



Teton Interagency Fire Ecology Annual Report Calendar Year 2008

Summary	2
Fire Effects Plot Workload	5
Management Objectives and Monitoring Results	7
Table 3: Grand Teton National Park and Bighorn Canyon National Recreation Area...	8
Table 4: North Zone Bridger-Teton National Forest	10
Table 5: West Zone Bridger-Teton National Forest	11
Table 6: East Zone Bridger-Teton National Forest.....	11
Fire Ecologist Accomplishments and Areas of Focus	12
Fire Effects Crew Accomplishments and Areas of Focus	13

Appendices:

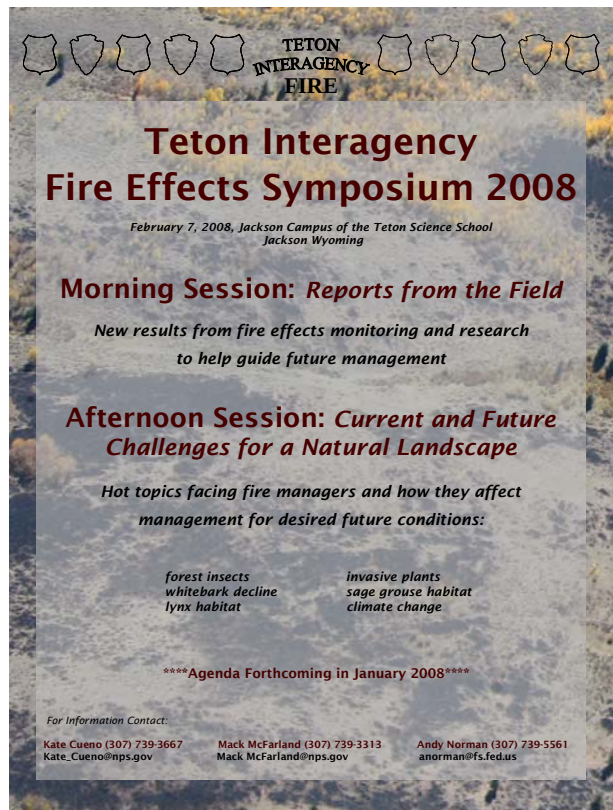
- A. Notes for the 2008 Annual Report Supplement
- B. Project Reports for Grand Teton National Park and Bighorn Canyon National Recreation Area
- C. Project Reports for the Bridger-Teton National Forest North Zone
- D. Project Reports for the Bridger-Teton National Forest West Zone
- E. Project Reports for the Bridger-Teton National Forest East Zone

Summary

The Teton Interagency Fire Effects Monitoring Program completed its tenth field season in 2008. New Crew Lead Kristen Shive led the field operations during the summer, with crew members Becky Spies, Adam Pfleeger, and Katie Brandt. In addition, our first SCA intern, Janice Bang, joined the crew for a short but intense season of monitoring work. Diane Abendroth made the transition from SCEP employee to Fire Ecologist.

The Teton Interagency Fire Effects Crew's transition to a project level monitoring process is now nearly complete, with over 20 projects with individual monitoring plans in Grand Teton National Park (GRTE), 30 in the Bridger-Teton National Forest (BTNF), and five at satellite parks Bighorn Canyon National Recreation Area (BICA) and Fossil Butte National Monument (FOBU). In 2008, field data was collected from 12 of these projects on National Park Service lands, and 14 projects on National Forest. Much of this work was done in conjunction with agency partners including the Wyoming Game & Fish Department. Summary Reports including data analysis and conclusions are found in the attached appendices. In addition to regular fire effects data collection, the crew assisted in a research project funded by NASA to test a predictive model for identifying invasive species habitats in burned areas.

In February, the fifth Teton Interagency Fire Effects Symposium was held at the Teton Science School Jackson Campus. Morning presentations outlined findings from local and regional research and monitoring including mechanical thinning at GRTE, invasive species modeling in burned areas of the park, and prescribed fire in aspen using spring prescriptions. The afternoon focused on hot topics affecting fire management, with guest presentations about sage grouse habitat mapping, lynx habitat needs, and whitebark pine ecology. Posters were also provided about prescribed fire in Yellowstone, cheatgrass monitoring in Jackson Hole, and landscape scale burns in southwest Wyoming sagebrush communities. The Fire Effects Symposium provides a great opportunity for fire managers to connect with research and monitoring information for adaptive management.



In March, Kristen joined the Fire Effects program as the new Crew Lead. Right away, Diane and Kristen coordinated meetings with fire managers at each of the three Teton Interagency Fire zones to share fire effects results from the 2007 season and to facilitate fire effects planning and scheduling for the 2008 field season. Zone meetings involved fire, resource, and forest managers and were a great success.

In summer, Kristen had her hands full learning plants and new field protocols, while managing three seasonal employees. She also instigated the first ever Student Conservation Association internship with the fire effects crew, bringing in volunteer Janice Bang from Purdue University. In the fall, Kristen spearheaded the transition to the FFI program for much of the program's data storage and analysis. .

In April, Diane completed her Master's degree in Forestry and Fire Ecology at Colorado State University. Her thesis, entitled "Canopy Mortality Modeling and Mapping in Burned Areas" focused on burn severity mapping in GRTE and BTNF, and used CBI plot data collected over the years by the Fire Effects Crew. Her findings indicate that the relative differenced Normalized Burn Ratio can be used to map stand replacing fire effects, but is less accurate for mixed mortality burns.

The 2008 fire season was relatively slow in northwest Wyoming, but the Fire Effects Crew was able to provide FEMO services for the 11,000-acre New Fork fire near Pinedale, Wyoming. Management of this fire included a large burnout operation that utilized recent prescribed burns in aspen stands as control boundaries. Two members of the Fire Effects crew took also assignments with the Teton Interagency Type II crew on this fire. In addition, Fire Effects crew members also traveled to Grand Canyon and Rocky Mountain National Parks with the Yellowstone Fire Use Module, and detailed with the Zion Fire Use Module on the BTNF (see fire effects crew section).

The International Association of Wildland Fire's "1988: Yellowstone & Beyond" conference was held in Jackson in September. This provided a great opportunity for local fire managers to present their work to the fire ecology community. It was also a great learning opportunity for the fire effects crew. GRTE Fire Ecology program representative Mack McFarland gave a slide show about during burn monitoring and linking fire conditions, fire effects, and burn prescriptions. Kristen Shive produced a poster outlining the interagency project level fire effects monitoring process. Diane Abendroth's research on mapping forest mortality in burned areas using remote sensing was also featured as a poster.

The Fire Ecologists and Fire Use Managers of Forest Service Region 4 have formed a group to address the new Wildland Fire Decision Support System. Diane Abendroth and Kristen Shive have participated in monthly conference calls with this group, and provided information about the monitoring program. A major project in the works is to articulate a suite of example resource objectives that can be used as part of WFDSS documents.

With Diane assuming the title of Fire Ecologist following her graduation in August, the park and forest began to formulate a new concept for the Interagency Fire Ecology Program. The draft mission statement and goals associated with the program are as follows:

DRAFT TETON INTERAGENCY FIRE ECOLOGY PROGRAM MISSION STATEMENT:

“The Teton Interagency Fire Ecology Program supports interagency fire management by providing assessments of treatment effectiveness and science-based information in conjunction with professional knowledge and judgment to facilitate adaptive management.”

DRAFT PROGRAM OBJECTIVES:

1. Provide a consistent fire effects monitoring program which interacts positively with fire managers involved in planning vegetation management projects to provide data collection, management, analysis, and interpretation about the efficacy of projects in meeting stated objectives.
2. Recognize and utilize adaptive management to engage with fuels project planners early in the project development stage and assist with formulating treatment objectives, reviewing ecological lessons learned by previous projects in similar fuel types, and providing ecological relevancy to discussions with inter-disciplinary team members.
3. Evaluate, review, and provide guidance on vegetation/fire management research projects proposed, ongoing, and completed as they relate to fuel models and proposed actions.
4. Provide ecological information to assist with fire response decision making during unplanned fires (e. g. WFDSS). Assess the effectiveness of wildland fire in meeting these objectives.
5. Assist with project (or incident) fire education and information efforts to ensure that fire ecology objectives and messages are present and consistent throughout the campaign.

The “Fire Ecology Program” includes the work of the Fire Ecologist, Lead Fire Effects Monitor, Fuels Specialist, Prescribed Fire Specialist, Fire Planner/GIS Specialist, and other employees such as the BTNF Fuels AFMOs. Program refinement will continue, with detailed descriptions of duties, EPAP elements, and annual work plans. The Teton Interagency Fuels and Fire Effects Monitoring Plan

will then be updated to incorporate these additions. In the winter of 2009, the Fire Effects Crew SOPs will be finalized, with more detailed information about crew duties and expectations. See the Fire Ecologist Accomplishments section for more information.

In 2008, several new fire ecology issues began to emerge that will affect treatment monitoring and project development. Whitebark pine and limber pine have suffered from the combined effects of mountain pine beetle attack and blister rust to the degree that managers are concerned about protecting seed-bearing individuals from fire. In the future it may be difficult to undertake prescribed burns in these forests without taking steps to avoid whitebark or limber pine mortality.

Cheatgrass has continued to gain ground in northwest Wyoming. In the 1990s it was present only in isolated patches of intense soil disturbance, and did not spread rapidly. In 2008, there are many more infestations along the roadsides of Grand Teton National Park and the Bridger-Teton National Forest. Fire effects monitoring will need to track the presence of this invasive plant, and post-burn herbicide application may need to play a role in future fuels projects.

A new approach to aspen restoration used by Teton Interagency Fire has been to slash and leave any conifer trees on the ground prior to burning a mixed aspen-conifer stand. This method has gained popularity with burn bosses because it encourages more intense burning during times of the year when aspen would otherwise not burn very hot. It will be important for the fire effects monitoring program to monitor the severity, ground cover, and aspen recovery of this method, in order to provide rapid feedback about its effectiveness in meeting resource objectives.

Fire Effects Plot Workload

This summer the crew completed monitoring for 12 fuels projects (both mechanical thinning and prescribed fire monitoring) in Grand Teton National Park and Bighorn Canyon National Monument. On the Bridger-Teton National Forest, they visited 14 projects. With individualized project-level monitoring, this required a total of 567 plots of different kinds, and 52 permanent photopoint installations or retakes. In much of this work, the fire effects crew was assisted by our inter- and intra-agency partners from Wyoming Game & Fish, Teton Interagency Fuels Crew, Grand Teton National Park Weed Crew, Teton Interagency Engine 4, Bighorn Canyon NRA staff, Grand Teton GIS Staff, and volunteer Arielle Furtado.

Table 1. Fire Effects Plot Workload 2008

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-Burn	Imm. Post	Post (1-20 yrs)	Total Plots
Grand Teton National Park	Flagg Mechanical	Stand Exams	10			10
		Photopoints	1			1
	Death Canyon Mech.	Stand Exams	10	10		20
		Photopoints	1	2		3
	Antelope South RX	FMH Brush			4	4
	Timbered Island RX	FMH Forest			4	4
	Wolff Ridge RX	Aspen Circular Plots			44	44
		Photopoints			2	2
	Eynon Ridge RX	Aspen Circular Plots			41	41
		Photopoints			3	3
	Blacktail Fire Sage	Line Intercept Trans.			35	35
	Row Fire Sage	Line Intercept Trans.			52	52
		Photopoints			1	1
	Blacktail Unit C RX	FMH Brush			2	2
		Line Intercept Trans.			52	52
North Zone Bridger-Teton National Forest	South Gros Ventre RX	Line Intercept Trans.			28	28
	Bitterbrush Control	Line Intercept Trans.			20	20
	Granite Creek RX	Sage Circular Plots		50		50
		Photopoints		3		3
		Burn Severity map		1		1
Bighorn Canyon National Recreation Area	Sorenson RX	FMH Brush			5	5
	Barry's Island RX	FMH Brush		2		2
West Zone Bridger-Teton National Forest	South Burro RX	Species Comp & Cover		2		2
		Sage Circular Plots		37		37
				3		3
	NE Quad Mech & RX	Photopoints	10			10
		Stand Exams	2			2
	Heart Six RX	Photopoints	30			30
		Stand Exams	3			3
	Lower GV J&K RX	Photopoints	8			8
	Lower GV GHI RX	Photopoints	13			13
	Lava Creek RX	Photopoints	1			1
East Zone Bridger-Teton National Forest	Hardscrabble Fire CBI	Species Comp & Cover	43			43
		CBI				
West Zone Bridger-Teton National Forest	Lower Cottonwood RX	Photopoints		3		3
		Burn Severity Map		1		1
East Zone Bridger-Teton National Forest	South Boulder RX	BFH Macroplot			2	2
	Pinyon RX	Ground Cover Trans.	30			30
		Photopoints	1			1
	Burnt Lake RX	BFH Macroplot			2	2
	Horse Creek Fire	Aspen Circular Plots			29	29
		Photopoints			2	2
	Monument 1 RX	Photopoints			4	4
		Ground Cover Trans.			12	12
East Zone Bridger-Teton National Forest	Maki Creek RX	Burn Severity Map		1		1
		Photopoint		1		1

Table 2. Fire Ecology Staffing 2008

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Diane Abendroth Fire Ecologist	1/1/08	12/31/08	26	No	L-280: Followership to Leadership First Aid/CPR MS in Forestry Completed PIOF (T) Taskbook initiated FFI Database Training '88 Yellowstone Fires Conference, presented poster
Kristen Shive Lead Monitor	3/17/08	11/07/08	17	Yes	S-131: Squad Boss Training L-280: Followership to Leadership First Aid/CPR FFI Database Training '88 Yellowstone Fires Conference, presented poster
Katie Brandt	5/18/08	10/09/2008	10	No	S-131: Squad Boss Training L-280: Followership to Leadership First Aid/CPR FEMO(t) details w/ Yellowstone FUM and Zion FUM Completed FEMO taskbook
Becky Spies	6/10/2008	10/23/2008	10	No	First Aid/CPR FEMO(t) details w/ Yellowstone FUM Teton Type II Crew Worked on Squad Boss and FEMO taskbooks Teton Type II Crew assignment
Adam Pfleeger	6/23/2008	9/18/2008	7	No	S-130/S-190: Fire School '88 Yellowstone Fires Conference Teton Type II Crew assignment
Janice Bang SCA Intern	6/02/2008	8/14/2008	9 (<i>Intern</i>)	No	S-130/S-190: Fire School

Management Objectives and Monitoring Results

The following tables (3-6) show the results of project work conducted during the 2008 field season. Detailed summaries for each project are included in the appendices. See previous GRTE Annual Reports for additional project results. Monitoring results in **BOLD** indicate significant results with 80% confidence.

Table 3: Grand Teton National Park and Bighorn Canyon National Recreation Area

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
Antelope South RX (Year 10 Post-burn)	Reduce sagebrush cover and density by 40%. Increase native grass and forb cover by 10%.	Did not reduce sagebrush density or cover significantly. Did not increase native forb or grass cover significantly.	NO NO
Flagg Ranch Mechanical (Unit 2 Pre-Thinning)	•Reduce downed woody fuel loading to ≤ 10 tons/ac •Reduce Visual Obscurity to less than 40% below 2.5m	• Pre treat woody fuel loading 13.4 tons/ac •Pre treatment mean sightability 40-60%	Pre data only
Eynon Ridge RX (2 years Post-burn)	Regenerate aspen in conifer encroached stands.	• Increased live aspen sucker density by 180.1% to 3992 (± 1261) stems per acre ($n=40$ circular density plots) • Removed 78.9% of live overstory aspen and 87.0% of live conifers ($n=20$ circular density plots)	YES
Wolff Ridge RX (6 Years Post-burn)	• ≥ 1000 live aspen suckers per acre over 2m tall 10 years post-burn	• 1002.9 $\pm$ 295.2 suckers per acre over 2m 6 years post-burn • 4588.6 $\pm$ 898.5 total aspen suckers per acre • Percent Browse 25.1% ($n=48$ circular aspen plots)	YES, ahead of schedule
Timbered Island RX (6 Years Post-burn)	For PICO plots & 1 PSME plot: • Reduce fuel load by 40-60% (PICO) and 40-80% (PSME) in YR01 • Reduce pole and seedling density by 40-60% (PICO) and 10-20% (PSME) by YR02 • 20% reduction in PICO overstory density in YR02 • No more than 30% reduction in PSME overstory density in YR02	• PICO plots mean reduction= 20.7% • Reduction on PSME plot=49.0% • 102.8% increase in seedlings in YR01 on PICO plots • 25% decrease in seedlings on PSME plot • 42.3% increase in mean pole density by YR02 on PICO plots • 50.0% reduction in pole density by YR02 on PSME plot • No significant reduction detected. • PICO plot snag density increased 149.7% in YR06 • No significant reduction detected.	NO NO NO NO NO NO YES in near future? YES

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
Death Canyon Mechanical (Unit 1 Immediate Post, Unit 3 Pre-Thinning)	•Reduce downed woody fuel loading to ≤ 10 tons/ac •Reduce Visual Obscurity to less than 40% below 2.5m	•Unit 1: Woody Fuel loading reduced to 14.3 tons/ac •Unit 1 Post treatment Visual Obscurity less than 2 •Unit 3: Pre treat woody fuel loading 11.8 tons/ac •Unit 3 pre treatment mean sightability 40-60%	NO YES Pre data only
Blacktail Unit C RX (10 Years Post-burn)	Monitor sagebrush and bitterbrush recovery: • Estimate density in burned area pre and post-burn. • Estimate cover in burned and unburned area.	• 80.1% decrease in bitterbrush density • 87.5% decrease in sagebrush density • Burned Area Cover: 5.9% bitterbrush; 1.3% sagebrush • Control Area Cover: 32.0% bitterbrush; 23.9% sagebrush	YES (by conducting monitoring)
South Gros Ventre (10 Years Post-burn)	Monitor sagebrush and bitterbrush recovery: • Estimate cover in burned and unburned area.	• Burned Area Cover: 4.1% bitterbrush; 1.5% sagebrush • Control Area Cover: 32.0% bitterbrush; 23.9% sagebrush	YES (by conducting monitoring)
Granite Creek RX (Immediate Post-burn)	•Reduce mature sagebrush density by $\geq 60\%$ in Unit B •Map burn severity using aerial photographs	• 60.2% decrease in sagebrush in Unit B (<i>n</i>= 40 circular plots) •68% burned in Unit B (<i>GIS burn severity map analysis</i>)	YES
Blacktail Fire Sage (5 Years Post Fire)	Monitor sagebrush recovery: •Estimate live sagebrush density •Estimate live sagebrush cover and average height	•2983 (± 600) stems per acre in year 2 (includes tiny seedlings) (<i>n</i>=36 circular plots) •1.7% ($\pm .06\%$) cover in year 5 (<i>n</i>=40 line intercept transects) •Average height 24.3 cm (<i>n</i>=138 plants)	YES
Row Fire Sage (14 Years Post Fire)	Monitor sagebrush Recovery: •Estimate live mature sagebrush density •Estimate live sagebrush cover and average height	•900 (± 173) mature stems per acre in year 10 (<i>n</i>=28 circular plots) •5.5% ($\pm .95\%$) cover in year 13 (<i>n</i>=52 line intercept transects) •Average height 70.1cm (<i>n</i>=169 plants)	YES
BICA Sorenson RX (Year 7 Post)	• Reduce juniper cover by 60%. • Reduce shrub density by 30-50% • Increase herbaceous cover by 30%	• Juniper cover reduced by 62.4% • Shrub density reduced by 66.8% • Herbaceous cover: - grass cover increased 202.8% - forb cover increased 1728.6%	YES YES YES

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
BICA Barry's Island (Imm. Post)	• Burn 40-70% of the acreage in a mosaic pattern • Achieve 70-90% reduction in juniper cover imm. post-burn • Achieve 70-90% reduction in juniper density imm. post-burn	• Waiting for data from BICA • Juniper cover reduced by 59.0% • Shrub density reduced by 75.6%	Unknown NO YES

Table 4: North Zone Bridger-Teton National Forest

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
South Burro RX (Year 2 Post)	• Reduce sagebrush density by 50% • Increase native forb and grass cover by 25%	• Unable to detect change in sagebrush density (may be due to protocol used) • Increased forb cover by 25-75% across 2 plots • Decreased native grass cover by 65.5-78.8% across 2 plots • Increased non-native grass cover by 666.7-8000% across 2 plots	NO YES YES YES
Heart Six RX (Pre)	Objectives still in development	• 3 permanent photopoints and 30 stand exams installed • Pre burn woody fuel loading: Stand 1: 17.6 tons/ac Stand 2: 24.5 tons/ac Stand 3: 18.2 tons/ac	Pre burn data only
Lower Gros Ventre Units J&K RX (Imm. Post)	• Treat 20-40% of forested vegetation • Treat up to 40% of burnable sagebrush	• Burned 20.1% of entire unit, and 24.4% of highest priority forested vegetation (GIS-based burn mosaic map)	YES YES
Lower Gros Ventre Units GHI RX (Pre)	• Treat 20-40% of forested vegetation • ≥ 1000 live aspen suckers per acre over 10ft tall 15 years post fire	• 13 permanent photopoints installed	PRE data only
Hardscrabble Fire Severity (1 Year Post)	• Ground truth and map burn severity using dNBR	• Completed 43 CBI plots	YES

Table 5: West Zone Bridger-Teton National Forest

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
Lower Cottonwood RX (Immediate Post)	•Burn $\geq 50\%$ of unit •Treat 25-60% of targeted mountain mahogany vegetation	•Burned 79% of unit •Burned 76% of all mahogany (GIS analysis of burn mosaic maps)	•YES •PROBABLY

Table 6: East Zone Bridger-Teton National Forest

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
South Boulder RX (Year 10)	•Improve shrub age class diversity •Increase % cover of grasses and forbs •Maintain ground cover	•Drastic reduction in shrub density post-burn, recovery quite slow •11.3% increase in grass cover •69.6% increase in forb cover •Bare ground cover increased 171% (n=2 BFH Macroplots)	NO YES, YES NO
Pinyon-Osborn RX: Roaring Fork and Wilderness Units (Pre)	•Restore and perpetuate landscape-level disturbance regime •$\geq 85\%$ ground cover in sage and $\geq 95\%$ ground cover in aspen 3 years post-burn •≥ 1000 live aspen suckers per acre over 10ft tall 15 years post fire	• Pre-burn ground cover in sagebrush = $93.8\% \pm 2.0\%$ (n=30 point intercept transects)	Pre data only
Burnt Lake RX (Year 10)	•Improve shrub age class diversity •Increase % cover of grasses and forbs •Maintain ground cover	•Gradual sagebrush density recovery •44.2% increase in grass cover •61% increase in forb cover •Bare ground cover increased 70.3% (n=3 BFH Macroplots)	NO YES, YES NO
Horse Creek Fire (Year 2 Post)	• ≥ 1000 live aspen suckers per acre over 10ft tall 15 years post fire	•6024.1 ± 1542 live suckers per acre •Average percent browse 14.1% (n=29 circular plots)	Too soon to tell
Monument Ridge Unit 1 RX (Year 2 Post)	•$\geq 60\%$ ground cover in sage 2 years post and $\geq 80\%$ 5 years post-burn	• $87.8 \pm 1.9\%$ percent ground cover in year 2 post-burn (n=12 point intercept transects)	YES, ahead of schedule

Monitoring Unit	Treatment Objectives	Monitoring Results (80% confidence in bold)	Objective Achieved? (Statistically Significant in bold)
Maki Creek RX (Immediate Post)	• ≥1000 live aspen suckers per acre over 10ft tall 15 years post fire	• Burned 79% of the 1249 acre unit. (burn severity map)	Too soon to tell

Fire Ecologist Accomplishments and Areas of Focus

In August 2008, Teton Interagency Fire officially gained a Fire Ecologist, when Diane finished her Master's degree and was converted from her previous SCEP appointment. Diane had been helping out with many fire ecologist duties prior to that. Teton interagency fire managers are currently working with Diane and Kristen to clarify what the "areas of focus" actually are for the fire ecology program (see **Summary** section, above). The new mission statement and objectives being drafted will be used to help prioritize work, evaluate performance, and set expectations for the program.

Table 7 gives a list of some of the fire ecology tasks Diane and Kristen have undertaken this year. A row for monitoring field work was added in order to account for the percentage of time spent.

Table 7. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	10%	▪ GRTE Fire Resource Council group ▪ Drafting TIF Fire Effects Monitoring Plan document ▪ Development of plans for future fuels and fire treatments at GRTE with Fuels Specialist ▪ FS Region 4 Fire Ecology group: Drafting generic objectives for WFDSS documents for fire use ▪ Project-level monitoring plan development (ongoing) ▪ Phelps Bench prescribed burn project development with prescribed fire specialist ▪ Burn plan review: Lower Gros Ventre prescribed burn (limber pine issues)
Presentations	10%	▪ Co-coordinated sixth annual Fire Effects Symposium ▪ Masters thesis defense practice presentation to park employees ▪ Presented methods for updating vegetation maps in burned areas at RSAC, Salt Lake UT ▪ Fire Effects results presentations at three Forest Service Zone meetings ▪ Restoring the West Conference, Ogden: Aspen monitoring and treatment objectives setting presentation ▪ Fire Effects Monitoring Program presentation to FS Region 4 & Leadership Team ▪ Poster presentation at Yellowstone Fires and Beyond Conference
NPS Meetings/ task	1.5%	▪ FS Region 4 Fire Ecology Group

groups		GRTE Fire Resource Council
Interagency work		- Jackson Hole Interagency Habitat Initiative (JIHI) group – prioritizing and setting objectives for prescribed burns in Jackson Hole - Upper Snake River Sage Grouse management plan review and GIS mapping - Dry Quad project field trip with JIHI group and Rocky Mountain Elk Foundation to develop Stewardship grant project
Fire Assignments	5%	- PIOF(T) – 2 assignments - FFT1 – 1 assignment - FEMO – 3 assignments
Research	15%	- Completed and defended Master’s thesis, “<i>Canopy mortality mapping and monitoring in burned areas of northwest Wyoming</i>” - Park Liaison for NASA invasive species forecasting research project - Worked with RSAC to develop methods for updating vegetation maps in burned areas - Graduate student and kids research project design with Teton Science School
Data entry	3%	4 days
Data Conversion	.05%	1 day - See Lead Monitor section – Kristen did most of this
Data analysis	10%	20 days
Supervision/Admin	20%	- Hired & trained new term Lead Fire Effects Monitor - Burn severity CBI training - Invasive species forecasting accuracy assessment training - Developed new EPAPs for Fire Ecologist and Lead Monitor - Facilitated AAR for Signal Mountain RX Burn - Facilitated seasonal recruiting - Selection committee for hiring new interagency Fire Planner / GIS Specialist
Training	5%	- FFI database training, Sacramento - L280 Followership to Leadership - First Aid – CPR - Safety refresher - PIOF – Public Information Officer trainee - Supervisor training, Idaho Falls
Miscellaneous	5%	- GIS project to update BTNF vegetation map in recent fires using burn severity data - Assisted with FPA model inputs - Landfire rapid refresh product review
Monitoring Field Work	15%	

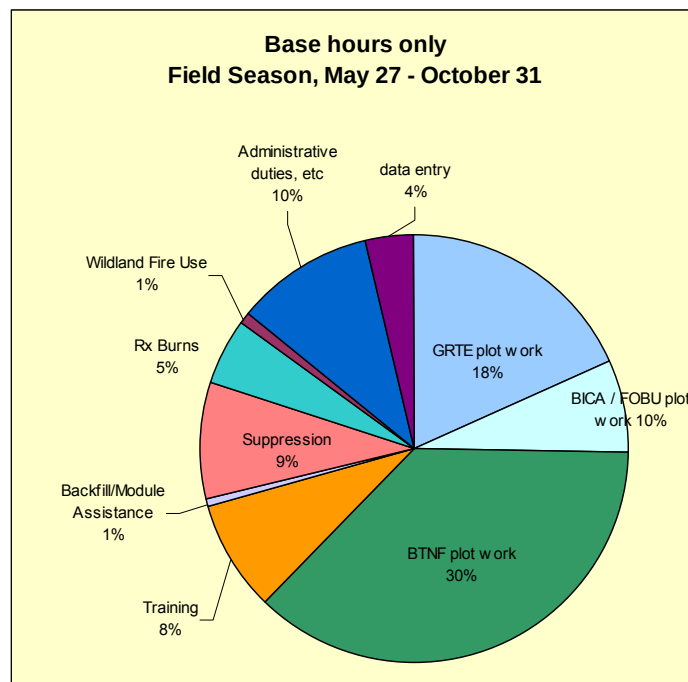
Fire Effects Crew Accomplishments and Areas of Focus

In 2008, the Fire Effects crew managed to accomplish a large amount of fieldwork, complete numerous fire assignments and attend several trainings. Crew accomplishments throughout the year have been entered into the table below. In addition, a pie chart outlining how the crew spent the actual field season, and how those activities were split between agencies, is included as Figure 1.

