

NORTH CAROLINA SUPPLEMENT – 342-IV-1

U. S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

Technical Guide - Section IV
Rev. April 1991

CRITICAL AREA PLANTING (Acre)

Shrubs, Vines, Trees and Other Plants

Conditions Where Practice Applies

Where a permanent, long-lived vegetative cover other than turf is desired.

Specification Guide

Plant Selection

The plants in this group were selected because they have some definite conservation use and in addition, have the ability to grow on certain problem soils and site conditions. (See Table 342-IV-4). It is not a complete list, but rather a collection of the more common plants -- most of which are available at commercial nurseries.

Planting

Early spring. This allows for the maximum root and top development to check erosion and allows the plant to become established before winter.

Soil Preparation

It is expected that the soils at most critical area planting sites will be amended by the addition of topsoil, compost, peat, sawdust, manure or other organic material. Fertilizer will be used for each planting. Lime will also be required unless the soil is known to have a pH of 6 or above or if the plant requires an acid site.

For close spaced mass plantings apply a commercial granular fertilizer, such as 5-10-10 and organic supplement (such as composted cow manure, peat or well rotted sawdust), and work into the soil prior to planting. Fertilizer rate – 3 to 5 lbs. per 100 sq. ft. The amount of organic material needed will depend upon the soil and plant being used. Plants such as Pachysandra require a high rate of organic material, about a 2-inch layer worked into the root zone. Depending on the soil type and steepness of slope, the depth of soil working will vary from 4 to 6 inches.

For mass plantings on steep slopes (3 to 1 or steeper), working up the entire planting area would not be practical and would induce erosion. Instead, work up the soil in contour rows or dig single holes for each plant. Blend the needed lime, fertilizer and organic material with the soil removed from each hole or furrow. Great care must be taken to avoid fertilizer burn. Use it sparingly. Mix it thoroughly with the soil before planting. If the soil on the slope is not suitable for plant growth, it is best to batch blend a planting medium, such as a mixture of 1:1 or 2:1 sandy loam soil and peat, composted cow manure or well rotted sawdust and 10 lbs. of 5-10-10 and 20 lbs. of lime per cubic yard of soil mix. (If manure is used, delete the 5-10-10).

The entire planted slope should be covered with a protective mulch, such as shredded hardwood bark, grain or pine straw or other weed free organic material. These are essential to conserve moisture, control erosion and suppress weeds. (Note: It requires about a 6-inch layer of mulch to prevent weed growth).

Where erosion hazard is very high, heavy jute matting stapled to the slope will provide excellent erosion control, as will landscape mats of fiberglass or excelsior.

For spaced plantings of individual vines, shrubs or trees, single holes are dug for each plant. Holes must be at least a third larger than needed to accommodate the root system.

If the soil removed from the hole is moderately suitable for plant growth, the organic material, lime and fertilizer may be blended with it and the mixture used for refilling. If the soil is very poor (such as

parent material) mix up a batch of topsoil as described above and use for refilling. The soil around each plant must be thoroughly firmed and left in a saucer-like shape to retain water. The plant must then be watered and mulched. Support tall tree transplants with guy wires.

Maintenance

Some watering, weeding, remulching and feeding may be required for new ground covers or spaced plantings during the period of establishment. Cultivation as such is not recommended as this may encourage erosion and might also cause some root injury. Competing weeds should be pulled or controlled with approved herbicides.*

- * **CAUTION:** Pesticides are dangerous. Use only as directed and heed all precautions on the container label. Check the registration number and be sure that the directions for use include the target pests. Drift from aerial spraying can contaminate nearby crops and forage, lakes, and reservoirs. Improper use and careless disposal of unused portions can lead to poisoning of humans, domestic animals, desirable plants, pollinating insects, fish, and wildlife and can contaminate water supplies.

Fertilize the plantings the spring of the second growing season and thereafter as needed using 2 to 3 lbs. of a granulated commercial fertilizer such as 5-10-10 per 100 sq. ft.

PLANT SPECIES	CONS. USE*	ADAPTED FOR SITES**	ADAPTED AREA CP, P, MTS.	GROWTH RATED RAPID MEDIMUM SLOW	HEIGHT	See PAGE NO.
A. LOW MAT FORMING EVERGREENS						
Bugleflower (Ajuga reptans)	1	a, f	All	R	4-8"	342-IV-8
Lilyturf (Liriope spicata)	1	a, f	All	S	8-12"	342-IV-8
Aaronsbeard (Hypericum calycinum)	1	a, b, f	CP, P	R	10-12"	242-IV-8
Japanese spurge (Pachysandra terminalis)	1, 6	f	All	S-M	6-12"	342-IV-8
Moss pink (Phlox subulata)	1	a, b	All	S	6"	342-IV-8
Lavender cotton (Santolina chamaecyparissus)	1,9	a, b	All	M	1-2'	342-IV-8
Green santolina (Santolina virens)	9	a, b	All	M	10-16"	342-IV-9
Wineleaf cinquefoil (Potentilla tridentata)	1	a, b, c	All	S	4-12"	342-IV-9
B. HERBACEOUS PLANTS						
Daylily (Hemeracallis sp.)	1, 2, 9	a, b	All	M	16-24"	342-IV-9
Crownvetch (Coronilla varia)	1, 2	a, b	P, MTS	M	24"	342-IV-9
Iris (bearded) (Iris sp.)	1	a, b	All	S	1-2'	342-IV-9
Flat pea (Lathyrus sylvestrus)	1	a, b	All	S	1-1 1/2'	342-IV-9
Beargrass (Yucca filamentosa)	1, 6, 9	a, b	CP	S		342-IV-10
Spanish bayonet (Yucca alinifolia)	1, 6, 9	a, b	CP, P	S	4-10'	342-IV-10
Bamboo (Various species)	1, 3	a	CP, P	S	1-20'	342-IV-10
C. EVERGREEN VINES						
English Ivy (Hedera helix)	1, 6	a, f	All	M	1'	342-IV-10
Wintercreeper (Euonymus fortunei)	1, 6	c, f	All	S	10"	342-IV-11
Honeysuckle (Lonicera japonica)	1, 2, 7, 8	a, b, c, e, f	All	M	2'	342-IV-11
Periwinkle (Vinca minor)	1, 6	f	All	M	8"	342-IV-11
Carolina jessamine (Gelsemium sempervirens)	1	a, b, c, e	CP, P	S	16"	342-IV-11
*Conservation Uses:			**Soil & Site Conditions:			
1. Critical area erosion control and beautification 2. Shorelines, stream and ditch banks 3. Screens and windbreaks 4. Clipped hedges 5. Foot traffic barriers 6. City conditions (smog, etc.) 7. Songbird game bird food or cover 8. Upland game bird food or cover 9. Seashore			a. Infertile soils b. Dry sites c. Acid soils d. Wet sites e. Steep cuts f. Shady locations			

PLANT SPECIES	CONS. USE*	ADAPTED FOR SITES**	ADAPTED AREA CP, P, MTS.	GROWTH RAPID MEDIMUM SLOW	HEIGHT	See PAGE NO.
D. DECIDUOUS VINES						
Virginia creeper (Parthenocissus quinquefolia)	1, 6, 7, 9	a, b, c, e	CP, P	M		342-IV-12
Peppervine (Ampelopsis arborea)	1, 9	a, b, c, e	All	R		342-IV-12
Porcelain vine (Ampelopsis brevipedunculata)	1, 7	a, f	CP, P	M		342-IV-12
Muscadine grape (Vitis rotundifolia)	1, 7, 8, 9	a, b, c, e, f	All	S		342-IV-13
Trumpet creeper (Campsis radicans)	1	a, b, c, e	CP, P, MTS	R		342-IV-13
Memorial Rose (Rosa Wichuraiana)	1, 6	a, b, c, e	All	M		342-IV-14
E. EVERGREEN SHRUBS WITH NEEDLES						
Creeping juniper (Juniperus horizontalis)	1, 6	a, b	All	S	12-16"	342-IV-13
Sargent juniper (Juniperus chinensis sargentii)	1, 6, 9	a, b	All	S	2-3'	342-IV-13
Pfitzer's juniper (Juniperus chinensis pfitzeriana)	1, 6, 9	a, b	All	S	3-6"	342-IV-13
Shore juniper (Juniperus conferta)	1, 6, 9	a, b	All	M	1-2'	342-IV-14

