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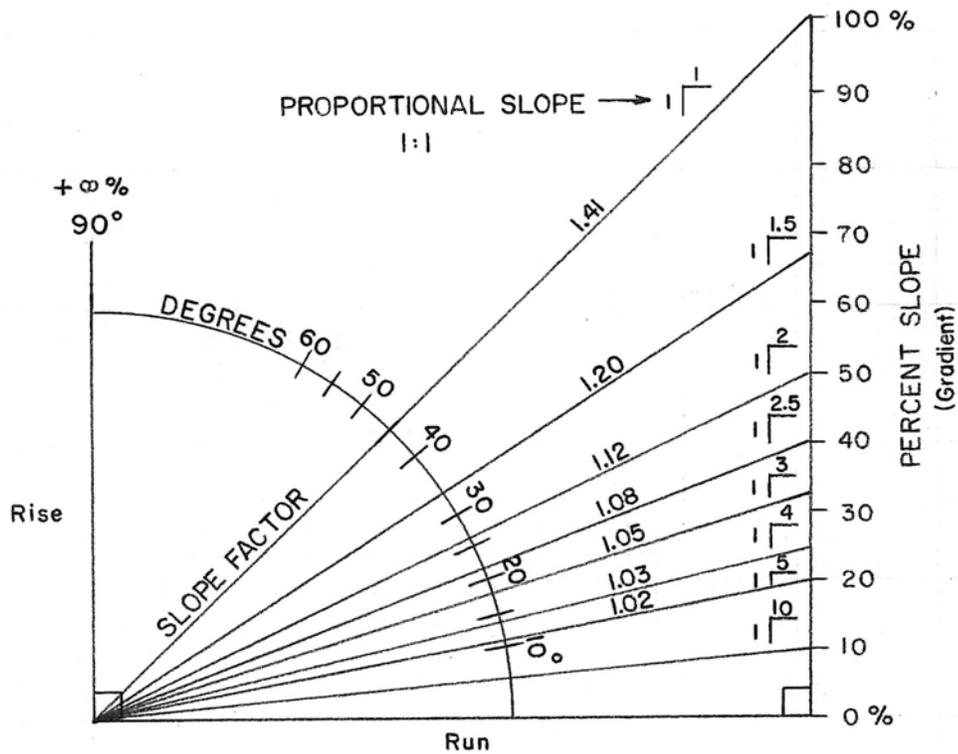
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Appendix I: Slope Conversion Guide



$$\text{PERCENT SLOPE} = \frac{\text{Vertical Height}}{\text{Horizontal Length}} \times 100$$

$$\text{PROPORTIONAL SLOPE} = \frac{\text{Horizontal Length}}{\text{Vertical Height}}$$

$$\text{SLOPE FACTOR} = \frac{\text{Slope Length}}{\text{Horizontal Plane Length}}$$

Appendix II: Grasses and Legumes Used for Mined Land Reclamation

Mine operators are responsible for doing any research necessary to determine that a plant is correct for their specific mine site. However, information on a few grasses and legumes is presented here to provide a head start (additional grasses and legumes are listed in Part IV tables). **Note that the majority of information included here comes from the U.S. Dept. of Agriculture Plants Database <http://plants.usda.gov> and the University of Cornell's Forages copyrighted website <http://www.forages.org>. Both have a mix of conservation and agricultural information which means that this Appendix may include some nationwide information that is not completely tailored to New York and some agricultural information that may not completely apply to a challenging mine setting. Nonetheless, it should provide useful background.**

It is very important to recognize that plant traits can vary* by both geographic source and cultivar (e.g. rate of growth, cold hardiness, soil preferences, etc.). Therefore:

- **Check with your nursery supplier on the exact requirements and traits of plants they are selling.**
- Remember that Regional Mined Land Reclamation Specialists, staff at local Soil and Water Conservation District Offices, and staff at Cornell University may also have additional information on how a plant will perform in your area of New York and type of mine setting involved.

***Variety and Cultivar Warning**

Occasional information is included here on the range of cultivar traits (such as pH and minimum temperature), but the issue was not specifically researched. Note that the minimum temperature range for a species can vary by 30, 40 or even 50 degrees, which will affect whether the plant behaves as an annual or perennial.

For further assistance selecting the correct grass or legume, see the Tables in Part IV and the recommended cultivars.

Appendix IIA: Warm Season Grasses

Big Bluestem (*Andropogon gerardii* Vitman), and
Little Bluestem (*Andropogon Scoparium* Michx.)

Origin: Native*

Warm-season grasses that grow in large clumps and have dense deep root systems. Big bluestem grows up to 6 ft. tall and little bluestem up to 3 ft. tall. Slow to establish. Long-lived. Traits listed below are for Big Bluestem only.

Uses: Bluestem is recommended for erosion control for sand and gravel pits, mine spoil, and roadsides. Birds and mammals use big bluestem for nesting and escape in summer and winter. It resists lodging under snow cover almost as well as Switchgrass, thereby contributing to spring nesting habitat. Wildlife browse palatability high.

Good yield potential, Livestock grazing palatability high, but forage quality low. Unacceptable for ruminants in New York State.

Growth Requirements: Grows on moderately well-drained to excessively well-drained soil. Fluffy seed difficult to sow, but consult experts for planting and management tips. Seed 10 to 15 lb per acre.

Tolerances:

Min. Temp. -46 to -9° (cultivar range)**

Shade - Low

Drought - High

Salinity - Low -Med (cultivar range)**

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - Low

Soil pH - 5 to 8 (cultivar range)**

Weeping Lovegrass (*Eragrostis curvula* Schrad.)

Origin: Introduced*

Warm-season, dense bunch grass 3 feet tall. Rapid first year growth, spreads by tillering. Individual plants can be 12 to 15 inches in diameter in 2-3 years. Short-lived.

Uses: Valuable as temporary cover for erosion control and terrace stabilization purposes. Can provide almost immediate cover on steep outer slopes even where land is low fertility and rather acidic. Wildlife browse palatability low.

Persists well under livestock grazing and has medium palatability.

Continued ⇨

Weeping Lovegrass continued

Growth Requirements: It will thrive on soils of low fertility and does even better on high fertility soils. Not grown on poorly-drained soils. Easy to establish by seed and excellent seedling vigor, but low winter temperatures cause it to act as an annual or a tender perennial. Consult with experts for planting and management tips. Seed 1 to 3 lb per acre.

Tolerances:

Min. Temp. -8° to +7° (cultivar range)**

Shade - Low

Drought - High

Salinity - Conflicting Information

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - Low pH - 4.5 to 8.5 (cultivar range)**
to High (cultivar range)**

Deertongue (*Panicum clandestinum*)
aka (*Dichanthelium clandestinum* L. Gould)

Origin: Native*

Warm-season bunch grass, up to 3 feet high, spreads slowly by rhizomes and seed. Moderate growth rate. Produces complete cover in 2 years. Long-lived.

