

GRCA FES

# PRESCRIBED FIRE PROGRAM SUMMARY REPORT

*GRAND CANYON NATIONAL PARK  
1995*



NATIONAL PARK SERVICE  
BRANCH OF AVIATION AND FIRE MANAGEMENT  
P.O. BOX 129  
GRAND CANYON, AZ 86023

**Prescribed Fire Program Summary Report**  
**Grand Canyon National Park**  
**1995**

Prepared by:

*Jim Schroeder*  
Prescribed Fire Technician, GRCA

Date: 2-7-96

Prepared by:

*John A. Orlowski*  
Prescribed Fire Specialist, GRCA

Date: 2-7-96

Approved by:

*Ray P. Ott*  
Aviation and Fire Management Officer, GRCA

Date: 2-7-96

ACTIVE

## Acknowledgements

Many people have contributed to the success of the prescribed fire program in 1995. Special thanks are due to Tom Nichols, Paul Reeberg, Dan O'Brien, Steve Botti, and Tom Zimmerman for their inspiration and support in achievement of fire management objectives. We would like to thank the Kaibab National Forest, especially George Kleindienst and Pat Garbutt, for the focused coordination and involvement on the ground with the program. Finally, we would like to acknowledge the efforts of the seasonal aviation and fire management staff, especially the prescribed fire crew consisting of Carl Helquist, Brenda Zimpel, Tonja Carriere, Kelley Corbett, Carrie Dennett, and Susan Stremel for their quality work and relentless enthusiasm during the 1995 fire season.

## *Introduction*

Over the past four years, Grand Canyon National Park has made significant accomplishments in the skillful application of prescribed fire. This report includes wildland fire statistics and brief summaries of the prescribed natural fire, management ignited prescribed fire, fuel and fire weather monitoring, and fire effects monitoring programs.

The prescribed fire program is a vital component of the visitor and resource protection efforts in the park, and is simultaneously essential to the achievement of wilderness and ecosystem management objectives. The ecological conditions due to fire suppression and magnitude of the hazard fuel situation in the park, especially in the forests on the North Rim, necessitate an ambitious program applied with vigilance.

Many questions will need to be answered as the program continues to grow, including ecological, operational, logistical, and long-term planning concerns. The perpetuation of native ecosystems, as well as the safety and success of the prescribed fire program, will require a commitment to the goals of fire and ecosystem management by park managers and program specialists.

A primary strategy of the wildland fire management program is to develop and implement an integrated program of action, where both prescribed fires and wildfires are effectively managed to meet resource objectives and protect values at risk. The achievements of the 1995 season at Grand Canyon National Park are a step forward and renewed commitment to a successful program.

**Grand Canyon National Park  
Aviation and Fire Management  
Annual Summary  
1995**

**PRESCRIBED FIRES**

*Prescribed Natural Fires (PNF)*

<u>Name</u>	<u>Size (acres)</u>	<u>Location</u>	<u>Fuel Model</u>	<u>Ignition Date</u>
Birdseye	0.1	W. of Shiva	2	5/02/95
Towago	0.1	Mt. Sinyala	2	5/22/95
Castor	0.1	Castor Temple	2	6/26/95
Mollie's	75	Mollie's Nipple	2	6/27/95
Sanup	193	Sanup Plateau	1	6/28/95
Lame	98	Sanup Plateau	1	6/28/95
Matthes	1000*	Walhalla Plateau	9	7/29/95
Cheops	0.1	Cheops Pyramid	2	7/29/95
Thor	0.1	Thor's Temple	2	7/29/95
Snap I	120.5	Snap Canyon	1	7/31/95
Snap II	0.1	Snap Canyon	2	7/31/95
Snap III	0.1	Snap Canyon	1	7/31/95
120	0.1	120 Mile Creek	2	8/14/95

*PNF Acres: 1487.3*

\* Acres burned in PNF status before conversion to wildfire.

*Management Ignited Prescribed Fires (MIPF) as of 2/1/96*

<u>Name</u>	<u>Size (acres)</u>	<u>Burn Type</u>	<u>Fuel Model</u>
Grapevine	735	Broadcast	2,9
Tiyo I	58.0	Piles/Broadcast	9,10
Hance	670	Broadcast	2,9
CC Hill	42	Broadcast	9,10
Watson II	687	Broadcast	2,9
Widforss I	20	Piles	9,10

*MIPF Acres: 2212*

**WILDFIRES**

	<u>#</u>	<u>Acres</u>
Lightning-caused	40	4258.1
Human-caused	37	5.4

*Wildfire acres: 4263.5*

**OTHER**

Support actions/mutual aid	31
False alarms	5

## *Management Ignited Prescribed Fire Summary - 1995*

Following a very wet and relatively cool spring in 1995, the first management ignition occurred on the Grapevine project in late May, where roughly 60 acres were completed before the weather became hot and dry. Further ignition on Grapevine did not occur again until July, after the monsoon moisture had moved into northern Arizona. Eventually, 735 acres of NPS lands were successfully accomplished under ideal burning conditions on this interagency project. Approximately 1,000 acres were accomplished on adjoining Kaibab National Forest lands. This project is one of several interagency ecosystem management projects which cross agency boundary lines, first initiated in 1993.

During the monsoons, pile ignition began on the perimeter of the Tiyo I project, located on the north rim. Fire roads are used as primary boundaries of most North Rim projects, which provide usually acceptable perimeters. However, due to over fifty years of accumulated debris along the roads, due to fallen trees, there are extensive amounts of large fuels literally wind-rowed next to the roads. The park has taken the strategy to either pile and burn these fuels, or conduct jackpot burning in the early winter.

Much of the perimeter treatment and hand piling over the past three years has been accomplished by various Type I and Type II Crews, in addition to the NPS-Prescribed Fire Support Crew (PFSC). GRCA was supported by the SAGU, YELL, and BAND PFSC modules for various prep work on management ignited prescribed fire projects. For the past two years, we have hosted the Arrowhead Hotshots in early June as a component of their detail to the Southwest Area. The work accomplished by both the Hotshots and the PFSC modules have been greatly beneficial to the hazard fuel reduction and ecosystem management projects.

Beginning in August, the Hance project was ignited, located along the east rim boundary with the USFS. A significant amount of blacklining was conducted at night along critical perimeter segments, followed by interior ignition once cooler conditions allowed. The Hance project was 670 acres. This project was completed only minutes before a significant wetting rain affected the area, with positive benefits from smoke management and holding perspectives. Interestingly, conditions on all other projects remained hot, very dry, and often windy for several days, requiring constant surveillance during this period. This has tended to be the "norm" for weather patterns at GRCA during in-season burning.