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F. EVERGREEN SHRUBS-BROADLEAF						
Thorny elaeagnus (<i>Elaeagnus pungens</i>)	1, 3, 4, 5, 6, 7, 9	a, b, f	CP, P	M	6-10'	342-IV-14
Bigleaf winter creeper (<i>Euonymus fortunei</i> vegetus)	1, 2, 6	a, e, f	All	M	3-4'	342-IV-14
Evergreen euonymous (<i>Euonymus japonicus</i>)	3, 4, 6, 9	a, b	CP, P	R	7-10'	342-IV-14
Waxmyrtle (<i>Myrica cerifera</i>)	1, 3, 7, 8, 9	a, c, d	CP, P	M	10-30'	342-IV-15
Bayberry (<i>Myrica pennsylvanica</i>)	1, 7, 8, 9	a, b, c	All	M	4-7'	342-IV-15
Yaupon holly (<i>Ilex vomitoria</i>)	3, 7, 9	a, b, c, d	CP, P	S	10-24'	342-IV-15
Inkberry (<i>Ilex glabra</i>)	1	a, d	CP	S	6-9'	342-IV-15
California privet (<i>Ligustrum ovaliflorum</i>)	1, 3, 4, 9	a, b	All	R	10-15'	342-IV-16
Japanese privet (<i>Ligustrum japonicum</i>)	1, 3, 4, 6, 9	a, b, f	All	R	8-16'	342-IV-16
Glossy privet (<i>Ligustrum lucidum</i>)	1, 3, 6	a, b	All	R	15-30'	342-IV-16
Regal privet (<i>Ligustrum obtusifolium</i> regelianum)	1, 6, 7, 9	a, b	All	R	4-5'	342-IV-16
Oleander (<i>Nerium oleander</i>)	9	a, b	CP	M	7-15'	342-IV-17
Pittosporum (<i>pittosporum tobira</i>)	3, 6, 9	b	CP	M	6-10'	342-IV-17
Wintergreen barberry (<i>Berberis julianae</i>)	1, 4, 5	a, b, f	All	S	4-6'	342-IV-17
Firethorn (<i>Pyracantha coccinea</i>)	3, 5, 7, 8	f	CP, P, MTS	M	6-10'	342-IV-17

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				RAPID MEDIMUM SLOW	HEIGHT	
G. DECIDUOUS SHRUBS (Continued)						
Tatarian honeysuckle (<i>Lonicera tatarica</i>)	1, 7	a, b	All	R	10-15'	342-IV-18
Arnold dwarf forsythia (<i>Forsythia arnoldi</i>)	1, 6	a, b	All	R	2-3'	342-IV-18
Showy forsythia (<i>Forsythia intermedia Spectabilis</i>)	1, 6	a, b	All	R	7-9'	342-IV-18
Winter jasmine (<i>Jasminum nudiflorum</i>)	1	a, b	All	M	2-4'	342-IV-18
Beautyberry (<i>Callicarpa americana</i>)	1, 7, 8, 9	a, b	CP	M	3-5'	342-IV-19
Rugosa rose (<i>Rosa rugosa</i>)	1, 5, 6, 7, 9	a, b	All	R	4-6'	342-IV-19
Scotch broom (<i>Cytisus scoparius</i>)	1, 9	a, b	All	R	5-7'	342-IV-19
Autumn olive (<i>Elaeagnus umbellata</i>)	1, 3, 7, 8, 9	a, b, c	All	R	7-11'	342-V-20
Tag alder (<i>Alnus rugosa</i>)	2	d	All	M	6-15'	342-IV-20
Rose acacia (<i>Robinia hispida</i>)	1	a, b, c	All	R	5-8'	342-IV-20
Elderberry (<i>Sambucus canadensis</i>)	2, 7	d	All	R	9-12'	342-IV-20
New Jersey tea (<i>Ceanothus americanus</i>)	1	a, b, c	All	M	2-4'	342-IV-21
Shining sumac (<i>Rhus copallina</i>)	1, 8, 9	a, b, c	All	R	11-15'	342-IV-21
Smooth sumac (<i>Rhus glabra</i>)	1, 8, 9	a, b, c	P, MTS	R	12-20'	342-IV-21
Fragrant sumac (<i>Rhus aromatica</i>)	1	a, b, c	P	R	3-6'	342-IV-21
Coralberry (<i>Symphoricarpos orbiculatus</i>)	1, 8	a, b	P, MTS	M	1-2'	342-IV-22
"Bankers" dwarf willow (<i>Salix cottetii</i>)	2	a, d	CP, P	R	4-5'	342-IV-22
"Streamco" purpleosier willow (<i>Salix purpurea</i>)	2	a, d	CP, P	R	6-12'	342-IV-22
Bicolor lespedeza (<i>Lespedeza bicolor</i>)	1, 8	a, b	CP, P	R	6-10'	342-IV-22
Japonica lespedeza VA-70 (<i>Lespedeza japonica VA-70</i>)	1, 8	a, b	CP, P, MTS	R	4-6'	342-IV-22

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Conservation Uses:

1. Critical area erosion control and beautification
2. Shorelines, stream and ditch banks
3. Screens and windbreaks
4. Clipped hedges
5. Foot traffic barriers
6. City conditions (smog, etc.)
7. Songbird game bird food or cover
8. Upland game bird food or cover
9. Seashore

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Soil & Site Conditions:

- a. Infertile soils
- b. Dry sites
- c. Acid soils
- D. Wet sites
- e. Steep cuts
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PLANT SPECIES	CONS. USE*	ADAPTED FOR SITES**	ADAPTED AREA CP, P, MTS.	GROWTH RAPID MEDIMUM SLOW	HEIGHT	See PAGE NO.
H. TREES						
Black locust (Robinia pseudo-acadia)	1, 7, 8	a, b, c	P, MTS	R	75-80'	342-IV-27
Carolina laurel cherry (Prunus caroliniana)	2, 3, 4, 5, 8, 9	a, b, c, f	CP, P, MTS	R	15-30'	342-IV-24
Chinese chestnut	1, 2, 5, 7, 8	a, b, c	CP, P, MTS	R	50-60'	342-IV-24
Eastern redcedar (Juniperus virginiana)	1, 3, 5, 7, 8	a, b, c, f	CP, P, MTS	M	40-50'	342-IV-25
Japanese black pine (Pinus thunbergii))	1, 3, 7, 8, 9	a, b, c, d, e	CP, P, MTS	M-R	90-100'	342-IV 25
Loblolly pine (Pinus taeda)	1, 2, 3, 6, 7, 8	1, b, c, d, e	CP, P	R	90-100'	342-IV-26
Virginia pine (Pinus virginiana)	1, 3, 5, 7, 8	a, b, c, e	CP, P, MTS	M-R	40-50'	342-IV-26
Eastern redbud (Cercis canadensis)	1, 2, 7, 8	a, b, c, f	CP, P, MTS	M-R	15-45'	342-IV-24
River birch (Betula nigra)	1, 2, 7, 8	a, b, c, f	CP, P, MTS	M-B	50-60'	342-IV-25
White poplar (Populus alba)	1, 2, 6, 9	a, b, c, e	CP, P, MTS	R	25-35'	342-IV-27

*	**
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Plant Descriptions

Bugleflower – Ajuga – Reptans

Description: Low fleshy stemmed, leafy forming mats of purple or dark green leaves. Spreads by rhizones. Bright blue to white spring flowers on spikes.

Soil & Site: Prefers moderately moist soils. Will tolerate low fertility and wet to dry sites. Sun or shade.

Use: Medians, roadbanks and other situations in urban areas where planting can be maintained. Low landscaping plants around buildings. Not for traffic areas. Plant 8 to 12" apart. Mulch between plants.

Lilyturf – Liriope spicata

Description: Forms dense cover of dark green, grass-like leaves. White spike of flowers in July. May be mowed but takes only limited foot traffic. Spreads by rhizomes. Extremely heavy mat of roots. Slow grower. (Also, L. graminifolia with narrower and shorter leaves and Ophiopogon japonicus, dwarf mondograss, similar in habit to above but not cold hardy in mountains.)

Soil & Site: All but droughty sites. Prefers shade, tolerates sun.

Use: Especially shady areas, for low borders, circle of cover around tree trunks, medians, etc. Plant 8-10" apart. Mulch between plants helps.

Aaronsbeard – Hypericum calycinum

Description: Leafy stems from ground with solitary, bright yellow flowers, 3" in diameter at branch tips. Leaves to 4" long. Spreads fast from rhizomes.

Soil & Sites: Shady to sunny, sandy, moist to dry.

Use: Roadbanks (northern exposures best), low borders, low masses, city medians. Propagated by divisions, cuttings or seed. Plant 1' apart.

Japanese spurge - Pachysandra Terminalis

Description: Flowers and berries not showy, upright stems thick, fleshy, leaves lustrous, light green 2-4" long. Mass of uniform height.

Soil & Site: Moist soils with high organic matter. Shade to partial shade only. Will grow undertrees but will not take traffic.

Use: Plant rooted cuttings 1' apart under trees or other shade areas.

Moss pink = Phlox subulata

Description: Very low, dense slowly creeping cover resembling a coarse moss. Flowers in spring are blankets of red, white or lavender. Fertilize sparingly.

Soil & Site: Poor, dry, sandy, rock sites in full sun.

Use: Roadbanks, rock gardens and similar situations. Plant 1' apart.

Lavender cotton - Santolina chamaecyparissus

Description: Leaves silvery gray, wooly, ½ to 1 ½" long, aromatic. Has appearance of a "dry land" plant. Plant spreads 3 to 5'. Clip after flowering to control excess growth.

Soil & Site: Poor sandy or gravelly soil, dry sites, full sun.

Use: In group with yuccas, etc., for desert-like motif. City road9ad medians, etc. Plant spacing 18 to 24".

Green santolina - Santolina virens

Description: Same as above except smaller and leaves emerald green all year.

Wineleaf cinquefoil - *Potentilla tridentata*

Description: Flowers 5-petaled white ¼". Leaves dark green, strawberry like, lustrous and very attractive. Grows to a very dense mass. Spreads by rhizomes, but is quite slow. Also, *P. tripetalum* with 3-petal flowers and smaller leaves.

