



**National Park Service
Fire Ecology Annual Report
Calendar Year 2004**

Summary

The Everglades National Park fire monitoring program has completed five years of data collection using Fire Monitoring Handbook protocols. This is an important milestone for fire effects monitoring and fire management at Everglades National Park. Not only does this data set represent a significant program accomplishment, but also the quality of the data serves as a testament to dedicated field staff working in the harshest of conditions. In the fire-frequent system found at Everglades National Park, these data capture numerous fire treatments in most of the systems. At this point, this data set provides scientists and managers an opportunity to assess the efficacy of treatments as well as the monitoring program itself. Also with a programmatic Environmental Assessment in progress as well as significant Fire Management Plan updates, these data provide information with a high level of veracity.

Everglades National Park fire effects monitors serve as advisors to the Pine Rockland Working Group, an international, multi-agency effort which has been effective at making recommendations and taking action to protect this imperiled ecosystem. Everglades National Park fire effects personnel have designed photo-monitoring protocols which will be made available for use by working group members in South Florida and the Bahamas.

Fire Ecology staff are key members of the Environmental Assessment team in support of our FMP. Because of their familiarity with fire effects and fire as an ecological process, fire ecology staff has guided fire managers through critical elements of the preparation of this document. In addition Fire Effects monitors have reviewed and made extensive comments on the fire management plan update. Beyond the FMP and EA, fire effects personnel are an important asset to fire operations. They serve, as qualified, on most prescribed fires and wildland fires. With the participation of fire ecology staff, operations have enhanced their ecological effectiveness while maintaining a safe fireline environment.

Table 1. Fire Effects Plot Workload 2004

In the year 2004 Everglades fire effects monitors conducted 94 plot-read visits. The majority of visits are within the summer period when field conditions are notoriously difficult. Also vast road less are that containing plots which require long hikes or helicopter shuttle increasing logistical complexity and safety risks. Considering that it takes a day to complete a single plot, this is a substantial workload.

No new plots were installed at Everglades National Park during the year for a number of reasons including: reduced staffing due to vacant assistant position, significant amount of the lead monitors' time dedicated to FEAT development and environmental assessment, and reduced burning in monitoring types. Also, it was previously decided that, due to the high cost and minimal effectiveness of monitoring with current design in Coastal Prairie monitoring type, existing plots would be maintained but no new ones established.

Additional plots were installed at Canaveral National Seashore in an existing burn unit that was not burned last year and in a new burn unit that is the next scheduled to burn. Previous plots were installed following FMH protocols. This year, however, existing plots were updated and new plots installed with a modified FMH protocol. Please see section on sampling design and field methods for details.

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn	Immed. Post	6 Months Post	Postburn (1-20 yrs)	Total Plots
Everglades	Slash Pine Savanna	FMH forest plot	0	4	4	21	27
Everglades	Short Hydroperiod Prairie	FMH brush plot	0	4	4	15	28
Everglades	Long Hydroperiod Prairie	FMH brush plot	0	0	0	0	11
Everglades	Coastal Prairie	FMH brush plot	0	0	N/A	9	18
Everglades	Melaleuca / Exotic	Modified FMH forest plot	0	0	0	0	1
Canaveral	Slash Pine Flatwoods	Modified FMH forest plot	4	0	0	0	9
Total			4	8	8	45	94

Table 2. Fire Ecology Staffing 2004

The fire ecologist position was vacant from December, 2003, and during most of this year until being filled by Rick Anderson. Also, Steve Newland, assistant lead monitor, vacated his position during the first month of this year. It was filled briefly by Liz Struhar who subsequently accepted another position. The vacancy could be filled by the end of February, 2005. Monitors Ramsey and Ploos continued to fill the subject-to-furlough positions this year. Germaine Ploos was funded to work an extra four pay periods for work on completing the FMP environmental assessment.

Employee	Starting Date	Ending Date	# of Pay Periods	Training and Development
Rick Anderson, Ecologist	8/9/04	12/31/04	10	
Gina Hernandez, Monitor	1/1/04	12/31/04	26	Involvement in FEAT

				development
Steve Newland, Monitor	1/1/04	1/23/04	2	Look up, Look down
Liz Struhar, Monitor	6/1/04	9/3/04	7	
Germaine Ploos, Monitor	2/9/04	12/10/04	22	S-216
Shanna Ramsey, Monitor	2/9/04	7/23/04	18	S-216, Time Management Seminar, Retirement,
	9/20/04	12/10/04		

Table 3. Management Objectives and Monitoring Results 2003

An underlined number of plots indicates that the minimum sample size has been attained for that variable.

