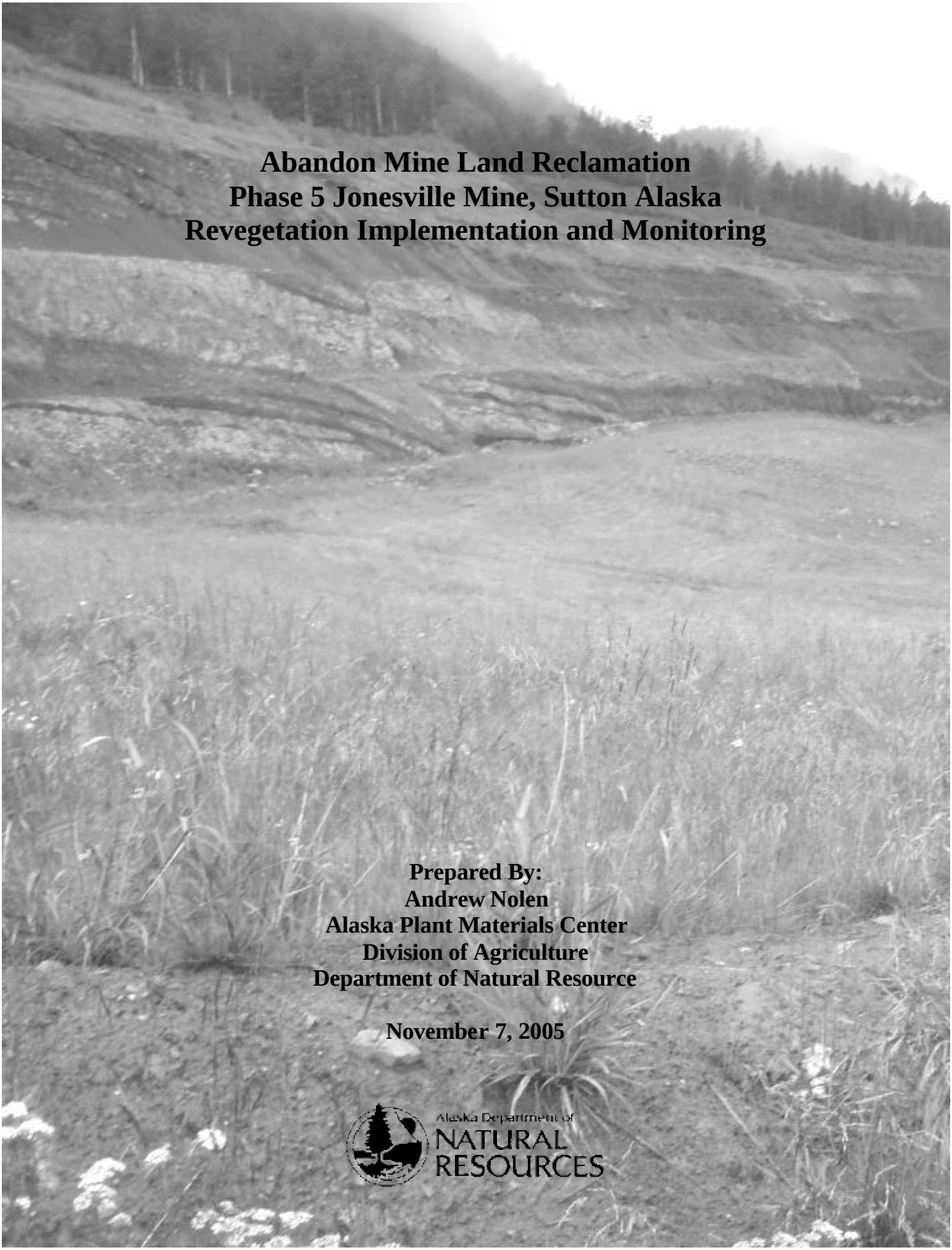

Abandon Mine Land Reclamation
Phase 5 Jonesville Mine, Sutton Alaska
Revegetation Implementation and Monitoring

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Alaska Department of
NATURAL
RESOURCES

Introduction

The Alaska Plant Materials Center (PMC), in cooperation with the Division of Mining, Land and Water Abandon Mine Land Program, reclaimed the Jonesville Coal Mine near Sutton, Alaska. The reclamation of Phase 5 was accomplished in the summer of 2002. The PMC was responsible for the seed and fertilizer recommendations and applications as well as long term monitoring and maintenance for the project.

