DOVE CREEK FIRE: CN53

MONITORING SUMMARY and FUNDING REQUEST

Fiscal Year of Fire	2008
Fire Containment Date	6/10/06
Fire Size	73
BLM Acres Burned	53
ES Plan Total Planned Costs	$19,000 *(Actual = $24,074)*
ES Acres Treated	53
BAR Plan Total Planned Costs	N/A
BAR Acres Treated	N/A
State/Field Office	Utah – Monticello Field Office
Contact Person	Brian Keating
Area Code/Phone Number	(435)259-2194

1) MONITORING SUMMARY (End of 3rd year)

Emergency Stabilization Treatments

Treatment 1:

ES Treatment		Unit	# Units	Cost/Unit	Total Cost	Degree of Success
S-16	Monitoring	*acres*	53	$37.73	$2,000	Fully Successful
Objective: Vegetative monitoring of the treatment area to determine the success and/or failure of the stabilization treatments. Monitoring objectives for FY2009 included monitoring of the germination and establishment of both seeded and invasive species within macroplots established in FY2007. In addition, a third year final monitoring report will be completed and submitted as required by ES&R policy.						
Implementation Monitoring: Monitoring activities include reading and data collection of existing monitoring plots throughout the treatment area.						
Effectiveness Monitoring: Monitoring will include the interpretation of collected data to determine the establishment rate of seeded grasses as well as the amount (cover and frequency) of invasive species to the project area.						

Monitoring Results**:**

For fiscal year 2009, cover and frequency data and repeat photography were collected on the three macroplots that were established in FY2007. Data analysis has been completed and observations indicate that only the seeded grass species have germinated with reasonable establishment while cheatgrass establishment was relatively high. Functional group cover and frequency data for the three macroplots are shown below (Fig. 1 and 2). The "preferred" functional groups include both seeded and non-weedy naturally occurring plants but may not have significant wildlife value. Only the preferred grasses achieved the objective thresholds for frequency while only approaching the objective threshold for cover. Crested wheatgrass was the most successful of the seeded species. For both cover and frequency, the seeded forbs and shrubs failed in all macroplots. Cheatgrass cover is high throughout the entire project area and management and the objectives were not met for reducing cheatgrass cover. Overall, the seeding treatments were not successful for this project.

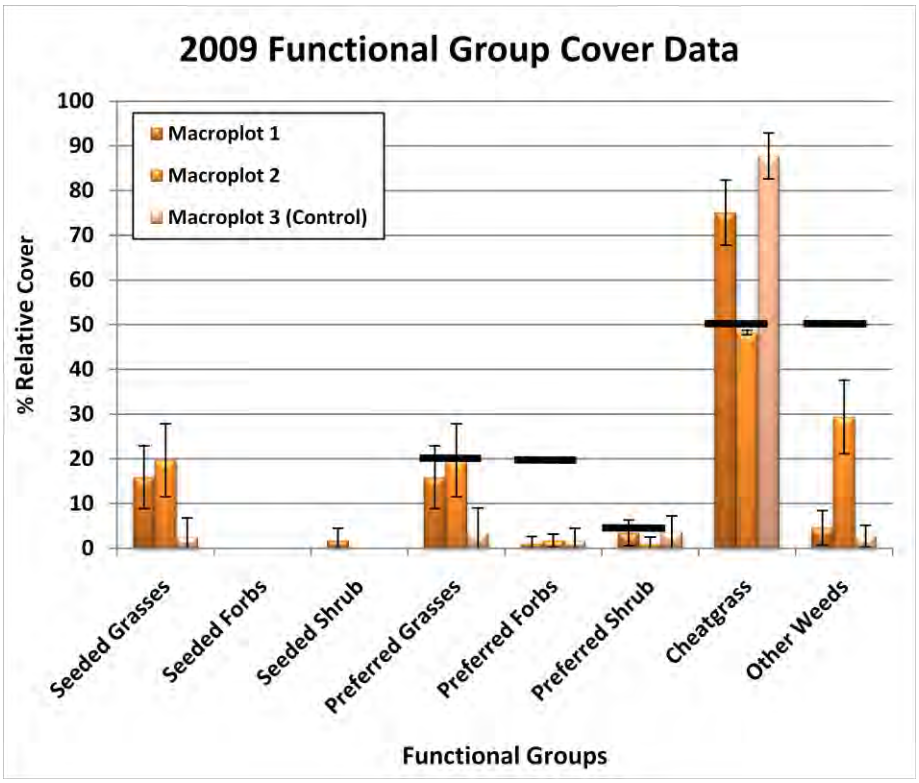

Figure 1. Relative Percent Cover of Functional Groups in 2009. Black lines show objective thresholds and error bars show 90% confidence interval.

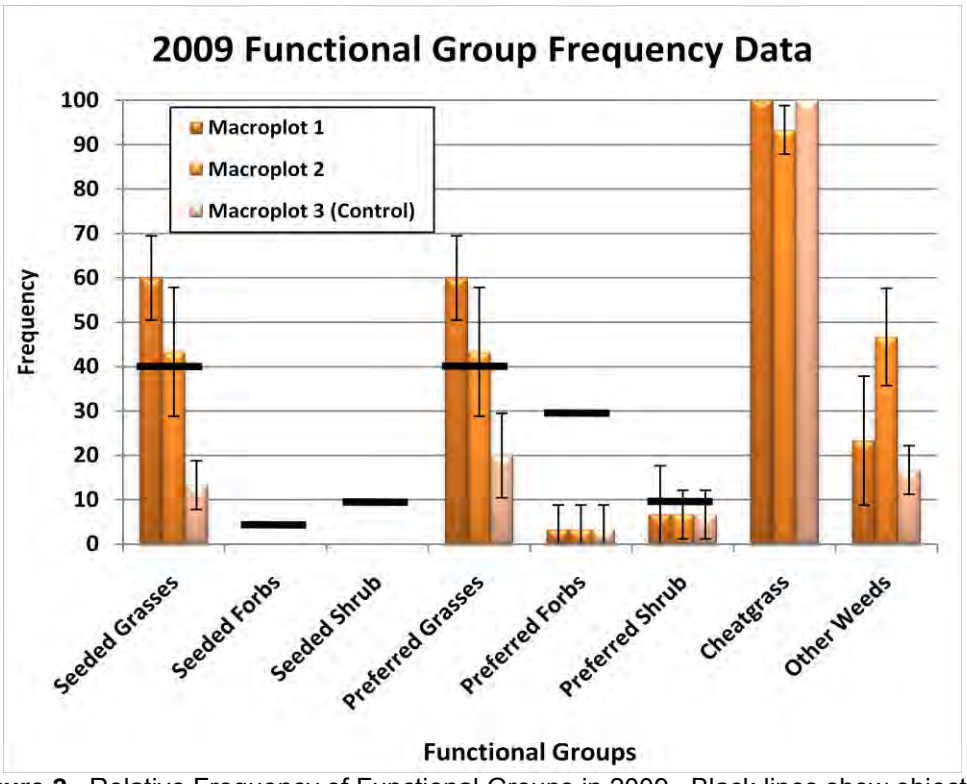

Figure 2. Relative Frequency of Functional Groups in 2009. Black lines show objective thresholds and error bars show 90% confidence interval.

