Nonmetallic Mining Newsletter

Spring 2009 (PUB WA 1340 2009)

In this issue:

I. Status and success of statewide NR 135 reclamation program

Prior to the establishment of the statewide ch. NR 135, Wis. Adm. Code, nonmetallic mining reclamation program, reclamation of nonmetallic mines in Wisconsin was very uncertain. When it did occur it was either because it was required through zoning permits or done on a voluntary basis. Many jurisdictions had no zoning and when zoning did require reclamation, the requirements varied widely. Because of this, there was no way for citizens and operators to count on a "level playing field" of fair, consistent and known expectations. In addition, some mines were still being closed and abandoned without any reclamation, contributing to the legacy of safety hazards, environmental risks and aesthetic scars on the landscape.

Fortunately, those days are over. Since NR 135 took full effect in 2001, all Wisconsin's counties that were required to have enacted reclamation ordinances and are administering reclamation programs. A number of municipalities (cities, villages and towns) have also opted to enact reclamation ordinances.

Perhaps the most important indications of program success are that mines are no longer abandoned without reclamation; both citizens and mine operators benefit from the known set of expectations regarding reclamation; and, above all, the desired outcome of establishing a level playing field has largely been achieved. More quantitative information on NR 135 program status and reclamation is included later in this newsletter.

The dynamic role of the DNR

Initially, the Department of Natural Resources (DNR)'s role was to draft the reclamation rules and facilitate the establishment of county and local reclamation programs. Once NR 135 reclamation programs were in place, the DNR began conducting program review audits and providing more specific technical support. The DNR's role has changed over time, commensurate with the experience and efficacy of these programs. Today, much of our efforts are in response to specific county or local regulatory authority (RA) needs.

Going forward, we anticipate increased use of online resources to support RAs and address their training needs. As the NR 135 program evolves, we will continue to work with partners such as the Nonmetallic Mining Advisory Council (NMAC) and strive to provide the program support that the public, RAs and fee-paying operators expect.

New program contact information

The times are changing, and we are too! During the early days of the program implementation, we needed more intensive regional representation to ensure that RAs had the support they needed to develop viable NR 135 mine reclamation programs. Now that those programs are in place, we will be transitioning to a more centralized point of contact for routine program questions and audits.

To that end, please note that the statewide program contact will now be **Tom Portle**. Tom can be reached at (608) 267-0877 or Thomas.Portle@wisconsin.gov.

Be assured that regional staff will continue to be involved in the program, although in a more reduced role. If you are currently working with a regional contact on a project or issue related to nonmetallic mining, continue working with that individual. However, for future questions, technical assistance or other program needs Tom should be your first point of contact.

When Tom is out of the office, feel free to contact Phil Fauble at (608) 267-3538 or the general Waste and Materials Management Program number at (608) 266-2111.

By the numbers

91	RAs with a reclamation ordinance
88	Total RAs with ordinance and active programs
County	
71	Number of county RAs with a reclamation ordinance
1	Number of counties exempt by law
1	Number of county RAs with ordinance but no mining activity
61	Number of county RAs administering program
9	Number of county RAs administered by an agent
70	Active county RAs
Local	
15	Number of active self-administered local RAs (city, village and town)
3	Number of inactive local RAs
3	Number of active local RAs administered by an agent
18	Active local RAs

II. Permit, acreage and reclamation trends

A more quantitative way to gauge success, within limits, is to compile existing information obtained from RAs in their annual reports. Careful use of such information allows for the identification of trends in reclamation across the state.

It is important not to make sweeping generalizations based on this information, since these data are somewhat limited. Several factors affect how and to what extent it can be used to demonstrate the success or effectiveness of the NR 135 program, or to identify significant trends in reclamation. For example, hard rock quarries have often been around for decades, and their final reclamation may not be scheduled for decades in the future. By contrast, aggregate operations can increase or decrease in acreage in any given year, and they often have mine lives of only a few months to a year.

Currently, there are approximately 2,507 permitted nonmetallic mines operating in Wisconsin. Counties issue reclamation permits for the vast majority of nonmetallic mines. Of the current 2,507 reclamation permits, 2,471 are from the 70 county NR 135 programs, with the remaining 36 mines issued by the 18 city, village and town NR 135 programs.