Table 8. Fire Effects Crew Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	10%	5 brush plots and 4 forest plots
CBI plots	5%	2007 Hardscrabble Fire on the BTNF
Other plot work	30%	Common Stand Exams, aspen and sage density circles, brush line intercepts, point-intercept cover plots, photopoints, NASA Weed Model ground-truthing, Brucellosis Feedground Habitat plots
Fire Assignments	10%	2 crewmember FEMO(t) details with Yellowstone FUM 1 crewmember detail with Zion FUM 2 crewmember assignments with Teton Fire Type II Crew
Fuels Project work	1%	1 crewmember assisted Teton Fuels Crew
Data entry	20%	This includes entering all past data for this year's plots as well as FFI database management/troubleshooting.
Data conversion		Because we did not use FEAT in the past, we did not have to convert data. However, we had to enter all past data for this year's plots because they were previously stored in Excel, which increased data entry time greatly.
Data analysis	5%	Lead Monitor assisted in data analysis for several projects.
Supervision/Admin	10%	Lead Monitor hired and supervised 3 seasonals and an SCA intern, as well as several volunteers and members of the Weed crew.
Training	10%	- Refresher Training (4 attendees) - L-280: Followership to Leadership (3 attendees) - S-131: Squad Boss Training (2 attendees) - S-130/S-190: Fire School (2 attendees) - FFI Database Training (2 attendees) - CPR/First Aid (6 attendees)

Figure 1. Fire Effects Crew Field Season Time Chart



Appendix A: Notes for the 2008 Annual Report Supplement

The following notes are clarifications for the 2008 Teton Interagency Annual Report Supplement spreadsheet.

Supported Parks: The Teton Interagency Fire Ecology Program supports three satellite parks; Bighorn Canyon National Recreation Area, Fossil Butte National Monument, and Fort Laramie National Historic Site. To date, no fire effects work has been done at Fort Laramie, so no mention of the unit is made in the supplemental spreadsheet. It is likely that we will coordinate with the Northern Great Plains Fire Ecology Program when projects are initiated that require monitoring or ecological input.

While not a National Park, the Bridger-Teton National Forest is a major priority for the fire ecology program, and has been since 1999. Recently, the Forest has become our biggest workload (see pie chart, above). The USFS provides funding for one of our seasonal crew employees, as well as other important logistical support. Therefore, the forest was added in the supplemental spreadsheet.

Databases: This year the Teton Interagency Fire Effects Program began to utilize FFI for data storage and analysis. Kristen Shive valiantly led this transition. About 75% of the data is still entered and analyzed using Microsoft Excel. Forest fuels treatment project data is also analyzed using the Forest Vegetation Simulator Fire and Fuels Extension (FVS FFE). The free program FVS writer is used to enter data into FVS format, although we hope to be able to use FFI for this in the near future.

Fire Effects Monitoring Plan: A draft Teton Interagency Fuels and Fire Effects Monitoring Plan is in use at this time. In 2009, the document will be updated to reflect the new RM18 Chapter 8, and then submitted for review.

BAER: The Teton Interagency Fire Ecology Program has not been involved in BAER projects to date, however we do obtain rapid assessment burn severity mapping from RSAC. Few fires in the area have received extensive emergency rehabilitation. In the future, we may need to consider herbicide treatments in wildfire areas because of increased spread of cheatgrass.

Appendix B:
Project Reports for Grand Teton National Park and
Bighorn Canyon National Recreation Area

Flagg Ranch Phase II Mechanical Thinning

The 31-acre Flagg Ranch mechanical fuels thinning project will be implemented in the summer of 2009 or 2010. Prior to the treatment, the Fire Effects Crew collected stand exam data and sightability monitoring in order to evaluate how the treatment will affect fuel loading and fire behavior.

The goals of this mechanical thinning project are to reduce fuels around the wildland interface at the Flagg Ranch village in the John D. Rockefeller Parkway (JODR). Fuel reduction is intended to create defensible space and improve firefighter and public safety, by increasing fire containment opportunities during wildland fire events. Objectives for the mechanical treatment are as follows

- Reduce dead and down fuel loading to 10 tons per acre
- Remove all ladder fuels (limb trees, remove conifer regeneration)
- Increase tree spacing distance to 10-12 feet (1500 stems per acre) between trees or groups of trees.

Treatment methods will include limbing and felling trees with chain saws, and subsequently burning the slash in piles. The Forest Vegetation Simulator (FVS) Fire and Fuels Extension (FFE) program is used with stand exam data to compare pre- and post-treatment fuels, predicted fire behavior, and effects. Sightability transects will give an additional indication of change in ladder fuels.

The fuel loading summary for Flagg Ranch Phase II pre treatment is summarized in the table, below:

Fuel Model	FM8 83%, FM10 17%
Litter Tons/ac	1.71
Duff Tons/ac	11.4
1, 10, & 100 Hour Fuels Tons/ac	2.5
1000 hour Fuels Tons/ac	10.9
Total Woody Fuels Tons/ac	13.4
Canopy base Height, ft	6
Canopy Bulk Density kg/m3	0.175

This unit did not have particularly heavy downed woody fuel loading pre-burn, however it is located very close to developed areas and employee housing. The stand is very young and dense, which affects the predicted fire behavior (summarized below for moderate and severe fire weather):

	Moderate 75th %	Severe 97th %
Surface Flame Length, ft	1.3	2.3
Fire Type	Surface Fire	Surface Fire
Probability of Torching	37%	47%
Torching Index, mph	67.5	63.6
Crowning Index, mph	15.4	15.3
Potential mortality, % of BA	66%	68%
Potential Smoke tons per acre <2.5	0.21	0.23

The torching and crowning indices refer to the wind speed required to initiate torching or crowning.

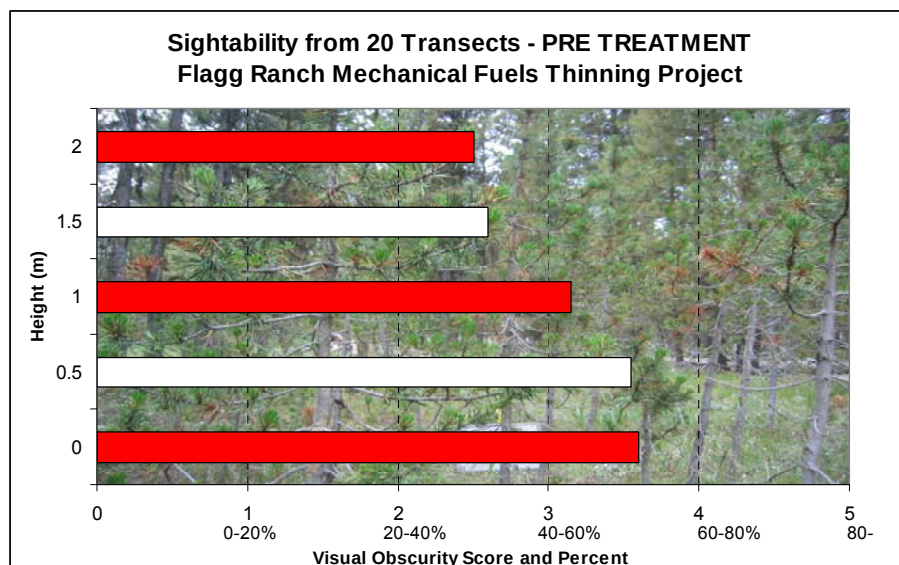
A photopoint in the Flagg Ranch Phase II stand shows the characteristics of the young lodgepole pine forest. Note that there is a 2m x .5m red and white sightability board in each photo (located 50ft from the camera location):



Pre-treatment photopoint FLAG01 looking East

FLAG01 looking South

Sightability transect data is shown here for the pre-treatment monitoring event. Visual obscuration is analogous to the amount of ladder fuels in the stand.



Death Canyon Phase I Mechanical Thinning

The Teton Interagency Fuels Crew completed the 18-acre Death Canyon Phase I thinning project in the summer of 2006. In the fall of 2007, the debris piles for the Death Canyon Phase 1 mechanical fuels project were burned, and the project was completed. The Teton Interagency Fuels Crew and Fire effects Crew revisited the site in the summer of 2008 to collect post-treatment monitoring.

The goals of this mechanical thinning project are to reduce fuels around wildland interface areas to create defensible space, and improve firefighter and public safety by increasing fire containment opportunities during wildland fire events. In this case, the travel along the Death Canyon road and the associated trailhead development are the values at risk. Objectives for the mechanical treatment are as follows

- Reduce dead and down fuel loading to 10 tons per acre
- Remove all ladder fuels (limb trees, remove conifer regeneration)
- Increase tree spacing distance to 10-12 feet (1500 stems per acre) between trees or groups of trees.

Treatment methods included limbing and felling trees with chain saws, and subsequently burning the slash in piles. Monitoring methods used to evaluate project effectiveness involved modeling of fuel loading and expected fire behavior using the Forest Vegetation Simulator (FVS) Fire and Fuels Extension (FFE) program, as well as sightability transects that give an indication of ladder fuels. FVS inputs required stand exam and Brown's transect data, which was collected pre- and post-burn (ten stand exams per event, with two Brown's transects each). Sightability transects were co-located with the Brown's transects.

Pre- and post-treatment comparisons of fuels characteristics are summarized in the table, below. The Death Canyon Phase I unit was converted from mostly a fuel model 10 to mostly a fuel model 2, indicating a much more manageable grass fuel type. Total fuel loading was reduced by an average of 7.4 tons per acre. At a post-treatment fuel loading of 14.3 tons per acre, the treatment did not quite achieve the objective of 10 tons per acre.

	Pre-treatment	Post-treatment
Fuel Model	FM8 5%, FM10 95%	FM2 74%, FM10 26%
1, 10, & 100 Hour Fuels Tons/ac	3	3.2
1000 hour Fuels Tons/ac	18.7	11.1
Total Woody Fuels Tons/ac	21.7	14.3
Canopy base Height, ft	4	8
Canopy Bulk Density kg/m3	0.081	0.048

Fire behavior predictions for moderate, high, and severe weather conditions indicate reduced probability of torching, percent mortality of basal area, and fire type. Stronger winds will be needed to generate tree torching and crown fire (see torching and crowning indices). Predicted flame lengths are greater with a grass fuel model post-treatment than

they were with a timber litter model pre-treatment. Potential smoke emissions are also greater post treatment.

	PRE-TREATMENT			POST-TREATMENT		
	Mod. 75 th %	High 90 th %	Severe 97 th %	Mod. 75 th %	High 90 th %	Severe 97 th %
Surface Flame Length, ft	1.7	4.1	4.8	3.5	5.4	6.7
Fire Type	Surface Fire	Passive Crown Fire	Passive Crown Fire	Surface Fire	Surface Fire	Passive Crown Fire
Probability of Torching	27%	100%	100%	82%	93%	96%
Torching Index, mph	6.1	5.9	5.7	10.3	9	9
Crowning Index, mph	27.1	27.5	27	39.7	40.3	39.6
Potential mortality, % of BA	54%	93%	99%	44%	76%	94%
Potential Smoke tons per acre <2.5	0.13	0.20	0.20	0.27	0.29	0.30

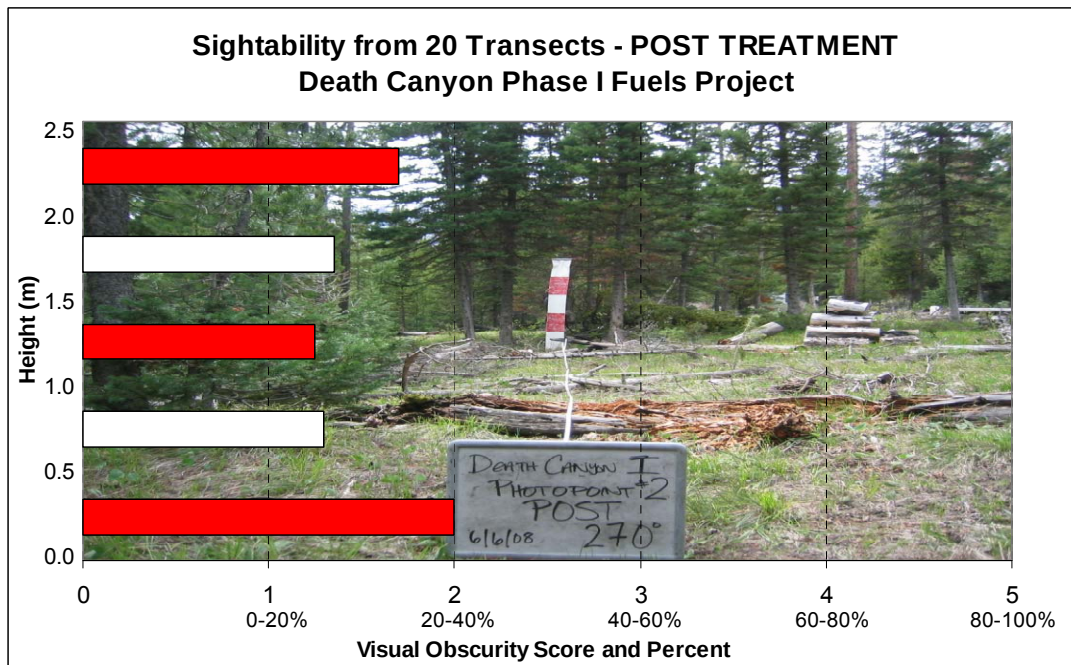
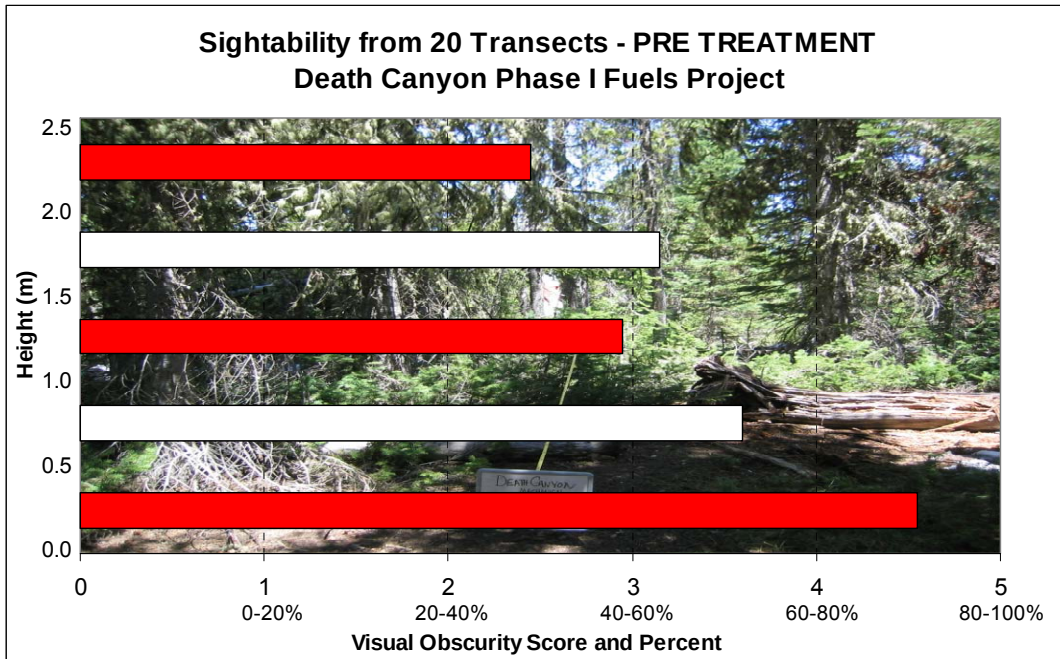
Photopoints taken in the Death Canyon project show that removal of small conifers and limbing of larger ones has removed ladder fuels in the understory and improved sightability. Note the red and white sightability board is visible in the post treatment photo but completely obscured in the pre treatment photo.



Photopoint DC02: 360°, pre-treatment

The same location post-treatment

The following graphs show the average visual obscurity at five height levels from the sightability transects pre and post treatment. The results indicate that ladder fuels have been drastically reduced.



Death Canyon Phase III Mechanical Thinning

The Teton Interagency Fuels Crew began treating the 14-acre Death Canyon Phase III thinning project in the summer of 2008. Prior to project initiation, the Teton Interagency Fuels and Fire Effects Crews collected pre-treatment monitoring.

As with all GRTE fuels projects in the wildland urban interface, the goals of this mechanical thinning project are to reduce fuels around wildland interface areas to create defensible space, and improve firefighter and public safety by increasing fire containment opportunities during wildland fire events. In this case, the travel along the Death Canyon road and the associated trailhead development are the values at risk. Objectives for the mechanical treatment are as follows

- Reduce dead and down fuel loading to 10 tons per acre
- Remove all ladder fuels (limb trees, remove conifer regeneration)
- Increase tree spacing distance to 10-12 feet (1500 stems per acre) between trees or groups of trees.

Treatment methods include limbing and felling trees with chain saws and subsequently burning the slash in piles. Monitoring methods used to evaluate project effectiveness include modeling fuels and fire behavior using the Forest Vegetation Simulator (FVS) Fire and Fuels Extension (FFE) program, as well as sightability transects that give an indication of ladder fuels. FVS inputs use Common Stand Exam data, so ten of these plots were conducted. Sightability transects were co-located with Brown's planar intercept fuels transects at each of these plots.

The fuel loading summary for Death Canyon Phase III pre-treatment is summarized in the table, below:

Fuel Model	FM8 91%, FM10 9%
Litter Tons/ac	.95
Duff Tons/ac	10
1, 10, & 100 Hour Fuels Tons/ac	2.4
1000 hour Fuels Tons/ac	9.4
Total Woody Fuels Tons/ac	11.8
Canopy base Height, ft	3
Canopy Bulk Density kg/m3	0.047

This unit did not have particularly heavy downed woody fuel loading pre-burn, however it is located very close to the Whitegrass Ranch, where unwanted fire could endanger several historic buildings. Predicted fire behavior for moderate and severe fire weather conditions are summarized below:

	Moderate 75th %	Severe 97th %
Surface Flame Length, ft	0.7	2
Fire Type	Surface Fire	Surface Fire
Probability of Torching	100%	100%
Torching Index, mph	38.1	35.3
Crowning Index, mph	39.9	39.8
Potential mortality, % of BA	50%	51%
Potential Smoke tons per acre <2.5	.18	0.20

Note that the torching and crowning indices refer to the wind speed required to initiate torching or crowning. While the indices require high winds, the probability of torching is 100% even under average winds of 8.2 (moderate) and 15.8 (severe) miles per hour.

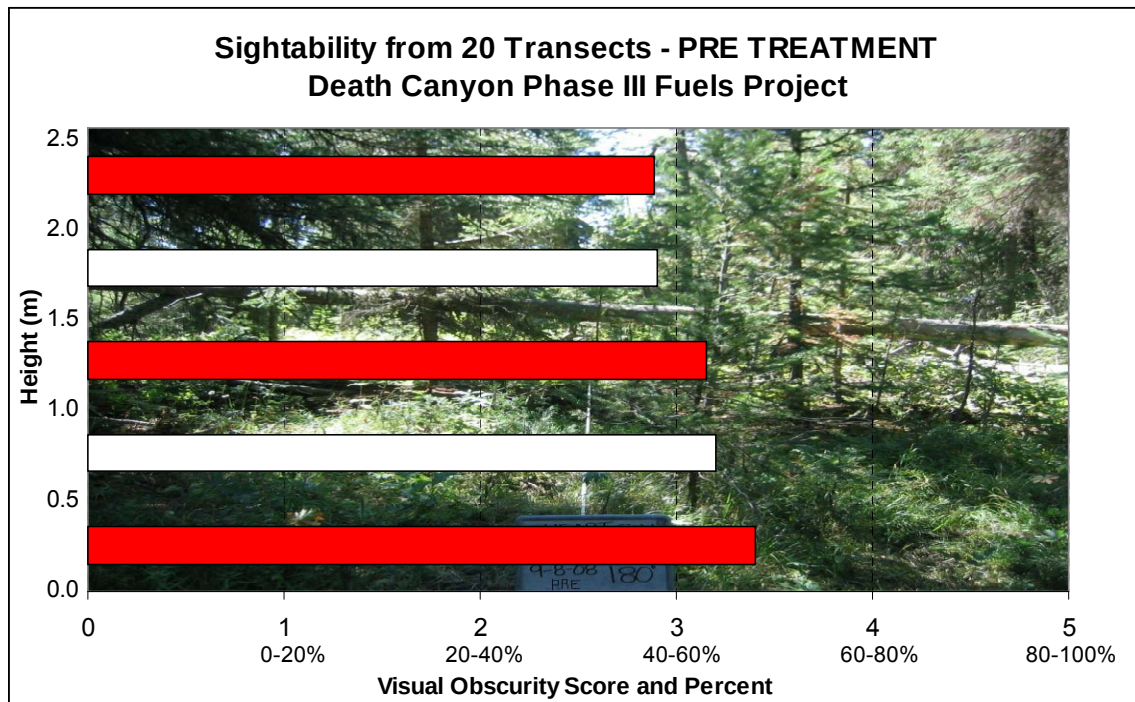
Photopoints taken in the Death Canyon Phase III pre-treatment barely show the 2m x .5m red and white sightability board located 50 feet from the camera location:



Death Canyon Photo DC04 270 pre treatment

Death Canyon Photo DC04 180 pre treatment

Sightability measurements made at all 10 plots using this board averaged around 40% obscuration. This is measured as a way to indicate change in the presence of ladder fuels.



Antelope South Prescribed Burn

Antelope South is a sagebrush unit located in Antelope Flats, north of the Blacktail Unit C and South Gros Ventre burns. Three FMH plots with shrub density belts and point intercept vegetation transects were installed pre-burn in 1998. The plots were then monitored pre-, immediate post, YR01, YR02, YR05, and YR10, which was read this year. In the YR05 visit, a line intercept protocol was added to monitor shrub cover in addition to density.

Monitoring objectives from the original FMH-4 are somewhat general and often only target vegetation change through YR02. A new monitoring plan is currently being developed to reflect current interests in vegetative change at the site. This year, analysis focused on changes in shrub density, in shrub, forb and grass cover, and in non-native grasses and forbs.

The following objectives reflect the original 1998 programmatic approach for sagebrush in GRTE.

Fire Management Objectives

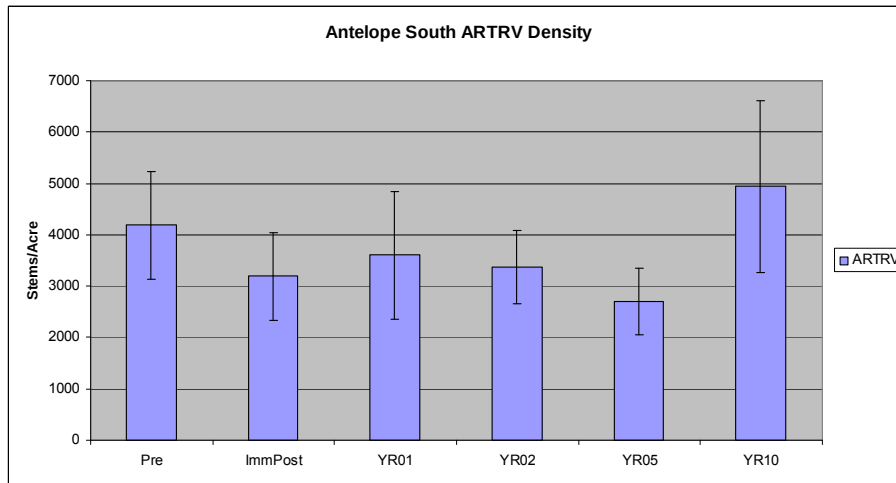
- In the burned portion, reduce total live sagebrush cover and density by a minimum of 60%.
- In the burned portion, obtain a post fire severity rating of 3 or less.
- Increase post fire grass cover by at least 25%.
- Increase forb species diversity and percent cover by 25%.

Monitoring Objectives

- Detect, with a 90% certainty, a 40% reduction in sagebrush density and cover from pre-burn to year two, with the acceptance of a 20% chance that we will say a change took place when it did not.
- Detect, with 90% certainty, a 10% increase in total native grass cover from pre-burn to year two, with the acceptance of a one in five chance that we will say a change took place when it did not.
- Detect, with an 80% certainty, a 10% increase in total native forb cover from pre-burn to year two, with the acceptance of a one in five chance that we will say a change took place when it did not.
- Detect, with 80% certainty, a mean post fire severity rating of <3 in burned plots with a standard error less than (undetermined)%.

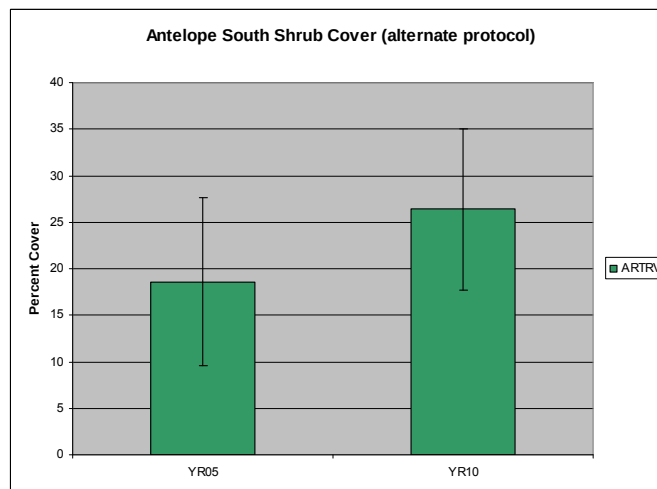
Shrub Density

Only *Artemisia tridentata* var. *vaseyana* was observed for brush species on these plots. It was not possible to detect change with 80% statistical certainty (changed from the original objective of 90% certainty), and the means themselves are variable between reads without indicating any real trends. Shrub density in YR10 is similar to the pre-read. The lack of detectable change is likely due to the fact that these plots did not burn very severely. Severity data was not collected for these plots but slides taken immediately post-burn show low severity.



