# STRONG HABIT OF SPRUCE DOMINATES HOMES YET FITS INTIMATE AREAS

**By Douglas Chapman,** Horticulturist, Dow Gardens, Midland, MI

Spruce *(Picea)* makes an effective tree for golf courses, institutional grounds, parks, and large-area landscapes. It is also a fine specimen and attractive in mass plantings. Spruce grow native in the cool-humid-boreal region of the country from New England through the Great Lakes to the West Coast. Species spruce are fairly stiff and formal. Their habit is a strong vertical line which can dominate home landscapes, yet cultivars have been developed which fit small, intimate landscapes. When young, the trees are thick; while at maturity, the lower branches thin or die off destroying the landscape effectiveness. They are sun dependent. Shade or competition from other trees will cause thinning, decline, or death. Generally, *Picea* grow best in fertile, moist, yet well-drained soil.

Cytospora canker, heartwood decay (fomes), root rot, rust, and needle cast will attack spruce. Cytospora canker is the most devastating. It limits the useful life of Colorado Spruce *(Picea pungens)* to 20 to 25 years in much of the Midwest.

Insect problems include galls, aphids, budworm, spruce needle miner, scale, and mites. Aphids, spruce needle miner, and mites are the most difficult insects to control in the Midwest. Bagworm causes a significant problem in the Southern Great Lakes, e.g., Illinois, Indiana, and southern Ohio.

The most important species of spruce in the Midwest and Northeast are Norway, White, Serbian, Oriental, Englemann, and Colorado.

**Norway Spruce** *(P. abies)*, a native to Europe, is an outstanding spruce for the Midwest and Northeast. It prefers cool, humid climates, and is very hardy to -72°F., depending upon provenance or local adaption. *P. abies* has a shallow root system and will grow in sandy soil with a relatively high water table. When young, it is a stiff, formal plant; at maturity, this 60-foot tree becomes graceful with pendulous branches. The 4- to 6-inch long cones are cylindrical and hold on for the entire winter. The contrast against a dark green foliage is spectacular. Norway Spruce tolerates salt spray but not soil-applied chlorides. It is an effective specimen tree for large area mass plantings or at the borders of open areas. I feel it is the most graceful and effective of the species spruce.

Several cultivars of Norway Spruce work well for home landscapes. They include 'Maxwell,' 'Nest,' and 'Remont.' 'Maxwell' Norway Spruce *(P. abies*

**Steel blue needles** (above) accentuate the Colorado Spruce, which grows in a wide range of soils but is very susceptible to Cytospora canker.

**Servian Spruce** (*P. Omorika*—left) grows in a dense, symmetrical fashion and reaches an effective landscape height between 40 and 50 feet.

**Spruce** *from page 41*

'Maxwellii'), a dwarf, low globe, growing about one inch a year, has short, bright green needles completely surrounding the stems. 'Nest' Norway Spruce *(P. abies* 'Nudiformis') is a dwarfed, somewhat flat-top globe, growing 2 to 4 inches in height each year with an ultimate height of 7 to 10 feet. 'Remont' Norway Spruce *(P. abies* 'Remonti') is a wide, conical dwarf, reaching 12 feet in height. It grows 4 to 6 inches annually and has brilliant green foliage. These cultivars are extremely effective as accent plants in intimate areas.

**White Spruce** *(P. glauca)* is a broad, pyramidally-shaped tree when young, and becomes somewhat ascending at maturity. Its ultimate peak height ranges between 40 to 60 feet with a spread of 10 to 20 feet. White Spruce is particularly effective in mass plantings, tolerating shade more than Norway or Colorado Spruce. The leaves are ½-inch long, usually crowding the upper side of the stem. They are pale green to glaucous in color. White Spruce transplants readily in moist, loamy soils. Some of its outstanding characteristics include good tolerance to wind, heat, cold, drought, and especially crowding, which is exceptional for spruce. It is most effective in mass planting or groups (3-5) and has a fairly rapid rate of growth.