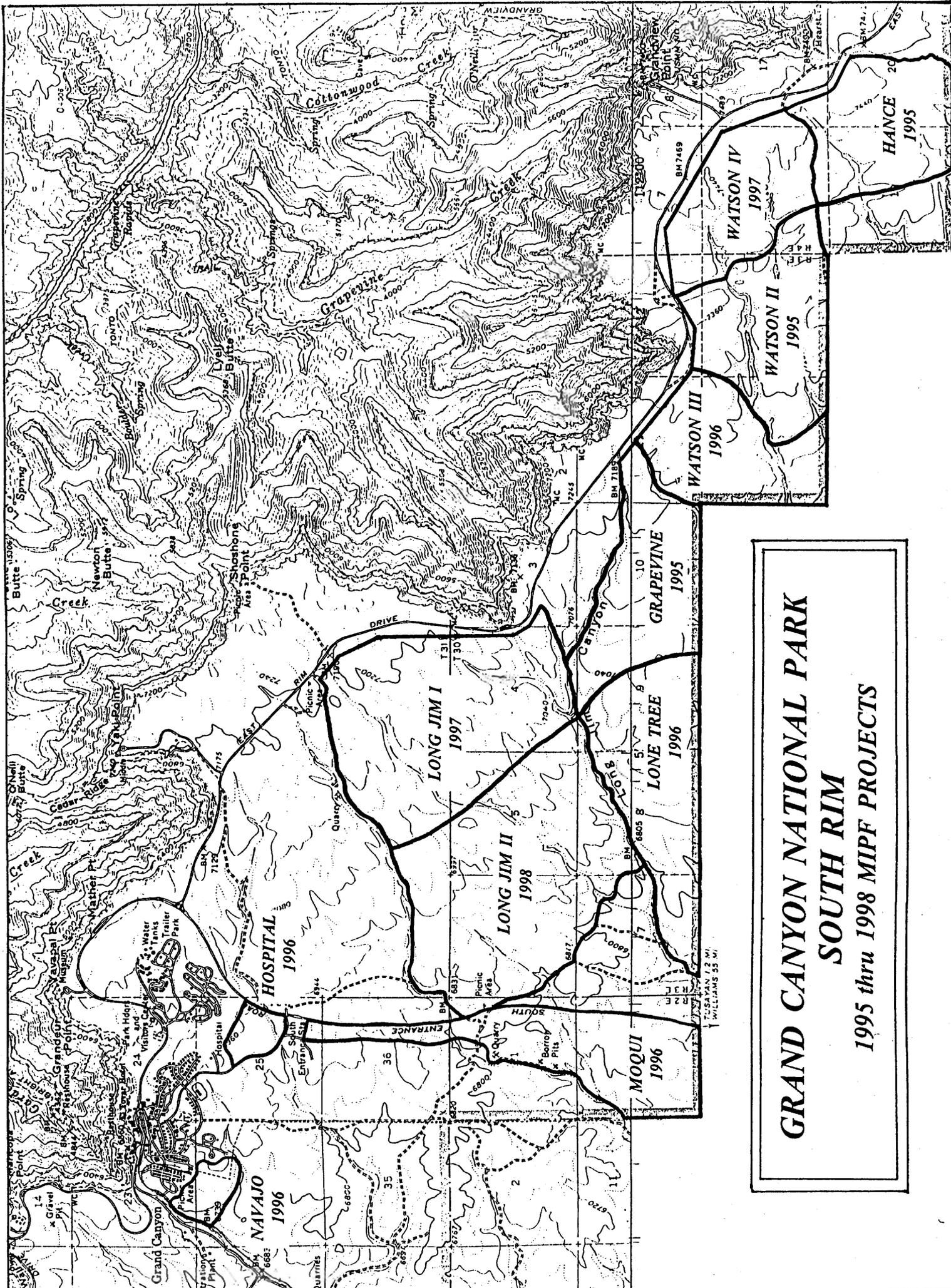
The CC Hill project began in mid-September, located along the developed area interface on the North Rim, which included spruce, fir, aspen, and pine forests. Near the end of the CC Hill project, two of the largest wildfires of the season were detected on the North Rim; holdovers from thunderstorms from the previous week. However, the park was able to mobilize resources from the CC Hill project and the South Rim to provide aggressive initial attack, followed by the assistance of two Type I crews in final control and mop-up.

Fall efforts were directed toward the Watson II project, which required construction of nearly three miles of handline, along with the deployment of several thousand feet of hose. Due to excellent coordination and teamwork, all preparation work was completed within a short timerframe and on schedule, followed by ignition in early October. Weather conditions at times became tenuous, with strong, dry surface winds, but eventually, 687 acres were accomplished in achievement of objectives in this project.

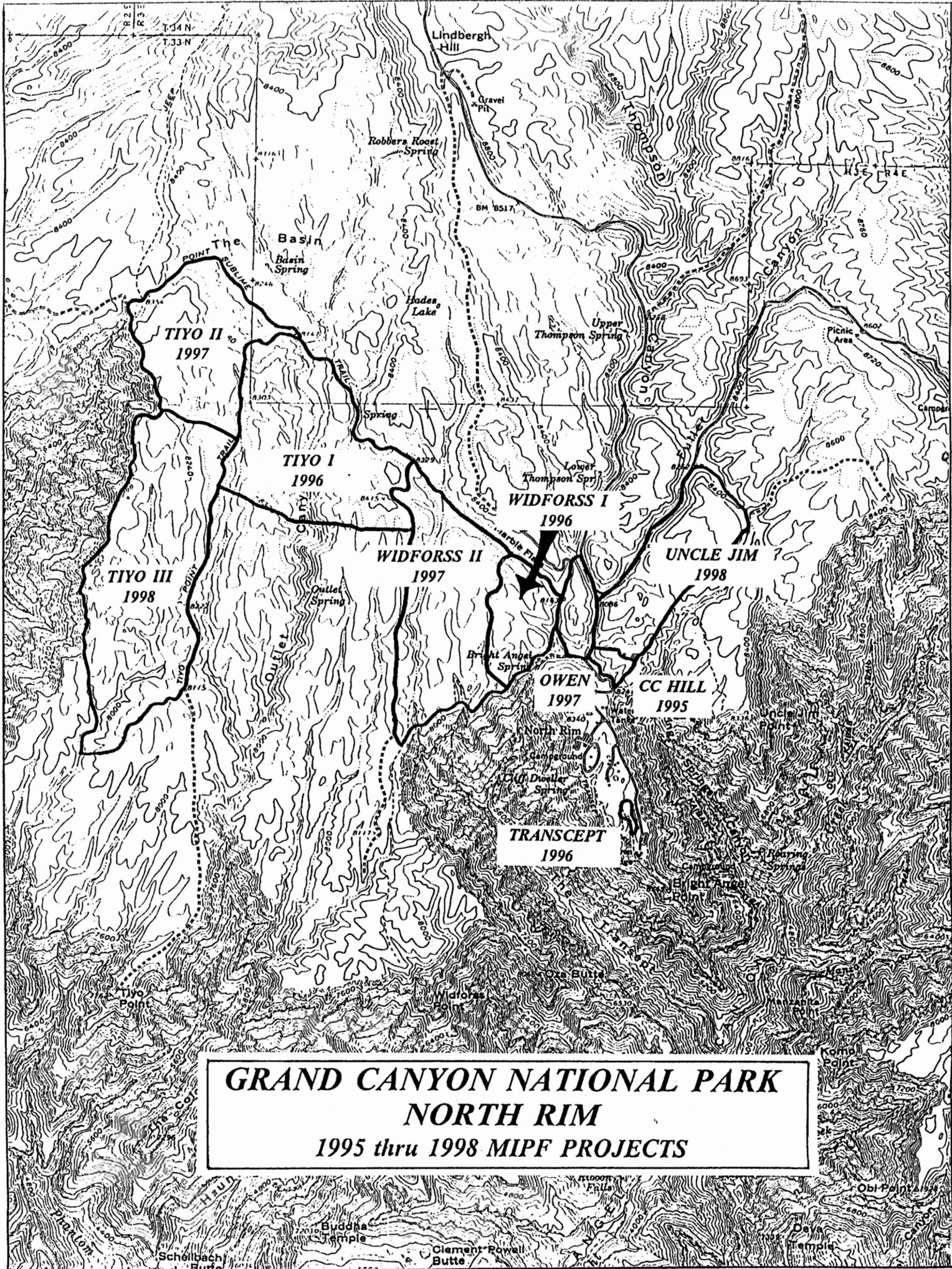
An unusually dry late fall and early winter provided an opportunity to continue prescribed burn projects on the North Rim. An estimated 500+ handpiles, mostly along burn unit perimeter areas were a primary target, in addition to any broadcast burning conditions would allow.