Shrub Cover

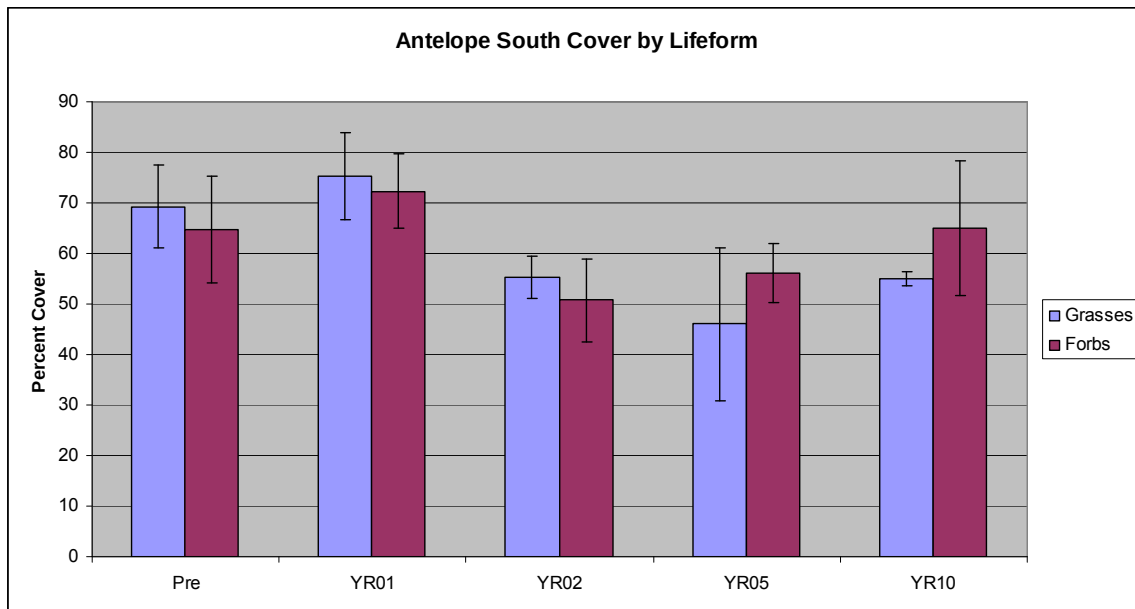
In YR05 (2003), it was determined that density belts were inadequately assessing shrub recovery in this area. In that year a line-intercept protocol was added to measure shrub cover on all three plots. This protocol was re-read in YR10 and will continue to be read during future monitoring. Unfortunately, the wide error bars shown below show that a statistically significant change could not be detected. Again, given the low severity burn, the lack of much change in a sagebrush community between YR05 and YR10 is not unreasonable. This measure is likely to prove more interesting into the future.



Forb and Grass Cover

Forb and grass cover was monitored using point intercept transects. As demonstrated by the overlap of error bars in the chart below, it was not possible to detect statistically significant changes in forbs between the pre-read and YR10, perhaps reflecting that the distribution of cover by lifeform is returning to conditions similar to its pre-burn state. Given the low intensity of this burn, it would not be unreasonable for these distributions to recover in ten years.

Only grass cover remains significantly lower in YR10 than pre-burn. In addition, while not statistically significant, there is a trend in the mean data that suggests a spike in forb and grass cover in YR01 that was subsequently reduced. This first year spike in herbaceous cover, followed by a slight decline, is consistent with vegetative behavior in other burned areas.

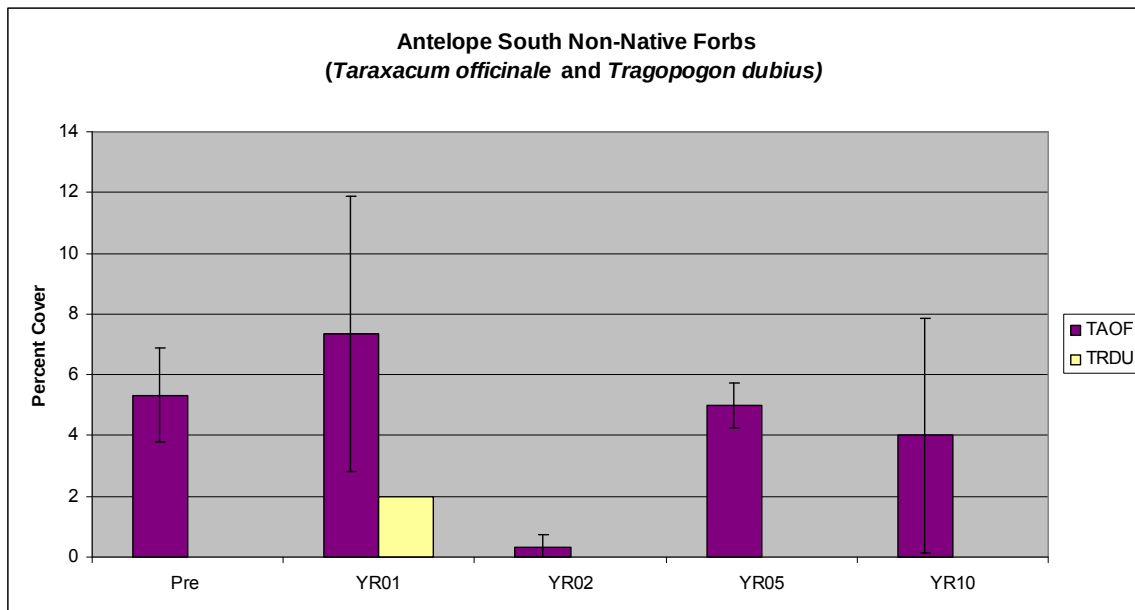


Non-Native Grass and Forb Cover

While non-native grasses and forbs were analyzed, no statistically significant trends could be detected. For grasses, the non-native *Poa compressa* does not appear until YR02 and its cover is then variable from then on. For the pre and YR01 reads, the native *Poa cusickii* was observed. It seems unlikely that *Poa cusickii* would vanish from the plot and *Poa compressa*, a common invasive grass in the area, would not appear at all until YR02. It seems likely that there were problems with *Poa* identification in the past; due to this uncertainty about the grass data, it is not possible to make conclusions about changes in native grass cover.

Non-native forbs observed included *Taraxacum officinale*, found on most of the plots for most reads, and *Tragopogon dubius*, which was only found on one plot in YR01. A statistically significant difference in *Taraxacum officinale* was not detectable pre- and

post-burn, suggesting that the light severity burn did not necessarily encourage an increase in this exotic.



The three plots in Antelope South show that the plant community and fuels conditions have not experienced any detectable, significant changes, which is to be expected given the low severity of the treatment. The monitoring results of this project support the idea that higher severity burns are needed to produce real vegetative changes on the landscape. Unfortunately, quantifiable severity measurements were not taken, so it is not possible to make quantitative recommendations on how low is “too” low in terms of severity. Rather, this project serves as anecdotal evidence that should be used in conjunction with other project findings.

Timbered Island RX

Timbered Island is a 235 acre unit northeast of Moose, WY that burned in spring of 2003. As its name applies, it is an elevated island of mixed conifer in a sea of sagebrush flats. The unit is primarily dominated by *Pinus contorta* with stands of *Pseudotsuga menziesii*, both with components of *Abies lasiocarpa*. Due to fire suppression, fuel loadings and shade-tolerant *Abies lasiocarpa* are increasing, as is stand density. In order to monitor stands of *Pinus contorta*, three FMH forest plots were installed. In order to monitor stands of *Pseudotsuga menziesii*, one plot was installed within this unit.

Due to the presence of two different stand types, two FMH-4s with burn objectives were originally developed for the project in 1999. These objectives are very similar, changing only slightly in desired percentage ranges. Most of the data presented here was analyzed using all four plots, but where objectives were markedly different they were analyzed

separately. In addition, it is noted any time unusual or interesting changes occurred in one plot type versus the other.

Objectives designated in the FMH-4s were as follows:

Fire Management Objectives

Variable	PICO (3 plots)	PSME (1 plot)
Fuels	Reduce total fuel load by 40-60% one year post-burn.	Reduce total fuel load by 40-80% 1 year post-burn.
Poles and Seedlings	Reduce understory pole and seedling density by 40-60% within two years post-burn.	Reduce pole tree density by 10 - 20% within two years post-burn.
Overstory Trees	Reduce lodgepole pine overstory trees by 20-80%	Limit the reduction/mortality of 50+cm dbh overstory trees to <20% within two years post-burn.

Fire Monitoring Objectives

Variable	PICO	PSME
Fuels	Detect with 80% certainty that at least a 40% reduction of dead and down fuel one year post-burn.	Detect with 90% certainty that a 40 to 80% reduction of dead and down woody fuel loading has occurred 1 year post-burn to be within 25% of the population mean.
Poles and Seedlings	Detect with 80% certainty that a 40% reduction of pole and seedling tree density has occurred two years post-burn.	Detect with 80% certainty that a 20 to 40% reduction of pole size trees occurred two years post-burn to be within 25% of the population mean.
Overstory Trees	Detect with 80% certainty that a minimum detectable 20% reduction of lodgepole pine overstory tree density has occurred two years post-burn.	Detect with 90% certainty that there is not greater than a 30% reduction in overstory trees two years post-burn to be within 25% of the population mean.

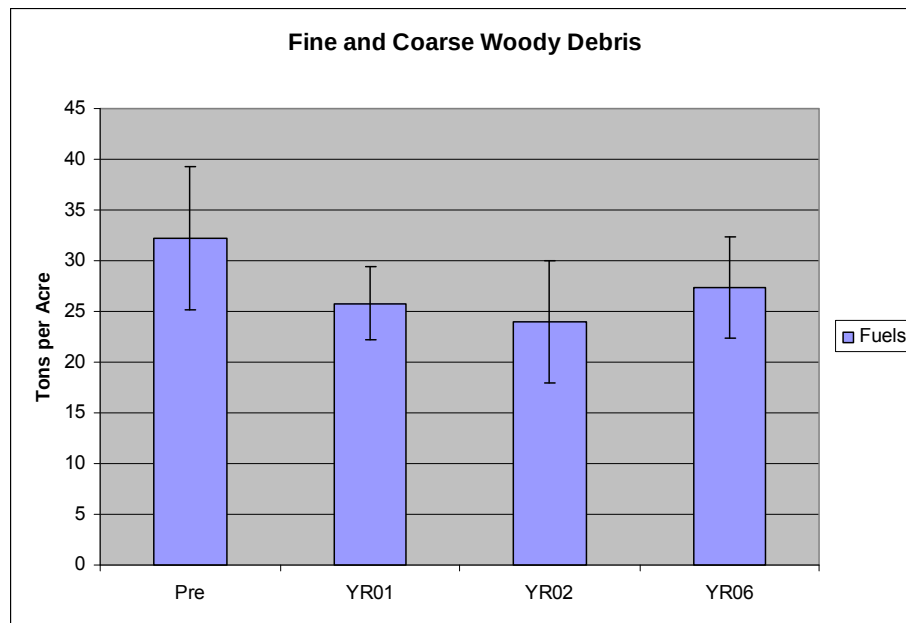
Because most of the monitoring objectives only targeted changes within one or two years post-burn, and because standards for writing objectives have changed over time, this project is currently being re-visited. Either new monitoring objectives will be written or the project will be considered complete.

Fuels

Fuel loads were measured using four Brown's transects at each of the four plots to calculate fuel loading in tons per acre. Analyzing all four plots, a change could not be

detected with 80% certainty to have occurred. Separating the plots by forest type does not demonstrate significant changes either.

The inability to detect significant change when analyzing all four plots or just the PICO plots is partly due to one of the PICO plots, which had exceptionally large numbers of heavy fuels pre- and post-burn. Removing that plot from the dataset did result in the detection of a significant change post-burn, but that change amounted to a reduction of only 13.1%, which is still far below objectives.

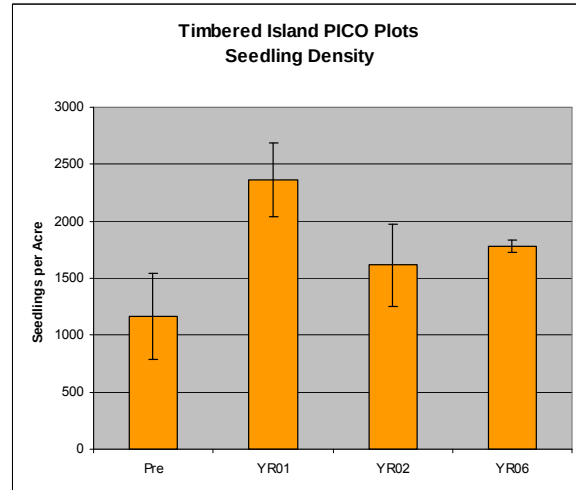
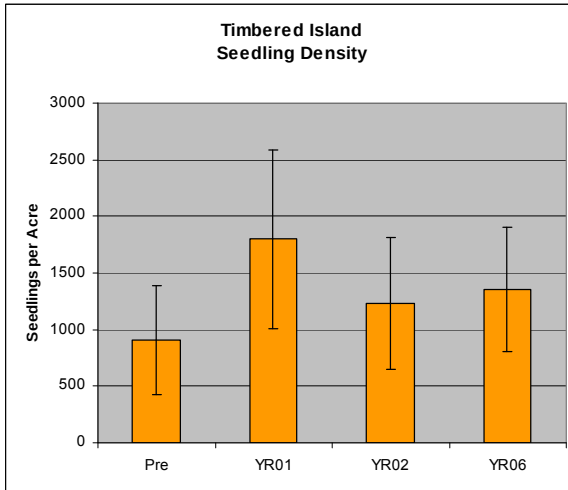


Seedlings

Seedlings were sampled in one quadrat in each PICO plot and in two quadrats in the PSME plot, where objectives called for a reduction in density of 40% and 20-40%, respectively, by YR02. A statistically significant change could not be detected for densities when analyzed together.

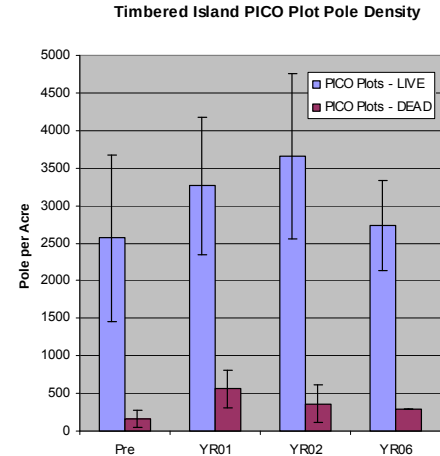
PICO plots alone, however, showed a marked, statistically significant increase of 102.8% in seedlings during YR01, escalating from an average of 1166 +/- 664 seedlings per acre to 2363 +/- 567 seedlings per acre. This average decreased again in YR02, but a significant increase remains observable between Pre and YR06 reads. Seedlings in YR06 were still 52.8% higher than before burning. The objective to decrease seedling density was not met.

Seedling density in the sole PSME plot decreased by 25%. While this is within the desired 20-40% reduction, one plot does not provide a statistically valid inference.



Pole-size Trees

Pole trees, defined as 2.5-15 cm DBH, were sampled in one quadrat in each PICO plot and in two quadrats in the PSME plot. Objectives called for a reduction in density of 40% and 20-40%, respectively, by YR02. Again, a statistically significant change could not be detected for live pole densities when analyzed together, which suggests that objectives were not met.

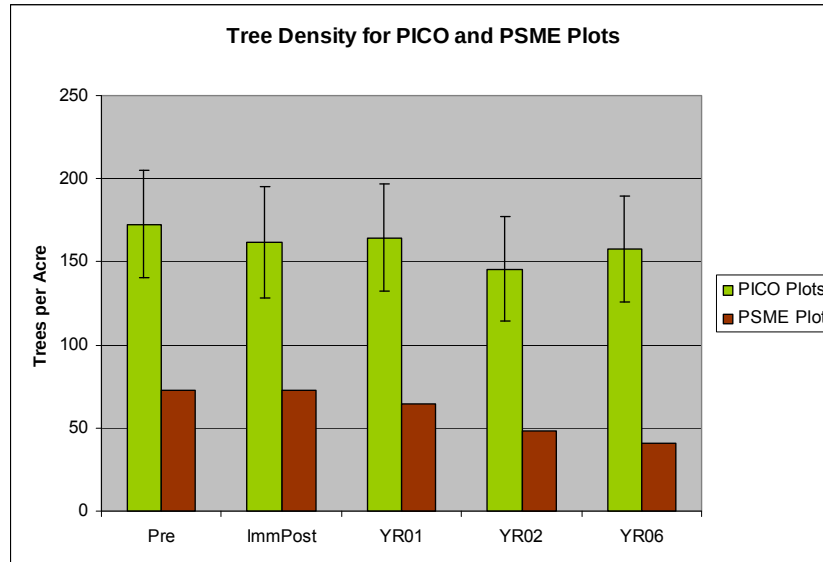


A significant increase in dead pole densities was detected in YR01 and YR06 amongst PICO plots, suggesting that pole-size trees were killed by fire. The increase in mean for live poles is likely a result of the growth of seedlings that moved into the pole category. The PSME plot exhibited a delayed 50.0% pole mortality.

While the YR02 objectives to reduce pole density were not met, the increasing pole mortality suggests at least that some change was made to the strata.

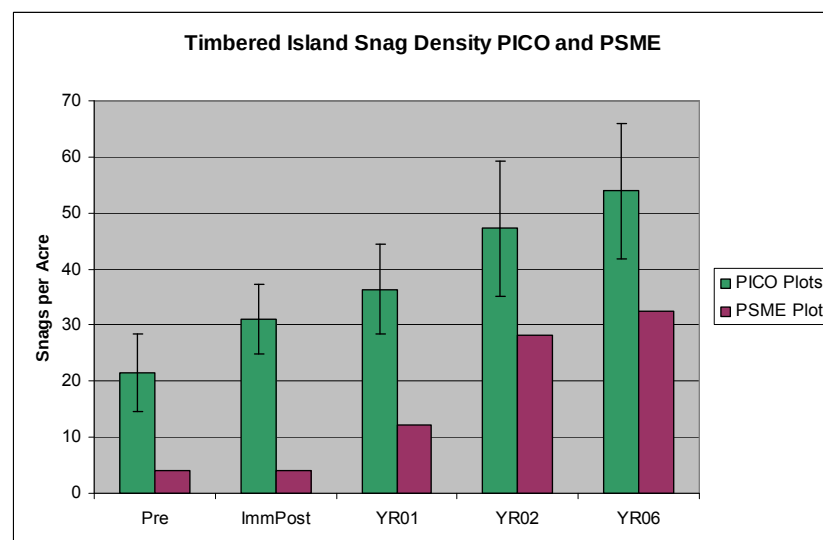
Overstory Trees

Overstory trees, defined as being greater than 15 cm DBH, were sampled in all four quadrats on all plots. Objectives called for a reduction in overstory tree density of 20% in PICO stands and 30% in PSME stands by YR02. Statistically significant differences in tree density could not be detected post-burn for PICO plots, and only a small reduction in tree density occurred at the one PSME plot

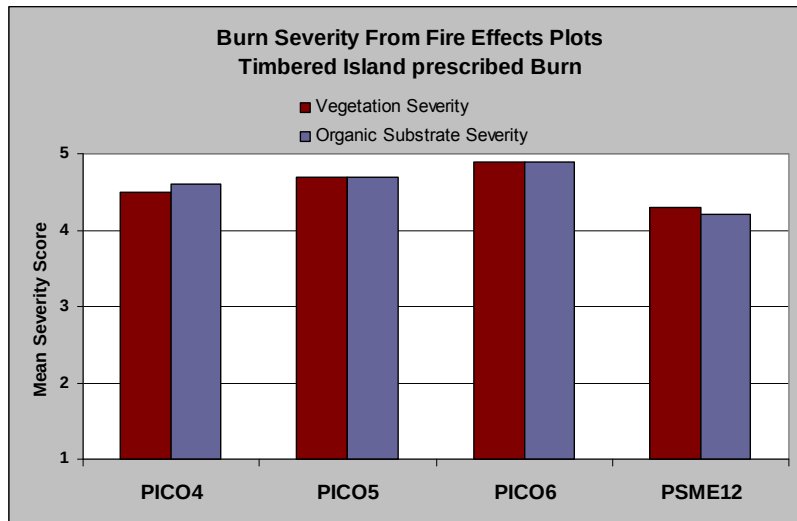


Interestingly, snag densities increased dramatically over time, as a result of delayed mortality. As shown in the chart below, there was a 118.7% increase in snags per acre in PICO plots by YR02, and a 149.7% increase by YR06. These snags are an important variable for several reasons. In and of themselves, they are likely valuable habitat trees for wildlife. In addition, canopy cover may reduce over time as a result of dead tree fall, and the loss of needles on many of the trees may have already begun to open up the canopy.

The PSME plot exhibited a large increase in snag density through YR06, but it is important to recall that this is actually from only one plot. That specific plot had 17 live overstory trees pre-burn, 7 of which were dead by YR06; four of the seven died in YR02. Much of this is likely to due to delayed mortality, though the timing also coincides with a regional outbreak in Douglas fir beetle. These beetles are known to prefer trees with scorched foliage and so the burn may have provided more opportunity for attack. Specific data on exact causes of mortality for each tree was not taken, however.



While the overstory tree density objective was not met, the increase in tree mortality suggests a likely reduction in canopy closure, which can be understood as a related objective. While the burn has not achieved many of the project objectives, this is one area that was met with some success.



Burn Severity Rating: 5=unburned, 4=scorched, 3=lightly burned, 2=moderately burned, 1=heavily burned

Finally, burn severity was assessed during the immediate post-burn visit in 2003. All of the plots were rated between “lightly scorched” and “unburned.” Overall, the Timbered Island monitoring data suggest that little change has taken place for all variables, which is likely a direct result of the light burn severity shown here.

Wolff Ridge Aspen Sucker Monitoring

The Wolff Ridge prescribed burn was implemented in the fall of 2002, in sagebrush, aspen, and lodgepole pine vegetation. Several FMH forest-style plots were used to monitor programmatic objectives; however additional statistically significant data was needed to track aspen response under conditions of heavy ungulate browse pressure. In the winter of 2003-2004, an electric fence was installed to exclude ungulates from a portion of the burned aspen. The Fire Effects Crew and colleagues from the Wyoming Game & Fish Brucellosis Feedground Habitat Program used randomly-located circular density plots to compare sucker density, height, and browse status within the fence and in an adjacent control area. The fence was not successful in excluding ungulates, and it was difficult to maintain its efficacy in deep snow, which resulted in its removal in 2005. Aspen monitoring has continued every year since then, with the formerly-fenced and control areas now lumped together.

The objective addressed by this monitoring is as follows, “Attain 1000 live aspen suckers (<15cm dbh) per acre in burned aspen areas ≥ 10 feet tall within 10 years post-burn.”

In June of 2008, aspen regeneration was once again monitored at Wolff Ridge. Live suckers were sampled in 100th acre circular plots. In addition, two permanent photo

points were retaken, one that was once inside the electric fence, and one that was in the control area.

As was found in previous years, some areas of the burn have taller aspen suckers and apparently less browsing than others. It is likely that this difference is related to growing site quality and snow deposition as well as wildlife utilization. As the photographs below show, aspen in some parts of the burned area are quite dense and tall, after 6 growing seasons.

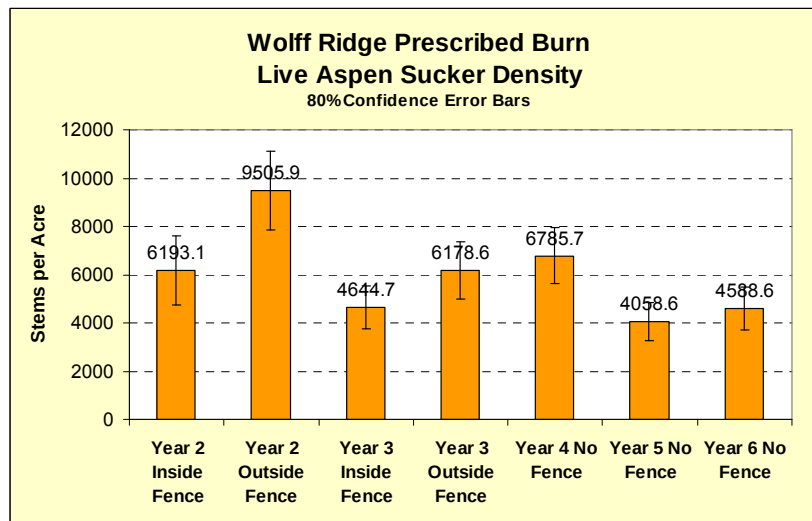
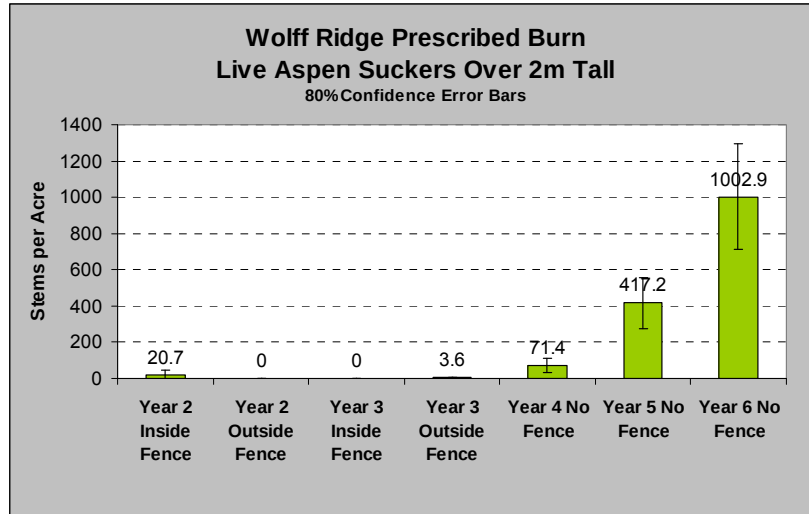


Summer 2008 aspen growth at Wolff Ridge

Close-up view of aspen stand burned in 2002

Aspen density and browse is measured in random locations within burned aspen clones only. Interspersed sagebrush or meadow areas with no evidence of aspen in the past or present are not included. The 2008 estimate for density of aspen suckers with 80% confidence is 4588.6 ± 898.5 stems per acre. Of these stems, 25.1% were browsed. In 2004, when the fence was in place, browsing in the unfenced area was estimated to be 40.4%, and within the fence it was 27.0%. It is likely that wolves wintering recently in the Wolff Ridge area and heavy snowfall combined to reduce browsing on aspen in recent years.

The average density for aspen suckers over 2 meters in height in 2008 was 1002.9 ± 295.2 stems per acre, which comes very close to the objective of 1000 per acre ten years post-burn. Next time this data is collected, sampling will target 80% confidence for the suckers over 2 meters in height. In 2008 the 1-2 meter aspen height class was estimated to have 2631.4 ± 545.3 stems per acre, which indicates potential for meeting the 10-year aspen objectives in 2009 (only 7 years post-burn). Overall, aspen density in the burned area has declined somewhat over time, which is expected with natural competition.



Two example permanent photopoint retakes are included here to show patterns of aspen regeneration. The site that had been inside the fence has experienced marked growth, while the control site has much sparser, shorter aspen. The differences may be related to the fence that was in place for two winters, but likely also result from site characteristics.



