



**National Park Service
Fire Ecology Annual Report
Calendar Year 2004
Gulf Islands National Seashore**

Introduction

Monitoring of fire effects by the National Park Service began at Gulf Islands National Seashore in 2000, with the establishment of the first permanent vegetative monitoring plots. During 2004, the NATR Fire Effects Monitoring (FEM) crew worked in 12 different monitoring plots and 5 burn units. This report will summarize the fire effects monitoring data available through 2004. The purpose of this report is to inform fire and resource management personnel of the trends associated with prescribed fire, thereby facilitating the first steps of adaptive management.

The FEM program is undergoing transition from the current DOS-based data management program Fire Monitoring Handbook (FMH) to a Microsoft Access-based data management program referred to as the Fire Ecology Assessment Tool (FEAT). FEAT will allow for increased flexibility in data handling and analysis. Perhaps most importantly, FEAT will allow for the easy export of data into readily-available statistical software packages such as Minitab. The transition to FEAT is expected to be completed by September, 2005. Once the transition is complete, data will be analyzed using inferential statistics. Data presented here is analyzed descriptively.

The prescribed burning program at Gulf Islands has been inactive during 2004-2005. Past fire suppression activities are largely responsible for the current condition of ecosystems within GUI. Whereas preliminary results presented here suggest that prescribed fire is facilitating ecological objectives, continued use of fire is critical if such trends are to continue.

Fire Effects Monitoring Methods

The fire effects monitoring that occurs at GUIS is adapted from the NPS Fire Monitoring Handbook protocol (see http://www.nps.gov/fire/fire/fir_eco_science_monitoring_FMH.html). In general, the monitoring consists of installation of permanent vegetation plots in representative monitoring types¹. Currently, there are 27 plots at GUIS in 3 different monitoring types (Table 1). The form referred to as the FMH-4 describes the characteristics and objectives of prescribed fire in the particular monitoring type. The FMH-4s for each monitoring type are given in Appendix 1. The FMH-4s are fluid documents, and are meant to be refined as more information is gained regarding appropriate burn prescriptions, seasons, and intervals. Input from the research community, resource management, fire managers, and local experts is also of the utmost importance in refining the FMH-4s and the burning program.

The general goal is to install 10 plots in each monitoring type, and then to reevaluate the need for additional plots. Ideally there will be monitoring plots in each burn unit, but limitations of time and money can prevent installations in every unit (Table 2).

Table 1. Burn units at and associated plot information (through 2004).

Burn Unit	Number of Plots	Year Plots Established	Year of Burn(s)
NLO-5	7	2000, 2001	2000, 2001, 2003
NLO-6	3	2001	2002
NLO-7A	3	2002	2003
NLO-7B	6	2000, 2002	2000 (4 plots unburned)
NLO-8	3 (partial)	2002	unburned
NLO-9	3	2000	2000
NLO-10	1	2001	unburned
Davis Bayou	1	2001	2002
Total	27		

¹ A monitoring type is defined as a major fuel-vegetation complex or vegetation association subject to a particular burn prescription.

Table 2. Plot Monitoring and Install Schedule for GUIS.

Monitoring Type	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL	FPICL
Plot #	1	2	3	4	5	6	7	8	9	10	11
Burn Unit	NLO 5	NLO 5	NLO 5	NLO 9	NLO 7B	NLO 7B	NLO 6	NLO 7B	NLO 7B	NLO 7B	NLO 7B
Install Date	January-00	January-00	January-00	January-00	January-00	January-00	April-01	May-02	May-02	May-02	May-02
Burn Status	unburned	1/2 Burned March-02	unburned	February-00	February-00	February-00	March-02	unburned	unburned	unburned	unburned
00Pre	October-02	April-01	October-02	January-00	January-00	January-00	April-01	April-03	April-03	October-02	October-02
01Post	Waiting for word on burning	May-02	Waiting for word on burning	April-00	April-00	April-00	May-02	Waiting for word on burning	Waiting for word on burning	Waiting for word on burning	Waiting for word on burning
01Yr01		October 2003		February-01	February-01	February-01	October 2003				
01Yr02		December 2004		February-02	February-02	February-02	December 2004				
01Yr03											
01Yr04											
01yr05		To Be Done April 2007		Did Not Complete See (1)	Done February 24th 2005	Done February 24th 2005	To Be Done April 2007				
01yr10				To Be Done February 2010	To Be Done February 2010	To Be Done February 2010					

***Note: Some plots were read at the incorrect date for herbaceous analysis, i.e. post read date does not coincide with 00-Pre Read date.**

(1) PICL 4: Did not complete 01yr05 read due to safety and time constraints.

GUIS hit by Hurricane Ivan in Mid-September 2004.

Table 2, continued. Plot Monitoring and Install Schedule for GUIS.

Monitoring Type	FPICL	FPICL	FPICL	FPIPA	FPIPA	FPIPA	FPIPA	FPIPA	FPIPA	FPIPA	FPIPA
Plot #	12	13	14	1	2	3	4	5	6	7	8
Burn Unit	NLO 8	NLO 8	NLO 8	NLO 5	NLO 5	NLO 9	NLO 9	NLO 5	NLO 6	NLO 6	NLO 10
Install Date	May-02	May-02	May-02	January-00	January-00	January-00	January-00	January-00	April-01	April-01	April-01
Burn Status	Not Likely To Be Burned	Not Likely To Be Burned	Not Likely To Be Burned	2002: 1/2 burned March 2003	March-03	Mar-00	Feb-00	March-03	Mar-02	Mar-02	unburned
00Pre	Hold Off on Completing Install	Hold Off on Completing Install	Hold Off on Completing Install	April-01	October-02	January-00	January-00	October-02	April-01	April-01	October-02
01Post				March-02	April-03	April-00	April-00	April-03	May-02	May-02	Waiting for Burn
01Yr01				N/A	March 2004	January-01	February-01	March 2004	September 2003 (Incorrect)	September 2003	
01Yr02				N/A	To Be Done October 2005	February-02	February-02	To Be Done October 2005	December 2004	December 2004	
01yr05						Done February 23rd 2005	Done February 26th 2005		To Be Done April 2007	To Be Done April 2007	
01yr10						To Be Done February 2010	To Be Done February 2010				
02Post				April-03							
02yr01				March-04							
02yr02				To Be Done April 2005							

*Denotes that only the 01 yr 05 read herbaceous data will coincide with the 00 Pre Read season.

Table 2, continued. Plot Monitoring and Install Schedule for GUIs.

Monitoring Type	FPIPA	FPIPA	FPIPA	FPIPA	FSAAL
Plot #	9	10	11	12	1
Burn Unit	NLO 5	NLO 7A	NLO 7A	NLO 7A	Davis Bayou
Install Date	April-01	May-02	May-02	October-02	April-01
Burn Status	March-03	March-03	March-03	March-03	March-02
00Pre	April-01	May-02	May-02	October-02	April-01
01Post	No 01 Post Taken	April-03	April-03	April-03	March-02
01Yr01	March-04	March-04	April-04	March 2004	October 2003
01Yr02	To Be Done April 2005	To Be Done April 2005	To Be Done April 2005	To Be Done October 2005	December 2004 (Incorrect Read Date
01Yr03					To Be Done April 2005
01Yr04					
01yr05					
02Post					
02yr01					
02yr02					

Gulf Islands National Seashore

Results

Results for objective variables are given in Table 3. All results shown are 80% confidence intervals of the mean unless otherwise noted. Fuel reduction objectives/results are mean percent reduction from preburn to immediate postburn, unless otherwise stated. An underlined number of plots denote that minimum sample sizes have been achieved. Figures associated with each objective variable follow Table 3.²

Table 3. Management Objectives and Monitoring Results through 2004.

