

WHARF RESOURCES (U.S.A.), INC.



January 26, 2011

Sarah Eggebo
District Conservationist
Belle Fourche NRCS Field Office
1837 5th Ave.
Belle Fourche, SD 57717

Re: Proposed Seed Mix for New Permit Reclamation Plan.

Dear Ms. Eggebo,

As per my email and your response on January 4, 2011, I need a letter from you indicating that we conferred on the selection of our final seed mix for reclamation of the proposed area affected by the area we are proposing to permit for mining. I have attached the final seed mix table along with a table showing the nurse seed mix that will be used in conjunction with the final seed mix during reclamation.

If you have any questions please feel free to contact me at 605-584-4155.

Sincerely

A handwritten signature in blue ink, appearing to read "Ron Waterland", with a stylized flourish at the end.

Ron Waterland
Environmental Manager
Wharf Resources

WHARF RESOURCES (U.S.A.), INC.

Wharf Reclamation Seed Mix

Final Reclamation Seed Mix

<u>Species</u>	<u>Pounds PLS/ACRE</u>
Alfalfa	0.5
White Dutch Clover	0.5
Slender Wheatgrass	7.0
Thickspike Wheatgrass	7.0
Hard Fescue	1.5
Timothy	1.0
Western Wheatgrass	8.0
Russian Wildrye	3.0
Canada Bluegrass	0.5
Pubescent Wheatgrass	2.5
Blanket Flower	0.3
Black-eyed Susan	0.1
Rocky Mt. Penstemon	0.1
<u>TOTAL</u>	<u>32.0</u>

Nurse Crop Seed Mixture

(*PLS = Pure Live Seed)

<u>Species</u>	<u>Pounds PLS*/ACRE</u>
Spring Wheat	40
Siberian Millet	7
Annual Ryegrass	4
<u>TOTAL</u>	<u>51</u>

United States Department of Agriculture



Natural Resources Conservation Service
1837 5th Ave S
Belle Fourche, SD 57717

*Helping People
Help the Land*

Phone: (605) 892-3368, Ext. 3
Fax: (605) 892-6189

January 31, 2011

Ron Waterland
Environmental Manager
Wharf Resources, Inc.
10928 Wharf Road
Lead, SD 57754-9710

Dear Ron,

I received your letter and the final seed mix for the proposed reclamation site. I approve the seed mixture. I believe that the seeding mixture will provide adequate cover.

Please contact me at (605) 892-3368, Ext. 3 if you have questions or need further clarification on this matter.

Thank you.

Sincerely,

A handwritten signature in blue ink, appearing to read "Sarah Eggebo", is written over the typed name.

Sarah Eggebo
District Conservationist
Belle Fourche Field Office



Wharf Resources (USA), Inc.

January 13, 2021

Ms. Roberta Hudson
SD DENR
Minerals & Mining Program
Joe Foss Building
523 East Capitol Avenue
Pierre, SD 57501

RE: Wharf Exploration Notice of Intent Application Completeness Review

Dear Bobbie:

Wharf received DENR's completeness review (dated December 29, 2020) of the Exploration Notice of Intent application that Wharf submitted on December 16, 2020. Please see Wharf's responses to the outstanding items below:

1. SDCL 45-6C-8(2): Provide a reclamation timetable and seed mix approved through the Lawrence County Conservation District.
 - Please see attached email response from Justin Boerboom with NRCS for approval of Wharf's seed mix. Wharf also spoke to Mitch Faulkner from NRCS with regard to species adaptability in the Black Hills. In addition, please see attached email from Victor Tuschen with NRCS for approval of the EXNI reclamation timetable.
2. SDCL 45-6C-9: The map provided contains excellent information but does not meet the requirements established under this statute.
 - Wharf has attached an updated map which includes known wells, waterlines, and buildings, encompassing an area ½ mile from the proposed drill area. Proposed drill collar locations were removed for clarity.
3. Is it one hole per drill pad or is there a potential for additional drill holes over 200? If so, what may be the maximum number of drill holes? (from DENR email 12/29/20)
 - Wharf typically plans one hole per pad in accessible terrain. One additional hole could be drilled on a pad at a different orientation in the interest of minimizing disturbance on steep slopes.

Please contact me at 605-584-4134 if you have any additional comments or questions.

Sincerely,

Kenan Sarratt
Sr. Geological Engineer

Allen, Amy

From: Boerboom, Justin - NRCS, Sturgis, SD <justin.boerboom@usda.gov>
Sent: Monday, January 4, 2021 9:19 AM
To: Allen, Amy
Cc: Tuschen, Victor - NRCS, Belle Fourche, SD; Westlake, Andrea - NRCS, Belle Fourche, SD
Subject: RE: Wharf Seed Mix
Attachments: Coeur Wharf Seed Mixtures.pdf

Hello Amy,

First off, the species in the mix you sent me should work as a general recommendation. If you would like to get a more site specific recommendation please work with Andrea or Victor. I cc'd them on this email so you have their contact information. I'm no longer in the DC position in Belle Fourche and for future recommendations Victor should be able to help you out. Thanks,

Justin Boerboom

Resource Unit Conservationist, NRCS
Hills Resource Unit (Belle Fourche/Rapid City/Sturgis/Wall)
Sturgis Field Office
2202 Main Street
Sturgis, SD 57785-1338
605-347-4952 ext. 3018
Cell: 605-920-8206

From: Allen, Amy <aallen@coeur.com>
Sent: Wednesday, December 30, 2020 7:08 AM
To: Boerboom, Justin - NRCS, Sturgis, SD <justin.boerboom@usda.gov>
Subject: RE: Wharf Seed Mix

Hi Justin,

I'm reaching out again to confirm that Wharf's seed mix is suited for reclamation at the mine site. DENR would like NRCS confirmation for reclamation likely to occur in 2021 and beyond. I have attached our most recent quote from Foothills Seed that details both our nurse crop and permanent seed mixture.

Thanks for your help,
Amy

 **COEUR WHARF™**
Amy Allen | Sr. Environmental Compliance Coordinator
Coeur Wharf | 10928 Wharf Road | Lead, SD 57754
t: 605.584.4112 | aallen@coeur.com
NYSE: CDE | www.coeur.com

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Allen, Amy

From: Tuschen, Victor - NRCS, Belle Fourche, SD <victor.tuschen@usda.gov>
Sent: Wednesday, January 13, 2021 9:10 AM
To: Allen, Amy
Subject: RE: Reclamation Timeline

Amy,

This reclamation timeline looks good for NRCS. For the planting times the seeding window would be best in Early Spring Prior to May 15th. If that window doesn't work the next best option would be to dormant seeding. These dates give the best growing conditions to Cool season grasses and also allows for warm season grasses in the mix.

Thank you

Victor Tuschen
District Conservationist
USDA-NRCS
[1837 5th Ave](#)
[Belle Fourche, SD 57717](#)
Office: 605-892-3368 (ext. 3075)
Cell: 605-667-0022

From: Allen, Amy <aallen@coeur.com>
Sent: Wednesday, January 13, 2021 8:35 AM
To: Tuschen, Victor - NRCS, Belle Fourche, SD <victor.tuschen@usda.gov>
Subject: Reclamation Timeline

Hi Victor,

As discussed on the phone, I have copied below the snip from Wharf's EXNI application that addresses our reclamation timeline. Please let me know if you have any further questions and/or if the timeline as presented is suitable to NRCS. Thank you for your help!

-Amy

In preparing this Reclamation Plan, please address each item in detail, following SDCL 45-6C-8 and 45-6D-9. Also, refer to the reclamation standards outlined under SDCL 45-6C-27 through 45-6C-34, SDCL 45-6D-33 through 45-6D-39, and the state's hole plugging regulations as detailed under ARSD 74:11.

- 1.) Describe the type of reclamation the operator proposes to achieve in the reclamation of the affected land.

Wharf will use a backhoe, loader, and/or bulldozer, as necessary, to conduct the earthwork required for reclamation. After sloping and topsoiling is complete, Wharf will seed the affected land with broadcast seeders or a hydroseeder, depending on location and availability. Wharf will use its nurse crop and permanent seed mix, both previously approved by DENR and Lawrence County NRCS, to complete seeding.

- 2.) Provide a proposed timetable for seeding and replanting indicating when and how the reclamation plan will be implemented. Such timetable shall be developed after consulting with the County District Conservationist as to the nature of the soils and native vegetation in the area of the proposed operation. These recommendations shall be followed, if any are provided, and copies of all correspondence shall be provided to the Department.

Reclamation will generally occur during the fall, after exploration drilling has concluded. Drill pads and trails that have no future use will be reclaimed during the same year. Drill pads and trails that are needed for reentry, additional drilling, or other ancillary uses on Wharf land will be reclaimed following the conclusion of those activities.



COEUR WHARF™

Amy Allen | Sr. Environmental Compliance Coordinator

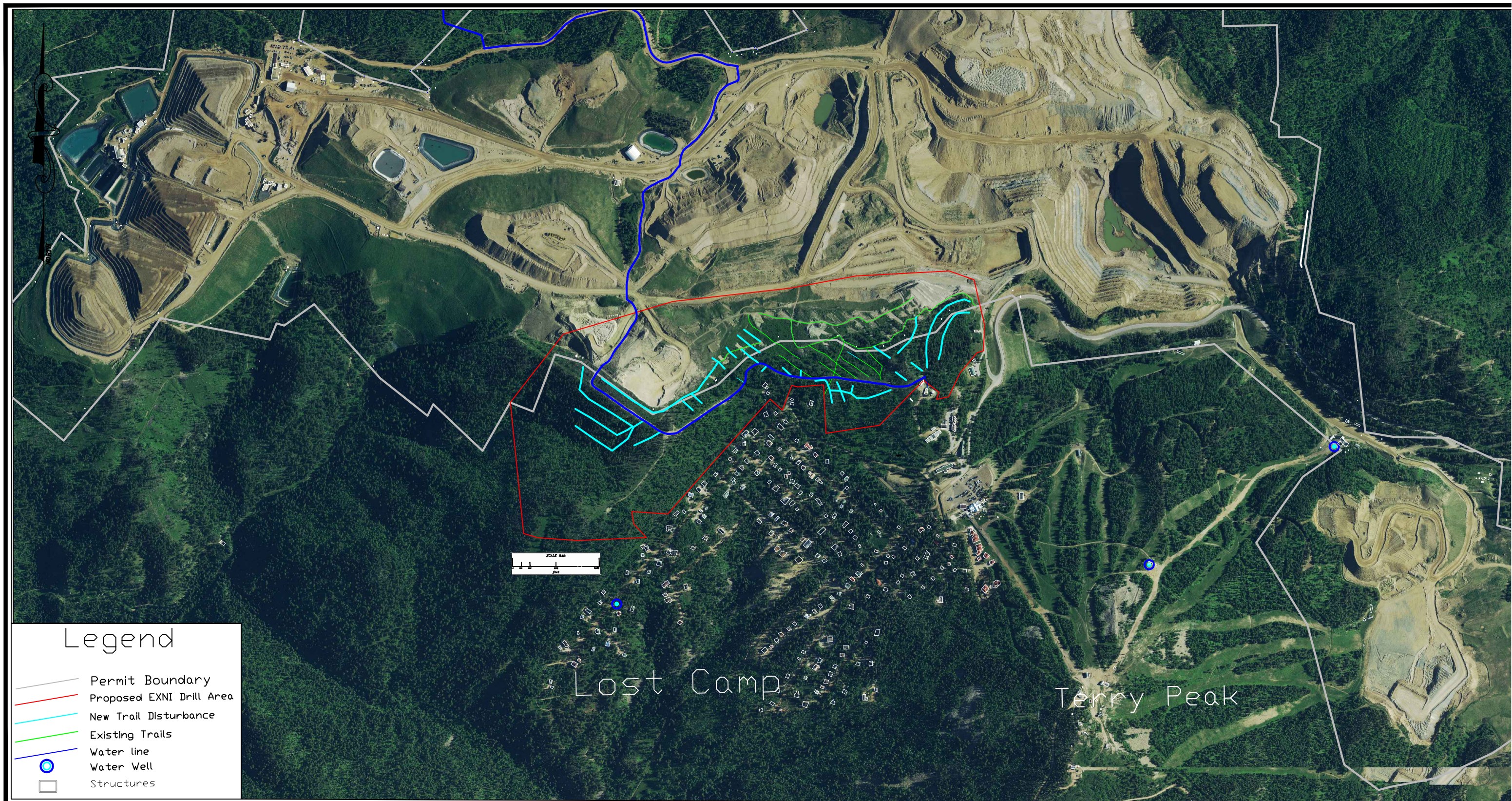
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Portland Ridge and Flossie
Proposed 2021 Drilling

