Vegetation Information

Introduction

Mountain-Brush, Desert Shrub, Pinion-Juniper Woodland, Sagebrush-Grass, Conifer-Aspen, and minor stream-side vegetative types cover the total mine plan area. Most of the area is covered by the Mountain-Brush type while the Pinion-Juniper Woodland type is predominant in the mine mouth area as well as the access routes and utility corridors; this area has been reseeded with a mixture as recommended by the U.S.D.A. S.C.S. (please see Soil Survey and Vegetation Inventory in Appendix M). Appendix M now also includes soils and vegetation information pertaining to the newly acquired AEP Lease. Because there will be no additional surface disturbance on the lease area, a First Order Survey is not deemed necessary.

As the Mathis Tract and New Federal Summit Creek Lease boundary change is simply an extension of underground mine workings under roughly 2,600 to 3,000 feet of cover there will be absolutely no effect on vegetation, fish or wildlife.

Andalex has selected and marked three reference areas in the field for vegetation. The Division has reviewed and approved these reference areas. Areas chosen include all types of vegetation conditions such as drainage areas, shallow slopes and steep slopes. Andalex contacted the SCS to help evaluate the condition of these sites. Please see SCS letter in Appendix M. It should be noted that Andalex does have the benefit of a revegetation test plot located on one of the topsoil piles. The drainage area reference area is the most adaptable to the left fork fan installation.

The revegetation map now shows the acreages for the three range types. Shrub clumps make up 2.15 acres, drainage areas make up 15.02 acres and steep slopes make up 17.03 acres. Total disturbed area, including the Aberdeen Mine left fork fan and road is 35.34 acres.

New vegetation mapping has been created for the entire permit area of the Centennial Mine including the Mathis Tract and New Federal Summit Creek Lease area. The mapping was done by Mt. Nebo Scientific, Inc. Springville, Utah. See Plate 19A.

The vegetation map will be created by using new and/or current available aerial photography with field work accomplished as a means for ground-truthing. Aerial photography used will be from appropriate periods of the growing season. Field verification work will be conducted during the growing season of 2002. The final vegetation map will be provided to the State of Utah, Division of Oil, Gas & Mining in December 2002.
It should be noted that no wetland or riparian areas are known to exist on the Mathis/Summit Creek I.B.C area, based on vegetation mapping and site visits by company and Division personnel.

Source of Data

Department of the Interior, 1979. Final Environmental Statement, Development of Coal Resources in Central Utah; Part 1 Regional Analysis; Part 2 Site Specific Analysis.


A.M.C.A. Coal Leasing, June, 1978 Mining and Reclamation Plan (Zion's fee). Submitted to the State of Utah, Department of Natural Resources, Division of Oil, Gas, and Mining.

Revised 8/8/95

Earth Environmental Consultants
September, 1981
Soil Survey and Vegetation Inventory (Appendix M)

Description

Vegetative Types: Please see Soil Survey and Vegetation Inventory in Appendix M.

The vegetative types include Mountain Brush, Pinion-Juniper Woodland, Sagebrush-Grass, and Conifer-Aspen. The new Sunedco Lease as well as the new Graves Lease are located primarily in the Mountain Brush and Conifer-Aspen communities.

Threatened or Endangered Species

A listing of threatened or endangered plant species known to occur in Carbon County is included in Appendix M.

There have been no known threatened or endangered species observed in the lease area (Welsh 1977). A study was conducted in the Left Hand Fork for both the access road and the fan installation site to determine the presence of Canyon Sweetvetch. None was found. Additionally, the surveyor does not believe the habitat exists for this plant.

Plant Communities: Please see Soil Survey and Vegetation Inventory in Appendix M.
The Mountain Brush type is the largest in the area. It is found predominately at elevations of about 7,500 feet. This community consists of sage, mountain mahogany, serviceberry, snowberry, squaw apple, gambels oak, and maple. Minor amounts of rabbitbrush, cliffrose, and bitterbrush can be found. Associated grass species are wildrye, Indian ricegrass, wheat grass, bull grass, and blue grass.

The Sagebrush-Grass group is present from 7,200 to 9,000 feet on and in the low benches below the cliffs. Sage and rabbit brush appear associated with the common grasses occurring in other communities such as curly grass, Indian rice grass, and bull grass. Fourwing and saltbrush is found on better drained soils. Shad scale and curly grass associations are found on the heavier clay soils.

The Pinion-Juniper Woodland community occurs in the area from an elevation of 5,600 to 8,000 feet and dominates the area below the escarpment of the Book Cliffs. Pinion pine and Utah juniper are the dominant species with bull grass, Indian rice grass, and birch leaf mahogany as associated species.

The Conifer-Aspen becomes fairly extensive in the more moist sites and at higher elevations. Elevations range from about 7,000 to 9,000 feet. Aspen predominates at the lower elevations with associated species being serviceberry, snowberry, Oregon grape, mountain brome, and peavine. Douglas fir is scattered throughout the area above 7,500 feet elevation. A few big red pine, white pine, and fir are found in the upper canyon bottoms. Understory grasses present include curly grass, Indian rice grass, shadscale, black sage, and crested wheatgrass.

Identified species of noxious or poisonous weeds in the area are halogeton, cockleburr, loco, and copperweed. There are no concentrated areas or serious problems from these poisonous plants.