We had intended to broadcast ignite large areas in advance of cool and wet winter storms. Given these objectives, we earnestly tracked the weather conditions. The first winter storm in mid-November was predicted to bring only widely scattered showers, but somehow managed to coalesce into a fairly significant weather event bringing nearly 0.5" of precipitation to the North Rim. Nevertheless, this allowed GRCA fire staff to burn piles with relative ease for the next couple weeks. The first government shutdown halted further progress. As conditions remained dry into December, further burning was initiated on the North Rim, which included extensive jackpot burning along perimeters, as well as a large piece of the Tiyo I project. The fine fuels were too damp and compact to support much fire spread, however due to heavy dead and downed fuel loads in this mixed conifer forest, we accomplished significant fuel reduction. The second, three week, government shutdown again halted further accomplishment.

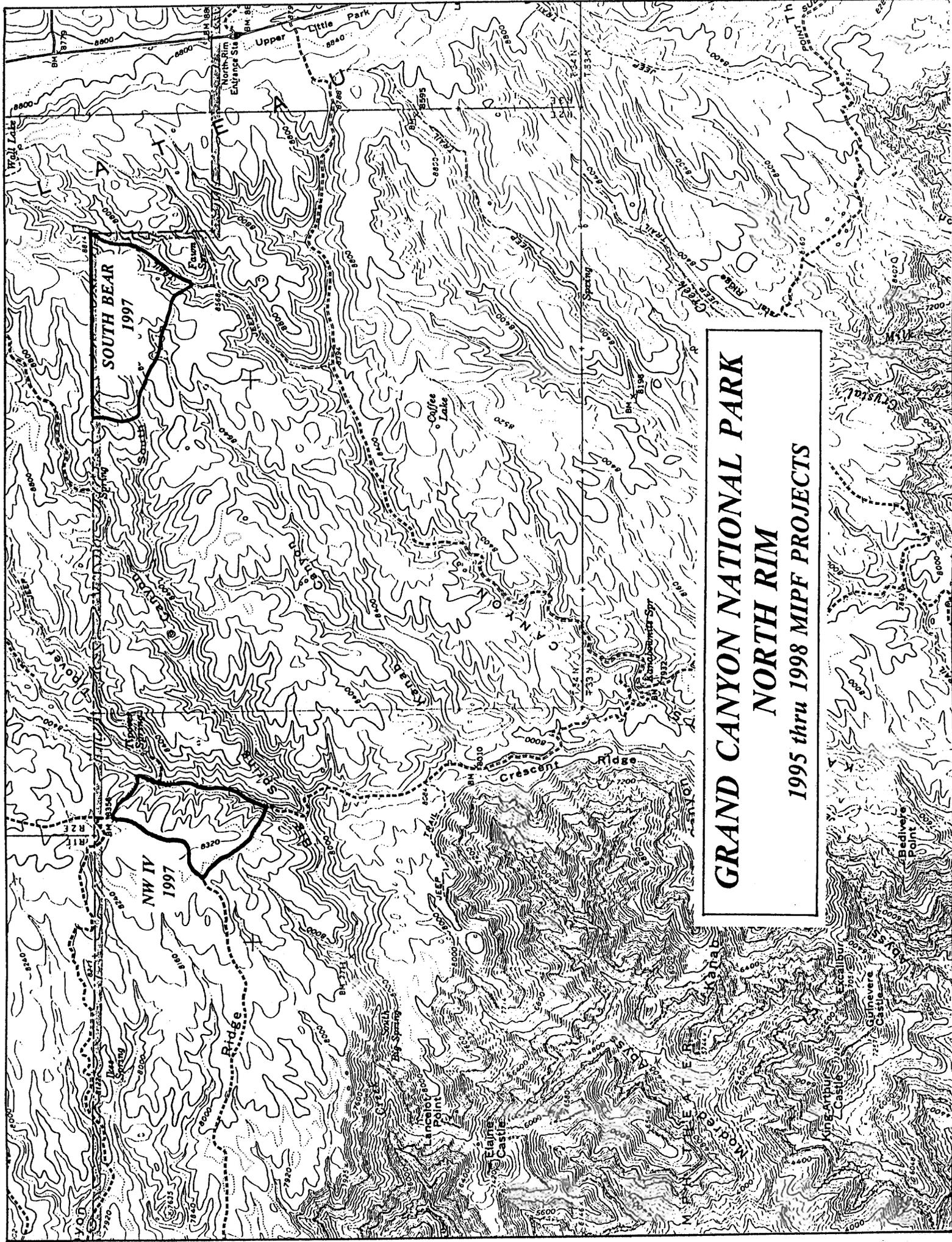
Approximately 58 acres were accomplished on the Tiyo I project. Perimeter jackpot burning continued on the Widforss project into January, where roughly 20 acres were completed. These winter accomplishments, where the fuel loads are in excess of 100 tons per acre were unprecedented in the history of the Grand Canyon NP prescribed fire program. The valuable lessons learned in this experimental burning will allow further progress in reduction of wildfire hazards and restoration of fire-dependent ecosystems on the North Rim. A total of 2,212 acres of management ignited prescribed fire projects were completed, before the first, true, season ending event prevented any further ignition.



