



**National Park Service
Fire Ecology Annual Report
Big Thicket National Preserve
Calendar Year 2009**

A. Summary

The year 2009 proved to be very productive in spite of the significant amount of sick leave used by both the fire ecologist for maternity leave, and the lead fire effects monitor who underwent two knee surgeries. Although both remained on light duty for the summer, they managed to successfully lead the fire effects monitoring crew and provide support to the fire management program.

Fire Effects Monitoring:

This field season monitors collected most of the data representing the damage from Hurricane Ike, which occurred in September 2008. Due to the amount of change to the downed woody fuel loading and overstory tree mortality, many of the objectives for fire management will have to be rewritten. During 2010, the monitors should capture any delayed mortality effects from Hurricane Ike, and fire ecologist will assess the burn units and adjust prescribed burn and monitoring objectives to more accurately reflect the conditions of the Preserve. In January 2010, the fire ecology program received converted data to be used in FFI and this field season staff will learn how to use the program and quality check the data. Additionally, the lead monitor administered live fuel moisture data submitted to the national database. This data is collected on *Ilex vomitoria* (yaupon) every two weeks throughout the year.

***Pinus palustris* (longleaf pine) Restoration Work:**

In January, the fire ecologist coordinated a volunteer workweek of 12 students from Saint Michael's College who conducted a variety of service work including planting longleaf pine seedlings around the new fire management facility. The fire ecologist also supervised the contract planting of 24,000 longleaf pine seedlings within 76 acres of Big Thicket National Preserve as part of a joint grant with The Nature Conservancy from America's Forest Global ReLeaf Program. This grant was submitted by the fire ecologist and TNC's Big Thicket Project Director in efforts to restore longleaf pine in areas of hurricane damage within BITH and TNC property. The fire effects monitoring crew monitored the seedling survivorship during the

growing season to keep track of restoration success. The fire ecologist continues to facilitate meetings and coordinate work among the Longleaf Pine Restoration Team which consists of the Preserve's resource management staff and local TNC staff.

Fire Management Activities:

Although staff did not go on any western fire assignments, the fire ecology program supported fire management activities at Big Thicket, Padre Island National Seashore, and local partners such as TNC and FWS. The fire ecologist helped with fire suppression as a fire fighter on a FWS wildfire, assisted overhead on a wildfire at PAIS, and worked as a FFT1 and FEMO on several TNC and NPS prescribed burns during the first half of the year. The lead fire effects monitor worked as a FEMO on NPS prescribed burns before going on light duty in March. The lead monitor also coordinated and helped teach two 130/190 classes with BITH staff, one at the Preserve and the other at Padre Island. Overall, approximately 50 students were trained from a diverse group of federal, state, AD employees, and members of volunteer fire departments.

Endangered Species Monitoring (*Phlox nivalis* ssp. *texensis*, Texas Trailing Phlox):

The fire ecologist worked to improve a PMIS proposal for the endangered Texas Trailing Phlox reintroduction at Big Thicket and supervised an intern from the Chicago Botanical Gardens to improve the Phlox monitoring program. Improvements were made to the plots, data archives, plant maps, and spatial data. The fire ecologist and the intern submitted a poster to two conferences which was presented by partner. The fire effects monitors also assisted the intern with field work throughout the summer.

Mechanical Fuel Reduction Monitoring:

In 2009 the fire program added another grinding machine to the mechanical program, to assist with the increased downed woody fuels from the hurricanes. The new machine is a Fecon with grinding head, sheers, and grapple attachments, and it joins the Skidsteer and Gyrotrac grinding and mulching machines. The fire effects monitoring program will continue to monitor and document the changes in the fuels from large area mechanical fuel reduction projects. This season, the lead monitor worked with a seasonal fire fighter to cross-train and collect data within a treatment area. Together they completed a report on the preliminary results (see attached). The fire ecology program continues to refine the mechanical fuel reduction program and has complied protocol for a monitoring plan. The ecologist continues to administer the NEPA, NHPA, and section 7 consultations on a project basis in PEPC and compiles the supporting documents into the fire's central files.