Some of the most important vegetation species are listed in Table III-10 following this page.
### TABLE III-10
Vegetation Possibly Occurring in Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grasses:</strong></td>
<td></td>
</tr>
<tr>
<td>curly grass</td>
<td>Hilaria jamesii</td>
</tr>
<tr>
<td>indiana rice grass</td>
<td>Oryzopsis hymenoides</td>
</tr>
<tr>
<td>squirreltail</td>
<td>Sitanian hystix</td>
</tr>
<tr>
<td>needle and thread grass</td>
<td>Stipa commata</td>
</tr>
<tr>
<td>no eatum grass</td>
<td>Aristida fendleriana</td>
</tr>
<tr>
<td>western wheat grass</td>
<td>Agropyron smithii</td>
</tr>
<tr>
<td>bull grass</td>
<td>Elymus salinus</td>
</tr>
<tr>
<td><strong>Shrubs:</strong></td>
<td></td>
</tr>
<tr>
<td>nuttal saltbush</td>
<td>Atriplex nuttallii</td>
</tr>
<tr>
<td>mat saltbush</td>
<td>Atriplex corrugata</td>
</tr>
<tr>
<td>shadscale</td>
<td>Atriplex confertifoldia</td>
</tr>
<tr>
<td>fourwing saltbush</td>
<td>Atriplex canecens</td>
</tr>
<tr>
<td>big sagebrush</td>
<td>Artemisia tridentate</td>
</tr>
<tr>
<td>black sagebrush</td>
<td>Artemisia arbuscula nova</td>
</tr>
<tr>
<td>greasewood</td>
<td>Sarobatus vermiculatus</td>
</tr>
<tr>
<td>small rabbitbrush</td>
<td>Chrysothamnus viscidiflorus</td>
</tr>
<tr>
<td>big rabbitbrush</td>
<td>Chrysothamnus nauseosus</td>
</tr>
<tr>
<td>mountain-mahogany</td>
<td>Cercocarpus montanus</td>
</tr>
<tr>
<td>serviceberry</td>
<td>Amelanchief alnifolia</td>
</tr>
<tr>
<td>curlleaf mahogany</td>
<td>Cercocarpus ledifolius</td>
</tr>
<tr>
<td>squaw apple</td>
<td>Peraphyllum ramosissimum</td>
</tr>
<tr>
<td>snowberry</td>
<td>Symphoricarpos oreophilus</td>
</tr>
<tr>
<td><strong>Trees:</strong></td>
<td></td>
</tr>
<tr>
<td>juniper</td>
<td>Juniperus osteosperma</td>
</tr>
<tr>
<td>pinion</td>
<td>Pinus edulis</td>
</tr>
<tr>
<td>ponderosa pine</td>
<td>Pinus ponderosa</td>
</tr>
<tr>
<td>aspen</td>
<td>Populus temuloides</td>
</tr>
<tr>
<td>limber pine</td>
<td>Pinus flexilis</td>
</tr>
<tr>
<td>douglas fir</td>
<td>Pseudotsuga menziesii</td>
</tr>
<tr>
<td>gambel oak</td>
<td>Quercus gambelii</td>
</tr>
</tbody>
</table>
**Extent of Cover**

Since the elevations and terrain varies drastically from steep walled canyons to high ridges, vegetation density also varies. Percent cover is greater at the higher elevations and on the gentler topography. The Bureau of Land Management estimates cover of 25 to 30 percent at the higher elevations and 10 to 12 percent on the lower canyon sides and bottoms.

**Shrub Height**

Shrub height varies over the lease area. Topography, aspect, elevation, and soil cause these modifications.

**Area to be Disturbed**

The surface area disturbed is very minimal, 34.2 acres as shown on Plate 7. It should be again stressed that there will be no additional surface disturbances and no additional surface facility construction on the new AEP Lease area. Mining on the AEP Lease will simply be an extension of existing underground workings. Site of the present surface facilities is located in an area that has been previously impacted by mining activities. Actual plant communities which have been disturbed are the Pinion-Juniper and associated species and similar impact is foreseen on vegetation overlying the remainder of the lease area at the proposed surface facilities' sites. Extreme care will be taken however, to disturb as little vegetation as possible and revegetation has been immediately carried out on all disturbed areas no longer needed for the mining operation.

**Fish and Wildlife Resources and Plan**

**Introduction**

The mine plan area is located in the West Tavaputs Plateau, a region which supports about 360 vertebrate wildlife species. The abundance and distribution of wildlife in the lease area is directly related to present land use activities and capabilities. Use of this area by certain species is limited to lack of perennial water. Mammal and bird species possibly occurring in the lease area are listed in Table III-11. Please refer to Plate 34 which has been revised to include the AEP Lease. A "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah", compiled by the Utah State Division of Wildlife Resources, can now be found in Appendix A.
Source of Data


Utah Department of Natural Resources, Division of Wildlife Resources.

Habitats

Previously described vegetation provides fair to excellent habitat for a variety of wildlife species.

Species (See Table III-11)

Mammals

Mammals occurring in the area can be divided into two groups, game species and non-game species.

The main game species include mule deer, mountain lion, black bear, elk, and cottontail rabbits. Mule deer, however, are the most important wildlife resources in the area. Mountain lion are present but little information is available due to their ranging habits. Generally, their movement coincides with the migration of deer. Black bear may occasionally be found in the vegetated canyons, usually along the cliff face. They normally inhabit the Book Cliffs to the north but little data is available on their populations. The permit area is within the lower limits of the elk range, however, elk are generally found north of the mine plan area at higher elevations. Cottontail rabbits are distributed throughout the area.

Non-game mammals include several species of small animals inhabiting the area. Predator species such as coyote and bobcat occasionally are found in the area and depend on small rodents and rabbits for their source of food. Information on non-game species is generally unavailable.

Additional information on species, habitat, and status, can be found in Appendix A.
### TABLE III-11