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (80% confidence interval)	Objective Achieved?
Slash Pine Savanna	0-40% reduction overstory pine density by one year post burn	Total reduction in density = 1 – 9% (<i>n=26 plots, 13 fires</i>)	YES
	0 – 50% reduction of organic substrate (periphyton) at immediate post burn	Total change in percent cover of periphyton = -25 – 7% (<i>n=22 plots, 12 fires</i>)	YES
	75 – 100% reduction of 1 and 10 hour dead fuel loading by immediate post	Total change in 1 hour fuel load = -26 – 35%, change in 10 hour fuel load = -1 – 44% (<i>n=25 plots-meets min for 10 hour only, 13 fires</i>)	NO for both
Short Hydroperiod Prairie	0 – 50% reduction of organic substrate (periphyton) at immediate post burn	Total change in percent cover of periphyton = -2 – 27% (<i>n=21 plots, 9 fires</i>)	YES?
	50 – 100% reduction of exotics immediate post burn, 10 – 100% 1 year post burn	Percent cover of exotics in pre and post data = 0% (<i>n=21 plots, 10 fires</i>)	Reassess relevance of objective
Coastal Prairie	≥ 50% reduction of exotic species immediately post burn	Total reduction of relative cover of exotics = 3 -- 50% (<i>n=13 plots, 9 fires</i>)	NO
	5-yr postburn stand density: 50-250 trees/ha <80 cm DBH 10-75 trees/ha ≥ 80 cm DBH	stand density = 310-562 trees/ha <80 cm DBH 9-35 trees/ha ≥ 80 cm DBH (<i>n=5 plots, 3 fires</i>)	Uncertain – sample size too small

Ecologist Accomplishments

The fire ecologist, Rick Anderson arrived in early August 2004. Rick had previously worked in 8 different national parks over 20 years of service. Most recently Rick worked for 5 years as Southeastern Fire Management Officer with The Nature Conservancy. With extensive experience

with fire ecology in long-needled pine ecosystems in the US, Belize and the Bahamas, Rick has brought an important set of skills to the Everglades National Park fire program.

Already a member of the Pine Rockland Working Group through his work with The Nature Conservancy, he possessed familiarity with managers and researchers within the group. He now serves on the science committee and has been instrumental in instituting ecosystem-wide monitoring standards.

With 5 years of FMH data available he and Gina Hernandez began data analysis. Limitations in the FMH statistical software were quickly identified and additional expertise was required. Local researchers and statisticians were consulted. Two respected investigators, Mike Ross and Jay Sah of Florida International University, already working with fire and vegetation data, took the raw data and provided a proposal for further analysis. Funding is currently being sought for this project. It is expected that the results of these data will play a significant role in shaping management strategies within the fire program.

The fire ecologist presented “*Fire Effects Monitoring at Everglades National Park*” as part of the Cape Sable Seaside Sparrow Symposium held in Homestead Florida in December 2004. Rick has played a key role in the FPA process along with the rewrite of the park’s Fire Management Plan and Environmental Assessment.

The fire ecologist has established a working relationship with Big Cypress fire effects staff as well as the Resource Management Specialist at Canaveral National Seashore. A review of Big Cypress fire effects monitoring was conducted and there are many possibilities for collaboration between these two NPS units. At Canaveral Seashore refinements were made to prescribed fire objectives and monitoring protocols.

Sampling Design & Field Methods

Everglades National Park:

1. After a review of the products of the photo monitoring associated with FMH plots, the following conclusions were drawn and changes initiated:
 - The topic of digital v. slides was discussed again. The known longevity of slides currently seems more desirable than the still-unknown quality of long-term storage of digital images. However, the need for immediate access to photos in digital form was apparent. Some time ago a high quality slide scanner with batch processor was purchased with the intent to scan a great number of slides in fire management storage. Use of this scanner to digitize fire effects photo monitoring slides will now be a priority.
 - The nine photos taken currently at each forest plot during each visit are excessive and will be reduced to four. These four will be taken back and forth along the length and width center lines of the plot.
 - More effort needs to be exerted to create a more repeatable, professional photo series. There is still much variability in the subject of the photo, placement of photo board, people visible in the photo, etc. A new protocol is being written and tested. It includes some of the following changes:
 - A graduated range pole will be added to the photo.
 - A monopod with a level will be used to keep the camera at a consistent height (breast height, 1.37 meters)
 - The camera will be placed exactly at the plot rebar marking the bottom end of the subject instead of standing some distance behind the rebar and trying to include the rebar in the photo.