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (80% confidence interval)	Objective Achieved? (minimum plots achieved/needed)
GUIS³ FPICL1D07 Sand pine-scrub oak forest <i>Pinups clausa</i>	20-40% litter and duff reduction ⁴ immediate postburn (Year 2 data presented as no 01 Post data is available)	Litter/duff increase of approximately 10% per year ⁵ . (n=5, 1 fire) Figure 1	No- but minimum sample size not met (5/15)
	40-60% reduction of sand pine poles by 2 nd year after 3 rd burn	Sand pine pole density reduction =11% by Year 2) (n=5, 1 fire) Figure 2	No- but minimum sample size not met (5/13)
	50-90% hardwood pole reduction by Year 1	Pole density reduction = 25% by Year 2). (n=5, 1 fire) Figure 3	No- but minimum sample size not met (5/13)
	20-40% increase in herbaceous cover by 2 nd year after 3 rd burn	Increase in relative cover = 23% by Year 2 (n=3, 1 Fire) Figure 4	No-but but minimum sample size not met and 3 burns not achieved

² For most variables in the three monitoring types, minimum sample sizes have not yet been met. Therefore, results presented here reflect trends in a desirable direction, but are not conclusive.

³ No new installations were performed at GUIS due to uncertainty regarding burning, therefore many minimum plot calculations are the same as last year.

⁴ Year 1 and Year 2 postburn fuels data was averaged across plot data taken 12-19 months postburn (for Year 1) and 24-33 months postburn (for Year 2; see GUIS monitoring schedule for details).

⁵ Area was hit by Hurricane Ivan in 9/04; data from two post-hurricane plots included here.

Gulf Islands National Seashore

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (80% confidence interval)	Objective Achieved? (minimum plots achieved/needed)
GUIS FPIPA1D07 Longleaf-slash pine forest <i>Pinus palustris</i>	20-40% litter and duff reduction immediate postburn (Year 1 data presented)	Litter and duff reduction = 37% by Year 1 (n=5, 1 fire) Figure 5	Yes- but minimum sample size not met (7/24 with R=25)
	50-90% hardwood pole reduction by Year 1	Hardwood pole density reduction =56% by Year 1 (n=9, 1 fire) Figure 6	Yes, but minimum sample size not met (9/19)
	20-40% increase of herbaceous cover by 2 nd year after 3 rd burn	Cover change =-21% by Year 1 (n=10, 1fire) Figure 7	No- but minimum sample size not met (10/34 with R=25)
GUIS FSAAL1D07 Pitcher plant forest <i>Sarracenia alata</i>	20-40% decrease in litter and duff loading immediately postburn	Average litter/duff reduction = 49% ⁶ (n=1, 1 fire) Figure 8	Yes, but minimum sample size not met
	40-90% pole density reduction by Year 1	No change (n=1, 1 fire)	No- but minimum sample size not met ⁷
	20-40% increase of herbaceous cover by 2 nd year after 3 rd burn	Herbaceous cover change was -5% ⁸ by Year 1 (n=1, 1 fire) Figure 9	No- but minimum sample size and required number of fires not met

⁶ Result is same as last year because no additional plots were installed.

⁷ Need additional plot before minimum sample size can be estimated.

⁸ Season of postburn read for the SAAL plot did not coincide with preburn read. Plot will be reevaluated in Spring 2005.

Gulf Islands National Seashore

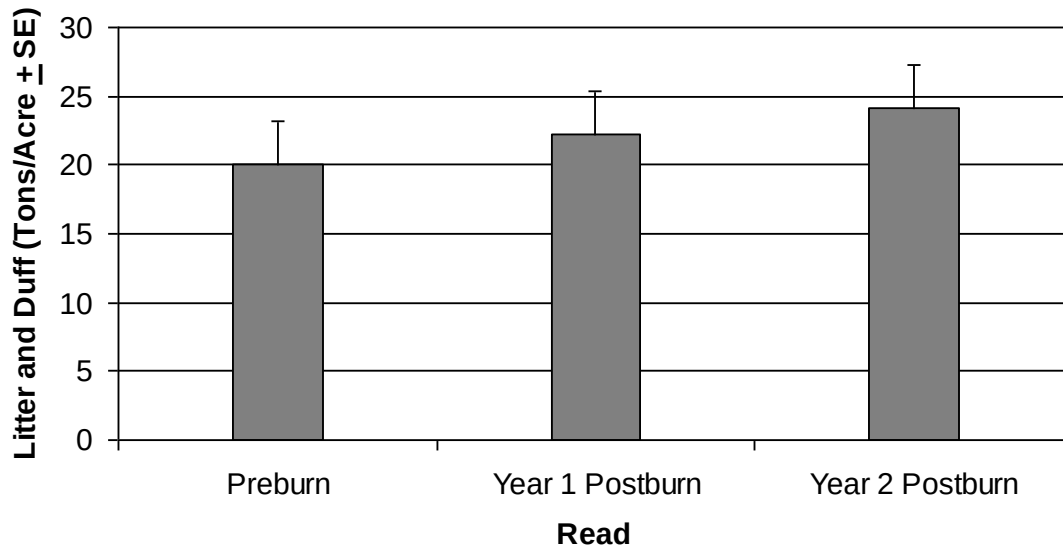


Figure 1. Average litter and duff loading for 5 *Pinus clausa* plots at GUIs ($\pm$ average standard error). Year 1 data was taken from 12-19 months postburn, while Year 2 data was taken 24-33 months postburn. Objective for litter and duff reduction is 20%; observed change was an increase of 20% by Year 2.

Gulf Islands National Seashore

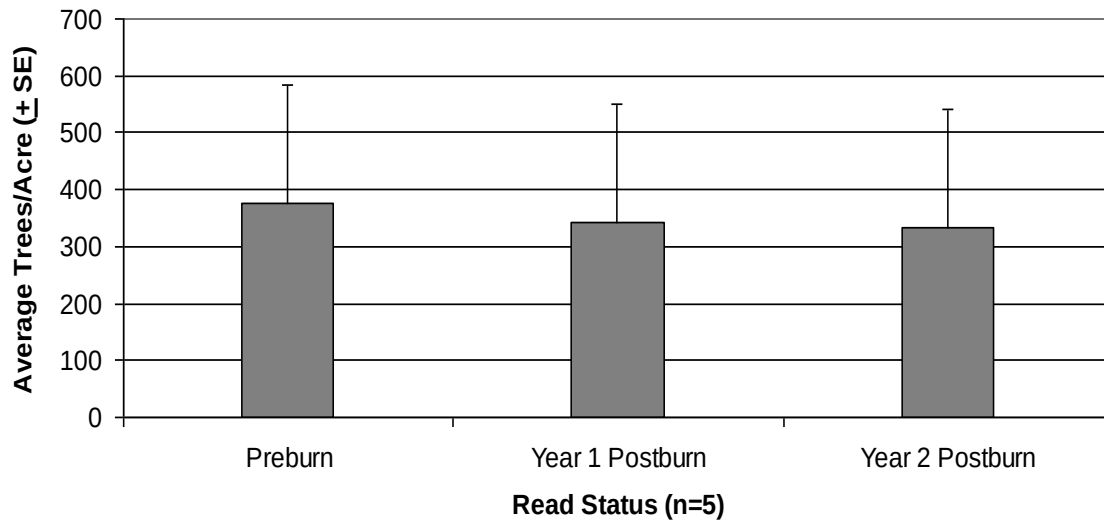


Figure 2. Average density of *Pinus clausa* trees per acre for 5 plots at GUIS ($\pm$ average standard error). Year 1 data was taken from 12-19 months postburn, while Year 2 data was taken 24-33 months postburn. Objective for pole reduction is 40%; actual reduction was approximately 11% by Year 2.