Table 1. Fire Effects Plot Workload 2009

Park	Monitoring Unit	Veg Type	Type of Plot (FMH, photo point, other)	Pre-burn	Immed. Post	Postburn (1-20 yrs)	Cont rols	Total Plots
Big Thicket	Big Sandy	Upland Pine Forest	Fire Monitoring		1	2	1	4
		Upper Slope Pine Oak Forest	Fire Monitoring			3	2	5
		Mid Slope Oak Pine Forest	Fire Monitoring		2	2	1	5
		Lower Slope Hardwood Pine Forest	Fire Monitoring		1		2	3
			Gyro-Trac	8*	6*			14
			Phlox					
	Village Creek Corridor	Long Leaf Pine Restoration area	Brown's line+ Photo pt	5	5			10
	Hickory Creek	Wildland Urban Interface	Fire Monitoring			2		2
	Turkey Creek	Sandhill Pine Forest	Fire Monitoring	1	2		2	5
		Upland Pine Forest	Fire Monitoring	2			1	3
		Upper Slope Pine Oak Forest	Fire Monitoring	1	1		2	4
		Mid Slope Oak Pine Forest	Fire Monitoring				2	2
		Lower Slope Hardwood Pine Forest	Fire Monitoring	1			1	2
			Phlox					
	Lance Rosier	Wetland Pine Savannah	Fire Monitoring	3			2	5
TOTALS				21	18	9	16	64

* Pilot sampling plots, pre-treatment, post-treatment

Table 2. Fire Ecology Staffing 2009

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Deanna Boensch Fire Ecologist	01/2009	12/2009	26	NO	Wildland Fire Refresher IT, PA, RMA, and Ethics Training CPR and 1 st Aid HAZCOM Refresher Alternative Consultation Training NEPA Training Fire Ecology Conference
Iola Hallock Lead FEMO	01/2009	12/2009	26	NO	Wildland Fire Refresher IT and Ethics training Helicopter Manager Workshop IS-700 CDSO Training & Certification HAZCOM Refresher Assisted in teaching S-130/190 Completed NPS Fundamentals I
Meredith Sanders FEMO Seasonal	5/2009	9/2009	10	NO	Discrimination in the workplace IT Security Training HAZCOM Refresher Initial Wildland FFT Training
Michael Whitson FEMO Seasonal	5/2009	9/2009	10	NO	Discrimination in the workplace IT Security Training HAZCOM Refresher Initial Wildland FFT Training
Alicia Rodriguez FEMO Seasonal	5/2009	8/2009	8	NO	Discrimination in the workplace IT Security Training HAZCOM Refresher Initial Wildland FFT Training
Katie Gallagher Chicago Botanical Intern	6/2009	11/2009	11	NO	

Table 3. Management Objectives and Monitoring Results 2009

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?
Big Sandy Bugs Gyro- trac MFR	50-80% total downed woody fuel reduction within 2 years post treatment	Total fuel reduction = 28% (<i>n=6 plots, 1 mechanical treatment</i>)	NO* *results are immediate post treatment, which typically has an increase in the smaller fuels after grinding*
Texas Trailing Phlox – Woodpecker Hill Site	75% survival rate after 2 years of planting	Survivorship Rate = 84% (<i>n=125 plants within 5 plots</i>)	YES

****Fire effects monitoring data from the Big Sandy Central Burns of Spring 2008 did not meet any objectives since the 2009 field season data captured the damage from Hurricane Ike in September 2008. The objectives for the burn areas will need to be adjusted will be analyzed next year since the 2009 data was too soon to capture any delayed mortality from the wind damage.**

B. Fire ecologist accomplishments and areas of focus

Table 4. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	10%	Burn and Mechanical Treatment Plan Reviews, SHPO Consultation, BSU EA, PEPC Administration, ESF's, Decision Memorandums, and Administrative Records
Presentations	5%	Chataqua field trip, Phlox Poster submitted to CPC conference, Attended Fire Ecology Congress.
NPS Meetings/ task groups	10%	ATBI Science Committee, Fire Mgmt Meetings, ID Team Meetings
Interagency work	10%	Facilitator for Longleaf Pine Restoration Team, Member of Phlox Working Group, Coordinated work week for 12 person volunteer group
Fire Assignments	10%	Three BITH Rx Burns, Two TNC Rx Burns, FWS and PAIS Wildfire Assignment
Research	<5%	Fuels Reserve Funding Request Research Project
Data Collection	10%	FEMO and Phlox Plots (stopped all field work in July b/c of Pregnancy)
Data entry	<5%	Getting Data prepared for FFI Conversion
Data analysis	<5%	Phlox data analysis, LLP survivorship analysis, Annual Report
Supervision/Admin	10%	Hiring seasonal crew, EPAP's, Filled in for Lead FEMO while she was out with knee surgery
Training	5%	Wildland Fire Refresher, IT, PA, Ethics Training, CPR and 1 st Aid HAZCOM Refresher, Alternative Consultation Training, IMR NEPA Training
Miscellaneous	25%	Sick Leave and Annual Leave for Pregnancy and Maternity Leave