In the 2007 reporting year, the most recent year for which data are available, about 35,000 acres were actively being mined. About 1,260 acres had been certified by RAs as reclaimed through 2007. Approximately 70 new nonmetallic mines were permitted in 2007. RAs approved 1,236 new acres to be mined and reported 569 acres reclaimed, giving a ratio of approximately 2.2 new acres brought into production for each acre reclaimed.

One important observation is that the number of nonmetallic mines in Wisconsin tends to be relatively constant. This is despite fluctuations in the level of development, the number of housing starts, the level and proximity of transportation projects, and other factors.

Based on data from 30 major counties, it appears that there were more or about the same number of permits (mines) in 2007 as in 2003. The acreage being mined in each county in 2007 either decreased or stayed about the same as in 2003.

This seems to indicate that, in general, mines were more likely to be slightly smaller with less unreclaimed acreage. If this is true on a statewide basis, it appears as though current practice is consistent with the legislative intent of promoting reclamation and reducing the total number of acres subject to erosion, while maintaining a viable nonmetallic mining industry in the state.

III. Innovative approaches to reclamation

Reclamation of nonmetallic mines in Wisconsin can be difficult where there is a deficiency of topsoil. The deficiency occurs in cases where the original topsoil was sold, simply lost through mismanagement or was minimal to begin with. This most often seems to be the case on pre-law nonmetallic mine sites. NR 135 acknowledges this problem and provides an option of using substitute topsoil as a way to address this common challenge.

While past issues have addressed substitute topsoil (see March 2003 and December 2003), and the fall 2008 newsletter addressed the potential use of materials—including foundry sand—for fill material, this article moves into new territory.

First, there is a report on reclamation results using a blend of foundry sand and paper mill residuals (PMR) at the Amon Pit in Manitowoc County.

Next, we provide further information on reclamation success using foundry sand as waste fill at the Foley Pit in Waupaca County.

Finally, we introduce a project in Polk County that evaluates revegetation results using biosolids (municipal wastewater sludge) and compost compared with borrowed topsoil.

Paper mill residuals and foundry sand for the stabilization of nonmetallic mine sites

By Richard Wolkowski, Senior Scientist,
UW–Madison Department of Soil Science

Ch. NR 135, Wis. Adm. Code, was created to establish uniform standard for reclamation of nonmetallic mine sites. The major goals of reclamation include site stabilization, erosion prevention and the achievement of a productive post-mining land use. These objectives are often reached through the establishment of permanent vegetative ground cover. Unfortunately, many mine sites lack sufficient amounts of quality topsoil to support the establishment of vegetation. Often, original soils have either been sold or were limited before mining due to the thin surface soil common on many glacial soils of eastern Wisconsin. Paper mill residuals (PMR) represent one of the largest, if not the largest, sources of organic residual material in Wisconsin. Historically, PMR have been used in agricultural land spreading programs and have proven beneficial for low organic matter sandy soils. Currently, much of this material is landfilled for economic reasons and because few alternative uses exist. Another waste material found in eastern Wisconsin is foundry sand. This material is typically used for highway and commercial construction projects under the DNR's NR 538 beneficial use program, but also has potential as a mineral base for an artificial soil. The combination of these waste streams could keep some of the material out of landfills while simultaneously addressing the lack of suitable soil for mine reclamation.

The objective of the study was to determine the feasibility of blending PMR with foundry sand to generate a topsoil substitute material for use in mine reclamation and to facilitate the establishment of vegetative cover capable of both stabilizing the site and supporting the intended post mining land use.

Table 1. Dry matter content, ground cover, and selected soil test parameters for the paper mill residual/foundry sand artificial soil study, Kiel, Wis., 2006 – 2007.