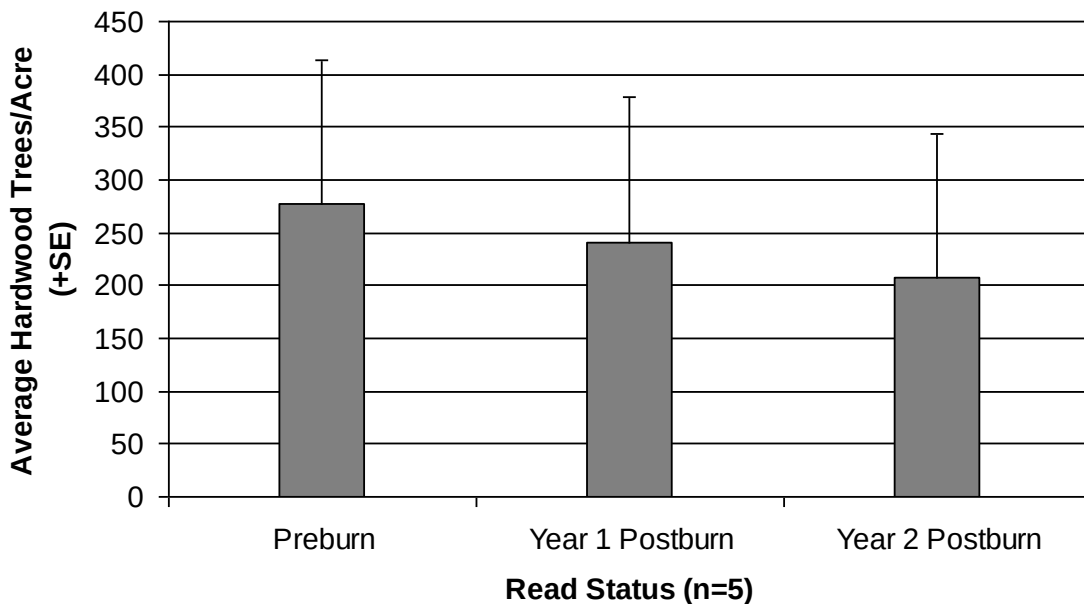


Figure 3. Average density of hardwood trees per acre for 5 *Pinus clausa* plots at GUIS ($\pm$ average standard error). Year 1 data was taken from 12-19 months postburn, while Year 2 data was taken 24-33 months postburn. Objective for pole reduction is 50%; actual reduction was approximately 25% by Year 2.

Gulf Islands National Seashore

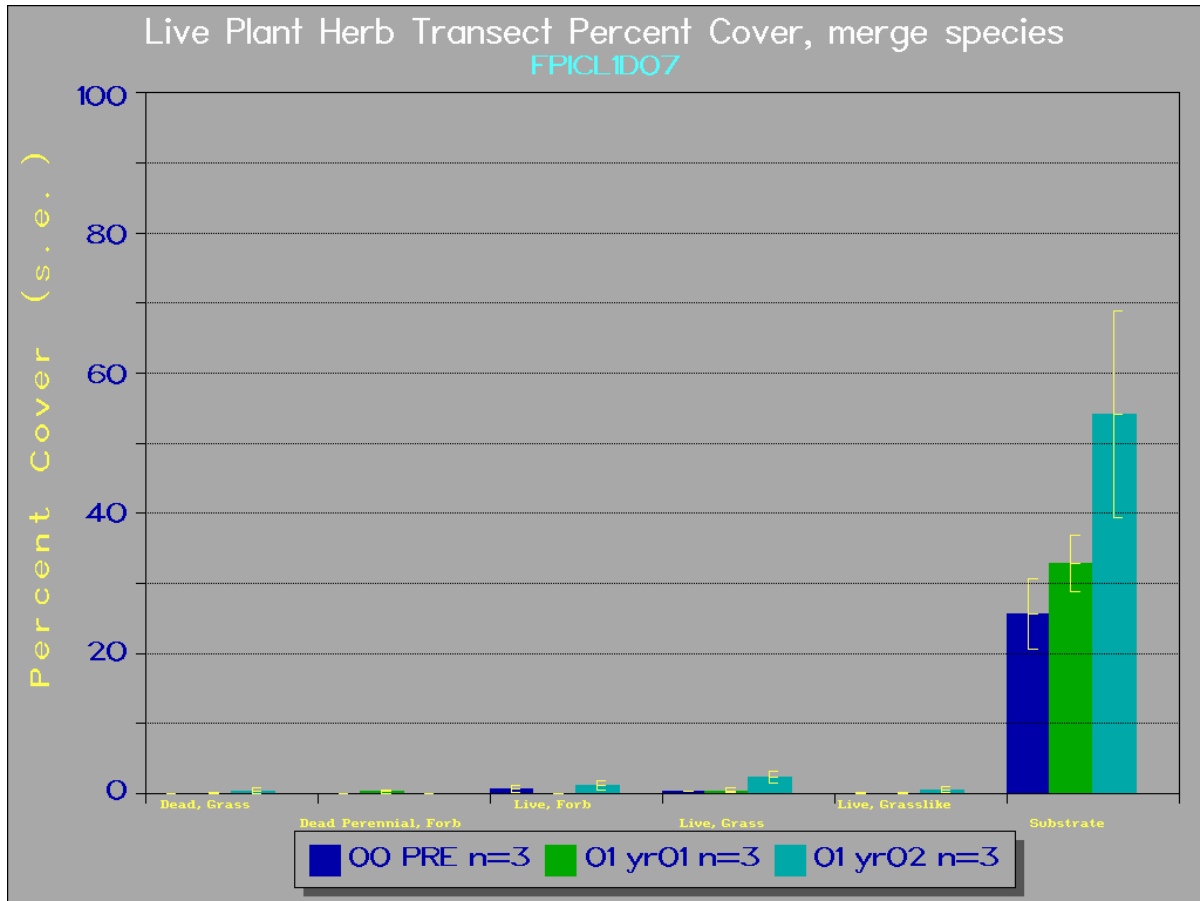


Figure 4. Average percent cover of herbaceous species (lumped by lifeform) for 3 *Pinus clausa* plots at GUIs ($\pm$ average standard error). Objective for herbaceous cover is a 20% increase; actual increase was approximately 23% by Year 2.

Gulf Islands National Seashore

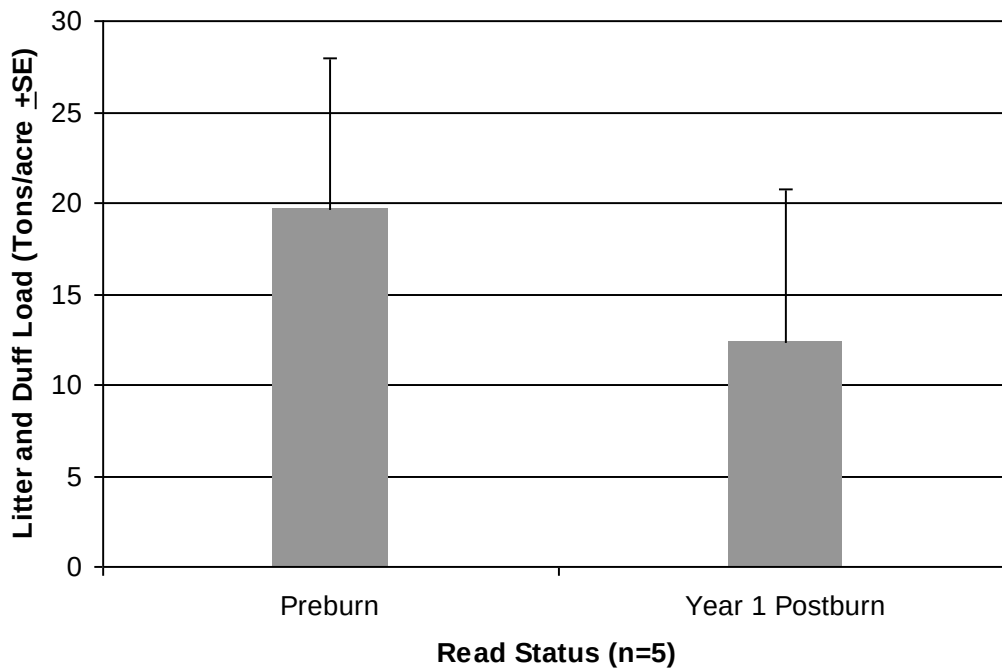


Figure 5. Average litter and duff load for 5 *Pinus palustris* plots at GUIs ($\pm$ average standard error). Year 1 data was taken from 12-18 months postburn. Objective for litter and duff reduction is 20-40%; actual reduction was approximately 37% by Year