- The photo board will be held consistently on one side of the photo and at a set distance from the camera.
 - A concerted effort will be made to include as little as possible of the arm of the person holding the photo board.
2. Dead and down fuel transects will no longer be sampled. It was determined that the data collected along the Brown's transects is just not relevant to this system.
 3. During the spring field season of 2005, the existing FMH plots will be maintained; however, no new plots will be installed until the contracted analysis of existing data is complete and the sampling design has been critiqued and modified.

Canaveral National Seashore:

In November, 2004, Rick Anderson, John Stiner and Gina Hernandez met to discuss fire management and monitoring activities at Canaveral. Upon reviewing the monitoring type description for the Bill's Hill area, it appeared that several of the stated objectives did not reflect the issues that are truly important to resource management. The relevant issues were clarified and documented in a draft revision of the FMH-4 (Attachment 1). Changing some of the objectives then necessitated revising the sampling design. The following are the changes:

1. Oak species or any other hardwoods will not be considered trees. Only pine species (so far only *Pinus elliottii* has been found) will be considered trees.
2. Pole tree sample area will be extended from only quarter 1 to all quarters.
3. Seedling trees (again, pines only) will be sampled in all of quarter 1 and mapped.
4. Only data for seedlings $\geq$ height class 2 will be collected.
5. Only litter depth will be collected along the Brown's transects.
6. Shrub density will no longer be collected.
7. The herbaceous point intercept transect will no longer be collected.
8. The same photo monitoring protocol described in the Everglades section above will be implemented.

Status of Planning Documents

As mentioned above Fire Ecology Staff serve on the FMP rewrite. This rewrite is expected to be completed by late February 2005. The fire effects monitoring plan while largely complete is expected to have significant changes based on the analysis of the 5 years of data collected.

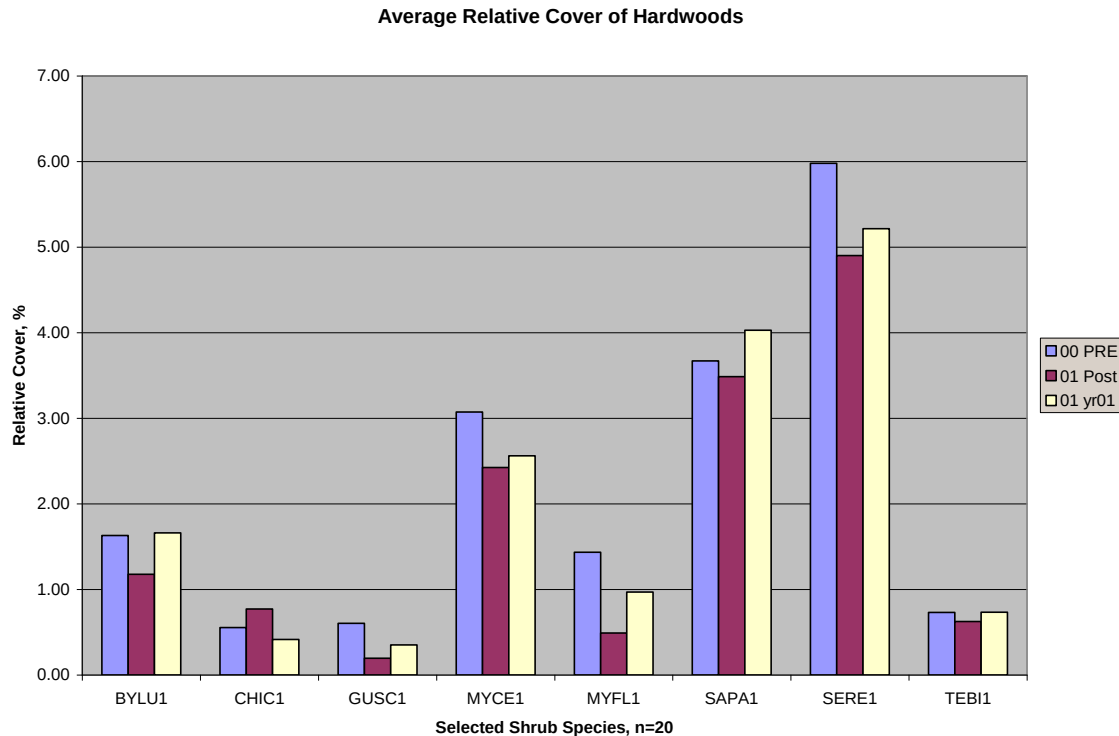
Monitoring Results

Everglades National Park:

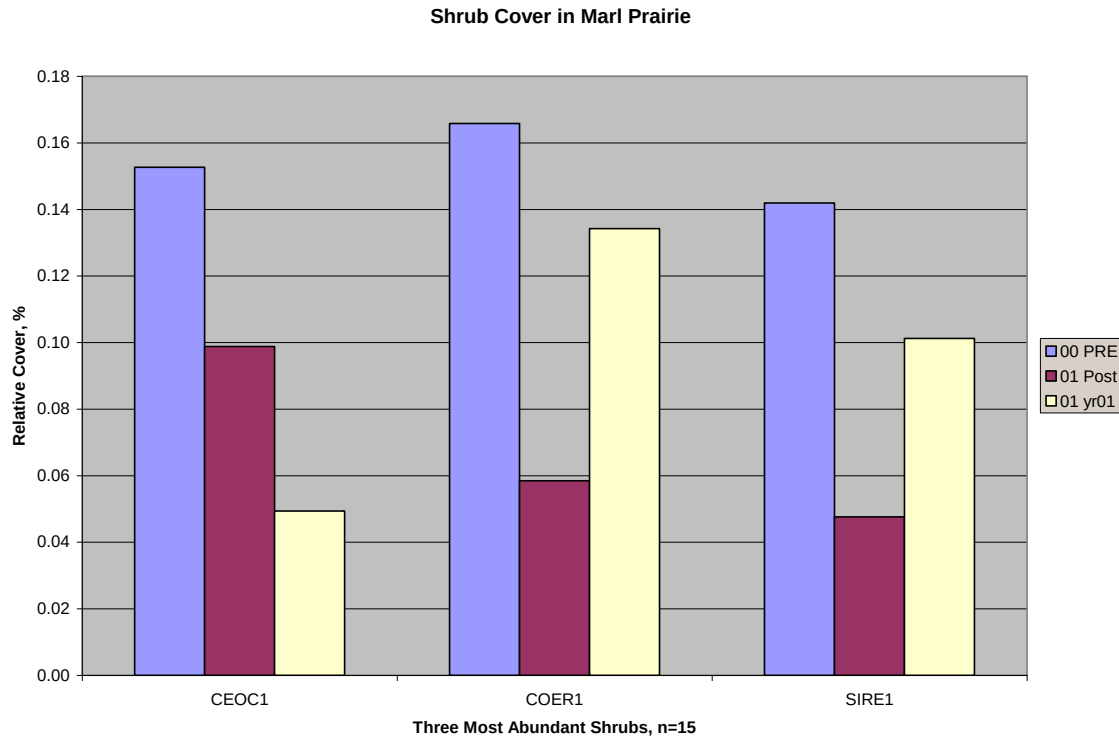
Please note that the following analyses are gross summaries only. The graphs are charts of the means at a given burn status with no indication of confidence. When analyses of cover of herbaceous species lumped by life form was attempted in FMH, erroneous values were consistently produced. FMH, when calculating cover by life form apparently only recognizes a "hit" of that life form if it is the first hit. For that reason, the raw data was summarized in Excel using the most abundant shrub species in each monitoring type. However, confidence intervals for the results as a whole are not determined.