Soil & Site: Dry sites on acid in full sun.

Use: Low garden borders or masses in front of taller permanent plants, median plantings along walkways, etc. Use transplants 6-12" apart.

Daylily - *Hemeracallis* sp.

Description: Various varieties with orange-yellow to red, large lily-like flowers in July. The old fashioned orange types are best for erosion control work. Leaves bright green long, 2' or more, arching, 1 to 1 ½" wide dying to ground in fall. Spreads by tubers.

Soil & Site: Good or poor soil in sun or shade. Prefers moist situations but will do well on dry banks. Will not bloom in shaded locations.

Use: Roadbanks and other slopes and fills, along streambanks. Will do well at the beach if some topsoil is added to sand. Space plants 12 to 24" apart.

Crownvetch - *Cornilla varia*

Description: Abundant fine leafy and viny growth in summer. Leaves compound, blue-green. Pink and white flower clusters (crowns) during long early summer period. Dies to ground in winter leaving only a green rosette. Spreads widely by rhizomes. Takes 2 to 3 years to establish. It is a high lime requiring plant. Best in mountains and upper Piedmont.

Soil & Site: Infertile, rocky, dry soils. Especially well adapted on "sweet" soils and rocky limestone areas. Full sun to partial shade.

Use: Idea for roadbanks, fills and other slopes and along streambanks. New sprouts from rhizomes may be transplanted using a 2 to 3' spacing. Also, seeded at 10 to 15 lbs. per acre. Seed must be inoculated. A light over-seeding of tall fescue (10 to 20 lbs. Per acre) will help to prevent erosion during establishment of the vetch. This is a high lime requiring plant. On acid soils re-lime every 4 to 5 years.

Iris - *Iris* sp.

Description: Upright blade-like leaves 1 to 2 ½" wide and 8 to 24" long, light blue-green, long pointed. Flowers large, showy and of various colors. The bearded irises (large rhizome types) are best for erosion control on poor, dry sites. Does not furnish complete soil protection --especially in winter.

Soil & Site: Dry, fertile to infertile, often rocky sunny sites.

Use: Beautification and erosion protection on banks, fills and roadside gardens in urban areas where some maintenance is possible. Plant rhizomes 1' apart or in contour rows with 1 ½ to 2' middles. Plant near the surface with about 1" or less of soil cover. Clip off half leaf surface when transplanting.

Flat pea - *Lathyrus silvestrus*

Description: A scrambling, viny-type plant with bluish leaves and stems with pink, reddish brown or white sweetpea-like blossoms. Vines 6 to 8' long climbing up on other vegetation and dying back in winter.

Soil & Site: Fertile to infertile, dry to moist sites in full sun to one-half shade.

Use: Beautification of banks and fills. Provides food and cover for wildlife. Seems to be especially vigorous in the upper Piedmont and mountains. Propagation by seed sown in late winter and planted 1 ½ to 3" deep--usually in contour rows. Lathco cultural name.

Beargrass - *Yucca fillimentosa*

Description: Bold, stiff leaves from the ground in tufts 1 to 2' tall with curly threads attached and hanging from edges of leaves. White, bell-shaped flowers borne in June on a tall central stalk to 6'. Fruit -- brown fleshy pods. Seed stalk dies each fall. Also, *Y. filimentosa concava* with broad, stiff, spoon-like leaves.

Soil & Site: Full sun to partial shade. Poor, dry infertile soils including beach dunes.

Use: Road medians, banks, etc., for accent. Often used with Santoline species for desert-type motif. Usually single specimens rather than close groups. Good with tall growing yuccas.

Spanish Bayonet - *Yucca alnifolia*

Description: Slender, tapered, dagger-like, sharp pointed leaves from a central crown at the ground. Flowers in June-early July. Fruit black-purple on a central flower stalk. Short, stocky trunk. Also, *Y. gloriosa* with leaves 2" wide, stiff, smooth and nearly flat. Flowers, sometimes red tinged, appear in October. Forms a short trunk as plant ages. If dead leaves are trimmed from trunk, the plant resembles a miniature palm.

Soil & Site: (See Beargrass above.)

Use: (See Beargrass above.)

Bamboo - Various species

Description: Tall perennial evergreen grasses with hard, hollow, jointed, woody stems. Height varies from the dense growing ground cover types (1 to 2') to tall 40 to 50' specimens, such as the timber bamboo. There are also two general groups: one which spreads vigorously from rhizomes and a second group which increases slowly to form compact clumps. Each stem of bamboo is the product of one growing season. It never adds additional height after the first year. Not until the third or fourth year do the new culms grow to maximum height. Consult local nurseryman for adapted species and additional use information

Soil & Site: Bamboos prefer a moist but well drained site. It is especially adapted along river and stream banks. However, it has been used successfully on moderately dry infertile sites and in gullies. Sun to partial shade.

Use: Low dense types for edgings, foreground plantings. Seldom for mass ground cover. Tall species used for background, screens, and unclipped hedges and windbreaks. Plant rhizomes about 3" deep and end to end in a furrow if a continuous row is desired. For clumps, plant 2 or 3 rhizomes.

English ivy - *Hedera helix*

Description: Mottled gray on green leafy vine, wide spreading on the ground but climbing develops. Aggressive in shaded areas on good soil. Will take out shade grasses, Aaronsbeard, lilyturf and wintercreeper. Very dense ground cover to about 1' deep.

Soil & Site: Prefers moderately fertile sites with medium drainage and high organic content. But will grow on poorer, dryer sites. Prefers shade or north slopes if not under tree cover.

Use: For ground cover in shady area, on banks, or low clipped borders along walks, circles under trees. Plant rooted cuttings 16 to 24" apart. Mulch between plants.

Wintercreeper - *Euonymus fortunei*

Description: Clinging evergreen vine which will form a dense ground cover and will also climb by means of aerial roots on solid surfaces. Stems tack down. Leaves 1 to 2" and dull dark green. Slower and not as vigorous as English ivy but with a smoother, finer textured appearance. Also, *E. fortunei colorata* with leaves turning to purplish red in the winter and *E. fortunei radicans* with leaves 1" long. All of these species are sometimes bothered by Euonymus scale.

Soil & Site: Moist soils of moderate fertility with high organic content. Will grow on well drained sites and will tolerate acid soil.

Use: For weed free, low dense mats in shaded locations. Edging, foreground in front of junipers, etc. Does well on north slopes. Plant rooted cuttings 1" apart.

Honeysuckle - *Lonicera japonica*

Description: The common evergreen vine of southern woods, fence rows and roadsides. Fragrant whitish-yellow blooms in spring, black berries in the fall. Tangled mass of leafy stems which will form a 2' deep ground cover or will climb other vegetation by twining. Stems tack down.

Soil & Site: Wide range of soils – moist to dry, fertile to moderately infertile and acid. Sun or shade.

Use: Principally for roadbanks and especially slopes too steep to seed. After the first year, use nitrogen generously. Mulch between plants which should be spaced 2 to 3'. For a minimum planting, two rows of plants in the moist and loose talus slope will eventually do the job, but at least one more row at the top of the bank will greatly increase the speed of covering. Plants may be seedlings or rooted cuttings from a nursery or rooted stems good wildlife food and cover. A number of songbirds eat the seed. Quail, turkey and deer graze the leaves as well.

Periwinkle - *Vinca minor*

Description: A delicate much branched vine with dark green, lustrous leaves, opposite 1 to 1 ½" long and pointed at both ends. Stems not wide ranging and will not climb. Spring flowers lilac-blue, single, 5 petaled, about 1" in diameter. Forms a dense low mat. One of the best ground covers. Spread is rather slow.

Soil & Site: Sun or shade, will endure moderately infertile and acid soils, moist to fairly dry.

Use: One of the most widely used ground covers because of its wide adaptation to soil and site and its beauty. Use especially in shady locations, low 8" borders, around trunks of trees where grass will not grow on shady banks and those with north exposures. Space plants 12 to 18". An 18" spacing will close by the end of the second season.

Carolina jessamine - *Gelsemium sempervirens*

Description: A twining somewhat straggly vine with narrow, pointed, opposite evergreen leaves. Showy yellow flowers which appear in the spring are very fragrant. The vine is a high climber, and it blooms mostly abundantly when it is hanging from other vegetation or supported on trellis. Trailing stems make a good but not dense ground cover. Vines root at nodes. This plant is the state flower of South Carolina.

Soil & Site: Will grow on poor dry sandy sites and is found mostly on the sandy Coastal Plain soils. Sun or shade.

Use: Specimen plants supported by shrubs, small trees or trellises. Mainly for roadbanks in Sandhills area where honeysuckle is not well adapted. Plant spacing 3'.

Virginia Creeper - *Parthenocissus quinquefolia*

Description: Perennial deciduous vine. Leaves consist of 5 leaflets each 2 to 4" long. Sometimes confused with poison ivy which is 3 leaved. Vines will climb by tendrils and adhesive "hold fasts". Growth habit is loose. Does not usually form dense ground cover. Small greenish flowers in spring with open clusters of blue-black berries in fall. Autumn foliage brilliant red.

Soil & Site: Prefers medium fertility on well drained sites. Tolerates dry, rocky, poor or very sandy sites.