**GRAND CANYON NATIONAL PARK**  
**SOUTH RIM**  
 1995 thru 1998 MIPF PROJECTS



**GRAND CANYON NATIONAL PARK**  
**NORTH RIM**  
1995 thru 1998 MIPF PROJECTS



**GRAND CANYON NATIONAL PARK**  
**NORTH RIM**  
*1995 thru 1998 MIPF PROJECTS*

**Grand Canyon National Park  
Branch of Aviation and Fire Management**

***Management Ignited Prescribed Fire  
Proposed Three-year Schedule***

<u>Project</u>	<u>FY</u>	<u>Acres</u>	<u>Location</u>	<u>Comments</u>
Watson III	96	538	S Rim	
Lone Tree	96	<del>860</del> 1126	S Rim	Interagency
Moqui	96	855	S Rim	Interagency
Tiyo I	96	850	N Rim	
Widforss I	96	300	N Rim	
NW IV	96	25	N Rim	Perimeter treatment
Hospital	96	50	S Rim	Pile burn on interface
Navajo	96	120	S Rim	" " "
Transcept	96	20	S Rim	" " "
Watson IV	97	575	S Rim	
NW IV	97	315	N Rim	
Long Jim	97	1,000	S Rim	
South Bear	97	800	N Rim	Interagency
Tiyo II	97	707	N Rim	
Owen	97	200	N Rim	
Widforss II	97	700	N Rim	
Uncle Jim	98	900	N Rim	Urban interface
Tiyo III	98	800	N Rim	Aerial ignition
Manzanita	97	800	N Rim	
Grandview	98	600	S Rim	Interagency
Long Jim II	98	1,000	S Rim	

Rough List  
John  
3yr PLAN

## PROPOSED 3-YEAR MIPF EXECUTION PLAN

1997

WATSON IV  
VILLAGE FUEL BREAK  
WIDFORSS (A and B subunits)  
HOSPITAL (pile and broadcast)  
TIYO I  
NW IV  
LONETREE

1998

OWEN  
ANGEL  
TIYO II  
LONG JIM I  
KANABOWNITS  
RX300

1999

MANZANITA  
UNCLE JIM  
NORTHWEST V  
LONG JIM II  
TOPEKA (possible 2nd entry burn)  
SANTE FE (possible 2nd entry burn)

## *Prescribed Natural Fire Summary - 1995*

Both the Prescription Criteria and Decision Flow Chart of the GRCA Fire Management Plan were modified during winter planning for the 1995 pnf season to reflect Step-Up Actions identified in the National Mobilization Guide. A draft Interagency Prescribed Natural Fire Burn Plan and Observation Record were authorized for testing at GRCA, replacing the NPS Fire Situation Analysis. The Federal Fire and Aviation Leadership Council has since recommended approval of these documents with minor changes.

Prior to the onset of the monsoon season, two small pnf were detected in the inner canyon during May. Over four weeks later, the first series of monsoonal thunderstorms ignited four pnf in the Sanup Plateau area, in the far western portion of the park. Three of these were fast moving fires burning primarily in Mohave and Great Basin Desertscrub communities for a total of 366 acres. The Mollie's Fire burned lands on both Lake Mead National Recreational Area and Grand Canyon National Park. The location and mapping of these fires was facilitated by more effective reconnaissance and detection in these areas of the park.

Another month later, at the end of July, the Matthes Fire was discovered on the North Rim. Burning on the southern end of the Walhalla Plateau, this pnf presented some significant challenges to park staff and cooperators. Although the fire remained within the Maximum Manageable Area (MMA), the pnf was converted to a wildfire due to an unanticipated secondary peak in the seasonal energy release component values, an inability to obtain holding resources within an acceptable timeframe, and safety concerns associated with compromised holding resources. Following a national level review of the fire, the management and mobilization issues, lessons learned, and recommendations for future pnf management were incorporated into a presentation delivered at the NPS Western Region FMO meeting.

Four additional pnf were detected in the far western portions of the park, with the last observed pnf ignition occurring on August 14. A total of 1487.3 acres was burned by prescribed natural fire in 13 separate ignitions.

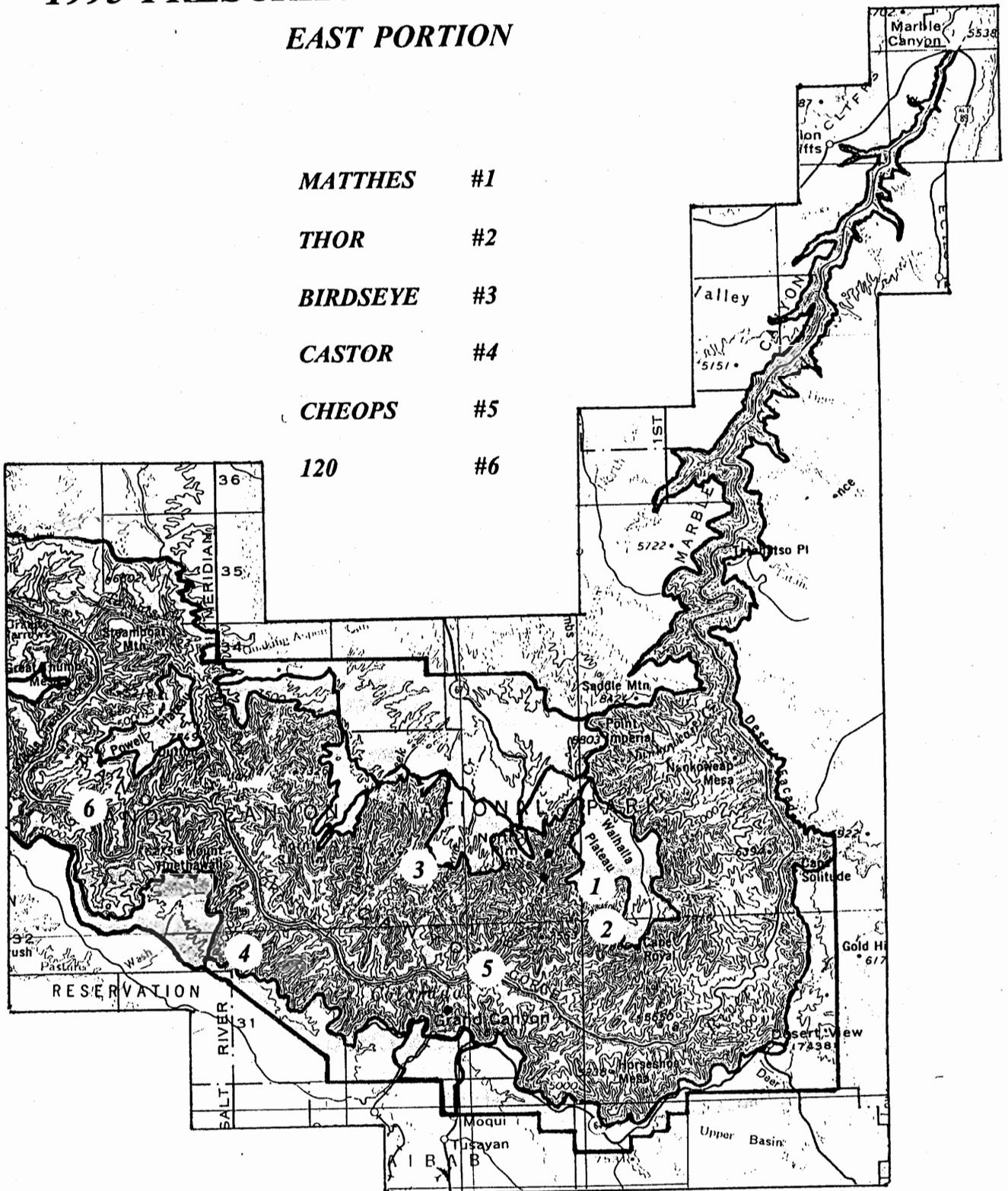
In 1996 the formulation of pnf overhead teams along with the NPS-Prescribed Fire Support Crew will facilitate effective future pnf management. With impending changes in the regulation of emissions from pnf from the state of Arizona, the upcoming season will likely entail a greater workload and complexity.