C. Fire effects crew accomplishments and areas of focus

Table 5. Fire Effects Crew Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	18%	Completed all pre-burn, 1 st year, 2 nd year, and post-burn, and control reads needed for the 2009 season.
WUI plots	.3%	Read Hickory Creek WUI Plots.
CBI plots	0	There are none on the BITH
Other plot work	8%	• Texas Trailing Phlox monitoring • Longleaf pine seedling mortality surveys • Photo pt plots in longleaf pine restoration area • Gyro-Trac fuels treatment plots
Fire Assignments	1%	• Assisted Aransas & Anahuac NWR with 2 Rx burns as FFT1 & ENGB. • Assisted cooperator TNC on 3 Rx burns as ENGB, FFT1 & FFT2 in

		both spring and fall.
Fuels Project work	3%	FEMO crew participated in Preserve Rx fire activities as FEMO, FFT1 & FFT2 for a total of 2091 acres.
Data entry	33%	• Standard Data Entry • Data quality check project • FFI data conversion project • Tree map conversion project • Post burn evaluation conversion project • Quality check of phlox data
Data analysis	.2%	Created graphs and PowerPoint for S-130/190 from Preserve live fuel moisture data.
Supervision/Admin	.5%	Supervised a 3 person monitoring crew.
Training	14%	• Wildland Fire Refresher • NPS- Discrimination in the workplace • NPS IT & Ethics Training • HAZCOM Refresher • Helicopter Manager Workshop • IS-700 • Initial Wildland FFT Training • CDSO Training & Certification • Assisted in teaching S-130/190 • Completed NPS Fundamentals I
Miscellaneous	22%	• 9% of time spent on CDSO • Planting Longleaf pine seedlings & phlox rehab with St. Michael's crew. • Plant ID, training & enrichment (interp. walks, mussel id canoe trip) • Historical FMO documents scanning project. • GIS plot map project • Coordinated S-130/190 for both BITH and PAIS • Coordinate recycling, office cleaning & organizing

D. Complete Annual Report Supplement (“2009 Annual Report Supplement.xls”)

E. Annual Report Supplement Additional Information

Be sure to **complete numbers 1 and 2 below**. Number 3 is optional.

1. Identify types of fire effects monitoring databases or spreadsheets being used (e.g., FFI, Access, and Excel).

In 2009 all data was compiled in an excel spreadsheet and all photo points were filed within PowerPoint slideshows so we can easily view the photo points over time. Data was submitted for conversion into FFI in January 2009 and the draft database was received in February 2010. The fire ecology program will spend 2010 learning FFI and transitioning data collection methods to enter into FFI.

2. Annual Meetings - Provide a brief description of the 2009 meeting(s) where fire ecologists present and discuss monitoring results with fire and non-fire park staff, and others have informal discussions.

Every year, the fire ecologist attends the NFPORS planning meeting and assists with planning the following year's projects. Monitoring results are used by the prescribed fire specialist when writing burn plans to help predict fire behavior runs in BEHAVE. During the burns the FEMO will take fire behavior measurements and report back to the prescribed fire specialist on the accuracy of the BEHAVE runs. While working as a FEMO on one of the burns, the fire ecologist was able to catch an error in BEHAVE calculations (the wrong wind reduction factor was used) and was able to justify an increase in prescribed wind speed. The fire ecology program has an open dialog and good relationship with fire and resource management staff helping to maintain good communications of monitoring results. The fire staff attends regular Monday morning meetings and frequently attends impromptu meetings to discuss fire management operations. The fire ecology program has all data products posted to the fire management staff on a shared server and we have been complimented on the accessibility of the data and reports.

3. If further explanation for the Annual Report Supplement information is needed, please provide it here as well as any other information relating to the spreadsheet that you would like to include.