Photo WRIN 270° inside the electric fence in 2004



The same scene in 2008

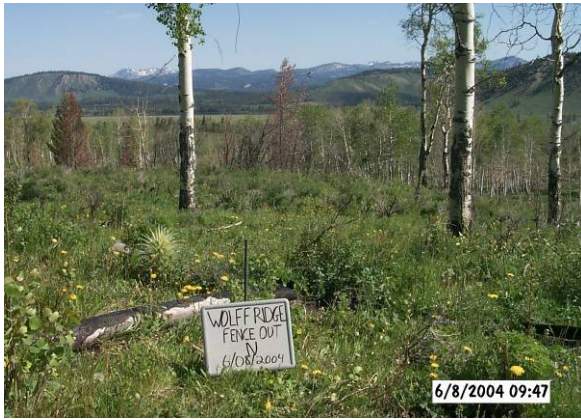


Photo WROUT 360° outside the electric fence in 2004



The same scene in 2008

Eynon Ridge Aspen YR02 Post-burn monitoring

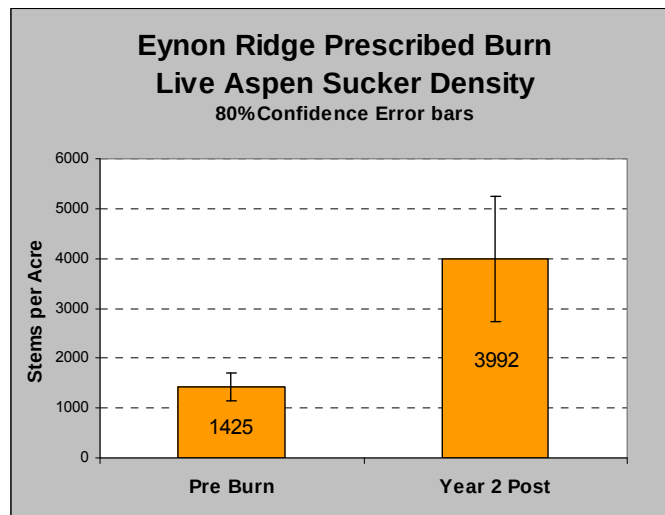
The Eynon Ridge prescribed burn project was a collaborative effort between Teton Interagency Fire and the Jackson Interagency Habitat Initiative, a local interagency working group. The 806-acre project combined mechanical thinning and prescribed burning treatments. Mechanical thinning was completed in areas of conifer-encroached aspen in 2005. Felled trees were left to cure for one year in order to create an additional fuel bed to encourage increased fire behavior during the prescribed burn. The prescribed burn was completed in the fall of 2006.

Burn goals were focused on aspen and mixed-conifer vegetation types. Specific vegetation objectives, taken directly from the burn plan, include:

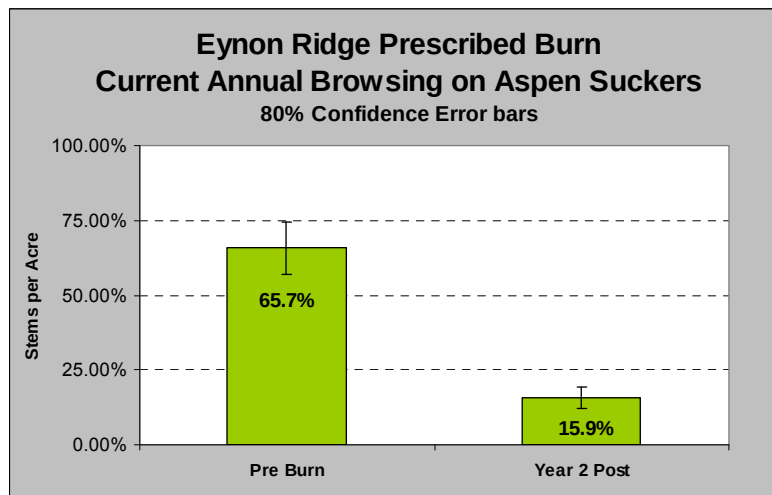
- Create disturbances which mimic natural fire severity in Douglas fir stands within the project area.
- Use prescribed fire to simulate a natural fire occurrence within conifer encroached aspen stands in order to restore fire to former aspen communities as a way to maintain these communities within the landscape by setting succession back to an early seral stage.

In 2008, post-burn aspen monitoring was conducted in a designated stand, where pre-burn data had been collected in 2005. Non-permanent circular density plots were used to estimate live aspen sucker and overstory tree density, as well as conifer tree density. These plots were randomly located with a sample size sufficient for 80% confidence on aspen sucker density.

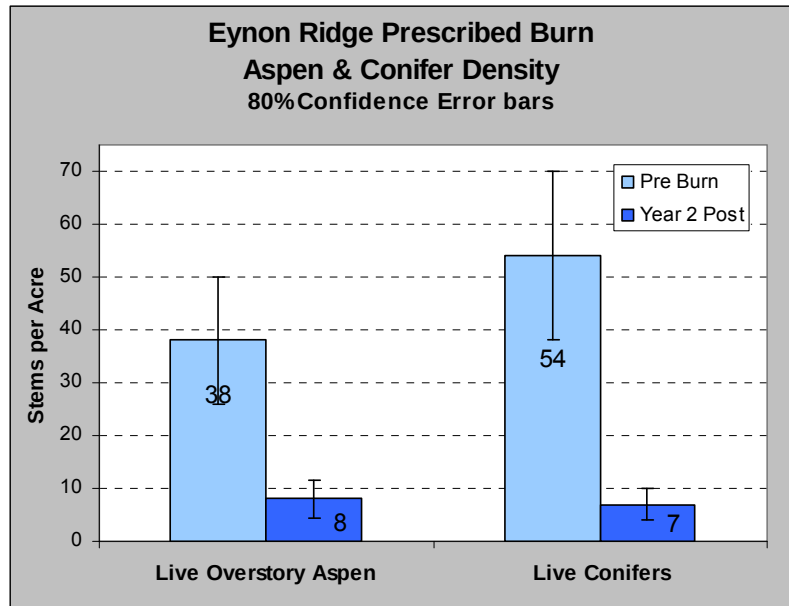
According to the aspen data, average live sucker density increased by an average of 180.1%, from 1425 stems per acre to nearly 4000. Aspen suckers were tallied by height classes (0-3, 3-6, 6-10, and 10+ feet tall). The most common (mode) height class was 0-3ft both pre-burn and post-burn.



The average current annual percent browsing on terminal leaders was 65.7% $\pm$ 18.8% pre-burn (measured in 2005) and only 15.9% $\pm$ 3.5% post-burn. This indicates a drastic reduction in ungulate impacts to the aspen community. Similar trends have been noted in recent years at the nearby Wolff Ridge prescribed burn. The presence of a wolf pack in winter, coupled with record snow accumulation in 2007-2008 may be responsible for this browse decrease.



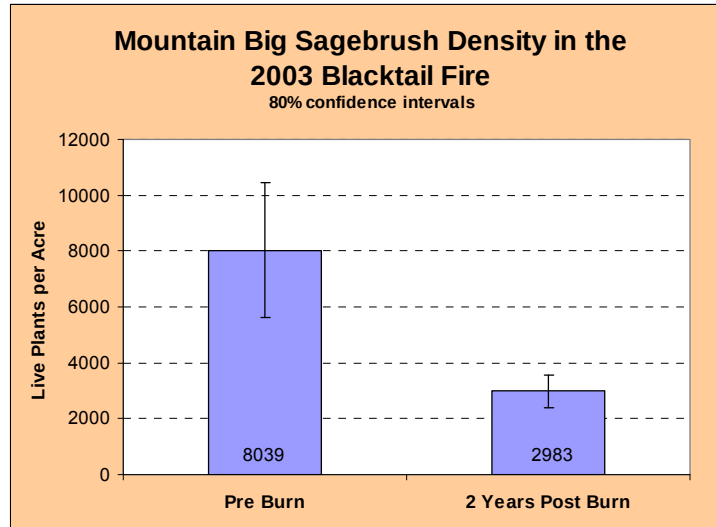
Conifer and overstory aspen density data was also collected in the aspen stand at Eynon Ridge. Density of all live conifers (seedlings, poles, and overstory trees) decreased by 87.0%, while live overstory aspen stems per acre declined 78.9%. These significant reductions were due to both mechanical felling and fire.



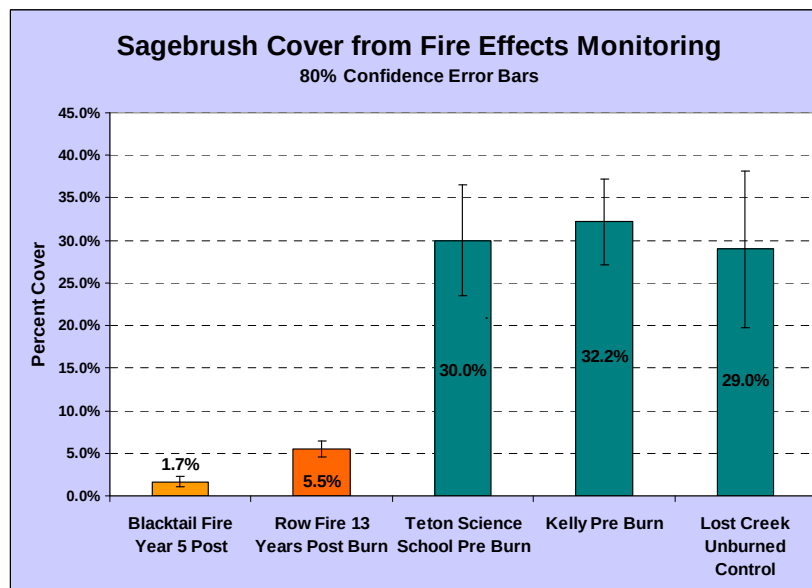
Blacktail Fire Sagebrush Monitoring

Over 3000 acres of sagebrush vegetation to the south of Blacktail Butte were burned as a result of a naturally-caused wildfire in August, 2003. The wind-driven fire burned rapidly and consumed nearly all of the vegetation down to the soil level. Firefighters were able to conduct a burnout operation where fuels were converted to a grass type by the 1998 Gros Ventre South prescribed burn. This prevented the Blacktail fire from spreading onto the Butte. In 2005 the fire effects crew began to monitor the return of sagebrush to the site.

Live mature sagebrush density was estimated in 2005 (two years post-burn) using randomly-located circular plots. All plants, including the smallest seedlings, were counted. Live mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) density averaged 2983 +/- 600 stems per acre (80% confidence). Pre-burn sagebrush density information is less statistically useful (several shrub belts from FMH plots averaged 8039 +/- 2043 stems per acre). This data would give the Blacktail fire area one of the highest density levels found in the park, nearly twice the amount of other monitored projects including pre-burn Kelly (3945 +/- 1956 stems per acre), the Teton Science School (5733 +/- 2078), and Lost Creek (4760 +/- 345).



According to the 2005 monitoring data, sagebrush density is recovering rapidly. Many of these plants are tiny seedlings, however, which have uncertain survival rates. Shrub density is therefore a somewhat misleading measure of recovery. Furthermore, it is difficult to monitor density consistently because it is often impossible to determine individual plants (versus clumps of stems from the same plant). In addition, the percent cover and height of sagebrush is perhaps more important to determine habitat values for wildlife such as sage grouse. In 2008, the fire effects crew revisited the Row Fire to measure these attributes of sagebrush re-establishment five years post-burn. Randomly-located 50-meter line intercept transects were measured in the burned area. The results showed an average of 1.7% +/- 0.6 percent cover. The average height of 169 plants encountered was 24.3 centimeters. The following diagram shows this in comparison to the nearby Row Fire, which burned 13 years ago, as well as pre-burn percent cover from three prescribed burn areas in the park. Control data will be gathered in 2010 (15 years post-burn).



Sagebrush is beginning to return to the Blacktail Fire area, as shown in the photographs taken at FMH plots located there. The density and cover data illustrate that there are certainly adequate sagebrush seed sources. It is not known how long full recovery will take, but the monitoring effort will be repeated every five years.



A 2001 Photopoint, pre-fire

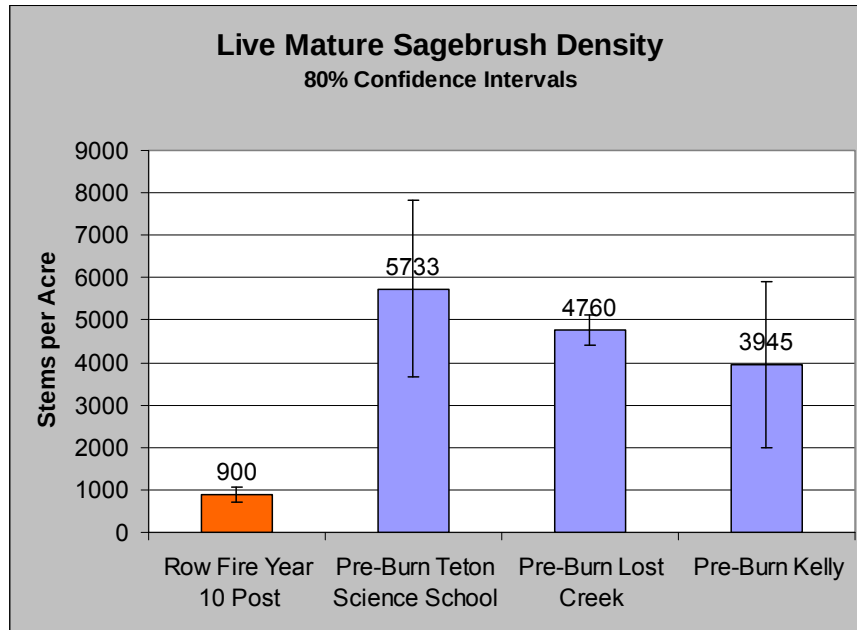


YR05, post-burn

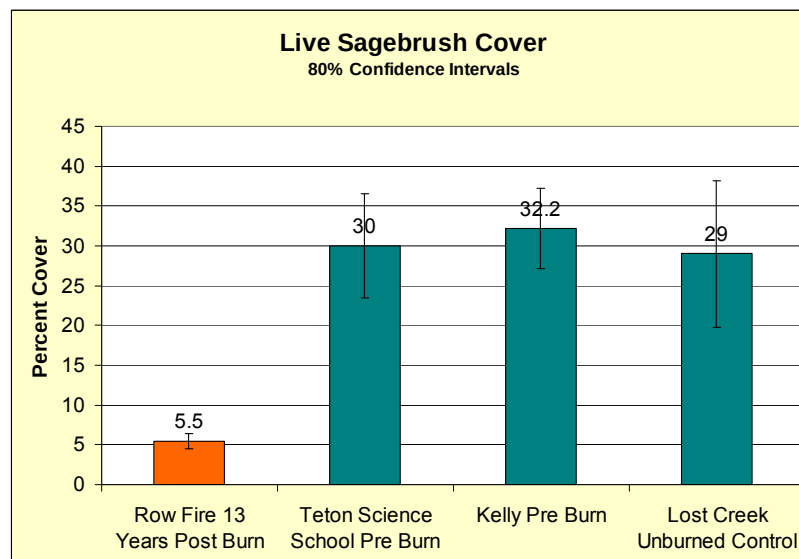
Row Fire Sagebrush Monitoring

Over 3000 acres of sagebrush vegetation on the south end of Antelope Flats were burned as a result of a naturally-caused wildfire in August, 1994. The wind-driven fire burned rapidly and consumed nearly all of the vegetation down to the soil level. In 2005, the Fire Effects Crew began to monitor the return of sagebrush to the site, first by looking at density; and in 2008 they began to monitor percent cover.

Live mature sagebrush density estimation in 2005 (ten growing seasons post-burn) used randomly-located circular plots. Only plants over 15cm in height were counted. Mature sagebrush in the burned area was found to have a density of 900 stems per acre (+/- 173 at 80% confidence). Nearby pre-burn sagebrush data from the Teton Science School, Lost Creek and Kelly prescribed burn areas included in the diagram below for comparison. The sagebrush communities at the three sites are somewhat different, however the data illustrate that density of mature plants is much lower than the levels of long-unburned areas.



Shrub density is difficult to monitor consistently because it is often difficult to determine individual plants, versus clumps of the same species. In addition, the percent cover and height of sagebrush is perhaps more important to determine habitat values for wildlife such as sage grouse. In 2008, the fire effects crew revisited the Row Fire to measure these attributes of sagebrush re-establishment. Fifty-two randomly-located line intercept transects were measured in the burned area. The results showed an average of 5.45 +/- .95 percent cover 13 growing seasons post-burn. The average height of 169 plants encountered was 70.1 centimeters. There is no pre-burn data for comparison, however pre-burn sagebrush percent cover measured using line intercept transects at Teton Science School, Lost Creek, and Kelly show sagebrush percent cover near 30%. Control data will be gathered from a comparable location in 2010 (15 growing seasons post-burn).



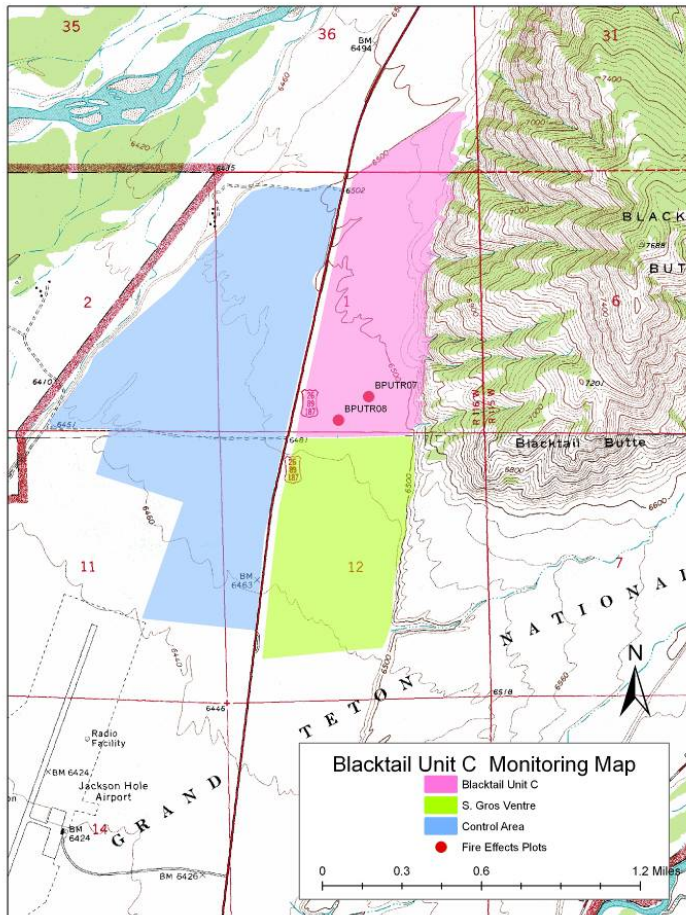
Sagebrush is evidently returning to the Row Fire area, as shown in the photographs taken at a permanently marked location during 2005 and 2008. The density and cover data illustrates some progress toward achieving pre-burn conditions 10 and 13 growing seasons later. This monitoring effort will be repeated every five years to help track sagebrush recovery over time.



Row Fire, Year 11 (10 growing seasons) post-burn

Year 14 (13 growing seasons) post-burn

Blacktail Unit C and Gros Ventre South Prescribed Fire



Blacktail Unit C is a 278 acre sagebrush and bitterbrush unit that was burned in the spring of 1998. Gros Ventre South is a 242 acre unit of similar vegetation that was burned in the fall of that same year, and is located to the south and southeast of Unit C. Within Gros Ventre South, the area immediately to the south of Unit C has a bitterbrush component. Because of bitterbrush's importance to moose and other wildlife, monitoring bitterbrush recovery in this area began in 2008. Monitoring focused on these two areas and a control area to the west.

Monitoring has been ongoing in Unit C, beginning with a pre-read in 1997. This monitoring focuses on brush density plots with photopoints. In the area of interest within South Gros Ventre there is no monitoring history.

The remainder of the Gros Ventre South unit, which stretches eastward, south of Blacktail Butte, was re-burned in the 2003 Blacktail Fire. Monitoring of sagebrush recovery in that unit is discussed under the "Blacktail Fire" section later in this document.

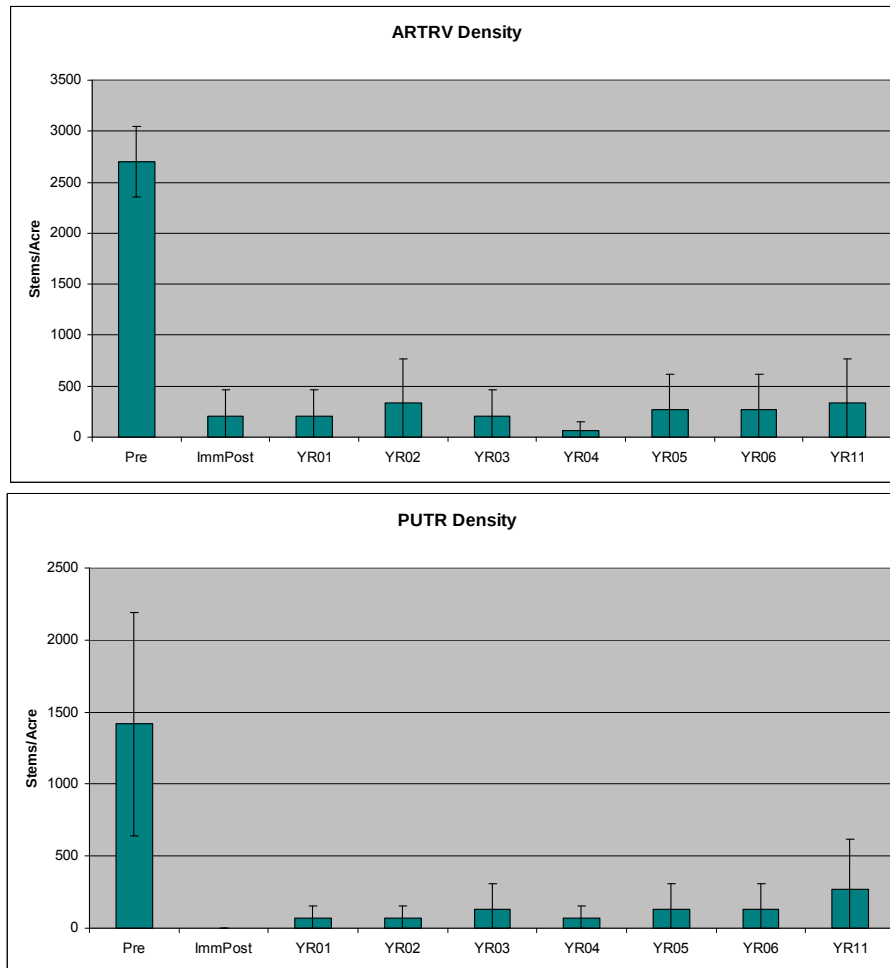
Specific objectives for monitoring antelope bitterbrush in Blacktail Unit C and Gros Ventre South are as follows:

- Detect the recovery of antelope bitterbrush (*Purshia tridentata*) and sagebrush (*Artemisia tridentata sub. vaseyana*) density in the burned areas and adjacent unburned control following the prescribed burns.
- Detect the recovery of antelope bitterbrush (*Purshia tridentata*) and sagebrush (*Artemisia tridentata sub. vaseyana*) percent cover in the burned areas and adjacent unburned control following the prescribed burns.

Brush Density

Sagebrush and bitterbrush density are being monitored in density belts on two FMH plots. While there has been a statistically significant reduction in sagebrush and bitterbrush cover post-burn, it has not been possible to detect post-burn recovery rates of

either species with statistical confidence. This difficulty is due in part to the small sample size, exacerbated by total mortality without recovery at one of the two plots. This variability between data sets causes the wide error bars. In addition, it is possible that recovery is too slow and patchy to be detected by two plots.



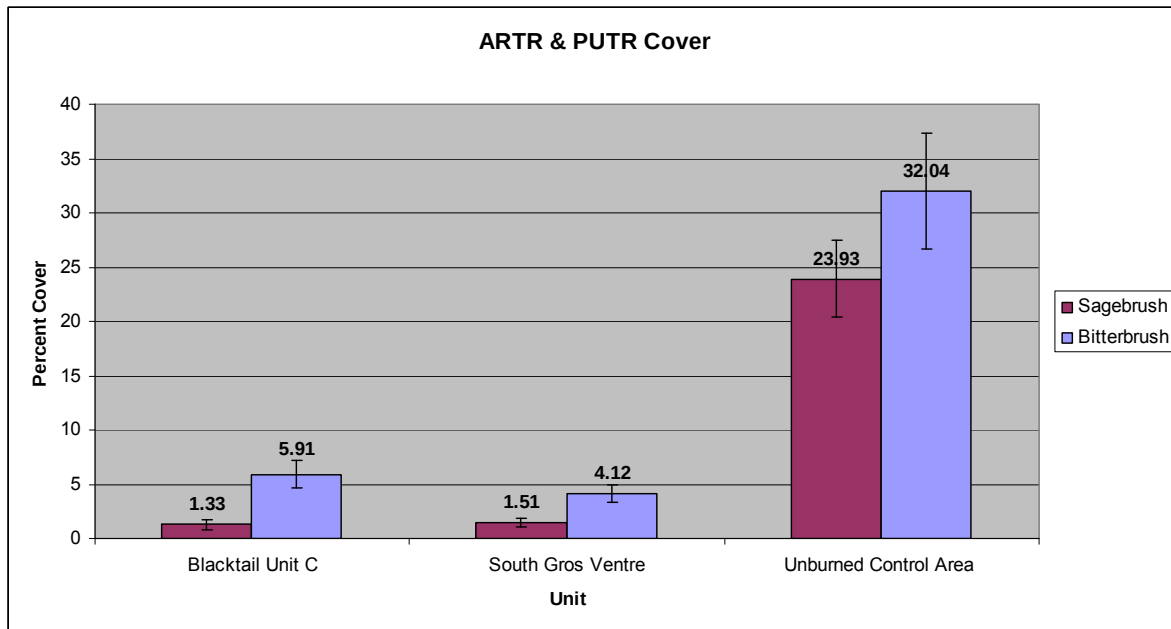
Because the two FMH brush plots have provided limited information (i.e. large error bars), new protocols to assess shrub recovery were adopted in 2008.

Shrub Cover

In order to measure bitterbrush and sagebrush recovery, non-permanent, random, line-intercept transects were used to sample canopy cover in 2008. Bitterbrush is recovering more rapidly than sagebrush in both units, and doing slightly better in South Gros Ventre. Ten years post-burn, both species in both units are still far below the cover represented in the unburned control area.

Sagebrush is easily top-killed and re-establishes from seed, whereas bitterbrush tends to re-sprout. Community re-establishment of sagebrush can take up to 15 years or longer, so current cover on these sites may not be abnormal. Because of the patchy nature of the

prescribed burns, there are seed sources within the unit which should further facilitate colonization of the site.



Little is known about bitterbrush recovery rates in burned areas as observations in past studies have been highly variable. However, because bitterbrush is a re-sprouter, the low percent cover in YR10 may be due in part to re-sprouts being small and young. It is also likely reflective of a low re-sprout rate. It is unclear how bitterbrush and sagebrush regeneration will change community composition in the long run.

Monitoring visits will be made every five years to track the return of bitterbrush and sagebrush and composition changes on site.

Granite Creek Prescribed Burn

The Granite Creek prescribed fire project was implemented in the spring of 2008. It is located in sagebrush vegetation in the wildland urban interface area near the Grand Teton National Park Southwest Entrance Gate.

The burn area was divided into two units, A and B. Unit A consists of a mixture of sagebrush (*Artemisia tridentate ssp. vaseyana*) and bitterbrush (*Purshia tridentata*). The soils are coarse, and the understory consists of many species of forbs and sparse grasses. Unit B has a dense sagebrush community with abundant rhizomatous grasses such as smooth brome (*Bromus inermis*). There is much less bare ground exposed in Unit B. The intent of the burn was to reduce shrub fuels along the roadside and adjacent to private homes within the park. Specific monitoring objectives were as follows:

- Reduce the stems per acre of mature sagebrush by 60% in dense areas (Unit B).
- Maintain or reduce the presence of non-native plants.

Sagebrush (and bitterbrush in Unit A) density was measured and compared pre- and post-burn in each unit using non-permanent circular plots. Photopoints were taken in each unit to document additional fire effects. In addition, species composition and cover plots were conducted pre-burn at the three photopoint locations. These will be repeated in 2009.

The Granite Creek burn prescription was developed as the table below indicates. Only the upper-end prescription indicators are given.