**Engelmann Spruce** *(P. engel mannii)* is native throughout the Cascades from British Columbia to New Mexico. It is perfectly hardy, withstanding temperatures from -50°F. to a high of 90°F. In its native range it often reaches 100 to 120 feet in height; in the Midwest, this dense, narrow, pyramidal tree rarely reaches over 50 feet in height. It has been reported tolerant to sulfur dioxide and chloride sprays. Disease problems are rare, showing a high degree of resistance to Cytospora canker and heartwood rot (fomes). This species has a coarse texture due to 1-inch long blue-green needles. Engelmann Spruce should be considered one of the outstanding spruce, ranking as high as Norway or White Spruce. In fact, Wyman considered it the best of the ornamental spruces available. As a species or accent in large areas, this plant should be emphasized to increase availability in the trade.

**Servian Spruce** *(P. Omorika)* is an extremely effective dense, symmetrical tree. It grows slower than Norway Spruce, reaching an effective landscape height between 40 and 50 feet, but has been reported over 100 feet in height. It is native in southeastern Europe. The foliage is a good dark green. *P. omorika* is particularly effective for industrial and park landscapes. It does require some winter protection or placement in a north or northeast side of buildings in fertile soil that is well-drained.

**Oriental Spruce** *(P. orientalis)* is a dense, compact pyramidal tree with horizontal branching. Its effective

*Continues on page 55*

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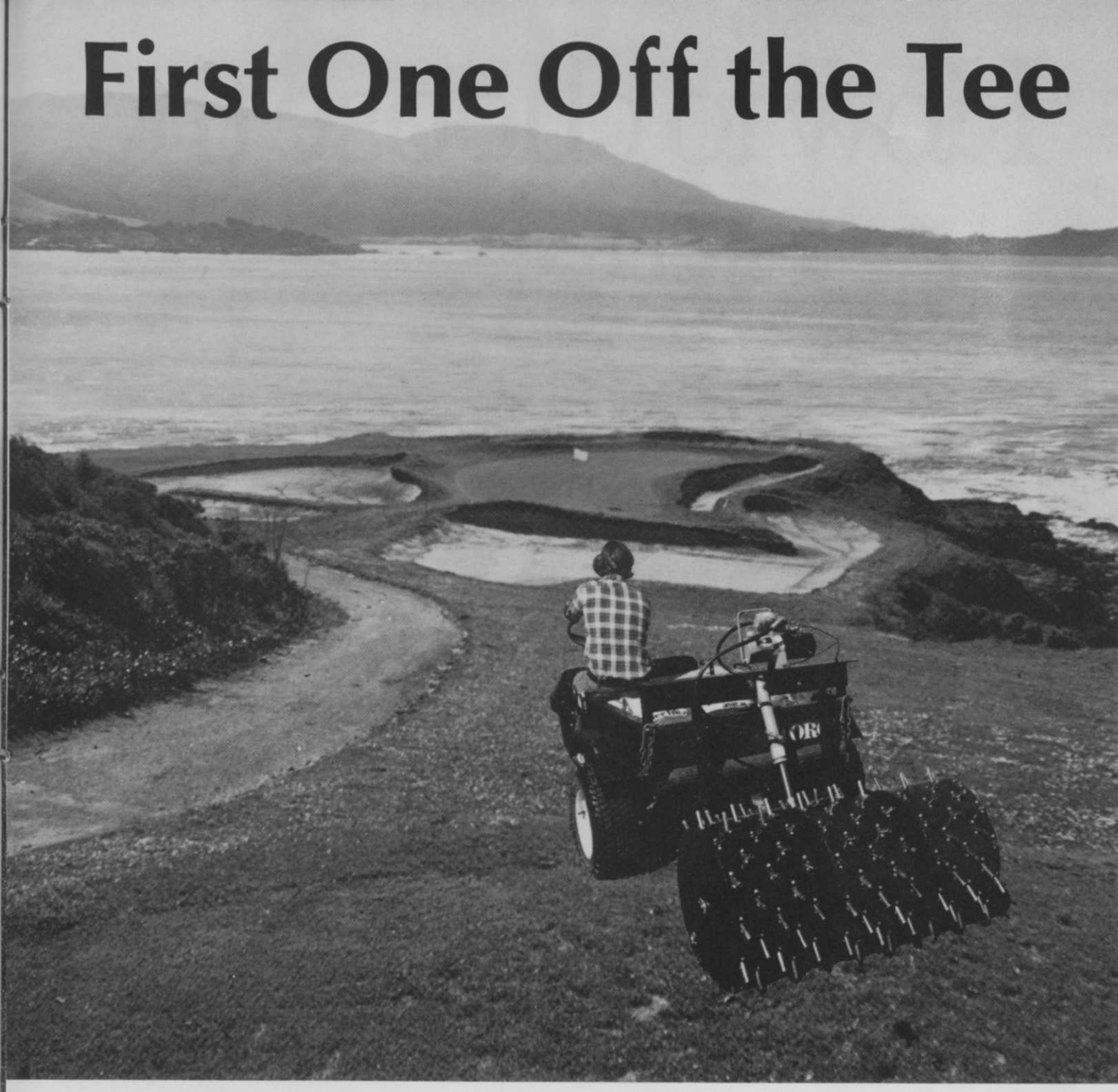