2) END OF THIRD-YEAR CLOSEOUT SUMMARY

The Dove Creek fire consumed 73 acres of public and private lands in San Juan County, Utah in June, 2006. The fire consisted of 53 acres of BLM managed lands and 20 acres of private lands and was located near Monument Canyon west of the Utah/Colorado border and approximately 23 miles east of Blanding. The affected area falls within the BLM Monticello Field Office and is located in an area dominated by an overstory vegetation of primarily pinyon/juniper, with an abundance of invasive plants mixed with other forbs and grasses. Other vegetation consumed by the fire included sagebrush, bitterbrush, cliffrose, four-wing saltbush, small amounts of Gambel oak, and native grassesmix of native grasses and forbs with a moderate cheatgrass component. The fire left the soils uncovered and subject to erosion from wind and water, while compromising historic and pre-historic cultural resources. Invasive plants that had moved into the area prior to the wildland fire include cheatgrass and jointed goatgrass. Both of these invasives out-compete native species for reestablishment, and both species also alter fire regimes. The alteration of fire regimes could lead to further ecosystem compromise as a result of more frequent, intense wildland fire if the invasives dominated the site. It was determined that without treatment, the area would be at risk of soil erosion and loss of productivity as well as invasive species domination and spread to adjacent agricultural lands. The fire rehabilitation plan identified 53 acres to be drill seeded with a mix of native and non-native grasses, forbs and shrubs. In addition, damaged fence would be repaired or replaced as part of the rehabilitation effort. Costs associated with the Dove Creek Fire Rehabilitation Project over the three year life span of the project total approximately $24,074 ($1,750 for initial ID team and final plans; $1,500 for archeology survey; $1,985 for seed/processing; $4,102 for labor for seeding and equipment; $5,087 for labor and materials for fence reconstruction; $5,400 for monitoring/data analysis, $2,500 for labor/vehicles and $1,750 for misc. supplies and materials).

A monitoring plan was developed for the project with the goal of determining the success of the drill seeding treatment. Three macroplots were established (two in the treated area and one as a control plot in a non-treatment area) utilizing 100' linear transects. Frequency was measured through a nested frequency frame and cover was measured through the use of line-point intercept methodology. In addition, photopoints were established at each macroplot and data was collect at each site pre-treatment, post-treatment and three growing seasons following treatment. Monitoring results show that only the preferred grasses fully achieved the frequency objective thresholds for overall vegetative recovery and approached the objective threshold for cover. The frequency objective for treatment effectiveness was met by only seeded grasses. With all cover and frequency objectives, the seeded forbs and shrubs failed in all macroplots. Cheatgrass cover is high throughout the entire project area and management objectives were not met for reducing cover or frequency. Overall, the seeding treatments were not successful for this project.

Lessons learned from the Dove Creek Fire Rehabilitation Project include practical applications as they relate to treatment implementation as well as adjustments to how future monitoring objectives are defined and methodology applied. Overall, the project was successful at meeting the defined objectives and provided valuable data that will be incorporated into future fire rehabilitation and vegetative restoration projects.

NOTE: See attachment for full monitoring summary report

3) REQUEST FOR NEXT YEAR'S FUNDING (2822)

Not applicable.

4) REQUEST FOR FOLLOWING YEAR REHABILITION FUNDING (2881)

Not applicable.

Prepared by: Brian Keating
Date: November 12, 2008

United States Department of the Interior
Bureau of Land Management

September, 2009

Dove Creek Emergency Stabilization and Rehabilitation Monitoring Report

T. 36 S., R. 26 E., Secs. 3 and 10

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Executive Summary

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I. Introduction

The Bureau of Land Management, Monticello Field Office, Moab Fire District, conducted stabilization activities on approximately 53 acres of public land near Monument Canyon west of the Utah/Colorado border and approximately 23 miles east of Blanding in San Juan County, Utah. The stabilization consisted of primarily of seeding along with the construction of a short section of fence, implemented in fall 2006.

The lightning-caused Dove Creek Fire spread over approximately 53 acres of public lands managed by the BLM. The fire occurred on June 7, 2006, and burned 85% of existing vegetation with severe scorching of unburned pockets. Overstory vegetation throughout the fire site was primarily pinyon/juniper, with an abundance of invasive plants mixed with other forbs and grasses. Other vegetation consumed by the fire included sagebrush (*Artemesia spp.*), bitterbrush (*Purshia spp.*), cliffrose (*Purshia stansburiana*), four-wing saltbush (*Atriplex canescens*), small amounts of Gambel oak (*Quercus gambelii*), and native grasses.

The fire left the soils uncovered and subject to erosion from wind and water, while compromising historic and pre-historic cultural resources. Invasive plants that had moved into the area prior to the wildland fire include cheatgrass (*Bromus tectorum*) and jointed goatgrass (*Aegilops cylindrical*). Both of these invasives out-compete native species for reestablishment, and both species also alter fire regimes. The alteration of fire regimes could lead to further ecosystem compromise as a result of more frequent, intense wildland fire if the invasives dominated the site. Without treatment, the area would be at risk of soil erosion and loss of productivity as well as invasive species domination and spread to adjacent agricultural lands.

The seeding portion of the stabilization plan included distributing seed throughout the burned area using broadcast seeders mounted on all-terrain vehicles as well as hand-operated seeders. To improve germination success, a drag harrow was utilized both to prepare the seedbed and to provide soil cover for seeds. Seeding took place in the late fall to allow seed scarification and to take advantage of spring moisture for germination. Seed selection focused on native species except when unavailable, cost-prohibitive, or inconsistent with management goals and objectives. The cultural resource survey delineated areas for hand-seeding and/or non-treatment to mitigate further potential cultural resource impacts and to achieve cultural resource goals and objectives.

Approximately two miles of temporary fencing was constructed to protect the newly seeded burn area from livestock grazing. Fence construction conforms to BLM handbook specifications (H-1741). Temporary fencing was removed when stabilization of the site was achieved, and fencing materials would be recycled for other projects.

Monitoring of treatment methods and effectiveness occurred throughout the project area to establish success levels, determine potential treatment adjustments, and to document results for future ES&R treatment considerations. Monitoring results, weather patterns,

or other factors could initiate a second stage of seeding treatment to provide optimum vegetative establishment.

In analyzing treatment alternatives, an interdisciplinary team determined that seeding was the most effective treatment to successfully prevent soil erosion, protect cultural and historic sites, and improve habitat condition. The area was considered to be in Condition Class III (CC3), Fire Regime II prior to the wildland fire. In CC3 areas, fire regimes and vegetation attributes have been substantially altered from their natural/historical range and the risk of losing key ecosystem components from wildland fire is high. The goal of the seeding treatment was to stabilize soils, manage the spread of invasive species, and move the area toward Condition Class I (CC1), where fire regimes are within the natural/historical range and the risk of losing key ecosystem components is low. In subsequent years, as a result of this stabilization treatment, soils damaged by the Dove Creek fire should become stable and support vegetative composition, structure, and patterns representative of a functional sagebrush/grassland ecosystem.

The goal of this project is to monitor the effectiveness of the drill seeding treatment. This monitoring project was undertaken to establish success levels, determine potential treatment adjustments, and to document results for future ES&R treatment considerations.