Weather	Prescription Range	High End Indicators Burn with Caution	Outside of Prescription Indicators
Temperature °F	≤ 75°		
Relative Humidity	10 – 35%		
Wind Speed (Eye Level)	≤ 15 mph	10-15 mph	> 15 mph
Fuels			
Fine Fuel Moisture	6 – 30 %	6 –8 %	< 6 %
Probability of Ignition	20 – 60%	50-60%	> 60%
Fire Behavior			
Flame Lengths	≤ 7 feet	5-7 feet	Sustained > 7 feet
Drought Indicators			
ERC(Timbered Island RAWS)	<60	>60 (90 th Percentile)	>65 (97 th Percentile)

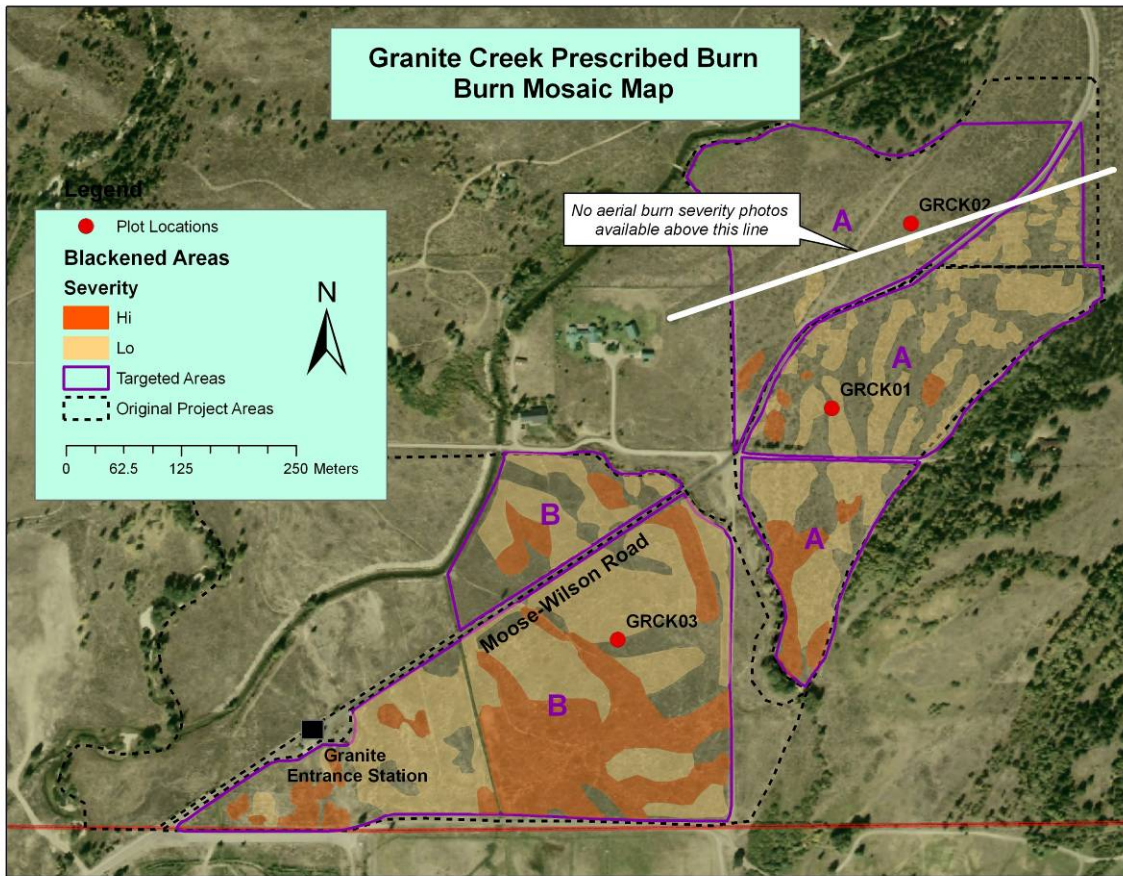
The test burn occurred at 1130 am on May 16, followed by burning in Unit A. Fire spread was very minimal, with white smoke. Ignitions in Unit B began at 1400, at which time winds increased and the RH dropped. Greater flame lengths and better fire spread occurred in the afternoon, with darker smoke dispersing well. Fire behavior began to die down around 1700, and ignitions ended at 1845. With consistent fine fuels and warmer, windier weather, Unit B experienced much more complete and extensive burning than Unit A did.

Weather observations were recorded every half hour during the burn operations. These are compared to prescription elements in the following chart.



A post-burn helicopter overflight made it possible to obtain aerial photographs of the Granite Creek Burn mosaic. These photos were used to draw and digitize a map showing two levels of severity. The “Hi” level (in orange) describes well-blackened areas where shrub leaves and small branches were completely consumed. “Lo” severity (in yellow) corresponds to scorched areas where shrubs were partially killed, with a patchy burn pattern.

In Unit B, 33.8 acres were targeted for ignition on May 16th. According to the mosaic map, 68.2% was burned. 10.1 acres had “Hi” severity, and 14.0 acres had “Lo” severity. It was not possible to map the north half of Unit A, because there was not a photograph covering this area. The portion south of the Moose-Wilson road, however, was only 48.8% burned (9.98 of 20.5 acres), with 0.14 acres in the “Hi” category.



Photopoints were located on both sides of the road in Unit A. One photopoint was located in Unit B. At each location, a digital picture was taken facing each cardinal direction.

Photopoint GRCK01 shows the very patchy burn mosaic typical of unit A:



Pre-burn June 2006



Post-burn June 2008

Photopoint GRCK03 in Unit B shows the much more extensive burn mosaic, with large areas of sagebrush mortality.

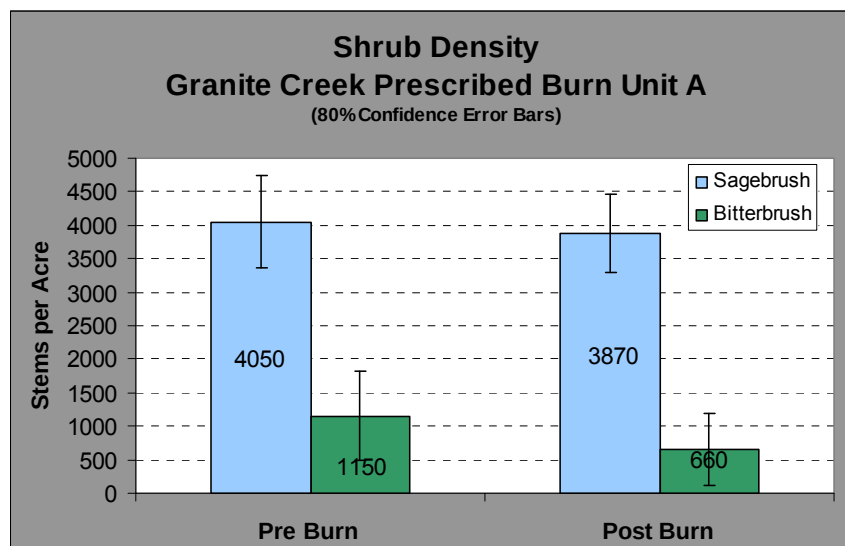


Pre-burn, June 2006

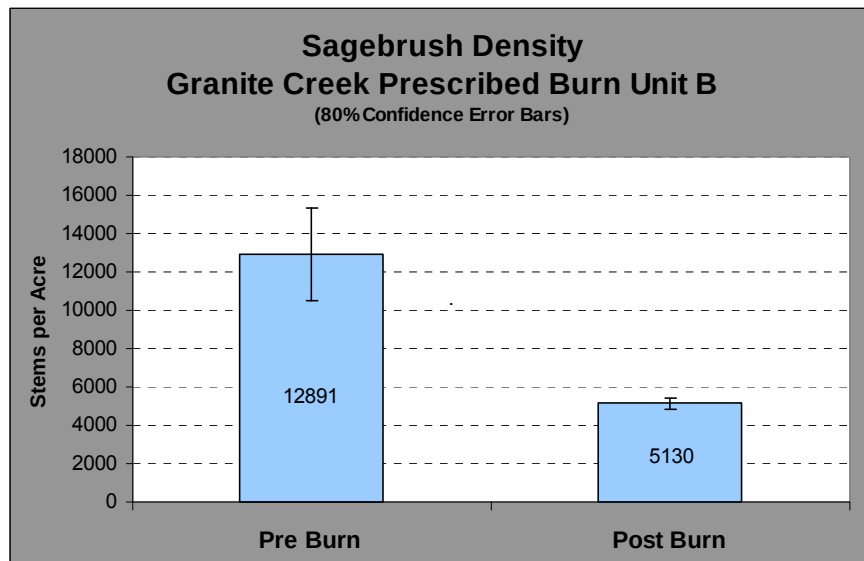
Post-burn, June 2008

Randomly located circular shrub density plots were conducted separately for unit A and unit B. Live shrubs only were counted and split into mature or immature using a height cutoff of 15cm. (Both sagebrush and bitterbrush were classed as mature or immature). Sufficient plot numbers were determined for 80% confidence on mature sagebrush.

In unit A, no significant difference in Sagebrush or bitterbrush density was evident at the 80% confidence level.



Unit B shows a statistically significant reduction of sagebrush density for portions of the unit that experienced fire. No circular plots were included that did not show evidence of burning within them. It appears that the 60% reduction objective was met in these areas.



The Granite Creek prescribed burn treatment was most effective in Unit B, where shrub density was high and continuous, and afternoon weather was more favorable to fire spread. Shrub density reduction objectives were met over nearly 70% of this area. Unit A was also treated to reduce shrub fuels; however the burn mosaic was very patchy. This sparser unit already featured approximately one third the shrub density found in Unit B prior to the burn. With the prescribed burn completed, both units A and B now contain low densities of shrubs, with fuel characteristics that will be easier for fire crews to address in the event of an unwanted fire.

Bighorn Canyon NRA - Sorenson Burn

The Sorensen prescribed burn was conducted in the fall of 2001 in the Bighorn Canyon National Recreation Area. The burn unit is 1750 acres and is located to the south of Layout Creek at the base of a large cliff face. The slopes are steep to gradual with elevation ranges from 3720-5100 feet within the unit. The vegetation is characterized by an overstory of Utah juniper and black sagebrush (*Juniperus osteosperma* and *Artemisia nova*). It is believed that as a result of fire suppression and grazing, juniper has expanded in the last century into areas that were once mainly grasslands and sage. Juniper is known to be highly competitive with other plants, and has probably led to greatly reduced grass and forb cover on these sites.

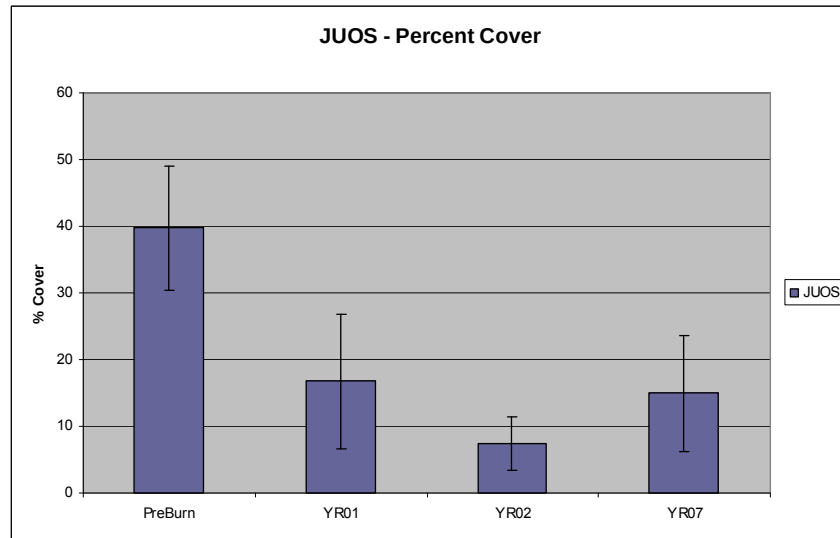
Because the Sorensen area is important habitat for bighorn sheep, a primary intent of the burn was to improve forage by increasing grasses and reducing visual barriers caused by juniper encroachment. Prescribed fire was used to kill the juniper and allow early successional plants to dominate.

Five FMH-style brush plots were installed within the unit and were read Pre-, YR01, YR02 and were re-visited in 2008 for the YR07 read. Objectives were outlined 2000 as follows:

- Detect with 80% certainty that the percent cover of Utah juniper in burned areas was reduced by at least 60% one year post-burn within 20% of the population mean.
- Detect with 80% certainty that the density of shrub species was reduced two years post-burn by 30-50%, within 20 % of the population mean.
- Detect with 80% certainty that an increase of at least 30% herbaceous cover occurred two years post-burn, within 25% of the population mean.

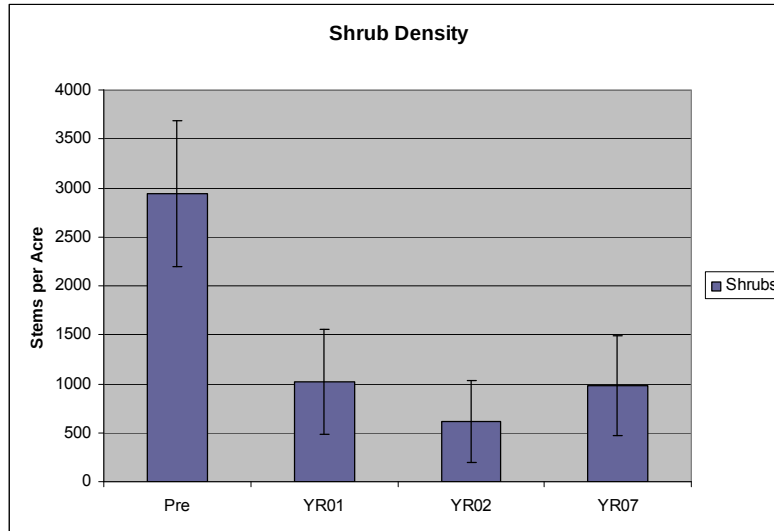
Utah Juniper Cover

Utah juniper cover was monitored using 30-meter line-intercept transects at five FMH plots. Juniper cover decreased significantly post-burn. Utah juniper cover was reduced by 81.4% in YR02 (meeting the YR02 objective of at least 60%) and in YR07 was still 62.4% less than pre-burn levels.



Shrub Density

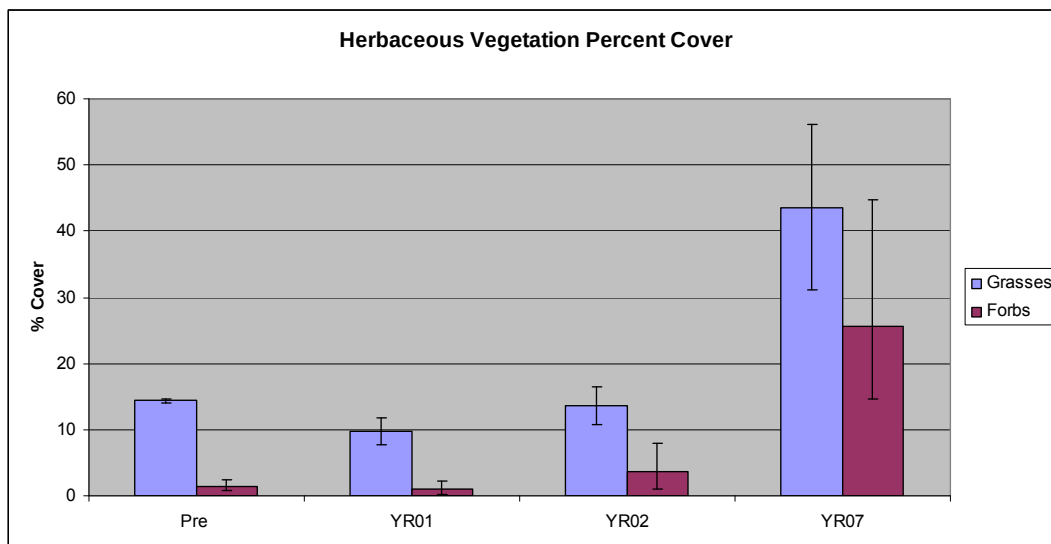
Shrub density was measured using density belts, five meters wide, along 30 meter transects at five FMH plots. All live and dead, mature and immature brush species were tallied; in these plots shrub species included *Juniperus osteosperma* and *Artemisia nova* with a small number of *Rhus trilobata* occurring on one plot pre-burn. Mature, live shrub density decreased similarly to cover, and so the density objective (to reduce density by 30-50%% by YR02) was exceeded. In YR07, shrub density is 66.8% less than pre-burn levels.



Herbaceous Cover

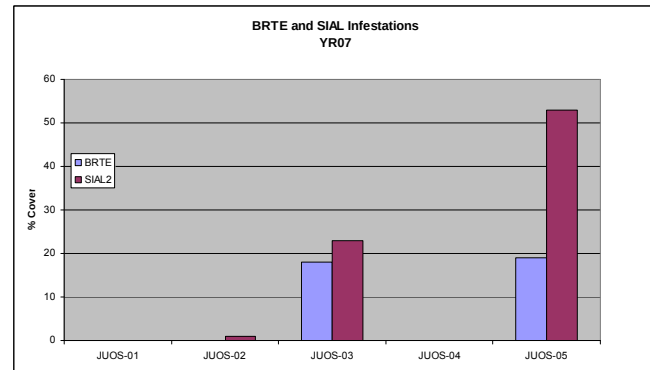
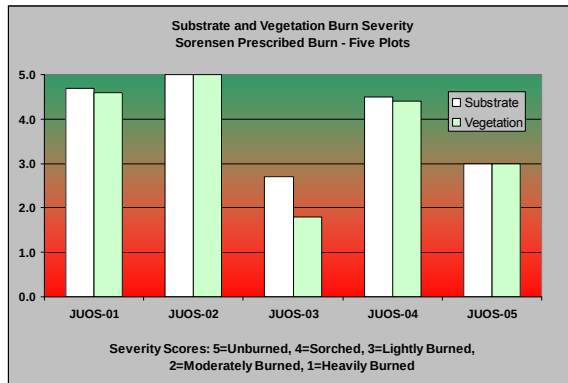
Herbaceous cover was measured using a point-transect protocol along five 30-meter transects. After an initial small reduction in grasses in YR01, there was no significant increase in grasses or forbs by YR02 as desired in objectives. There was, however, a statistically significant increase in both by YR07. Grasses increased 202.8% and forbs increased ten-fold, by 1728.6% from pre-burn levels.

Unfortunately, one of the monitoring plots (JUOS-05) included a large infestation of two highly invasive exotics: *Bromus tectorum* (Cheat grass) and *Sisymbrium altissimum* (Tumble mustard) in YR07. The graph below represents changes in herbaceous vegetation including all plots; an analysis without JUOS-05 still resulted in a 175.9% increase in grass cover and a 957.1% increase in forb cover. While the herbaceous cover objective was not met in YR02 as desired, it was met in YR07.



Weeds

Substrate and vegetation burn severity data taken immediately post-burn was compared to the exotic infestations in YR07 to look for any correlations. Plots JUOS-03 and JUOS-05 had the highest infestations, and these burned the least severely of the five plots. This is not enough data to draw any conclusions about severity levels and exotics, and exotic presence in plots may have more to do with plot proximity to seed source. In addition, Bighorn Canyon NRA has sprayed exotics within the Sorenson burn, which further complicated inferences about fire effects. Nevertheless, further monitoring could shed some light on the relationship between burning and these exotic species.



Future Monitoring

Original objectives were only designated for desired conditions within two years post-burn, all of which were met by YR07. Future monitoring objectives are currently being developed.

Bighorn Canyon NRA – Barry’s Island-Chain Canyon Burn

The Barry’s Island and Chain Canyon unit is approximately 450 acres of Utah juniper-dominated desert. The area is important for bighorn sheep, and the burn is intended to improve habitat for this species. The unit was burned this year, in spring of 2008, and the immediate post visit was made in July.

Specific monitoring objectives are as follows:

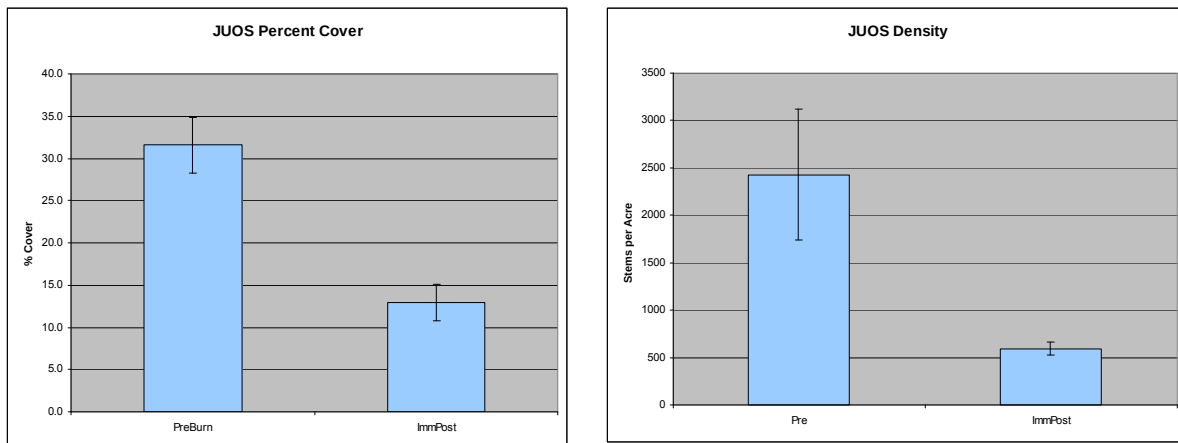
- Burn in a mosaic pattern between 40-70% of the targeted acreage, to be measured immediate post-burn.
- Achieve 70-90% juniper mortality in dense stands across the unit immediately post-burn.

Five FMH-style fire effects brush plots were installed in the unit pre-burn in 2007, and were modified to include an extra 30 meter transect for shrub density and line intercept.

Only two of these plots burned this year. The immediate post-burn visit included assessments of juniper cover, density and overall burn severity.

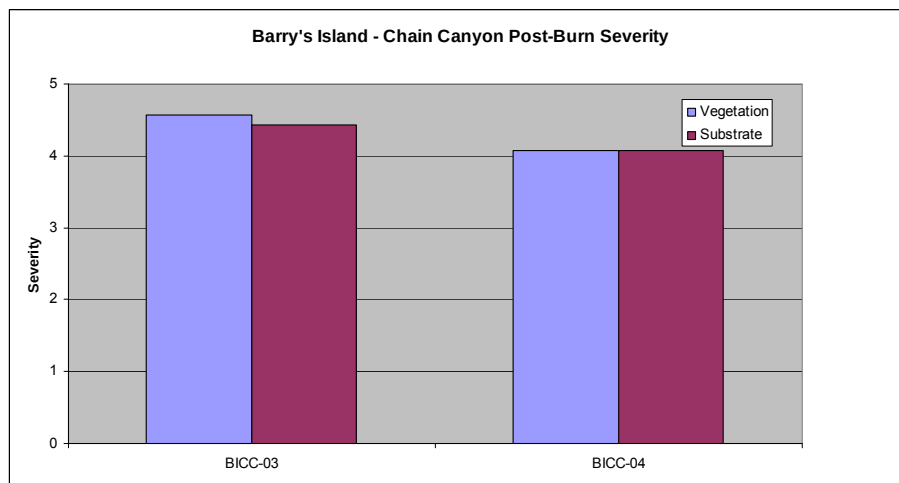
Juniper Cover and Density

Live juniper cover was reduced by 59.0%, falling just short of the desired 70-90% mortality. Density was reduced by 75.6%, falling within the desired range prescribed by the second objective.



Burn Severity

Burn severity was measured along two 30-meter transects at both plots, and assessed the severity of fire effects on both the vegetation and substrate. Despite the high juniper mortality listed above, both plots were only lightly scorched.



Severity Scores: 5=Unburned, 4=Scorched, 3=Lightly Burned, 2=Moderately Burned, 1=Heavily Burned

Appendix C: Project Reports for the Bridger-Teton National Forest North Zone

South Burro Hill

The South Burro Hill prescribed burn was conducted in September of 2007. The unit is located on a south-facing slope, over-looking the Buffalo Fork River valley and is comprised primarily of sagebrush with small aspen stands. Monitoring immediately post-burn revealed that burn severity on the ground averaged scorched to lightly burned, which was less than desired objectives.

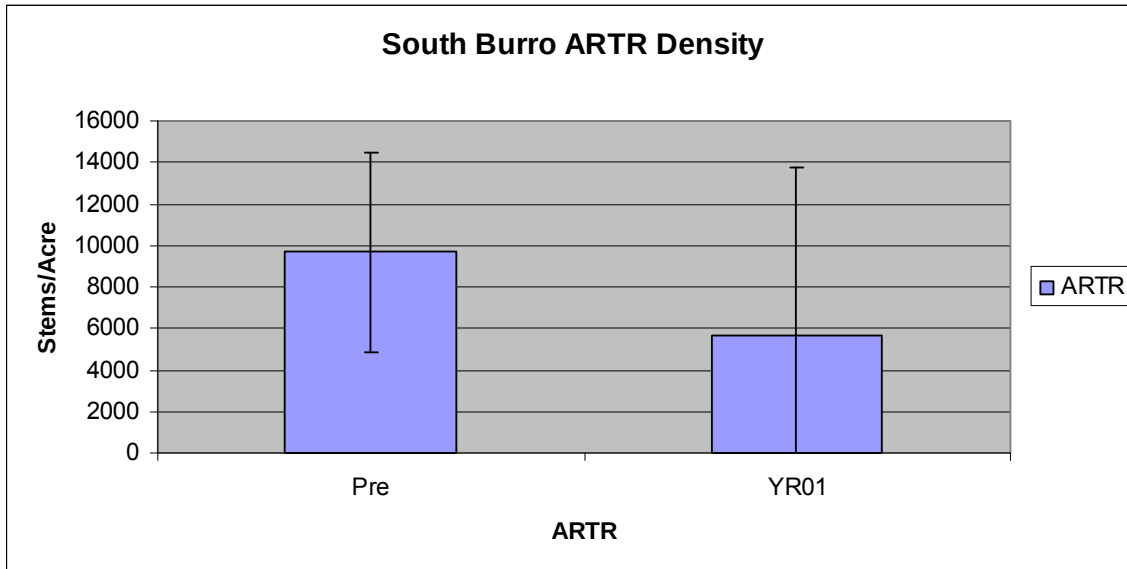
The objectives evaluated in 2008 for this project are as follows:

- Within sagebrush vegetation in project area reduce total live sagebrush density by a minimum of 50% immediately post-burn.
- Increase forb and native grass cover in burned sagebrush by at least 25% by one year post-burn

Sagebrush Density

Sagebrush density was monitored using non-permanent, fixed radius circular plots. Pre-burn monitoring in 2007 sampled sagebrush density at 9693 +/- 1647 stems per acre. YR01 objectives outline a 50% reduction in sagebrush density to 4847 stems per acre, but this objective was not met with statistical confidence. In YR01, density was measured at 5695 +/- 8097 stems per acre.

While density appears to be lower, the 80% confidence error bars show that it is not considered statistically significant due to the highly variable stem densities encountered in the random sample plots, which is in turn due to the patchy nature of sagebrush burns. A random plot within the unit can land in an area that did or did not burn, and so have either 100% or zero mortality. When used together, this data is then so variable that change detection is difficult. Future sampling design will likely fine-tune plot rejection criteria so that the variability due to the patchy mosaic does not appear as sampling error.

