Using Native Grasses to Return Productivity to a Superfund Site in Richmond Township, Crawford County, PA

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Meadville, PA 16335
147-acre Superfund site, Richmond Twp., Crawford County, PA
Site History

- Activities of Frank Schiller and the Presque Isle Chemical Company between 1970-1993 contaminated the soil, surface water and groundwater with trichloroethylene and tetrachloroethylene, which was spread on the soil to evaporate volatile organic solvents; in addition, 350 drums of heavy metal sludge were stored in the woods out of sight.
- 1993-PA DEP began a prompt interim response to action.
- 2000-PA DEP completed remediation totaling $7,353,000.
- 2011-Ernst purchased at a tax sale.
- 2012-PA DEP notified Ernst that volatile organic compound samples they obtained and tested yielded below standard results.
- 2013-PA DEP and Ernst worked out a Consent Order & Agreement to produce native grasses on the site.
- Total cost of site with legal fees and reimbursement to PA DEP - $236,338.
Site Preparation

- Barn and two dilapidated residences razed; hazardous materials removed from site.
- Rusty cattle fence removed.
- Dying Scotch pines and miscellaneous invasive shrubs removed with track excavator and dozer and burned.
- Herbaceous vegetation mowed with brush hog and disked into soil surface.
Early site preparation
Soil Test – April 22, 2015

This test served as a guide for our lime and fertilizer applications.

SOIL TEST REPORT FOR:

ERNST CONSERVATION SEEDS
884 MERCER PIKE
MEADVILLE, PA 16335

DATE: 04/22/2015
LAB #: 516-12319
SERIAL #: 26350
COUNTY: Crawford
ACRES: 90
ASCS ID: SCH 1
FIELD ID: Venango

SOIL NUTRIENT LEVELS

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Below Optimum</th>
<th>Optimum</th>
<th>Above Optimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH</td>
<td>5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>10 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>65 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>60 ppm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECOMMENDATIONS:

Limestone*: 12000 lbs/A for a target pH of 6.5. Magnesium (Mg): NONE

*Calcium Carbonate equivalent

For a 2 to 11 inch piece depth, lime recommendation was multiplied by 1.5

Plant Nutrients:

<table>
<thead>
<tr>
<th>Year</th>
<th>Crop</th>
<th>Expected Nitrogen Yield (lbs N/A)</th>
<th>Phosphate (lbs P2O5/A)</th>
<th>Potash (lbs K2O/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horticultural Cover Crop</td>
<td>40</td>
<td>100</td>
<td>60</td>
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</tbody>
</table>

See Table 1 for other crop recommendations:

2
0 0 0

3
0 0 0

ADDITIONAL RESULTS:

<table>
<thead>
<tr>
<th>Calcium (g/g)</th>
<th>Acid Extractable (mg/100 g)</th>
<th>CEC (mg/100 g)</th>
<th>pH Saturation of CEC</th>
<th>Organic Matter Loss %</th>
<th>Nitrogen-N ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>464</td>
<td>9.3</td>
<td>12.3</td>
<td>1.3</td>
<td>4.1</td>
<td>18.9</td>
</tr>
</tbody>
</table>

Test Methods: 1.1 soil water pH, 1.2 Mallich 3 (SCP), 1.3 Mallich Buffer pH, 1.4 Oxidation of Cations
<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>10 ppm</td>
<td>18 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>63 ppm</td>
<td>66 ppm</td>
<td></td>
</tr>
<tr>
<td>WSG</td>
<td>15 ppm</td>
<td>30 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 ppm</td>
<td>90 ppm</td>
<td></td>
</tr>
<tr>
<td>Turf</td>
<td>75 ppm</td>
<td>110 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>140 ppm</td>
<td>200 ppm</td>
<td></td>
</tr>
</tbody>
</table>
Fertilizer Applications

- 6/6/16 - 5,000 lb agricultural lime
- 6/5/17 - 200 lb monoammonium phosphate, 110 lb potash
- 6/13/17 - 400 lb monoammonium phosphate, 150 lb potash
- 6/13/17 - 138 lb ammonium sulfate
- 6/7/18 - 126 lb ammonium sulfate, 74 lb urea
Soil Test – February 27, 2018

The balanced results of the 2015 lime and 2017 fertilizer applications.
Species Selection

- Soil maps reviewed and on-site hydrology evaluation made.
- Soil fertility, pH and hydrology needs of native species produced by Ernst.
- *Panicum clandestinum* (*Dichanthelium c.*) (Deertongue) selected for its tolerance to low fertility, low pH and low water-holding capacity.
**‘Tioga’ deer tongue**

The major use for ‘Tioga’ deer tongue (Dichanthelium clandestinum) is for revegetating disturbed areas where site conditions limit the use of other species. It is tolerant of sites with a pH as low as 3.8, aluminum concentrations which limit growth of other species, light textured soil which is droughty, and infertile and seasonally wet soils.