Uses: The major use of Deertongue is for revegetating disturbed areas where site conditions limit use of other species due to low pH and/or high aluminum levels. Deertongue can provide ground cover at sand and gravel mines and has been used to revegetate acid mine spoil. Wildlife browse palatability high and known to be good wildlife foodsource.

Very low livestock palatability. Not a source of ruminant forage

Growth Requirements: Deertongue grows well on droughty and infertile sites, but can tolerate a wide range of soils, including somewhat poorly-drained (but not wet) soils. The USDA NRCS Plants Fact Sheet specifically recommends against mulching in sand and gravel pits. For other planting and management tips, consult with experts including the USDA Big Flats Plants Materials Center in Corning, NY where Tioga, sole cultivar of this plant, was released. Seed 10 to 15 lb per acre.

Tolerances:

Min. Temp. -33°

Shade - Low

Drought - Excellent

Salinity - Low

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - Low

(some sources
Soil pH - 4.0 to 7.5 say pH 3.8)

Switchgrass (*Panicum virgatum*)

Origin: Native*

Warm-season sod-forming grass 3 to 5 feet tall. Slow to establish. Long-lived.

Uses: Switchgrass is one of the most widely used native warm season grasses. It is a valuable soil-stabilization plant on mines, sand dunes, dikes and other critical areas. It also provides excellent nesting and fall-winter cover for pheasants, quail and rabbits. It holds up well in heavy snow (particularly Shelter and Kanlow cultivars). The seeds provide food for pheasants, quail, turkeys, doves and songbirds. Wildlife browse palatability medium.

Yield potential and livestock browse palatability high, but unacceptably low forage quality. Loses forage quality rapidly.

Growth Requirements: Widely adapted to moist, fertile soils, but will tolerate acidic, infertile and droughty sites. Better suited to poorly-drained soils than Big Bluestem, but does not do well in very heavy soils. Must be grown in separate pasture. Slow to establish, but good seedling vigor. Consult experts for planting and management tips. Seed 10 to 15 lb per acre.

Tolerances:

Min. Temp. -43 to -10° (cultivar range)**

Shade - Medium

Drought - Good eastern U.S.

Salinity - Medium

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - Low

Soil pH - 4 to 7.5 (cultivar range)**

Eastern Gamagrass (*Tripsacum dactyloides*)

Origin: Native*

Warm season grass 5 to 8 feet tall. Grows in a large clumps 1 to 4 feet in diameter. Spreads by thick, knotty rhizomes. Long-lived, but difficult to establish (see below).

Uses: Wildlife browse palatability high. Also excellent for wildlife cover.

Primarily used as a hay crop, but Cornell Forages website states “management practices for northeastern US not yet clear” and it is difficult to establish. Very high forage quality. High yield potential. Livestock browse palatability high. Not adapted to continuous grazing.

Growth Requirements: Good tolerance of acid and droughty soils. However, it does best in moderately well-drained to somewhat poorly-drained soils. In the Northeast U.S., gamagrass is prone to frost heaving over the first winter, though this is less likely on well-drained soils.

Continued ⇨

Eastern Gamagrass continued

It will tolerate extended periods of flooding. Consult with experts for planting and management tips. Seed at 5-10 lbs. per acre.

Tolerances:

Min. Temp. -23°

Shade - Low

Drought - ?¹

Salinity - Low

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - ?²

Soil pH - 5.1 to 7.5

¹ Cornell Forages website rates as good drought tolerance, but USDA Plant Characteristics sheets for different cultivars indicate drought tolerance ranges Low-High.

² Natural habitat is high fertility soil. Info not found on tolerance to low fertility.

Indiangrass (*Sorghastrum nutans*)

Origin: Native*

Erect warm-season grass 4 feet tall. Common in association with Big and Little Bluestem and Switchgrass. Slow and difficult to establish, but long-lived.

Uses: Can be used on critical area seeding, for roadside cover, and on areas subject to wind erosion. Very useful in mixtures planted on sites with occasional flooding. Excellent for wildlife habitat and food for deer. Wildlife browse palatability medium.

Good yields possible, but unacceptably low forage quality quickly deteriorates. Unacceptable forage quality for ruminants in New York. Livestock browse palatability high.

Growth Requirements: Best suited to fertile, well-drained soils, but tolerates a wide range of soil types. Not suited to poorly-drained soils. Tolerates drought conditions, and also tolerates brief or periodic flooding. Must be grown in separate pastures. Fluffy seed difficult to sow. Slow and difficult to establish, but consult with experts for planting and management tips. Seed 10 - 15 lbs. per acre.

Tolerances:

Min. Temp. -23°

Shade - Low

Drought - Medium

Salinity - Low

Soil Requirements:

Soil Fines 0-15%

Soil Fertility - Low

Soil pH - 4.5 to 8.0 (cultivar range)**

* Native plant means native to New York State according to the New York State Museum's *Revised Checklist of New York State Plants*, 1997.

** Nationwide pH and temperature ranges came from the Plant Characteristic sheets in the USDA PLANTS database and may include some cultivars otherwise not suited to New York.

The majority of information in Appendix came from the University of Cornell's Forages website (copyrighted, used with permission) and the USDA PLANTS database. See Reference section for full citations.

Appendix II-B: Cool Season Grasses:

Redtop (*Agrostis alba*)

Origin: Introduced*

Naturalized sod-forming grass 2 feet tall used for pasture, quick cover for grass waterways, diversions and road banks. Spreads by stolons (creeping stems). Vigorous seedlings, but no serious competition for slower-growing species. Endophyte-infected preferred (see pages 39 & 41). Seed 5 to 10 lb per acre.

Advantages: easy to establish, fast germination, good tolerance to acid and poorly-drained soils, higher yields than most grasses that volunteer on poor soils.

Concerns: low yield potential, low forage quality, not adapted to heavy soils that are droughty in summer, not competitive on fertile soils.

Combined nationwide cultivar range**

pH 4.5-8

Min. Temp. -38°

Perennial Ryegrass (*Lolium perenne*)

Origin: Introduced*

A cool season bunch grass 1-2 feet tall, very rapid seedling growth, provides quick short-term stabilizing cover on exposed soils, good for soil improvement. Better suited to pasture. Must be used in combination with other species. Endophyte-infected preferred (see pages 39 & 41). Seed 25 to 35 lb per acre.

Advantages: very good quality possible, easy to establish, rapid growth rate, good tolerance to close grazing.

Concerns: poor drought and heat tolerance, not well suited to poorly-drained soil, poor shade tolerance, no varieties have consistently persisted in New York State to date.

Combined nationwide cultivar range**

pH 5-8

Min. Temp. -53° to -18°

Canada Bluegrass (*Poa compressa*)

Origin: Introduced*

A 2-foot tall, rhizomatous perennial that can be used under conditions too dry or not otherwise entirely favorable to Kentucky bluegrass. Slow starting and seldom used alone. Seed 2-5 lbs. acre.

Advantages: shade and drought tolerant, low fertility requirement.

Concerns: slow spreading, low seedling vigor.

Combined nationwide cultivar range**

pH 5-7

Min. Temp. -38°

Tall Fescue (*Festuca arundinacea* Schreb.)