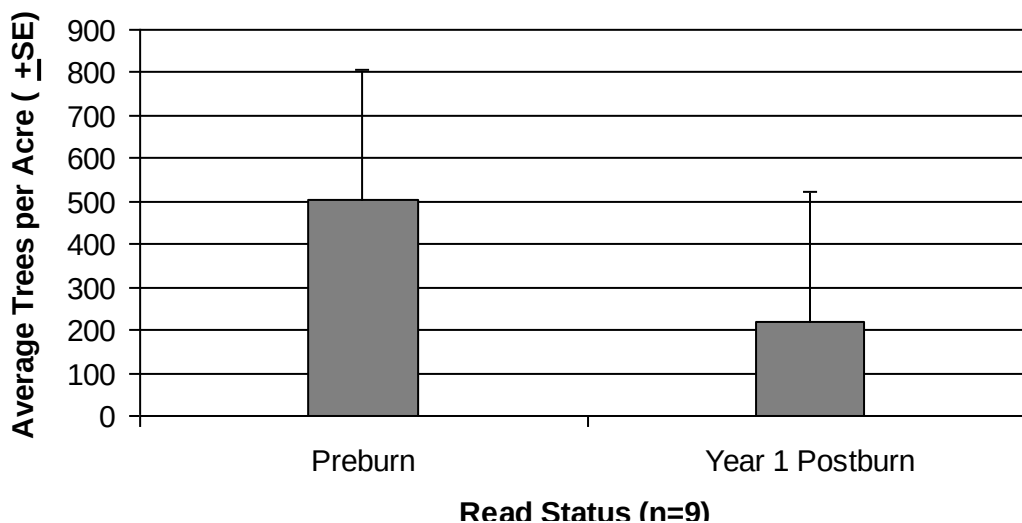


Figure 6. Average density of hardwood trees per acre for 9 *Pinus palustris* plots at GUIs ($\pm$ average standard error). Year 1 data was taken from 12-18 months postburn. Objective for pole reduction is 50%; actual reduction was approximately 56% by Year 1.

Gulf Islands National Seashore

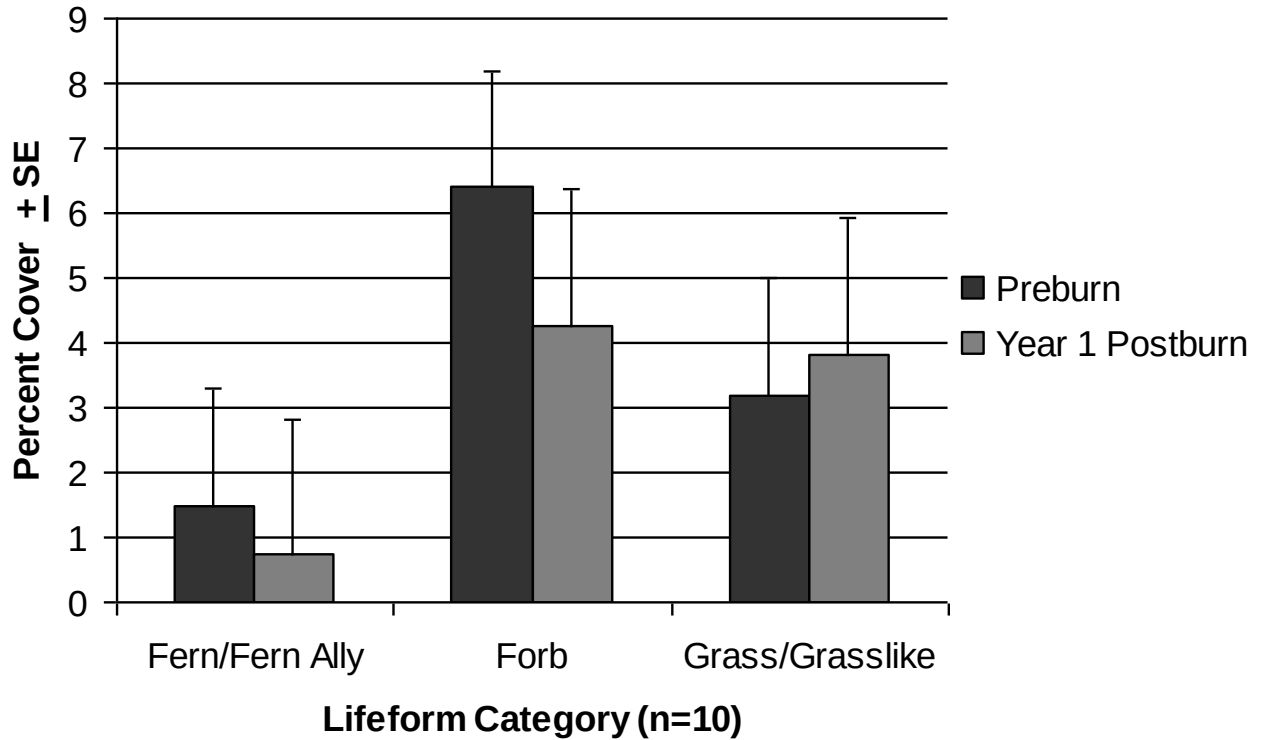


Figure 7. Mean percent cover $\pm$ SE of herbaceous species (lumped by lifeform) on 10 *Pinus palustris* plots at GUIs. Data was taken from 12-18 months postburn. Objective for herbaceous cover increase is 20%; observed change for ferns, forbs and grasses was a 21% decrease in relative cover. Note increase in cover of grass/grasslike species.