				Soil test (0 – 3 in)				
Treatment	Straw Mat	Dry Matter	Ground Cover	pH	P	K	Organic Matter	Soluble Salts
		t DM/a	%		---- ppm ----		%	dS/M x 100
27 June 2006								
Fall-2005	No	0.75	68	7.9	12	70	3.3	65
Fall-2005	Yes	0.99	68	7.8	9	70	3.8	67
Spr.-2006	No	0.15	30	7.9	12	81	3.3	77
Bare Soil	No	1.28	85	7.8	20	76	2.8	7
Bare Soil	Yes	0.74	95	na				
26 June 2007								
Fall-2005	No	1.01	69	7.7	19	60	3.0	51
Fall-2005	Yes	1.39	74	7.8	19	80	3.1	41
Spr.-2006	No	0.89	80	7.7	15	67	3.0	41
Bare Soil	No	1.02	75	na				
Bare Soil	Yes	0.96	78					

Note: Dry matter measurements collected by clipping forage from replicate 2.5 x 2.5 ft areas. Ground cover assessed independently by three evaluators, soil test from cores collected from 0 – 3 in. depth.

Kiel site prior to primary grading of gravel pit slope, August 2005.

Kiel site following primary grading and distribution of PMR-foundry sand mix, October 2005.

A replicated research/demonstration project was conducted from 2005–2007 at the Amon Pit, a pre-law gravel pit located about six miles north of Kiel, Wis. An area along 180 feet of a steep, gravely slope was graded to a 3:1 slope prior to treatment. The PMR and foundry sand were mixed on-site in a 70:30 volumetric ratio (foundry sand:PMR) and were graded over the study area at a 12-inch depth with a bulldozer in fall 2005. The site was then seeded to a mixture of forage crops, including timothy, brome grass, and alfalfa with and without rolled straw mulch; or was seeded without mulch the following spring. Each treatment was replicated three times. Measurements were also taken from a graded, but untreated adjacent area for comparison.

The following measurements were taken: ground cover and dry matter production of the vegetative stand, mineral nutrient content of the harvested biomass, bulk density and water content of the PMR and foundry sand mixture, and soil testing of the mixture at several locations along the slope. Table 1 shows a summary of selected data.

These results show the effect of seeding time and the use of rolled straw mats to reduce erosion. The bare soil area was also seeded in fall 2005. Only minimal differences were noted in the study and the use of straw mats did not appear to be beneficial for growth or erosion control. Forage production and ground cover was very good in June 2006 and only slightly increased by June 2007. While the dry matter production was higher in the bare soil, much of this growth was from annual weeds. Soil samples were extremely difficult to collect from the bare soil area because of stoniness and were not taken in 2007.

One of the more interesting findings of the study was the relatively high soluble salt content of the topsoil substitute material, which is interpreted to be in the moderate range. Values as high as 185 were found in the top 9 inches of the mixture. The foundry sand likely contributed the salts. The high salt content initially observed in the topsoil substitute material was likely responsible for the stress and some mortality in forage crops that was noted during a dry period in July 2006, although it is unknown if that effect would have been observed

Kiel site, June 2007.

Kiel site, forage sampling, June 2007.

during a period of more typical precipitation. The forage crops recovered from this effect later in the season and no symptoms of salt injury were observed in 2007.

The soil test values for the mix were similar to those found in native soils. Nutrient concentration of the forage indicates that the topsoil substitute material is capable of providing an adequate supply of essential plant nutrients. The plant availability of metallic micronutrients (e.g. Zinc, Copper, Iron and Manganese) was decreased because of the relatively high pH of the soil.

This project demonstrated that a mixture of PMR and foundry sand can successfully be used as a topsoil substitute material for establishing a grass/legume mix to reclaim the nonmetallic mine sites and achieve the intended post mining land use. Although, salt injury may initially occur, this effect may be less severe in a less droughty growing period, mitigated through dispersal by subsequent precipitation or managed by selection of more salt tolerant species. It is recommended that seeding is done with a standard agricultural grain drill, although broadcasting seed followed by light incorporation with a spike drag, as was done in this study, is acceptable. Seeding should be performed soon after topsoil substitute materials are placed to quickly establish cover and stabilize the site. Although there may be increased potential for adverse effects due to higher soil salinity levels in the first growing season this can be minimized by seeding when the probability for precipitation is high; i.e. spring or fall or by the selection of more salt tolerant species.

Foley Pit Waste Fill—Beneficial Use Project

Foundry sand was used as an unconfined geotechnical fill material in the reclamation of the Foley Pit. The foundry sand was from the ThyssenKrupps Waupaca Foundry, is an industrial byproduct classified as a Category 2 material under ch. NR 538, Wis. Adm. Code. The DNR granted an approval to allow its use in mine reclamation.