II. Disturbance History

The disturbance history is relatively unknown. Geospatial fire history data show no old fires within the project area.

III. Description of Ecological Model

The majority of the project area occurs in soil map unit MvG. This unit is described as Montvale very rocky, very fine sandy loam, on 2-25% slopes. This corresponds to an Upland Shallow Loam (Pinyon-Juniper) site and 14-17 inches of annual precipitation. The climax plant community, in terms of canopy cover, consists of 10% perennial grasses 5% forbs, 30% shrubs, and 25 % trees. Important species include indian ricegrass, galleta, and Nevada bluegrass.

A portion of the project area occurs on NIC. This unit is described as Northdale loam on 0-6% slopes. This cooresponds to an Upland Loam (Basin Big Sagebrush) ecological site. The climax plant community, in terms of canopy cover, consists of 50% perennial grasses 5% forbs, 15% shrubs, and 0 % trees. Important species include needleandthread grass, indian ricegrass, mutton grass, and blue grama.

IV. Treatment

The seed mix was applied in November 2006 using an ATV with a broadcast seeder and a harrow.

Table 1. Dove Creek ESR Seed Mix.

Common Name	Scientific Name	Lbs/Acre	# Viable Seeds/ft^2
Crested Wheatgrass	*Agropyron cristatum*	1.5	6.9000
Sand Dropseed	*Sporobolus cryptandrus*	0.05	7.9560
Fourwing Saltbush	*Atriplex canescens*	1	1.3000
Sagebrush, Wyoming	*Artemisia tridentata wyomingensis*	0.25	19.0128
Indian Ricegrass	*Achnatherum hymenoides*	1.5	7.0500
Bitterbrush	*Purshia tridentata*	0.5	0.1500
Small Burnet	*Sanguisorba minor*	0.25	0.4003
Ladak Alfalfa	*Medicago sativa*	0.5	2.6500
	Total	**5.55**	**45.42**

V. Management Objectives

The following objectives were defined in the final Bryson Emergency Stabilization Plan. These first two years had defined density objectives and were not quantified because of the prevalence of rhizomatous species that could not be captured using density. *This was a shortcoming of the monitoring plan*. Year three objectives will be adopted for a determination of success.

A. Defined Objectives

Year 1 and 2 objectives will not include the seeded shrubs. Lessons from the Rattle Fire Complex ES&R Monitoring Project indicate that the first two years are dominated by grasses and forbs. Shrubs began to emerge after year two and therefore shrub objectives will not be defined until year three. Grass and forb germination is expected to be high in the first growing season but many of the seedlings will not establish and persist into the second and third growing season. The target threshold objectives are designed around this ecological trend.

Year 1 Objectives

Vegetation Objective:
Obtain average densities of seeded grasses of 10 plants/m^2 and seeded forbs of 5 plants/m^2 by the end of the first growing season following seeding within all soil types of the Dove Creek ES&R treatment area.

Soil Stability Objective:
Soil stability test values from the burned sites will vary by only one stability class from the unburned sites within similar soil types of the Dove Creek ES&R treatment area by the end of the first growing season.

Year 2 Objectives

Vegetation Objective:
Obtain average densities of seeded grasses of 5 plants/m^2 and seeded forbs of 3 plants/m^2 by the end of the second growing season following seeding within all soil types of the Dove Creek ES&R treatment area.

Soil Stability Objective:
Soil stability test values from the burned sites are at the same stability class ranking as the unburned sites within similar soil types of the Dove Creek ES&R treatment area by the end of the second growing season.

Year 3 Objectives

Year 3 objectives are combined with overall vegetation treatment monitoring objectives for the Dove Creek fire rehabilitation project:

- **Management Cover Objective for Overall Vegetative Recovery**
  Obtain relative vegetative cover values for preferred lifeforms of 20% for grasses, 20% for forbs and 5% shrubs within the Dove Creek burn site by the year 2010.

- **Management Frequency Objectives for Overall Vegetative Recovery**
  Obtain frequency values for preferred life forms (native species) of 40% for grasses, 30% for forbs, and 10% for shrubs by the year 2010 for the Dove Creek burn area.

- **Management Cover Objective for Treatment Effectiveness**
  Limit the relative vegetative cover of annual weeds to 50% for cheatgrass (*Bromus tectorum*), Russian annual wheatgrass (*Eremopyrum tricetum*), halogeton (*Halogeton glomeratus),* redstem stork's Bill (*Erodium cicutarium)* and Russian thistle (*Salsola kali)* within the Dove Creek burn area by the year 2010.

- **Management Frequency Objectives For Treatment Effectiveness**
  Obtain relative frequency values for the seeded species of 40% for perennial grasses, 5% for forbs, and 10% for woody species within the burn area by the year 2010.

- **Management Soil Stability Objective for Overall Recovery/Treatment Effectiveness**
  Soil stability test values from the burned sites are at the same stability class ranking as the unburned sites within similar soil types of the Dove Creek ES&R treatment area by the end of the second growing season.

VI. Monitoring Design

A. Sampling Objective

- **Sampling Objective for Cover**
  I want to be 90% confident that the estimated cover values I obtain are within 20% of the estimated true value.

- **Sampling Objective for Frequency**
  I want to be 90% confident that the estimated frequency values that I obtain are within 20% of the estimated true value.

- **Sampling Objective for Density**
  I want to be 90% confident that the estimated density values that I obtain are within 20% of the estimated true value.