Gulf Islands National Seashore

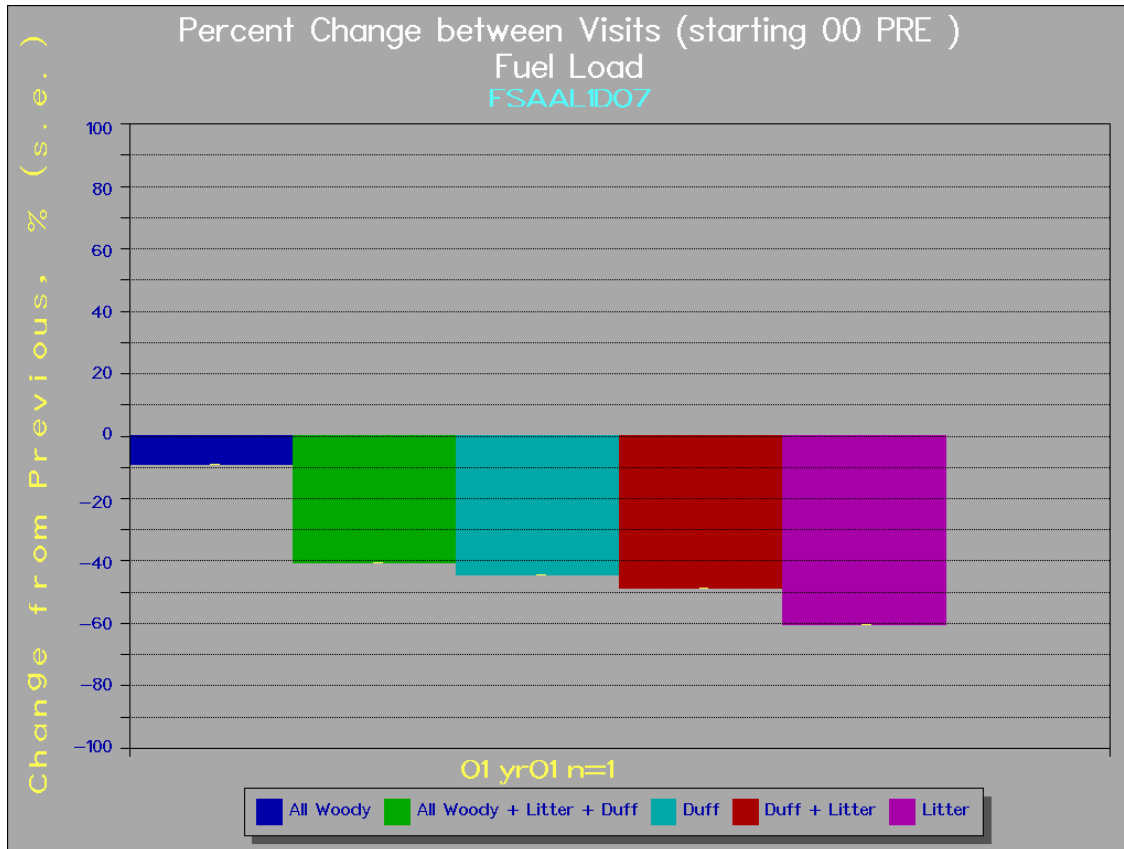


Figure 8. Total fuel load reduction on one *Sarracenia alata* plot at GUIs. Average reduction for litter and duff was 49%, and the minimum reduction objective was 20%. Standard error was not calculated because data from only one plot is represented.

Gulf Islands National Seashore

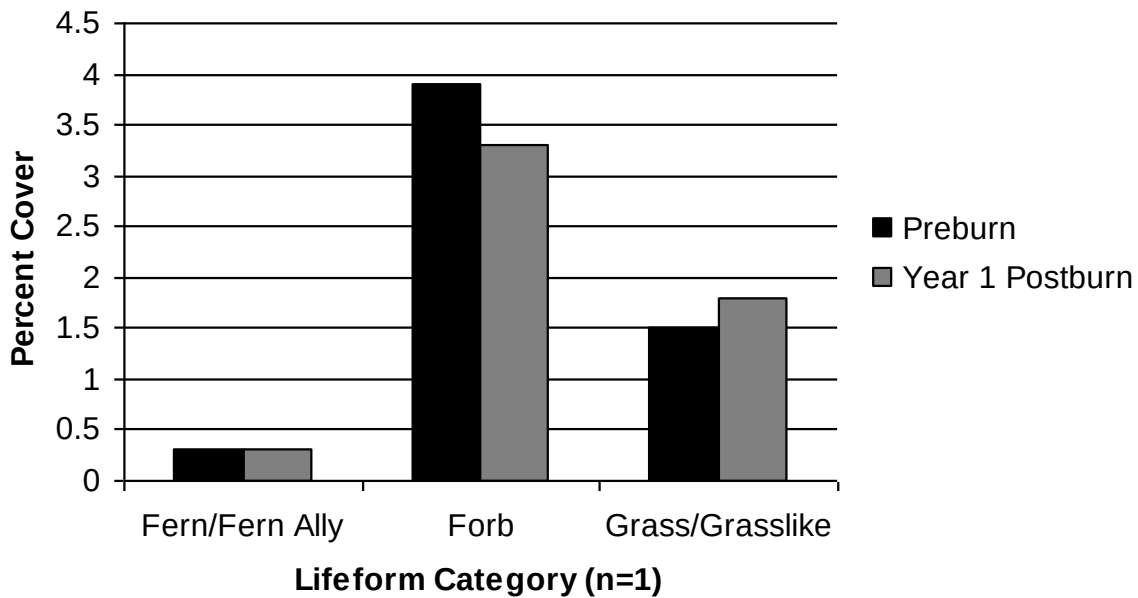


Figure 9. Percent cover + SE of herbaceous species (lumped by lifeform) on 1 *Sarracenia alata* plot at GUIs. Data was taken from 19 months postburn. Objective for herbaceous cover increase is 20%; observed change for ferns, forbs and grasses was a 5% decrease; however, season of postburn read did not coincide with season of preburn read. Note increase for grass/grasslike species percent cover. Standard error was not calculated because data from only one plot is represented.

Gulf Islands National Seashore

Discussion

Sand pine (*Pinus clausa*) Monitoring Type

The objective for litter and duff reduction in the sand pine monitoring type is 20-40% immediately postburn. Data from 5 plots evaluated at two years postburn reflect an increase of 10% per year (Figure 1). This result is not unexpected for two reasons. First, the area containing some of the monitoring plots was affected by Hurricane Ivan in September, 2004. Secondly, the objective was intended for evaluation immediately postburn, not at 2 years postburn⁹. Since the data presented is from two years after the fire, it is not surprising that a decrease in fuel load was not evident.

Density of pole-sized sand pine and hardwood trees reflect a decreasing trend with a reduction of 11% and 25% by two years postburn, respectively (Figures 2 and 3). However, these reductions did not achieve the minimum desired reductions of 40% and 50%. Relative cover of herbaceous species, grouped by category, increased by 23% (Figure 4) and was therefore within the objective range of 20-40%¹⁰. Cover of herbaceous species in this monitoring type is generally sparse, with less than 5% cover.

Longleaf pine (*Pinus palustris*) Monitoring Type

In the longleaf pine monitoring type, litter and duff was reduced by 37% by one year postburn, thereby meeting the objective of a 20-40% reduction (Figure 5). Since regeneration of longleaf is dependent inhibited by deep litter and duff, this trend toward reduction is especially notable. Hardwood pole density decreased by 56%, thereby meeting the minimum objective reduction of 50% (Figure 6).

Herbaceous cover data in the longleaf pine monitoring is relatively variable, as indicated by a minimum sample size of 34 for this variable (Table 3). Both fern/fern allies and forb cover appeared to decrease by 1-2%, while grass and grasslike species cover increased by approximately 2%. These values translated into 21% average decrease in relative cover of all 3 herbaceous species categories (Figure 7). However, the requisite number of fires has not yet occurred (1 of 3) and the minimum sample size has not been achieved. Therefore, as with the other results presented here, no definite conclusions can be made at this point. Nevertheless, further examination into the observed decreasing trend of forb and fern cover is necessary and ongoing.

⁹ Data from immediate postburn read not available.

¹⁰ Objective for herbaceous cover is intended for analysis after 3 burns.

Gulf Islands National Seashore

Yellow trumpet pitcher plant (*Sarracenia alata*) Monitoring Type

Currently there is one pitcher plant monitoring plot installed in Davis Bayou. A trend toward fuel reduction was also observed in the pitcher plant monitoring type (49% reduction in litter and duff immediately postburn, Figure 8). There was no change in pole density by one year postfire. Herbaceous cover of fern/fern allies remained constant, while forb cover decreased and grass/grasslike species cover increased (n=1 plot, Figure 9).

The Davis Bayou area was hit by Hurricane Katrina in August of 2005. The post-hurricane status of the plot will be evaluated in September, 2005 and submitted to GUIS personnel.

Conclusion

Preliminary analysis for all three monitoring types at GUIS suggests that fire is associated with beneficial effects such as fuel load reduction. The continuation of prescribed fire is critical for the restoration and maintenance of the unique ecosystems at GUIS. Continued use of prescribed fire will allow for expansion of the dataset, which in turn will allow for more definitive conclusions about the effects of fire.

Status of Planning Documents

As stated in RM-18 Chapter 11, fire monitoring plans are required for all park units using prescribed fire or wildland fire use. These plans are necessary in order to ensure that treatments are effective and that management goals and objectives are met. The fire monitoring plan is an appendix to the Fire Management Plan, which is tiered to both the Resource Management Plan and the General Management Plan. Currently, the fire management plan is being updated and, a fire monitoring plan for GUIS is scheduled for completion during FY06 under contract with Sue Grace of the USFWS.