Origin: Introduced*

Cool season deep-rooted bunch grass 2.5 to 3 feet tall, very winter hardy, good for stored feed and intensive pasture. Used for stabilizing grass waterways, slopes and road banks, also food and cover for wildlife. Good for areas of heavy livestock or machinery traffic. Avoid endophyte-infected (see pages 39 & 41). Not recommended for dairy cow pasture or hay crop. Seed 10 to 25 lb per acre.

Advantages: good quality possible, easy to establish, high yield with good summer production, good stockpiled forage for late season grazing, adapted to acid and somewhat poorly-drained soils.

Concerns: not well suited to droughty soils, not as winter-hardy as smooth bromegrass or timothy.

Combined nationwide cultivar range**

pH 5-9

Min. Temp. -43° to +12°

Creeping Red Fescue (*Festuca rubra*)

Origin: Introduced*

Cool season grass 1.5 feet tall, spreads by underground stems, adapted to a wide range of soil types, tolerant of dry sites, valuable for its shade tolerance. Shortness makes it suitable for mowed areas or general purpose turf. Also good for stream banks or grass waterway protection, soil improvement and areas with heavy animal traffic. Endophyte-infected preferred (see pages 39 & 41). Seed 20 to 40 lb per acre.

Advantage: easy to establish, good tolerance to acid and poorly-drained soils.

Concerns: low yield potential, low palatability.

Combined nationwide cultivar range**

pH 5-8

Min. Temp. -53° to +7°

Creeping Red Fescue Illustration

USDA-NRCS PLANTS Database/ Britton, N.L. and A. Brown, 1913 Illustrated Flora of the Northern States and Canada. Vol. 1:270



* Native plant means native to New York State according to the New York State Museum's *Revised Checklist of New York State Plants, 1997*.

** Nationwide pH and temperature ranges came from the Plant Characteristic sheets in the USDA PLANTS database and may include cultivars otherwise not suited to New York.

The majority of information in this Appendix came from the University of Cornell's Forages website (copyrighted, used with permission) and the USDA PLANTS database. See Reference section for full citations.

Appendix II-C: Legumes

White Clover (*Trifolium repens*)

Origin: Introduced*

Clover is a half foot to 2-foot tall legume with nitrogen-fixing ability that is beneficial to overall grass vigor on critical sites. Component of wildlife mixtures as feed for deer. Used for pasture only, withstands continuous grazing. Both standard and ladino types are readily adapted to most cool season grass mixtures.

Advantages: excellent quality possible, easy to establish, good tolerance to wide pH range, good tolerance to close grazing.

Concerns: does not persist 2 growing seasons, very low yielding, low drought tolerance, low winter hardiness, can cause bloat.

Combined nationwide cultivar range**

pH 6-7.5

Min. Temp. -39°

Alfalfa (*Medicago sativa*)

Origin: Introduced*

Deep-rooted 1 to 2-foot tall perennial that is the most important pasture and hay plant in New York State. Needs well-drained, well-limed soils. Alfalfa seedlings also need phosphorus and potassium at planting time. Seed 12 - 15 lb per acre.

Advantages: excellent quality possible, higher yielding than grass, on good alfalfa soil more drought tolerant than grass.

Concerns: not adapted to acid or variably-drained soils, not suitable for alfalfa snout beetle-infested regions, can cause bloat, needs fall rest period, potential for heaving in New York State.

Combined nationwide cultivar range**

pH 6-8.5

Min. Temp. -43° to -33°

Red Clover (*Trifolium pratense*)

Origin: Introduced*

Biennial legume, 2 feet tall with red flowers. Good for short-term stand when spotty or poor drainage rules out alfalfa.

Advantages: high seedling vigor, high Nitrogen fixation, high forage quality.

Concerns: low drought tolerance, intolerant of shade, slow spread rate.

Combined nationwide cultivar range**

pH 6-7.6

Min. Temp. -38° to +2°

Birdsfoot Trefoil (*Lotus corniculatus*)
aka Birdfoot Deervetch

Origin: Introduced*

Winter hardy perennial 1-foot tall, persists in NYS by reseeding. Useful for erosion control, soil improvement and forage for deer. Can be grazed frequently, but not closely. Needs 6 weeks of growth in fall to overwinter. Seed 5-10 lb per acre.

Advantages: excellent quality possible, well adapted to acid soils or variably-drained soils, fair drought tolerance. Best legume to stockpile for fall grazing

Concerns: bloat hazard, not persistent in N.Y. due to fusarium disease, slow to establish, slow spring growth and regrowth, lower yielding than alfalfa, needs fall rest period, poor shade tolerance.

Combined nationwide cultivar range**

pH 5-7.7

Min. Temp. -33° to +7°

Crownvetch (*Coronilla varia*)
aka Purple Crownvetch

Origin: Introduced*

Winter hardy perennial legume 3 feet tall, spreads by creeping underground roots, requires well or moderately well-drained soils. Useful for erosion control, steep roadbanks and wildlife habitat (cover for ground nesting birds, rabbit food and cover). Seed 10 to 15 lb per acre.

Advantages: no bloat hazard.

Concerns: low seedling vigor, slow to establish

Combined nationwide cultivar range**

pH 5-7.5

Min. Temp. -38° to -28°

Flatpea (*Lathyrus sylvestris*)

Origin: Introduced*

Perennial legume 2.5 feet tall with deep tap root and vine-like stems that climb to 8 feet. Seedlings slow to develop, but once established, plants are vigorous and form a thick ground cover. Not adapted to wet sites, but will persist on moderately well-drained soils. Seed 25 to 35 lb per acre.

Advantages: excellent drought tolerance once established, tolerates moderate shade better than crownvetch, established flatpea hinders woody plant growth into clearings.

Concerns: slow to germinate and grow first year.

Combined nationwide cultivar range**

pH 5-7.8

Min. Temp. -38°

* Native plant means native to New York State according to the New York State Museum's *Revised Checklist of New York State Plants, 1997*.

** Nationwide pH and temperature ranges came from the Plant Characteristic sheets in the USDA PLANTS database and may include some cultivars otherwise not suited to New York.

The majority of information in Appendix came from the University of Cornell's Forages website (copyrighted, used with permission) and the USDA PLANTS database. See Reference section for full citations.

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Appendix III: Shrubs Used for Mined Land Reclamation

Mine operators are responsible for doing any research necessary to determine that a shrub is correct for their specific mine site. However, information on several shrubs is presented here to provide a head start.

Note that the majority of information included here comes from the U.S. Forest Service's website at <http://www.na.fs.fed.us> and the U.S. Dept. of Agriculture PLANTS Database <http://plants.usda.gov>. These main sources were supplemented with other paper and web sources. The mix used (national vs. New York, forestry vs. landscaping) means that this Appendix may include some information that does not completely apply to a challenging mine setting. It may also include nationwide information that is not completely tailored to New York. Nonetheless, it should provide useful background.