F. Optional

Attach additional material not already covered: Describe in narrative form alternative monitoring activities, unique solutions to problems, and challenges facing monitoring program. Include any collaboration with natural resource managers, other federal agencies, or research institutions. Provide graphics and/or tables of data analysis results presentations, photographs of Monitoring and fire activities.

Alternative Monitoring Activities

Texas Trailing Phlox Program

The fire ecologist co-mentored and supervised a Chicago Botanical Garden Intern who worked at Big Thicket National Preserve from July till November on the Texas Trailing Phlox monitoring program. The intern was able to assist the fire ecologist with much needed improvements to the data protocol, archiving, and plot rehabilitation within the reintroduction site. The reintroduction program started in 1998 and many of the sites still had old stakes without plants which the intern helped to pull hundreds of stakes of plants that had died and posted stakes at hundreds of plants that had germinated. All the monitoring data was recorded and improved on fixing many errors that had occurred from inconsistent data collection over the years. GIS data was re-collected with sub-meter accuracy and metadata was created on the naturally occurring and reintroduced plants, and this information will be shared with partners and

utility right-of-way personnel to protect the plants over time. The ecologist and the intern also worked collaboratively on a poster that was submitted to a botanist from the Mercer Arboretum and Botanic Gardens to present at the Center for Plant Conservation Symposium in September 2009. The poster was also submitted to the Texas Native Plant Conservation Conference. The data and findings from the poster are

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Gyrotrac Monitoring

The lead fire effects monitor continues to work on refining monitoring of the mechanical fuels treatments. The biggest challenge to this type of monitoring is the coordination between the monitor and the equipment operator in addition to environmental factors that affect operations. Since the mechanical treatments are not uniform and the operator has discretion as to what areas need grinding, our monitoring plots are often skipped over. We have solved this problem by remaining on site during the treatments. In addition, the equipment operator is very cooperative and will treat any plots that may have been missed. Factors outside our control occur when a project area is not completed either from weather delays, equipment failure, or lack of funds to complete the project. The lead fire effects monitor worked with a seasonal firefighter to cross train on monitoring and their gyrotrac monitoring report is attached.

***Phlox nivalis* subsp. *texensis* (Texas trailing phlox) reintroductions: Restoring an endangered wildflower into the longleaf pine ecosystem.**

Deanna Boensch¹, Katie Gallagher¹, and Anita Tiller²

Big Thicket National Preserve¹, Mercer Arboretum and Botanic Gardens²

Introduction

On September 30, 1991, *Phlox nivalis* subsp. *texensis* (Texas trailing phlox) was federally listed as an endangered species endemic only to Hardin, Polk, and Tyler counties in southeast Texas. This perennial evergreen plant forms clumps and trails over deep, sandy soils of relatively open fire-maintained pine forests (Poole et al., 2007). Currently, the most successful natural populations occur on the xeric sandhills of longleaf pine (*Pinus palustris*) forests that are periodically managed with fire.

Threats to its habitat include land development, clearing for pine plantations, agricultural practices, and encroachment by native and exotic plants species due to fire suppression (USFWS, 1995). In 1995, recovery efforts were initiated at Big Thicket National Preserve within Hardin County; however, the early reintroduction sites were unsuccessful.

More sites were planted in Polk County in 2003, however the highest rates of survivorship occurred after 2006 when there was a better understanding of habitat suitability and planting requirements. All sites were impacted by Hurricanes Rita (2005) and Ike (2008). In 2007, permission was granted to establish a Tyler County population within a prime longleaf pine habitat on privately-owned land.



Figure 1. *Phlox nivalis* subsp. *texensis* (D. Boensch, NPS).

Materials and methods

National Park Service (NPS) and The Nature Conservancy (TNC) employees selected 5 sites on a privately-owned longleaf pine forest with a dense herbaceous community, little midstory brush and that was well-maintained by fire. The site was also verified to be optimal for reintroduction using a habitat prediction model developed for Texas trailing phlox (Schwelling et al., 2000). Plots were placed along a gentle topographical gradient in order to observe effects due to slope position. Stephen F. Austin State University's Pinewoods Native Plant Center (PNPC) provided 125 plants derived from wild plants from TNC Roy E. Larson Sandyland Sanctuary, Hardin County. The plants were conditioned outside the greenhouse for several months without fertilizer in order to increase survivorship. The planting occurred in December 2007 during favorable dormant season conditions. The soil surrounding each plant was pressed in firmly in order to decrease air pockets, cover up exposed roots and thereby minimize drought stress (Grant, 2008). In February 2009, a prescribed burn was completed.