A common conservation use of deer tongue is for revegetating acidic coal and other surface mine spoil and sandy infertile disturbed areas such as highway slopes and gravel pits. It can be planted successfully with other warm season grasses.

‘Tioga’ was cooperatively released by the USDA Natural Resources Conservation Service, the Pennsylvania Agricultural Experiment Station, and Cornell University Agricultural Experiment Station.

Deer tongue has considerable merit for food and cover for wildlife. Turkeys, for example, eat the seeds readily and young pouls have been observed to eat the new growth in June and July. The seed is eaten by all gamebirds and over 15 songbirds common to the Northeast. Deer eat the seed and may graze on the new fall rosette growth. ‘Tioga’ is not recommended as a livestock forage due to the low nutrient content.

**Description**

‘Tioga’ deer tongue is a perennial, cool season grass native to the eastern United States and southeastern Canada. The midsummer growth normally reaches one to three feet in height. Leaves are 1/2 to 1/4 inches wide and four to eight inches long. ‘Tioga’ produces short, strong rhizomes. Two seed crops are produced annually - an early crop on an open terminal panicle and a later crop on a panicle enclosed in the swollen leaf sheath. Most of the early crop is sterile and shatters easily. The second crop, produced in the enclosed panicle, produces an abundance of seed.

**Area of Adaptation for ‘Tioga’**

Deer tongue should be seeded as early as possible in the spring. The seed dormancy is easily overcome when deer tongue is planted when the weather is cool. If the site conditions are such that planting cannot be done in the early spring, it is advisable to make a dormant seeding in the late fall or early winter.

On sites where conventional farm equipment can operate, prepare a normal seedbed as for a pasture planting. Seed with a grain or grass drill. If seed is to be drilled or hand-seeded, do not place seed deeper than one inch. Native grass range drills are very successful with seeding native grass seed mixtures.

On rough, rocky sites not suitable for tillage by conventional farm equipment, but accessible to power equipment, some method of scarifying the surface should be used. Operations should be carried out on the contour or across the slope. On these sites, it is generally necessary to broadcast the seed then track it in with a bulldozer.

**Establishment**

The natural distribution of deer tongue is Nova Scotia, Quebec, and Maine to Kansas, south to northern Florida and Texas.

It has a wide natural adaptation to soil moisture conditions and is found growing on dry sites as well as on moist soils and on streambanks. It is a pioneer on low fertility, disturbed sites. It occurs naturally on sites with a pH of 4.0. Under these conditions, it is reduced in stature and vigor but persists and spreads.

‘Tioga’ deer tongue lodges over winter and forms a mat of vegetative cover. This is an important factor in the natural spread of deer tongue in areas without vegetation. The old stems and leaf parts form a natural mulch that aids in seedling establishment.
Pre-Existing Vegetation


Measures To Reduce Erosion & Improve Fertility

- Existing thatch not completely removed or destroyed.
- June 2016-5,000 lb of agricultural lime applied.
- One herbicide application pre-plant: 1qt Roundup® (glyphosate), .2 oz Escort® (metsulfuron) (for woody species), 4 oz Banvel® (dicamba), 12 oz 2,4-D, 4 oz Milestone® (aminopyralid).
- Late June 2016-Deertongue planted with a Truax no-till drill at 6 PLS lb per acre.
- Oats cover crop drilled at 30 lb per acre with the deertongue to provide quick cover.
Post-Plant Management

- August 2016-4 oz Stinger® (clopyralid), 8 oz 2,4-D Amine.
- September 2016-Oats cover crop mowed to 6” once deertongue established.
- September 2016-1.5 lb Atrazine 90 DF.
- April 2017-2 lb Atrazine 90 DF, 6 oz 2,4-D.
- June 2017-.76 oz Beacon® (primisulfuron), 4 oz Dicamba.
- May 2018-.76 oz Beacon® (primisulfuron), 4 oz Dicamba.
Harvest

- Fall 2017-first seed crop harvested.
- Deertongue yield: Approx. 100 lb per acre.
- Another native grass, *Panicum sphaerocarpon* (*Dichanthelium s.*) (Roundseed Panicgrass), volunteered, yielding 12 lb per acre.
- Post-harvest: Sub-soiled to increase uniformity of drainage.
May 2018- Panicum clandestinum (Deertongue)
Panicum sphaerocarpon
(Roundseed Panicgrass)
Panicum sphaerocarpon (Roundseed Panicgrass)
Panicum sphaerocarpum (Roundseed Panicgrass)
Some of the toughest sites -

May 2018-
Panicum clandestinum (Deertongue)
July 2018-
Panicum clandestinum (Deertongue)
July 2018-
Panicum clandestinum (Deertongue), self-seeding & thickening
July 2018-
Beacon®/Banvel®
effective in killing
quackgrass in
deertongue
2018
A Superfund Site Ready to Harvest