It is very important to recognize that plant traits can vary by both geographic source and cultivar (e.g. rate of growth, cold hardiness, soil preferences, etc.). Therefore:

- **Check with your nursery supplier on the exact requirements and traits of plants they are selling.**
- Remember that Regional Mined Land Reclamation Specialists, staff at local Soil and Water Conservation District Offices and staff at Cornell University may also have additional information on how a plant will perform in your area of New York and type of mine setting involved.

Redosier Dogwood (*Cornus stolonifera* Michaux.)

Origin: Native*

A deciduous many-stemmed shrub usually 3-10 feet high. The young stems start out bright red, fade to gray-green and return to red in the fall and winter. The mature berry is white. Red osier may form a dense thicket. Long-lived.

Uses: Redosier is recommended for rehabilitating moist sites. It is also used for streambank protection and fish and wildlife habitat improvement projects. It adapts well to disturbed areas and is excellent at stabilizing soil since it is easy to establish and grows rapidly. Over 25 species of birds eat the berries and the shrub also provides excellent bird nesting habitat. The fruit and foliage are eaten by black bears, beaver, and a wide assortment of smaller mammals. Browse palatability rating Low, but deer and rabbits browse the twigs and buds. Redosier Dogwood fruit is low in sugar which makes it: 1) less attractive to animals when other food sources are available, 2) less likely to rot. Therefore, it remains on the shrub in winter when animals need it more.

Growth Requirements: Redosier grows in soils that are saturated for at least part of the growing season. It is common on the edges of lakes, ponds and streams. It is also found in wetlands, but tends to prefer the outer margins where its roots will not be saturated all year and the ground may even dry up in late summer.

Tolerances:

Min. Temp. -38° Shade - Intermediate Drought - Medium Salinity - None

Soil Requirements:

Soil pH 4.8 - 7.5 Soil Fertility - Medium Root Depth (Min.) 16"
Soil Texture - Fine to Coarse

Silky Dogwood (*Cornus amomum*)

Origin: Native*

Silky Dogwood is a deciduous shrub with an upright rounded growth habit. It attains heights of 4-10 feet and creates thickets. Moderate growth rate, moderate lifespan.

Uses: Silky Dogwood is used for slope stabilization, wildlife borders and other fish and wildlife habitat improvement projects. It is also being used along with willows for streambank protection. The fruit is a favorite food of turkey, grouse, quail, and many songbirds. Silky Dogwood is frequently planted for wildlife cover. Browse potential rating is Low.

Continued ⇨

Silky Dogwood continued

Growth Requirements: Silky Dogwood grows on moist to well-drained soils and does best in full sunlight. It is primarily seen on streambanks and in shrubby thickets adjacent to wooded swamps.

Tolerances:

Min. Temp. -33° Shade - Intermediate Drought - Low Salinity - None

Soil Requirements:

Soil pH 5-7 Soil Fertility - Medium Root Depth (Min.) 16"
Soil Texture - Fine to Coarse

Highbush Cranberry (*Viburnum opulus* Var. americana)
aka (*Viburnum trilobum*)

Origin: Native*

Highbush Cranberry is a multi-stemmed deciduous shrub that grows roughly 6 feet tall, but may reach 15 feet. Produces red berries at 5 years. Slow growing, long-lived.

Uses: The bright red fruits persist throughout the winter giving the shrub aesthetic value. Songbirds usually do not find the berries palatable until they have frozen and thawed several times. Browse palatability rating Low. Still the shrubs provide some food value to deer, moose, fox, raccoons, chipmunks, squirrels, mice, rabbits, grouse, pheasants, robins, cedar waxwings and other songbirds.

Growth Requirements: Highbush Cranberry is found in moist woods or forests, along stream or lake margins on gravel or rocky banks, and on swamp or bog margins. Grows best on consistently moist, but well-drained soils. Historically there have been no significant pest problems for this shrub, but it is now susceptible to the *Viburnum* leaf beetle which has recently been spreading across the New York State from west to east. Cornell has preliminarily classified Highbush Cranberry as the most susceptible viburnum in NY State with high levels of damage possible (total defoliation, death of shrub in 2-3 years).

Tolerances:

Min. Temp. -38° Shade - Intolerant Drought - None Salinity - None

Soil Requirements:

Soil pH 5.5- 7.5 Soil Fertility - Medium Root Depth (Min.) 14"
Soil Texture - Fine to Medium

Name Confusion: The native shrub is "*Viburnum opulus* Var. americana". According to USDA and Cornell, it is much hardier than the straight "*Viburnum opulus*", a European plant grown strictly for ornamental use which is also more susceptible to aphid attacks. Since name usage varies from nursery to nursery, check plant traits carefully.

Sweetfern continued

Growth Requirements: Sweetfern grows well in clearings, pastures and openings in coniferous forests with well-drained, dry, acid, sandy or gravelly soils. Because of its nitrogen-fixing ability (low level), it does well on disturbed sites or sites with sterile soil (abandoned fields, pine barrens). Difficult to propagate by seed. In the Adirondack Mountains of New York, it grows on limestone soils from 200 to 2,300 feet (61-700 m) elevation.

Tolerances:

Min. Temp. -38° Shade - Intolerant Drought - High Salinity - Low

Soil Requirements:

Soil pH 4-7 Soil Fertility - Low Root Depth (Min.) 14"
Soil Texture - Medium to Coarse

Eastern Red Cedar (*Juniperus virginiana*)

Origin: Native*

A columnar or conical evergreen that is not a true cedar, but actually a juniper. Maximum height at 20 years is 20 feet (mature 50 feet). However it is likely to remain shrub-sized in mine reclamation settings. Small blue-green berries September to March. Slow growth rate, moderate lifespan.

Uses: Eastern Red Cedar is widely used in shelterbelts. While Red Cedars have some browse potential for deer (low), their main wildlife attraction is the berries which are eaten by turkeys, grouse, pheasant and numerous smaller birds, particularly the cedar waxwing. Their dense foliage is also important for bird nesting and roosting sites and winter shelter for all types of animals. The wood is fragrant and is used extensively for cedar chests, paneling, pencils and novelties. Durability on contact with soil makes it good for fence posts.

Growth Requirements: Eastern Red Cedar grows in a wide range of habitats from poor, thin, dry rocky soils to fine-textured saturated soils in swamps. It can grow in settings where water is near the surface or where soil moisture fluctuates from near saturation in winter to extreme dryness in summer which means it has high drought tolerance. However, it does not tolerate flooding. It is adaptable to a wide soil-pH range, but see * below. Subject to Cedar Apple Rust which is a fungus which requires both eastern red cedar and apple trees to complete its life cycle so do not plant with Crabapples unless known to be disease resistant.

Tolerances:

Min. Temp. -43° Shade - Intermediate Drought - High Salinity - Low

Soil Requirements:

Soil pH 4.7- 8¹ Soil Fertility - Low Root Depth (Min.) 20"
Soil Texture - Fine to Coarse

¹ Needles' high calcium content changes surrounding soil to neutral or slightly alkaline relatively quickly.