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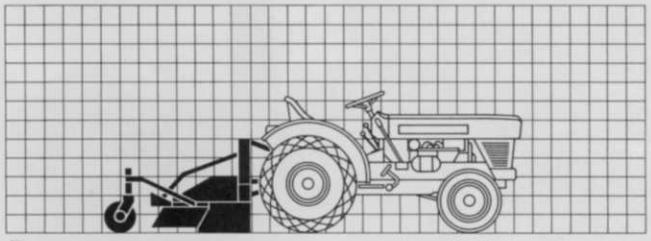

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# REVEGETATING MASSACHUSETTS HIGHWAYS WITH AN ARRAY OF WILDFLOWER SODS

**By Douglas L. Airhart,** assistant professor, Dept. of Plant Pathology and Soil Sciences, University of Massachusetts, Amherst, MA

The task of revegetating and maintaining roadsides is a major concern of highway engineers. Shallow, acid soils with low fertility and poor moisture retention, steep slopes, and southern exposures make challenging problems.

Improved safety specifications have forced areas to be regraded, which requires revegetation. The best solution for these areas would be to establish native plants that are aesthetic yet permanent, requiring minimal cost and maintenance. The standard practice has been to seed with grass, but grasslands are not a natural or climax vegetation in New England and proper maintenance is quite costly.

Another approach, to seed and plant native wildflower species along roadsides, has been established in many prairie states as an alternative to grasses. The flowers chosen are native, sometimes endangered in the area, and are not necessarily limited to highway use (5). Some problems still exist with wildflowers since some seeds are prohibitively expensive, dormancy requirements and grass or plant competition are not fully understood, and methods of establishment have not been specified. The use of sods for plant establishment has been practiced with turf (3) for a number of years. More recently, improved sods have been prepared using plastic netting to reinforce turf (4) or landscape materials (7). These sods provide quick and effective ground cover with proper handling, and can be used for slope stabilization or erosion control (6). Increased interest in roadside beautification has supported the use of wildflower species for plant cover and slope stabilization along highways.

Although some methods have been compared (2) for Massachusetts highways, the most successful method has not been selected. This project was designed to test the adaptiveness of wildflowers being studied on Massachusetts highways for sod production and the ability of these wildflower sods to become established on highway slopes.

## Materials and Methods

The seeding rate study was conducted in French Hall greenhouses on the University of Massachusetts, Amherst campus (U.Mass.). In this test, four seed rates of each of thirteen wildflower species were compared in completely randomized design. The control seed rates varied with suppliers recommendations, and multiple rates of 5, 10, and 20 times were the treatments (Table 1). Sod seedbeds were prepared, using plastic trays (28 x 26 x 5 cm) known as half flats, with a pine barkpeat substrate above and below a piece of Spartan cloth netting to serve as a root binder.