DATE: 2021/01/13

DRAWN BY: KDS



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

April 7, 2008

Carol Koerner
Environmental/Governmental Affairs
Wharf Resources
10928 Wharf Road
Lead, SD 57754

RE: Technical Revision to Revise the Forage Production Performance Criteria for the
Postmine Land Use of Woodland Grazing

Dear Ms. Koerner:

Staff review has been completed on the technical revision submitted January 17, 2008 and supplemental information submitted January 22, February 19 and 27, and April 3, 2008. The technical revision would allow Wharf to revise the forage production performance criteria at the Wharf Mine for the postmine land use of woodland grazing. Based on our review, the department grants conditional approval for the technical revision. This approval is contingent on Wharf complying with the following conditions:

1. The useable forage production criteria listed on page 9 in the February 19, 2008 revision to the "Revegetation Monitoring and Bond Release Program" document will be one of the criteria used by the department to determine whether areas are eligible for reclamation liability release. Wharf shall insert the new forage production criteria into the Reclamation Performance Criteria document with the American Eagle information during the next update.
2. Wharf shall submit a map showing revegetation units and sampling locations at least 30 days prior to sampling.
3. Wharf shall notify the department at least 10 days prior to the commencement of vegetation sampling.

This letter serves only to approve the above-mentioned technical revision. This letter in no way is to be construed as agreement to, or approval of, any plans associated with the project.

If you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric Holm". The signature is fluid and cursive, with the first name "Eric" and last name "Holm" clearly distinguishable.

Eric Holm
Natural Resources Engineer
Minerals and Mining Program
Telephone: (605) 773-4201
FAX: (605) 773-5286
E-mail: eric.holm@state.sd.us

cc: Mark Keenihan, Rapid City Regional Office
Stan Michals, Game, Fish, and Parks

WHARF RESOURCES (USA) INC.

REVEGETATION MONITORING (SECTION I) / BOND RELEASE (SECTION II) PROGRAM

By:

CEDAR CREEK ASSOCIATES, INC.

Fort Collins, Colorado

(970) 223-0775

January, 2008

Revised February, 2008

WHARF RESOURCES (USA) INC.

REVEGETATION MONITORING (SECTION I) / BOND RELEASE (SECTION II) PROGRAM

Section I. Site-Specific Procedures for Monitoring of Revegetated Mine Facilities

1.0 Introduction

Reclamation monitoring includes several elements including the monitoring of vegetation establishment, plant community composition, and soil stability. This document describes the revegetation evaluation procedures to be used by Wharf Resources (USA) Inc. (Wharf) for monitoring and analysis of vegetation establishment (revegetation) of permitted disturbances. These procedures support the process leading to eventual financial guarantee or assurance release in accordance with permit requirements for documentation of successful revegetation.

It is the intent of Wharf to establish a reasonable and effective program to track the progress of revegetation on areas generally closed to active mine operations. This program will track progress both during the period of vegetation establishment and development (approximately 3 to 4 years after planting) and during the period that follows (after 4 years) until the financial assurance is released. When implemented, this "plan" will provide a scientifically defensible means to determine when units of reclaimed land have met reclamation success criteria and can be identified as "ready for surety and liability release" (releasable). The procedures will also identify those areas, or substantive portions of areas, that are not responding sufficiently to be releasable.

2.0 Revegetation Monitoring Procedures

2.1 Step One – Organization of Existing Information

The first step in the overall monitoring process is to collect and organize all existing information regarding each unit of currently revegetated land. A revegetated unit consists of a defined area based on management criteria (e.g., areas with common revegetation procedures, initiation times, defined functions such as a waste rock area, or areas with other unique designations or segregation). Often, segregation will be made based on slope, aspect, change of revegetation technique or practice, or other informational basis. Necessary information includes mapping, to document the extent of applied procedures with respect to the permit area and all applied revegetation specifications as indicated on an "as-built" sheet (illustrated below). Once all currently existing revegetated units have been documented in this manner, an "as-built" sheet will be completed for each new revegetated unit forward.

Example "As Built" Sheet

Revegetation Unit		Unit Code	
Location of Unit: _____			
Reclamation Supervisor: _____		Revegetation Contractor: _____ Unit Acreage: _____	
Topography:		Soil Amendments:	
Aspect: _____ % Slope: _____		How Applied: _____	
Subsurface Material: _____		When: _____	
Regrading Notes: _____		First Pass Included: _____	
Topsoli: Yes / No		Seed Mix / Fertilizer / Mulch / Tackifier	
Depth of topsoil: _____ Mo/Yr of Placement: _____		Second Pass Included: _____	
Surface Preparation: _____		Seed Mix / Fertilizer / Mulch / Tackifier	
Alt. Growth Media: Yes / No		Fertilizer:	
Depth of AGM: _____ Mo/Yr of Placement: _____		Material Applied	
Surface Preparation: _____		Lbs/Ac.	
Seeding / Planting:		Mulch:	
Source of Seed Mix: _____		Material Applied	
Method of Application: _____		Lbs/Ac.	
Mix Name: _____		When Applied: _____	
When Applied: _____		Tackifier:	
Species Seeded: _____ lbs of PLS		Material Applied	
Species Planted: _____ Total Number		Lbs/Ac.	
Total: 0		OPTIONAL Growth Media Sample Results	
Other Notes: _____		Parameter	
pH		0 - 12"	
E. Cond. (microhm/cm)		12 - 24"	
SAR (ppm)		pH	
CEC		E. Cond. (microhm/cm)	
% Org. Mat.		SAR (ppm)	
NO ₃ -N (ppm)		CEC	
NH ₃ (ppm)		% Org. Mat.	
P (ppm)		NO ₃ -N (ppm)	
K (ppm)		NH ₃ (ppm)	
Potash		P (ppm)	
Lime		K (ppm)	
CaCO ₃ (%)		Potash	
Zn (ppm)		Lime	
Fe (ppm)		CaCO ₃ (%)	
Mn (ppm)		Zn (ppm)	
Mg (ppm)		Fe (ppm)	
Cu (ppm)		Mn (ppm)	
Na (ppm)		Mg (ppm)	
Ca (ppm)		Cu (ppm)	
Bo (ppm)		Na (ppm)	
S (ppm)		Ca (ppm)	
Salt (EC?)		Bo (ppm)	
% Sand		S (ppm)	
% Silt		Salt (EC?)	
% Clay		% Sand	
Texture		% Silt	
Other:		% Clay	
Post-Planting Treatment:		Texture	
Surface Treatments:		Other:	
Supplemental Fertilizer:		Post-Planting Treatment:	
Other:		Surface Treatments:	
Total: 0.00		Supplemental Fertilizer:	
		Other:	

2.2 Step Two -- Monitor Existing Revegetated Units

Existing revegetated units should be evaluated and assessed for expressed conditions and "releasable" status. In this regard, Year 2 monitoring protocols (see Step Four below) would be implemented on all existing revegetated units as deemed necessary. Resultant data would be analyzed and interpreted and recommendations proffered with regard to these units as discussed for the overall protocol.

2.3 Step Three -- Site Reviews

It is anticipated that site reviews of revegetation by the agencies will become a regular event as concurrent reclamation matures and becomes releasable. It is Wharf's proposal that such site reviews be scheduled during the late Spring / early Summer following sampling for release of any given revegetated unit as opposed to a visit prior to sampling. In this manner, any areas unsuitable for release will be identified by Wharf and have treatment plans developed prior to review by the agencies.

An opportunity will be provided to agency representatives for field review of areas which have met reclamation success criteria and are ready for partial or complete release. Any remaining concerns can be discussed and addressed at this time. If substantial work requirements remain, submittal for release can be postponed until subsequent evaluations support moving ahead with the process.

2.4 Step Four -- Revegetation Monitoring Schedule

With the exception of existing revegetated surfaces, revegetation efforts will be subjected to the following monitoring procedures during post-planting Years 1, 2, and 3. For revegetated units older than 3 years that have not been identified for release, a protocol for Post-Year 3 monitoring will be implemented to provide a means to ensure against adverse impacts to reclamation (e.g., weed infestation, overgrazing, etc.).

2.4.1 Year 1 Monitoring

During the first growing season following seeding, a revegetated unit will be subjected to a relatively brief evaluation to document plant establishment. This evaluation consists of a qualified observer traversing the subject area and evaluating vegetation establishment. Approximately 1 hour of qualitative review time per 50 acres will be expended. During the traverses, the observer will note, among other items: 1) poor seedling emergence, 2) pervasively weak or stressed seedlings, 3) indicators of soil fertility problems, 4) noxious weeds or invasive plant infestation, 5)

evidence of unintended livestock grazing, 6) excessive erosion, 7) evidence of acid formation, 8) evidence of structural instability (stress fractures, piping, etc.), 9) "pockets" of the aforementioned, and 10) any other similar revegetation / reclamation related problems.

In addition to this qualitative evaluation, the surveying observer will collect semi-quantitative samples to document the emergent density of seeded species. This procedure will occur as follows. For areas less than 10 acres in size, a total of 5 samples will be collected. For areas between 10 and 100 acres in size, a total of 10 samples will be collected. For areas between 100 and 500 acres in size, a total of 20 samples will be collected. Finally, for areas larger than 500 acres in size a total of 30 samples will be collected. Each sample will consist of a group of five 1-ft² quadrats distributed in an unbiased manner. The number of emergent plants rooted within the perimeter will be recorded accordingly into one of six classes: perennial grass, perennial forb, shrub, tree, annual grass, or annual forb. This procedure typically takes 2 to 3 minutes per sample point (5 quadrats) yet yields valuable information on the success of the seeding effort. Efforts that result in less than 1 perennial emergent per ft² are considered to be poor and may need remediation. Efforts exhibiting 1 to 2 perennial emergents per ft² are considered to be fair, while 3-4 perennial emergents per ft² are considered good. Finally, 5 or more perennial emergents per ft² are considered to be very good to excellent seeding efforts.