Toringo Crabapple (*Malus sieboldii*)

Origin: Introduced*

Toringa crabapples range in size from a shrub to a small tree (8-40 feet). Moderate growth rate and moderate lifespan.

Uses: Crabapples are planted primarily for beauty or to benefit wildlife. Birds and game both enjoy the fruit. The fruit is generally considered too tart for humans.

Growth Requirements: Crabapples can be grown on medium to heavy soils that are somewhat poorly to well drained. The pH should be 5.5 or higher. Full sun is preferred for best performance, but they will tolerate light shade. Subject to Cedar Apple Rust which is a fungus which requires both eastern red cedar and apple trees to complete its life cycle, Therefore, do not plant with Eastern Red Cedar unless found to be disease resistant.

Tolerances:

Min. Temp. -33E Shade - Intolerant Drought - Medium Salinity - Low

Soil Requirements:

Soil pH 5.3-7.5 Soil Fertility - Medium Root Depth (Min.) 30"
Soil Texture - Fine to Coarse

Bayberry (Northern) (*Myrica pensylvanica*)
aka *Morella pensylvanica*

Origin: Native*

A semi-erect rounded 5 to 8-foot tall coastal shrub that will be shorter on sand dunes and other poor sites. Slow to moderate growth rate, long lifespan.

Uses: This plant is excellent for controlling erosion of poor soils and its moderate nitrogen-fixing ability also helps improve the soil. It is good for dry exposed areas and very tolerant of road salt and sea spray. The shrub provides food and shelter for wildlife. It attracts swallows, thrashers, thrushes, wrens, bluebirds, turkeys, pheasant, chickadees and many other birds. The waxy gray “berries” of bayberry shrubs are used to make scented candles and soap. For these reasons it is listed on the NY State Protected Plants list as an exploitably vulnerable plant likely to become threatened in the near future if causal factors remain unchecked.

Growth Requirements: This plant grows in a range of coastal settings from sand dunes to swampy soils. It performs best on light-textured soils and starts best on bare ground.

Tolerances:

Min. Temp. -28E Shade - Intolerant Drought - High Salinity - Medium

Soil Requirements:

Soil pH 5.5-7.8 Soil Fertility - Low Root Depth (Min.) 20"
Soil Texture - Medium to Coarse

Streamco Willow (*Salix purpurea*)
aka Basket or Purpleosier Willow

Origin: USDA Release
(male clone)

A multi-stemmed dense deciduous shrub roughly 11 feet tall at maturity. Rapid growth, long-lived. Streamco is a male clone so it does not root sucker and spread.

Uses: USDA developed the Streamco Willow to prevent soil erosion along stream banks. The shrub is used extensively in soil bioengineering systems and to control erosion along streambanks resulting from flood and ice damage. The shrub provides cover to small animals, browse for deer, beaver and rabbits and exceptional nesting sites for birds. It helps shade small streams and maintain cooler temperatures. It is also a good wetland species. Due to the shrub's density it makes a good snow fence in moist settings. More disease and insect resistant than most willows. Browse palatability rating Medium but the USDA Plants Fact Sheet says it is susceptible to severe browsing by livestock and cannot be established without protection. Beaver can also have a big impact on this plant.

Growth Requirements: Must be planted in cleared, moist soil along stream banks, not in dry soil at top of banks. Banks that have been eroded and undercut to a steep slope must be re-graded prior to planting.

Tolerances:

Min. Temp. -38° Shade - Intolerant Drought - Low Salinity - None

Soil Requirements:

Soil pH 5.5-7.5 Soil Fertility - Medium Root Depth (Min.) 25"
Soil Texture - Fine to Coarse

Arnot Bristly Locust (*Robinia hispida* L. var. *fertilis* (Ashe) Clausen)

Origin: USDA Release

An erect shrub that may grow 12 feet tall, but on the challenging sites that it was specifically created for it will reach a mature height of 6 to 8 feet in 4 years. Spreads rapidly by underground root suckers to form dense thickets, unless there is significant pre-existing herbaceous growth. Overall rapid growth, moderate lifespan.

Uses: This species was developed and released by the USDA for erosion control and a vigorous, quick cover on sites with poor, dry, sterile soil, such as road banks, surface mine spoils and critical areas damaged by industrial activity. It is probably the best shrub for steep sloping sites with active erosion. Root exposure stimulates suckering and creates a denser root system that helps stop erosion. The shrub's value for wildlife food is minimal, but it has large attractive rose-colored flowers late May to mid-June. Bristly Locust has a high nitrogen-fixing ability which encourages the development and growth of native plants around it. The shrub has been used as a living fence to trap snow.

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Arnot Bristly Locust continued

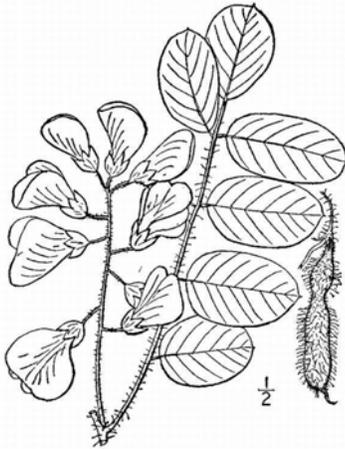
Growth Requirements: Bristly locust grows best at pH 6-7, but will thrive in both alkaline soils and acid shales, and can tolerate lower pH soils than any other shrub recommended in this appendix. Bristly locust grows best on silt loams and loamy soils with good drainage, however, it will tolerate soils that are moderately well-drained. It is the least cold tolerant shrub in the appendix and suffers winterkill above the snowline in USDA Hardiness Zones 3 and 4.

Tolerances:

Min. Temp. -23° Shade - Intolerant Drought - High Salinity - None

Soil Requirements:

Soil pH 3.5-8.0 Soil Fertility - Low Root Depth (Min.) 20"
Soil Texture - Medium to Coarse



Arnot Bristly Locust Illustration

USDA-NRCS PLANTS Database
Britton, N.L. and A. Brown, 1913
Illustrated Flora of the Northern
States and Canada. Vol. 2:375.

* Native plant means native to New York State according to the New York State Museum's *Revised Checklist of New York State Plants, 1997*.

The primary sources used for this Appendix are:

- U.S. Forest Service's website at <http://www.na.fs.fed.us> (Species Accounts and Silvics Manual)
- U.S. Dept. of Agriculture PLANTS Database <http://plants.usda.gov>.

Other supplemental sources are listed in the References section.

Appendix IV: Trees Used in Mined Land Reclamation

Mine operators are responsible for doing any research necessary to determine that a tree is correct for their specific mine site. However, information on a few trees is presented here to provide a head start (additional potential trees for reclamation are listed on pages 53-54).

Note that the majority of information included here comes from the U.S. Forest Service's website at <http://www.na.fs.fed.us> and the U.S. Dept. of Agriculture PLANTS Database <http://plants.usda.gov>. These main sources were supplemented with other paper and web sources. The mix used (national vs. New York, forestry vs. landscaping) means that this Appendix may include some information that does not completely apply to a challenging mine setting. It may also include nationwide information that is not completely tailored to New York. Nonetheless, it should provide useful background.

