



Revegetation with tall fescue and clovers on a Dippel & Dippel Coal Co. contour mine in Monongalia County. This site has produced approximately 1.5 tons of forage per acre during the past five years with little management.



Japanese millet (a summer annual) growing on a Davis Trucking Co. reclaimed surface mine in Tucker County.

# Species for Revegetation: Grasses

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Revegetating surface mined lands is important to control runoff, erosion, and sedimentation. Research has shown that streams in mined and revegetated watersheds have lower peak flows than streams in adjacent, unmined, forested watersheds.

Aside from reducing surface runoff and erosion, revegetation also enhances the aesthetic quality of the landscape and encourages minesoil development through the addition of organic matter. Ultimately, revegetation promotes establishment of productive land uses such as hayland, pasture, and wildlife habitat on the disturbed area.

Grasses are the most commonly seeded plants in revegetation programs for several reasons. First,

numerous grass species are available for seeding. Second, seed of grass species adapted to disturbed areas is readily available at a reasonable cost. Third, the grass family (when taken as a whole) is tolerant of a wide variety of environmental and soil conditions, and several grasses are adapted to germinate, establish, and grow on harsh sites. There are certain grass species that have proven their suitability in providing cover and forage for specific postmining land uses. Many species are capable of producing large amounts of biomass in just a few weeks and respond quickly to fertilizer and management, while other species may be slower growing and persist on the site for long periods without management.

For these reasons, a good revegetation program will always contain one or more grasses as a major component of the seed mix that will meet the postmining land use objective. Most West Virginia revegetation programs include two or three grasses and two legumes in the seed mix (see *Species for Revegetation: Legumes, Green Lands*, 17 (4): 35-39, Winter 1988).

## Temporary Cover

After regrading and topsoiling, all disturbed areas must be revegetated as quickly as possible. Species that germinate, establish, and grow rapidly must be selected to stabilize the site. Annual grasses (such as foxtail millet, Japanese millet, pearl millet, oats, rye, annual ryegrass, or wheat)



**Table 1. Grasses available for seeding in revegetation programs of the eastern U.S.**

Common Name ( <i>Scientific Name</i> )	Principal Cultivars	Life Cycle	Growth Season	Origin	Seeding Rate Pounds PLS/ac	Ease of Establishment
<b>Kentucky Bluegrass</b> ( <i>Poa pratensis</i> )	Numerous turf varieties	P	C	I	15-20	Fair
<b>Smooth Brome</b> ( <i>Bromus inermis</i> )	Saratoga Lincoln, others	P	C	I	10-15	Fair
<b>Deertongue</b> ( <i>Panicum clandestinum</i> )	Tioga	P	W	N	10-15	Fair
<b>Tall Fescue</b> ( <i>Festuca arundinacea</i> )	Kentucky 31, Johnstone, Alta Forager, Kenhy	P	C	I	10-20	Good
<b>Weeping Lovegrass</b> ( <i>Eragrostis curvula</i> )	Morpa	P	W	I	2-5	Good
<b>Foxtail Millet</b> ( <i>Setaria italica</i> )	German	A	W	I	20-30	Good
<b>Japanese Millet</b> ( <i>Echinochloa crusgalli</i> )		A	W	I	20-30	Good
<b>Pearl Millet</b> ( <i>Pennisetum americanum</i> )	Gahi - 1, Starr	A	W	I	15-20	Good
<b>Oats</b> ( <i>Avena sativa</i> )	Noble, Otee Ogle, others	A	C	I	30-50	Good
<b>Orchardgrass</b> ( <i>Dactylis glomerata</i> )	Pennlate, Potomac, Hallmark, others	P	C	I	10-20	Good
<b>Redtop</b> ( <i>Agrostis gigantea</i> )	Common	P	C	I	5-10	Fair
<b>Winter Rye</b> ( <i>Secale cereale</i> )	Balbo, Abruzzi Arostook	A	C	I	30-50	Good
<b>Annual Ryegrass</b> ( <i>Lolium multiflorum</i> )	Numerous cultivars	A	C	I	5-10	Good
<b>Perennial Ryegrass</b> ( <i>Lolium perenne</i> )	Numerous cultivars	P	C	I	10-15	Good
<b>Sudangrass</b> ( <i>Sorghum sudanense</i> )	Piper, Common	A	W	I	20-30	Good
<b>Switchgrass</b> ( <i>Penicum virgatu</i> )	Cave-in-Rock Blackwell, Kanlow	P	W	N	2-5	Fair
<b>Winter Wheat</b> ( <i>Triticum aestivum</i> )	Feland, Severn, Tyler, Wheeler, others	A	C	I	30-60	Good