Use: Rough steep roadbanks to lend fall color and supplement other denser growing vines. To hide unsightly fences. Dune erosion control and beautification. Good songbird food (8 species). Plant spacing 3 to 4'.

Peppervine - *Ampelopsis arborea*

Description: A vine with finely cut foliage divided twice to form a compound leaf resembling trumpet creeper or cow itch vine. New leaf growth at terminal ends of branches bronze-red. Small green flowers in spring. Black berries in fall. Tendrils enable it to over-top shrubs and climb trees. Seed resemble grape seed. Spreads by underground rhizomes. Trailing stems will also tack down. Considered a weed plant in one deep South state, but not as rambunctious as Kudzu.

Soil & Site: Moderately moist to dry sites. Mostly in sandy soils of Coastal Plain and prominent in coastal beach areas. Good growth was found on clay soils.

Use: Erosion control on steep critical sites (roadbanks, gullies, etc.). Use similar to Kudzu. On dune beach areas for cover after grass has stilled sand. Plant 3 to 4' apart. On banks plant at least one row at the top and one in the talus slope.

Porcelain vine - *Ampelopsis Brevipendunculata*

Description: A high climbing vine with tendrils and dark green grapevine-like leaves. Has divided and thickened tap root system. Berries lilac or whitish finally turning to a bright blue. Will not spread from underground roots or rhizomes.

Soil & Site: Not too particular but prefers rich moist sites. Plantings at beach indicate moderate adaptation to dune plantings. Sun or shade.

Use: As kudzu for roadbanks, gullies and similar steep areas difficult to seed. Plant in talus. Also one row on top of bank but improve this site by adding topsoil or peat. On trellises, or fences for screening. Seed are eaten by a number of songbirds.

Kudzu - *Pueraria thunbergiana*

Description: A high climbing, exceedingly vigorous vine with twining stems (no tendrils or aerial "holdfasts"). The plant is a perennial legume. Trailing stems tack down at the nodes and produce crowns at these points. Flowers violet in loose hanging clusters. Hairy brown bean-like seed pods borne in fall, but sparingly and mostly on supported vines. The plant is generally regarded as a pest especially because of its tree climbing habit. But there are a number of difficult erosion control problems where its vigor and dense cover is a necessity. In these circumstances, kudzu is often the most practical solution. Cattle will graze it out. Annual crop cultivation will keep it out of crop field. Will climb edge trees when bordered by woods.

Soil & Site: Full sun to partial shade. Will not grown into dense (especially broadleaf) forest shade. Well drained soils of medium to low fertility.

Use: Gullies, very large steep banks too difficult to seed. River and large stream and channel banks and spoils. Large mine spoil areas. Planting in the moist talus of roadbanks of gullies is usually very successful. Especially useful on road and channel banks since it greatly reduces maintenance on such sites. Plant spacing 4 to 5'.

Muscadine grape - *Vitis rotundifolia*

Description: A high climbing deciduous vine with tendrils. As a trailing plant on the ground, it makes a dense cover. Greenish-yellow flowers in spring. Fruit – a dark purple, marble-sized grape with a tough skin. It is found throughout the state but is most abundant in the sandy Coastal Plain soils. (This species also includes the Scuppernong grape with a green-yellow skin.)

Soil & Site: Dry, sandy, infertile. Often on dune sands, eroded areas. Sun to partial shade.

Use: Permanent cover on poor eroded sites, roadbanks, etc., mine spoils, beach dunes. For human food and wildlife use. Fourteen songbirds use it for food. Also, wild turkey.

Trumpet Creeper - *Campsis Radicans*

Description: A rather stringy, sparsely leaved vine at first but gradually increasing to a moderately dense ground cover. Leaves divided into 9 to 11 leaflets. Orange trumpet-shaped flowers in summer 3 to 4" long. Climbs by aerial rootlets. Long pointed capsule bearing double winged seed in fall. Familiar sight on utility poles, fence posts, etc.

Soil & Site: Full sun to half shade. Will tolerate infertile, eroded, dry acid sites.

Use: For erosion protection on banks too steep to plant (road cuts, spillway banks, etc). Possibly the best plant to vegetate bank abutments under bridges. Also, mine and dug channel spoils, coastal sand dunes. A favorite food flower of hummingbirds. Plant spacing 2 to 4'.

Creeping juniper - *Juniperus horizontalis*

Description: Evergreen perennial shrub with dark green to blue-gray needles. Branches lax and creeping to about 16" tall. Also, *J. horizontalis plumosa* (Andorra juniper) to 1 ½' tall and turning dull pink-purple in the fall. All shrub juniper types are acceptable for this work and all are hardy throughout North Carolina.

Soil & Site: Dry, hot, moderately infertile sites. Full sun to 1/3 shade.

Use: Road and other dry infertile banks where maintenance can be provided. Low mass plantings--sometimes in lieu of small lawn areas. Road medians; foreground plantings. Space plants 3 to 4'.

Sargent juniper - Juniperus chinensis sargentii

Description: This is one of the Chinese junipers. It is a low dense plant about 2 to 3' tall. The needles are steel-blue in color. Single plants have grown to rounded mats 8-10' in diameter. Will tolerate moderate exposure to salt spray.

Soil & Site: (See J. horizontalis above.)

Use: (See J. horizontalis above.)

Pfitzer's juniper- Juniperus chinensis pfitzeriana

Description: Similar to above but 3 to 6' tall, flat topped with long, drooping, graceful, horizontal branches. Needles dark green to steel-blue. One of the most used landscaping plants. Requires annual pruning to keep it dense and within bounds of desired height.

Soil & Site: Will tolerate dry, infertile sites and city conditions.

Use: Low screens, borders, background, road medians, specimen plants. Has also been used successfully for wildlife cover. Space plants 4'.

Shore juniper- Juniperus conferta

Description: A perennial evergreen shrub with bluish, light green needles. Drooping stems. Mat forming ground cover. A vigorous grower and the fastest spreading of all shrub junipers.

Soil & Site: Sand soils (including coastal dunes) to infertile Piedmont soils. Prefers full sun but will take part shade.

Use: Beach landscaping but requires organic additives to the sand. Mass plantings well adapted to day banks. Has become a popular substitute for grass for small areas formerly put in lawn. Drapes well in planter boxes, over walls, etc.

Thorny elaeagnus- Elaeagnus pungens

Description: Evergreen bradleaved shrub. Leaves shiny, dark green above, silvery underneath. Newer stems also silvery with cinnamon colored speckles. Stems long and pendulous. Twigs spurred. Flowers in December. Red silver-scaled—scaled berries ripen in April. Though not a legume, this plant has nitrogen fixing bacterial on its roots. The accumulation of nitrogen in the nodules is one important reason why this plant is able to prosper on poor sites. (A number of varieties, all good: Fruitlandi, Simoni, Reflexa.)

Soil & Site: Well drained soils of medium to low fertility including dune sands. Sun to 2/3 shade.

Use: Hedges, shrub borders, specimens, low screens, and as shrub understory in pine windbreaks. On eroded or other sites for wildlife food. Its berries are taken by turkey, quail and several songbirds. Frequent nesting site of mockingbird, brown thrasher, towhee and cardinal. The berries ripen when other foods are still scarce. Requires frequent pruning as a shaped trimmed hedge. In rows, space 3 to 4' in groups 4 to 5'.

Bigleaf wintercreeper- Euonymus fortunei vegatus

Description: Trailing evergreen vine to semishrub. Rounded leaves 1 to 1 1/2" long, leathery, dark shining green to top, dull light green beneath. Will form a weed free mat 1' or more deep. The thick green stems have aerial "holdfasts" and the plant will climb walls, buildings, posts, etc. It grows faster than other E. fortunei varieties. The stems tack at the nodes. Cuttings easily rooted in jar of water. Insignificant cream colored flowers produce white to pinkish capsules which split open to expose fleshy orange fruit inside.

Soil & Site: Well drained, poor to moderately fertile. Will tolerate moist or acid sites. Sun or shade.

Use: For ground cover 2' or more thick. Good on banks, mass plantings, wall or fence cover where it can be properly maintained.

Evergreen Euonymus- Euonymus japonicus

Description: Evergreen shrub with waxy green, leathery leaves 1 to 3" long. Stems green, upright. Small yellow flower clusters give way to capsules which split open in the fall exposing orange colored fruits. Sometimes over 12' tall. Cuttings easily produced by putting stems in a jar of water. Sometimes bothered

by Euonymus scale which can appear on most Euonymus species. A very popular and serviceable landscape plant in the South.

Soil & Site: Will tolerate infertile, moist sites. Better on well drained soils. Sun or shade.

Use: For clipped hedges, shrub borders, specimens. Leafy stems are excellent in flower arrangements. Excellent for beach landscaping where it has phenomenal resistance to salty sea winds.

Wax myrtle– Myrica cerifera

Description: Evergreen aromatic shrub which in some cases may be described as a small tree. Foliage narrow 1 to 3" long and yellow green in color -- especially underneath. In the fall the outer stems and twigs covered with small grey berries slightly less than 1/8" in diameter. Has fine texture and irregular form. The sexes are separate. Only female plants produce fruit.