Figure 2. Employees of NPS, TNC, PNPC, USFWS, Mercer Arboretum, and members of the Big Thicket Association assisted with the reintroduction and monitoring.

The 5 sites were labeled from WH-01 to WH-05. Each plant was permanently marked with metal stakes and tags in order to assist with annual monitoring. The general survivorship of the 125 plants among the 5 reintroduction sites was monitored in 2008 and 2009. The general health of each plant was recorded to be in the conditions of Good (**Fig. 3a**), Fair, Poor, No Green Visible (NGV) (**Fig. 3b**), or No Plant Visible (NPV).

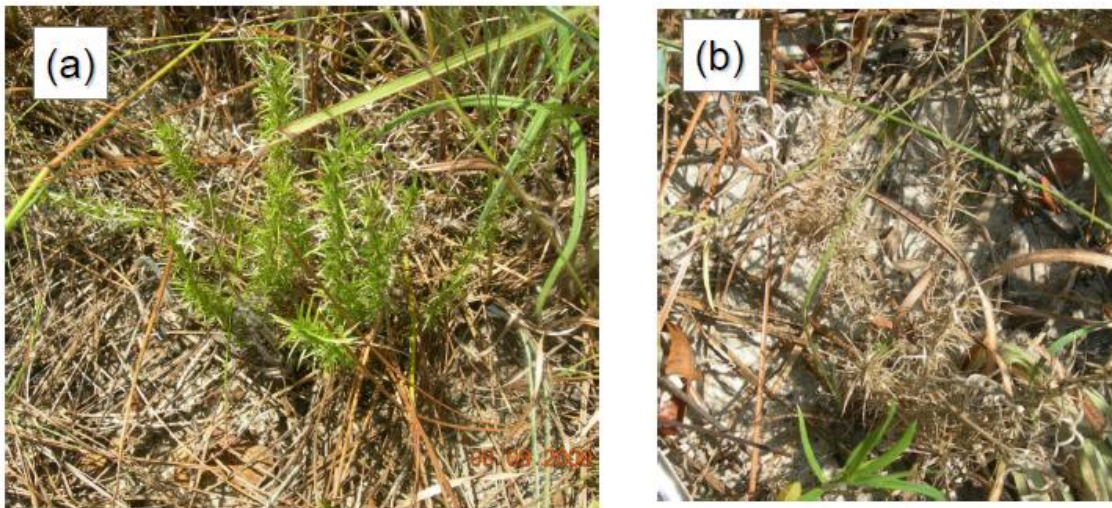


Figure 3. Two *Phlox nivalis* subsp. *texensis* plants located in plot WH-02. (a) plant recorded in Good condition indicated by entirely green vegetation and brown bracts from last season's flowers. Multiple stems also indicate good health after the first year of growth. (b) plant that exhibited dieback most likely caused by drought. Unsure if the plant will re-sprout, we will continue to monitor the plant before labeling it as dead (K. Gallagher, NPS).

Results

In December 2008, three plants were recorded as no plant visible (NPV), indicating probable mortality. In August 2009, 20 plants were recorded as NPV, yielding a total of 84% survivorship from the initial reintroduction in 2007.

Overall, each plot exhibited a decline in survival rates, with the lowest survival rate of 76% in WH-01 (**Fig. 4**). It is important to note that there is a larger but possibly insubstantial decline in general plot health in 2009 than there was in 2008. WH-02 exhibited a relatively average survival rate, but a very large increase in dieback, while WH-01 exhibited the opposite with the lowest survival rate and low dieback. WH-03 seems to show the strongest balance between low mortality and low dieback.