Appendix 1

Monitoring Type Descriptions

Note: Monitoring Type Descriptions are in review. Suggestions for improvement are welcomed. Final descriptions will be available in the GUIS Fire Monitoring Plan. A draft of the GUIS Fire Monitoring Plan is planned for Summer 2006. Areas in red need particular attention.

Gulf Islands National Seashore

Pinus clausa Monitoring Type

FMH-4

Monitoring Type Code: F P I C L 1 D 0 7

Park: GUIS

Date Described: 1/ 13 /2001

Monitoring Type Name: Sand Pine-Scrub Oak

Preparers: M. Nicholas, D. Wallner, J. Hooke, and P. Reeberg (1999). Reeberg, Lansing, Nicholas (2001). McInnis, Ruth (2004).

Burn Prescription (Restoration): Temperature: 40 - 85°F; relative humidity 30 -100%; wind direction: SW, S, & SE (burn blocks north of Hwy. 98) and NW, N & NE (burn blocks south of Hwy. 98); wind speed 2-6 mph; fuel moisture: 1-hour 4 - 12%, 10-hour 6 - 13%; rate of spread: 1 - 80 ch/hr; flame length 0.5 - 25 ft. Limit mortality in the 1-10 acre oak-magnolia-hickory hammocks. Burns will be conducted on a 3-10 year frequency. Restoration burns to be accomplished during winter months, maintenance burns during spring months using a combination of strip head and flanking fire ignition patterns. Pretreatment may include occasional access lines within the area mowed by Posi-Trac plow.

Burn Prescription (Maintenance): Add from burn plans.

Management Objectives (Restoration): Decrease density of pole hardwoods by 50–90% 1 year post burn. Decrease litter and duff loading by 20-40% immediate postburn. Increase herbaceous component of understory by 20-40% as measured 2 years after the third burn. Decrease density of pole-size sand pine by 40–60% as measured 2 years after the third burn.

Trigger Point for assessing the success of longleaf recruitment: If an increase of longleaf pine to 5 - 20/ha is not seen nine years after the initial treatment, the park will consider planting longleaf pine.

Management Objectives (Maintenance): To be developed

Monitoring Objectives: Monitor all objective variables in order to be 80% confident of detecting the following amounts of change, with acceptance of a 20% chance of saying a change took place when it did not. Density of pole hardwoods—80%, litter and duff loading – 30%, pole-size sand pine—50%, and % cover of herbaceous species—40%.

Objective Variables: Density of pole hardwoods and pole sand pine, litter and duff loading, and % cover of herbaceous species (grasses, sedges, and forbs).

Physical Description: This type occurs on sand ridges along former shorelines. The area is relatively flat to gently sloping ranging from 0—20 feet in elevation. Ortega soils (moderately well drained, dark gray at the surface, and yellow to brown beneath) are located on high ridges. Kureb soils (excessively drained, very droughty with a salt and pepper to brilliant white appearance on top, with yellow to pale brown below) are located at higher elevations.

Biological Description: Closed to open canopy forest dominated by oaks (*Quercus* spp.) and sand pine (*Pinus clausa*). The sand pine overstory (trees >15 cm) may be sparse, absent, or have nearly 100% crown closure. The midstory can have dense thickets of sand live (*Q. geminata*), Chapman (*Q. chapmanii*), laurel (*Q. laurifolia*), and turkey (*Q. laevis*) oaks (10-100% cover). Shrubs include myrtle oak (*Q. myrtifolia*), rosemary (*Ceratiola ericoides*), sparkleberry (*Vaccinium arboreum*), saw palmetto (*Serenoa repens*) and *Ilex* spp. (20-90% cover). Ground cover is often sparse (0—20% cover) and

Gulf Islands National Seashore

Pinus clausa Monitoring Type

consists mostly of grasses (*Andropogon*, *Panicum*, etc.), sedges (*Rhynchospora* spp.), goldenrod (*Solidago* spp.), gopher apple (*Licania michauxii*), and lichens.

Rejection Criteria: Exclude old control lines, anomalous vegetation patches (e.g., blowout), barren areas (>50% of the plot); and areas within 20 meters of: developed areas, physical barriers such as roads or trails, boundaries between monitoring or other vegetation types, and oak-magnolia-hickory hammocks.

Notes: Monitoring schedule: Preburn, immediate postburn, year one, year two, and year five.

GENERAL PROTOCOLS		Yes/No
Preburn		
Control Plots	No	
0P/Origin Buried	No	
Voucher Specimens	Yes	
Abbreviated Tags	Yes	
Herb Fuel Load	No	
Brush Fuel Load	No	
Stakes (REBAR) Installed: 17		
Burn		
Duff Moisture	Yes	
Flame Depth	No	
FOREST PLOT PROTOCOLS		
Preburn Read (00 Pre)		
Overstory		
Trees Tagged	Yes	Area Sampled: 50 x 20 m Quarter(s) Sampled: All 4 quarters (Q1-Q4)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Live Crown Position Coded	Yes	
Live Damage Coded	Yes	
Dead Crown Position Coded	Yes	
Dead Damage Coded	No	
Pole-Size		
Trees Tagged	Yes	Area Sampled: 25 x 20 m Quarter(s) Sampled: 2 quarters (Q1 and Q2)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Height Code Recorded	Yes	
Seedling		
Seedlings Mapped	No	Area Sampled: 2 x 25 m belt along 0P-50P line Quarter Sampled: Q1
Dead Recorded	No	
Height Code Recorded	Yes	
Tally Count	Yes	

Gulf Islands National Seashore

Pinus clausa Monitoring Type

Brush

Tally Count	Yes
Age (immature, resprout, mature)	Yes
Live and Dead Recorded	No

Area Sampled: 3 x 50 m belt along inside of Q4-Q1 line

Separate tallies for 0-1m and 1-3m belts until 10 plots of data achieved.

Quarters Sampled: Q4 and Q1

Note: Do not collect brush density for *Aronia arbutifolia*, *Gaylussacia* spp., *Ilex glabra*, *I. vomitoria*, *Quercus myrtifolia*, *Serenoa repens*, *Vaccinium darrowi*, *V. myrsinites*, *V. stamineum*, or *V. tenellum*, as they are clonal.

FOREST PLOT PROTOCOLS Yes/ No [continued]

Preburn Read (00 Pre) [continued]

Herbaceous

Point Intercept Method	Yes
Tallest Species Height Recorded	Yes
All Species Intercepted Recorded	Yes

Point Intercept Recorded for full length of Q4-Q1 (start tape @ Q4)

Fuel

Loadings

Sampling Plane Lengths along Brown's Transects:

1 hour fuels: 0-6 feet

10 hour fuels: 0-6 feet

100 hour fuels: 0-12 feet

1,000 hour fuels (rotten and solid): 0-100 feet

Litter and Duff Measurements: 1,5,10,15,20,25,30,35,40, and 45 feet

Immediate Postburn Read (01 Post, 02 Post, 03 Post, etc...)

Overstory

Record Tag #	Yes	Area Sampled: 50 x 20 m
Record Tree Status (alive, dead, resprout, consumed)	Yes	Quarter(s) Sampled: 4 quarters (Q1-Q4)
DBH	No	
Maximum Scorch Height	Yes	
% Crown Scorched	Yes	
Char Height	Yes	

Pole-Size

Record Tag #	Yes	
Live and Dead Recorded	Yes	Area Sampled: 25 x 20 m
DBH	No	Quarter(s) Sampled: 2 quarters (Q1 and Q2)
Height	No	
Maximum Scorch Height	Yes	
% Crown Scorched	Yes	

Gulf Islands National Seashore

Pinus clausa Monitoring Type

Fuel Loadings

Char Height

Yes

Sampling Plane Lengths along Brown's Transects:

1 hour fuels: 0-6 feet

10 hour fuels: 0-6 feet

100 hour fuels: 0-12 feet

1,000 hour fuels (rotten and solid): 0-100 feet

Litter/Duff Measurements along Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet

Burn Severity

Burn severity recorded along all 4 Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet

Post Burn Reads (01 yr 01, 01 yr 2, etc...)