List of Animals Possibly Occurring in Lease Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals:</strong></td>
<td></td>
</tr>
<tr>
<td>Badger</td>
<td><em>Taxidea taxus</em></td>
</tr>
<tr>
<td>Black Bear</td>
<td><em>Ursus americanus</em></td>
</tr>
<tr>
<td>Bobcat</td>
<td><em>Lynx rufus</em></td>
</tr>
<tr>
<td>Coyote</td>
<td><em>Canis latrans</em></td>
</tr>
<tr>
<td>Deer mouse</td>
<td><em>Peromyscus maniculatus</em></td>
</tr>
<tr>
<td>Desert Cottontail</td>
<td><em>Sylvilagus audubonii</em></td>
</tr>
<tr>
<td>Elk</td>
<td><em>Cervus elaphus</em></td>
</tr>
<tr>
<td>Ground Squirrel</td>
<td><em>Spermophilus tridecelineatus</em></td>
</tr>
<tr>
<td>Least Chipmunk</td>
<td><em>Eutomias minimus</em></td>
</tr>
<tr>
<td>Mountain Lion</td>
<td><em>Felis concolor</em></td>
</tr>
<tr>
<td>Mule Deer</td>
<td><em>Odocoileus hemionus</em></td>
</tr>
<tr>
<td>Porcupine</td>
<td><em>Evethizon dorsatum</em></td>
</tr>
<tr>
<td>Striped Skunk</td>
<td><em>Mephitis mephitus</em></td>
</tr>
<tr>
<td>White-tailed Jackrabbit</td>
<td><em>Lepus townsendii</em></td>
</tr>
<tr>
<td><strong>Birds:</strong></td>
<td></td>
</tr>
<tr>
<td>Brewers Sparrow</td>
<td><em>Spizella breweri</em></td>
</tr>
<tr>
<td>Blue Grouse</td>
<td><em>Dendragapus obscurus</em></td>
</tr>
<tr>
<td>Common Nighthawk</td>
<td><em>Chordeiles minor</em></td>
</tr>
<tr>
<td>House Sparrow</td>
<td><em>Passer Domesticus</em></td>
</tr>
<tr>
<td>Lark Sparrow</td>
<td><em>Chondestes grammacus</em></td>
</tr>
<tr>
<td>Magpie</td>
<td><em>Pica pica</em></td>
</tr>
<tr>
<td>Mourning Dove</td>
<td><em>Zenaidura macroura</em></td>
</tr>
<tr>
<td>Pinion Jay</td>
<td><em>Gymnorhinus cyanocephala</em></td>
</tr>
<tr>
<td>Red-tailed Hawk</td>
<td><em>Buteo jamaicenis</em></td>
</tr>
<tr>
<td>Robin</td>
<td><em>Turdus migratorius</em></td>
</tr>
<tr>
<td>Ruffed Grouse</td>
<td><em>Bonasa umbellus</em></td>
</tr>
<tr>
<td>Sage Grouse</td>
<td><em>Centrocercus urophasianus</em></td>
</tr>
<tr>
<td>Sparrow Hawk</td>
<td><em>Falco sparverius</em></td>
</tr>
<tr>
<td>Turkey Vulture</td>
<td><em>Cathartes aura</em></td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td><em>Pooecetes gromineus</em></td>
</tr>
</tbody>
</table>

**INCORPORATED**

**OCT 07 2002**

**DIV OF OIL GAS & MINING**

3-7
Birds

Raptors

The turkey vulture and red-tailed hawk frequent the area. A variety of other raptors breed in the Price area; however there is a poor density of raptors throughout the mine plan area. A raptor survey performed for Andalex Resources of the proposed permit area by Clayton M. White of Brigham Young University is attached as Appendix D. Please see Plate 34. This Plate now includes information from the raptor survey performed in May, 1994, by the Utah DWR and the Utah DOGM. Also refer to letter from USFWS found in Appendix J indicating clearance for our powerline distribution regarding raptors.

Other

Sage grouse inhabit the sagebrush flats at the foot of the cliffs. Blue and ruffed grouse may occasionally be found in the vegetated canyons of the area. Chukkers can be found around the cliffs. Mourning doves are generally distributed throughout the area, however, the lack of perennial water limits dove nesting habitat in the area. Other representative birds include the magpie, bluebird, robin, and several species of sparrow.

Reptiles and Amphibians

The most prominent species of reptiles include the rattlesnake and sagebrush lizard. No aquatic fauna are present in the area.

Fish

There are no active fisheries as there are no permanent bodies of water or perennial streams in the area. No aquatic fauna are found.

Threatened or Endangered Species

There have been no known threatened or endangered species on or near the lease area according to a survey conducted by the Utah Division of Wildlife Resources (Boner 1977).
Impacts of Operation

Construction of all roads, powerlines, and surface facilities has been completed. The earthwork and surface facilities for the Aberdeen Mine are complete. The fish and wildlife information contained in this MRP pertains to the entire permit area which includes the Aberdeen minesite. The only potential impact to wildlife as a result of construction (golden eagle nests) has been addressed thoroughly and a negative impact determination was made. Regarding temporary interruption of wildlife habitat, this has also been addressed in the Fish and Wildlife Plan and the Reclamation Plan. Therefore, no additional impact of operations on wildlife is anticipated. Wildlife education has been implemented through the training department. All new employees will receive wildlife education training.

Fish & Wildlife Plan (please see Appendix A).

There will be no additional surface disturbance required on any new coal leases. Consequently, there will be no additional disturbance or adverse impacts on fish and wildlife or related environmental values. Please refer to Plate 34, Revised Wildlife Distribution Map included with this submittal.

Andalex will make every possible effort to minimize disturbances to wildlife habitat in the area and where possible enhance that habitat during reclamation. It should be noted that there is no aquatic life in the permit area as these canyons are dry except as a result of direct precipitation (ephemeral streams). Please note that the Hoffman Creek drainage is also ephemeral. Straight and Alrad Canyons are also ephemeral drainages. Andalex has performed numerous mitigative measures including extensive revegetation. Andalex has performed all mitigative measures outlined in the Fish and Wildlife Plan (Appendix A) with the exception of the use of swareflex reflectors.

Andalex has advised and encouraged employees to avoid unnecessary disturbances to all wildlife regardless of the season, but especially the depleted winter season or the breeding season. Hunting and all wildlife regulations are adhered to.

The largest part of Andalex's road is screened from view by vegetative cover. During revegetation, Andalex will use seed mixtures which are favorable for wildlife enhancement.

To date, Andalex has had no use for poisons for rodent control or any other use.
Andalex has maintained small islands of natural vegetation within the site, but upon final reclamation, we do not intend to remove natural revegetation from other sites and transplant it. Andalex does not intend to encapsulate seed and fertilizer for release over several years. All disturbed slopes have been revegetated.

Snake dens will be reported to the DWR.

Berry producing shrubs have naturally re-occurred within the disturbed area for avifauna species. No avifauna will be disturbed within Andalex's minesite and in particular, raptors and their nests. Andalex's powerline was constructed under the guidance of the Utah DWR.