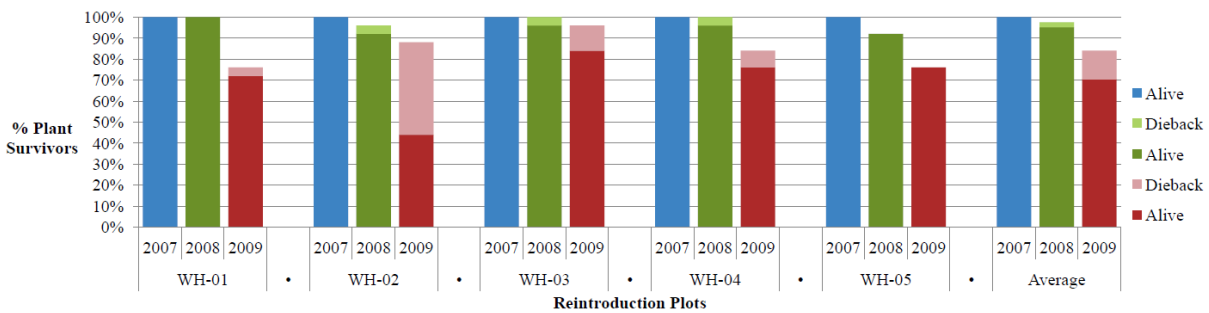
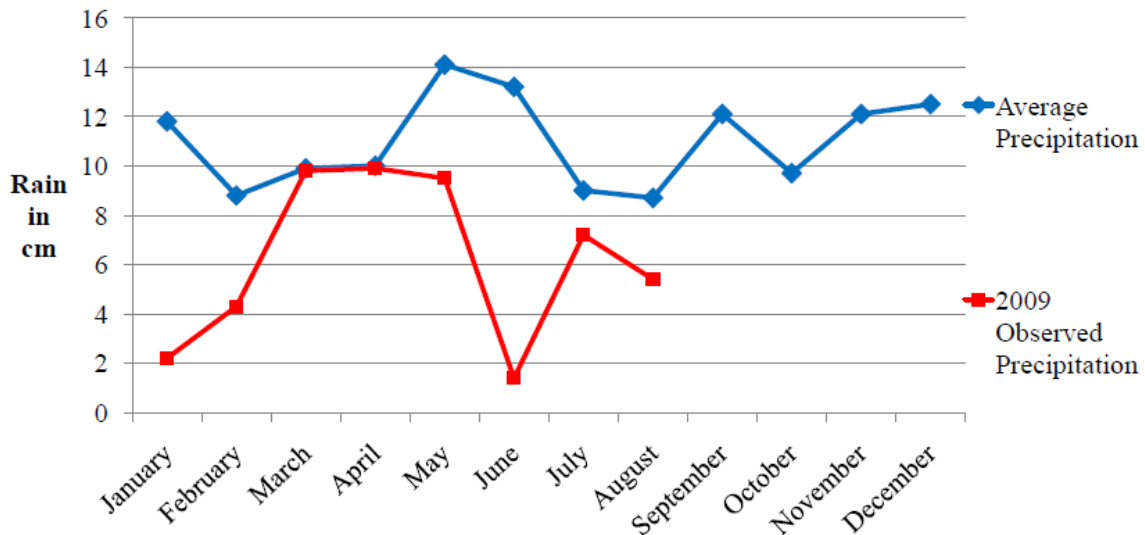


Figure 4. Percent survivorship at five reintroduction plots with 25 plants per plot (n=25). Bold colors represent the percent of visible plants that had Good, Fair, or Poor health. Lighter colors represent plants that were NGV, ie. visible but had no green vegetation. In 2007, all individuals were planted, yielding the expected 100% survivorship.

The annual rainfall for Tyler County is 131cm, and is distributed evenly throughout the year with a small increase during the summer months. Summer of 2009 brought exceptionally low precipitation levels during June and caused heavy drought conditions after the blooming period of late March and early April (**Fig. 5**).



WH-01 exhibited the highest decrease in survivorship from 2008 to 2009 at 24%, but also showed the smallest percent decrease in the number of plants in Good condition at 8% (**Tbl. 1**). Additionally, WH-04 showed an average decrease in survivorship at 16%, and the highest decrease in the number of Good plants at 44% (**Tbl. 1**).

Table 1. Number of plants declined from good health status compared to the decrease in survivorship rates between 2008 and 2009.

Plots	Change in # of Good plants	Percent decrease in # of Good plants	Percent decrease in survivorship
WH-01	-2	8%	24%
WH-02	-9	36%	8%
WH-03	-8	32%	4%
WH-04	-11	44%	16%
WH-05	-9	36%	16%

Literature cited

- Grant, G. 2008. Proper planting technique for Texas trailing phlox and other container grown plants. Nacogdoches, TX.: Stephen F. Austin State University Pineywoods Native Plant Center
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Acknowledgments

We thank all past and present members of the Texas Trailing Phlox Working Group including individuals from the Big Thicket Association, Mercer Arboretum and Botanic Gardens, National Park Service, The Nature Conservancy, Stephen F. Austin's Pineywoods Native Plant Center, Texas A&M University, Texas Parks and Wildlife Department, and the U.S. Fish and Wildlife Service.