1. Slash Pine Savanna monitoring type:
 - Objective: Reduce relative cover of hardwoods and saw palmetto by 50 – 100% immediately post burn and 0 – 50% one year post burn.
 - The following species, being the most abundant shrub species, were considered:
 - BYLU1 – *Byrsonima lucida* – minimum sample size attained for 01 YR01
 - CHIC1 – *Chrysobalanus icaco*
 - GUSC1 – *Guettarda scabra*
 - MYCE1 – *Myrica cerifera* – minimum sample size attained for 01 YR01
 - MYFL1 – *Myrsine floridana* – minimum sample size attained for 01 YR01

- SAPA1 – *Sabal palmetto* – minimum sample size attained for 01 YR01
- SERE1 – *Serenoa repens* – minimum sample size attained for 01 POST and 01 YR01
- TEBI1 – *Tetrazygia bicolor*



- Conclusion: Total relative cover of these species lumped together is 17.67% 00 PRE, 14.07% 01Post, and 15.93% 01 yr01. Percent change from 00 PRE to 01 Post is -20.39%. Change from 00 PRE to 01 yr01 is -9.84%. This indicates that the first part of the objective likely was not met. The second part of the objective was possibly achieved but surely on the low end of the desired range.
2. Short Hydroperiod monitoring type:
- Objective: Reduce relative cover of hardwoods and saw palmetto by 50 – 100% immediately post burn and 0 – 50% one year post burn.
 - The following species, being the most abundant shrub species, were considered:
 - CEOC1 – *Cephalanthus occidentalis*
 - COER1 – *Conocarpus erectus*
 - SIRE1 – *Sideroxylon reclinatum* var. *austrofloridense*
- Note: Minimum plots required for all of these species are numerous and none has reached adequate sample size.



- Conclusion: The combined relative cover of the most common hardwood shrub species in this monitoring type is less than 0.5%. Shrub cover is so negligible that either the objective should be questioned or the sampling design revised.

Research Projects/Collaboration

With the arrival of the fire ecologist, collaboration has increased significantly. The above mentioned Pine Rockland Working Group and Annual Cape Sable Seaside Sparrow Symposium are two forums where collaboration and research projects have their genesis. New research projects such as fire history using carbon-coring techniques are being evaluated with Florida International University and University of Vermont. Everglades fire ecologist has provided vegetation sampling expertise in the pinelands concerning cavity nesting avian species being conducted by Gary Slater of the Eco Institute. The fire ecologist is also collaborating with Brian Beckage from University of Vermont on spatial extent of fire history within the Everglades landscape. Finally we collaborated with the Southern Everglades Restoration Project to develop fire-hydrology related performance measures for tree islands.

Adaptive Management

Programmatically, fire effects data is currently being used to rewrite the FMP as well as prescribed fire goals and objectives. This is the first time that this data will have been used to make changes in the objectives and strategies of Everglades fire management. Additionally, an assessment of FMH protocols are occurring with adaptations already accomplished.

Attachment 1

FMH-4

MONITORING TYPE DESCRIPTION
SHEET

Park: CANA

Monitoring Type Name: Slash Pine Flatwoods

Monitoring Type Code: F P I E L
1 G 0 7

Prepared By: J. Stiner, D. Wallner, P. Reeberg, J. Hooke,
K. Walsh

Date Described: 12/08/99
Revised by Hooke & Wallner, 5/2000
Revised by Lansing, Stiner,
Hernandez, 11/2001
Revised by Anderson, Stiner,
Hernandez 11/2004

FGDC Association?

Burn Prescription: Season – December through March; Fire return interval - 3 to 5 years;
Relative humidity - 30 to 70%; Temperature - 60 to 100°F; Firing method - head fire, spot
ignition; KBDI < 650; Days since last wetting rain - 1 to 5; Soil moisture (hammock) > 82%;
Mid-flame wind speed - 0 to 15 mph.

Habitat Management Goals: Restore, maintain, and preserve a fire-dependant
ecosystem. Increase populations of eagles, scrub jays, gopher tortoises, and indigo
snakes.

Fire Management Objectives: How should we change these?

- Limit mortality of *Pinus elliottii* and *P. palustris* overstory trees to less than 30% as measured two years post burn.
- Reduce density of pole-size hardwoods by 50-100% immediately post burn.
- Reduce percent cover of saw palmetto (*Serenoa repens*) by 50-100% immediately post burn.
- Increase relative cover of non-woody species by 50-70% as measured 2 years from the second application of fire.
- Reduce total litter, duff and downed woody fuel loading by at least 60% immediately post burn.
- Promote recruitment of pole sized PIEL and PIPA
- Reduce height of hardwoods and shrubs
- Increase cover of bare ground/open space

Fire Monitoring Objectives: Monitor all objective variables in order to be 80% confident of detecting the following amounts of change, with the acceptance of a 20% chance of saying a change took place when it did not. Minimum Detectable Change: Density and percent cover of pole and seedling hardwoods—80%, duff depth—30%, density of overstory longleaf and slash pine—50%, and % cover of herbaceous species—40%.