Soil & Site: Best in moist Coastal Plain soils but O>D. in Piedmont. Will tolerate dryer sites and even sand dune areas. Full sun to ½ shade.

Use: For tall shrub borders, or as understory for pine windbreaks. Specimens, road medians, etc., around buildings, city malls (where trimmed to a small to a small tree form). Also, moderately good salt wind resistance for beach work.

Bayberry vine– Myrica pennsylvanica

Description: A semi-evergreen shrub mostly of the northern coastline in North Carolina. Leaves narrow, about 3" long and aromatic when crushed. Inconspicuous flowers produce clusters of waxy berries about ¼" in diameter. These appear along the stems on old wood. The plant grows to 5 to 7' and spreads to form open growing colonies by means of root suckers. It is very resistant to salt spray.

Soil & Site: Found naturally on pure dune sands. Dry infertile sites in full sun.

Use: Excellent for landscaping and erosion control in beach areas. Also, being tested for wildlife and critical site protection in Piedmont and mountains. Use in groups or rows for shrub backgrounds. The berries are still used to some extent to make bayberry candles. They are also a staple food of turkey, quail, and 35 species of songbirds. Plant spacing 3' in rows, 4 to 5' in groups.

Yaupon holly– Ilex vomitoria

Description: Evergreen native shrub to small tree with dark waxy-green foliage. Leaves long oval about 1" long. Bright red berries in the fall are very showy. The berries remain on the plant through the winter and following spring. Spreads very slowly by occasional sprouts from root suckers. Will withstand shearing. Considered as being the most drought resistant holly. Has irregular form and fine texture. The sexes are on separate plants. Use only stock from cuttings to get all fruiting plants. Growth is slow.

Soil & Site: Poor dry sandy or clay soils. Will also endure moist acid sites. Full sun to partial shade.

Use: Shrub borders, clipped hedges, specimen shrub or trained to small tree in malls, medians, etc. Christmas decoration. In rows, space plants 2 to 3', in groups 4 to 5'. The berries are an emergency food of five songbirds.

Inkberry– Ilex glabra

Description: A native, upright, semi-globe shaped, evergreen shrub. Leaves 1 to 2" long, lustrous and dark. Flowers are inconspicuous. Single black berried fruits (1/4") in fall. Male and female plants required for inkberry production. Female plants turn purplish in the winter. Withstands severe pruning. Foliage not dense and the texture is medium. Growth is slow. Sometimes bothered with a scale.

Soil & Site: Dry to moist, well drained sites. Will grow on infertile sites if organic matter is added. Sun to part shade.

Use: Good background plant, shrub borders, or often in groups. Not for banks. Groups in medians, malls.

California Privet– Ligustrum ovalifolium

Description: A tall semi-evergreen shrub to 10-15'. Leaves glossy, 1 to 2" long, turn purplish in fall. Flowers creamy white. Black berries in small 2 to 3" clusters in fall. Easily propagated by hardwood cuttings. Rather stiff upright habit of growth. Densely branched. Can be heavily trimmed. The leaves are partially resistant to salty sea winds.

Soil & Site: Will tolerate dry infertile sites if started off with some topsoil or organic material. Does moderately well in beach sand -- again with organic soil amendment.

Use: Beach landscaping, clipped hedges, tall borders, understory for pine windbreaks. Not usually in singles or groups.

Japanese privet– Ligustrum japonicum

Description: Shrub to about 15' but usually 6 to 8'. Evergreen leaves, leathery up to 4" long and quite glossy. Flowers have strong odor, are creamy white in panicles about 6" long. Berries blue-black on terminal branches in fall. A vigorous grower and much used in landscaping. May be clipped. Fairly dense growth in full sun.

Soil & Site: Not particular -- infertile sites, dry to medium moist (not wet). Sun or shade.

Use: Clipped hedges or even better in unclipped screens or borders. Specimen plants. In medians for headlight shading or as understory in pine windbreaks. Berries are favorite food of cedar waxwing. Also, taken readily by five other species. One of the most used species in beach landscaping. Spacing in rows 2' (close hedges), 3 to 4' (borders, etc.).

Glossy privet– Ligustrum lucidum

Description: This is the tallest of the privets to 30' but commonly about 15'. Its leaves are larger (up to 6") and more pointed and less glossy than those of L. japonicum. Growth upright and soon a small tree if so pruned. Large panicles (8 to 16" or more) of white flowers in spring. Blue-black, drooping panicles of berries in the fall. Cannot take heavy pruning. Use corrective trimming only. Growth rate fast.

Soil & Site: Tolerant of average sites. Requires medium fertility, drainage and depth. Use topsoil or additives on droughty poor soils.

Use: For tall shrub windbreaks or as pine windbreak understory. Screens and borders. A number of songbirds use the berries for winter food. Small specimen trees for small spaces. Plant 4' to 5' apart in rows.

Regel privet – Ligustrum obtusifolium regelianum

Description: This is a low, graceful, horizontally branched variety of border privet. Stems are quite thin and curved downward. Leaves opposite (as all privets) and very regularly spaced. Leaves "bronze off" in fall with purple tinge. Flowers are white; berries a dull blue-black. It can withstand pruning to keep in bounds and is a fast grower. Somewhat open growing.

Soil & Site: Seems to have better adaptation than previous species to poor dry sites. Sun to 2/3 shade.

Use: As low, graceful shrub borders or small groups. Good on moderate slopes to hide rock or just for cover, but may not give complete erosion protection. Will not obstruct visibility in road medians. Berries are taken by several songbirds. In rows, plant 3' apart, in groups 4'.

Oleander – Nerium oleander

Description: An upright evergreen shrub with most branching directly from ground. Leaves long (3 to 5") slim and pointed. Many varieties with flowers of many colors (red, white, yellow, purple), --single and double. Best adapted to the lower Coastal Plain. May be heavily pruned. Both leaves and flowers are poisonous. Stems will root if placed in a jar of water. Good salt wind resistance.

Soil & Site: Withstands dry, hot situations. Best in full sun. Seems to prefer sandy Coastal Plain soils.

Use: Mainly for beach landscaping. Its poisonous quality has probably restricted its use in urban plantings. It will do well in borders or groups. Is striking for single plant accent along medians. Border or group spacing 3-4'.

Pittosporum – Pittosporum tobira

Description: Evergreen shrub to about 10'. Growth is stiff and bushy. Foliage, blunt, leathery, rolled inward and 3 to 4" long—somewhat resembling rhododendron. Clusters of orange-like blossoms in spring with brown capsules in fall. These split open showing orange colored seed covered with glue-like substance. Leaves extremely resistant to salt wind burn. This shrub is the No. 1 landscaping plant on Carolina beaches. An outstanding evergreen shrub. Not cold hardy below 20° F.

Soil & Site: Tolerates dry sandy or finer textured soil conditions. Avoid soils with shallow hardpans. Prefers loose deep soils. Good drainage required, moderate fertility appreciated. Sun to ¼ shade.

Use: Beach landscaping, borders, low screens. Not too good as a clipped hedge. Single specimens or groups for general landscaping—medians, malls, school grounds, etc. Spacing in rows 3 to 4', in groups 4 to 5'.

Wintergreen barberry – Berberis julianae

Description: Upright and dense, evergreen shrub. Leaves glossy, narrow, spiny, evergreen and to 3" long. Thorns on twigs are three-parted and very sharp and stiff. Small yellow flowers (1/3") appear in April; blueberries in the fall. The shrub usually is narrower at the bottom and somewhat top heavy. The plant is very hardy and disease free. It tolerates pruning well and is free of insects.

Soil & Site: Will grow on relatively infertile, dry sites in sun or part shade.

Use: For trimmed or untrimmed hedges which are impenetrable. To protect areas from foot traffic. Also, promise as one component of wildlife cover plantings (principally for rabbits).

Firethorn – Pyracantha coccinea

Description: Firethorn grows to about 8 to 10' with a spread usually greater than its height. Leaves are evergreen, oval and about 1 ½" long. Growth is open, formless and the twig ends more or less spurred. Dense clusters of white flowers appear in early May—well after frost date in most areas. Thus, the berry production each fall is very dependable. Orange to red (or on variety "Aurea" – yellow) berries ripen in the fall in dense brilliant clusters. Orange berried "Kasan" and "Lalandee" with scarlet fruit are supposed to be the most cold hardy and are preferable in the mountains. Bare rooted plants do not take well to transplanting. It is best to use plants grown in gallon cans. It is subject to several diseases and insects, yet is a much used landscape plant because of its winter beauty.

Soil & Site: Not a poor soil plant but can be grown on dry infertile sites with organic soil amendments. Sun or part shade.

Use: Screens, borders, groups and specimens in many situations. Effective as an espallier—a plant trained against a well, fence, etc. A fine wild turkey food. Also, taken by cedar waxwing, robins, cardinal and mockingbird. Plantings in the wild must be protected from deer grazing and cultivated for at least two years.

Tartarian honeysuckle – Lonicera tartarica

Description: Deciduous, upright shrub to 10' with leaves 1 to 2 ½" long, light green, short and fuzzy. Flowers pink, crimson or white. Fruit – a red juicy berry about ¼" ripening in June. It is free of disease and insects.

Soil & Site: Will grow on poor dry sites. Best in full sun.

Use: Will perform moderately well on critical areas, in contour row or clumps. Also, summer songbird food.