For further information

Please contact deanna_boensch@nps.gov, Atiller@hcp4.net, or wledbetter@tmc.org.



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BIG SANDY UNIT: NW Big Sandy Bug Kill Gyro-Track Monitoring

Authors: Iola Hallock and Kristen Sehr

Objective:

Past events including logging, fire suppression, and the Southern Pine beetle infestation in the NW bug kill zone of Big Sandy have created dense brushy areas dominated by yaupon (*Ilex vomitoria*). While yaupon is volatile in drought conditions, it doesn't carry fire well under moderate prescribed burning conditions. Using the gyro-track to clear and shred the mid-story brush should reduce the potential for catastrophic wildfire by reducing the rate of fire spread, flame lengths, and intensity. Removing the brush will expose more ground to sunlight and encourage savannah grasses and more herbaceous diversity. It should also result in prescribed fires carrying better.

Implementation:

Pre- and post-fuel and vegetation data was collected and photos were taken to document the immediate results of gyro-tracking. Eight plots were established on July 20, 2009. On August 19 and 20, 2009 the gyro-track ground the mid-story brush in six of the plots and data was collected. The gyro-track was not used in plots one and eight, either because they were in a difficult to access blow down or because treatment was not necessary. Most of the plot markers were gyro-tracked around and some were pushed into the ground and then pulled out after treatment. The main stake in plot three was buried by the gyro-track and not found, so the end stake and back azimuth had to be used to determine the location of the line.

Results:

Overall, fuel loading decreased from 11.15 tons/acres to 8.01 tons/acre after the gyro-track treatment. A dramatic decline in thousand hour fuels off-set the significant increase in one, ten, and hundred hour fuels (see table below). Rotten thousand hour (>3") fuels went from 4.83 tons/acre to 0 tons/acre as they were crushed into much smaller pieces. Sound thousand hour fuels decreased as well. Some were shredded into smaller pieces and it is possible that others were moved so that they no longer crossed the Brown's line and were not counted. Duff depth became slightly shallower due to the gyro-track exposing bare soil and redistributing litter.

	Duff Depth	Tons/Acre 0-0.25"	Tons/Acre 0.25-1"	Tons/Acre 1-3"	Tons/Acre >3" Sound	Tons/Acre >3" Rotten	Tons/Acre Total
7/20/09 Pre-gyro	0.35"	0.14	0.92	0.53	4.72	4.83	11.15
8/20/09 Post-gyro	0.25"	0.79	3.25	3.30	0.68	0.00	8.01

The percent coverage of live woody plants dropped significantly in all of the plots after gyro-tracking. Prior to clearing, live wood ranged from 20-90% coverage with the average being 60%. After clearing the live wood coverage ranged from 0-10% with an average around 5%. The amount of dead woody plants increased in all but one measurement. The average went from about 13% dead wood coverage pre-gyro tracking to about 50% coverage post-gyro tracking. Live and dead herbaceous coverage was not high to begin with, likely due to the density of shrubs and shading and decreased only slightly after gyro-tracking.

The photos below provide a side by side visual comparison of what an area looks like before and after being cleared. There is a dramatic reduction in the brush component and ground cover.



Pre-gyro



Post-gyro

Plot 2



Pre-gyro



Post-gyro

Plot 3



Pre-gyro

Plot 4



Post-gyro



Pre-gyro

Plot 5



Post-gyro



Pre-gyro

Plot 6



Post-gyro



Pre-gyro



Plot 7

Post-gyro

Conclusion:

It is evident that the gyro-track achieves the immediate desired result of reducing yaupon and other brush. Plots should continue to be monitored to determine longer term effects. It will be useful to know if and when herbaceous coverage increases and when brush re-sprouts to determine a good burn window. Ideally, the area will be burned before it returns to its pre-gyro tracked state. If a prescribed fire does not occur, continued monitoring will show the rate of brush recovery and how many growing seasons it takes before the area looks as it did pre-gyro tracking.