Seed and Fertilizer Recommendations

PMC agronomists worked directly with Division of Mining, Land and Water staff to develop and implement the revegetation portion of the project. Since phase 5 of Jonesville Mine is divided by a large high wall, the area was separated into two treatment areas. The slope above the high wall, which totals approximately 8.5 acres, was designated Treatment Area 1. A seeding rate of 20 pounds per acre was decided on for that portion. The area below the high wall totals approximately 27.3 acres and was designated Treatment Area 2. A seeding rate of 12 pounds per acre was determined appropriate for that section. This lower seeding rate was chosen with the goal of controlling erosion while allowing for natural reinvasion of primary successional species. The area above the high wall needed the increased seeding rate due to the steepness of the slope and increased erosion potential. The fertilizer recommendation was 450 pounds per acre of 20-20-10 chemical fertilizer for both treatment areas.

The seed mix recommendation consisted of three grass species and two forbs. The grass species included 'Arctared' fescue (*Festuca rubra*), 'Nortran' tufted hairgrass (*Dechampsia caespitosa*), and 'Gruening' alpine bluegrass (*Poa alpine*). One hundred forty pounds of each variety were acquired and mixed. The two forbs chosen were lupine (*Lupinus nootkatensis*) and yarrow (*Achillea millifolium var. boreale*). The lupine was added to the mix at a rate of one pound per 12 pounds of grass seed mix. The yarrow was added to the mix at a rate of 1/3 pound per 12 pounds of grass seed mix. All of the varieties used were procured from Alaska Mill and Feed in Anchorage with the exception of the yarrow which was donated by the PMC.

Implementation

The application of seed and fertilizer was accomplished in two phases. Treatment Area 1 was completed July 18, 19 and 22, 2002. Treatment Area 2 was completed August 8, 9 and 12, 2002.

Treatment Area 1

The slope above the top terrace of the high wall is long and narrow. Seed and fertilizer applications were quite labor intensive due to the steepness of the slope and inaccessibility. The work was accomplished in 140 man hours over three days with two agronomists and a five member labor crew.

<u>Equipment</u>:
2 four wheel drive pickup trucks
2 Rented 4-wheelers
5 external frame camping packs
3 hand held crank broadcast spreaders
300 foot rag tape

hanging scale
4700 pounds of 20-20-10 fertilizer in 50 pound bags
200 pounds of specified seed mix in 50 pound bags

Methods:
The area was broken down into treatment zones for ease of calculating fertilizer and seed requirements. On the ground measurements indicated a slightly larger treatment area than what was expected. Existing survey markers along the top of the ridge were determined to be consistently 66 feet apart. Each stake was numbered, 1-46, starting at the east end of the project. The area was then divided into 8 treatment zones, A-G, based upon the distance from the top of the ridge to the top of the closest terrace. Treatments were as follows:

Zone A: Stake 1-Stake 7, about 1.5 Acres. 775 lbs fertilizer and 30 lbs seed mix
Zone B: Stake 8-Stake 11, about 0.6 Acres. 300 lbs fertilizer and 12 lbs seed mix
Zone C: Stake 12-Stake 20, about 1.8 Acres. 800 lbs fertilizer and 36 lbs seed mix
Zone D: Stake 21-Stake 24, about 0.75 Acres. 350 lbs Fertilizer and 14 lbs seed mix
Zone E: Stake 25-Stake 28, about 0.75 Acres. 350 lbs fertilizer and 14 lbs seed mix
Zone F: Stake 29-Stake 39, about 2.5 Acres. 1200 lbs fertilizer and 50 lbs seed mix
Zone G: Stake 40-Stake 46, about 2 Acres. 900 lbs fertilizer and 40 lbs seed mix

Pickup trucks and 4-wheelers were used to transport materials and personnel as close to the treatment area as possible. All of the seed and fertilizer was packed manually into position along the narrow and treacherous trail at the top of the ridge. Spreading of seed and fertilizer was accomplished with hand held crank broadcast spreaders. Care was taken to assure that applications were only made to the upper slope and not the terraces.