Arnold dwarf forsythia – Forsythia arnoldi

Description: This plant originated at the Arnold Arboretum in 1941. It was selected for its low dwarf habit (to 3') and widely spreading to prostrate branches (to 7' or more). Branches root where they touch the ground. Flowers are a poor faded yellow—not as showy as on the following type. It finally makes a thick mat of interlocking branches at or near the ground surface – its chief claim to fame. Growth is rapid. Propagated readily from cuttings.

Soil & Site: Any well drained soil in full sun.

Use: For ground cover on rough or relatively steep places between rocks, roadbanks, other cuts. Not recommended for its beauty. Plant spacing 2 to 3'.

Showy forsythia – Forsythia intermedia spectabilis

Description: This shrub is noted for its brilliant, deep yellow bell-like flowers (2" in diameter). It will grow erect and 5 to 9' tall but less on poor sites. Flowers prolific in early spring before leaves appear. Dry to valved seed capsules in fall. Transplants well, roots quickly and is a fast grower. Takes pruning well. Renew occasionally by taking out three-year-old wood. Other good varieties: "Spring Glory," "Lynwood Gold" and "Beatrice Farrand." Also, E. sypensae sieboldi is an excellent choice with pendulous, spreading, rooting branches.

Soil & Site: Any well drained soil in full sun.

Use: On rough banks, medians, etc. One of the best for spring beauty. Use in groups, in rows for borders or as single specimens for any landscaping job on poor soil conditions.

Winter jasmine – Jasminum nudiflorum

Description: A densely, green branched, drooping shrub to about 4' (usually less). Leaves small, trifoliate. Widely spaced, small yellow flowers appear in January and February before the leaves. Twig tips root when in contact with loose dirt. Forms dense cover up off the ground. Prune occasionally to rejuvenate. Does not look bare in the winter.

Soil & Site: Well known plant for difficult infertile dry soil conditions. Sun or shade.

Use: Banks, above walls, low dense borders, accent specimens with low ground covers and for other various poor soil sites. In rows or groups, space plants 2 to 3' apart.

Beautyberry – Callicarpa Americana

Description: A native shrub with arching upright stems mainly from the ground with regularly spaced, opposite leaves 3 to 6" long. Thick rounded clusters of lilac colored berries in the fall. Need dark green background to show off fruit to best advantage. Not good against red brick background. Does not furnish good erosion control alone.

Soil & Site: Seems to prefer sandy soils of Coastal Plain. Prefers moist sites but will tolerate Sand Hills on dry infertile soils. Sun to almost complete shade.

Use: Select this one for color of autumn fruit and as an addition to wildlife and songbird food plantings. Also for beach plantings in flats between dunes. In groups or rows with plants 3' apart.

Rugosa rose – Rosa rugosa

Description: A very sturdy upright shrub with a fairly dense mass of stems. Leaflets thick, dark green turning orange in the fall. Flowers 2-3" in diameter with overlapping purplish petals. Fruit a bright brick red hip. This is one of the least exacting of the roses. It is a rapid grower. It spreads slowly from root suckers. Many good varieties: one of the best is "Mix Graf" a trailing pink rose.

Soil & Site: Will endure poor moderately dry sites, in beach sand and elsewhere. Full sun. Withstands salt spray.

Use: Borders, shrubberies, specimens in medians, etc. Use especially for color of its flowers, fruit and foliage. Plant spacing 3' in rows, 4-5' in groups.

Memorial rose – Rosa wichuraiana

Description: A very long-branched, trailing shrub with canes 6' or more. Flowers single, white and 2" in diameter. Fruit-reddish hips not showy. Leaves lustrous and semi-evergreen. Stems make good, low ground cover but require a number of years to become dense. Stems will root where covered by soil.

Soil & Site: All but poorly drained soils. Will grow on stony rough slopes, etc. Best in full sun.

Use: As ground cover on banks and other slopes. Will scramble over rough rocky sites. On steep banks plant row at top with plants 2-3' apart. Seed balance of bank with an adapted grass or legume. Rose will gradually take over. If practical plant additional rows 6' apart.

Scotchbroom – Cytisus scoparius

Description: Upright, stringy, green branched shrub. Yellow pea-like flowers in April. Flat brown seed pods in fall. This plant is not easy to transplant. The plant is inclined to be top-heavy with little growth near the ground. It is not a good ground cover, but it is still useful in landscaping on poor sites. Growth is moderately fast and it has no pest problems. Also Cytisus procumbens a lower growing shrub to 30" tall. Not as vigorous as above but better ground cover.

Soil & Site: Will grow on typical critical area sites which are infertile and droughty.

Use: Use for its winter green color of twigs and stems and for yellow flowers. For accent, informal background on banks, etc.

Plants should be carefully dug, tops should be sheared back and the plants firmed and watered.

Autumn olive – Elaeagnus umbellata

Description: Large spreading deciduous shrub to 12'. Often spiny at ends of silvery brown branchlets. Leaves oval often crisped at margins, green on top, silver with brown speckles beneath. Flowers insignificant in leaf axials. One seeded berries which ripen in late September-October are red with silvery scales. Branches often pendulous with heavy fruit crops. Easy to transplant. Very vigorous and hardy. Will produce berries 2nd and 3rd year after transplanting.

Soil & Site: Will grow on dry, infertile, acid sites. Not for wet soils. Needs full sun to 1/3 shade.

Use: For large areas, screens, borders, backgrounds. Understory for pine windbreaks. Contour rows and clumps for songbirds (17 species) and also quail, turkey, grouse. Successful on mine spoils. Moderately good at the beach with organic soil amendment.

Tag alder – Alnus rugosa

Description: A tall shrub of stream banks, shores and marshes. Long, somewhat crooked and bare main stems supporting an umbrella-like top canopy when mature. Twigs rusty and fuzzy. Leaves dark green with jagged edges and usually with brownish fine hair beneath. Male and female flowers separate but on the same plant (as in Pine). Small wingless seed produced in female cones in early fall.

Also A. glutinosa, European black alder which is actually a small tree with spreading branches and a symmetrical avoid top.

Soil & Site: Moist to wet sites along streams, ponds, etc. Will endure dryer and moderately infertile soils.

Use: Mainly to control erosion (wave action, etc.) along shorelines of lakes and also for protection of streambanks. A. glutinosa especially, has promise of shading out waterweeds along ditch and canal banks.

Rose acacia – Robinia hispida

Description: Mostly single stemmed plants from the ground but then branching. Spread vigorously from root suckers to form thickets. Smaller stems, twigs and leaf axials covered with small stiff amber hair. The plant is a native legume. Leaves divided into 7-13 leaflets. Flowers lavender to pink, pea like in loose hanging clusters. Flat pea pods in fall. Nitrogen fixing bacteria on roots promotes its growth on infertile soils. (Also called R. fertilis) A good selection developed by the S. C. S. is called Arnot bristly locust.

Soil & Site: Any well-drained soil-tolerates droughty soils and rough slopes. Also Sand Hill area. Prefers full sun.

Use: Due to its vigorous spread give plenty of room. Good for the typical critical sites, spoil from excavations, mine spoil dumps, etc.

Elderberry – Sambucus canadensis

Description: A native shrub – large wide spreading, deciduous with coarse compound leaves. A vigorous grower. White flowers in large flat clusters. Heavy flat clusters of dark purple berries are conspicuous in autumn. Leaves, buds, young shoots, roots and bark are poisonous. Boys, now men, who have made whistles of the hollow stems take note!

Soil & Site: Moist to wet sites. Full sun for heavy berry production, but will grow in 2/3 shade. Usually on rich sites.

Use: Along stream banks, shorelines or other damp areas and especially where songbird food is desired. It is taken by 14 bird species. The fruit is sometimes used in various preserves and for wine. Used in this way the berries are not harmful.

New Jersey Tea – *Ceanothus americanus*

Description: Small, upright native shrub with dark green leaves which were used for tea during the Revolutionary War. A dense “crown” of small white flowers bloom on branch ends in the spring. These are noticeably attractive. A three seeded “drupe,” black in color, ripens in late August and September. This plant has nitrogen fixing bacteria on its roots. This thoughtful arrangement accounts for its successful occurrence along dry sterile roadbanks. New Jersey tea spreads very slowly from root suckers. Branches buried in soil sediment will root. This allows the plant to grow thru and spread out as sediment is deposited around it.

Soil & Site: Endures dry eroded acid soils. Rough banks, gully bottoms. Full sun to ½ shade. Prominent in the mountains.

Use: On roadbanks and other rough sites usually as part of a landscape plan – for accent and spring flower beauty. Not good alone for erosion control except in gully bottoms where depositing sediment spurs growth and spread.

Shining sumac – *Rhus Copallina*

Description: Native shrub to 15’ on good sites but on poor soils where it is useful the usual height is 4 to 6’. Single stems from ground later branching to make a canopy. Leaves rich green, compound with 9-23 leaflets – mostly 9-11. The leaf stems are winged with a flange-like margin of tissue. A panicle of greenish flowers bloom after the leaves appear. A loose, bright red “cone” of seed is born at the terminal ends of main branches. This sumac spreads rather vigorously from root suckers to form colonies fairly open underneath but with a complete canopy above. The leaves turn scarlet in the fall. On roadbanks etc., this canopy helps to suppress encroachment of undesirable native vegetation. Easy to transplant. May be cut to the ground each winter with harm.

