APPENDIX D

DETERMINATION OF REVEGETATON SUCCESS AND RETRIEVAL OF FINANCIAL ASSURANCE

When preparing a mine reclamation plan the operator must identify methods that will be used to verify that reclamation and revegetation of the site is complete. These revegetation success criteria will provide a reference point to evaluate the success of the reclamation in an objective manner. Success criteria are necessary so it will be clear to both the operator and the regulatory authority when the end point of the reclamation period has been reached. **The success criteria information provided below are recommendations only and may not be appropriate for every mine reclamation plan.** These examples simply form a basis for discussion. The post-mining land use and unique site conditions will dictate the appropriate success criteria for your reclamation project. Likewise, the absence of any possible success criterion in this appendix implies nothing about the usefulness of that criterion.

The following table represents an example of some possible success criteria that could be used to evaluate the success of revegetation at a reclaimed site.

Post-mining Land Use and Success Criteria Table

Post-mining Land Use	**Seed Mix From Appendix C**	**Stage/Phase**	**Success Criteria**	**Years to Show Success**
Wildlife	#1 and/or #3	1, 3, 4, 5, 6	% cover, diversity, biomass (yield)*	3
Pasture	alfalfa, fescue, clover, etc.	2	% cover, biomass (yield) with a minimum 90% of comparable site*	1
Pond margins or wetlands	#4	final reclamation	% cover, diversity	2

* Based on consultation with local Land Conservation and/or UW-Extension office or other appropriate sources of yield (productivity) information considering the soil type, seasonal variables or similar local sites under the same seasonal conditions.

Upon completion of reclamation activities, whether this includes a portion of the site or the entire mining site, the regulatory authority will inspect the site in order to verify if reclamation was

successful. The criteria for this determination of success are linked to the approved post-mining land use. These criteria are contained within the approved reclamation plan. As a means to integrate the costs of revegetation into the financial assurance, as well as general specifics, please refer to Appendix F.

It is important to understand the relationship of the approved reclamation plan to the financial assurance requirement. Financial assurance is intended to guarantee that the reclamation plan is faithfully executed. Care should be taken to ensure that realistic, effective and objective criteria (success standards pursuant to s. NR 135.13) are documented in the reclamation plan as required according to s. NR 135.19 (4)(g).

Criteria for Measuring the Success of Revegetation

The criteria for assessing when reclamation is complete, and therefore when the financial assurance may be released, shall be specified in the reclamation plan per s. NR 135.13. Possible methods that could be used to determine if compliance with the revegetation success standards are met are listed in ss. NR 135.13(2) through (5)

There are several different techniques that can be used to evaluate the success of revegetation and thus reclamation:

- Compare the recently revegetated area to some reference area that represents an older, stabilized reclaimed site or an undisturbed area nearby that contains vegetation representative of the site's final goal (e.g. native prairie or oak savanna).

- Collect baseline data on the vegetative cover (i.e. density, diversity, percent cover) that exists prior to mining and compare it to the reclaimed, revegetated areas.

- Compare the density, diversity and percent cover of the reclaimed area to an approved alternate technical standard contained in an accepted reference publication (i.e. from the local Land Conservation or UW-Extension office).

Since a primary objective of this work is to stabilize the site, it is important to provide a high degree of vegetative cover, as quickly as possible. This will result in greater protection of the soil from the effects of raindrop impacts, which will be absorbed by the vegetative "canopy". This protection translates into reduced erosion and sedimentation.

The criteria that may be used to evaluate the success of revegetation may include percent cover, biomass and/or diversity. Among these, percent cover and biomass are generally the most widely used parameters since they are easier to measure and compare with existing data or established criteria. In addition, survivorship or another analysis of community development may be used as appropriate.

Percent Cover

Percent cover is determined by estimating the percentage of an area covered by vegetation. Cover may be thought of as the percentage of an area that is covered, shaded or intercepted by vegetation. Percent cover is used as a revegetation success standard because it is easy to measure and a useful

predictor of site stability. A typical standard for percent cover should be 70 percent cover (primarily leaf and stem area) averaged over the site at 90 percent statistical confidence level. Count may be physical and photodocumentation (that includes the quadrat) is advised. The measurement of cover should be timed to correspond with the period of peak vegetative growth, generally in August.

A prescribed number of quadrats, typically a 1.0 meter square (roughly equal to a square yard), can be used to represent the vegetative cover of the entire site. The necessary number of quadrats is based upon total acreage but in no case will be less than five and is performed for each type of land use. This number is dependent upon the size and complexity of the site and the post-mining land use.

Biomass

Biomass can also be thought of as productivity in a given area and is fairly equivalent to how agricultural "yield" is measured (i.e. bushels or tons per acre). Biomass gives a good indication of the productivity of the reclaimed site, and thus is useful in comparing to pre-mining productivity or to a local expectation (based on established records) or a technical standard. Plant material is collected, dried and weighed. Success may be determined by comparing the biomass data at the time the notice of completion to the time when the site is being evaluated for the certificate of completion. If the post-mining land use involves a forest or a wetland it may not be practical to use this criterion.

Diversity

Diversity is important in establishing long-term stability in the plant community. It also helps to ensure that the plant community is not susceptible to being taken over by weeds during times of stress. Such stability is especially important in withstanding stress such as climatically unfavorable or extreme years, disease, pest infestation, disturbance from grazing, wildlife utilization, insect infestation, fire, drought or windfall. The method of measuring diversity should be included in the reclamation plan and based upon appropriate scientific methodology.

Survivorship

This may be an important parameter to quantify for forest type plantings.

Other

If wetland restoration is selected it may be necessary to use evaluation measures such as frequency of occurrence by species, species similarity of the standing crop to initial planting, density and percent cover along transects.