Lodges, nests, and dens for all mammals will be protected from disturbance. Andalex has reduced speed limits posted within the minesite and the entire length of the haulroad year-round (20 mph and 40 mph). Swareflex reflectors will not be implemented.

There are no unpaved sections of the haul road and swareflex reflectors are not being used. Andalex has demonstrated mitigation of impacted habitat through revegetation efforts on areas in and outside the permit area. We have had employee wildlife education sessions in the past and may perhaps in the future. A description of the values of wildlife as well as methods for avoiding impacts to wildlife could be written into a form which could be passed out during annual employee training. The Division of Wildlife Resources may be able to assist Andalex with this idea. The powerline was constructed under strict guidelines and has been thoroughly checked by both the Utah DWR and the U.S. Fish and Wildlife Service. Both agencies are pleased with the design and the as-built facilities. Andalex is willing to adhere to reasonable and practical recommendations given by any agency and has for the most part taken the advice of the DWR on most all occasions as outlined in the Wildlife Resources, Appendix A. Special condition #7 was answered by posting 40 mph speed limits, year round.

To the extent possible, Andalex will commit to prevent, control, and suppress range, forest, and coal fires within the permit area. The control of range and forest fires may very well be out of Andalex's hands and it may only be possible for Andalex to report these incidences to organizations such as the BLM who are equipped to handle these situations.

Andalex has committed to continuing wildlife education as part of its employee training. This will be coordinated with the local office of UDWR through the use of videos and possibly guest speakers. All new employees will review our wildlife education tape.

Andalex, through raptor surveys conducted, has identified Golden Eagle nests which could be impacted by subsidence. Andalex is
committed to acquiring necessary take permits prior to longwall mining under these sites. Andalex is also committed to additional mitigation which might include measures to prevent nesting on those nests which could be affected by subsidence or removal of nests for scientific study. Please refer to Plate 34 for the most current raptor nesting information including the raptor survey conducted in May, 1994, with the Utah Division of Wildlife Resources and the Utah Division of Oil, Gas and Mining. Three nests have been identified as being located within potential subsidence impact zones. They are identified on Plate 34 and a take permit application for these nests is on file with the U.S. Fish and Wildlife Service. The longwall panel affecting these nests will not be removed prior to the acquisition of this permit.

Andalex has committed to compensation for livestock lost as a result of subsidence which in turn is a direct result of underground mining activities. Also, major cracks caused by subsidence which are demonstrated to be a direct result of underground mining will be repaired.

R645-301-311. VEGETATIVE, FISH AND WILDLIFE RESOURCES

See R645-301-310.

R645-301-312. POTENTIAL IMPACTS

See R645-301-310 "Area to be Disturbed".

R645-301-313. RESTORATION OR ENHANCEMENT

See R645-301-240.

R645-301-320. ENVIRONMENTAL DESCRIPTION

See R645-301-310, Appendices A, D and M.

R645-301-321. VEGETATION INFORMATION

See R645-301-310, Appendix M.

R645-301-321.100. POTENTIAL FOR REESTABLISHING VEGETATION

Appendix M
R645-301-321.200. PREMINING PRODUCTIVITY

Appendix M

R645-301-322. FISH AND WILDLIFE INFORMATION

See R645-301-310, and Appendices A, D, and M.

R645-301-322.100. PROTECTION AND ENHANCEMENT PLAN

Appendix A

R645-301-322.200. SITE-SPECIFIC RESOURCE INFORMATION

Appendix A

R645-301-322.210. THREATENED OR ENDANGERED SPECIES

See R645-301-310.

R645-301-322.220. HABITATS OF UNUSUALLY HIGH VALUE FOR FISH AND WILDLIFE

see R645-301-310.

R645-301-322.230. OTHER SPECIES OR HABITATS REQUIRING SPECIAL PROTECTION

N/A

R645-301-322.300. FISH AND WILDLIFE SERVICE REVIEW

Appendix A

R645-301-323. MAPS AND AERIAL PHOTOGRAPHS

Appendix A

R645-301-323.100. REFERENCE AREAS

See R645-301-331 "Reference Areas".

R645-301-323.200. MONITORING STATIONS

N/A
Most of the maps and plans previously submitted as part of the approved Mining and Reclamation Plan, are applicable. Where necessary, the original maps have been revised to indicate the addition of new leases and rights-of-ways and the revisions are indicated in this submittal in Volume II.

1) All necessary maps and plans to complete this section are found in Volume II of the submittal and also in the appendices, specifically,

a) Underground coal mining activities to be conducted and lands to be affected by surface facilities are shown on Plates 6, 29, 30, 31 and 41.

b-1) Buildings, utilities, and facilities are depicted on Plates 6 and 7.

2) The area to be affected is shown on several plates, including 4, 5, 6, and 41. These last four plates show the sequence of mining in the four seams over the five year term of the permit. Plate 29, 30, 31, 41 has been revised to show immediate development in the Gilson Seam as soon as approval is achieved. Reclamation will not take place until after all four seams are mined out. This activity is depicted on Plates 15, 16, 17, and 20.

3) Plate 6 depicts the entire disturbed area for which a performance bond is posted. The acreage is shown on Plate 5.

4) Coal storage and loading areas are shown on Plate 6. No cleaning takes place.

5) Plate 6 shows a non-coal waste storage area as well as topsoil storage areas. Plates 36 and 37 show the topsoil piles in detail.

6) All water diversions and other water facilities are shown on Plates 6, 8, 9, 11, 12, and 13. Also, typical diversions for disturbed area and undisturbed areas are shown in the Sedimentation and Drainage Control.
Diversion ditches as they exist are shown on Revised Plate 6. Topographic detail has been added to Plate 8 to allow determination of watershed slopes within the disturbed area.

Topographic detail has been added to Plate 8 to allow determination of watershed slopes within the disturbed area. Plate 16 has been revised to show drainage during the reclamation period before and after removal of sediment ponds (Phase I).

Plate 17 shows final drainage details.

Plate 9 shows delineations of watershed areas.