The varieties tested were Black-eyed Susan *(Rudbeckia hirta)*, Blanketflower *(Gaillardia aristata)*, Butterfly Milkweed *(Asclepias tuberosa)*, Chicory *(Chicorum intybua)*, Daisy *(Chrysanthemum leucanthemum* 'Alaska' and 'Ox-eye'), Dame's Rocket *(Hesperis matronalis)*, Evening Primrose *(Oenothera lamarkiana*, Purple Coneflower *(Echinacea purpurea)*, Prairie Coneflower *(Ratibida columnaris)*, Spiked Gayfeather *(Liatris spicata)*, and Yarrow *(Achillea millefolium)*. Seeds were sown by hand on the

**Table 1.** Species, Name, Source and Recommended Seed Rates of Wildflowers used in Sodding[z] Study.

| Wildflower species | Common Name | Source[y] | Recommended Rate g/HF | lbs/Ac |
|---|---|---|---|---|
| *Achillea millefolium* | Yarrow | H | .0104 | 1 |
| *A. millefolium* | 'Roseum' Yarrow | E | .0104 | 1 |
| *Asclepias tuberosa* | Butterfly Milkweed | H | .0520 | 5 |
| *C. leucanthemum* | 'Alaska' Daisy | H | .0624 | 6 |
| *C. leucanthemum* | 'Ox-eye' Daisy | E | .0624 | 6 |
| *Cichorium intybus* | Chicory | E | .0520 | 5 |
| *Echinacea purpurea* | Purple Coneflower | E | .1249 | 12 |
| *Gaillardia aristata* | Blanketflower | E | .1041 | 10 |
| *Hesperis matronalis* | Dame's Rocket | H | .0832 | 8 |
| *Hesperis matronalis* | Dame's Rocket | E | .0832 | 8 |
| *Liatris spicata* | Spiked Gayfeather | E | .1249 | 12 |
| *Oenothera lamarckiana* | Evening Primrose | E | .0312 | 3 |
| *Ratibida columnaris* | Prairie Coneflower | E | .0312 | 3 |
| *Rudbeckia hirta* | Black-eyed Susan | H | .0416 | 4 |
| *Rudbeckia hirta* | Black-eyed Susan | E | .0416 | 4 |

[z]Seeds sown on peat-pine bark medium in 28 x 26 x 5 cm plastic half-flats (HF) under greenhouse conditions (15° C. NT).

[y]E = Environmental Seed Producers, El Monte, CA 91734; H = Herbst Bros. Seed, Brewster, NY 10509.

surface of the substrate and germinated in the greenhouse at 15°C. night temperatures with intermittent misting. After germination, seeds were fertilized weekly with 200 parts per million nitrogen from soluble 20-20-20 fertilizer. Evaluations for sod use were based on the uniformity of plant cover and density of root growth after eight weeks while transplanting into field plots. After 1 year, sods were again examined for overwinter survival and spread into adjacent areas.

The same species were prepared (June, 1979) at the best seed rate for testing on highway slope areas. The test was located on a 2:1 sandy slope facing southwest along I-91 northbound in Bernardston about two miles south of the Vermont border. Plant establishment was evaluated in September and December, 1979.

**Results and Discussion**

The best seed rate for satisfactory sod formation of each species was as follows:

The field seed rate was satisfactory for sod formation of Black-eyed Susan, Evening Primrose and Yarrow, but other species required 5 or 10 times the field seed rate to produce sods. Spiked Gayfeather required 20 times the field rate, which may be economically unfeasible. These seed rates may appear high, but one report (1) stated that four times the recommended rate produced longer and more effective blooming of two wildflowers. A pinestraw mulch increased plant establishment in most cases. If these sods can by placed on bare or critical slopes, natural spreading may be encouraged without expensive treatments or equipment being needed. The grouping or patchy appearance would not be unlike other grass or flower patches that appear on Massachusetts highways, particularly on steep slope areas that are minimally maintained even though they are extremely visible to motorists.

All but four species survived well in the field trial, with half of the survivors beginning to spread into adjacent areas. Winter snow cover was mild, which may have caused part of the mortality due to poor insulation or moisture loss from the substrate. Some plants appeared dead when examined in early spring, but had revived by early summer. Those that spread—Yarrow, Black-eyed Susan, Ox-eye Daisy, Evening Primrose—are recommended for further study for critical slope stabilization.