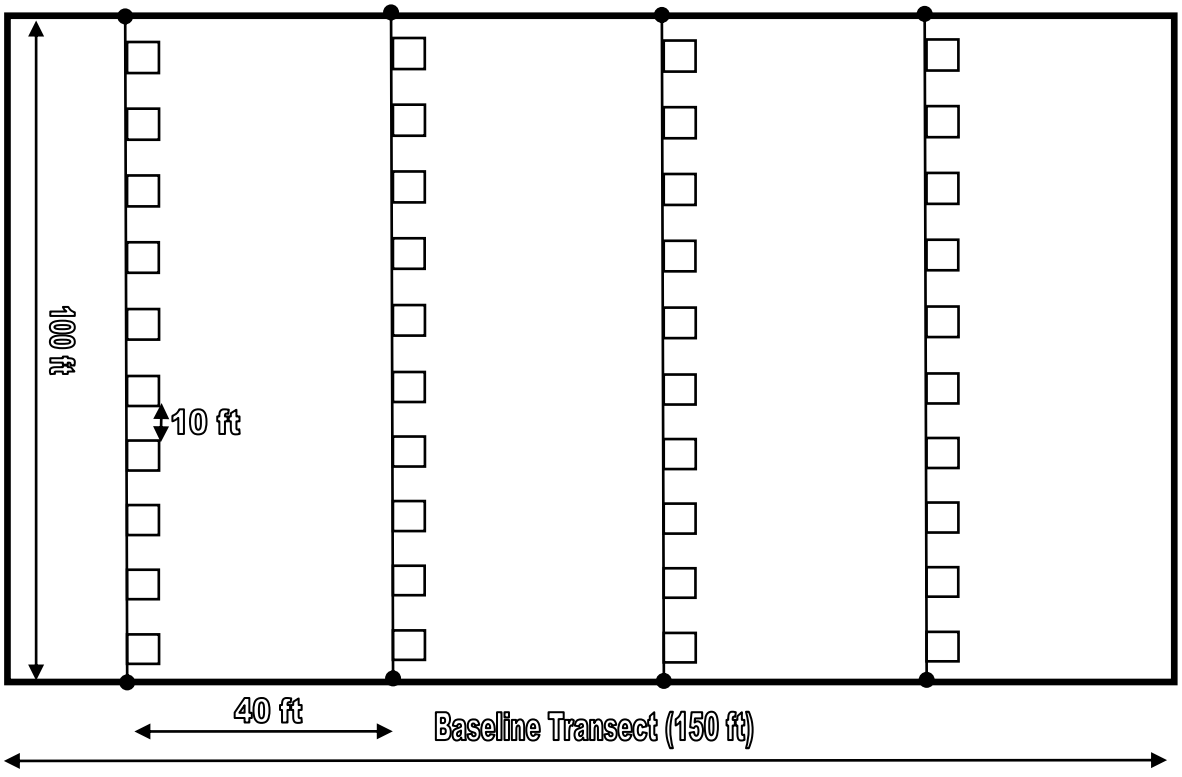

Figure 1. Macroplot Layout. Lines with dots are subtransects and squares are nested frequency sampling frame locations. Cover points not shown but include 50 pts/subtransect.

B. Sampling Design

A two-stage sampling design was employed in the Dove Creek ESR project for quantifying vegetative response and treatment effectiveness. In other words, subtransects or macroplots can be analyzed as the sample unit. Sampling was stratified by SSURGO soil map unit. All macroplots are randomly located in SSURGO Soil Map unit 2 because this was the predominant soil type treated.

Macroplots were subsampled by collecting data on four 100' subtransects. Subtransects were systematically located 30' apart within the macroplot with an initial random start between 0-28' (Fig. 1). Quantitative response variables measured at each subtransect include line-point intercept cover and nested frequency. Line-point intercept cover included 50 pts per transect and measured only the first hit for all grass, forb, shrub vegetation. Nested frequency frames included 10 frames per transect and measured all grass, forb, and shrub frequency. Density was not utilized as planned because of the prevalence of rhizomatous species for which individual counting units could not be defined.

C. Field Measurement Protocols

The baseline transect, at each plot location, is monumented with a T-post at the start and a 2' piece of rebar at the end. GPS locations for these monuments were collected using a Trimble GeoXT and differentially corrected to achieve maximum positional accuracy. A 150' tape measure is stretched between the two markers and 100' subtransect tapes are extended perpendicularly to this (Fig. 1).

Figure 2. Nested Frequency Sampling Frame.

Frequency was measured using a nested frequency frame with quadrat sizes of 24" x 24", 12" x 12", 6" x 6", and 3" x 3" (Fig. 2). The quadrat sizes were selected to be consistent with data collected by the range program in the Monticello Field Office. The sampling frame was placed 10 times along each subtransect every 10 feet starting at the 5 ft mark. All species rooted with greater than 50% of the plant base occurring within one of the nested quadrats were tallied. Refer to Measuring and Monitoring Plant Populations (Elzinga et al, 1998) for more information on nested frequency.

Cover was measured using the line-point intercept method (Bonham, 1989; Elzinga et al, 1998) using a pin flag. Cover points are a systematically placed, every two feet, along the subtransect starting at the two foot mark on the tape for a total of 50 points per subtransect. Only the top canopy hit was recorded for each point for all plants.

Repeat photography was taken at each of the plots. The T-posts are monumented with the ribbed side of the T-post pointing True North (i.e. no declination adjustment). This

results in the three flanged edges pointing in the three other cardinal directions. Using the T-post as a guide or "tripod", by resting the camera on top, photographs were taken for each cardinal direction. Additional photographs were taken of plants present in the area.

D. Timing of Monitoring

Monitoring occurred prior to treatment and the first three growing seasons following treatment (Table 2).

Table 2. Dove Creek Sample Events.

Monitoring Status	Macroplot 1	Macroplot 2	Macroplot 3
Pre Treatment	No Data	No Data	No Data
1st Growing Season	11/13/2007	11/13/2007	12/04/2007
2nd Growing Season	09/26/2008	09/26/2008	09/30/2008
3rd Growing Season	09/09/2009	09/09/2009	09/09/2009

E. Monitoring Location

Table 3. Dove Creek Macroplot Locations.

Macroplot	Northing (m)	Easting (m)	Elevation (ft)
Macroplot 1 Start	4171763.9	672232.0	6597
Macroplot 1 End	4171793.9	672266.1	6598
Macroplot 2 Start	4171604.8	671989.7	6598
Macroplot 2 End	4171575.1	671954.0	6595
Macroplot 3 Start	4171460.1	671850.9	6589
Macroplot 3 End	4171504.8	671835.9	6587

F. Intended Data Analysis Approach

Summary statistics will be calculated on the frequency and cover data. Simple means, proportions, standard deviations, standard errors, and confidence intervals will be calculated and compared to objectives. A T-test may be used to compare different treatment means in an attempt to find significant differences in the measured variables. T-values will be used instead of Z-values because of the small sample size.

VII. Data Sheet Example

See Appendix B.

VIII. Management Implications of Potential Results

The results of the monitoring program may show either treatment success or failure. If the results of this monitoring project show that the drill seeding treatment was unsuccessful in meeting objectives then several considerations need to be addressed.

First, the objectives need to be evaluated to determine if they were reasonable given the soil type, precipitation zone, range/ecological site, fire severity, timeframe and type of treatment. If, in hindsight, they are deemed unrealistic then future projects may still be implemented and successful within the framework of an altered set of objectives. If the objectives are deemed appropriate in a post-hoc consideration than future drill seedings under similar conditions should not be implemented.

Second, if monitoring data show that certain species exhibited greater levels of germination, establishment, and persistence over others and that increasing seeding rates of these species might meet objectives, than future projects may be successful with an altered seed mix.

Third, the monitoring data may show treatment failure in certain areas where implementation of the seeding was the cause of failure. In other words, seeding may have been successful in certain areas but not in others due to an implementation failure of not applying seed uniformly throughout the project area. In this case reapplication of the seed in these areas may be performed.

IX. Summary of Results

See Table 4 below for a key to the species codes and functional groups. Only the 24”x 24” frequency quadrat and the first pin flag intercept were analyzed.