It is very important to recognize that plant traits can vary by both geographic source and cultivar (e.g. rate of growth, cold hardiness, soil preferences, etc.). Therefore:

- **Check with your nursery supplier on the exact requirements and traits of plants they are selling.**
- Remember that Regional Mined Land Reclamation Specialists, staff at local Soil and Water Conservation District Offices and staff at Cornell University may also have additional information on how a plant will perform in your area of New York and type of mine setting involved.

All Recommended Trees

The following applies to all the trees recommended in this Appendix:

Advantages: All the trees included in this Appendix are conifers. Compared to deciduous trees they are generally less palatable to wildlife for winter food so less susceptible to browse damage. Conifers are also particularly good at providing year-round visual screening, which may be a useful aesthetic consideration. Depending on the setting, their ability to serve as wind barriers can also reduce erosion, provide a living snow fence and/or save on energy consumption.

Problems: With the exception of the Blue Spruce, the coniferous trees included in this appendix are sensitive to salt damage, which should be considered in roadside reclamation.

Blue Spruce (*Picea pungens*)

Origin: Introduced*

An evergreen tree with a dense, pyramidal to spire-shaped crown. Maximum height of 20 feet at 20 years (maturity 70-115 feet). The tree is slow growing and long-lived.

Uses: Blue Spruce is valued mainly for its appearance. It is planted as an ornamental and grown commercially for Christmas trees. Good for roadside reclamation. Provides cover for a variety of bird and animal species. Browse potential low.

Growth Requirements: According to the US Forest Service, basic information on the exact soil and siting needs of Blue Spruce is limited. Blue Spruce grows on soils that vary widely in texture and physical and chemical characteristics. Usually the soils are young. Due to its shallow roots, Blue Spruce does best on moist sites where water is close to the surface. It can withstand some flooding, but also withstands drought better than any other spruce.

Tolerances:

Min. Temp. -38° Shade - Medium Drought - Medium Salinity - ?¹

Soil Requirements:

Soil pH 5.5-7.8 Soil Fertility- Medium Root Depth (Min.) 18"
Soil Texture - Medium to Coarse

¹ - Listed in USDA Plant Characteristics sheet as "None", but USDA staff say this is an error and actually rates **Medium (nationwide scale)**, which might equal High for NY. **Cornell rates as High.**

White Spruce (*Picea glauca*)

Origin: Native*

Conical-shaped evergreen with maximum height of 30 feet at 20 years. Mature height in northeast U.S. typically 40 - 70 feet. Slow growth rate. Moderate lifespan.

Uses: White Spruce is an important commercial tree harvested primarily for pulpwood and lumber. White Spruce provides good wildlife cover and is particularly important as winter shelter. While White Spruce is not a preferred browse (rated Low), the seeds are very important to a number of smaller mammals and birds. White Spruce seed is a primary food of red squirrels and they prefer the seeds over those from Black Spruce. Chickadees, nuthatches and the pine siskin extract seed from open cones and eat seeds off the ground. Mice, voles, shrews and chipmunks consume large quantities of seed off the ground.

Growth Requirements: White Spruce grows well on moderate to well-drained loams, silt loams, and clays, but rather poorly on sandy soils. Of the trees recommended in this appendix, White Spruce covers the broadest pH range and has lowest temperature tolerance (-65E), the highest drought tolerance and the highest soil fertility requirements. Suffolk County Cooperative Extension has identified it as a tree that will grow well on moist sites, but stresses that this does not mean compacted, poorly-drained soils. It takes fairly well to city air pollution.

Tolerances:

Min. Temp. -65° Shade - Medium Drought - High Salinity - None

Soil Requirements:

Soil pH 4-8.2 Soil Fertility- High Root Depth (Min.) 30"
Soil Texture - Fine to Coarse

Norway Spruce (*Picea abies*)

Origin: Introduced*

Pyramidal evergreen with pendulous branches. Maximum height at 20 years is 35 feet (mature 100-130 feet). Slow growth rate, moderate lifespan.

Uses: Norway Spruce has been successfully used in reclaiming surface mine spoils in Indiana for over 40 years. Norway Spruce wood is widely used for construction, pulp, furniture and musical instruments. The tree provides important winter cover for a wide range of wildlife. While Norway Spruce is not a preferred browse (rated Low or Very Low), grouse eat spruce needles and the seeds are consumed by a number of small birds and mammals.

Growth Requirements: Norway Spruce prefers moderately moist well-drained sandy sites, but can succeed on a wide range of soil types and difficult settings. Permanently waterlogged soils

Continued ⇨

Norway Spruce continued

inhibit the spruce's growth, but it does occur on poorly-drained soils and in bogs. However, it is not suited for nutrient-deficient or persistently droughty soils. Tolerates city air pollution well.

Tolerances:

Min. Temp. -38° Shade - Medium Drought - Medium Salinity - None

Soil Requirements:

Soil pH 5-7 Soil Fertility- Medium Root Depth (Min.) 28"
Soil Texture - Fine to Medium

Red Pine (*Pinus resinosa*)

Origin: Native*

An erect evergreen tree with a maximum height of 30 feet at 20 years. It usually attains a height of 70 to 80 feet at maturity, but occasionally reaches almost 150 feet. Rapid growth rate, moderate lifespan.

Uses: Stands of Red Pine provide cover, nesting sites, and food for many species of birds and mammals similar to White Pine. If bald eagles are present, they may build their nest in the crown of a living Red or White Pine. Red Pine is used primarily for structural timber and pulpwood. The wood is moderately hard and straight grained. The tree's browse potential is Low.

Growth Requirements: Red Pine thrives on dry gravelly ridges and sandy plains where poor (dry sandy, acidic, infertile) soils are found. The tree also grows on hilltops and mountain slopes up to 2,700 feet in the Adirondacks. Rare on low wet ground. Red Pine performs well on a variety of mine spoils, especially in the northern Appalachian Mountain region. Red Pine is recommended for planting on: dry upper slopes, outwash sand and gravel deposits, sandy valley floors, all sandy loamy mine spoils, and on clay spoils that have a high proportion of stone.

Tolerances:

Min. Temp. -43° Shade - Intolerant Drought - Low Salinity - None

Soil Requirements:

Soil pH 4.5-6 Soil Fertility- Low Root Depth (Min.) 40"
Soil Texture - Medium to Coarse

Eastern White Pine continued

compacted clay soils. Cornell rates as extremely sensitive to air pollution. Seedlings require weed control for the first few years after planting.

Tolerances:

Min. Temp. -33° Shade - Intermediate Drought - None Salinity - None

Soil Requirements:

Soil pH - 4-6.5 Soil Fertility- Low Root Depth (Min.) 40"
Soil Texture - Medium



Eastern White Pine Illustration

USDA-NRCS PLANTS Database
Britton, N.L. and A. Brown, 1913
Illustrated Flora of the Northern
States and Canada. Vol. 1:56.

* Native plant means native to New York State according to the New York State Museum's *Revised Checklist of New York State Plants*, 1997.