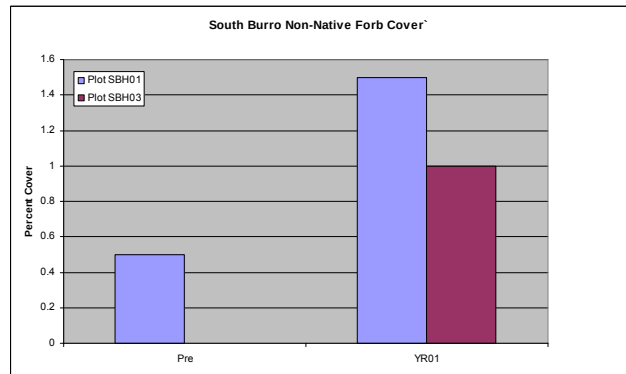
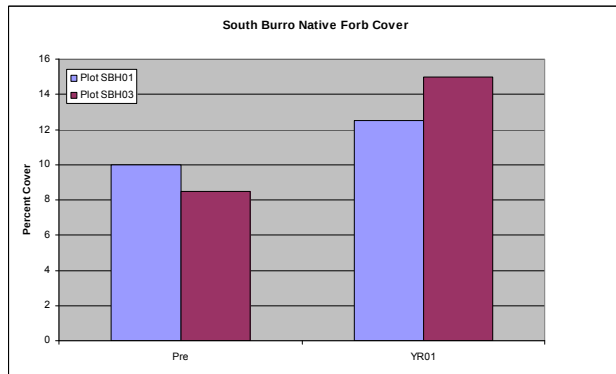


Other shrub species observed include: *Rosa woodsii*, *Ericameria nauseosa*, *Prunus virginiana*, *Artemisia cana* and *Dasiphora floribuna*. These ranged anywhere from 10-680 stems per acre, with *Artemisia cana* being the most prevalent. In addition, *Chrysothamnus viscidiflorus*, *Artemisia tripartita*, *Purshia tridentata*, *Amelanchier alnifolia*, *Tetradymia canescens* were all observed in the pre-read but not found in YR01. Because these shrubs generally exhibit re-sprouting habits after burns it is surprising that they were not found in YR01, but it seems likely that they will return to the site in the future.

Forbs and Native Grasses

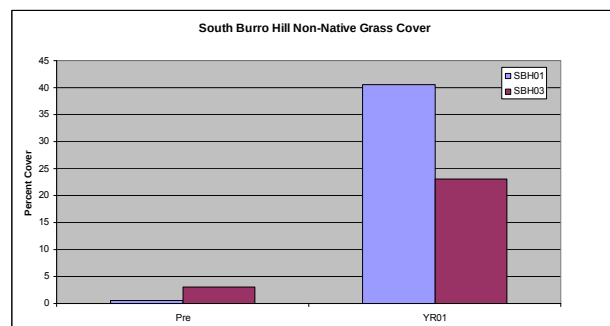
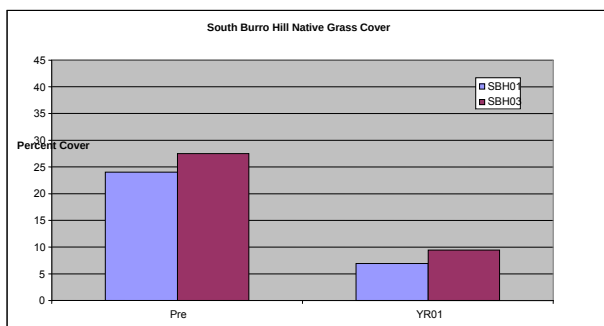
Herbaceous cover was monitored using two vegetation composition plots. All species within a 10th acre, permanent circular plot were identified and assigned ocular estimates of cover class. Cover estimates were then also made by life form. Because only two plots were monitored, it is not possible to assess cover changes with statistical certainty; it is possible, however, to look at the data sets as general trend indicators. Photographs from one of these plots are included at the end of this section.

There was a substantial increase in forbs in both plots. Native forb cover at plot SBH01 increased by 25%, and by 76.5% in plot SBH03, which suggest that the YR01 objective to increase forb cover by 25% may have been met. Unfortunately, non-native forbs also increased. These included: *Thlaspi arvense*, *Cirsium arvense*, *Phleum pratense*, *Taraxacum officinale* and *Tragopogon dubius*. There was a 200% increase at SBH01, and a completely new infestation at SBH03. The overall cover of these species is small, 1.5% and 1% respectively, but because they potentially represent a post-fire increase they will continue to be monitored.



Native grass cover was reduced and exotic grass cover increased in both plots. Native grass reduced 70.8% in plot SBH01 and 65.5% in plot SBH03. This is far below objectives to increase native grass cover by 25%. This is likely a direct result of competition from non-native grasses, which increased here by 8000% in SBH01 and 666.7% in SBH03. Non-native grass species included: *Poa compressa*, *Poa pratensis*, and *Phleum pratense*. Because the non-native *Poa* can be confused with the native *Poa secunda*, it is possible that some of the estimates made in the pre-read are skewed, though unlikely by very much. Both *Poa compressa* and *Poa pratensis* are strong re-sprouters immediately post-burn and their cover may subside in future years.

In YR01, one ocular estimate was made for all *Poa* since it was too early in the season to distinguish the native and non-native *Poa* for overall ocular cover estimates. In order to conduct the analysis on nativity, however, it was necessary to apply cover estimates to each species. The general cover estimate was applied to *Poa compressa* in the analysis due to its frequency in the area and the relative infrequency of the native *Poa secunda*. The <1% cover estimate was applied to *Poa secunda* in order to maintain its presence in the data set. Furthermore, the non-native *Poa pratensis* also received the <1% cover estimate because it is not as common as *Poa compressa*, and should it be slightly higher, its lack of nativity is still captured by treating it all as *Poa compressa*.



SBH01 Photopoint/Vegetation Comp and Cover Plot:



pre-burn, 2007



immediate post-burn, 2007



YR01, 2008

Heart 6 Prescribed Burn

The Heart Six Prescribed Burn is planned as part of the Mount Randolph Fuels Project on the Bridger-Teton National Forest near Moran, Wyoming. The intent of the burn is to reduce fuels around developed areas in the nearby Buffalo Valley. Specific project objectives are still in development, but pre-treatment monitoring was completed in 2008 in three high-priority conifer stands. The Fire Effects Crew collected stand exam data and sightability monitoring pre-burn in order to evaluate how the treatment affects fuel loading and predicted fire behavior. The Forest Vegetation Simulator (FVS) Fire and Fuels Extension (FFE) program will be used with stand exam data to compare models of pre- and post-treatment fuels, predicted fire behavior, and effects. The sightability transects will give an indication of change in ladder fuels.

The three stands selected for monitoring have different characteristics representative of the denser conifer forests in the Mount Randolph area. Photopoints located in each stand show the pre-treatment fuels conditions. Stand 1 is a mixed conifer forest with

occasional large Douglas-fir trees. Stand 2 is nearly pure Englemann spruce. Stand 3 is a young lodgepole pine and Douglas-fir stand. Note that each photograph includes a red and white sightability board that is two meters tall, located 50 feet away from the camera location.



Stand 1 Photo HRSX01 looking West



Stand 1 Photo HRSX01 looking North



Stand 2 Photo HRSX02 looking West



Stand 2 Photo HRSX02 looking South



Stand 3 Photo HRSX03 looking East



Stand 3 Photo HRSX03 looking South

FVS FFE models for pre-treatment fuels characteristics for the three stands are shown in the table, below. Stands 1 and 3 are fairly similar, while the Englemann spruce stand 2 has much heavier fuel loading.

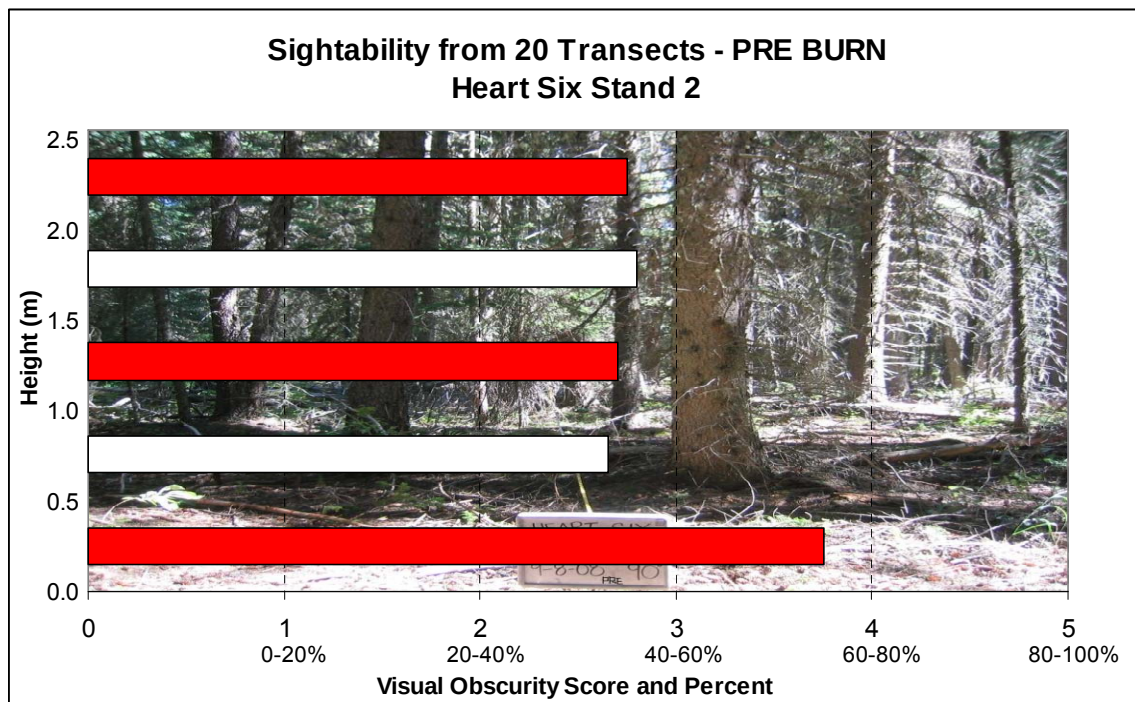
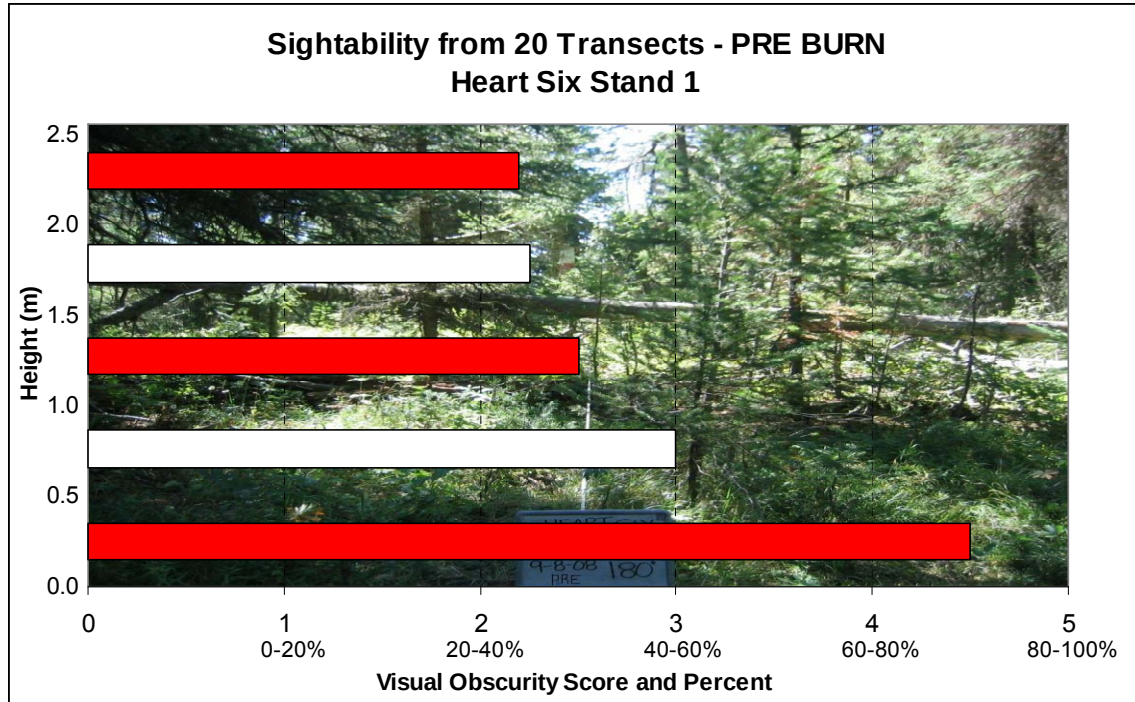
	Stand 1 <i>Mixed Conifer</i>	Stand 2 <i>Englemann Spruce</i>	Stand 3 <i>Lodgepole Pine/Douglas-fir</i>
Fuel Model	FM8 54%, FM10 46%	FM8 6%, FM10 94%	FM8 54%, FM10 46%
Litter Tons/ac	0.9	1.85	1.76
Duff Tons/ac	20.9	30	15
1, 10, & 100 Hour Fuels Tons/ac	3.6	4.4	3
1000 hour Fuels Tons/ac	14	20.1	15.2
Total Woody Fuels Tons/ac	17.6	24.5	18.2
Canopy base Height, ft	3	5	3
Canopy Bulk Density kg/m3	0.051	0.162	0.193

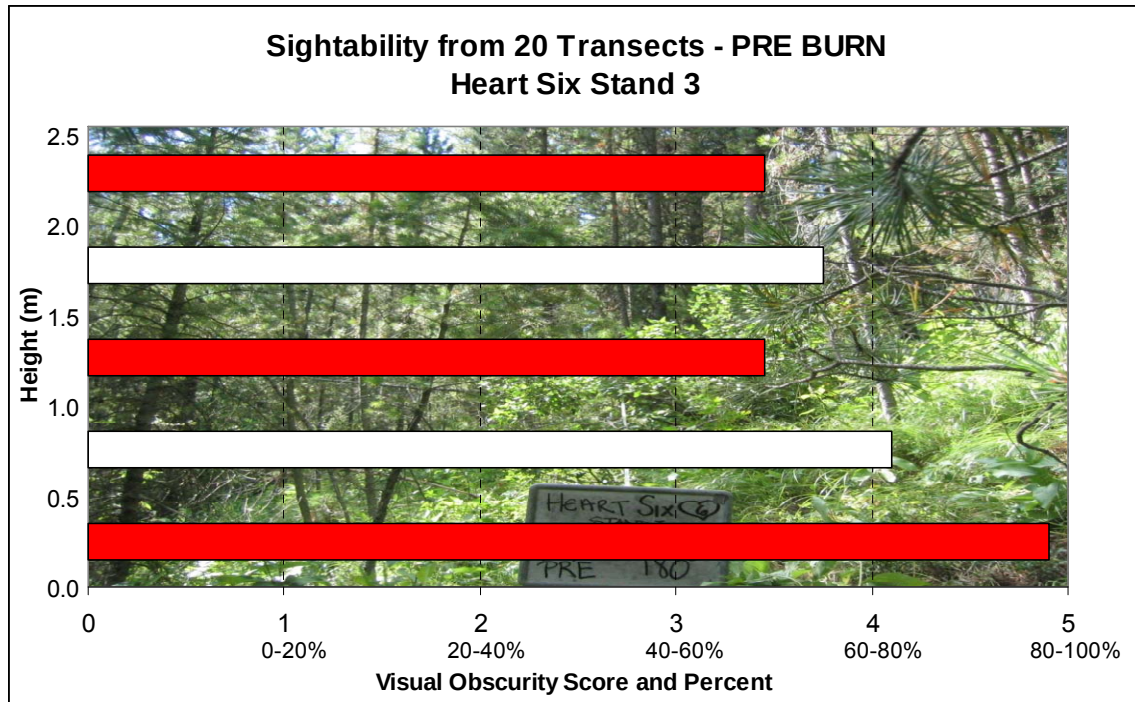
Fire behavior predictions were generated by FVS FFE for the three stands using moderate (75th percentile) and severe (97th percentile) fire weather scenarios. The prescribed burn will be implemented using a prescription more representative of the moderate weather, while a fire during severe weather could pose a serious threat to developed areas in the Buffalo Valley, since all three stands will support crown fire and tree torching with moderate winds during severe weather. These same models will be used to compare stand conditions measured after the prescribed burn with these predictions.

	Stand 1 Moderate 75th%	Stand 1 Severe 97th%	Stand 2 Moderate 75th%	Stand 2 Severe 97th%	Stand 3 Moderate 75th%	Stand 3 Severe 97th%
Surface Flame Length, ft	1.2	3.6	1.6	3.8	1.2	2.6
Fire Type	Surface Fire	Passive Crown Fire	Surface Fire	Passive Crown Fire	Surface Fire	Conditional Surface Fire
Probability of Torching	100%	100%	28%	98%	100%	100%
Torching Index, mph	12.2	11.6	14.7	14.2	22.4	21.3
Crowning Index, mph	38.0	37.9	16.2	16.2	14.2	14.2
Potential mortality, % of BA	39%	56%	43%	99%	56%	100%
Potential Smoke tons per acre <2.5	0.33	0.36	0.46	0.60	0.27	0.37

Sightability transects were conducted in each stand to measure visual obscurity in the understory. This is used as an analogy to ladder fuels, and will also be re-measured post

burn. Stand 3 has the highest obscurity due to the presence of so many young trees, which corresponds to a high probability of torching. In addition, this stand has the lowest crowning and highest torching indices (a measure of the wind speed required to generate crown fire behavior or tree torching, respectively).





Lower Gros Ventre Prescribed Burn Units J & K

The Lower Gros Ventre burn project is a very large area (17,000+ acres) of sagebrush, aspen, and mixed conifer vegetation located to the east of Grand Teton National Park and north of Jackson, Wyoming. The Gros Ventre Valley is considered to be a particularly important area for big game species throughout the year. The several Lower Gros Ventre burn units were prioritized by a group of local wildlife biologists because of crucial habitat for bighorn sheep, elk, mule deer, and moose. Units J and K contain particularly crucial bighorn sheep habitat, and several organizations including the Foundation for North American Wild Sheep and the Wyoming Governor's Wildlife Task Force helped to fund the prescribed burn.

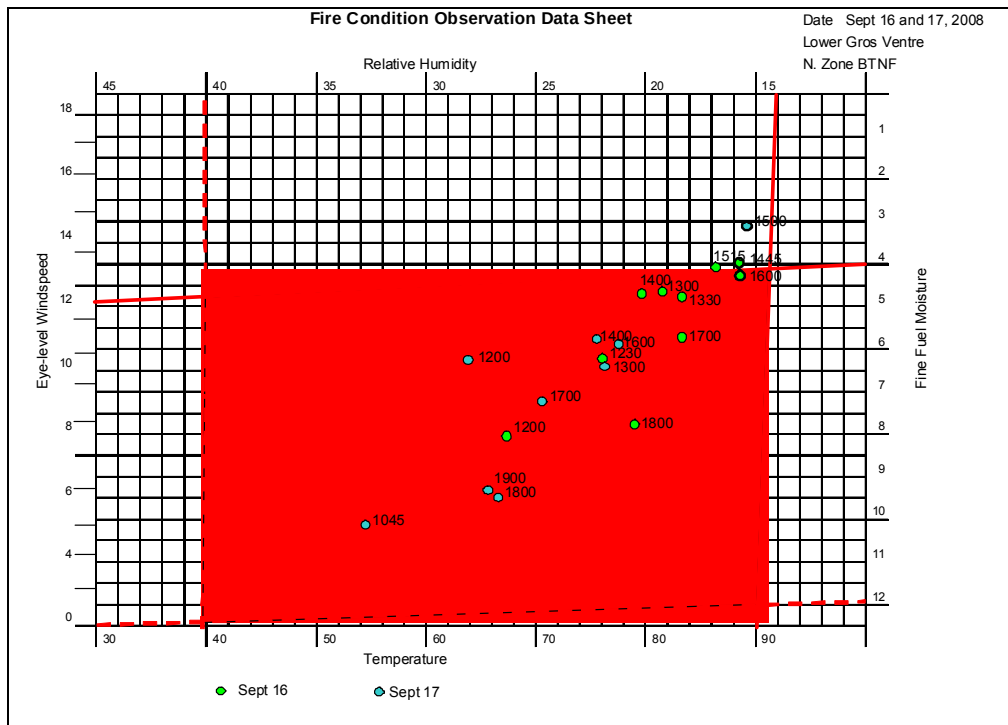
The Lower Gros Ventre burns will take place over several years, depending on burn windows and resource clearances. Treatment and monitoring objectives include conifer mortality, aspen regeneration and browse, maintenance of limber pine, reduction of sagebrush density, and improvement of bighorn sheep and elk forage production and nutritional quality. Conifer-encroached aspen stands, limber pine, and sagebrush stands designated as important bighorn sheep and elk winter habitat are of highest priority, and are identified on maps used in burn plan development and implementation.

In the fall of 2007, a portion of Lower Gros Ventre J was burned. No pre-burn monitoring plots or photopoints had been installed in this unit; however the burn mosaic was mapped. In September and October 2008, Units J&K were completed.



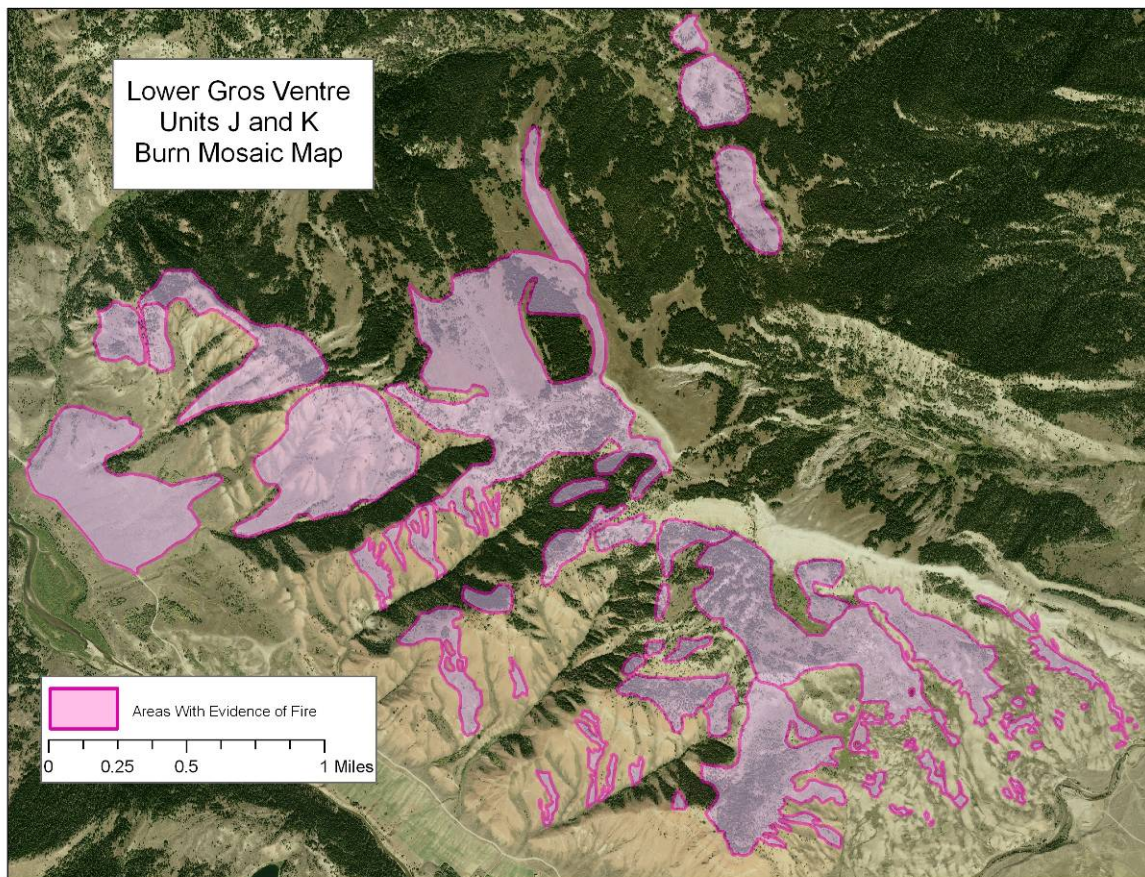
Burn Boss Mack McFarland Directing the Helitorch – M.Gocke photo

Burning conditions were very hot and dry, near the upper end of the burn plan's prescription. Fire behavior was determined to be desirable and manageable, so ignitions continued despite relative humidity observations below 15%. Even with this weather, the helitorch operation moved slowly and required much gel to attain conifer mortality in the most important stands. The fire conditions chart below shows weather observations from the first two days of implementation (The 5,908-acre unit took more than ten days to complete). In future burns, prescriptions may be expanded to include desired fire behavior at the hotter and drier end.



When the fall 2008 burning at Lower Gros Ventre was completed, aerial photographs were used to generate a burn mosaic map, which was digitized into a GIS shape file for analysis. Burned areas in this map are defined as portions of the unit that were affected by fire on the ground or in the forest canopy.

The total burned acreage in units J and K (for both 2007 and 2008) was 1,188, which was 20.5% of the 5,908 acre area. A similar percent (24.4%) of the highest priority wildlife habitat was burned (540 of a designated 2,220 acres). In the second priority habitat area, 38.9% was burned (345 of 886 acres). Finally, 14.9%, or 86.6 of 583 acres of “priority 5” habitat was burned.



Several permanent photopoints were retaken immediately after the prescribed burn was completed. They show a mixture of fire effects over several vegetation types. Photopoint LGVK02 is located just outside of the aspen stand where the Fire Effects Crew will be conducting aspen sucker density monitoring in 2010:



LGVK02 Pre-burn



Immediate post-burn

Photopoint LGVK03 shows a patchy burn mosaic in a sagebrush stand to be monitored in 2009:



LGVK03 Pre-burn



Immediate post-burn

Photopoints LGVK07 and LGVK05 show fire effects to limber pine communities. Objectives called for removal of smaller-diameter limber pine trees, while retaining larger trees ($\geq 16''$ dbh) in areas that would not normally carry fire due to sparse fuels:



LGVK07 Pre-burn



Immediate post-burn



LGVK05 Pre-burn



Immediate post-burn

Photopoint LGVK01 shows a pre- and post- burn view of a Douglas-fir stand. Fire effects are unclear immediately post-burn, but future photographs may indicate some mortality. The red trees pictured in the post-burn photograph are most likely associated with Douglas-fir beetle attack.



LGVK01 Pre-burn



LGVK01 Immediate post-burn

Lower Gros Ventre Prescribed Burn G, H, and I

Lower Gros Ventre units G, H, and I are part of the second phase of the Lower Gros Ventre burn project. In 2008, the Fire Effects crew began to implement pre-burn monitoring using 13 photopoints installed in aspen and aspen-conifer mix stands in the Horsetail Creek drainage. The objectives for units G, H, and I are similar to the J and K burn, however the priorities are different. Instead of removing conifers in bighorn sheep habitat and reducing sagebrush density, the main focus of this phase is to regenerate aspen in stands where conifers have encroached.

The Jackson Hole Interagency habitat Initiative (JIHI) group is currently developing recommendations for particular aspen stands within units G, H and I for monitoring with circular density plots. These will be conducted in the summer of 2009, and will include additional photopoints. After the burn, photopoints that do not show useful fire effects will be retired.