# GRAND CANYON NATIONAL PARK

## 1995 PRESCRIBED NATURAL FIRES

### EAST PORTION

- |                 |    |
|-----------------|----|
| <i>MATTHES</i>  | #1 |
| <i>THOR</i>     | #2 |
| <i>BIRDSEYE</i> | #3 |
| <i>CASTOR</i>   | #4 |
| <i>CHEOPS</i>   | #5 |
| <i>120</i>      | #6 |



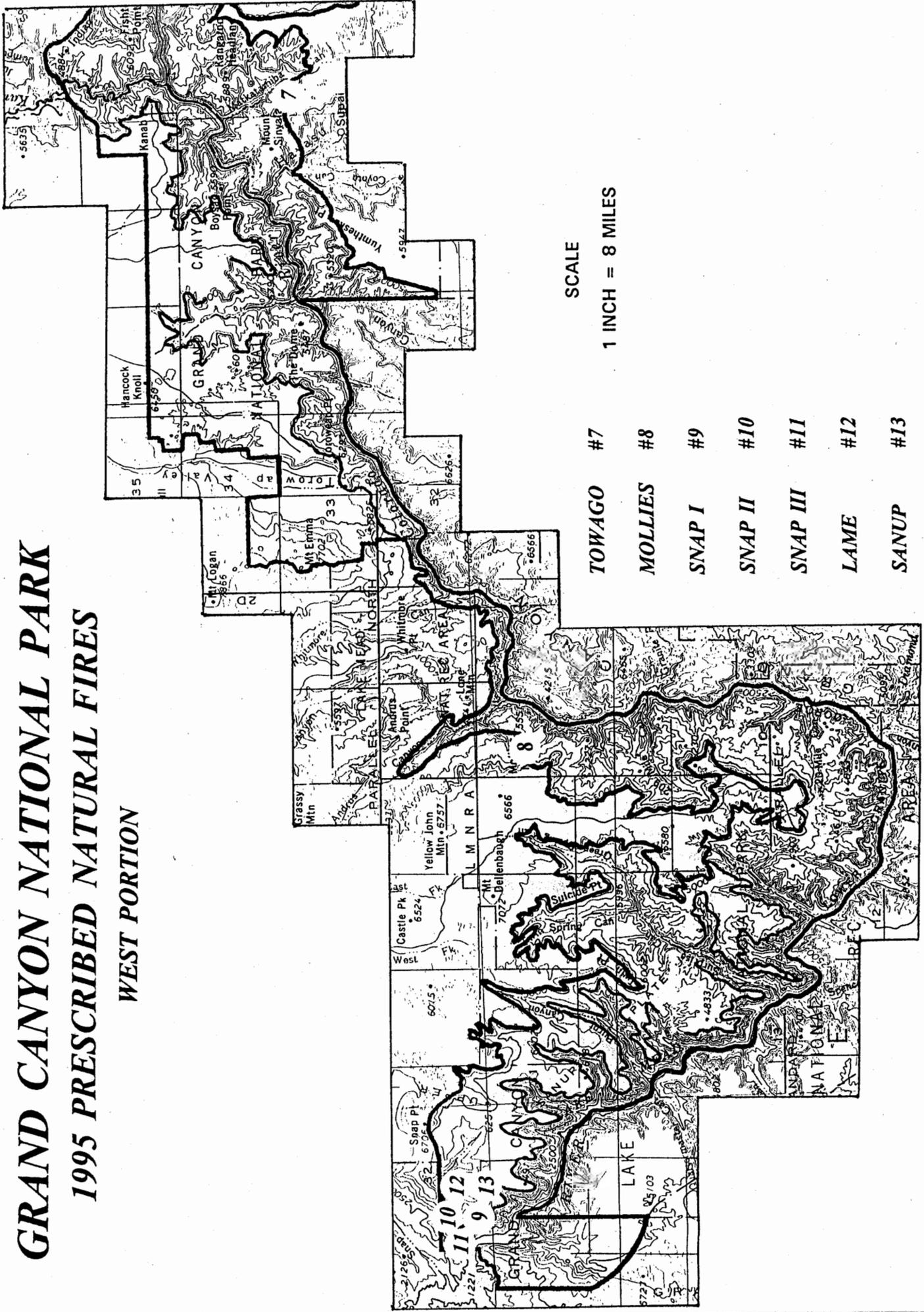
SCALE

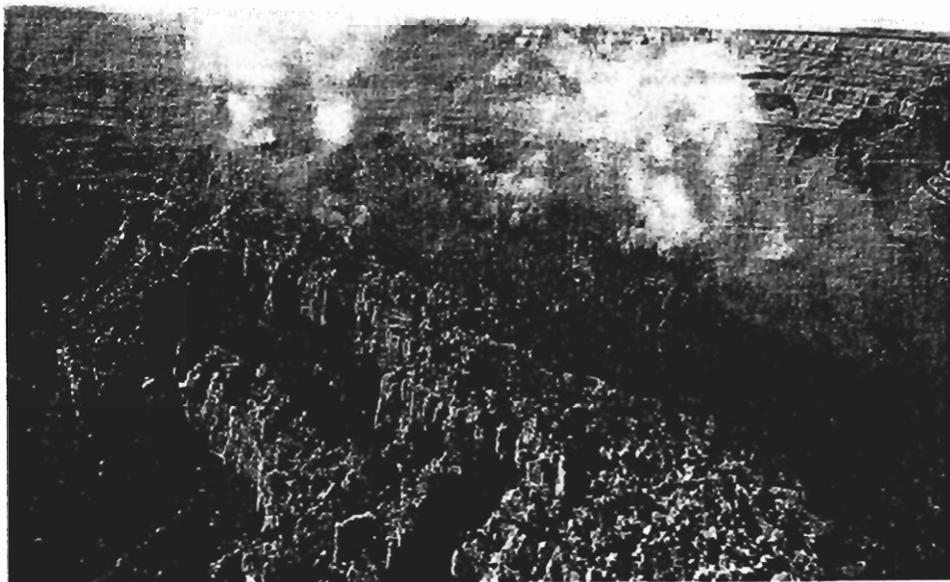
1 INCH = 8 MILES

# GRAND CANYON NATIONAL PARK

## 1995 PRESCRIBED NATURAL FIRES

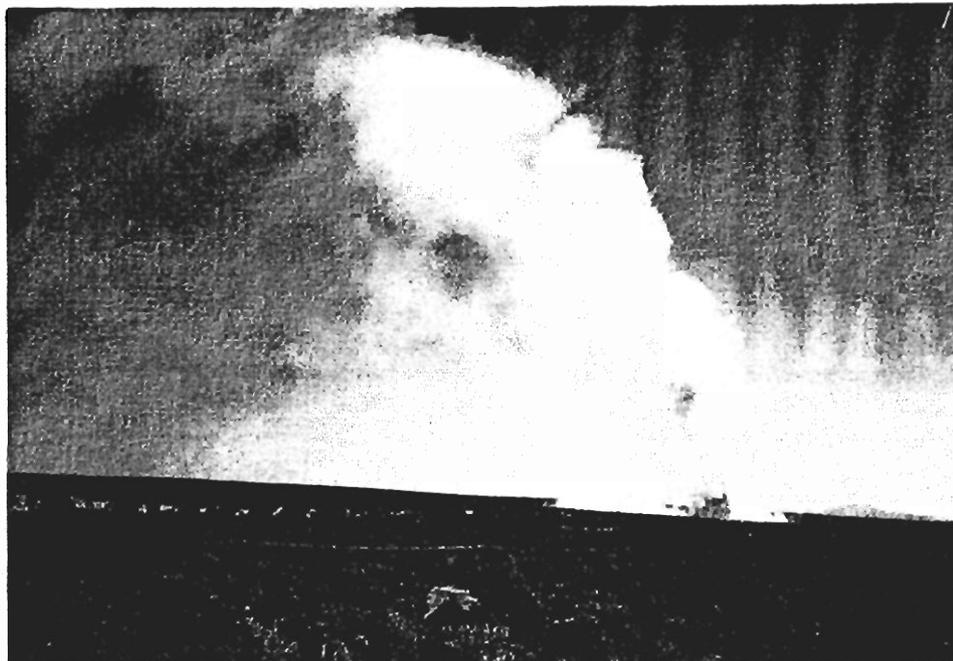
### WEST PORTION





**Plate 1. Prescribed natural fire on the North Rim of Grand Canyon National Park.**

**Plate 2. Watson management ignited prescribed fire on the South Rim, executed in cooperation with the Kaibab National Forest.**



**Plate 3. Smoke dispersal from a management ignited prescribed fire on the wildland/urban interface of the South Rim.**

# GRAND CANYON NATIONAL PARK FIRE EFFECTS MONITORING PROGRAM - 1995

## PLOT NETWORK INFORMATION

TABLE 1. Plot installation by plot type.

<i>Number of Plots Installed Previous Years</i>	<i>Number of Plots Installed 1995</i>	<i>Total Number Plots Installed</i>
52	1	53

TABLE 2. Plot rereads for 1995 and 1996.

<i>Total Plots Reread 1995</i>	<i>Total Plots to Reread 1996</i>
19	22

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

<i>Number of Plots</i>					
1996	1997	1998	1999	2000	2001
32	32	30	--	--	--

TABLE 4. Projected plot installation.

<i>Plots to be Installed 1996</i>				<i>Projected Total</i>			
PIED	PIPO	PIPn	PIEN	PIED	PIPO	PIPn	PIEN
2	3	4	0	17	19	19	18

TABLE 5. Number of plots that have burned.

<i>Total Plots Burned 1995</i>	<i>Total Plots Burned to Date</i>
2	32

TABLE 6. Postburn plot summary.

	FPIED1D02	FPIPO1D09	FPIP1D09	TOTAL
<i>Immediate Postburn</i>	0	1	0	1
<i>1 Year Postburn</i>	2	2	0	4
<i>2 Year Postburn</i>	6	3	2	11
<i>5 Year Postburn</i>	x	x	x	0

TABLE 7. Number of plots installed by monitoring type in 1995.