The revegetated unit should also be circumnavigated on foot with a sub-meter GPS to field delineate the unit boundary. In this manner, any discrepancy between planned and actual area of revegetation will be documented. However, this activity is optional depending on the veracity of planned vs. actual reclamation.

The results of the qualitative and semi-quantitative survey will form the basis for recommendations for any future needs of the revegetated unit. For most efforts it is anticipated that a recommendation to proceed to Year 2 monitoring will be made. Other possible recommendations include:

1. Allow additional time for seed to emerge and re-evaluate using Year 1 Protocols.
2. Retreat all or parts of a unit by reseeding, fertilizing, weed control efforts, addressing acid generation or stability concerns, etc. An important concept that must be kept in mind is that precipitation is not always favorable for revegetation efforts in any given year, just as occurs for agricultural practices. Also, species, growth form and depredation by granivores, mold and fungus will be reviewed. Therefore, as indicated above, a second growing season is occasionally necessary to achieve the desired seedling emergence. If however, after two growing seasons emergence is still unsatisfactory, reseeding may be necessary.

2.4.2 Year 2 Monitoring

During the second growing season for a unit that is progressing as expected, evaluation will consist of a rapid quantitative evaluation of ground cover to document the level of progression. This effort will entail a qualified observer systematically establishing "ground cover" sampling transects across the revegetated unit at the following sampling intensity:

Units less than 10 acres	5 Transects	Units from 100 to 500 acres	20 Transects
Units from 10 to 100 acres	10 Transects	Units greater than 500 acres	30 Transects

These transects will be systematically distributed as opposed to being randomly distributed. In this application a systematic distribution of samples is superior because it ensures sample representation from across the entire reclaimed unit. Also, this procedure better accounts for heterogeneous expressions of multiple seedlings or revegetation conditions by "forcing" a patterned distribution of samples which minimizes sample bias resulting from vegetated pockets being either entirely missed or overemphasized. This "forced" distribution also facilitates a second overall look at the revegetated unit for the Year 1 qualitative parameters noted above.

Ground cover transects will consist of 10-meter long 100-intercept "line-point transects" ("point-intercept transects"). The sampling methods are described in Section II entitled: **Site-Specific Standards for: Determination of Successful Revegetation and Subsequent Financial Guarantee or Assurance Release for Mined or "Mine-Related" Areas**. As routinely documented in the heavily regulated coal industry, this methodology, using modern laser instrumentation, facilitates the collection of the most unbiased, repeatable, precise, and cost-effective* ground cover data possible.

Depending on the results of data analyses and interpretation from the quantitative survey, appropriate management recommendations will be generated for the unit. For most efforts, it is anticipated that a recommendation to proceed to Year 3 - bond release sampling will be forthcoming. Other possible recommendations include:

1. Allow additional time for the establishing community to mature and then re-evaluate using Year 2 Protocols.
2. Retreat all or parts of a unit by reseeding, fertilizing, weed control efforts, addressing acid generation or stability concerns, etc.

* In typical revegetation, transects completed with laser instrumentation can be implemented by an experienced observer at a rate of 6 or 7 transects per man-hour of effort with a range of 4 to 9 transects depending on the diversity of vegetation and size of the revegetated unit.

If conditions are such that a particular revegetated unit is not quite ready for release, a recommendation will be made to monitor the unit in Year 3 using Year 2 procedures to provide verification that the unit has achieved "releasable" status. Thereafter, the revegetated unit should be re-monitored on a 2-year cycle using Year 2 protocols to facilitate detection of vegetative change, either desirable or undesirable, until managerial or operational considerations allow for a unit to be sampled for release.

2.4.3 Year 3 Monitoring

Year 3 is typically the first year of potential eligibility for demonstration of reclamation success and application for release of financial guarantees. If Year 2 monitoring has suggested that a revegetated unit may be releasable and managerial / operational / other* considerations so indicate, then release sampling may be initiated as described in the section entitled: **Site-Specific Standards for: Determination of Successful Revegetation and Subsequent Financial Guarantee or Assurance Release for Mined or "Mine-Related" Areas**. As indicated above, if an area is not managerially or operationally ready for release, monitoring using Year 2 protocols should occur in subsequent years to verify the status of the unit and insure that no additional work needs to occur.

2.5 Step Five –Prepare Monitoring Report

Following collection of monitoring data, a monitoring report will be prepared. This report will present the results of monitoring data analyses and any management recommendations. The report will provide a detailed description and exhibition of the methodology utilized to facilitate implementation of an identical protocol in subsequent years by independent observers. Results will be presented and described, by segregated unit (treatments and/or reclamation units in each area) in text, tabular, and as possible graphic form to aid interpretation by reviewers. For example, comparisons with standards (shown as a "threshold value") will facilitate immediate comprehension of a reclaimed unit's status.

In addition to recommendations relating to financial assurance release, additional recommendations resulting from the monitoring program may include: recommendations to modify revegetation procedures and/or seed mixtures for future revegetation areas, recommendation for weed control and recommendations regarding future grazing management.

* Additional reclamation performance criteria must also indicate that a unit of land is releasable before formal procedures can be initiated. These criteria are listed in Wharf's Reclamation Performance Criteria (March 2001) documentation and include standards for topics such as "slope stability on waste rock, spent ore, and heap leach pads; and whether surface and ground water quality parameters are compliant.

A summary section will be developed as a portion of this report that includes an overall compendium and map exhibiting the revegetation status of all reclaimed areas. Field data will be included in appendices to the report.

Section II - Site-Specific Protocols for: Determination of Successful Revegetation and Subsequent Financial Guarantee or Assurance Release for Mined or "Mine-Related" Areas

1.0 Introduction

This document details sampling and analysis procedures and the revegetation success criteria as proposed by Wharf Resources (USA), Inc. (Wharf) for evaluation of reclamation of mine-related disturbances. These criteria and protocols are developed in accordance with prior permitting documentation or sound scientific principals where modifications appear to be necessary.

2.0 Revegetation Success Evaluation

Consistent with the requirements of DENR Permits 356, 434, 435, and 464, revegetation success at the Wharf Mine will be evaluated by the following:

- Comparison to standards representative of the pre-existing vegetation community(s) a/k/a "Reclamation Performance Criteria;
- Plant species present in, and/or resulting from, the proposed (and planted) seed mixes; and
- The post-mining land use (primarily woodland livestock grazing with secondary incidental use by wildlife).

Baseline vegetation surveys as well as adjacent area observation indicate that pre-mining vegetation communities at the Wharf Mine were dominated by ponderosa pine dominated woodlands. Occasional subdominant types include white spruce and aspen woodlands. Minor communities include 1) talus slopes or rock outcrop (~ 5% of the permit area) and 2) herbaceous meadows (~2% of the permit area). Because these communities were in apparent equilibrium, and arguably 'late seral' ecological status, certain allowances must be made when comparing these to early seral plant communities developing after reclamation treatment otherwise comparisons would be scientifically invalid.

Total vegetative cover, composition, and carrying capacity are important factors in determining the success of revegetation efforts. However, of primary importance to reclamation success is the achievement of soil stabilization. Without soil stability, revegetation efforts may regress along the successional continuum and thereby preclude the achievement of long-term land use goals. If revegetation success criteria are achieved as detailed later in this section, it can be reasonably assumed that soil stability will be achieved as well.

The long-term goal of reclamation efforts at the Wharf Mine is to establish self-sustaining biotic systems with appropriate ecological resistance and resilience. This does not necessarily mean that the reclaimed area will exactly replicate the surrounding vegetation communities, but that it will successfully support the designated post-mining land uses (woodland grazing). In general, it would be an undesirable condition that the reclaimed area match exactly the surrounding vegetation communities, since community diversity adds significantly to the overall wildlife and habitat diversity of the area. The seed mixtures designated by the reclamation plan include a significant component of species native to the region, with limited introduced species that are designed to provide interim soil stability and forage value. The seed mixes contain a complement of grasses, forbs, shrubs, and trees to provide establishment of a diverse plant community within the reclaimed areas. Plant species used in the seed mixtures are generally drought tolerant, promote evapo-transpiration of soil moisture, and will provide forage for livestock and wildlife.

3.0 Revegetation Success Criteria

Although the goal of the reclamation program is to return the permit area to a self-sustaining ecosystem that stabilizes the soil, primary revegetation success will be assessed against a performance standard for both current annual production (carrying capacity) and vegetative ground cover. Revegetation efforts will be considered successful when standards have been met for two consecutive years following planting efforts.

3.1 Vegetative Ground Cover Criterion

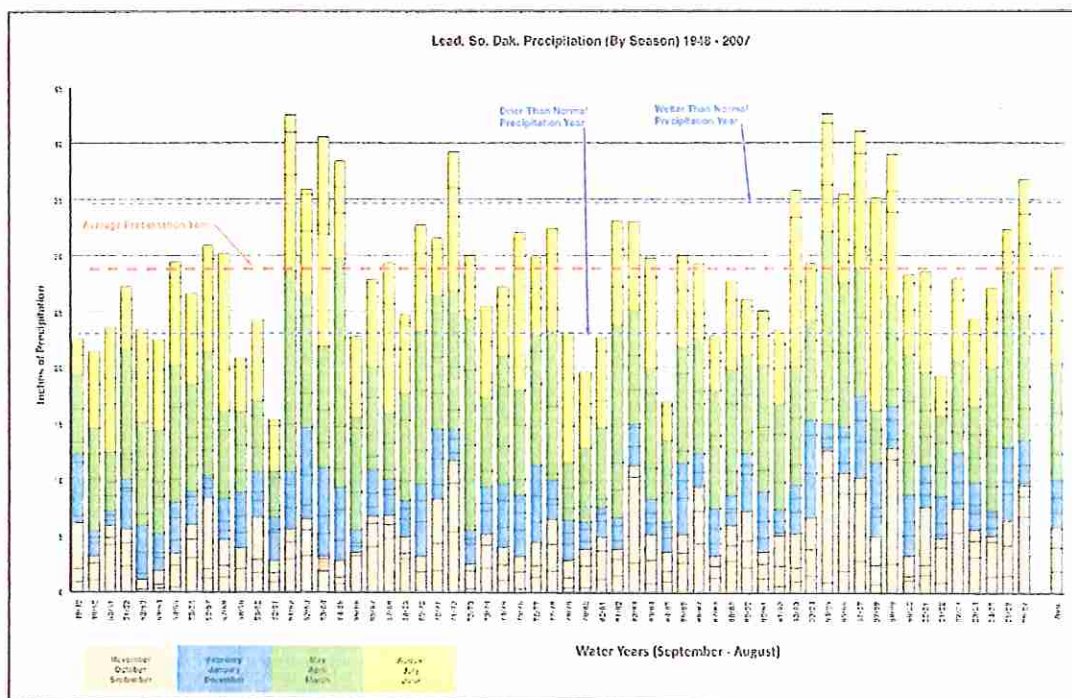
Live vegetative ground cover must meet the following criterion:

- The total vegetative ground cover (exclusive of listed noxious weeds) in the revegetated unit equals or exceeds a fixed standard of 40 percent (as currently exists in permitting documents).

3.2 Useable Forage Production Criterion

The Wharf Reclamation Plan establishes a goal of revegetation as follows: "Reclaimed land must support a livestock carrying capacity equivalent to that of the surrounding area...". "The carrying capacity is determined by the useable forage production of the land" under a given set of climatic circumstances. Therefore, in years of below average precipitation, useable forage production shall be at least 190 pounds per acre (ADB or air-dry basis). In years of average precipitation, useable forage production shall be at least 275 pounds per acre. Finally, in years of above average precipitation, useable forage production shall be at least 330 pounds per acre.