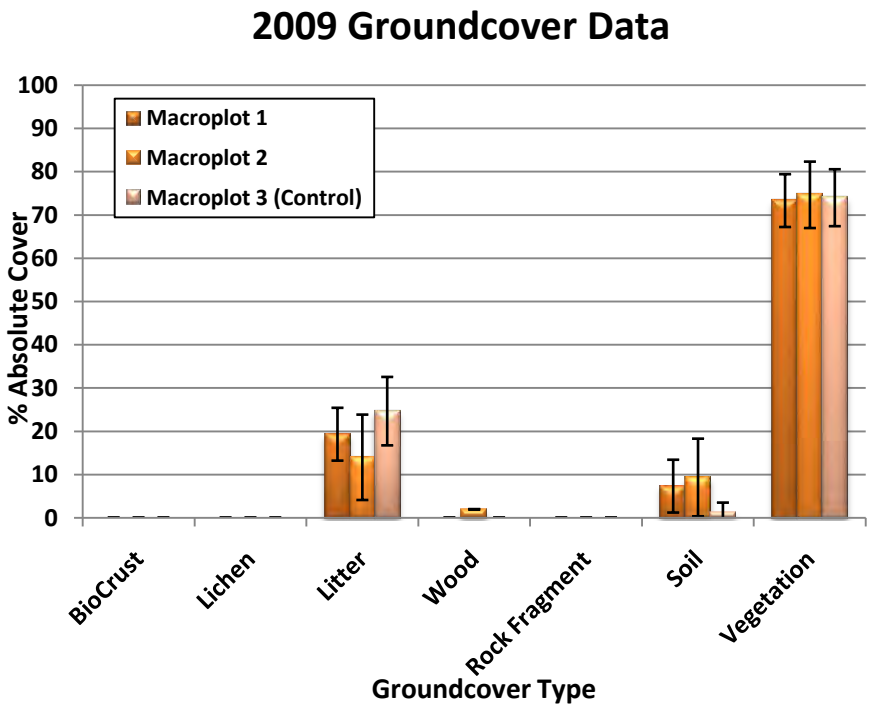

Figure 3. Absolute Percent Cover of Ground Cover Types in 2009. Error bars show 90% confidence intervals.

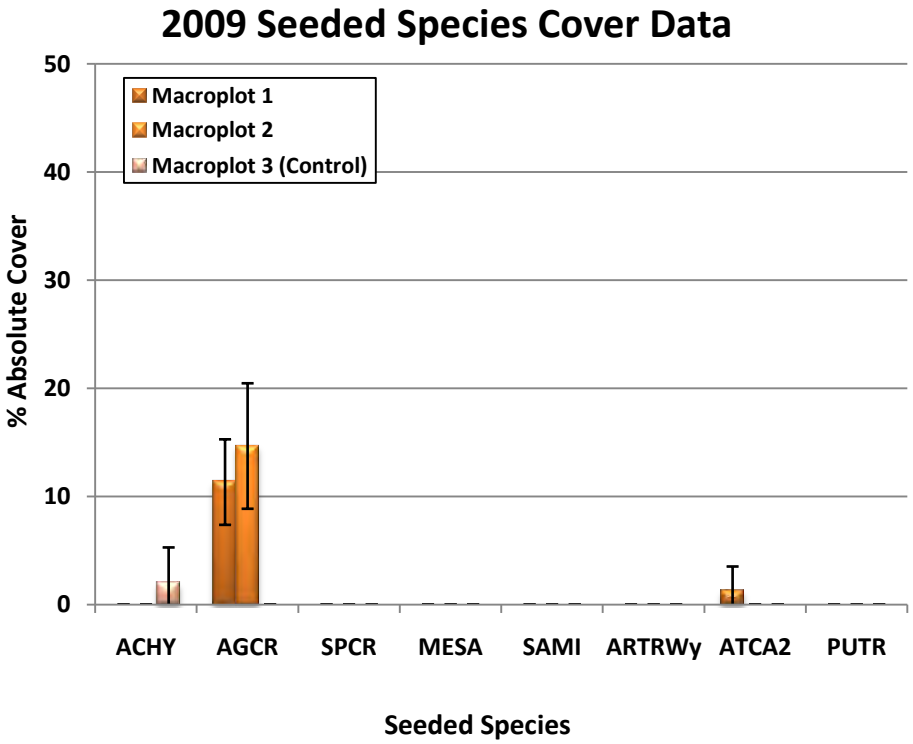

Figure 4. Absolute Percent Cover of Seeded Species in 2009. Error bars show 90% confidence intervals.

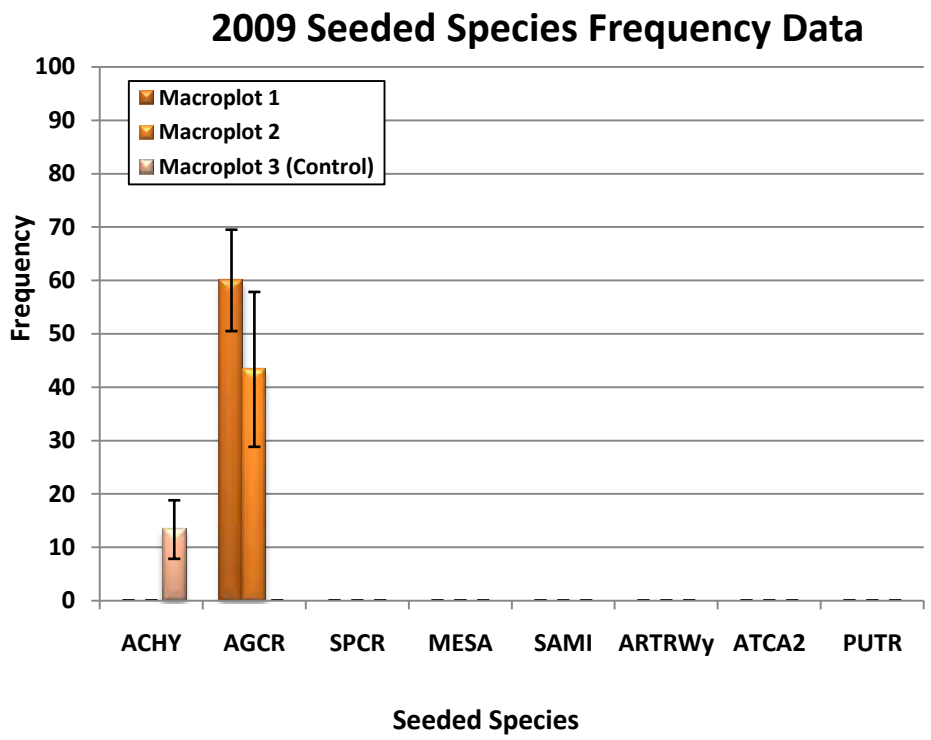

Figure 5. Relative Frequency of Seeded Species in2009. Error bars show 90% confidence interval.