*Same as 00 Pre-Read

Gulf Islands National Seashore

Pinus palustris Monitoring Type

FMH-4

MONITORING TYPE DESCRIPTION SHEET

Park: GUIS

Monitoring Type Code: F P I P A 1 D 0 7

Date Described: 1/13 /2001

Monitoring Type Name: Longleaf-Slash Pine Forest

FGDC Association:

Preparers: M. Nicholas, D. Wallner, J. Hooke, Reeberg (1999); Nicholas, Dellinger, Hernandez, Lansing (2001); Reeberg, Lansing, Nicholas (2002). Revised by McInnis and Ruth (2004).

Burn Prescription (Restoration): Temperature: 40 - 85°F; relative humidity 30 -100%; wind direction: SW, S, & SE (burn blocks north of Hwy. 98) and NW, N & NE (burn blocks south of Hwy. 98); wind speed 2-6 mph; fuel moisture: 1-hour 4 - 12%, 10-hour 6 - 13%; rate of spread: 1 - 20 ch/hr; flame length 0.5 - 6 ft. Limit mortality in the 1-10 acre oak-magnolia-hickory hammocks. Burns will be conducted on a 3-5 year frequency. Restoration burns to be accomplished during winter months, maintenance burns during spring months using a combination of strip head and flanking fire ignition patterns. Pretreatment may include occasional access lines within the area mowed by Posi-Trac plow.

Burn Prescription (Maintenance): To add from burn plans.

Management Objectives (Restoration): Decrease density of all pole hardwoods by 50–90% 1 year post burn. Decrease litter and duff loading by 20-40% immediate postburn. Limit mortality of overstory pine (slash and longleaf) trees to less than 20% as measured 2 years post burn. Increase herbaceous component of understory by 20-40% as measured 2 years after the third burn.

Management Objectives (Maintenance): To be further refined after consultation with research community. Maintain pole hardwood density at _____ stems/ha as measured 1 year post burn. Maintain overstory pine (slash and longleaf) trees at _____ stems/ha as measured 2 years post burn. Maintain litter and duff layer at _____ tons/acre as measured immediate post burn. Maintain herbaceous cover at >20%.

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 of pole hardwoods - 80%; duff and litter load - 30%, density of overstory longleaf and slash pine -50%, and % cover of herbaceous species - 40%.

Objective Variables: Total density of pole hardwoods, duff and litter loading combined, overstory slash and longleaf pine mortality combined, and total % cover of herbaceous species (grasses, sedges, and forbs).

Physical Description: This type is part of both the flatwoods and sand hill areas, and is higher than surrounding soils. The area is relatively flat to gently sloping (0—8% slopes), ranging from 0—20 feet in elevation. The soils are composed of deep marine deposited, yellowish sands that are well drained and relatively sterile. Ortega soils (moderately well drained, dark gray at the surface, and yellow to brown beneath) are located on high ridges. Kureb soils (excessively drained and very droughty with a salt and pepper appearance on top, with yellow to pale brown below) are located at higher elevations.

Biological Description: Longleaf pine (*Pinus palustris*) and slash pine (*P. elliotii*) are the dominant trees (at least 60% of the overstory [trees >15cm]) in this community with a crown closure of 10-100%. Turkey (*Quercus laevis*), Chapman (*Q. chapmanii*), laurel (*Q. laurifolia*), and live oaks (*Q. virginiana*) are the prominent midstory species (10-90% cover). Shrubs include myrtle oak (*Q. myrtifolia*), gallberry (*Ilex*

Gulf Islands National Seashore

Pinus palustris Monitoring Type

glabra.), yaupon (*Ilex vomitorium*), wax myrtle (*Myrica cerifera*), smilax (*Smilax* spp.), rosemary (*Ceratiola ericoides*), saw palmetto (*Serenoa repens*), and *Vaccinium* spp. (20-90% cover). Ground cover consists mostly of grasses (*Andropogon*, *Aristida*, *Panicum*, etc.), sedges (*Rhyncospora* spp.), goldenrod (*Solidago* spp.), gopher apple (*Licania michauxii*) and lichens (0-50% cover).

Rejection Criteria: Exclude old control and posi-trac lines, anomalous vegetation patches (e.g., blowout or oak-magnolia-hickory hammocks.), barren areas (>50% of the plot); and areas within 25 meters of: developed areas, physical barriers such as roads or trails, and boundaries between monitoring or other vegetation types.

Notes: Monitoring schedule: Preburn, immediate postburn, year one, year two, year five.

Gulf Islands National Seashore

Pinus palustris Monitoring Type

GENERAL PROTOCOLS		Yes/No
Preburn		
Control Plots	No	
OP/Origin Buried	No	
Voucher Specimens	Yes	
Abbreviated Tags	Yes	
Herb Fuel Load	No	
Brush Fuel Load	No	
Stakes (REBAR) Installed: 17		
Burn		
Duff Moisture	Yes	
Flame Depth	No	
FOREST PLOT PROTOCOLS		
Preburn Read (00 Pre)		
Overstory		
Trees Tagged	Yes	Area Sampled: 50 x 20 m Quarter(s) Sampled: All 4 quarters (Q1-Q4)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Live Crown Position Coded	Yes	
Live Damage Coded	Yes	
Dead Crown Position Coded	Yes	
Coded		
Dead Damage Coded	No	
Pole-Size		
Trees Tagged	Yes	Area Sampled: 25 x 20 m Quarter(s) Sampled: 2 quarters (Q1 and Q2)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Height Code Recorded	Yes	
Seedling		
Seedlings Mapped	No	Area Sampled: 2 x 25 m belt along OP-50P line Quarter Sampled: Q1
Dead Recorded	No	
Height Code Recorded	Yes	
Tally Count	Yes	
Brush		
Tally Count	Yes	
Age (immature, resprout, mature)	Yes	
Dead Recorded	No	
Area Sampled: 3 x 50 m belt along inside of Q4-Q1 line Separate tallies for 0-1m and 1-3m belts until 10 plots of data achieved		
Note: Do not collect brush density for <i>Aronia arbutifolia</i> , <i>Gaylussacia</i> spp., <i>Ilex glabra</i> , <i>I. vomitoria</i> , <i>Quercus myrtifolia</i> , <i>Serenoa repens</i> , <i>Vaccinium myrsinites</i> , <i>Vaccinium darrowi</i> , <i>V. stamineum</i> , or <i>V. tenellum</i> , as they are clonal		

Gulf Islands National Seashore

Pinus palustris Monitoring Type

FOREST PLOT PROTOCOLS		Yes/ No	[continued]
Preburn Read (00 Pre) [continued]			
Herbaceous			
	Point Intercept Method	Yes	
	Tallest Species Height Recorded	Yes	
	All Species Intercepted Recorded	Yes	
	Dead recorded	Yes	
	Point Intercept Recorded for full length of Q4-Q1 (start tape @ Q4)		
Fuel Loadings			
	Sampling Plane Lengths along Brown's Transects:		
	1 hour fuels: 0-6 feet		
	10 hour fuels: 0-6 feet		
	100 hour fuels: 0-12 feet		
	1,000 hour fuels (rotten and solid): 0-100 feet		
	Litter and Duff Measurements: 1,5,10,15,20,25,30,35,40, and 45 feet		
Immediate Postburn Read (01 Post, 02 Post, 03 Post, etc...)			
Overstory			
	Record Tag #	Yes	Area Sampled: 50 x 20 m
	Record Tree Status (alive, dead, resprout, consumed)	Yes	Quarter(s) Sampled: All 4 quarters (Q1-Q4)
	DBH	No	
	Maximum Scorch Height	Yes	
	% Crown Scorched	Yes	
	Char Height	Yes	
Pole-Size			
	Record Tag #	Yes	Area Sampled: 25 x 20 m
	Live and Dead Recorded	Yes	Quarter(s) Sampled: 2 quarters (Q1 and Q2)
	DBH	No	
	Height	No	
	Maximum Scorch Height	Yes	
	% Crown Scorched	Yes	
	Char Height	Yes	
Fuel Loadings			
	Sampling Plane Lengths along Brown's Transects:		
	1 hour fuels: 0-6 feet		
	10 hour fuels: 0-6 feet		
	100 hour fuels: 0-12 feet		
	1,000 hour fuels (rotten and solid): 0-100 feet		
	Litter/Duff Measurements along Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet		
Burn Severity			
	Burn severity recorded along all 4 Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet		
Post Burn Reads (01 yr 01, 01 yr 2, etc...)			
*Same as 00 Pre-Read			