The determination of average vs. above average vs. below average will be made based on the recorded precipitation over the past 59 years (1948 – 2007) from the NOAA station in Lead, South Dakota whereby an average of 28.9 inches of precipitation has been observed. Where precipitation from September through the following August is within about 20% of 28.9 inches, then precipitation will be assumed to be average (60% of years). If precipitation over this period is about 20% above 28.9 inches (34.7 inches) or more, then above average conditions will be assumed (20% of years). If precipitation over this period is about 20% below 28.9 inches (23.1 inches) or less, then below average conditions will be assumed (20% of years).



The determination of "useable forage" shall be based on the average percent palatability of individual plant taxa (for consumption by cattle) based on the following publication:

United States Dept. of Agriculture, U.S. Forest Service. 1937. Check List, Palatability Table and Standard Symbol List of Colorado and Wyoming Range Plants. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. June 16, 1937. 41 pp.

"This compilation represents both a revision and an expansion of 'Palatabilities of Colorado and Wyoming Range Plants found in the 1936 Forage Inventory' ". "The addition of species which occur on the national forests has greatly extended the list.

This list applies specifically to Colorado and Wyoming and in general to the Black Hills of South Dakota and to the western one-fourth of Kansas and Nebraska."

Although somewhat dated, this publication is still one of the best compilations of the "usability" or "palatability" of forage plants available for the determination of specific estimates of carrying capacity. Additional internet sources (U.S. government plant data bases) may be used in a similar manner for certain "introduced" species that are often found in reclamation mixes. For example, alfalfa can be readily assumed to exhibit approximately 80% palatability, if not more.

3.2.1 Previous Standard

Prior to the information compiled within this document, the success criterion proposed for Wharf's "useable forage production" was a generically derived 800 pounds per acre (ADB). It seems apparent that this value was based on the presumption that 50% of the total estimated production (1600 lbs per acre) occurring largely on small grasslands in the vicinity of the project area was "useable" and that this value represented the entirety of Wharf's disturbance footprint. This "ballpark" reasoning exhibits two fundamental misunderstandings that substantially elevate the success criterion beyond that which would have resulted given a more specific and narrowly-defined reasoning process.

3.2.2 Determination of Revised Standard

The first misunderstanding alluded to above involves the fact that native grasslands (reasonably estimated to exhibit 1600 pounds per acre total production) are not representative of the entire baseline area disturbed by Wharf, but rather only an estimated 2% of the pre-mining acreage. "Affected land must have the capability to support a livestock carrying capacity that is equivalent to that of the surrounding area..." not just one type in the surrounding area. Fortunately, Wharf requested Mr. Thomas Quinn, District Conservationist of the NRCS in 2000 to review several example baseline areas in the vicinity of the Wharf Mine and make estimates of the production.

In this regard, Mr. Quinn made the following qualified estimates that appear to be both correct and reasonable (see Exhibit 2 – Letter from Thomas Quinn to Kim Schultz - 9/19/00):

Grass dominated baseline areas (2 sites) –	1600 pounds of total production.
Shrub/herbaceous dominated baseline area (1 site) –	1200 pounds of total production.
Woodland dominated baseline areas (1 site) –	700 pounds of total production.
Rock Outcrop dominated baseline areas (1 site) –	0-100 pounds of total production.

Exhibit 2- Letter from Thomas Quinn to Kim Schultz 9/19/2000



United States
Department of
Agriculture

Natural Resources
Conservation
Service

Belle Fourche Service Center
1847 5th Avenue, S
Belle Fourche, SD 57717-2086
(605) 892-3368 -- Ext. 3

9-19-00

Kim Schultz
Environmental Coordinator
Wharf Resources
Lead SD 57754

Dear Kim,

I apologize for taking so long to finish this report of my findings from the field survey that I conducted with you and Carol Koerner on 6-14-2000. The field survey that we conducted was to determine the livestock carrying capacity and the average production levels of the surrounding areas. We did visual surveys of the Perkins area, LAC cabin area, Micro-Tower area and Deer Mountain. At each area, we stopped and I walked through undisturbed areas and visually estimated pounds of production. At the Perkins area, there was approximately 1600 lbs of total forage in the form of grass species, clover, forbs and shrubs. Using a 50% level of use, there was approximately 800 lbs. of usable forage. At the LAC cabin area, there were more shrubs and forbs and less grass. I estimated 600 lbs of usable forage (1200 lbs. total) in the open areas and 350 lbs. usable (700 lbs. total) in the heavier timber. In the Micro-Tower area, we found lots of sedges, Kentucky bluegrass, some ricegrass and Timothy, forbs and shrubs on the lower parts of the slopes. The upper parts of the slopes were bare rock outcrop and pine litter. I estimated 800 lbs. usable forage (1600 lbs. total production) on the lower parts of the landscape, and 0-100 lbs. usable forage in the rock outcrop areas. We found a lot of disturbed areas on the Deer Mountain sites that we surveyed. Smooth brome grass had become established, which increased production to approximately 1000 lbs. usable forage (2000 lbs. total forage production). Because of the presence of Smooth Brome grass on this site, I don't feel that it is representative of a native site in that geologic formation.

Carrying capacities or forage production is extremely variable in the northern Black Hills, due to extreme variations in rainfall and other weather conditions from one year to the next. The survey that I conducted followed a winter that was warmer and drier than normal, but Spring rains were about average.

A handwritten signature in dark ink, appearing to read "Tom Quinn", written over a horizontal line.

Thomas G. Quinn
District Conservationist
USDA-NRCS
Belle Fourche, SD 57717

The Natural Resources Conservation Service works hand-in-hand with the American people to conserve natural resources on private lands.

AN EQUAL OPPORTUNITY EMPLOYER

To more accurately compute the average (or weighted) total production for the "surrounding area", each of Mr. Quinn's estimates needs to be weighted based on the acreage or percent of original baseline area occupied by each community type. In this regard, and based on baseline mapping, grassland meadow areas occupied about 2% of the pre-mine area. Shrub / herbaceous areas were not mapped (i.e., did not exist in sufficient size to form a map unit), and rock outcrop areas occupied about 5% of the pre-mine baseline area. The remaining 93% of the baseline area exhibited mature woodland communities, either Ponderosa pine, white spruce, or aspen dominated.

Therefore, using Mr. Quinn's qualified estimates of total production and the aforementioned community composition of pre-mine baseline areas, the following calculation results in the total weighted production to be expected from the "pre-mine baseline area" or "surrounding area".

Grasslands =	1600 total pounds/ac x 2% =	32 weighted pounds / ac.
Shrublands =	1200 total pounds/ac x 0% =	00 weighted pounds / ac.
Rock Outcrop =	100 total pounds/ac x 5% =	5 weighted pounds / ac.
Woodlands =	700 total pounds/ac x 93% =	651 weighted pounds / ac.

Average pre-mine baseline area total production = $32 + 0 + 5 + 651$
= **688 total weighted pounds / ac.**

The second misunderstanding is simply that the "rule-of-thumb" proportion (50%) used to determine the useable forage component of total production is typically erroneous when applied to "woody" communities such as woodlands or shrublands. This 50% "rule-of-thumb" is more typically applicable to open prairie [grassland] communities. Therefore, a less simplistic calculation is apposite. Since cattle are the target post-mining livestock category, the assumption of 50%, or even 60%, useable forage for the life form of grasses would be reasonably acceptable. However, a large portion (typically 80% or more) of the composition of the "surrounding area's" native vegetation is comprised of forbs and shrubs that exhibit only 10% (or less) useable forage for cattle. If sheep were the consideration for post-mining livestock, than the reverse ratio between grasses and forbs would be necessary.

Even though less than 20% of the total production of average woodland communities is composed of grasses, there are circumstances (e.g., aspen communities) where the grass contribution to total production can be as much as 50 to 60%. Therefore, to be conservative, the assumption will be made that 60% of the composition (by weight) of total production will be due to grasses and 40% will be due to forbs and shrubs. Given this more refined life-form "composition", the overall estimate of the percent useable forage for communities in the area of the Wharf mine

would conservatively be estimated at 40% of total production, not 50%. This conservative, yet more refined and accurate value is determined as follows:

Assume 60% of the composition (by weight) is grasses and 40% is forbs and/or shrubs.
Assume 60% of grasses are useable forage, and 10% of forbs and shrubs are usable.
Average useable forage would then be: $(0.6 \times 0.6) + (0.4 \times 0.1) = 0.36 + 0.04 = 40\%$.

Applying this value to the estimate of 1600 pounds of total forage for native vegetation would result in a gross total useable forage value of 640 lbs/ac. However, as explained above, the 1600 pounds of total forage is only applicable to a small percentage of the pre-mine acreage. The weighted pre-mine total production was determined to be 688 pounds per acre. Therefore, utilizing the revised value of 40% to modify the total weighted production (688 pounds per acre) results in the more correctly determined value of 275 useable pounds per acre (ADB). Although Mr. Quinn indicated that "Spring rains were about average" prior to his field estimates of total production on June 14, 2000, the aforementioned NOAA-based precipitation chart shows that an average year (with a wet winter and spring) had actually occurred (28.24 inches of precipitation fell from September, 1999 through August of 2000 in comparison to the overall average of 28.89 inches over the 59 year history). Therefore, the value of 275 useable pounds per acre should apply for normal-year situations. To calculate a "dry-year" precipitation standard and a "wet-year" precipitation standard, typical NRCS "rules-of-thumb" could again be employed. However, rather than again use such "rules-of-thumb", Cedar Creek has data specifically on-point from the Rosebud Mine located in southeastern Montana (only 200 miles distant) in an area of Ponderosa pine savannah.

Data collected by Cedar Creek over a period of almost two decades has resulted in development of a regression curve that provides a reasonably strong level of prediction ($r^2 = 0.72$). Calculation of the expected production for a 20% reduction as well as a 20% increase in precipitation from normal values results in production values that increase 45% from dry to normal years, and 20% from normal to wet years. Therefore, application of these relationships to Wharf's normal-year standard (275 pounds/ac) would result in a dry-year useable forage standard of 190 pounds per acre ($275 / 1.45$) (ADB). Similarly, Wharf's wet-year standard would calculate to 330 pounds per acre of useable forage (275×1.2) (ADB).

4.0 Revegetation Evaluation Procedures

Monitoring and eventual evaluation will involve sampling of ground cover and current annual production within each revegetated unit under consideration for financial guarantee or assurance release (and at least 3 years of age). Species diversity information will be calculated from the

ground cover data and presented for informational purposes. Sampling for ground cover will be accomplished utilizing the point-intercept procedure along transects of 100 intercepts each, preferably using modern instrumentation (e.g. lasers or optics). Sampling for production will be accomplished by standard harvest techniques from within quadrats of specific dimensions (0.5m x 1.0m) or 0.5m².