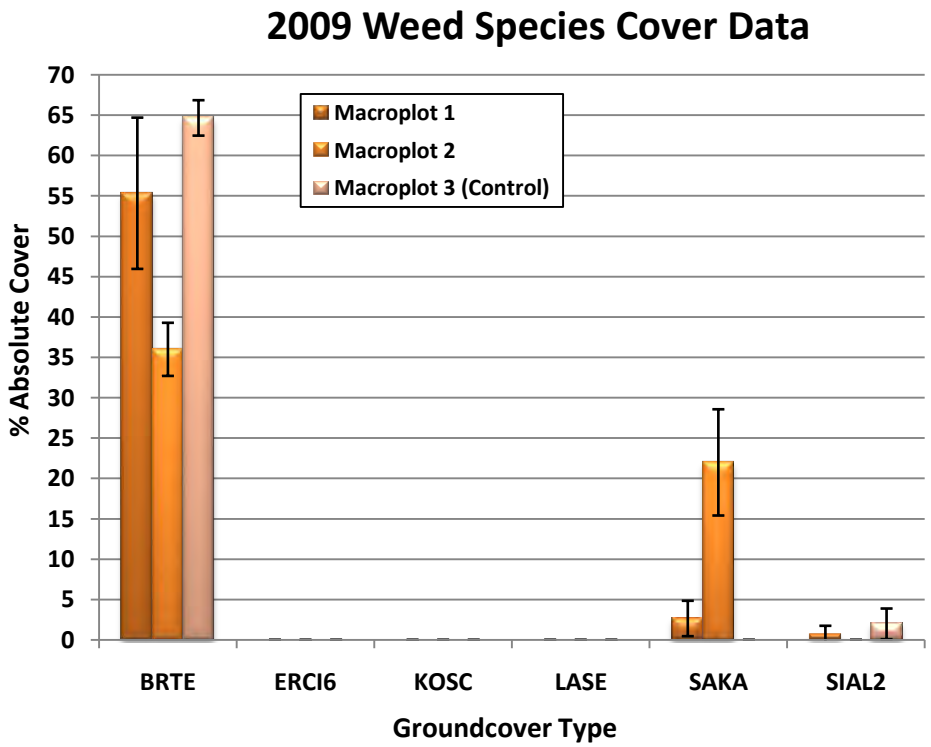

Figure 6. Absolute Percent Cover of Weed Species in 2009. Error bars show 90% confidence intervals.

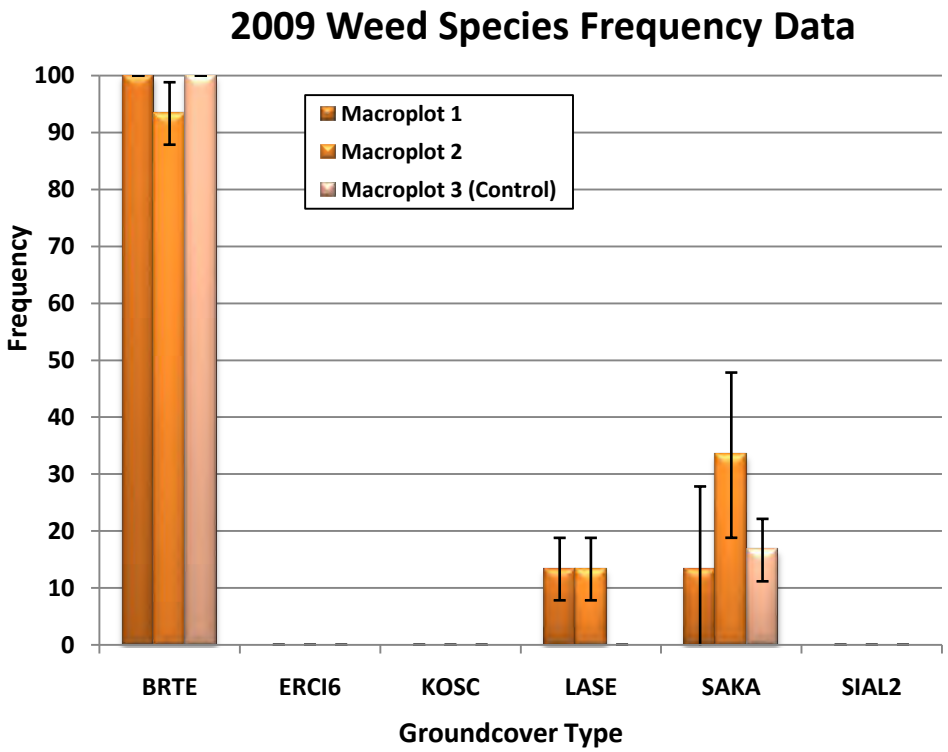

Figure 7. Relative Frequency of Weed Species in2009. Error bars show 90% confidence interval.

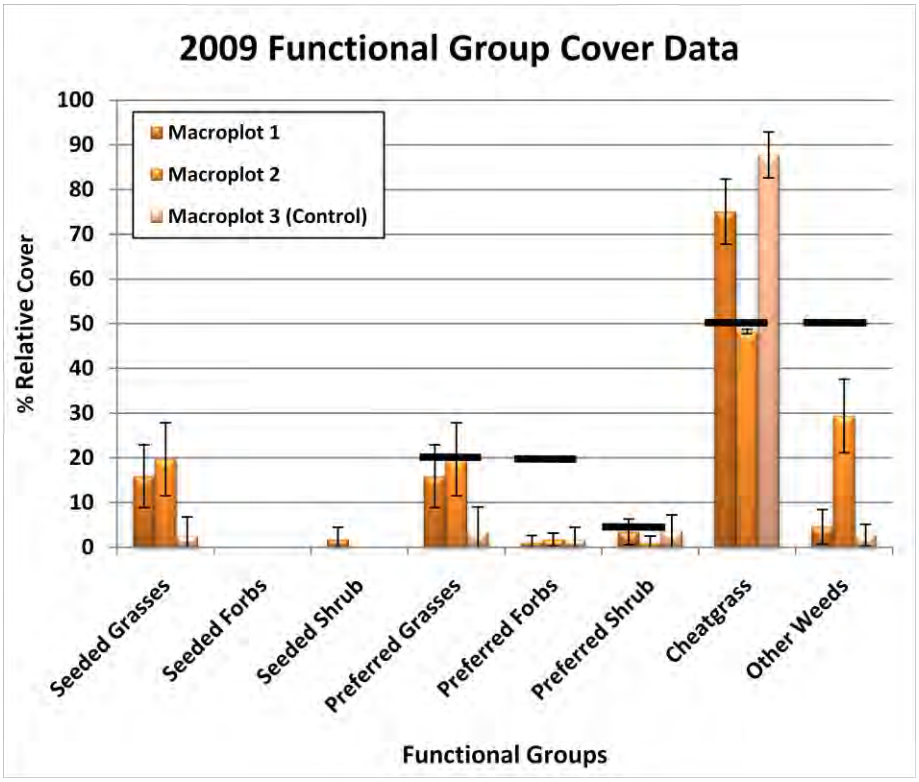

Figure 8. Relative Percent Cover of Functional Groups in 2009. Black lines show objective thresholds and error bars show 90% confidence interval.