The response of the highway trial was slightly different, with all but 5 species surviving. Dame's Rocket and Purple Coneflower were not successful survivors in this trial. The slope is steep and sandy, with little cover besides mosses, and the weather was hot and dry when the sods were set out. Water was applied weekly for three weeks after planting but conditions were extreme. The number rooted and alive decreased more than expected, but the winter

*Continues on page 50*

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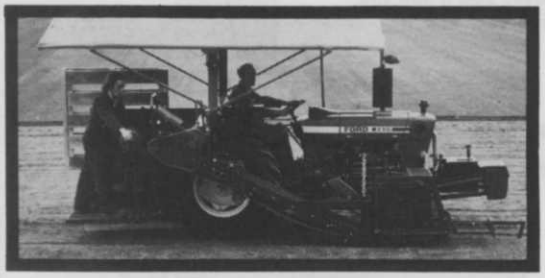

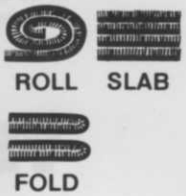


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appearances may not be a true indication of survival or death. There was no indication of spreading into adjacent areas at the last examination (December, 1979).

Wildflower sods can be easily prepared using the techniques described here, although a root binder and high seed densities are required. The binder material can be plastic or cloth netting, with little differences in sod stability between them if roots are given sufficient time to develop. Eight weeks was sufficient time for fine netted cloth, but loose netted plastic may require a longer development period. The binder material serves an additional use when planting on slopes, since excess binder can be covered with soil to help retain the sod and soil adjacent to the sod.

The tap-rooted varieties, Butterfly Milkweed and Spiked Gayfeather, were most difficult to establish and handle as sods, and were not completely satisfactory. Sods of Black-eyed Susan, Ox-eye Daisy, Evening Primrose and Yarrow were first to become established and spread into adjacent areas, by seed or root growth. If suitable, these would be the first varieties to attempt for sodding roadside slopes, although other varieties may be more suitable in different areas.

Time of planting and weather (moisture) conditions may be more critical than sodding method or plant species. The sods can be treated as a container crop, fertilized, hardened off before planting, or held for periods of time until planting conditions are favorable. Flowering may occur before transplanting with Black-eyed Susan, but no apparent setback was noticed in these trials. The sods were easily handled and could be cut into smaller sections to fit small spaces or spread more effectively on slopes. Wildflowers may be established quickly and easily with this sodding method, which may provide the nucleus for establishing larger colonies on inaccessible areas or other areas needing low maintenance and colorful display.

**Literature cited**

1. Doubrava, N. and Raulston. 1978. Establishment techniques for seeding wildflowers on roadsides. HortScience 13(3): 270.
2. Falls, K. M. and Airhart, D.L. 1979. Field Specifications for Establishing Wildflowers in Massachusetts. Mass. Dept. of Public Works R5-9 Interim Report 1.
3. Hanson, A. A. and Juska, F. V. (Eds.). 1963. Turf Grass Science. Am Soc. Agron., Series 14.
4. Mitchell, W. H. and Langston, D. 1974. Sod Production With Plastic Netting. Coop. Ext. Serv., Univ. of Delaware, Newark.
5. Salac, S. S., P. N. Jensen, J. A. Dickerson and R. W. Gray, Jr. 1978. Wildflowers for Nebraska Landscape. Agr. Exp. Sta. Report MP 35. Univ. of Nebraska, Lincoln.
6. Soil Conservation Service. 1975. Conservation Planting on Critical Erosion Areas. U.S.D.A., S.C.S., Syracuse, NY 13260.
7. Sterret, R. B. and T. D. Syndor. 1976. Ground Cover Plants as Sods-A New Production Technique. HortScience 11(3): 329.
8. Zak, R. S. and J. M. Zak. 1977. The Use of Native Wildflowers as Roadside Vegetation. Mass. Dept. of Public Works R5-5 Interim Report 51.