The main culvert will be removed entirely during the reclamation/earthwork phase except under Pond E. Pond "E" will be enlarged, and the entire drainage area above will flow into the restored channel RC-1 and through Pond "E-PM". Once reEVEGATATION and water quality standards have been met, Pond "E-PM" will be removed and reclaimed.

7) There is no coal processing waste at the Centennial facility. There are no pollution control facilities other than sedimentation ponds on the permit area. Waste rock from the Centennial Mine rock tunnels has been disposed of underground in the Pinnacle Mine.

8) Specific facilities are not used to protect or enhance wildlife with the exception of the powerline which was built according to strict guidelines issued by the Division of Wildlife Resources and the U.S. Fish and Wildlife Service regarding raptor protection. The powerline design is included in Volume I as Appendix I (powerline design). Also, speed limits are posted within the permit area.

9) The two powder magazines are shown on Plates 6 and 7.

10) Plates 6, 7, 8, and 9 show these facilities associated with protection of the hydrologic balance including sedimentation ponds and storage of non-coal waste. There are no permanent impoundments, coal processing wastes or underground development wastes. Any underground development waste or excess spoil which was generated while putting in the Aberdeen portals, has been used as stock pile pad material at the Aberdeen Minesite. The volume of this material is minimal.

11) Plates 16 and 17 show the final reclamation contours and configuration of the surface for Phases I and II respectively.

12) Subsidence monitoring points are shown on Plate 25. An additional station was added to Plate 25 to cover pillar extraction on the new AEP Lease. Also new stations were added under the Graves and Hoffman Creek Leases. Water
monitoring location are shown on Figure IV-11. Additional water monitoring will be added as station 12-1 in Alrad Canyon below the AEP lease.

13) There will be no facilities left on the permit area permanently with the exception of the roads through the right fork of Deadman Canyon. The left hand fork road will be reclaimed. After the completion of underground mining, all facilities will be removed with the exception of one downstream sedimentation pond. This pond will be removed upon final reclamation.

c) Maps, plans, and cross sections required under

b) (5), (6), (10), and (11) have been prepared under the direction of, and certified by a registered professional engineer. Assistance has come from a registered land surveyor. Revised 8/8/95

1) Detailed maps, plans, and cross sections for our sediment ponds, Plates 11, 12, and 13 have been certified by a registered professional engineer.

2) Andalex has not used any excess spoil or underground development waste maps or cross sections. A map depicting the location of non-coal waste storage is included as Plate 6.

R645-301-331. MINIMIZING IMPACT AND SURFACE EROSION

REVEGATATION Plan

REVEGATATION and Interim REVEGATATION

REVEGATATION will be accomplished by Andalex or under Andalex's direct supervision and under the recommendations of the regulatory authority (see Plates 19 and 20).

Interim REVEGATATION for stabilization of disturbed areas will take place on all disturbed slopes within the disturbed area. These slopes will be hydroteased using the approved final reclamation seed mixture and rate of application along with hydromulch at the rate of one-and-one-half tons per acre. The vegetation cover will be maintained as necessary and slope stability will be measured by visual inspection.

Schedule of REVEGATATION

The seeding of native flora (consisting where possible of deer browse species), will commence as soon as is practical following shutdown and abandonment to stabilize erosion. Agencies such as the B.L.M., O.S.M., and Utah Department of Natural Resources will
be consulted at the time for recommendations on recontouring, soil reconditioning, and REVEGATATION. REVEGATATION will be accomplished by Andalex or under Andalex's direct supervision and under the recommendations of the regulatory authorities.

The first normal planting season will be used for REVEGATATION following the removal of all structures and regrading. The season for normal planting of seed mixtures is the fall, prior to snowfall and after October 1st. The normal season for shrub plantings is the spring after thawing while moisture is available.

Soil Testing Plan and Soil Preparation
Where possible the soil will be distributed along the contour. The thickness of the re-established soil will be sufficient to support vegetation equal to or superior to pre-mining history (6"). Soils will be tested according to the most advanced technology. Samples will be taken to determine any deficiencies which would affect the growth of newly revegetated areas. Any deficiencies will be corrected by adding to the soil chemical fertilizers, organic mulch, or any other substances recommended by the regulatory authority. Preparation techniques such as disking will be incorporated.

Species and Amounts of Seeds and Seedlings
The seed mixtures outlined for steep slopes and drainage areas developed by UDOGM (12-10-86) will be used. Shrub clumps will be planted as shown on Plate 20. This constitutes an area of 2.15 acres (Drainage areas are 15.02 and Slopes are 17.03). Species shall include serviceberry, mountain big sagebrush, squawbush, blue elderberry, mountain snowberry, and mountain mahogany. They will be planted at a rate of 1,000 containerized plants per acre using fertilizer and crimped straw for stabilization. Drainage area seed mix will be used around and among the shrub clumps beneath the straw stabilization. Re Reference Areas. Plate 20 in Volume II shows that Andalex will plant the drainage mixture around and beneath the shrub clumps (transplants). These transplants listed above will be used in the drainage areas as depicted on Plate 20.

Planting and Seeding Methods
Where possible the areas will be disked using conventional farm equipment. Andalex will make every effort to leave surfaces to be reseeded as rough as possible (one method could be gouging by a trackhoe). The seed will be spread using a rangeland drill where possible. Areas which cannot be seeded mechanically will be hand seeded or hydroseeded. Steeper slopes will be raked to provide a slight soil cover for the seed. Steep slopes may also be hydroseeded and hydromulched.

Mulching Techniques
Vegetative cover will be promptly re-established following cessation of mining activities to stabilize erosion. Mulch will be used and re-seeding will occur during the first normal planting season following the removal of all structures and regrading.
for favorable growth following regrading. Mulch will be applied
to all reseeded areas. Where hydromulching cannot be used, straw
mulch (at the rate of 1-1/2 to 2 tons/acre) will be crimped
either mechanically or by hand. Hydromulch will be used on steep
slopes and straw will be used wherever possible.