The use of foundry sand in the Foley Pit reclamation serves is an illustration of permitting considerations and coordination among agencies, the mine and the generator. Besides the DNR approval, the project received a permit from the East Central Wisconsin Regional Planning Commission (ECWRPC) for the amendment to the reclamation plan. ECWRPC

Successful reclamation at the Foley Pit. (DNR photo)

Foundry sand used as fill needed to achieve favorable post-mining contours during mine reclamation at the Foley Pit. (Photo by Tom Portle)

administers the NR 135 program on behalf of several local counties, including Waupaca County.

The foundry sand was placed at 3:1 horizontal to vertical slope. Next, 18 inches of native soil and 6 inches of topsoil were used to cover the material and extend to the top of the pit sidewalls. The topsoil was then seeded. The foundry sand proved to be a safe and cost-effective fill material when used in achieving approximate original contours (AOC).

Polk County Reclamation Test Plots

By Candy Anderson of Milestone Materials

Project Description

Milestone Materials has established reclamation test plots on an existing depleted gravel pit in Polk County to evaluate different soil amendments. The monitoring of the plots is a cooperative arrangement between Milestone Materials, the gravel pit operator, and Polk County Land and Water Resources Department. Milestone will maintain the plots.

Background

- Project began as an idea from Polk County Land and Water Resources Department.
- Milestone Materials initiated site activity in fall or 2007 by grading four test plot sites.

Biosolids from the Village of Turtle Lake applied at a test plot at a Polk County nonmetallic mine.

Polk County Compost test plot.

- Prairie seed mix, purchased from Polk County Land and Water Resources Department, was applied June 25, 2008, by the DNR.

Test Plot Details

1. Topsoil test plot—approximately 4 acres at 6”
2. Compost test plot—approximately 4 acres at 4”
3. Biosolids (municipal wastewater sludge) test plot—approximately 1 acre at 6”
4. No soil amendments (sand)—approximately 3 acres

Progress to date

- Topsoil and compost amendments applied to test plots in fall 2007
- Biosolids applied to test plot in spring 2007
- Plots sprayed June 24, 2008

IV. Updating financial assurance

RAs must periodically review financial assurance (FA). This ensures that the dollar amount continues to be adequate to perform all reclamation activities necessary to comply with the uniform statewide reclamation standards in NR 135, and with the county or local reclamation ordinance.

The FA dollar amount is based on the cost the RA would incur if required to hire a contractor to carry out the reclamation activities specified in the approved reclamation plan. The FA must be periodically re-evaluated, as required by s. NR 135.40(3), to ensure the dollar amount remains adequate to cover the outstanding reclamation costs.

Along with being a requirement, there are several reasons for a periodic review of FA. These include:

- acreage that has been opened to mining and reclaimed acreage can be quite dynamic;
- costs can likewise be dynamic (for example, consider the volatility in fuel costs, which typically account for a substantial percentage of total reclamation costs); and
- it is incumbent on the RA to ensure reclamation is neither a fiscal liability for taxpayers nor a health or environmental hazard.

Timing the review of FA

There is no standard or requirement for the frequency of FA reviews, and RAs have taken different approaches. For example, although there is a clear distinction between zoning and reclamation, in some jurisdictions the periodic renewal of the conditional use permits serves as a trigger to review the FA. Other likely review times include when an expansion of the site occurs, or when the RA certifies reclamation on some of a site’s acreage. Others perform re-evaluation on a regular basis, as dictated by permit issuance date, alphabetically or according to some other regular schedule.

FA evaluation resources available

The DNR has an online publication that may aid the re-evaluation of FA. The guide, PUBL-WA- 835 2002, can be found on the DNR Web site at http://dnr.wi.gov/topic/mines/documents/nonmetfinassure.pdf. This document includes links to sources for checking current costs associated with common earthwork and reclamation activities.

Upon request, the DNR can also provide a tool used to calculate approximate FA dollar amounts. The tool consists of a Microsoft Excel file that was designed to support the reclamation cost worksheets included in the above publication.