Soil & Site: Will grow on most of our poorest, driest, most acid sites. Successful on beach sands.

Use: A very useful conservation plant because of its beauty and aggressiveness on trying site conditions. Plant in groups on banks, spoils and other dry sites to be landscaped. Interesting in confined landscape plots. Also for beach work – cottage plantings and dune erosion control. Space 3’ apart.

Smooth sumac – *Rhus glabra*

Description: Similar to shining sumac above but usually a heavier plant and somewhat taller. Dense rich red cone of fruit in fall. Leaves compound and with flanges of wings turning brilliant red in the fall. Spreads from root suckers to form thickets – open underneath but with almost complete canopy which is quite effective in suppressing other plant encroachment. May be severely pruned off or allowed to grow to small tree form.

Soil & Site: Will grow on most of our poorest, driest most acid sites. Successful on beach sands.

Use: A very useful conservation plant because of its beauty and aggressiveness on trying site conditions. Plant in groups on banks, spoils and other dry sites to be landscaped. Interesting in confined landscape plots. Also for beach work – cottage plantings and dune erosion control. Space 3’ apart.

Fragrant sumac – *Rhus aromatica*

Description: A straggly shrub 3 to 6’ tall but on poor sites 2 to 3’ and quite dense. Leaves in threes, thick pubescent on both sides especially when young.

Berry-like clusters at ends of branches turn red in fall along with the leaves. Somewhat resembles poison ivy. It blooms before the leaves appear in the spring. Spreads by root suckers to form colonies. Growth is rapid.

Japonica lespedeza VA-70 – *Lespedeza japonica*

Description: A selection made at the Gretna, Virginia, Soil Conservation Service Nursery in 1952. A leguminous shrub to 5' where woody stems are killed back to the ground each winter. This does away with the need to cut back the stems (as with "bicolor"). Pink to lavender pea-like blooms appear in late August-early September. Seed ripen in early October. Stems from the ground increase each year from the crown. This produces a clump 1 to 2' across with up to 40 closely growing stems. On the poorest sites, it will not perform as well as *L. bicolor*.

Soil & Site: Moderately well drained to dry soils of medium to low fertility. Requires full sun for best growth and seed production. Will endure one-half shade.

Use: Contour rows across fields. On banks where soil is relatively deep. Fills. Cloverleaf areas (mowed down once a year after frost). For quail food, it is preferred to bicolor since the seed crops are more dependable and it does not have to be cut back.

Established from plants or seed. Plants: 3 x 2'. Seed to 10 lbs. per acre broadcast or 30 seed per linear foot if in rows.

Fragrant sumac – *Rhus aromatica* (continued)

Soil & Site: Poor dry acid sites. Best in full sun

Use: Excellent shrub in front of taller plants or on banks. Do not use along unpaved roads since pubescent leaves catch and hold dust. Plant spacing 2 to 3'.

Coralberry – *Symphoricarpos orbiculatus*

Description: A low, native shrub with slender upright spreading branches. Forms clumps as it spreads from rhizomes. White flowers in the spring are insignificant, but the small clusters of coral colored fruit in the fall are attractive. Twigs and underside of leaves are densely pubescent. Appears in old over-grazed pastures, woods, borders, etc.

Soil & Site: Dry to imperfectly drained soils. Prefers basic to near neutral soils. Tolerates low fertility. Sun or shade.

Use: Banks, dry rocky rough slopes. Will not cover rocks. Plant 2' apart.

'Bankers' dwarf willow – *Salix cottetii*

Description: A dwarf willow to about 6-8' with high stem density, rapid semi-prostrate growth. Plant easily established by planting rooted or unrooted cuttings in moist soil in the spring before leaves appear. Lower limbs catch sediment.

Soil & Site: Fertile or infertile moist sites. Sun to one-half shade.

Use: Along streambanks, lake shores (to prevent wave action damage), and in moist sediment accumulations in gully bottoms. Plant spacing 2 to 3'.

'Streamco' purple osier willow – *Salix purpurea*

Description: This is a native of central North American growing to a height of 10 to 20'. It spreads rapidly from stolons and/or root suckers to form dense colonies. Stems are erect with sparse, side branching. This shrub is easily established by spring planting unrooted whips or rooted cuttings in moist soil. In the fall, the leafy stems produce a good protective mulch on the ground.

Soil & Site: (Same as *Salix cottetii*.)

Use: (Same as *Salix cottetii*.)

Bicolor lespedeza – *Lespedeza bicolor*

Description: Leguminous shrub to about 10' or more—usually 6 to 8' on poorer sites. Heavy flowering of lavender to pink pea-like blooms in September. Seeds ripen in mid to late October. Frost sometimes kills the seed before they mature. Flowers depend on insect pollination. Shrubs may be cut to the ground occasionally. This reduces following year height and induces an increase of stems from the ground. Has a very tough wiry root system.

Soil & Site: Wide soil adaptation—poor to rich, dry to moderately moist but not wet. Is a little better adapted to poor eroded areas, s land subclasses, spoils, etc., than Lespedeza japonica. Sun to one-half shade.

Use: On banks, especially very large ones or those where the soil may be inclined to slide. Large mountain fill areas. Permanent contour borders across fields. Spoils. Also proven winter quail food, but is giving away to Japonica VA-70 which is a more dependable seeder and does not require cutting back. Along roadbanks, do not block driver's visibility.

Established from seed or plants. Seed: 10 to 12 lbs. per acre broadcast for erosion control. For wildlife 8 lbs. per acre. Plants: 3 X 3' for wildlife and contour borders (use minimum of 3 rows), 3 x 2' for erosion control.

Carolina laurel cherry – Prunus caroliniana

Description: Small to fairly large tree; usually 15 to 30' high; up to 10" in diameter; occasionally 60' high when cultivated. Trunk is straight or inclined with slender horizontal branches forming a narrow, oblong or sometimes broad head. Leaves are evergreen, elliptic to elliptic-lanceolate, sharply pointed, thick leathery-textured, dark shiny green above and paler beneath; margins usually smooth, or sometimes finely toothed, slightly rolled to the lower side; 2-4 ½" long, ¾-1 ½" wide. Flowers are small, creamy white, borne in numerous, short racemes; appear February to April. Fruit is dull, black, thinly fleshed, one-seeded drupe, about ½" long. Ripens in autumn, but persistent to following flowering season. This tree is native to the Coastal Plain, but will grow in the approximate area east and south of Greensboro. It is believed to be rare as a native tree; more abundant as an escape from cultivation. Growth is fairly rapid on good sites.

Soil & Site: Laurel cherry grows most rapidly on deep, fertile, well drained, but moist, alluvial soils; however, it is not very exacting and will grow on dry sands. Best growth is made in full sunlight, but it will tolerate some shade.

Use: Ornamental, shade, windbreaks, screens, hedges, beach landscaping, and wildlife food and cover. Primary uses are for screens and windbreaks. Can be clipped and formed into a hedge. Spacing: (a) Windbreaks – 5-6' either in a single row, alone, or in outside rows with pines in center; (b) screens – 5-6' apart in 1 or 2 rows; (c) hedges – 2-3' apart. Does not survive well unless most of the leaves are clipped from the stem before transplanting.

Leaves contain hydrocyanic acid (also called prussic acid) and are poisonous to livestock if eaten when wilted.

Chinese chestnut – Castanea mollissima

Description: Small to medium-sized shrubby tree; but occasionally 50-60' high. Leaves are deciduous, simple, alternate, elliptic-oblong lanceolate, pointed; 3½ -6" long; margin coarsely toothed; surface smooth and green above, whitish-green and wooly beneath, turning yellow brown in fall. Fruit is a brown nut, about 1" wide; usually 2-3 enclosed in a spiny burr. Bark is furrowed. This species is a native of northern and western China. It is hardy throughout North Carolina and is more resistant to Chestnut blight, Endothia parasitica, than the American and European species.

Soil & Site: Grows best on deep, fertile, well-drained to moderately well-drained soils in full sunlight, but will tolerate rather dry and stony soil.

Use: Ornamental as specimens, groups, or tall borders; edible nuts; wildlife and cover.

Spacing: Ornamental – 15-20'

Eastern redbud – Cercis canadensis (Other common names: Judas-tree)

Description: Large shrub to small tree; usually 15 to 35' high; occasionally 45-50'; with a straight trunk, usually separating above the ground into stout branches that form on upright, rounded, or, frequently, a wide, flattened head. Leaves deciduous, simple alternate; nearly circular, often abruptly contracted at the apex into a sharp broad point; more or less heart-shaped at the base;

3-5' long and broad; margins smooth; bright clear yellow in autumn. Flowers conspicuous, pale pink to deep rose or purplish, appearing from late February to April, usually before the leaves. Fruit, a legume

(pod) 2 ½-3 ½" long. Seeds ¼" long, available in August. Pods frequently remain closed throughout winter unless opened by birds. Although found chiefly in Piedmont woodlands, redbud is fairly hardy and will grow throughout North Carolina except at highest elevations. Growth is fairly rapid on good sites.