<i>Monitoring Type Code</i>	<i>Monitoring Type Name</i>	<i>Number of Plots Installed in 1994</i>	<i>Total Number of Plots Installed</i>
FPIPO1D09	Cold Temperature Ponderosa Pine/Mixed Conifer Forest	1	17
FPIEN1D10	Rocky Mountain Subalpine Conifer Forest	0	3
FPIP1D09	Boreal/Cold Temperature Mixed Conifer Forest	0	19
FPIED1D02	Great Basin Conifer Woodland	0	15

## PROGRAM INFORMATION

### Staff Participants

	<i>GRADE</i>	<i>FUNDING SOURCE</i>	<i>POSITION TITLE</i>
Jesse Duhnkrack	GS-0401-9	Rx Permanent Staffing	Prescribed Fire Specialist
Jim Schroeder	GS-0462-7	Hazard Fuel Reduction	Prescribed Fire Technician
Carl Helquist	GS-0404-6	Fire Effects Monitoring	Lead Biological Technician
Tonja Carriere	GS-0462-5	Hazard Fuel Reduction	Fuels Technician
Kelley Corbett	GS-0404-5	Fire Effects Monitoring	Biological Technician
Carrie Dennett	GS-0404-5	PNF Monitoring	Biological Technician
Susan Stremel	GS-0404-5	PNF Monitoring	Biological Technician
Brenda Zimpel	GS-0404-5	PNF Monitoring	Biological Technician

### Length of Season

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

<i>Monitor</i>	<i>Starting Date</i>	<i>Ending Date</i>	<i># of Pay Periods</i>
Jim Schroeder	2/10/95	3/6/95	1
Carl Helquist	3/6/95	10/26/95	15
Tonja Carriere	4/17/95	8/4/95	8
Kelley Corbett	4/17/95	10/12/95	13
Carrie Dennett	4/17/95	10/13/95	13
Susan Stremel	4/17/95	10/12/95	13
Brenda Zimpel	5/16/95	10/26/95	13

### Changes in Protocol

The only change in protocol involved South Rim plots burned prior to 1993. These plots still had 50 foot 1000hr Brown's transects. These transects were extended to 100 feet to bring these plots into accordance with the NPS-FMH as amended.

## **Recommended Changes in Protocol**

None at this time.

## **Equipment Information**

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

## **Monitoring Type Information**

The park's prescribed fire staff has computerized the Fire Monitoring Handbook form 5. This has enabled the staff to update and edit the data more efficiently.

Table 3.