4.1 Sampling

The first step of the vegetation sampling procedure is to obtain ground cover and production data from each revegetated unit to be evaluated. A revegetated unit consists of a defined area based on management criteria, such as areas with common revegetation procedures and initiation times, areas with a defined function such as a waste rock facility, or areas with other unique designations or managerial implication. Sampling will occur approximately during the peak standing biomass period of the year (late summer) and sampling locations will be determined utilizing a systematic (bias-free) method with a random start¹. This systematic procedure also provides proportionate representation from across each reclaimed unit for additional characteristics such as aspect, slope, etc

4.1.1 Sample Site Location.

The systematic procedure for sample location in a revegetated unit will occur in the following stepwise manner. First, a fixed point of reference will be selected for the area to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions will be selected to provide a reasonable number (e.g., 20 or 30) of coordinate intersections that could be used for the initial set of sample sites. Typically a minimum of 20 samples is collected from each management unit. Third, a scaled representation of the grid will be overlain on field maps of the target unit extending along north/south and east/west lines or other appropriate direction. Fourth, the initial placement of this grid will be implemented by selection of two random numbers (an X and Y distance) to be used for locating the first coordinate from the fixed point of reference, thereby making the effort unbiased. Fifth, where an excess number of potential sample points (grid intersections) is indicated by overlain maps, the excess will be randomly chosen for elimination unless it is later determined that additional samples are necessary to meet sample

¹ Systematic sampling (with random initiation) is superior to other sample distribution procedures because it forces representation from across the reclaimed unit. It accounts better for heterogeneous expressions of multiple seedings or revegetation conditions by "forcing" a patterned distribution of samples. This method thus minimizes the risk that significant pockets will be either entirely missed or overemphasized.

adequacy. If additional samples are needed, the eliminated potential sample sites will be added back in reverse order until enough samples have been collected. Sixth, utilizing compass and pace techniques or a handheld GPS, the sample points will be located in the field.

4.1.2 Ground Cover Determination.

Ground cover at each co-located sampling site will be determined utilizing the point-intercept methodology as illustrated in Exhibit 1. This methodology will be applied as follows: First, a transect 10 meters in length will be extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a "laser point bar", "optical point bar" or 10-point frame will be situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits will be determined at each meter interval as follows:

1. When a laser point bar is used, a battery of 10 specialized lasers situated along the bar at 10-centimeter intervals will be activated and the variable intercepted by each of the narrow (0.02") focused beams will be recorded (see Exhibit 1);
2. If an optical point bar is used, intercepts will be recorded based on the item intercepted by fine crosshairs situated within each of 10 optical scopes located at 10-centimeter intervals.
3. If a 10-point frame is used, sharpened needles will be used to determine intercepts at 10-centimeter intervals. Care will be taken to NOT record "side touches" on the pins as this will result in overestimation error.

The following sampling rules should apply during data collection. Intercepts will be recorded for the first (typically highest) current annual (alive during the current growing season) plant part intercepted without regard to underlying intercepts or attachment to a living base. Otherwise, the intercept will be litter, rock or bare soil. Rock intercepts are based on a particle size of 2 mm or larger (NRCS definition) otherwise it would be classified as bare soil. To distinguish between current year senescent plant material and litter (including standing dead), the following rule should apply: 1) if the material is gray or faded tan it should be considered litter; and 2) if the material is bright yellow or beige it should be considered current annual (alive) and recorded by species. On occasion, experience with non-conforming taxa may override this rule.

When using laser or optic instruments during breezy field conditions, the observer should consistently utilize one of the following techniques for determining a hit: 1) record the first item focused upon that is intercepted by the narrow laser beam or cross-hair; 2) wait a few moments and record the item intercepted for the longest time, or 3) block the wind and record the intercept. When using a pin frame, the observer must wait for the wind to subside.

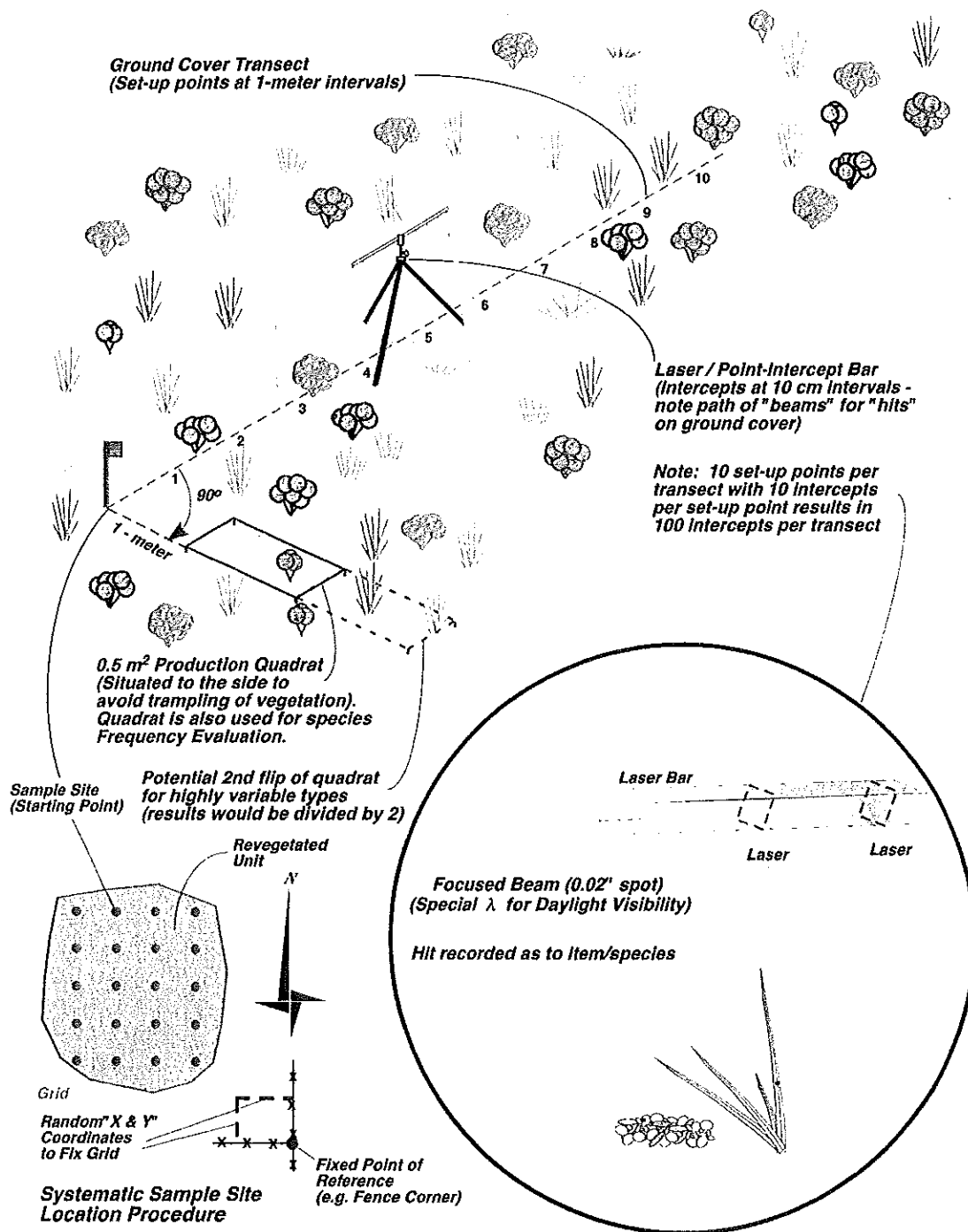


Exhibit 1
Sampling Procedure at a Systematic Sample Site Location

With regard to gaps in the overstory, the point-intercept procedure naturally corrects for overestimations created by 2-dimensional areal (quadrat) or 1-dimensional linear (line-intercept) techniques. In this regard, the 0-dimensional point is extended along a line-of-sight until it "intercepts" something that is then recorded. Frequently points simply pass through overstory gaps until a lower plant part, litter, rock or bare soil is encountered.

Regardless of instrument, a total of 100 intercepts per transect will be recorded resulting in 1 percent cover per intercept. This methodology and instrumentation (excepting the 10-point frame) facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible.

4.1.3 Determination of Current Annual Production

At each co-located sample site, current annual production will be collected from a 0.5 m² quadrat frame placed 90° to the right (clockwise) of the ground cover transect to allow avoidance of vegetation trampled by investigators during sample site location – see Exhibit 1. From within each quadrat, all above ground current annual plant growth within the vertical boundaries of the frame will be clipped and bagged separately by species.

Shrub production will be estimated by clipping a typical leader (by species) and counting all remaining leaders of the species in the quadrat. If only a small portion of a shrub is encountered the entire current annual production will be collected. Similarly, if only a very small amount of a given species occurs within a quadrat (e.g., < 2 grams), it may be estimated and recorded directly. Care must be made to note whether the estimate is green weight or dry weight.

All production samples will be returned to the lab for oven drying and weighing. Drying will occur at 105° C until a stable weight is achieved (usually after 24 hours). Samples will then be re-weighed to the nearest 0.1 gram. Because the success standard(s) are presented on an Air-Dry Basis (ADB), resulting Oven-Dry Basis (ODB) sampling data must be converted to be comparable. In this regard, oven-dry data will be increased by a factor of 11% (typical rule-of-thumb conversion between ADB and ODB data).

4.1.4 Sampling Adequacy.

Because the protocol calls for co-locating a production sample with each ground cover transect (see Exhibit 1), a determination of sample adequacy is only deemed necessary for the ground cover variable. Because of the co-location, there will be a minimum of 20 samples for

each management unit. If ground cover requires more than 20 samples for ground cover adequacy, then there will be an equal number of production samples collected.

In this regard, ground cover data collection (and co-located production quadrats) will continue within each discrete management unit until a statistically adequate sample has been obtained. Adequacy of sampling will be achieved when, for each unit, the number of samples actually collected (n) provides a level of precision that is within 10% of the true mean (μ) with 90% confidence (n_{\min}), i.e., when $n_{\min} \leq n$, and n_{\min} is calculated as follows:

$$n_{\min} = (t^2 s^2) / (0.1 \bar{x})^2$$

where: n = the number of actual samples collected with a minimum of 20 in each unit;
 t = 1-tailed value from the t distribution for 90% confidence with $n-1$ degrees of freedom;
 s^2 = the variance of the estimate as calculated from the initial samples;
 \bar{x} = the mean of the estimate as calculated from the initial samples.

As indicated above, this formula provides an estimate of the sample mean to within 10% of the true population mean (μ) with 90% confidence. Calculations of the mean and variance will be based on "total vegetation ground cover" exclusive of litter. Furthermore, a minimum sample size of twenty (20) will be collected from each discrete revegetated unit. If the initial 20 samples do not provide an adequate estimate of the mean (e.g., the inequality above is false), additional samples will be collected until the inequality is satisfied. However, in no case will more than 40 ground cover transects be collected in any given sampling unit.

4.2 Comparison Process

After adequate ground cover sampling, the comparison process will be initiated by calculating the mean ground cover value (excluding listed noxious weeds) for each revegetated unit. The test for revegetation success for ground cover will be considered acceptable if the statistically adequate sample mean is greater than or equal to the constant 40%.