Andalex would plan on using organic mulch (wood fiber). It will
be used wherever seeds are planted. These areas are shown on
Plate 20 and constitute 34.2 acres. The rate of application will
be one ton per acre. The remaining acres are shrub plantings
which will be stabilized with the drainage area seed mix and
crimped straw.

Management Practices, e.g., Irrigation, Pest, and Disease Control

Andalex does not anticipate irrigation will be used because of
the lack of water in the area. Vegetative growth will be subject
to normal rainfall and winter snowfall. As a contingency
irrigation by mechanical methods could be used if rEVeGATATION of
the transplants is unsuccessful. Vegetation will be protected
from both wildlife and livestock by drift-fences until the
reclaimed areas have been adequately re-established. Upon
approval, the fences will be removed. Pesticides and herbicides
will be used as necessary. Should any persistent pesticides be
needed, the Division’s approval will be obtained prior to their
use.

Measures to Determine Success

rEVeGATATION will be closely monitored. Areas which fail to
support sufficient growth to stabilize conditions will be tested
and reseeded until a proper cover is established. Vegetation
reference areas will be consulted to determine success. Physical
examinations will be conducted to note any species which are
not thriving or regenerating. If this occurs, species will be
substituted at the recommendation of the regulatory authority.
Any other species will be added at the time of reclamation upon
recommendation of the regulatory authority. The company will
maintain close contact with the Bureau of Land Management in all
of its Revegation efforts, and incorporate their suggestions into
its over all plan. All reclaimed areas will be monitored and
maintained by the constant observation of Andalex until the
surety release is granted.

rEVeGATATION monitoring parameters to be measured are growth
rate, plant density and percent cover. We would expect visual
monitoring to occur at least twice a year (Spring Fall) during
the first two growing seasons. From experience with interim
Revegation at the minesite, we have learned that two growing
seasons are needed to establish any success. After this we would
know whether reclamation was progressing successfully.

Vegetation inventories will take place during years 5, 9, and 10.
Future consultation with DOGM will determine if Year 7 monitoring might be required. Years 5, 9 and 10 will include estimates of cover, wood density, productivity, and composition, both on reclaimed areas and on reference areas. Parameters sampled on reclaimed areas will meet or exceed 90% of the reference area standard with a 90% confidence level. Andalex will use approved sampling methods and will use the same method for both reclaimed and reference areas.

In 1983, Andalex planted several shrub species which are part of our approved transplant mixture on topsoil pile F. These plantings were not performed under the direction of the Division and were merely for Andalex's reference. Andalex will attempt a new test plot with our approved transplant mixture in 1992 in the same area. Monitoring, both qualitative and quantitative, will be performed in years 5, 9, and 10. Future consultation with DOGM will determine if Year 7 monitoring might be required. Data will be submitted to the Division as part of the annual report starting in 1993.

Reference Areas

The reference areas to be used by Andalex Resources in revegetated are shown on Plate 9 which is a Watershed and REVEGATATION Reference Areas Map. These reference areas have been described by the Soil Conservation Service with regard to condition and production. This description can be found in Appendix M following EEC's soils and vegetation survey.

There are three reference areas, each one acre in size, two of which are located on slopes and one in a drainage area. Reference area R-1 will be used in conjunction with the seed mixture for drainage areas. Areas R-3 and R-4 will be used in conjunction with the seed mixture for slopes and will also be used in conjunction with drainage areas to establish the success of Gamble's Oak. See plate 9.

Each reference area established will be re-evaluated every five years prior to permitting.

The new Left Hand Fork fan installation will have its own separate topsoil storage area. Andalex will utilize this topsoil storage area to test shrub species in the coming years beginning in the fall of 1995.

Standards for success for woody species is 2000 woody plants-per-acre for stream bottom areas and east-facing slopes; 1500 woody plants-per-acre for west-facing slopes.

Sediment Pond E - PM will be maintained until removal is authorized by the Division and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.
Subsidence

Survey of Structures and Renewable Resource Lands

There are no structures present other than those constructed for mining operations, on the permit area. The land is presently used for grazing and wildlife habitat which constitutes a renewable resource area. It should be noted that geographic areas above Andalex's 5 year mine plan do not include any area suitable for grazing, nor do they contribute significantly to the long-range productivity of water, food or fiber products. Andalex commits to mitigate all subsidence related damage to renewable resources including, but not limited to water, grazing, and wildlife habitat including raptor nests.

Using the Best Technology Currently Available to Minimize Disturbance and Impact

As the Mathis/Summit Creek Incidental Boundary Change is simply an extension of our underground mine workings under roughly 2,600 to 3,000 of cover, there will be absolutely no effect to the surface biology of the area.

Preventive Measures

Subsidence due to mining on the Andalex property will not occur outside of the approved permit area. Stations have been set up as required for constant monitoring of subsidence movements. (See 6., Monitoring.) The only absolute preventive measure possible is to leave coal in place. This is in direct contrast to maximum economic coal recovery.

Resources on the lands above Andalex's mining plan consist only of wildlife habitat with very limited grazing access.

Subsidence monitoring stations will be established as necessary along the first proposed longwall mining. (See 6., Monitoring and Plate 28.) The results of this monitoring program will define monitoring and permitting needs in the future.

In the event problems should occur, which are verified by the company and the Division to be the result of mining, the company will develop a mitigation plan with the Division of Wildlife Resources.
There have been no known threatened or endangered species on or near the lease area according to a survey conducted by the Utah Division of Wildlife Resources (Boner 1977).

Calculations have been performed to evaluate the potential water depletion to the Colorado River system as a result of the mining at this site. The calculations are shown on Table III-12, and indicate a net increase of approximately 47.61 acre-feet of water per year to the Colorado River.

SITE-SPECIFIC PROTECTION OF THREATENED AND ENDANGERED SPECIES

See R645-301-310.

PROTECTIVE MEASURES DURING ACTIVE PHASES OF MINING OPERATIONS

Appendix A

RECLAMATION PLAN

See R645-301-240.

REVEGATATION

See R645-301-240.

SCHEDULE AND TIMETABLE

See R645-301-240.