Photo LGVG05 205 shows aspen-conifer at the head of Horsetail Creek



LGVI06 360 shows conifer encroached aspen



Photo LGVG03 360 had only light browsing on aspen suckers



LGVD01 7 gives a landscape view. Note beetle mortality in limber pine trees

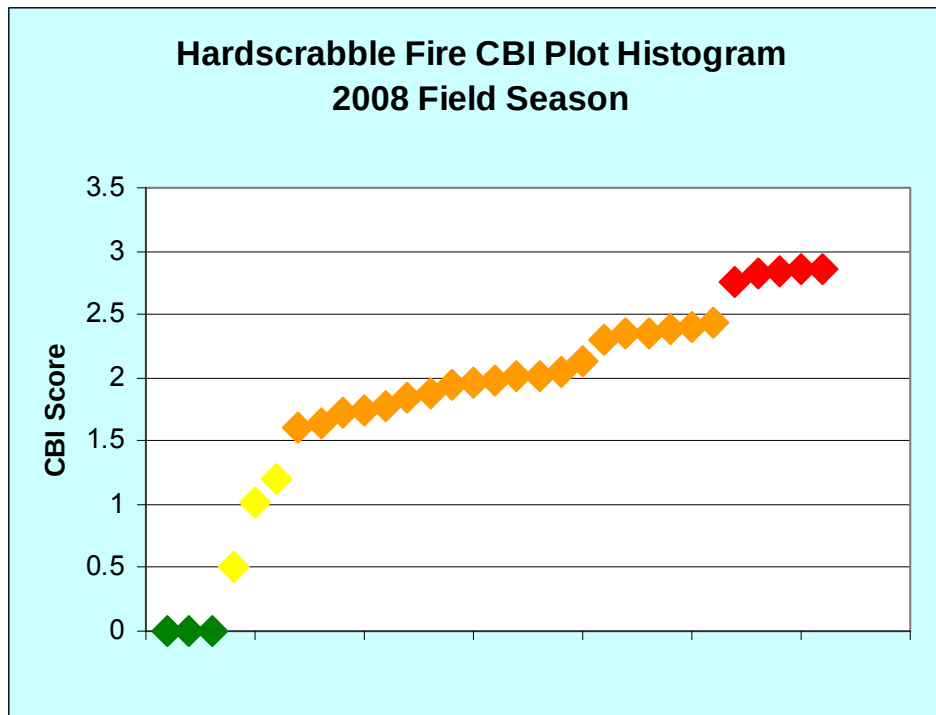
Hardscrabble Fire CBI

The 3,017 acre Hardscrabble Fire was caused by lightning on August 10, 2007 in the Bridger-Teton National Forest. Due to its location near the boundary with the Shoshone National Forest, which did not permit Wildland Fire Use, the fire was managed for suppression.

The Hardscrabble Fire occurred at high elevation along the Continental Divide. The vegetation consists of mixed conifer including lodgepole pine, spruce-fir, and many acres

of whitebark pine. Because of the whitebark pine, much of which had been attacked by mountain pine beetle, this fire became the highest priority for CBI data collection in 2008.

A total of 43 randomly-located CBI plots were visited in September 2008. The Fire Effects Crew noted slow recovery of understory vegetation compared to lower elevation fires in previous years. The histogram below shows the distribution of plot CBI scores.



Slow understory recovery may be due to high elevation and late snowmelt in 2008



Many stands of whitebark pine were burned in the Hardscrabble Fire

Appendix D: Project Reports for the Bridger-Teton National Forest West Zone

Lower Cottonwood Prescribed Burn

The Lower Cottonwood prescribed burn took place in the fall of 2008. The project is located in an area of mountain shrub vegetation in the foothills of the Salt Range south of Afton, Wyoming. Wildlife biologists proposed the burn in an effort to promote shrub health in big game winter range. The area is experiencing vegetative changes due to fire exclusion, with juniper and mountain mahogany stands spreading into adjacent mountain shrub communities.



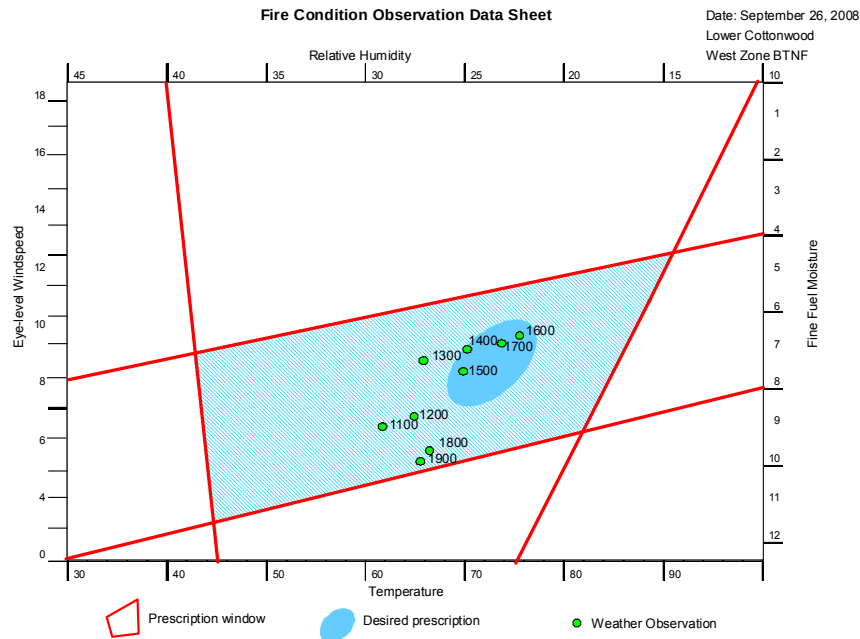
Scene from the Lower Cottonwood burn Area

Burn objectives call for the following measurable fire effects:

- Blacken or scorch $\geq 50\%$ of the area within the project boundary
- Blacken or scorch 25-60% of the acreage of mountain mahogany (*Cercocarpus ledifolius*) on deeper soil sites.
- Attain $> 60\text{-}80\%$ mortality of juniper (*Juniperus spp.*) in burned areas.
- Restore canopy cover of antelope bitterbrush (*Purshia tridentata*) to 50% or greater of pre-burn levels within 10 years and to pre-burn levels within 20 years.
- Restore canopy cover of palatable shrubs, in total, to pre-burn levels within 20 years.
- Decrease of juniper density by 60-80%
- Restore the pre-burn density of mountain mahogany on a designated site (terminal buds beyond wintering mule deer height) within 25 years.

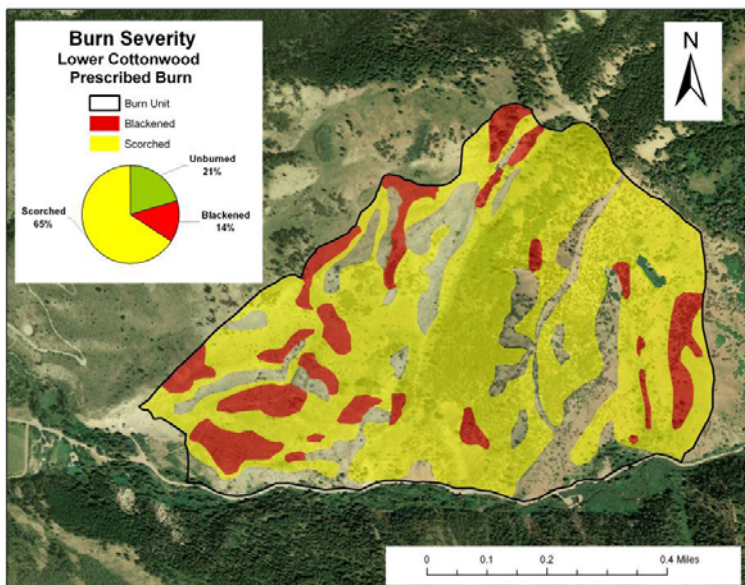
The burn prescription for Lower Cottonwood is shown graphically in the following fire conditions chart, along with hourly weather observations. Note that the very steep slopes

in this unit allowed fire to burn well under what would otherwise seem to be a somewhat conservative set of parameters.



Aerial photographs taken from a helicopter after the burn was completed were used to create a GIS map of the burn mosaic. Two levels of severity were detected; scorched and blackened. Scorched refers to evidence of fire burning through the vegetation, while blackened areas experienced evident consumption of vegetation.

According to the GIS map, 65% (169.1 acres) of the unit was scorched, and 14% (35.1 acres) was blackened. The remaining 21% (52.8 acres) was did not experience fire. The burn mosaic objective of more than 50% was clearly met.



The Bridger-Teton National Forest 2007 vegetation map showed 96.1 acres of mountain mahogany in the treated area. The severity map indicates that 73.4 acres (76.4%) of this was burned (this includes all mahogany vegetation, not just the priority areas on deeper soils). It is likely that the mahogany burn treatment objectives were met or exceeded, however the degree of mahogany mortality in these areas is unknown at this time.

Four permanent photopoints are located in the Lower Cottonwood burn area. Several examples of pre and post fire plant communities are shown below:

Shrub Area



Juniper Area



Mountain Mahogany Area



In summary, the Lower Cottonwood prescribed burn appears to have met its burn mosaic and prescription objectives. In 2010, the fire effects monitoring crew will return to conduct measurements on the vegetative response.

Appendix E:
Project Reports for the Bridger-Teton National Forest East Zone

South Boulder Prescribed Burn

The South Boulder prescribed burn was implemented in the spring of 1998. It was a cooperative project with the Wyoming Game & Fish Department Brucellosis Feedground habitat (BFH) program. The burn objectives reflect the goal of improving native elk habitats to reduce their dependence on artificial feed and lure them from the Fall Creek Feedground earlier in the spring to reduce the intra- and inter-specific brucellosis transmission risks.

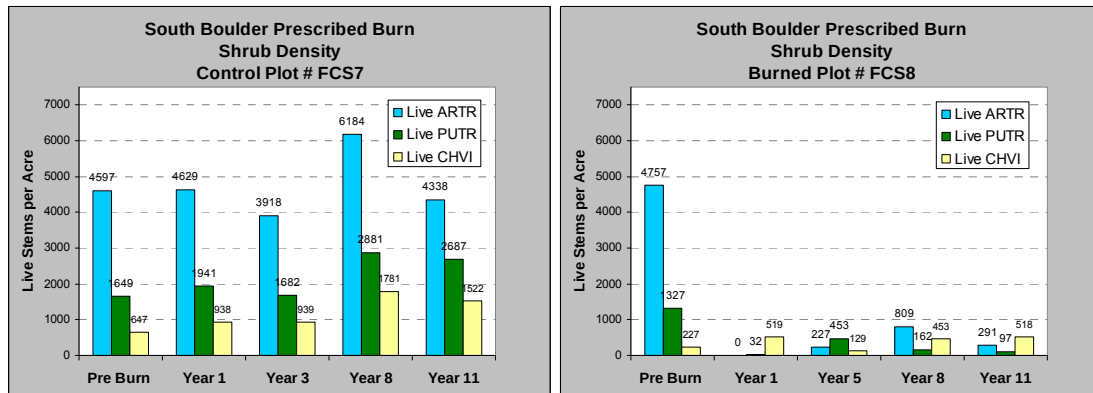
Objectives:

- Improve age class diversity in shrub communities
- Increase the percent cover of grasses and forbs
- Maintain suitable ground cover

Two BFH Macroplots were installed in 1996. One was burned, and one is a control plot. Post-burn revisits were somewhat inconsistent for the two plots, occurring in 1998, 2000, 2005, and 2008 for the control plots and 2000, 2002, 2005, and 2008 for the burned plot. The Fire Effects Crew assisted with plot work 2002 – 2008.

BFH Macroplots consist of a permanent 25 meter baseline with five randomly located transects running perpendicular to it. They are located along a tape measure using random numbers, and new locations are assigned with each revisit. Line-point intercepts for vegetation by species and ground cover are recorded every 25cm along each transect for a total of 500 points. Shrub density belts are measured along the left side of each transect also. Two photopoints are taken at each Macroplot.

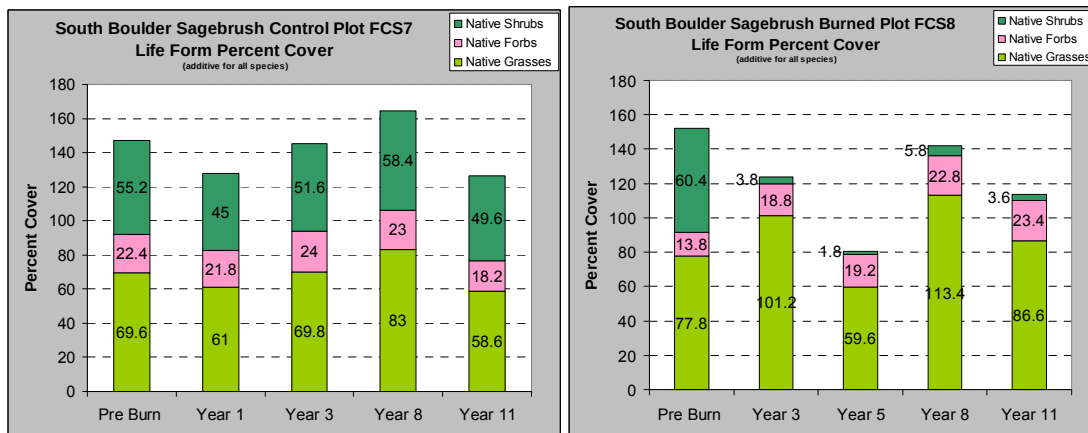
Shrub density for the two plots is shown in the graphs, below. Plot FCS8 was burned, and FCS7 is the control plot. Sagebrush (*Artemisia tridentata* ssp. *vaseyana* var. *pauciflora*) dominated the pre-burn shrub community. Bitterbrush (*Purshia tridentata*) was also fairly common. The burn removed most of these shrubs. The burned plot shows a drastic reduction in live sagebrush and bitterbrush density, which has persisted for 11 years. Note that each time these plots were re-read, the five transects were relocated using random locations along the baseline. This accounts for some of the variability between reads.



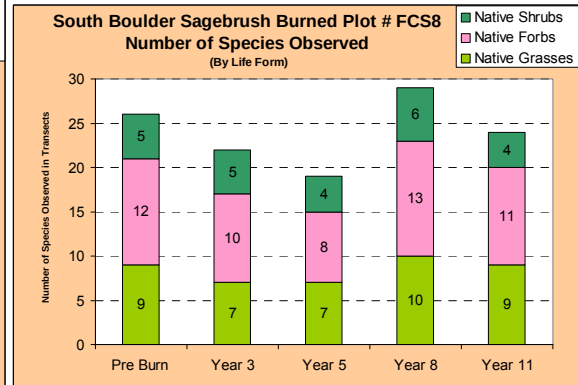
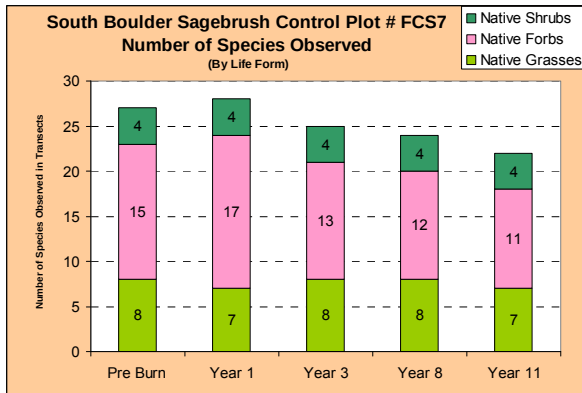
Percent cover data by species of plant was lumped by life form (grass & grass-like, forbs, and shrubs). In doing so, the total cover given was additive, and is therefore higher than the actual cover of these categories would be if they had been measured together in the field as a category.

Only native species were present in the Burnt Lake plots, except for one observation of a dandelion (*Taraxacum officinale*) in the control plot in 2008. Cheatgrass (*Bromus tectorum*) was present along the roadway, however.

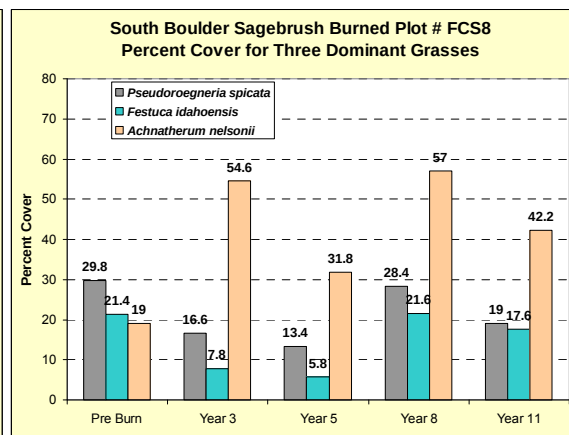
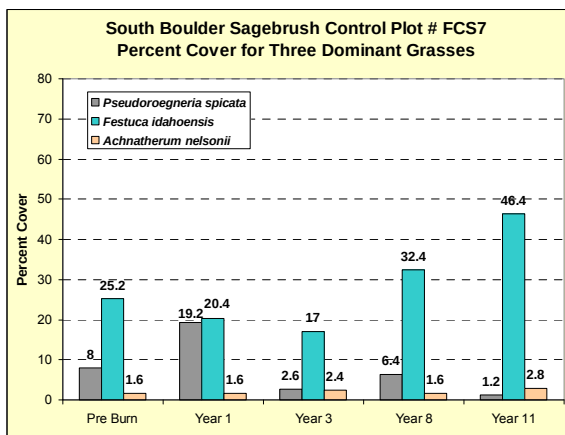
The burned plot marked reduction in cover of shrubs and slightly increased cover of grasses. It is likely that seasonal moisture variability also affected plant cover, because the control plot varied in a similar pattern as the two burned plots did for the years that both plots were read.



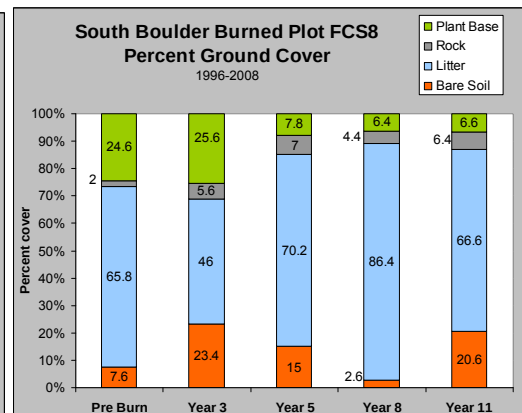
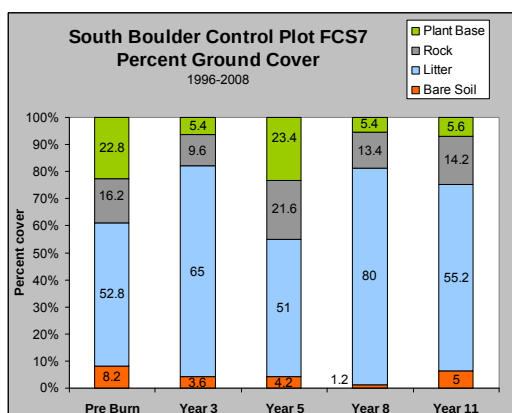
The numbers of species observed at the plots are shown in the next series of graphs. The differences between the two plots were minimal. Plant phenology at the time of monitoring can have an effect on the numbers of species observed by field crews.



Needlegrasses often increase after fire, which appears to have occurred at South Boulder according to burned plot FCS8, where Nelson's needlegrass (*Achnatherum nelsonii*) is the species with the greatest percent cover (see figures, below). In the control plot, Idaho fescue (*Festuca idahoensis*) has increased dramatically over time. It is not clear whether it has increased in the burned plot. Bluebunch wheatgrass (*Pseudoroegneria spicata*) seems to have remained fairly stable in percent cover.



Ground cover at Burnt Lake shows that the burned plot has a higher percentage of bare soil than the control plot. The highest recorded measurement was 23.4%, three years after the burn. This was the first time the plot was visited after the burn occurred. The control plot appears to be rockier than the burned plot.



Pinyon-Osborn Prescribed Burn: Roaring Fork & Wilderness Units:

In 2008, the fire effects crew joined Jill Miller, Habitat Biologist from the Wyoming Game & Fish Department, to conduct pre-burn monitoring at the Pinyon-Osborn Project, near Green River Lakes north of Pinedale. This is a very large project, which will be broken into sections for implementation. The first two burn units treated will be the 7600-acre Roaring Fork Unit, and the 2460-acre Wilderness Unit. The Wilderness unit is located in congressionally designated wilderness, which has never been part of a prescribed burn before on the Bridger-Teton National Forest.

The Wilderness unit includes a very steep and rugged mountainside (Osborn Mountain) featuring dense conifer growth encroaching onto formerly-open cliff bands and gullies. Wildlife biologists concerned about bighorn sheep habitat are hoping to remove many of these conifers to improve sight distances for the sheep, who tend to avoid areas with poor visibility.

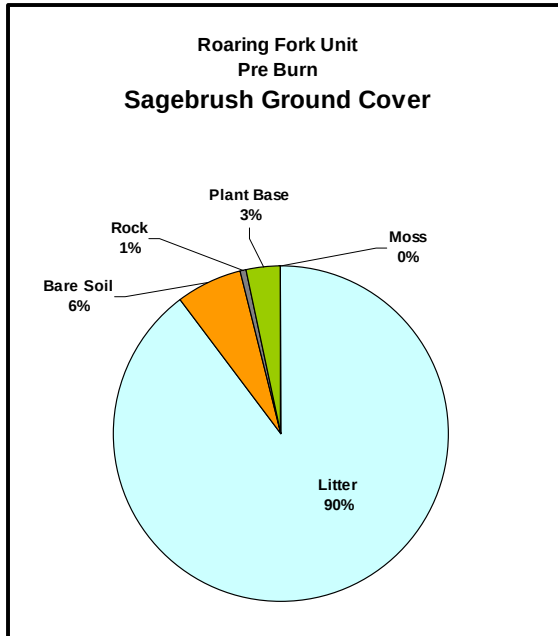
The Roaring Fork unit includes lower elevation benches and foothills with sagebrush, aspen, and conifer stands. It is an important area for elk transitional range and cattle grazing. The Wyoming Game & Fish Department has recommended prescribed fire for this area to attract elk away from the Upper Green River Elk Feedground, where they are crowded together during the peak transmission period for the disease brucellosis. In addition, mixed aspen and conifer stands will be targeted for treatment with fire.

The Roaring Fork – Wilderness Fire Effects Monitoring Plan includes the following draft objectives:

- Burn-mosaic mapping to indicate how the treatment helps to meet desired landscape-level seral diversity conditions.
- Attain at least 85% ground cover in burned sagebrush and 95% ground cover in burned aspen 3 years post treatment.
- Attain at least 1000 live aspen suckers per acre in burned aspen stands greater than 10 feet tall, 15 years post treatment.

The planned prescribed burn for these units is on hold until 2010. The monitoring objectives may change and additional items may be added prior to implementation.

In 2008, pre-burn ground cover measurements were made in sagebrush vegetation. With 29 randomly-located transects, bare ground was estimated to be only 6.2 +/- 2.0% (80% confidence).



Aspen ground cover monitoring will be conducted three years post-burn in a stand to be designated after the treatment.

Given the steep and rugged nature of the Wilderness Unit, photopoints were used to document the pre-burn status of conifer forest. Two locations were established, where post-burn pictures will be obtained for comparison.

Several BFH Macroplots have also been installed in the Pinyon-Osborn project area over the years. The Fire Effects Crew and Game & Fish will review the plot data and determine if it is necessary to re-collect pre-burn data at some of these plots.



Photopoint showing the sagebrush in the Roaring Fork Unit with the Wilderness Unit in the distance



View Across Green River Lake to the Wilderness Unit on the south side of Osborn Mountain.

Burnt Lake Prescribed Burn

The Burnt Lake prescribed burn was implemented in the fall of 1997. It was a cooperative project with the Wyoming Game & Fish Department Brucellosis Feedground habitat (BFH) program. The burn objectives reflect the goal of improving native elk habitats to reduce their dependence on artificial feed and lure them from the Fall Creek Feedground earlier in the spring to reduce the intra- and inter-specific brucellosis transmission risks.

Objectives:

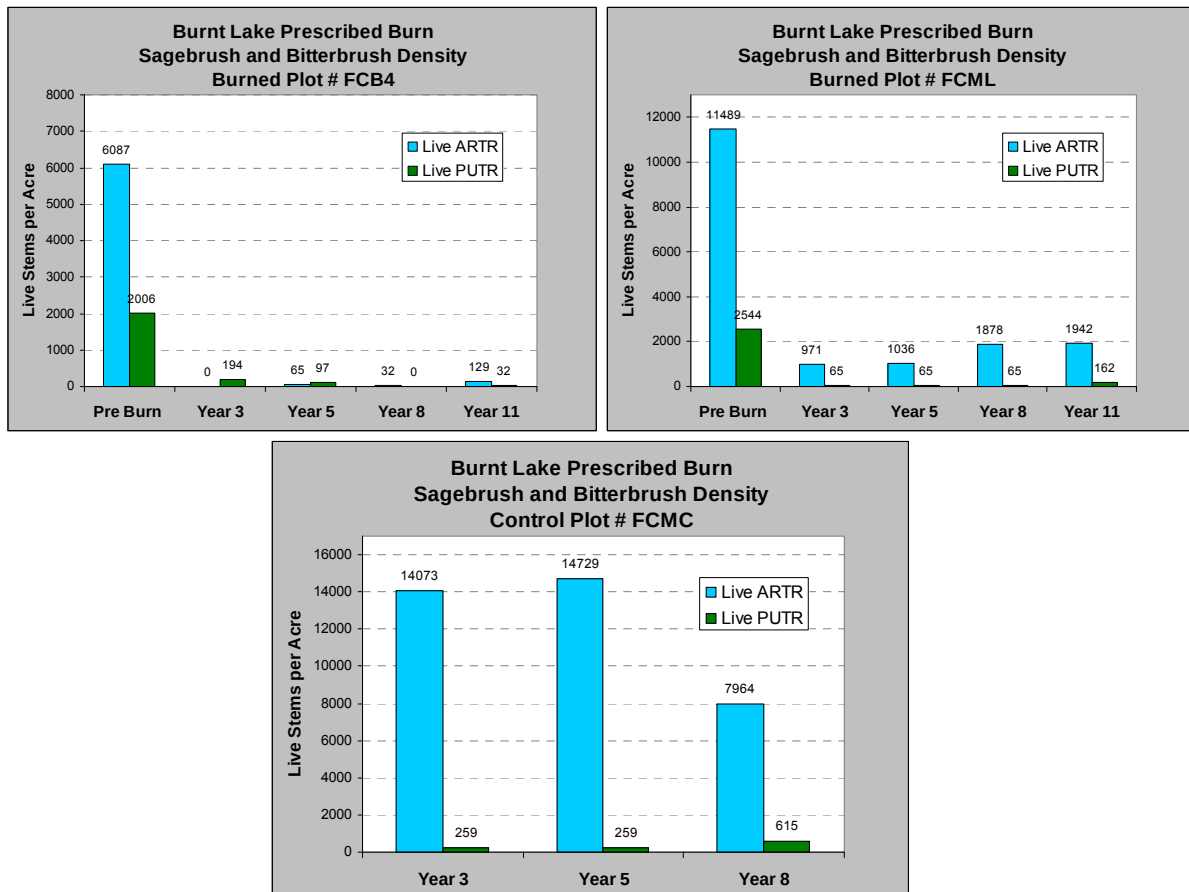
- Improve age class diversity in shrub communities
- Increase the percent cover of grasses and forbs

- Maintain suitable ground cover

Two BFH Macroplots were installed in 1993. They were re-read in 1996 prior to the burn. Post-burn revisits occurred in 2000 (Year 3 post), 2002 (Year 5), 2005 (Year 8) and 2008 (Year 11). The Fire Effects Crew assisted with plot work 2002 – 2008. In 2000, a third control plot was added in an unburned location, and revisited in 2002 and 2005.