All Zones were seeded and fertilized at the rates defined above except for Zone F. This section was fertilized on less than half of the zone due to inaccessibility. From Stake 31 to Stake 39 received no fertilizer. The area east of stake 1 was determined to be about 2 acres. It extends from the top of the ridge north to the road at the bottom of the project. This area received 800 lbs of fertilizer and 40 lbs of seed mix.

Treatment Area 2
The 27.3 acre area below the high wall was prepared prior to seed and fertilizer applications by contour ripping with a bulldozer. The reasonably flat and accessible area was suitable for mechanical seed and fertilizer application methods. All on site activities were completed in 161 man hours over three days with two agronomists, one tractor operator, and four laborers. The tractor was used for two of the three days.

Equipment:
40 horsepower four wheel drive tractor with a power takeoff (PTO) broadcast spreader
2 rented 4-wheelers with trailers
2 PMC 4-wheelers with broadcast spreaders
3 hand held crank broadcast spreaders

Methods:
The tractor was transported to the site by a hired tilt bed tow truck. The PTO broadcast spreader was calibrated to apply the desired seed and fertilizer rates. The fertilizer was

applied first followed by the seed mix. Most of the area was able to be treated with the tractor though large rocks and mud prevented access to some portions. The 4-wheeler spreaders or hand held spreaders were used in those locations including designated pull off areas along the north side of the project. 4-wheelers were also used to transport seed and fertilizer to the tractor as necessary.

Monitoring

Photo points (PP) were established on July 22, 2002 for long term monitoring of the success of the revegetation treatments. A hand held GPS was used to identify the individual points. The photo point locations are:

PP#1:	N 61° 44' 29.6"	W148° 57' 37.8"
PP#2:	N 61° 44' 28.9"	W148° 57' 32.1"
PP#3:	N 61° 44' 28.1"	W148° 57' 20.5"
PP#4:	N 61° 44' 28.5"	W148° 57' 13.5"
PP#5:	N 61° 44' 28.7"	W148° 57' 01.7"
PP#6:	N 61° 44' 28.6"	W148° 56' 53.5"
PP#7:	N 61° 44' 27.8"	W148° 56' 41.1"
PP#8:	N 61° 44' 23.5"	W148° 56' 43.7"

The site was visited September 9, 2002, June 9, 2003, September 4 2003, and July 21, 2004 for monitoring purposes. Photos were taken at the specified locations during the visits. The entire project is showing good growth since revegetation efforts were implemented. All planted species are thriving except for the lupine. The lupine germinated adequately, many seedlings were present the fall after planting. The planting date was too late in the season for good establishment. Some well developed lupine plants are present in isolated, protected locations. Plant establishment of the rest of the species in the seeding mix has occurred. Seed production on those species is considerable. Many primary successional species have also established on the site. They include: *Salix alaxensis, Alnus crispa, Populus balsamifera, Hordeum jubatum, Agropyron pauciflorum, Agrostis scabra, Calamagrostis canadensis, Artemisia tilesii, Polemonium pulcherrimum,* and *Oxytropis campestris.* A few areas at the west end of Treatment Area 2 seemed to have been skipped during the initial seeding. These were seeded with the seed mix from phases three and four on August 12, 2003. Overall, the project is greening up very nicely. No notable erosion is present except on the high wall. The only recommendation for future efforts evident at this time would be to set the seeding date between June 1 and July 15 to ensure adequate establishment time for the lupine.