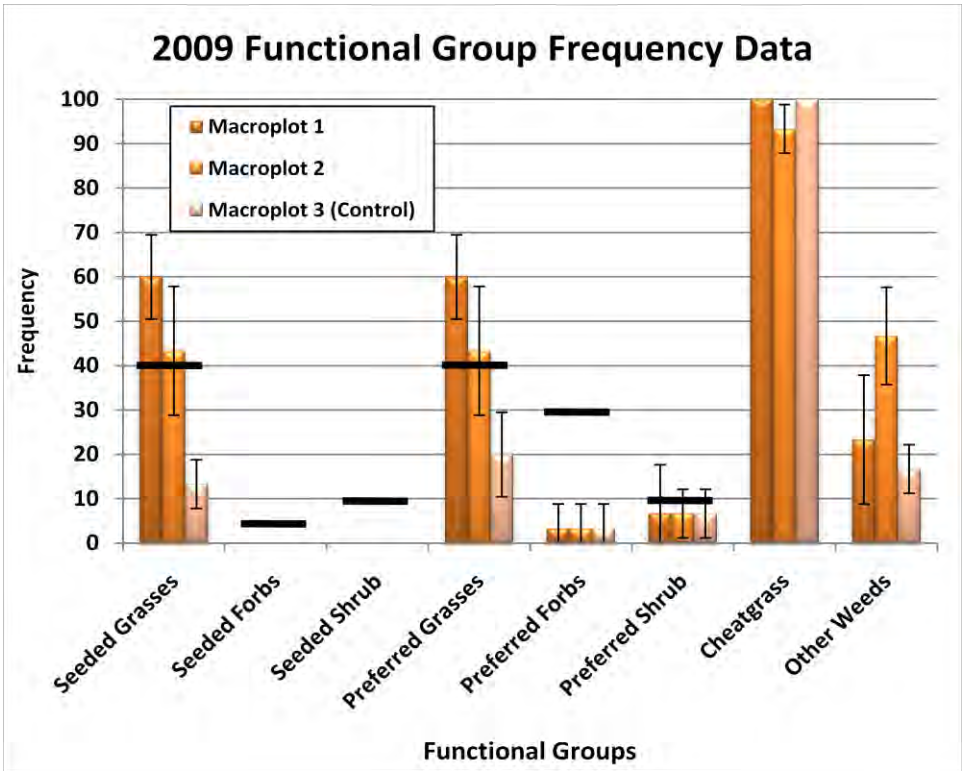

Figure 9. Relative Frequency of Functional Groups in 2009. Black lines show objective thresholds and error bars show 90% confidence interval.

Table 4. Key to Species Codes and Functional Groups

Species Code	Common Name	Scientific Name	Functional Group	
ACHY	Indian Ricegrass	*Achnatherum hymenoides*	Seeded Grasses	Preferred Grasses
AGCR	Crested Wheatgrass	*Agropyron cristatum*		
SPCR	Sand Dropseed	*Sporobolus cryptandrus*		
POSE	Sandberg's Bluegrass	*Poa secunda*		
HECO26	Needleandthread	*Heterostipa comata*		
VUOC	Sixweeks Fescue	*Vulpia octoflora*		
MESA	Ladak Alfalfa	*Medicago sativa*	Seeded Forbs	Preferred Forbs
SAMI	Small Burnett	*Sanguisorba minor*		
DEPI	Tansymustard	*Descurainia pinnata*		
LAOC3	Western Sticktight	*Lappula occidentalis*		
MACA2	Hoary tansyaster	*Machaeranthera canescens*		
PLPA2	Wooly Plantain	*Plantago patigonica*		
SPCO	Scarlet Globemallow	*Sphaeralcea coccinea*		
LUPUP	Rusty Lupine	*Lupinus pusillus*		
OEPA	Pale Evening Primrose	*Oenothera pallida*		
ARTRWy	Wyoming Big Sagebrush	*Artimisia tridentata wymongensis*	Seeded Shrubs	Preferred Shrubs
ATCA	Fourwing Saltbush	*Atriplex canescens*		
PUTR	Antelop Bitterbrush	*Purshia tridentata*		
GUSA	Broom Snakeweed	*Gutierrezia sarothrae*		
BRTE	Cheatgrass	*Bromus tectorum*		Weeds
ERCI6	Redstem Stork's Bill	*Erodium cicutarium*		
KOSC	Kochia	*Kochia scoparia*		
LASE	Prickly lettuce	*Lactuca serriola*		
SAKA	Russian Thistle	*Salsola kali*		
SIAL2	Tall Tumblemustard	*Sisymbrium altissimum*		

X. Interpretation of Results

There was no difference in the groundcover functional groups (Fig. 3). The cover and frequency of seeded and weed species are shown in Figures 4-7.

A. Objectives

The *Management Cover Objective for Overall Vegetative Recovery* was *not successful* in meeting the objective threshold for preferred grasses, preferred forbs, or preferred shrubs (Fig. 8). Interestingly, the preferred grass objective was within 5% of being met. The seeded species, crested wheatgrass comprises the majority of the preferred grass functional group and without the seeding the cover of preferred grasses would nearly be zero.

The *Management Frequency Objective for Overall Vegetative Recovery* was fully successful for preferred grasses, but was completely unsuccessful for preferred forbs and preferred shrubs (Fig. 9). For preferred grasses, the seeded plots have a significantly higher frequency than in the control.

The *Management Cover Objective for Treatment Effectiveness* focused on limiting the relative cover of annual weeds to less than 50% (Fig. 8). This objective was *not met* by any of the seeded macroplots or the control.

The *Management Frequency Objective for Treatment Effectiveness* was fully successful for seeded grasses but was completely unsuccessful for seeded forbs and shrubs (Fig. 9). For seeded grasses, the seeded plots had statistically higher frequencies of seeded species when compared to the control.

B. Other Results

The following bullets represent some other conclusions that can be drawn from this monitoring project:

- AGCR (crested wheatgrass) is establishing (Fig. 4, 5).
- BRTE (cheatgrass) is very prevalent on all sites (Fig. 6, 7)
- Seeded forbs and seeded shrubs failed (Fig. 4, 5).
- Vegetative response different among different soils (see below).

XI. Management Recommendations

A. Change in Management

When seeding in this MvG soils it may be advantageous to increase the seeding application rate for crested wheatgrass. Additionally, other species should be tested in future seedings.

B. Change in Monitoring

The Dove Creek ES&R monitoring project was successful in providing an understanding of the treatment effectiveness of the drill seeding. Important aspects to the monitoring plan included the incorporation of quantitative methods, random sampling, soil stratification and control plots. However, several changes to future ES&R monitoring programs are recommended to increase sampling efficiency, statistical rigor, and to bring the Canyon Country Fuels ES&R program in line with the national monitoring standardization effort.

Sampling efficiency could be improved by decreasing the subsampling intensity within each macroplot. In this project, five subtransects were sampled within each macroplot and a reduction to three subtransects is recommended. The Rattle Fire Complex Remote Sensing Report (Bissonette and White, 2008) showed that subsampling intensity could be reduced to three or four subtransects with satisfactory results in generating the cheatgrass cover regression model created for that project. A notable difference between the Rattle ES&R project and the Dove Creek ES&R project is that the diversity was far greater within Rattle. The use of three subtransects per plot in the lower plant diversity system of the Dove Creek ES&R project seems further justified.

Statistical rigor would be increase by increasing the number of macroplots to better capture the variability within the Dove Creek ES&R project. This is a common issue for land management agencies due to the limited time and money available for monitoring the large number of projects. However, increasing the number of macroplots per strata to three or four is recommended. A reduction in the amount of subsampling, as mentioned previously, will provide a cost savings that can be used to increase the number of macroplots on the landscape.

ES&R project monitoring has been criticized by the Government Accountability Office (GAO) because the methods currently employed throughout the Department of Interior (DOI) are dissimilar and do not often establish treatment success/failure. There has been considerable thought and effort applied to establishing a common approach to monitoring ES&R projects (Wirth and Pyke, 2007a) to address these shortcomings. Monitoring ES&R projects will follow the methodology outlined by Wirth and Pyke (2007b) with a small modification. Seeded rhizomatous species are often not easily quantified using density because defining an individual is problematic. Therefore, the density quadrat will be used as a frequency frame and frequency collect for seeded rhizomatous species.

XII. REFERENCES

Bissonette, G.J., White, M.A. 2008. Rattle Fire Complex Emergency Stabilization and Rehabilitation Remote Sensing Report. Bureau of Land Management, Moab Field Office. 23 p.