With regard to production, the mean current annual production (excluding listed noxious weeds) for each revegetated unit will be compared against the appropriate standard depending on whether the sampling year is determined to be a dry year, normal year, or wet year with regard to incident precipitation. The comparison will be made on an "Air-Dry Basis" (ADB) to one of the following three standards:

<u>Dry Year</u>	<u>190 pounds of useable production (ADB)</u>
<u>Normal Year</u>	<u>275 pounds of useable production (ADB)</u>
<u>Wet Year</u>	<u>330 pounds of useable production (ADB)</u>

The determination of "the percent usable forage" will be made as indicated in Section 3.2 above and/or based on the proportions of the various species as indicated by an analysis of composition from the ground cover data. For example, the USDA (1937) indicates that the following taxa exhibit palatability's (usability) as indicated:

<i>Agropyron dasystachyum</i>	80%
<i>Agroptryon smithii</i>	75%
<i>Poa pratensis</i>	75%
<i>Agropyron cristatum</i>	70%
<i>Koeleria cristata</i>	60%
<i>Mellilotus officinalis</i>	35%
<i>Linum lewisii</i>	10%
<i>Atriplex canescens</i>	20%
<i>Artemisia tridentata</i>	10%



April 6, 2011

Mr. Ron Waterland
Environmental Manager
Wharf Resources (USA), Inc.
10928 Wharf Road
Lead, South Dakota 57754

Re: Fertilizer rates for revegetation at the Wharf Mine

Dear Ron:

As we've discussed on occasion in the past, application of fertilizer is not recommended for revegetation at the Wharf Mine when native species are seeded into replaced topsoil that was either direct hauled or replaced from a topsoil salvage pile. This recommendation is based on significant observation over the past few years at both your operations as well as a multitude of others around the West. We (as well as most other reclamation professionals) have observed that two negatives tend to occur with fertilization. First, annual invaders (early seral weeds) are given a significant competitive edge and usually take full advantage of the additional nutrients, especially nitrogen. Artificially enhanced populations of such weeds slows the germination and establishment of desirable taxa, leads to weed control issues, or both. Second, diversity of desirable species is harmed because the more aggressive species, especially when given additional nutrients, take advantage and are able to outcompete less aggressive taxa. We have found repeatedly that native species are well adapted to dealing with lower nutrient and/or natural nutrient circumstances and therefore, are provided with the competitive advantage (when fertilizer is not used). It takes a little longer for thick stands of herbaceous species to develop, but when they do, they are more diverse and far more resilient to perturbation. Therefore, unless replaced growth media is extremely poor in nutrient content (i.e., something other than topsoil or subsoil), supplemental fertilizer will tend to do more harm than good to the reclaimed plant community.

If you have any additional questions on this or another reclamation-related matter, please don't hesitate to ask.

Sincerely,
CEDAR CREEK ASSOCIATES, INC.

Steven R. Viert
Principal

401-07

MIDDAKOTA VEGETATION MANAGEMENT

35920 CANHAM PLACE
MILLER, SD 57362

ANDREW CANHAM
605-853-3287 OR 605-530-8089

JACK DOOLITTLE
605-852-2869 OR 870-0130

April 26, 2011

Dear Ron,

Attached is the report for the Wharf Mining Area Noxious Weed Control. Our company specializes in Noxious Weed Management including chemical application, GPS mapping and GIS applications, grant writing, and researching.

Our company has worked with Wharf Mines since 2003. Invasive non-native weeds have decreased in both density levels and infestation areas. Canada Thistle, Hounds Tongue, Mullen, St. Johns Wart, Tansy were the main weeds of concern. Knapweed and bi-annual thistles were located in various areas with small infestations. With the introduction of new herbicides and aggressive application methods we have decreased the noxious weeds immensely. Application timing is very critical due to the elevation, various weed species, and growth rates of those species. A spring/early summer application followed up with a fall application offers the widest window of opportunity for best control.

If you have any questions please feel free to call me at 605-853-3287 - Cell: 605-530-8089, or my partner Jack Doolittle at 605-852-2689 - Cell: 605-870-0130.

Sincerely,



Andrew Canham and Jack Doolittle

10:43 AM

04/26/11

Mid Dakota Vegetation Management Find Report

Date	Name	Memo	Acco...	Amount	Balance
2010	Wharf Mine	Deposit	Sales	- 3,432.62	- 3,432.62
2009	Wharf Mine	Deposit	Sales	-15,424.84	-18,857.46
2008	Wharf Mine	Deposit	Sales	-18,005.77	-36,863.23
2007	Wharf Mine	Deposit	Sales	-19,911.58	-56,774.81
2006	Wharf Mine	Deposit	Sales	-18,788.96	-75,563.77
2005	Wharf Mine	Deposit	Sales	-16,980.48	-92,544.25
Total				-92,544.25	-92,544.25

Deposits for 2010

Deposits for 2009

Deposits for 2008

Deposits for 2007

Deposits for 2006

Deposits for 2005

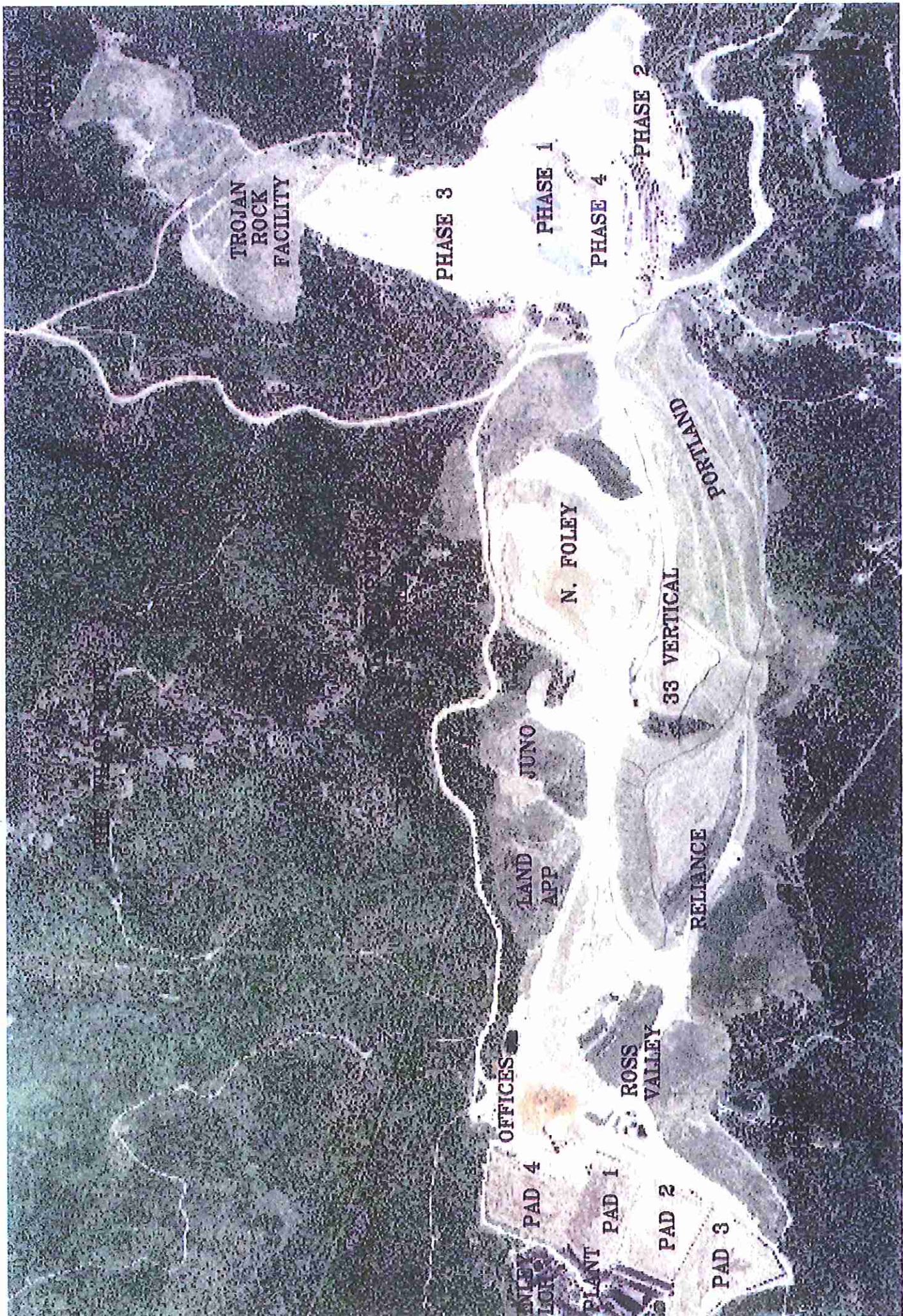
WHARF AREAS

1. Warbonnet Topsoil
2. North Foley
3. Juno
4. Land Application
5. Plant Pad
6. Ross Valley
7. Lower Reliance
8. Upper Reliance
9. 33 Vertical
10. Portland
11. A Frame
12. TRF
13. False Bottom Creek
14. Deadwood Creek
15. Cleopatra Creek
16. Main Road
17. Richmond Hill Road

AREA	WEEDS	TREES/SHRUBS	APP. METHOD	COMMENTS	
Warbonnet Topsoil	St. John's Wart, Tansy, C. Thistle, Mullen	None -- however to the SW by the old school there were new trees planted	Steep slopes, hose and reel and hand work.	This has been a problem area however this area has been totally changed.	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
North Foley	C Thistle, Tansy, Mullen	Established trees around the outside	ATV's and Hand	This area has changed in the past 2 years.	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Juno	C. Thistle, Tansy, Mullen	Est. trees to the north and east	ATV's and hand	Some areas are difficult to access from the mine side. Access was attained from the outside rd.	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Land Application	Fairly clean	Up by the roads	Hand, ATV	This area needs attention towards the road and office.	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Plant Pad	C. Thistle, Tansy, Scotch Thistle, Mullen	None	Hand, ATV	Behind the pads and office area inside the fence	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water

					Liberate Surfactant @ 1 quart per 100 gallons water
A Frame	Scattered weeds	Established trees	ATV's	Maintained in the yard	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
TRF	C. Thistle, Tansy, Scotch Thistle, Mullen, Leafy Spurge	Established trees around the outside and some within the area	ATV's	Large area, weeds scattered throughout	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
False Bottom Creek	C. Thistle, Tansy, Scotch Thistle, Mullen, Leafy Spurge	Established trees around the outside and some within the area	ATV's	Large area, weeds scattered throughout	Aquatic 2-4D 2 qts
Deadwood Creek	Fairly clean				Aquatic 2-4D 2 qts
Cleopatra Creek	C. Thistle, Tansy, Scotch Thistle, Mullen, Leafy Spurge	Established trees	ATV's and Hand	Large area, weeds scattered throughout, steep slopes and riparian area	Aquatic 2-4D 2 qts
Main Road	C. Thistle, Tansy, Scotch Thistle, Mullen, Leafy Spurge		ATV's	weeds scattered throughout roadside	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Richmond Hill Rd	C. Thistle, Tansy, Scotch Thistle, Mullen, Leafy Spurge		ATV's	Large area, weeds scattered throughout	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water

Ross Valley	C. Thistle, Tansy, St. John's Wart, Mullen	Small trees in designated areas	Hand, limited ATV	Thick by the roads, large rocks, steep and terraced. Ross Springs area is heavily infested	Aquatic 2-4D 2 qts around ponds and Annie creek drainage Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Lower Reliance	Hounds Tongue, Mullen, C. Thistle	Small trees in designated areas	Hand, limited ATV	Thick by the roads, large rocks, steep and terraced Annie Creek needs to be rechecked	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Upper Reliance	Hounds Tongue, Mullen, C. Thistle	Small trees in designated areas	Hand, limited ATV	Thick by the roads, large rocks, steep and terraced Access is hard.	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
33 Vertical	Hounds Tongue, Mullen, C. Thistle	Some trees and shrubs	Hand, limited ATV along roads	East side heavily infected	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces Liberate Surfactant @ 1 quart per 100 gallons water
Portland	C Thistle, Mullen	Established trees outside fence	ATV's on outside	Not much spray activity	Milestone Herbicide @ 7 ounces Escort XP Herbicide @ 1.5 ounces



10:43 AM

04/26/11

Accrual Basis

Mid Dakota Vegetation Management

Find Report

All Transactions

Date	Name	Memo	Acco...	Amount	Balance
2010	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 10,916.70	- 10,916.70
2009	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 16,360.84	- 27,277.54
2008	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 38,901.27	- 66,178.81
2007	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 36,393.92	-102,572.73
2006	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 20,138.56	-122,711.29
2005	Taxable non-gov't Golden Rewards Mining Co. LP	Deposit	Sales	- 32,768.58	-155,479.87
Total				-155,479.87	-155,479.87

Deposits for 2010

Deposits for 2009

Deposits for 2008

Deposits for 2007

Deposits for 2006

Deposits for 2005



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VEGETATION MANAGEMENT PRODUCTS / VEGETATION MANAGEMENT CONSULTING

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April 25, 2011

Mid Dakota Vegetation Management
Attn: Andy Canham
Miller, SD

SUBJECT: WARF/GOLDEN REWARD MINE SPRAYING

Andy,

Here are my recommendations for the sites and weeds at Warf/Golden Reward mine.