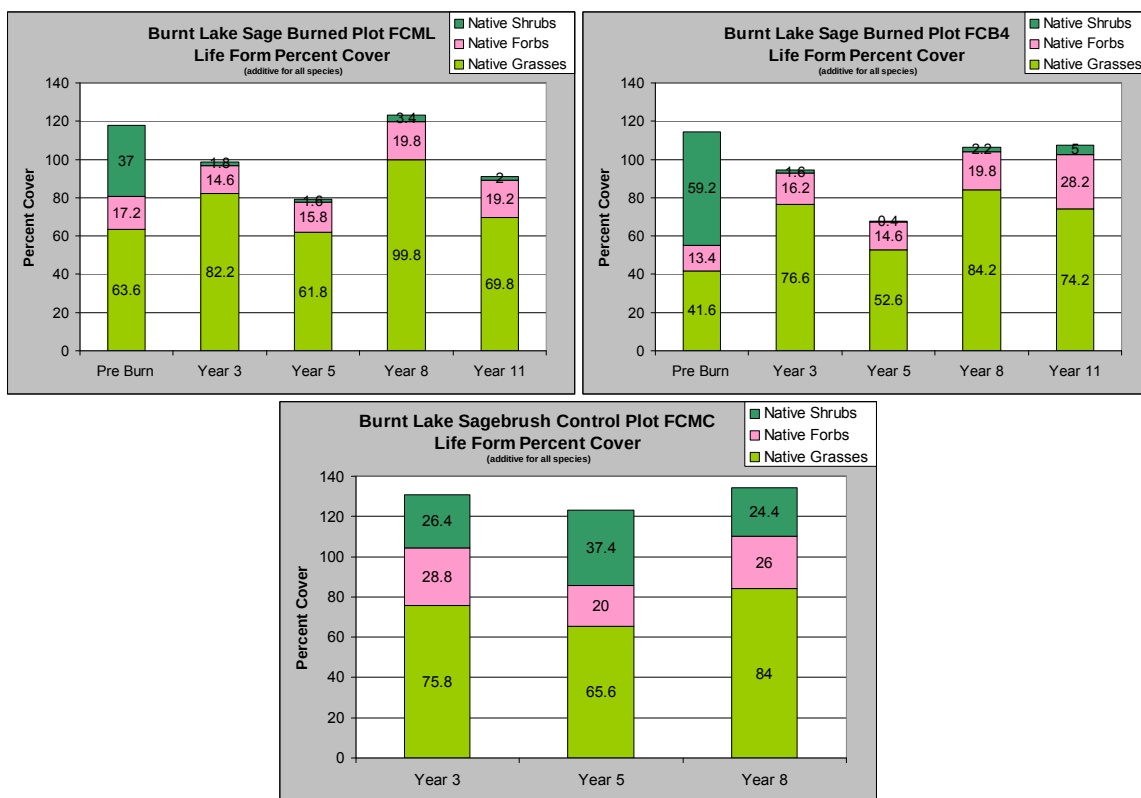
BFH Macroplots consist of a permanent 25 meter baseline with five randomly located transects running perpendicular to it. They are located along a tape measure using random numbers, and new locations are assigned with each revisit. Line-point intercepts for vegetation by species and ground cover are recorded every 25cm along each transect for a total of 500 points. Shrub density belts are measured along the left side of each transect also. Two photopoints are taken at each Macroplot.

Shrub density for the three plots is shown in the graphs, below. Plots FCML and FCB4 were burned and FCMC is the control plot. Sagebrush (*Artemisia tridentata* ssp. *vaseyana* var. *pauciflora*) dominated the pre-burn shrub community. Bitterbrush (*Purshia tridentata*) was also fairly common. The burn removed most of these shrubs. The control plot shows a drastic reduction in sagebrush density in year 8, which may be a result of inconsistent field methods. A severe drought also occurred during this period.

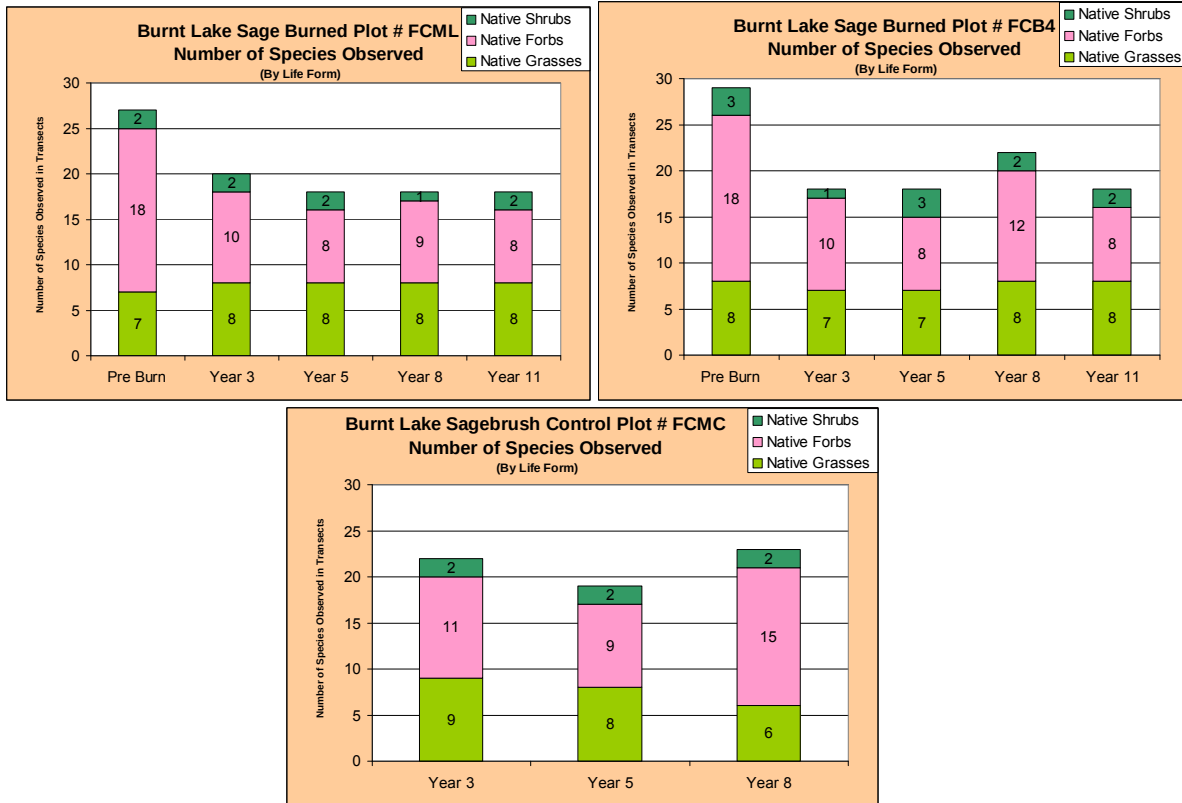


Percent cover data by species of plant was lumped by life form (grass & grass-like, forbs, and shrubs). In doing so, the total cover given was additive, and is therefore higher than the actual cover of these categories would be if they had been measured together in the field as a category.

Only native species were present in the Burnt Lake plots, except for one observation of a dandelion (*Taraxacum officinale*) in 2005. The reduction of shrub cover can be attributed to the burn. Forb cover was fairly consistent, except in 2002 (Year 5). Heavy grazing was noted to have occurred at Burnt Lake at that time. Grass cover was also lowest in 2002. It is likely that seasonal moisture variability also affected plant cover, because the control plot varied in a similar pattern as the two burned plots did.

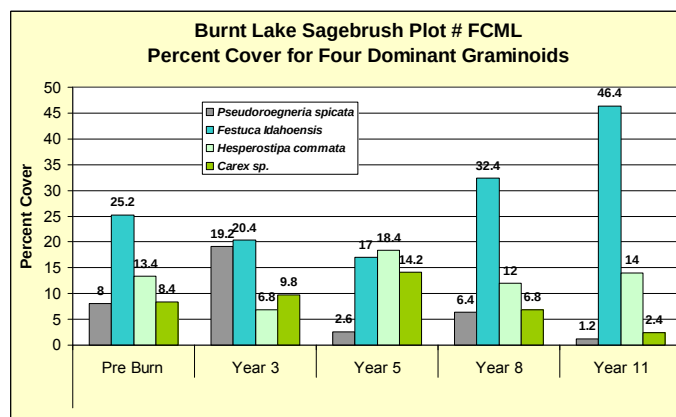


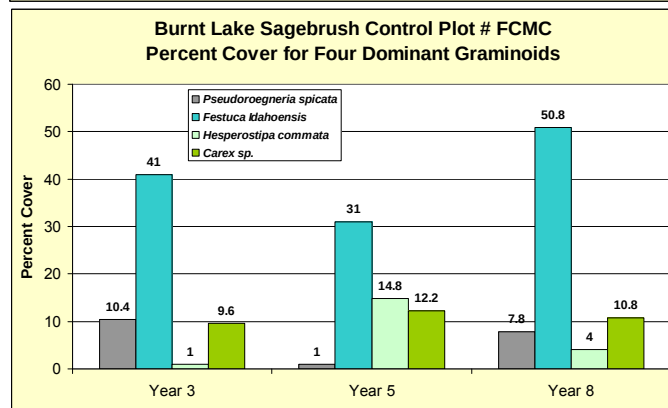
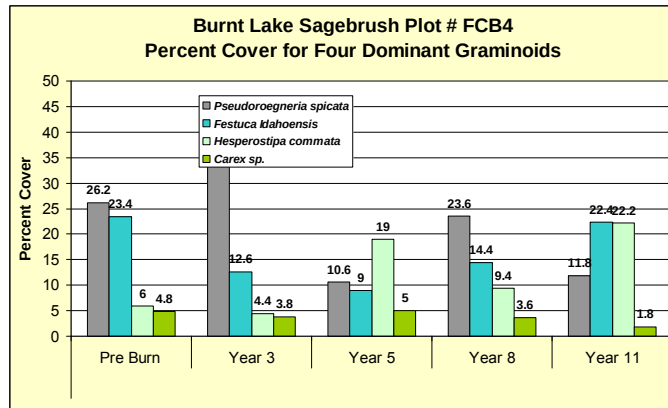
The numbers of species observed at the plots are shown in the next series of graphs. Forb diversity was the most variable. The greatest numbers of forbs were present in the pre-burn datasets. The fewest species were identified during the year that heavy grazing occurred. Plant phenology at the time of monitoring can also affect the numbers of species observed.



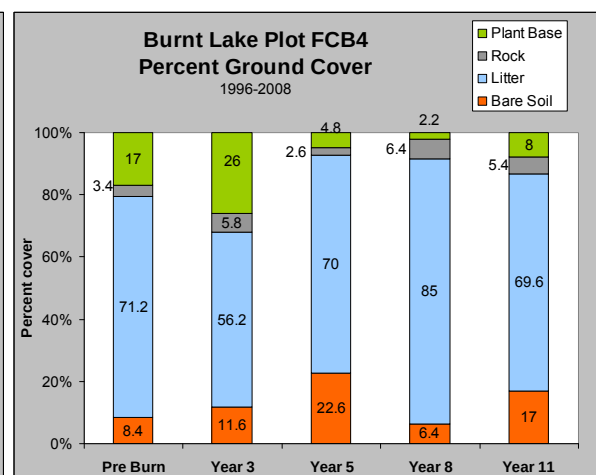
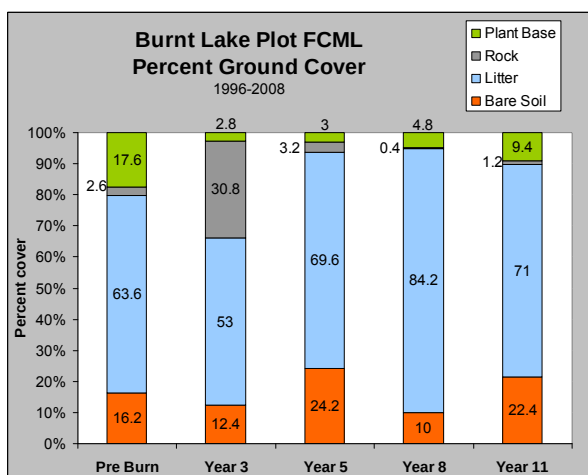
Grasses showed interesting changes in dominance in the plot data as well. The cover of grass species did not seem to change drastically as a result of the burn. But Idaho fescue (*Festuca idahoensis*) shows a consistent pattern of increase in the area, in both the burn and control locations, while bluebunch wheatgrass (*Pseudoroegneria spicata*) appears to have decreased. Bluebunch wheatgrass is sensitive to grazing during the early green-up period. Elk use in springtime may be favoring the Idaho fescue.

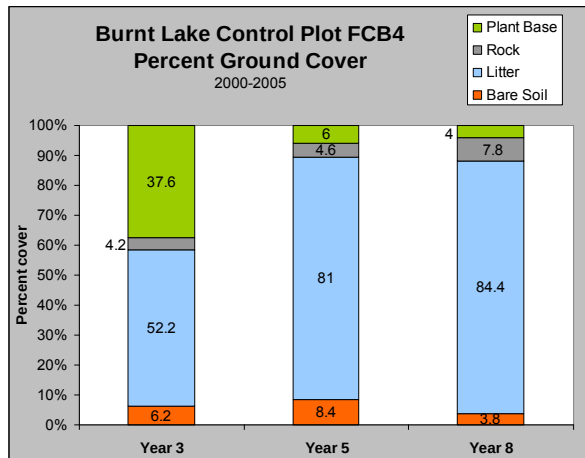
Needle-and-thread grass (*Hesperostipa comata*) often increases after fire, but this is only apparent in one of the burned plots. Possibly that plot was burned more severely. There is also the possibility of grass misidentification at these plots because the culms were often grazed.





Ground cover at Burnt Lake shows the highest percent of bare soil cover occurred during 2002 for all three plots. This was the year that heavy cattle grazing was noted. The effect of the 1997 burn on the proportion of bare soil is not evident.





Horse Creek Fire Aspen

The 9600 acre Horse Creek Fire occurred during the summer of 2007. It was located on the Piney Front foothills of the Wyoming Range, in the Big Piney Ranger District. The fire was human caused and managed for suppression.

Mixed aspen and conifer forest was burned, and widespread aspen regeneration is expected. The East Zone fire management organization and Wyoming Game & Fish Department biologists became interested in monitoring the reforestation by aspen in the burned area. With the local elk population above the herd size objective, and potential cattle grazing, it is possible that browsing pressure could threaten aspen recovery.

In 2008, one burned aspen-conifer stand was designated for monitoring. Objectives were stated as follows:

- Attain 1000 stems per acre in burned aspen areas ≥ 10 feet tall within 15 years post-burn.
- Attain 60% ground cover in burned aspen areas within 2 years post-burn and 80% within 5 years post-burn.

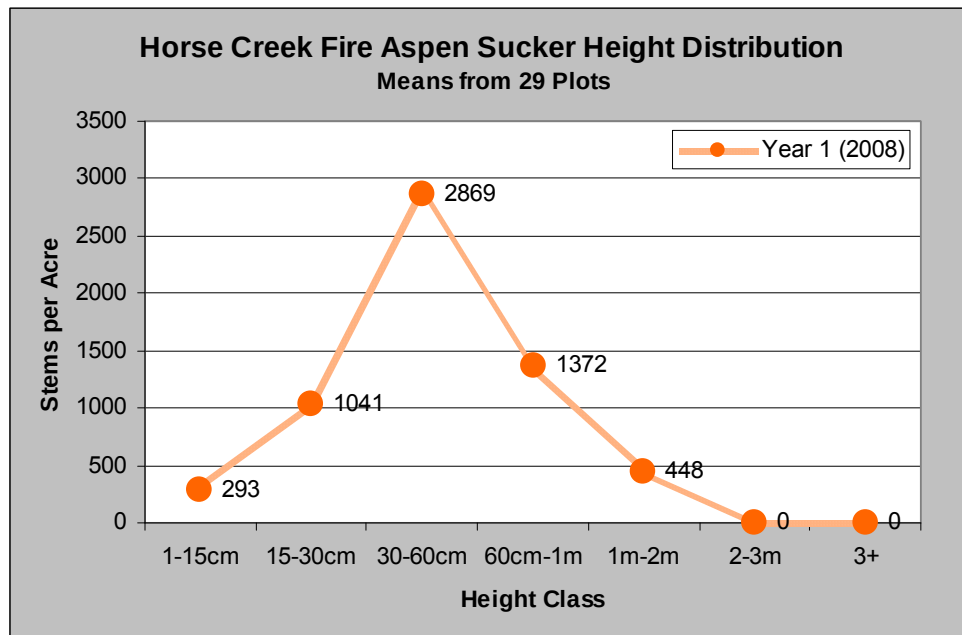
Non-permanent aspen circular plots were used to determine live aspen sucker density. Because aspen and conifer patches occur together in the stand, plot locations that did not have aspen presence were rejected. Specifically, at least one live or dead overstory aspen or one live aspen sucker had to be present in the plot for it to be counted.



View of Horse Creek Fire Monitoring Stand

Aspen Stand 1, permanent photopoint

As the following graph shows, the most abundant height class for aspen suckers was 30-60 centimeters. However there were an estimated 450 stems per acre over 1 meter tall.



Aspen suckers were distributed according to clumpy clonal patterns, as is typical. Movement of aspen into conifer areas had not yet occurred to a noticeable degree. The average density of approximately 6000 stems per acre is moderate, and comparable to the results from recent prescribed burns in the Pinedale area. The summer of 2008 provided above average moisture and the aspen suckers grew fairly tall.

Aspen utilization pressure in the monitoring stand was less than expected, with only 14.1% of the plants having browsed terminal leaders. No cattle were present in the area during the summer of 2008.

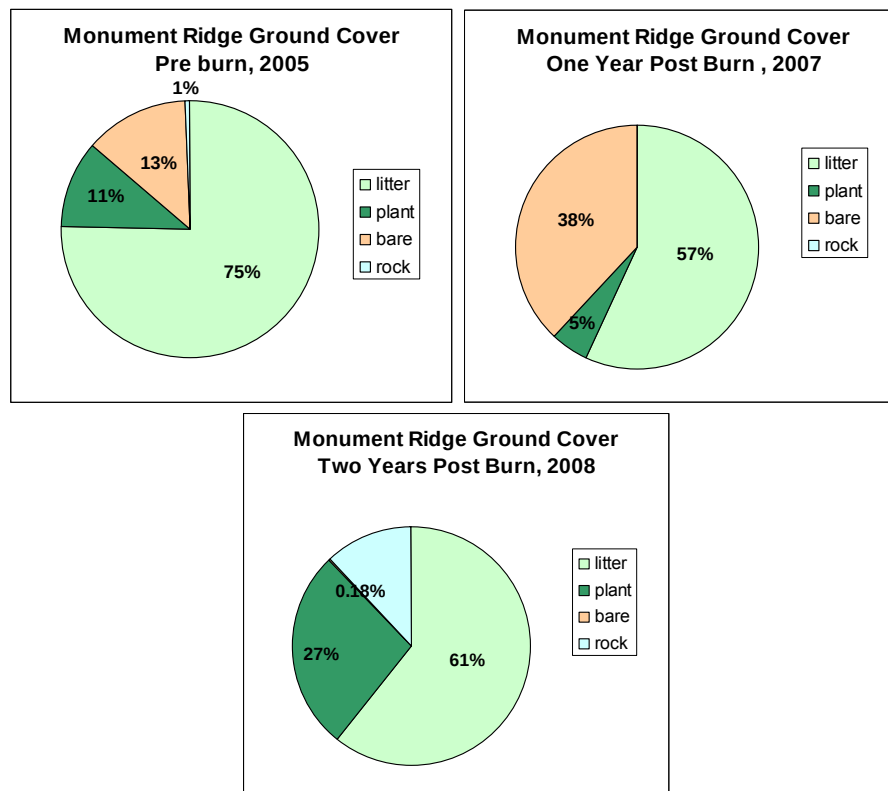
Monument Ridge Unit 1 Prescribed Burn

Monument Ridge Unit 1 was burned in the fall of 2006. It is located on the southwest side of US Highway 189-191 near Bondurant, Wyoming. The vegetation consists of mainly sagebrush with several parallel draws with Douglas-fir on the north-facing slopes and willows in the drainage bottoms.

The monitoring objectives for this burn unit were:

- Burn 30-60% of the sagebrush communities having >15% canopy cover in a mosaic pattern within the project area.
- Attain $\geq 80\%$ mortality of sagebrush in burned areas by 1 year post-burn.
- Attain 60% ground cover in sage/grass communities after the second growing season post-burn and 80% ground cover after the fifth growing season post-burn.
- Attain a diverse array of native successional plant species in burned areas.

In 2008, the fire effects crew visited Monument Ridge to retake photopoints and measure ground cover, using twelve point intercept transects. Two growing seasons post-burn, the ground cover was estimated to be $87.8\% \pm 1.9\%$. The immediate post-burn ground cover was 63%. Pre-burn ground cover (non-bare or rock) was estimated to be 86%. It appears that the litter and plant cover has nearly recovered, and the ground cover objective has been met with statistical significance.



Monitoring at Monument Ridge Unit 1 will continue in post-burn year 5, when sagebrush density and species composition will be measured again.

Maki Creek Prescribed Burn:

A portion of the Maki Creek prescribed burn project was implemented in the late fall of 2008. This project is a habitat improvement project targeting aspen restoration, developed by the Bridger-Teton National Forest and Wyoming Game & Fish Department. The goals are:

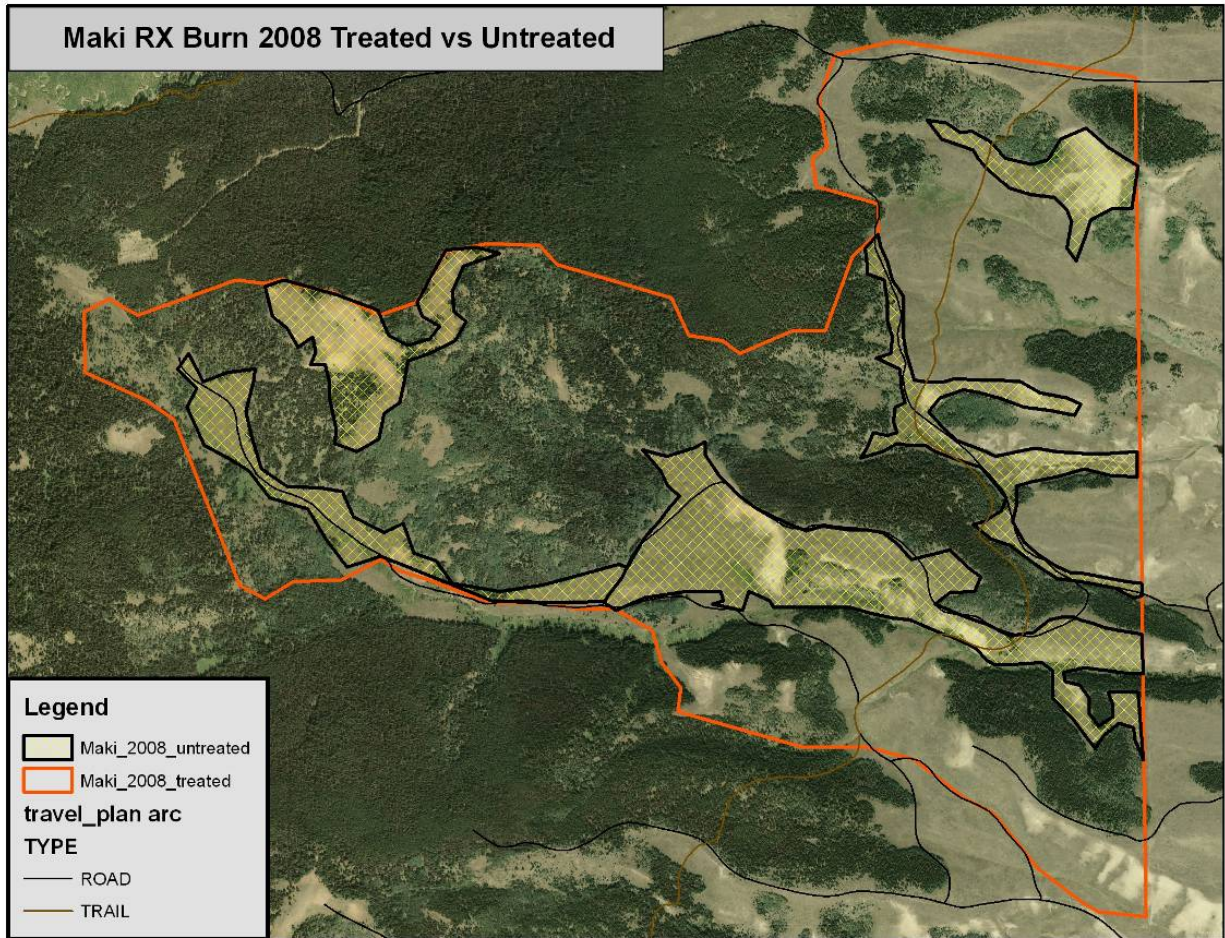
- Rejuvenate decadent aspen stands and adjacent vegetation communities on a 2,200 ac project area
- Reduce the dependency of elk to feed at the adjacent Jewett feedground.

In the summer of 2005 through fall of 2007, conifers in mixed stands were felled, and left as slash to facilitate a hot fire and conversion to aspen forest. Fire behavior was indeed intense, as shown below:



Wyoming Game & Fish Habitat Biologist (and former Fire Effects crewmember) Jill Miller is pleased with the conifer reduction at the Maki burn

Immediately post-burn, a GIS burn severity map showed that the majority (79%) of the 1247 acres in the targeted polygon was burned.



Burn mosaic map by Jill Miller

One of the permanent fire effects monitoring photopoints burned during the 2008 phase of implementation. It illustrates the most severe prescribed fire effects witnessed to date by the Teton interagency Fire Effects Crew:



Photopoint MACB-106 1, Pre-treatment



The same scene, immediately post felling and burning.



Photopoint MACB-106 2, Pre-treatment



The same scene, immediately post felling and burning.

Measurable aspen, sagebrush, and ground cover objectives will be monitored in 2009 and 2010, as the Fire Effects Crew and Wyoming Game & Fish Department follow up on pre-burn plot installations at Maki Creek.

INSTRUCTIONS FOR UPLOADING 2008 ANNUAL REPORT and SUPPLEMENTAL SPREADSHEET

1. Go to the Fire folder (<ftp://63.220.43.40/Fire/>) and then place the report and spreadsheet in the FEP Annual Report folder. Instructions for how to access and log into the FTP site are below; instructions include username and password.

2. Please e-mail Nate Benson, MaryBeth Keifer, and your regional ecologist to let us know when you get your report uploaded.

Call Nate Benson (208-387-5219) or Marybeth Keifer (559-561-6802) if you have any questions or problems.

Public FTP Server

The Denver Service Center announces the availability of a new public FTP server for use by the staff to transfer files outside of the NPS.

This is a public FTP server meaning NPS staff, cooperators and contractors located outside the NPS computer network can access the site. No anonymous FTP connections are allowed. Therefore, uploading and downloading of data requires a username and password. NPS staff may share this account information with cooperators but all are reminded that this site is for use only for NPS business.

The following usage policies should be observed:

Users must log on to the FTP server to download and upload files. No anonymous FTP access is allowed.

To conserve limited storage space, all folders and files on the server will be deleted 15 days from the date posted. Users are strongly encouraged to delete files and folders as soon as their contact/cooperator has downloaded them.

Users are reminded this is a public, non-reviewed site and therefore should **not** post sensitive or proprietary data on the site.

The Denver Service Center assumes no responsibility for the usage of this server.

Public FTP Site address: <ftp://63.220.43.40>

Username (UPDATED): [npsftpwin](#)

Password (UPDATED and case-sensitive): [FTP04npswin](#)

Please note: it is a zero, not an 'O'.