Grand Canyon National Park  
Branch of Aviation and Fire Management

***Fire Effects Monitoring Plots  
Projected Three-year Schedule***

<u>Plot ID</u>	<u>Assignment</u>	<u>FY</u>	<u>Burn Unit</u> 1 yr
PIED 2	2 YR POST	96	PICNIC June
PIED 7	2 YR POST	96	PICNIC June
<del>PIED16</del>	PRE-BURN	96	LONETREE
<del>PIED16</del>	IMMEDIATE POST	96	LONETREE
<del>PIED17</del>	PRE-BURN	96	MOQUI
PIED17	IMMEDIATE POST	96	MOQUI
<del>PIPO 5</del>	2 YR POST	96	PICNIC May
PIPO11	2 YR POST	96	PICNIC May 95
PIPO12	2 YR POST	96	PICNIC June 95
<del>PIPO15</del>	1 YR POST	96	HANCE Sept 96
<del>PIPO16</del>	PRE-BURN	96	WATSON III
PIPO16	IMMEDIATE POST	96	WATSON III
<del>PIPO17</del>	PRE-BURN	96	WATSON III-IV
<del>PIPO17</del>	IMMEDIATE POST	96	WATSON III-IV
<del>PIPO18</del>	PREBURN	96	LONG JIM I
<del>PIPO19</del>	PREBURN	96	<del>LONG JIM II</del> Lonotree
<del>PIPN 3</del>	REREAD PRE-BURN	96	TIYO I
<del>PIPN 3</del>	IMMEDIATE POST	96	TIYO I
<del>PIPN 4</del>	REREAD PRE-BURN	96	WIDFORSS I
<del>PIPN 4</del>	IMMEDIATE POST	96	WIDFORSS I
<del>PIPN 7</del>	REREAD PRE-BURN	96	TIYO I
<del>PIPN 7</del>	IMMEDIATE POST	96	TIYO I
PIPN 8	REREAD PRE-BURN	96	TIYO I
<del>PIPN 8</del>	IMMEDIATE POST	96	TIYO I
<del>PIPN13</del>	REREAD PRE-BURN	96	TIYO I
<del>PIPN13</del>	IMMEDIATE POST	96	TIYO I
<del>PIPN18</del>	REREAD PRE-BURN	96	<del>TIYO I</del>
<del>PIPN18</del>	IMMEDIATE POST	96	TIYO I
PIPN20	PREBURN	96	TIYO II
PIPN21	PREBURN	96	TIYO II
PIPN22	PREBURN	96	WIDFORSS II
PIPN23	PREBURN	96	WIDFORSS II

A: PLOT

<u>Plot ID</u>	<u>Assignment</u>	<u>FY</u>	<u>Burn Unit</u>
✓PIED 1	5 YR POST	97	ENTRANCE
✓PIED 4	5 YR POST	97	ENTRANCE
✓PIED 5	5 YR POST	97	ENTRANCE
✓PIED 8	5 YR POST	97	TOPEKA
✓PIED16	1 YR POST	97	LONETREE
✓PIED17	1 YR POST	97	MOQUI
✓PIEN 2	REREAD PREBURN	97	S.BEAR
✓PIEN 2	IMMEDIATE POST	97	S.BEAR
✓PIEN 4	REREAD PREBURN	97	S.BEAR
✓PIEN 4	IMMEDIATE POST	97	S.BEAR
PIEN 5	PREBURN	97	MANZANIT
PIEN 6	PREBURN	97	MANZANIT
PIEN 7	PREBURN	97	UNCLE JIM
PIEN 8	PREBURN	97	UNCLE JIM
PIPN 1	5 YR POST	97	NW I
PIPN 2	5 YR POST	97	NW I
✓PIPN 3	1 YR POST	97	TIYO I
✓PIPN 4	1 YR POST	97	WIDFORSSI
✓PIPN 7	1 YR POST	97	TIYO I
✓PIPN 8	1 YR POST	97	TIYO I
✓PIPN13	1 YR POST	97	TIYO I
✓PIPN18	1 YR POST	97	TIYO I
PIPN16	REREAD PRE-BURN	97	TIYO II
PIPN16	IMMEDIATE POST	97	TIYO II
PIPN17	REREAD PRE-BURN	97	WIDFORSSII
PIPN17	IMMEDIATE POST	97	WIDFORSSII
✓PIPN20	IMMEDIATE POST	97	TIYO II
✓PIPN21	IMMEDIATE POST	97	TIYO II
✓PIPN22	IMMEDIATE POST	97	WIDFORSSII
✓PIPN23	IMMEDIATE POST	97	WIDFORSSII
✓PIPO 1	5 YR POST	97	ENTRANCE
PIPO 2	5 YR POST	97	SANTE FE
PIPO 7	5 YR POST	97	ENTRANCE
PIPO 8	5 YR POST	97	VILLAGE
PIPO 9	5 YR POST	97	ATCHISON
PIPO15	2 YR POST	97	HANCE
PIPO16	1 YR POST	97	WATSON III
PIPO17	1 YR POST	97	WATSON III
PIPO18	IMMEDIATE POST	97	LONG JIM I
PIPO19	IMMEDIATE POST	97	LONG JIM-II Lonetree

<u>Plot ID</u>	<u>Assignment</u>	<u>FY</u>	<u>Burn Unit</u>
PIED 9	5 YR POST	98	QUARRY
PIED10	5 YR POST	98	QUARRY
PIED11	5 YR POST	98	QUARRY
PIED13	5 YR POST	98	ATCHISON
PIED14	5 YR POST	98	ATCHISON
PIED15	5 YR POST	98	ATCHISON
PIED16	2 YR POST	98	LONETREE
? < PIED17	2 YR POST	98	MOQUI
PIEN 2	1 YR POST	98	S. BEAR
PIEN 4	1 YR POST	98	S. BEAR
PIEN 5	IMMEDIATE POST	98	MANZNIT
PIEN 6	IMMEDIATE POST	98	MANZNIT
PIEN 7	IMMEDIATE POST	98	UNCLE JIM
PIEN 8	IMMEDIATE POST	98	UNCLE JIM
PIPN 3	2 YR POST	98	TIYO I
PIPN 4	2 YR POST	98	WIDFORSSI
PIPN 7	2 YR POST	98	TIYO I
PIPN 8	2 YR POST	98	TIYO I
PIPN 9	5 YR POST	98	NW III
PIPN12	5 YR POST	98	NW III
PIPN13	2 YR POST	98	TIYO I
PIPN16	1 YR POST	98	TIYO II
PIPN17	1 YR POST	98	WIDFORSSII
PIPN18	2 YR POST	98	TIYO I
PIPN20	1 YR POST	98	TIYO II
PIPN21	1 YR POST	98	TIYO II
PIPN22	1 YR POST	98	WIDFORSSII
PIPN23	1 YR POST	98	WIDFORSSII
PIPO 6	5 YR POST	98	QUARRY
PIPO10	5 YR POST	98	QUARRY
PIPO13	5 YR POST	98	ATCHISONII
PIPO14	5 YR POST	98	ATCHISONII
PIPO16	2 YR POST	98	WATSON III
PIPO17	2 YR POST	98	WATSON-III-IV
PIPO18	1 YR POST	98	LONG JIM I
PIPO19	1 YR POST	98	LONG JIM II