Photo Point #1 N 61° 44’ 29.6” W148° 57’ 37.8”

July 22, 2002

September 9, 2002

June 9, 2003

September 4, 2003

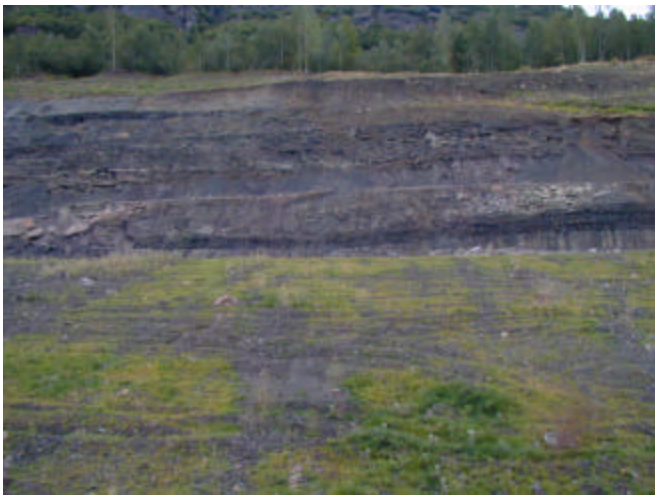
July 21, 2004

Photo Point #2 N 61° 44’ 28.9” W148° 57’ 32.1”

July 22, 2002

September 9, 2002

June 9, 2003

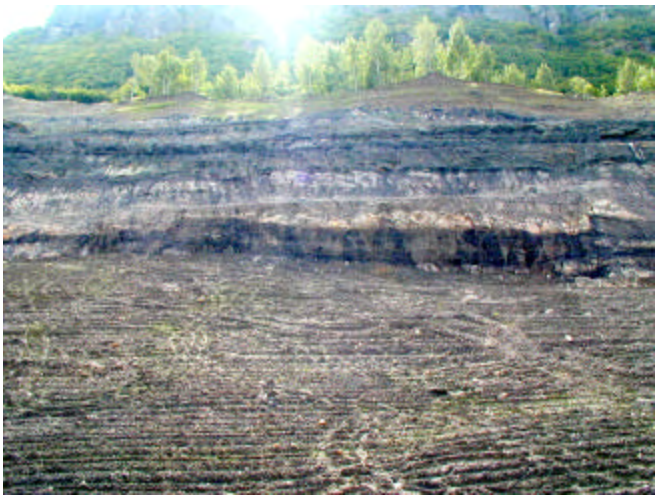


September 4, 2003

July 21, 2004

Photopoint #3 N 61° 44’ 28.1” W148° 57’ 20.5”

July 22, 2002



September 9, 2002

June 9, 2003

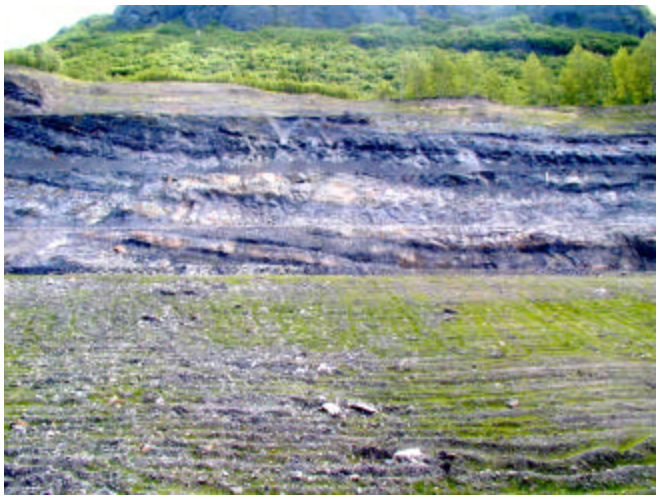
September 4, 2003

July 21, 2004

Photo Point #4 N 61° 44’ 28.5” W148° 57’ 13.5”

July 22, 2002

September 9, 2002



June 9, 2003

September 4, 2003

July 21, 2004

Photopoint #5 N 61° 44’ 28.7” W148° 57’ 01.7”

July 22, 2002

September 9, 2002

June 9, 2003

September 4, 2003

July 21, 2004

Photopoint #6 N 61° 44’ 28.6” W148° 56’ 53.5”

July 22, 2002

September 9, 2002

June 9, 2003

September 4, 2003

July 21, 2004

Photopoint #7 N 61° 44’ 27.8” W148° 56’ 41.1”

July 22, 2002

September 9, 2002

June 9, 2003

September 4, 2003

July 21, 2004

Photopoint #8 N 61° 44’ 23.5” W148° 56’ 43.7”

July 22, 2002

September 9, 2002

June 9, 2003

September 4, 2003

July 21, 2004