Gulf Islands National Seashore

Sarracenia alata Monitoring Type

FMH-4

MONITORING TYPE DESCRIPTION SHEET

PARK: GUIS

Monitoring Type Code: F S A A L 1 G 0 1 0

Date Described: 12/2003

Monitoring Type Name: Pitcher plant (*Sarracenia alata*) savannah

Preparer: Lisa McInnis and Andrew Ruth (2/2004)

Burn Prescription: Burning of units will occur between March and October.

Flame lengths 0.5-6 feet, Optimum - 2-3 feet

Air Temperature 50-95 degrees, Optimum - 65-85 degrees

Relative Humidity 15-90%, Optimum - 30-40%

1 hour fuel moisture 3-12%, Optimum - 5-6%

10 hour fuel moisture 5-14%, Optimum - 6-8%

Fire Management Objective(s): Decrease pole tree density by 40-90%, decrease shrub layer density by 40-90%, and increase cover of *S. alata*. Increase herbaceous component of the understory by 20-40% and measured 2 years after the 3rd burn.

Fire Monitoring Objective(s): Sample pole-size trees, shrubs and *S. alata* with adequate sample size to be 80% confident that the sample mean will be within 25% of the population mean

Fire Monitoring Variable(s): Pole density, shrub density and *S. alata* cover.

Physical Description: Also known as a wet pine savannah, this monitoring type is found in low, relatively flat and poorly drained areas of the coastal plain. These mesic sites are inundated with water from 50-100 days per year. Soils are typically poorly drained, exhibiting significant clay or organic matter content. Elevation ranges from 5-20 feet above sea level.

Biological Description: Forest canopy cover is approximately 50% closed. Dominant overstory species include longleaf pine (*Pinus palustris*), blackgum (*Nyssa sylvatica*), magnolia (*Magnolia virginiana*), sweetbay (*Persea borbonia*), water oak (*Quercus nigra*), red maple (*Acer rubrum*) and some slash pine (*P. elliotti*). Understory and ground cover species diversity is high, and can include many species of flatsedges (*Cyperus* spp.), rushes (*Juncus* spp.), asters (*Aster* spp.), huckleberries (*Gaylussacia* spp.), blueberries (*Vaccinium* spp.), greenbriars (*Smilax* spp.) and bluestems (*Andropogon* spp.).

Rejection Criteria Exclude plots within 10 m of trails, roads, or old control lines. Avoid anomalous vegetation patches, barren areas (more than 50% of plot) boundaries of other vegetation types (edges), and oak-magnolia-hickory mounds.

Notes: Monitoring schedule: Preburn, immediate postburn, year one, year two, and year five.

Gulf Islands National Seashore

Sarracenia alata Monitoring Type

GENERAL PROTOCOLS		Yes/No
Preburn		
Control Plots	No	
OP/Origin Buried	No	
Voucher Specimens	Yes	
Abbreviated Tags	Yes	
Herb Fuel Load	No	
Brush Fuel Load	No	
Stakes (REBAR) Installed: 17		
Burn		
Duff Moisture	Yes	
Flame Depth	No	
FOREST PLOT PROTOCOLS		
Preburn Read (00 Pre)		
Overstory		
Trees Tagged	Yes	Area Sampled: 50 x 20 m Quarter(s) Sampled: All 4 quarters (Q1-Q4)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Live Crown Position Coded	Yes	
Live Damage Coded	Yes	
Dead Crown Position Coded	Yes	
Coded		
Dead Damage Coded	No	
Pole-Size		
Trees Tagged	Yes	Area Sampled: 50 x 20 m Quarter(s) Sampled: 4 quarters (Q1-Q4)
Trees Mapped	Yes	
DBH	Yes	
Dead Recorded	Yes	
Height Code Recorded	Yes	
Seedling		
Seedlings Mapped	No	Area Sampled: 2 x 25 m belt along OP-50P line Quarter Sampled: Q1
Dead Recorded	No	
Height Code Recorded	Yes	
Tally Count	Yes	
Brush		
Tally Count	Yes	
Age (immature, resprout, mature)	Yes	
Dead Recorded	No	
Area Sampled: 3 x 50 m belt along inside of Q4-Q1 line 3 x 50 m belt along inside of Q3-Q2 line until 10 plots of data achieved. Separate tallies for 0-1m and 1-3m belts until 10 plots of data achieved.		
Note: All woody species counted in shrub belt; not limited to shrubs. Do not collect brush density for <i>Aronia arbutifolia</i> , <i>Gaylussacia</i> spp., <i>Ilex glabra</i> , <i>I. vomitoria</i> , <i>Quercus myrtifolia</i> , <i>Serenoa repens</i> , <i>Vaccinium myrsinites</i> , <i>V. darrowi</i> , <i>V. stamineum</i> , <i>V. tenellum</i> , as they are clonal. .		

Gulf Islands National Seashore

Sarracenia alata Monitoring Type

FOREST PLOT PROTOCOLS		Yes/ No	[continued]
Preburn Read (00 Pre) [continued]			
Herbaceous			
	Point Intercept Method	Yes	
	Tallest Species Height Recorded	Yes	
	All Species Intercepted	Yes	
	Recorded		
	Point Intercept Recorded for full length of Q4-Q1 and Q3-Q2 (start tape @ Q4 and Q3 respectively)		
Fuel Loadings			
	Sampling Plane Lengths along Brown's Transects:		
	1 hour fuels: 0-6 feet		
	10 hour fuels: 0-6 feet		
	100 hour fuels: 0-12 feet		
	1,000 hour fuels (rotten and solid): 0-100 feet		
	Litter and Duff Measurements: 1,5,10,15,20,25,30,35,40, and 45 feet		
Immediate Postburn Read (01 Post, 02 Post, 03 Post, etc...)			
Overstory			
	Record Tag #	Yes	Area Sampled: 50 x 20 m
	Record Tree Status (alive, dead, resprout, consumed)	Yes	Quarter(s) Sampled: 4 quarters (Q1-Q4)
	DBH	No	
	Maximum Scorch Height	Yes	
	% Crown Scorched	Yes	
	Char Height	Yes	
Pole-Size			
	Record Tag #	Yes	Area Sampled: 50 x 20 m
	Dead Recorded	Yes	Quarter(s) Sampled: 4 quarters (Q1-Q4)
	DBH	No	
	Height	No	
	Maximum Scorch Height	Yes	
	% Crown Scorched	Yes	
	Char Height	Yes	
Fuel Loadings			
	Sampling Plane Lengths along Brown's Transects:		
	1 hour fuels: 0-6 feet		
	10 hour fuels: 0-6 feet		
	100 hour fuels: 0-12 feet		
	1,000 hour fuels (rotten and solid): 0-100 feet		
	Litter/Duff Measurements along Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet		
Burn Severity			
	Burn severity recorded along all 4 Brown's Transects: 1,5,10,15,20,25,30,35,40, and 45 feet		
Post Burn Reads (01 yr 01, 01 yr 2, etc...)			
*Same as 00 Pre-Read			

Gulf Islands National Seashore

Sarracenia alata Monitoring Type

Literature Cited

USDI National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p.