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
ACM11	Y	Y	Achillea	millefolium			
AGAR1	Y	Y	Agoseris	arizonica			Arizona Mountain dandelin
ALMA1	N	N	Aletes	macdougali			MacDougal's Aletes
ANAP1	Y	Y	Antennaria	parvifolia			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
ARPL1	Y	Y	Argemone	pleicantha			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
ASDI1	N	N	?	?			check with E. German
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	sp.		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
BRC11	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
CAS11	Y	Y	Carex	siccatta			Sedge,grows individualy
CATH1	N	N	?	?			
CAXX1	Y	Y	Carex	spp.			Sedge
CEFE1	Y	Y	Ceanothus	fendleri			Fendler Buckbrush
CELE1	Y	Y	Cercocarpus	ledifolius			Curlleaf Mt-mahogany
CFIN1	N	N	?	?			
CHM11	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.			
CLH11	Y	Y	Clematis	hirutissima			Leather flower
CLSE1	Y	Y	Cleome	serrulata			Rocky Mountain Beeplant
COAR1	Y	Y	Convolvulus	arvensis			field bindweed
COL11	Y	N	Collomia-like	annual			Unknown Forb
COME1	Y	Y	Cowania	mexicana			Cliffrose
COMP1	N	N	Compositae	?	?	check with E. German	changed to Asteraceae
CONE1	--	--					
COPA1	Y	N	Colinsia	parvifolia			blue eyed mary
COV11	Y	Y	Corypantha	vivpara		arizonica	Arizona Beehive
CRPT1	--	--					
CRSE1	Y	Y	Cryptantha	setosissima			
CRUS1	--	--					
CRXX1	--	--					
CRYP1	Y	Y	Cryptogamic	soil			
DENE1	Y	Y	Delphinium	nelsonii			Larkspur
DEP11	Y	N	Descraiana	pinnata			Yellow Tansy Mustard
DUFF1	--	--	*Duff				Duff
ERC11	N	N	Erodium	cicutarium			Redstem storksbill
ERD11	Y	Y	Erigeron	divergens			Spreading fleabane
EREA1	Y	Y	Erigeron	eatonii			
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.			
EUAL1	Y	Y	Euphorbia	albomarginata			not 100% sure on species
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.			
GAP11	Y	Y	Gaillardia	pinnatifida			Blanketflower
GARA1	Y	N	Gayophytum	ramosissimum			
GER11	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		PIP015	
GUSA1	Y	Y	Gutierrezia	sarothrae			Broom snakeweed
HEV11	Y	Y	Heterotheca	villosa			Hairy golden aster
HYAC1	Y	Y	Hymenoxys	acaulis			Bitterweed
HYF11	Y	Y	Hymenopappus	filifolius			Fineleaf woollywhite
IPAG1	Y	Y	Ipomopsis	aggregata			Arizona 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
LIP01	Y	Y	Ligusticum	porteri			
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
LUH11	Y	Y	Lupinus	hillii			Lupine
LUK11	Y	N	Lupinus	kingii			
LUPA1	Y	Y	Lupinus	palmeri			Palmer Lupine
LUPU1	Y	Y	Lupinus	pusillus			Dwarf lupine
MAVU1	N	Y	Marrubium	vulgare			Horehound
MEOF1	N	N	Melilotus	officinalis			Yellow sweet clover
MIGR1	Y	N	Microsteris	gracilis			Little White Phlox
MOLO1	N	N	??	??			
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			
OPSP1	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
PHD11	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
PIP11	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 aspeeeen
POXX1	N	Y	Poa	spp.			
PSME1	Y	Y	Pseudotsuga	menziesii			Douglas fir
PTAQ1	Y	Y	Pteridium	aquilinum			bracken fern
PYP11	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

SED01	Y	Y	Senecio	douglasii	monoensis	Groundsel
SEFE1	Y	Y	Senecio	fendleri		Fendler's butterweed
SEMU1	Y	Y	Senecio	multilobatus		Butterweed
SET01	N	N	??	??		
SEWE1	Y	Y	Senecio	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
SPGR1	Y	Y	Sphaeralcea	grossulariaefolia		Gooseberryleaf globe malw
SPPA1	Y	Y	Sphaeralcia	parvifolia		Littleleaf globe mallow
STGO1	Y	Y	Stellaria	gonomisca		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	??	??		
SYLO1	N	N	??	??		
SYOR1	Y	Y	Symphoricarpos	oreophilus		
TAOF1	Y	N	Taraxacum	officinale		Common Dandelion
TECA1	Y	Y	Tetradyma	canescens		Spineless horsebrush
THFE1	Y	Y	Thlaspi	fendleri		Fendler's pennycress
THFE2	Y	Y	Thalictrum	fendleri		Meadow rue
THLI1	Y	N	Thelypodopsis	linearfolia		
TOEX1	Y	N	Townsendia	exscapa		Stemless townsendia
TRB11	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	--	--				
UNKN2	--	--				
VEMA1	Y	N	Verbena	macdougallii		Tall verbena
VETH1	Y	Y	Verbascum	thapsus		Woolly mullien
WOOD1	--	--	*Downed Woody	Litter		
YUAN1	Y	Y	Yucca	angustissima		Fine-leaf yucca
YUBA1	Y	Y	Yucca	bacatta		Bannana yucca

End of data

## *Fuel Moisture and Fire Weather Monitoring Summary - 1995*

An ambitious fuels sampling program was initiated in the spring of 1995, which included 10 hour time lag fuel moisture (TLFM), 1000 hour TLFM, and live fuel moisture. A bulletin board was established in the Fire Management Support Office to display the findings of the sampling program. Both a Computrac and a convective drying oven were used to determine fuel moisture values.

The Grand Canyon Wildland Fire Emergency Communications Center processed fire weather information in the Weather Information Management System (WIMS). Both 1000 hour TLFM and live fuel moisture measured values were used to correct the values generated in WIMS, using the National Fire Danger Rating System (NFDRS). Energy Release Component Values (ERC) were plotted by hand on a graph, displayed on the bulletin board, for a key representative fuel model/slope class at each of the four primary NFDRS fire weather stations in the park.

The following page is a summary of the proposed 1996 sampling program. We have consolidated sampling locations on both the South Rim and North Rim from the schedule in 1995, and revised the species of live fuel and 1000 hour TLFM to more accurately reflect the vegetation type. The micro-RAWS, previously located on the Walhalla Plateau, will be moved to Bright Angel Point, replacing the longest running manual station in the park. The quality of the data base should improve as a result of this move. The USFS has purchased several new Fire Technology System (FTS) units, one of which will replace the RAWS located on the Tusayan Ranger District. This unit is a primary station for park preparedness planning as well as representative of areas where current and proposed management ignited prescribed fire projects will be executed.

Additional plans for 1996 include the procurement of a PC for the North Rim, primarily for work on WIMS, ASCADS, WeatherBank, and other fire management software tools. We also plan to pursue funds for an additional Computrac and convective drying oven.

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

Station Name Station I.D.	Location	R I M	10 hour TLFM	1000 hour TLFM	Live F.M.	Wx Station Type	R a i n  G a u g e	H y g r o
Bright Angel (020211)	N.Rim Helibase	N R	Yes 1 and calculated	PIPO	PIPO ABCO	RAWS	Y	N
Lindberg (020220)	Lindberg Hill	N R	Yes 1 and calculated	ABCO PIEN	No	RAWS	Y	N
Walhalla	Walhalla Plateau	N R	Yes 1	No	No	DAVIS/ MANUAL	Y	Y
Buddha	W1-D Road	N R	Yes 1	No	No	MANUAL	Y	Y
Swamp Ridge	Swamp Ridge Road West of NW-IV RX Burn Unit	N R	Yes 1	No	No	MANUAL	Y	N
Tusayan (020207)	Tusayan D-4 U.S.F.S	S R	calculated	PIPO	ARTR	FTS	Y	N
Long Jim	Long Jim Canyon Road	S R	Yes 1	No	PIPO	MANUAL	Y	Y

PIPO     Pinus ponderosa  
 ABCO    Abies concolor  
 PIEN    Picea engelmanni  
 ARTR    Artemesia tridentada