Persistence	Tolerance					Lower pH limit
	Drought	Cold	Acid	Salt	High Water	
Fair Shallow rooted sod-former.	Poor	Good	Fair	Fair	Fair	5.5
Fair Forms dense sod. Good palatability.	Good	Good	Poor	Good	Fair	5.0
Good Acid tolerant, drought resistant.	Good	Poor	Good	Fair	Fair	4.0
Good Most commonly seed grass on mined areas. Drought resistant. Endophyte free seed.	Good	Good	Good	Good	Fair	4.5
Fair Tolerant of acid minesoils and dry conditions. Short lived perennial.	Good	Fair	Good	Fair	Fair	4.0
Poor Rapid establishing, temporary crop. Seed in summer.	Fair	Poor	Fair	Fair	Good	4.5
Poor Quick, temporary cover. Wildlife food.	Poor	Poor	Fair	Fair	Good	4.5
Poor Fast growing, tall, annual. Food for wildlife.	Poor	Poor	Good	Fair	Good	4.0
Poor Quick, temporary crop.	Fair	Fair	Fair	Fair	Poor	4.5
Good Develops rapidly and long lived. Used in wildlife plantings.	Good	Good	Fair	Fair	Good	4.5
Good Sod former. Adapted to a wide variety of soils. Short lived if not managed.	Good	Good	Good	Good	Good	4.0
Poor Suitable for cover crop. Provides quick temporary cover.	Fair	Fair	Fair	Fair	Poor	4.5
Poor Good winter annual. Outcompetes perennial grasses.	Poor	Good	Poor	Fair	Fair	4.5
Fair Short lived perennial. Dominates stands for 2 years.	Poor	Good	Poor	Fair	Fair	4.5
Poor Temporary, quick cover. Seed during summer.	Good	Poor	Fair	Fair	Poor	4.5
Good Rhizomatous, acid tolerant, tall. Slower establishing.	Good	Good	Good	Fair	Good	4.0
Poor Similar to rye.	Fair	Fair	Fair	Fair	Poor	4.5



are often seeded to provide quick, temporary cover (Table 1). The millets and sudangrass are often selected when seeding disturbed areas during summer months (June-August), while cool season annuals are best seeded during early spring and late fall. Some perennial grasses are known to establish quickly on disturbed sites (i.e., redbud, perennial ryegrass, weeping lovegrass, and tall fescue).

Competition among species for moisture, light, nutrients, and space is an inherent problem when seeding more than three species in a mixture. Usually one or two of the species in the mixture (especially the annuals) will germinate and establish quicker than the other species. A common practice is to seed permanent species (perennial grasses and legumes) into the mulch created by the temporary annual species either in the fall or spring following senescence of the annual crop.

#### Time of Seeding

Regardless of the season or month in which a regraded area is prepared for seeding, grass species can be found that are adapted to the particular soil and environmental conditions of the site. Cool season grasses are best suited for seeding in March-April and September-October. Some cool season grasses, especially the winter annuals, can be seeded through November. December seedings have generally not been successful because the tiny seedlings are unable to withstand the January and February cold weather.

Many reclamationists feel that seeding in summer is a waste of time and material. However, experience and research provide examples of successful establishment of both temporary and permanent vegetation during the summer months. Warm season grasses (especially the summer annuals) can germinate and establish under drier and hotter condi-

tions than cool season grasses, but the summer grasses still require some moisture to be present in the soil. The rainfall amount and distribution during June, July, and August can be highly variable from year to year, and are the two primary limiting factors for successful summer vegetation establishment.

Revegetation is a key in a successful reclamation program, and great strides have been made during the past 20 years in reclamation techniques to produce fertile minesoils and selection of plant species for use on disturbed lands. While each revegetation specialist has his/her own favorite seeding technique and seed mix, it is important to select plant species which will quickly provide cover on a site and reduce the potential for erosion. Successful establishment of the right kind of vegetation for creation of a productive land use is our reclamation objective.

## References

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