Bonham, C.D. 1989. Measurements for terrestrial vegetation. John Wiley and Sons, New York. 338 p.

Elzinga, C.L., Salzer, D.W., and Willoughby, J.W. 1998. Measuring and Monitoring Plant Populations. USDI Bureau of Land Management Technical Reference 1730-1. 492 p.

Hansen, D. T. 1989. Soil Survey of Grand County, Utah. Natural Resource Conservation Service, United States Department of Agriculture.

Wirth, T.A., Pyke, D.A., 2007a. Monitoring Post-fire Vegetation Rehabilitation Projects-A Common Approach for Non-forested Ecosystems: U.S. Geological Survey Scientific Investigations Report 2006-5048, P. 36.

Wirth, T.A., Pyke, D.A., 2007b. Standardized Emergency Stabilization and Rehabilitation Monitoring Protocols. **U.S. Department of Interior, U.S. Geological Survey Forest and Rangeland Ecosystem Science Center.** http://fresc.usgs.gov/research/esrmonitoring/Links.htm.

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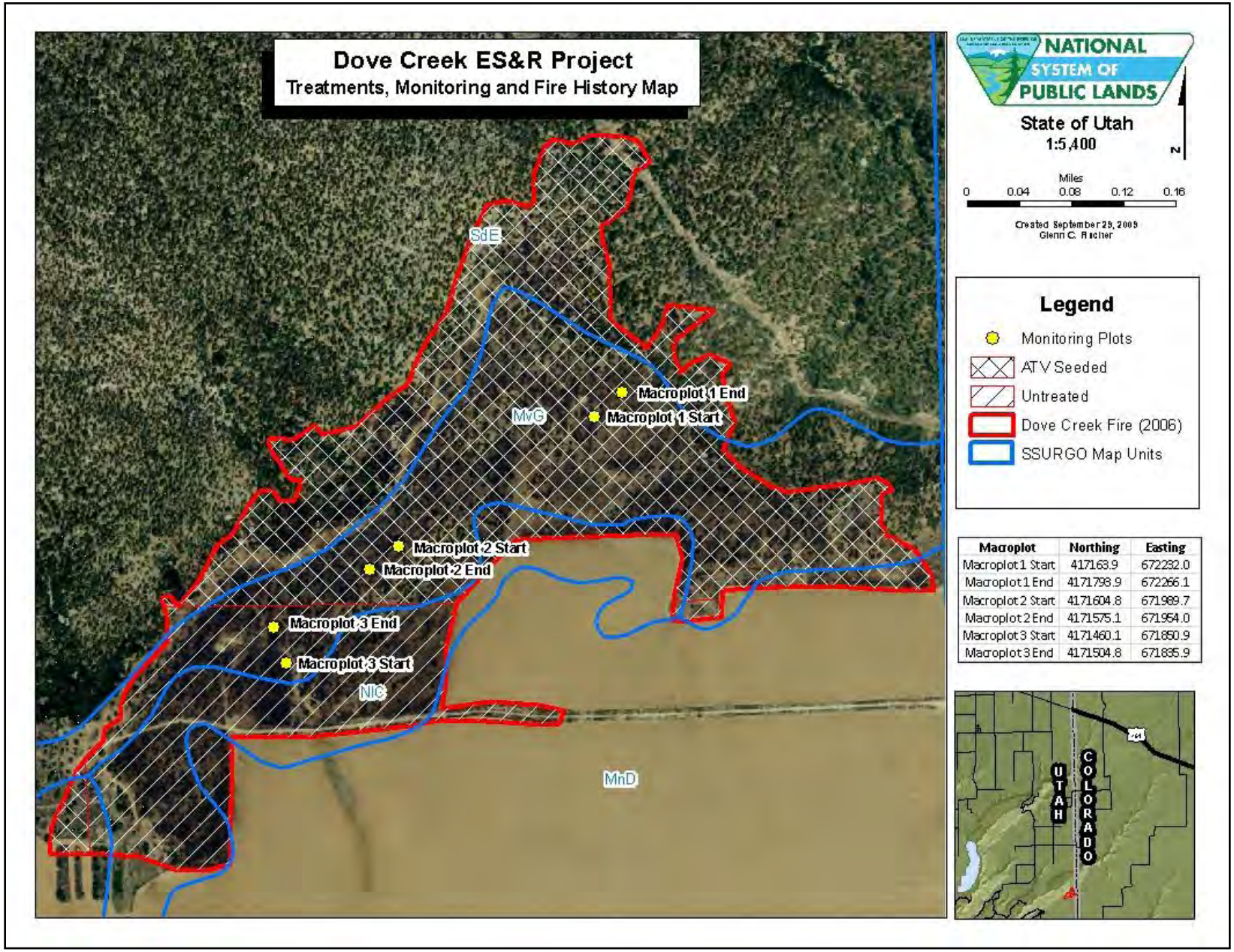
Appendix A – Project Map



Macroplot	Northing	Easting
Macroplot 1 Start	4171163.9	672282.0
Macroplot 1 End	4171793.9	672266.1
Macroplot 2 Start	4171604.8	671989.7
Macroplot 2 End	4171575.1	671954.0
Macroplot 3 Start	4171460.1	671850.9
Macroplot 3 End	4171504.8	671835.9

Appendix B - Data Sheets

UTM:

Nested Frequency

Study Site:	Date:	Examiner:	Recorder:
Main Transect Location & Length:	Number of quadrats: 10 on each subtransect		Quadrat size: 24" x 24"
Sub Transect Location & Length:	Sampling Interval:		
Design: random systematic	Subtransects read on	of baseline	Quadrats read on: of subtransect

Transect #:	Located at:	Random Quadrats start at:	Quadrat Interval:	Transect #:	Located at:	Quadrat Random Start at:	Quadrat Interval:

	Quadrats										Quadrats									
Plant Species, Soil Crust, Etc.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Cover Values read L to R	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
frame point 1																				
frame point 2																				
frame point 3																				
frame point 4																				
frame point 5																				

Notes and Species Observed:

Appendix C – Repeat Photography

Dove Creek ESR – Macroplot 1 North – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 1 North – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 1 North – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 1 South – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 1 South – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 1 South – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 1 East – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 1 East – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 1 East – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 1 West – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 1 West – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 1 West – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 1 Plotview – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 1 Plotview – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 1 Plotview – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 2 North – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 2 North – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 2 North – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 2 South – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 2 South – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 2 South – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 2 East – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 2 East – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 2 East – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 2 West – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 2 West – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 2 West – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 2 Plotview – 11/13/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 2 Plotview – 09/26/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 2 Plotview – 09/09/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 3 North – 12/04/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 3 North – 09/30/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 3 North – 09/10/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 3 South – 12/04/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 3 South – 09/30/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 3 South – 09/10/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 3 East – 12/04/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 3 East – 09/30/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 3 East – 09/10/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 3 West – 12/04/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 3 West – 09/30/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 3 West – 09/10/2009 (3rd Growing Season)

Dove Creek ESR – Macroplot 3 Plotview – 12/04/2007 (1st Growing Season)


Dove Creek ESR – Macroplot 3 Plotview – 09/30/2008 (2nd Growing Season)

Dove Creek ESR – Macroplot 3 Plotview – 09/10/2009 (3rd Growing Season)