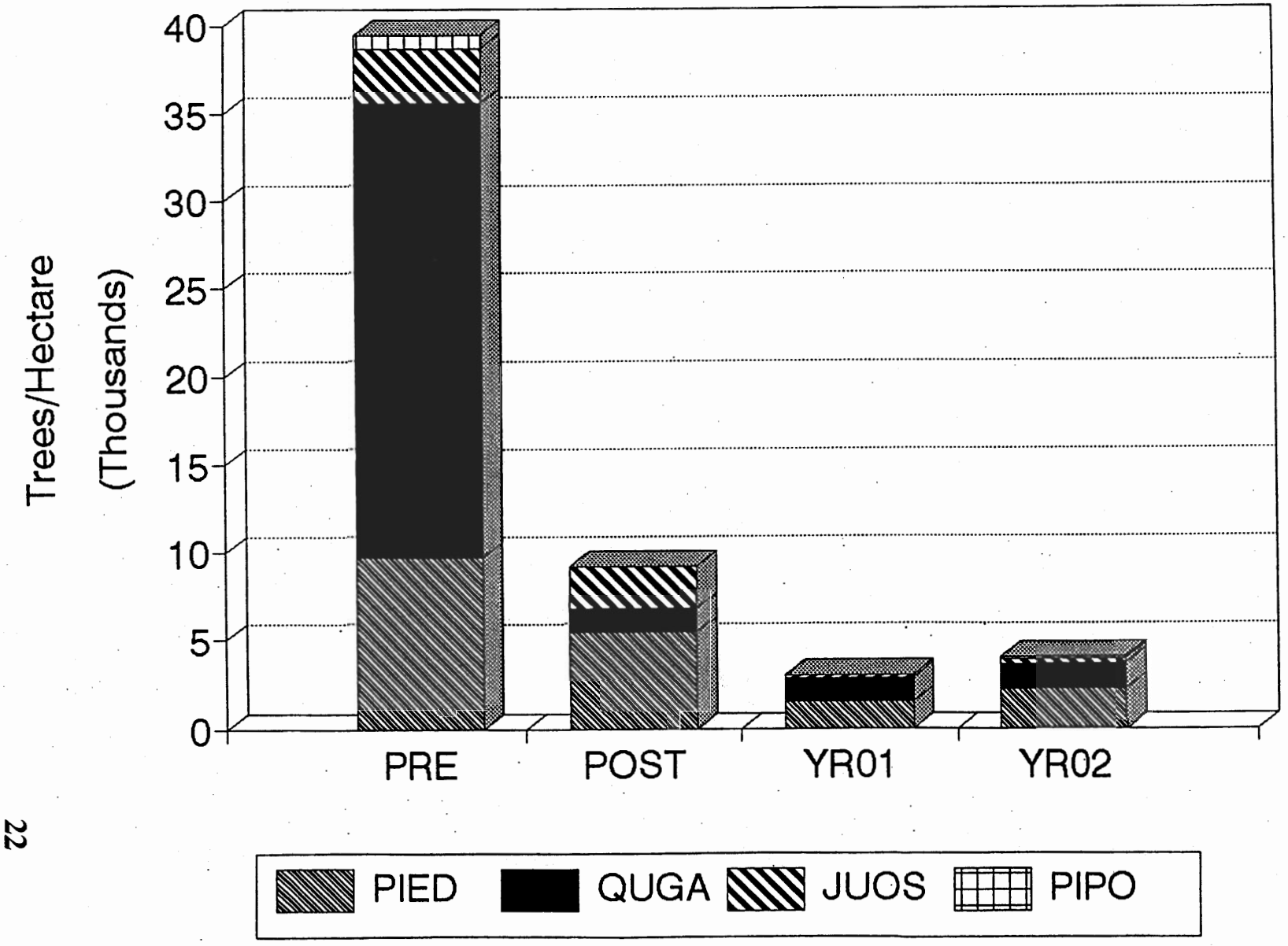
PIPO Seedling Tree Density



PIPN Seedling Tree Density



PIED Seedling Tree Density



Grand Canyon National Park
Branch of Aviation and Fire Management
Weather/Fuel Moisture Monitoring Plan

Station Name Station I.D.	Location	R I M	10 hour TLFM	1000 hour TLFM	Live F.M.	Wx Station Type	Rain Gauge	Hygro
Bright Angel (020211)	N.Rim Helibase	N R	yes 1	PIPO	NO	Manual/ Davis	Y	N
Lindberg (020220)	Lindberg Hill	N R	yes 1 and calculated	ABCO	NO	RAWS	Y	N
Canyon (020222)	Walhalla Plateau	N R	yes 2	PIPO	NO	RAWS	Y	N
Dry Park (020212)	Dry Park D-3 U.S.F.S	N R	calculated	calculated	NO	RAWS	Y	N
Vista	3/4 Mile North of Greenland Lake	N R	yes 2	NO	NO	Manual/ Davis	Y	Y
Tiyo	W1-D road	N R	yes 2	NO	NO	Manual	Y	Y
Swamp Ridge	Swamp Ridge Just west of NW-IV Rx unit	N R	yes 2	PIPN ABCO	NO	Manual	Y	Y
Tusayan (020207)	Tusyan D-4 U.S.F.S.	S R	calculated	calculated	NO	RAWS	Y	N
Watson	Watson Rx Unit	S R	yes 2	PIPO	PIPO	Manual/ Davis	Y	Y
Picnic	Picnic Rx Unit	S R	yes 1	PIPO PIED	ARTR	None	Y	Y
Hopi	Hopi Tower area	S R	yes 1	PIED JUOS	NO	None	N	N

All stations will be sampled at least every 14 days. A higher frequency of visits may be implemented for specific stations as required.