Streamline Herbicide @ 6 ounces per acre
Liberate Surfactant @ 1 quart per 100 gallons

This would work on all listed weeds on all sites, has no haying and grazing labeling as of yet but they should have no livestock running around the mine.

Costs per acre = \$35.25 per acre on the Streamline
 = \$1.00 per 15 gal. Load for Liberate

Approximate total costs per acre = \$36.25 per acre on the low to \$40.25 per acre on the high.

You would need this program for sure on the Leafy Spurge sites as Streamline will do a better job on the Leafy Spurge then other products.

If you want you could use this program on all sites that do not have Leafy Spurge on them.

Milestone Herbicide @ 7 ounces
Escort XP Herbicide @ 1.5 ounces
Liberate Surfactant @ 1 quart per 100 gallons water

Costs per acre = \$16.50 per acre for Milestone
 = \$13.50 per acre for Escort XP
 = \$1.00 per 15 gal. Load for Liberate

Approximate total costs per acre = \$31.00 per acre on the low to \$36.00 per acre on the high
"BUT" you will have to go back and do the Leafy Spurge later or use something added into the mix to get the Leafy Spurge as this mix will not get the Leafy Spurge.

If you have any questions please contact me at any of the above numbers.

Sincerely,

William "Bill" Walker
Territory Manager
CPS / Timberland Division
SD, ND, NE, IA

STATE NOXIOUS WEEDS[Leafy spurge](#) (*Euphorbia esula*)[SD Distribution map](#)[Canada thistle](#) (*Cirsium arvense*)[SD Distribution map](#)[Perennial sow thistle](#) (*Sonchus arvensis*)[SD Distribution map](#)[Hoary cress](#) (*Cardaria draba*)[SD Distribution map](#)[Russian knapweed](#) (*Centaurea repens*)[SD Distribution map](#)[Purple loosestrife](#) (*Lythrum salicaria*)[SD Distribution map](#)[Salt Cedar](#) (*Tamarix aphylla*, *T. chinensis*, *T. gallica*, *T. parviflora* and *T. ramosissima*) [SD Distribution map](#)**STATE DECLARED PESTS**Gypsy moth (*Lymantria dispar*)**LOCAL NOXIOUS WEEDS**Bull thistle (*Cirsium vulgare*)[SD Distribution map](#)Absinth wormwood (*Artemisia absinthium*)[SD Distribution map](#)[Musk thistle](#) (*Carduus nutans*)[SD Distribution map](#)Plumeless thistle (*Carduus acanthoides*)[SD Distribution map](#)Puncturevine (*Tribulus terrestris*)[SD Distribution map](#)Scotch thistle (*Onopordum acanthium*)[SD Distribution map](#)St. Johnswort (*Hypericum perforatum*)[SD Distribution map](#)Spotted knapweed (*Centaurea maculosa*)[SD Distribution map](#)Chicory (*Cichorium intybus*)[SD Distribution map](#)Common Burdock (*Arctium minus*)[SD Distribution map](#)Common mullein (*Verbascum thapsus*)[SD Distribution map](#)Common tansy (*Tanacetum vulgare*)[SD Distribution map](#)Poison Hemlock (*Conium maculatum*)[SD Distribution map](#)Dalmatian toadflax (*Linaria dalmatica*)[SD Distribution Map](#)Yellow toadflax (*Linaria vulgaris*)[SD Distribution Map](#)Houndstongue (*Cynoglossum officinale*)[SD Distribution Map](#)Diffuse knapweed (*Centaurea diffusa*)[SD Distribution Map](#)Giant Knotweed (*Polygonum sachalinense*)[SD Distribution Map](#)**LOCAL DECLARED PESTS**Mountain pine beetle (*Dendroctonus ponderosae*)[⇒⇒Integrated Weed Management | Weed Bio-Control⇐⇐](#)[Return to Plant Protection Program](#)



FACT SHEET: CANADA THISTLE

Canada Thistle

Cirsium arvense (L.) Scop.

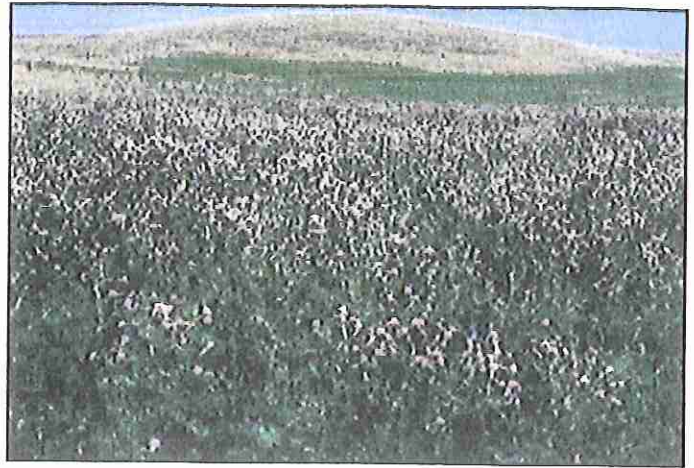
Sunflower family (Asteraceae)

NATIVE RANGE

Temperate regions of Eurasia

DESCRIPTION

Canada thistle is an herbaceous perennial with erect stems 1½-4 feet tall, prickly leaves and an extensive creeping rootstock. Stems are branched, often slightly hairy, and ridged. Leaves are lance-shaped, irregularly lobed with spiny, toothed margins and are borne singly and alternately along the stem. Rose-purple, lavender, or sometimes white flower heads appear from June through October, generally, and occur in rounded, umbrella-shaped clusters.

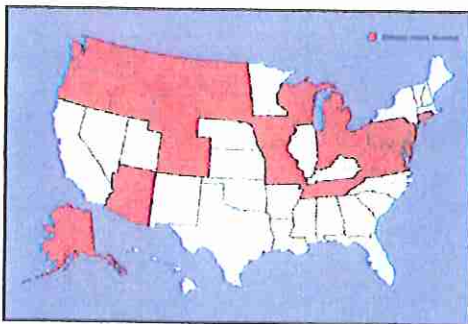


The small, dry, single-seeded fruits of Canada thistle, called achenes, are 1-1½ inches long and have a feathery structure attached to the seed base. Many native species of thistle occur in the U.S., some of which are rare. Because of the possibility of confusion with native species, Canada thistle should be accurately identified before any control is attempted.

ECOLOGICAL THREAT

Natural communities that are threatened by Canada thistle include non-forested plant communities such as prairies, barrens, savannas, glades, sand dunes, fields and meadows that have been impacted by disturbance. As it establishes itself in an area, Canada thistle crowds out and replaces native plants, changes the structure and species composition of natural plant communities and reduces plant and animal diversity. This highly invasive thistle prevents the coexistence of other plant species through shading, competition for soil resources and possibly through the release of chemical toxins poisonous to other plants.

Canada thistle is declared a "noxious weed" throughout the U.S. and has long been recognized as a major agricultural pest, costing tens of millions of dollars in direct crop losses annually and additional millions costs for control. Only recently have the harmful impacts of Canada thistle to native species and natural ecosystems received notable attention.



DISTRIBUTION IN THE UNITED STATES

Canada thistle is distributed throughout the northern U.S., from northern California to Maine and southward to Virginia. It is also found in Canada, for which it was named. Canada thistle has been identified as a management problem on many national parks and on preserves of The Nature Conservancy in the upper Midwest, Plains states, and the Pacific northwest.

HABITAT IN THE UNITED STATES

Canada thistle grows in barrens, glades, meadows, prairies, fields, pastures, and waste places. It does best in disturbed upland areas but also invades wet areas with fluctuating water levels such as streambank sedge meadows and

wet prairies.

BACKGROUND


Canada thistle was introduced to the United States, probably by accident, in the early 1600s and, by 1954, had been declared a noxious weed in forty three states. In Canada and the U.S., it is considered one of the most tenacious and economically important agricultural weeds, but only in recent years has it been recognized as a problem in natural areas.


Hounds-tongue *Cynoglossum officinale* L.

Family: [Boraginaceae](#), Borage
Genus: [Cynoglossum](#)


Description

General: coarse, single-stemmed biennial, 30-120 cm tall, leafy to the top, softly long-hairy throughout, from taproots.

 **Leaves:** forming a large basal rosette in the 1st year. In the 2nd year alternate, the lowermost ones oblanceolate or narrowly elliptic, tapering to the stalk, 10-30 cm long overall and 2-5 cm wide, the others stalkless and more oblong or lanceolate, numerous, only gradually reduced upward.

 **Flowers:** many on several long, 1-sided branches from the upper leaf axils. Mature flower stalks curved-spreading. Sepals broad, blunt-tipped, 5-8 mm long in fruit. Corolla dull reddish-purple, broadly bell-shaped, the limb about 1 cm wide or a little less, the fornicies protruding, broadly rounded. The anthers seated about at the corolla throat.

Flowering time: May-July.

 **Fruits:** 4 nutlets, 5-7 mm long, ovate, descending-spreading, forming a broad low-pyramidal fruit, remaining attached to the style above even after drying, covered with short, barbed prickles.

Distribution

A weed in disturbed sites, especially along roadsides, in most parts of MT. Native of Europe, now well established in N. America.



Medicinal plant: see below.



(click on image for full size)

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[Scientific Names Index](#)

[Family Index](#)





Common tansy (*Tanacetum vulgare*)



Description:

Appearance: Perennial herbaceous plant, 3' tall, up to 5' in shaded areas, and erect. A single stem branches extensively toward the top into short stems forming a flat-topped cluster of numerous button-like flower heads; plants have medicinal properties.

Leaves: Alternate, pinnately compound (leaflets arranged on both sides of a common stalk), irregularly lobed. Leaves become smaller towards the top of the stalk, and are strongly aromatic when crushed.

Flowers: Bright yellow daisy-like discs up to 0.5" wide, lacking rays, blooming from July through October.

Seeds: Numerous tufted seed dispersed by wind and water.