The primary sources used for this Appendix are:

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- U.S. Forest Service's website at <http://www.na.fs.fed.us> (Species Accounts and Silvics Manual)

Other supplemental sources are listed in the References section.

Appendix V: Top 20 Invasive Plants in New York State

1. **Black Locust:** *Robinia pseudoacacia*

Problems: An early successional plant that spreads rapidly, creating dense stands that shade and compete with native sun-loving plants. Nitrogen fixation in locust stands may allow other invasive plants to compete easily with natives. It resprouts after cutting, making control measures difficult. Although a late spring flowering tree, the large and fragrant blossoms can compete with native vegetation for pollination services. Black locust is most problematic in some rare habitats in NYS, especially pine barrens. Its seedlings can form a monoculture and crowd out other native tree species. Since no other species can exist with it, the soil beneath the trees is bare and subject to erosion.

2. **Black Swallow-wort** (Cynanchum species): *C. nigrum* and *C. rossicum*

Problems: Black swallow-wort is invasive in disturbed and recently cleared areas. The plant's numerous wind-borne seeds allow it to disperse over broad areas. This leads to the displacement of native plants through overcrowding. Black swallow-wort's fibrous root system makes it difficult to pull, and time consuming to eradicate. Over-wintering buds on the root crowns sprout readily when the plant is mowed or partially pulled.

3. **Buckthorn Species:** Common buckthorn - *Rhamnus cathartica*; Smooth buckthorn - *Rhamnus frangula*

Problems: Invasive, especially in calcareous soils where they replace woodland wildflowers and can change the structure of the plant community. They thrive in disturbed habitats, and establish in suitable natural areas. Plants invade selectively cut or grazed woods, and impede natural succession by forming dense monotypic thickets.

4. **Common Reed:** *Phragmites australis*

Problems: Spreads rapidly through prolific seeds and underground root systems called rhizomes. Rhizome fragments are dispersed by water, animals, and construction equipment; can quickly replace desirable wetland species such as wild rice, cattails, and native wetland orchids. Monocultures as large as 7,000 acres have been documented.

5. Curly Pondweed: *Potamogeton crispus*

Problems: New plants form under ice cover during late winter, making curly leaf pondweed one of the first nuisance aquatic plants to emerge in the early spring. Plant die-offs in mid-summer may result in a critical loss of dissolved oxygen. Also, decaying plant matter can increase water nutrients and contribute to subsequent algal blooms.

6. Olive Species: Autumn olive - *Elaeagnus umbellata*; Russian olive - *E. angustifolia*

Problems: Both are very troublesome invasives that create heavy shade and suppress plants that require direct sunlight in areas such as fields, prairies, open woodlands and forest edges. Russian olive can displace native plants such as cottonwoods and willows in riparian woodlands. They can become monocultures covering many acres.

7. Eurasian Watermilfoil: *Myriophyllum spicatum*

Problems: It produces dense water canopies that shade out native plants, including waterfowl food plants such as *Vallisneria* and *Ruppia maritima*. Infestations result in decreased oxygen levels under mats and an elevated pH. The decomposition of plant mass at the end of the season results in nitrogen and phosphorus loading. It reduces waterfowl overwintering in some water bodies. Eurasian water milfoil also provides breeding grounds for mosquitoes, interferes with navigation and recreation, and clogs water intakes.

8. Garlic Mustard: *Alliaria petiolata*

Problems: Garlic mustard is one of the few invasive plants that dominates the understory of forested areas by growing during early spring when native species are dormant. Prolific seed production and lack of natural predators allow it to quickly dominate the herbaceous layer. In stands dominated by garlic mustard, studies have shown that total perennial cover declines by 33-46%. Native herbs in competition with garlic mustard may suffer population declines.

9. Honeysuckles (non-native shrub species), including: Fly honeysuckle - *Lonicera morrowii*
Tartarian honeysuckle - *Lonicera tatarica*

Problems: Bush honeysuckles can rapidly invade a site by forming a dense shrub layer that suppresses native woody and herbaceous plants. Leaves emerge on honeysuckles during early spring, and foliage remains until November. Infestations of the plants lead to a decrease in available light and a reduction in soil moisture and nutrients. Honeysuckles may also release toxic chemicals into the soil that inhibit the growth of adjacent native plants.

10. Japanese Barberry: *Berberis thunbergii*

Problems: It has escaped into fields and woodlands, where it displaces native wildflowers, shrubs and tree seedlings. In areas with alkaline soil, it can become dominant in open pastures. Cows and deer only browse early spring growth, and established plants have no natural predators. Its less common cousin *Berberis vulgaris* (common barberry) may be a problem in more calcareous woodlands. Studies have found that *Berberis* infestations can also lead to changes in soil pH.

11. Japanese Honeysuckle: *Lonicera japonica*

Problems: Dense, strangling growths can affect desirable vegetation by decreasing light availability, depleting soil moisture and nutrients, and/or toppling upright stems under the weight of vines. Infestations may result in malformed tree trunks, suppression of plant growth, inhibition of regeneration in woody and herbaceous plants, and alteration of habitats used by native wildlife.

12. Japanese Knotweed: *Polygonum cuspidatum*

Problems: Stems produce dense stands that crowd all other vegetation, degrading native plant habitat. Control is difficult due to vigorous rhizomes that form a deep mat. Plants can re-sprout from fragments, and infestations are common along streams. During winter dormancy, the species standing biomass is a fire hazard.

13. Japanese Stilt Grass: *Microstegium vimineum*

Problems: Covers large areas as a monoculture and crowds out native herbaceous species. Persists throughout the growing season. Has a competitive advantage to native plants because it has no natural enemies and is not browsed by deer.

14. Multiflora Rose: *Rosa multiflora*

Problems: Multiflora rose spreads quickly, forming impenetrable thickets that exclude native plant species. It invades areas that have been subjected to land disturbance, and impedes succession. Studies have shown that it is highly competitive for soil nutrients, and it has lowered crop yields in adjacent field plantings.

15. Norway Maple : *Acer platanoides*

Problems: Generally a problem species invading natural areas near cities. Its seedlings can form a monoculture and crowd out other native tree species. Grasses do well as an understory ground cover. (Since no other species can exist with it, the soil beneath the trees may become bare and subject to erosion.)

16. Oriental Bittersweet: *Celastrus orbiculatus*

Problems: An extremely invasive plant that reproduces by seeds, above ground stems (stolons), below ground stems (rhizomes) and shoots from the roots (root-suckering). Dense stands of vines can shade and suppress native vegetation. Its climbing habit kills nearby plants by preventing photosynthesis, constricting stems, and uprooting plants. Once established, it is very difficult to control.

17. Porcelainberry: *Ampelopsis brevipedunculata*

Problems: Once established in natural areas, it grows quickly and covers large areas of shrub and tree canopy. It is relatively insect and disease resistant and can outcompete native species for sun, water, and nutrients.