DESCRIPTION

See R645-301-240.
Table III-12  
Potential Water Depletion to  
Colorado River Drainage

The following calculations are intended to define the potential depletion or addition of water to the Colorado River Drainage System, as a result of mining at this operation. It should be noted that the criteria is based on the U.S. Fish and Wildlife Service Windy Gap Process, and only those parameters that apply to this operation have been calculated.

**Projected Water Depletion**

1- Bathhouse/Office  
a. 140 people @ 35 gpd/ea x 240 days/yr = 1,176,000 gal/yr

2- Ventilation  
a. Evaporation
   1) 450,000 cfm = 236,520 M cf/yr  
   2) 2.5 gallon/M cf = 591,300 gal/yr

   Total Loss = 1,767,300 gal/yr  
               5.424 ac ft/yr

**Projected Water Addition**

1- Mine Discharge  
a. 100 gpm x 120 days/yr = 17,280,000 gal/yr

   Total Gain = 17,280,000 gal/yr  
               53.034 ac ft/yr

**Summary**

Projected Depletion = -5.424 ac ft/yr  
Projected Addition = +53.034 ac ft/yr  
Total Addition = +47.61 ac ft/yr

Note: Moisture loss from mined coal and use of sprays have not been included, since the spray water is derived from perched aquifers and is recycled within the mine. Any excess water from the perched aquifers is eventually discharged, resulting in the addition to streamflow.
Recommended Seed Mix for Steep Slope Areas
Andalex Resources, Inc.

**SPECIES**

### Grasses:

- **Agropyron smithii**
  - Western Wheatgrass
  - **# PLS/Acre**: 3.0

- **Agropyron spicatum**
  - Bluebunch Wheatgrass
  - **# PLS/Acre**: 2.0

- **Agropyron trachycaulum**
  - Slender Wheatgrass
  - **# PLS/Acre**: 2.0

- **Bromus marginatus**
  - Mountain Brome
  - **# PLS/Acre**: 3.0

- **Oryzopsis hymenoides**
  - Indian ricegrass
  - **# PLS/Acre**: 2.0

- **Poa sandbergii (secunda)**
  - Sandberg bluegrass
  - **# PLS/Acre**: 0.25

### Forbs:

- **Artemisia ludoviciana**
  - Louisiana sagebrush
  - **# PLS/Acre**: 0.1

- **Hedysarum borealis**
  - Northern sweetvetch
  - **# PLS/Acre**: 1.0

- **Linum lewisii**
  - Lewis flax
  - **# PLS/Acre**: 1.0

- **Melilotus officinalis**
  - Yellow sweetclover
  - **# PLS/Acre**: 0.5

- **Penstemon strictus**
  - ‘Bandera’ Rocky Mtn. penstemon
  - **# PLS/Acre**: 0.25

### Shrubs:

- **Amelanchier alnifolia**
  - Serviceberry
  - **# PLS/Acre**: 1.0

- **Artemisia tridentata vaseyana**
  - Mountain big sagebrush
  - **# PLS/Acre**: 0.2

- **Cercocarpus ledifolius**
  - Curlleaf mountain mahogany
  - **# PLS/Acre**: 1.0

- **Cercocarpus montanus**
  - True mountain mahogany
  - **# PLS/Acre**: 1.0

- **Chrysothamnus nauseosus albicaulis**
  - Whitestem rubber rabbitbrush
  - **# PLS/Acre**: 1.0

- **Purshia tridentata**
  - Bitterbrush
  - **# PLS/Acre**: 3.0

- **Symphoricarpos oreophilus**
  - Mountain snowberry
  - **# PLS/Acre**: 1.0

**Total**: 23.3

Rate is pounds Pure Live Seed/Acre for drill seeding. Broadcast seeding is double the drill rate.

12-10-86

3-21
Recommended Seed Mix for Drainage Areas
Andalex Resources, Inc.

SPECIES (DRAINAGE AREAS)

Grasses:

<table>
<thead>
<tr>
<th>Species</th>
<th># PLS/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropyron riparium</td>
<td>2.0</td>
</tr>
<tr>
<td>Western wheatgrass</td>
<td></td>
</tr>
<tr>
<td>Agropyron trachycaulum</td>
<td>2.0</td>
</tr>
<tr>
<td>Slender wheatgrass</td>
<td></td>
</tr>
<tr>
<td>Bromus marginatus</td>
<td>3.0</td>
</tr>
<tr>
<td>Mountain brome</td>
<td></td>
</tr>
<tr>
<td>Elymus cinereus</td>
<td>2.0</td>
</tr>
<tr>
<td>Great Basin wildrye</td>
<td></td>
</tr>
<tr>
<td>Phalaris arundinacea</td>
<td>0.5</td>
</tr>
<tr>
<td>Reed canarygrass</td>
<td></td>
</tr>
<tr>
<td>Poa pratensis</td>
<td>0.1</td>
</tr>
<tr>
<td>Sandberg bluegrass**</td>
<td></td>
</tr>
</tbody>
</table>

Forbs:

<table>
<thead>
<tr>
<th>Species</th>
<th># PLS/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achillea millifolium</td>
<td>0.1</td>
</tr>
<tr>
<td>Yarrow</td>
<td></td>
</tr>
<tr>
<td>Artemisia ludoviciana</td>
<td>0.1</td>
</tr>
<tr>
<td>Louisiana sagebrush**</td>
<td></td>
</tr>
<tr>
<td>Hedysarum borealis</td>
<td>1.0</td>
</tr>
<tr>
<td>Northern sweetvetch</td>
<td></td>
</tr>
<tr>
<td>Melilotus officinalis</td>
<td>0.5</td>
</tr>
<tr>
<td>Yellow sweetclover</td>
<td></td>
</tr>
<tr>
<td>Osmorhiza occidentalis</td>
<td>2.0</td>
</tr>
<tr>
<td>Sweet anise</td>
<td></td>
</tr>
</tbody>
</table>

Shrubs:

<table>
<thead>
<tr>
<th>Species</th>
<th># PLS/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amelanchier alnifolia</td>
<td>1.0</td>
</tr>
<tr>
<td>Serviceberry</td>
<td></td>
</tr>
<tr>
<td>Artemisia tridentata vaseyana</td>
<td>0.1</td>
</tr>
<tr>
<td>Mountain big sagebrush**</td>
<td></td>
</tr>
<tr>
<td>Rhus trilobata</td>
<td>1.0</td>
</tr>
<tr>
<td>Squawbush</td>
<td></td>
</tr>
<tr>
<td>Sambucus cerulea</td>
<td>1.0</td>
</tr>
<tr>
<td>Blue elderberry</td>
<td></td>
</tr>
<tr>
<td>Symphoricarpus oreophilus</td>
<td>1.0</td>
</tr>
<tr>
<td>Mountain snowberry</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Trees (transplants):

<table>
<thead>
<tr>
<th>Species</th>
<th>#/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Populus angustifolia (Narrowleaf cottonwood)</td>
<td>250</td>
</tr>
<tr>
<td>Acer negundo (Box Elder)</td>
<td>250</td>
</tr>
<tr>
<td>Prunus virginiana (Chokecherry)</td>
<td>250</td>
</tr>
<tr>
<td>Quercus gambeli (Gambel oak)</td>
<td>250</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
</tr>
</tbody>
</table>

Rate is pounds Pure Live Seed/Acre for drill seeding. Broadcast seeding is double the drill rate.

*This seed mixture and shrub list will be used for interim reclamation in the left hand fork fan installation and on the new topsoil pile. This seed mixture and shrub list will also be used for final reclamation. Also, this shrub list will be attempted on the new topsoil pile in the left hand fork.

**Big sage, Louisiana sage, rabbit brush and bluegrass will be broadcast behind the drill where possible.
METHODS USED IN PLANTING AND SEEDING

See R645-301-240.

MULCHING TECHNIQUES

See R645-301-240.

IRRIGATION AND PEST CONTROL MEASURES

See R645-301-240.

METHODS USED TO DETERMINE REVEGETATION SUCCESS

See R645-301-240.

STUDIES AND TESTING TO DEMONSTRATE FEASIBILITY OF REVEGETATION PLAN

See R645-301-240.

FISH AND WILDLIFE

See R645-301-310, Appendices A and D.

ENHANCEMENT MEASURES

Appendix A. Andalex will endeavor to use the best technology current available to enhance wildlife habitat during the reclamation phase of its operation. This will include, but not be limited to water sources (if available), thermal cover, escapeways, hiding and loafing places, and travelways. ANDALEX will consult with the Division of Wildlife Resources, at the time of final reclamation, to determine exactly what reclamation designs, planting arrangements, and artificial structures would best enhance a wildlife habitat.

PLANT SPECIES SELECTION


NUTRITIONAL VALUE

Appendix A
The vegetative cover will be as stated in the following categories.

The vegetative cover will be diverse, effective and permanent. Standards for reclamation success will be evaluated accordance with DOGM's "Vegetation Information and Monitoring Guidelines", Appendix A. The success of final reclamation will be judged on the effectiveness of the vegetation for the postmining land use and the extent of cover compared to the extent of cover for the reference area. Ground cover, production or stocking will be considered equal to the approved success standard when it reaches 90% of the success standard. Statistical adequacy of all statistical sampling will be determined using the following formula:

$$N_{\text{min}} - \frac{t^2 S^2}{(dx)^2}$$

where:
- $t$ = the value from appropriate $t$-table*, (2-tail test for pre-mine studies, 1-tail test for success studies)
- $s$ = the sample standard deviation,
- $d$ = the desired change in the mean,
- $x$ = the sample mean of the parameter in question
- * = All parameters are to be tested at the 90% confidence level with a 10% change in the mean ($d = .1$).

Ground cover will be estimated by using one of the methods listed
Andalex does not propose to stock shrubs or trees during interim or final revegetation.

Production measurements will be made in accordance with DOGM's "Vegetation Information Guidelines" Appendix A. Estimates may be made by the methodology which the vegetation consultant feels is the most suitable method to use for the work being performed.

An evaluation of species composition will be made, including species present, form and diversity.

For a postmining land use of grazing and wildlife habitat, the ground cover and production will be equal to or greater than a reference area. The Division's "Vegetation Information Guidelines", Appendix A will be utilized for the evaluation of the success of revegetation. Appendix B will be references for calculating diversity.

Siltation structures will be maintained until the disturbed area is revegetated and stabilized. They will remain in place at least two years after the last augmented seeding. Siltation structures may include straw bales, silt fences or filter baskets. Removal will be contingent upon revegetation and stabilization of the area as well as DOGM concurrence. Following removal, the area will be revegetated in accordance with the reclamation plan.

R645-301-353.120. NATIVE OR DESIRABLE INTRODUCED SPECIES

The vegetative cover will be comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use and approved by the Division.

R645-301-353.130. EXTENT OF COVER

The vegetative cover will be at least equal in extent of cover to the natural vegetation of the area.

R645-301-353.140. STABILIZING SOIL FROM SURFACE EROSION

The vegetative cover will be capable of stabilizing the soil surface from erosion.

R645-301-353.200. REESTABLISHED PLANT SPECIES

The reestablished plant species will:
R645-301-353.210. **COMPATIBILITY WITH APPROVED POST-MINING LAND USE**

The reestablished plant species will be compatible with the approved postmining land use.

R645-301-353.220. **SEASONAL CHARACTERISTICS OF GROWTH**

The reestablished plant species will have the same seasonal characteristics of growth as the original vegetation.

R645-301-353.230. **SELF-REGENERATION AND PLANT SUCCESSION**

The reestablished plant species will be capable of self-regeneration and plant succession.

R645-301-353.240. **COMPATIBILITY WITH AREA PLANT AND ANIMAL SPECIES**

The reestablished plant species will be compatible with the plant and animal species of the area.

R645-301-353.250. **COMPLIANCE WITH OTHER APPLICABLE LAWS OR REGULATIONS**

The reestablished plant species will meet the requirements of applicable Utah and federal seed, poisonous and noxious plant; and introduced species laws or regulations.