Roots: Spreads vegetatively forming new plants from even small root fragments.

Ecological Threat:

- Common tansy is wide spread across most northern United States and Canadian provinces.
- It is still cultivated in gardens and is common along roadsides and abandoned farmyards in northern Minnesota and along the north shore of Lake Superior. South sloping open areas are most vulnerable.
- It was introduced to the United States from Europe for medicinal and horticultural purposes.
- Common tansy is on the MDA **Secondary noxious weeds** list in Minnesota.

Control Methods:

Grazing

Tansy is distasteful and even toxic to some grazing animals, however, one source claims that sheep graze it and are not affected

Chemical

Spot-spraying with selective broadleaf herbicide such as clopyralid,

Description

Spotted knapweed generally is a short-lived perennial, reproducing solely by seeds. Seeds are brownish, less than 1/4 inch long, notched on one side of the base, with a short tuft of bristles at the tip. The seeds may germinate from spring through early fall. Seedlings emerging in the fall often overwinter as a rosette of leaves, resuming growth again in the spring (Figure 1). The plant grows 2 to 4 feet tall and bears alternate, pale green leaves which are 1 to 3 inches long. Leaf margins of the lower leaves are divided and smooth while the surface of the leaf is rough. The upper leaves are linear in shape. Stems are erect and rough, with slender branches. Numerous flowers are produced from early July through August. Flowers are pink to light purple and are borne on tips of terminal or axillary stems (Figure 2). The flower petals are surrounded by stiff, black-tipped bracts, giving the flower head a spotted appearance (Figure 3). Spotted knapweed can be distinguished most easily from Russian knapweed (a long-lived perennial of the same genus) on the basis of floral characteristics. Russian knapweed flowers are smaller than those of spotted knapweed and do not have black mottling on the flower bracts.



Figure 1. Spotted knapweed -- Rosette.



Figure 2. Spotted knapweed flower.



Figure 3. Spotted knapweed -- Flowering plant, notice black-tipped flower bracts.

Musk thistle (*Carduus nutans*)



Roots: Fleshy taproot.

Stems: Erect, 2-4 feet tall, spiny winged, highly branched.

Leaves: Alternate, serrated, no hairs, spiny.

Seed: Tufted, spread by wind, the only means of reproduction.

Flowers: Rose purple or may be white, 2 inches wide or wider, tend to lean over or nod, solitary on stem.

Origin: Eurasia.

Poisoning: None.

⇒⇒[Musk thistle bio-control](#)⇐⇐

[Return to Plant Protection Program](#)



FACT SHEET: COMMON MULLEIN

Common Mullein

Verbascum thapsus L.

Figwort family (Scrophulariaceae)

NATIVE RANGE

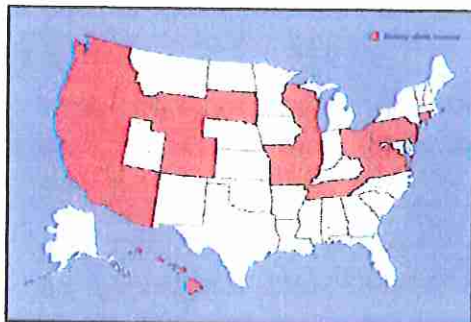
Europe and Asia

DESCRIPTION

Common mullein, also known as woolly mullein, is an erect herb. First year mullein plants are low-growing rosettes of bluish gray-green, feltlike leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.

ECOLOGICAL THREAT

Common mullein threatens natural meadows and forest openings, where it adapts easily to a wide variety of site conditions. Once established, it grows more vigorously than many native herbs and shrubs, and its growth can overtake a site in fairly short order. Common mullein is a prolific seeder and its seeds last a very long time in the soil. An established population of common mullein can be extremely difficult to eradicate.



DISTRIBUTION IN THE UNITED STATES

Common mullein was first introduced into the U.S. in the mid-1700's, where it was used as a piscicide, or fish poison, in Virginia. It quickly spread throughout the U.S. and is well established throughout the eastern states. Records show that it was first described in Michigan in 1839 and on the Pacific coast in 1876, probably due to multiple introductions as a medicinal herb.

HABITAT IN THE UNITED STATES

Common mullein can be found where mean annual precipitation is greater than 3-6 inches and the growing season lasts for a minimum of 140 days. Intolerant of shade, mullein will grow in almost any open area including natural meadows

and forest openings as well as neglected pastures, road cuts, industrial areas. Common mullein prefers, but is not limited to, dry sandy soils.

BACKGROUND

Common mullein is a monocarpic perennial (i.e., takes two or more years to flower and die). Brought over from Europe by settlers, it was used as a medicinal herb, as a remedy for coughs and diarrhea and a respiratory stimulant for the lungs when smoked. A methanol extract from common mullein has been used as an insecticide for mosquito larvae.

BIOLOGY & SPREAD

During the first summer after germination mullein produces a tap root and a rosette of leaves. During this vegetative stage, the rosette increases in size during the growing season until low temperatures arrest growth sometime during the autumn and winter. Beginning the next spring, second year plants bolt into maturity, flower, produce seed during the summer, and then die, completing the plant's normal life cycle. Flowers mature from the base to the tip of the stalk. The length of the flowering period is a function of stalk height; longer stalks can continue to flower into early October. It is

Dalmatian Toadflax

Yellow Toadflax

by **Rich Hansen**, USDA-APHIS-PPQ, Forestry Sciences Lab, Montana State University, Bozeman, MT 59717-0278.

Dalmatian toadflax, *Linaria dalmatica* (L.) Mill. (Scrophulariaceae), is a plant native from central Europe east to central Asia. Dalmatian toadflax was originally introduced into North America as an ornamental plant, beginning in the late 1800's. By the 1920's, *L. dalmatica* populations had escaped from cultivation and become weedy; presently, Dalmatian toadflax is found in at least 22 US states and seven Canadian provinces, but it is most widely distributed in the western US and Canada.



Dalmatian toadflax plant.
R.Hansen, USDA-APHIS



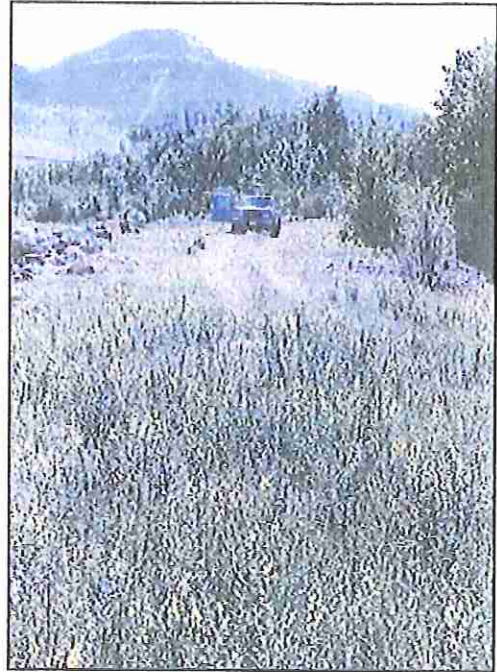
Dalmatian toadflax plant.
R.Hansen, USDA-APHIS

Linaria dalmatica is a short-lived perennial with a taproot that may extend 1 m or more into the soil. Most aboveground growth dies back in the fall, with the exception of short, prostrate stems that persist through the winter. In spring, erect shoots begin growth from root buds, reaching a height of 0.4 to 1.0 m; a single plant may produce 10 or more stems.

Flowers are bright yellow with orange markings and elongate spurs and occur in simple racemes on the stems. Flowering occurs from mid-summer to early fall. Flowers are pollinated by insects producing capsules containing 100-200 seeds. A single plant may produce several hundred thousand seeds. Dalmatian toadflax also reproduces vegetatively, from adventitious buds originating on horizontal roots.

Dalmatian toadflax is typically found along roadsides or railroads and in idle cropland, pastures, and rangelands, usually on comparatively dry sites with coarse, well-drained soils. Because seedlings are relatively poor competitors for soil moisture, establishment is favored by soil disturbances, such as road construction, or by overgrazing. Once established, however, Dalmatian toadflax may become an effective competitor, reducing the abundance of grasses and other forbs. In addition, Dalmatian toadflax contains alkaloids that may be

deleterious to grazing mammals, though livestock and wildlife species rarely consume the weed. Thus, the primary economic impact of *L. dalmatica* lies in reduced livestock production on infested pastures and rangeland.



**Dalmatian toadflax infestation in Wyoming.
W.Hartung, NRCS**

Yellow Toadflax, *Linaria vulgaris*

Yellow toadflax, sometimes called common toadflax and butter and eggs, resembles the snapdragon in appearance and is a member of the Figwort family. It was introduced from Europe as an ornamental and has now become a serious problem to rangeland and mountain meadows. It is a perennial reproducing from seed, as well as from underground root stalks. The stems of yellow toadflax are from 8 inches to 2 feet tall and leafy. Leaves are pale green, alternate, narrow, and pointed at both ends. The flowers are bright yellow with deep orange centers. These flowers are about an inch long and blossom in dense clusters along the stem as it lengthens and grows. The fruit is round, about 1/4 inch in diameter, brown, and contains many seeds.

Yellow toadflax emerges in April and May in most parts of Colorado. It is adapted to a variety of site conditions, from moist to dry and does well in all types of soils. Its displacement of desirable grasses not only reduces ecological diversity, it also reduces rangeland value and can lead to erosion problems. Because of its early vigorous growth, extensive underground root system, and effective seed dispersal methods, yellow toadflax is difficult to control.

[Management Strategies](#) | [List of Troublesome Weeds](#) | [Back to Weed District](#)

Leafy Spurge (*Euphorbia esula*)



Roots: Numerous pink buds, deep, reddish-brown, spreading, large nutrient reserves.

Stems: Erect, smooth, branched at the top, normally 1-2 feet tall.

Leaves: Alternate, narrow, length 1 to 4 inches

Seed: Born in exploding capsules that can expel seed to 15 feet, longevity 5 to 8 years.

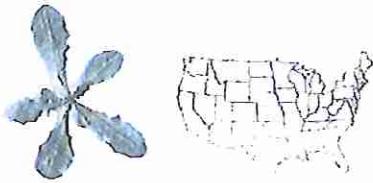
Flowers: yellowish-green to yellowish-orange surrounded by yellow-green bracts.

Origin: Eurasia, thought to have entered the USA as a crop seed contaminant.

Poisoning: Milky latex sap throughout the plant may cause dermatitis on human skin. Toxic to cattle, sheep and goats do not seem to be affected.

⇒⇒ [Leafy spurge bio-control](#) ⇐⇐

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[WILDSEED FARMS.](#)

Chicory

Cichorium intybus (Asteraceae)

A slender perennial, easily established from seed, producing a deep taproot. A native of Europe, it has escaped from cultivation and naturalized throughout North America. The plant contains a white, milky sap that appears if the stem is broken. Flowers are blue, remaining on the plant for only a single day. Prefers full sun in well-drained soils.

Average planting success with this species: 80%

Height: 2-4 feet

Germination: 7-21 days

Optimum soil temperature for germination: 65-75F

Sowing depth: 1/16"

Blooming period: May-October

Average seeds per pound: 426,000

Seeding rate: 5 lbs. per acre

Suggested use: Herb gardens, isolated areas.

Miscellaneous: When World War II disrupted shipping, most U.S. "coffee" was produced from chicory. Caffeine-free, it is regaining popularity.