18. Purple Loosestrife: *Lythrum salicaria*

Problems: Purple loosestrife crowds out native wetland vegetation, such as cattails, grasses, sedges and rushes. It can form extensive monospecific stands that replace native plant species. Biological control efforts are being undertaken in many parts of the state with European beetles and weevils.

19. Spotted or Bushy Knapweed: *Centaurea maculosa*

Problems: Spotted knapweed is able to rapidly colonize disturbed areas, leading to a decline in native vegetation. A phytotoxic substance present in knapweed's foliage and roots is effective at retarding the root growth of surrounding plants. The root system of the plant is a poor soil anchor, and studies have shown elevated erosion on infested sites. It is unpalatable to grazing animals and it has few natural predators.

20. Water Chestnut: *Trapa natans*

Problems: Mats of water chestnut plants can cover large expanses of water. Submerged aquatic plants such as *Vallisneria americana* and other waterfowl food plants are reduced due to shading. Infestations can make boating, fishing and swimming difficult or impossible. Rapid sedimentation may occur in water chestnut areas due to trapping of silt. Rapid decomposition of plants at the end of the summer can reduce dissolved oxygen levels. Seeds can cause painful injury when stepped on.

Appendix VI: Recommended Web Sites for Supplemental Information

Soil Maps & ID for NY - The main source of soil information in New York is the appropriate county office of the Soil and Water Conservation District for the mine area. The New York Association of Conservation Districts has contact information for each county office at <http://www.nyacd.org/districts.html>. Links for county SWCD offices that have a website can be found at <http://www.nacdnet.org/resources/NY.htm>. In addition to detailed soil maps, the staff in these offices often have great local expertise on growing conditions and the best plants to select.

Soil Testing in NY - Local County Cornell Cooperative Extension Offices listed at http://www.cce.cornell.edu/local_offices.cfm coordinate the wide variety of reasonably-priced soil testing services offered by Cornell University, Department of Crop and Soil Sciences.

Conservation Practices - The US Department of Agriculture (USDA), Natural Resources Conservation Service, publishes the online version of the “National Handbook of Conservation Practices” at their web site <http://www.nrcs.usda.gov>. Select “Technical Resources”, then select “Technical Reference” then select “Conservation Practice Standards”. Additional information on supplements specific to New York State can be found at <http://www.ny.nrcs.usda.gov/>.

The **Forage Species Selection Tool** was developed by Cornell University specifically for NY State. While designed mainly for agriculture, it also covers conservation uses, such as reclamation of disturbed areas, erosion control and creation of wildlife habitat. The user provides information on the site location, basic soil characteristics and intended plant use and the system generates a recommended seed mix. Soil type can be selected from a list, or the program can estimate the soil type based on county, zip code and basic soil characteristics. The site also contains links to fact sheets for 34 individual forage species and a number of mixtures. Go to <http://www.forages.org>.

Forage Information System (FIS) is being developed at the Department of Crop & Soil Science, Oregon State University (Corvallis) to provide a global forage information resource at <http://forages.oregonstate.edu/>. It has many excellent links.

VegSpec is an expert system developed jointly by three federal agencies. This powerful tool allows experts in the revegetation industry to select plants for land reclamation projects. To arrive at a list of suitable plants, the user is required to identify the reclamation objective (e.g. critical area planting, cover crop, filter strips, or pasture), soil series, climate, and site information. Users may further refine recommendations by entering additional factors such as season of growth, fire tolerance, etc.

Once the user settles on specific plants, VegSpec evaluates potential compatibility problems of the mixture and helps calculate seeding rates. The VegSpec system also helps design the planting operation, including site preparation, soil amendments, planting dates and methods, etc. VegSpec can be accessed at <http://plants.usda.gov/> (described on next page) under the “Plant Tools” box.

PLANTS Database at <http://plants.usda.gov/> is an award winning website developed by the U.S. Department of Agriculture, Natural Resources Conservation Service. It could safely be called the WalMart of plant information sites. It provides basic information on 43,000 plants found in the U.S. There is also much more detailed information on 2,000 conservation plants (ones with proven soil and water conservation uses) in the form of “Plant Characteristic” sheets covering over 80 traits (physiological, growth, reproductive and usage). There is also a wide selection of Plant Fact Sheets and Plant Guides (2-8 pages, 500 guides). See http://plants.usda.gov/cgi_bin/fact_sheet.cgi/. Other special categories of information on the website are too numerous to list here. Just check it out. Also see Website Tip #2 and footnote.

Plants/ Native Vegetation - Cornell has an easy-to-follow analysis of the complex issues involved in defining what a “native plant” is, as well as practical criteria for guiding native plant decisions at <http://www.gardening.cornell.edu/factsheets/ecogardening/native.html>. Information on how to select, plant, and maintain native plant species can be found at http://parks.state.co.us/cnap/Revegetation_Guide/Reveg_index.html and <http://www3.gov.ab.ca/srd/land/> and search under “Native Plants”. However, please note that these websites were written for other areas and not all information may be applicable to New York.

Plants/ Invasive Species - The Nation’s Invasive Species Information System at <http://www.invasivespecies.gov/> provides very useful information on invasive plants in the United States. It also lists the relevant federal and state laws and regulations on invasive plants. There is also extensive information on invasive species at <http://plants.usda.gov/>. For more specific information on invasive species in New York State, go to <http://www.ipcnys.org/>

National Reclamation Research - The Powell River Project Education Center is a coal mine reclamation research facility run by Virginia Tech University for the U.S. Office of Surface Mining since 1980. While New York does not have any coal mines, research conducted at this site has had a profound impact on reclamation practices for all types of mines nationwide. Go to <http://www.ext.vt.edu/pubs/mines/460-127/460-127.html>

U.S. Forest Service - Detailed species accounts for a wide assortment of trees (300), shrubs (330) and forbs (150) can be found at <http://www.fs.fed.us/database/feis/plants/>. They can also be accessed through the USDA PLANTS database. When the link is available it usually says “View species account from USDA Forest Service Fire Effects Information System (FEIS)”.

The U.S. Forest Service’s 2-volume Silvics Manual (Coniferous and Deciduous) found at http://www.na.fs.fed.us/spfo/fth_pub.htm has the most detailed tree information that staff encountered on the web (for example, White Spruce - 38 pages with 195 literature references).

Measuring Revegetation Success - “Standards for Evaluation of Revegetation Success and Recommended Procedures for Pre-and Post-mining Vegetation Assessments”, published by North Dakota Public Service Commission, Reclamation Division, can be found at <http://www.psc.state.nd.us>

Website Tips



Tip #1 Before visiting supplemental websites, become familiar with the information in this DEC Division of Mineral Resources' manual first.

Tip #2 When searching websites for plant factsheets, plant guides and other useful resources, you may need to check under more than one version of the plant name*. It depends on how integrated the website is.

* For example Highbush Cranberry may be covered under *Viburnum trilobum*, *Viburnum edule*, *Viburnum opulus*, *Viburnum opulus* var. *edule*, *Viburnum opulus* L. var. *americanum*, *Viburnum paucifolium* or *Viburnum acerifolium*. Many plants also have more than one common name.