Objective Variables:, overstory pole and seedling density of *Pinus elliottii* and *P. palustris*, litter depth

Physical Description: Relatively flat upland sites ranging from 1.5 to 15' in elevation. Soil and/or organic layer depth is minimal. Soils characterized as:

- Daytona-Poola-Astatula association, which are moderately well-drained, grayish, sandy soils with organic stained subsoil and excessively drained grayish and brownish soils interspersed with areas of poorly drained soils
- Myakka-Smyrna-Immokalee soil association, which are nearly level, poorly drained, sandy throughout to a depth of 40", and loamy below

Biological Description: Overstory of *Pinus elliottii* with crown closure between 0% and 50%. Understory cover consists of saw palmetto, scrub oak species (*Quercus myrtifolia*, *Q. geminata*, *Q. chapmanii*), rusty Lyonia (*Lyonia ferruginosa*), gallberry (*Ilex glabra*); saw palmetto may dominate the understory on wetter sites. The herbaceous understory includes wire grass (*Aristida* spp.), and beard grass (*Andropogon* spp.) (0-20%).

Rejection Criteria: Exclude transverse glades, hardwood hammocks, and dense oak hammocks, old control lines, anomalous vegetation patches (e.g., blowout), barren areas (>50% of the plot). Avoid areas within 30 meters of: developed areas, human created clearings, physical barriers such as roads or trails. Avoid areas within 50 meters of monitoring or other vegetation types, especially areas dominated by hardwoods, i.e., hammocks. Exclude plots farther than 200 meters from road or trail access.

Notes:

A modified FMH sampling design will be used as of November, 2004, in Bill's Hill monitoring unit. The 50 meter point intercept, shrub density belt, duff depth and dead woody fuel sampling will be eliminated. Overstory trees will continue to be sampled, tagged and mapped in the entire plot. The sample area for pole trees will be expanded to the entire plot, also tagged and mapped. Seedling trees of height class two and taller will be sampled and mapped in the whole area of quarter one. The only species to be sampled as a tree will be PIEL or PIPA if encountered. All oaks will be considered shrubs and density and height will be captured by using a graduated range pole in photo points (see new photo monitoring protocol – date). Only litter depth will continue to be sampled on the Browns transects.

PLOT PROTOCOLS

GENERAL PROTOCOLS		YES	NO		YES	NO
Preburn	Control Plots/Opt.		X	Herb Height/Rec.		X
	Herbaceous Density/Opt.		X	Abbreviated Tags	X	
	OP/Origin Buried		X	Crown Intercept/Opt.		X
	Voucher Specimens/Rec.	X		Herb. Fuel Load/Opt.		X

	Stereo Photography/Opt.		X	Brush Individuals/Rec.		X
	Belt Transect Width: 0.5, 1, 2, 3 meters Pilot Sampling #2			Stakes Installed: All		
	Herbaceous Data Collected at: Do not collect					
Burn	Duff Moisture/Rec.	X		Flame Zone Depth/Rec.	X	
Postburn	Herbaceous Data/Opt.		X	Herb. Fuel Load/Opt.		X
	100 Pt. Burn Severity/Opt.		X	7 Pt. Burn Severity	X	
	Brush Density		X			

FOREST PLOT PROTOCOLS		YE S	NO		YE S	NO
Overstory	Area Sampled: 50 x 20m			Quarters Sampled: Q1-Q4		
	Tree Damage/Rec.	X		Crown Position/Rec.	X	
	Dead Tree Damage/Opt.		X	Dead Crown Positions/Opt.	X	
	Record DBH year 1		X			
Pole-size	Area Sampled: 50 X 20 m			Quarters Sampled: Q1-Q4		
	Height/Rec.	X		Poles Tagged/Rec.	X	
	Record DBH year 1		X			
Seedling	Area Sampled: 25X 10			Quarters Sampled: Q1		
	Height/Rec.	X		Seedlings Mapped/Opt.		X
	Record Dead Seedlings		X	Record only seedlings ht. class 2 and taller		
Fuel Load	Sampling Plane Lengths: 6, 6, 12, 50, 50					
Postburn	Char Height/Rec.	X		Mortality/Rec.	X	
	Collect Burn Severity: on Fuels Transects					

Rec. = Recommended Opt. = Optional