Soil & Site: Redbud grows most rapidly on deep, fertile, well-drained, but moist, slightly acid alluvial soils; however, it will grow on drier sites in the uplands on slightly acid loams, sandy loams and sands, and even on slightly calcareous soils. Although it tolerates shade, best growth is made in full sunlight.

Use: Chiefly used as an ornamental for its showy flowers in early spring; also, wildlife food and cover.

Spacing: Ornamental – 15-20'. Special care may be necessary in some localities to establish and maintain this species.

Eastern Redcedar – Juniperus virginiana (Other common names: Red juniper, savin)

Description: Small to medium-sized, evergreen tree with dense, fragrant foliage; usually columnar. The trunk is usually grooved. Leaves are of two types: (a) minute and scale-like, clasping the stem in 4 ranks, or (b) awl-shaped, sharply pointed and spreading yellow-green to bluish green. Fruit is a berry-like, spherical, highly aromatic cone, ¼-1/3" in diameter, enclosing 1 or 2 seeds in a resinous pulp. Color is dark blue at maturity. Bark is very thin, reddish brown and shreddy. Eastern redcedar is the most widely distributed tree-sized conifer in the Eastern United States, being found in every state east of the 100th meridian.

Soil & Site: Red cedar is very adaptable, growing on a wide variety of soils, often under very adverse conditions – from swamp land to dry, rocky ridges, or rock outcrops. Soil depth and drainage are the most important site factors affecting growth. Growth is best on deep, well drainage alluvial soils and poorest on upland soils less than 12" deep. It will grow on soils with pH values varying from 4.7 to 7.8. Red cedar is intolerant of shade, requiring direct sunlight for best growth; however, on dry, sterile sites it can withstand competition from hardwoods.

Use: Ornamental, windbreaks, screens and sound barriers, roadbank protection, Christmas trees, wildlife food and cover; also, cedar chests, interior woodwork, furniture, flooring rustic woodwork, poles, posts, pencils, wood oil for perfumes, and leaf oil for medicines. Spacing: (a) Windbreaks – 5-6' in row, preferably as exterior rows with pines in center rows, 6' apart; (b) screens – 5-6' staggered in two rows 5' apart; (c) roadbank protection 3x3' to 4x4'; Christmas trees – 5'10'. Seedlings planted on dry, sterile sites should be mulched and fertilized.

Japanese Black Pine – Pinus thunbergii (Other common names: Thunberg Pine)

Description: Large, evergreen, needleleaved tree, 90-100' high; with spreading, somewhat pendulous branches. Branches form a broad, pyramidal, often irregular, head. Bark is irregularly divided into blackish gray plates. Needles are born 2 in a cluster; 2 ½-4 ½" long, bright green, stiff and sharply pointed. Fruit is a short-stalked, conic ovate, grayish brown, woody cone, 2-3" long. Under favorable conditions it is a rather fast-growing tree, usually assuming a handsome, often picturesque, form at maturity. This species is native to Japan.

Soil & Site: It is very adaptable and hardy species, and will grow on a wide variety of soils, under adverse conditions. It will live and grow in almost pure sand, thus, it is especially suitable for planting near the seashore but needs some protection from salty winds.

Use: Ornamental, screens, windbreaks, beach landscaping, and erosion control. Important timber tree in eastern Asia. Spacing: (a) Windbreaks – at least 2 rows, 6' apart, with 7' between trees in rows; (b) erosion control – 4 x 4'. Seedlings planted on dry, sterile sites should be mulched and fertilized.

River Birch – Betula nigra (Other common names: Red birch)

Description: Medium-sized to large tree, up to 100' high; 30-36" in diameter; usually 50' high, 15-20" in diameter, with a trunk that separates 15 to 20 above the ground into several arching branches. Leaves are deciduous, simple, alternate; ovate to elliptic 1 ½-3" long with conspicuous, sharply double-toothed, margins; upper surface is shiny, dark green; lower is whitish and usually wooly; turning yellow in autumn. Flowers are catkins (spike-like inflorescence); male and female occurring on the same tree. Fruit is a small, one-seeded samara, the body (nut) with 2 thin, lateral wings, compounded to form an erect brown cone, 1-1 ½" long; available for wildlife July-September. Bark is salmon-pink to reddish brown; peeling into tough,

papery layers; later becoming coarsely scaly on older trunks. River birch is a rapid-growing tree when young. It is the only birch occurring naturally at low elevations in the South.

Soil & Site: River birch commonly grows along streambanks and on floodplains on poorly drained to well-drained alluvial soils, but is not very exacting and will make good growth on dry, eroded upland sites. Tolerates flooding for a period of several weeks. Often seeds in naturally on road banks. Although shade-tolerant, best growth is made in full sunlight.

Use: Ornamental as specimens or groups, shade, streambank protection, erosion control, wildlife food and cover; also furniture, woodenware, turnery, fuel wood. Spacing: (a) Ornamental – 20-30'; (b) streambank protection and erosion control – 4 x 4' to 5 x 5'.

Loblolly pine – Pinus taeda (Other common names; Arkansas pine, foxtail pine, frankincense pine, North Carolina pine, old field pine, shortleaf pine, and southern pine)

Description: Large, rapid-growing, needleleaved, evergreen tree; usually 90-100' high; 24-30" in diameter. Under forest conditions, it develops a long, cylindrical bole. Although its crown is open, it is denser than other southern yellow pines. It matures in about 150 years. The needles are borne 3 in a cluster (occasionally 2); 6-9" long, dark yellow green, somewhat stiff, sharply pointed, slender and sometimes twisted; usually persistent until the third season. Fruit is a sessile, avoid-conical to narrowly conical woody cone, 3-5" long. Bark is variable; on young trees, scaly and nearly black; later becoming deeply furrowed with irregular brownish blocks, $\frac{3}{4}$ -2" thick.

Soil & Site: Loblolly pine will grow on a wide variety of soils from flat, poorly drained Coastal Plain soils to the residual soils of the upper Piedmont. Best growth is made on soils with a deep surface layer, a firm subsoil and poor surface drainage. In the Coastal Plain, growth is considerably slower on soils with hardpans in the reach of the tree roots. In the Piedmont, growth is best on floodplains and uneroded upland grows naturally in the Coastal Plain and well in the central Piedmont. Although, in North Carolina, it is not native to the upper Piedmont and mountains, it has been successfully planted in the upper Piedmont and in the southwestern mountain counties of Cherokee, Clay, and Macon at elevations up to 2,000 ft. Loblolly pine is relatively intolerant of shade and requires direct sunlight for best growth.

Use: Erosion control, windbreaks, screens, ornamental; also, lumber, veneer, pulpwood, poles and piling. Because of its abundance wide range, occurrence in pine stands and versatility, loblolly is the chief commercial pine species in the Southeast. Although it is an excellent litter producer, when used for erosion control, grasses and /or legumes should be planted to establish a quick cover until the trees are 5-7 years old. Spacing: (a) Erosion control 7 x 10'; (b) windbreaks – at least 2 rows 6' apart, with 6-7' between trees in row; (c) wood production - 7-10'.

Virginia pine – Pinus virginiana (Other common names: Bur pine, Jersey pine, North Carolina pine, poverty pine, scrub pine, and spruce pine).

Description: Evergreen, needleleaved tree; usually small, 40-50' high, 12-18" in diameter with long, horizontal branches. Lateral branches are usually persistent for many years, even after dying. This gives the tree a scrubby appearance, accounting for one of its common names. The needles are borne two in a cluster; 1 ½-3" long, yellow-green, stout and twisted. Fruit is a shiny, reddish-brown woody cone about 2" long. As cones may remain on branches 3-5 years, a treetop with many open cones is a characteristic of the species.

Soil & Site: Virginia pine will grow on a wide variety of soils, but is mainly characterized by its ability to grow on very dry, rocky, sterile, severely eroded or gullied soils where others cannot compete. It is less tolerant of wet sites and impeded drainage than loblolly and pitch pines. It will tolerate soil acidities ranging from a pH of 4.6 to 7.9. Virginia pine requires direct sunlight, dying if planted on densely shaded sites. Growth rate is fairly rapid on good sites, but slow on dry, sterile sites.

Use: Erosion control, screens, windbreaks, roadbank protection and Christmas trees; also, pulpwood, lumber, paneling and fuel. Although Virginia pine is a good litter producer, when used for erosion control grasses and/or legumes should be planted to establish quick cover until trees are 6-8 years old. If properly shared, Virginia pines will make handsome trees. Spacing: (a) Erosion control – 5 x 10'; (b) Christmas trees - 5 x 5'; (c) windbreaks - at least 2 rows 6' apart with trees 6-7' in row; (d) wood production – 5 x 10'.

White Poplar– Populus alba (Other common names: Silver poplar, abele)

Description: Usually a small tree about 30-35' high (10-15' on poor sites), with many wide-spreading branches. Leaves are deciduous, simple, alternate; long-stalked, ovate or 3-5 lobed, sharp-pointed; coarsely and irregularly toothed, 2 ½ - 4" long; dark green above and characterized by a white or gray wooly coat beneath, giving them a silvery appearance when blown. Flowers are catkins (spike-like inflorescence); male and female appearing on different trees in early spring. Fruit is a capsule containing cottony seeds. Bark is smooth, whitish or light gray, becoming dark-colored and furrowed on base of trunk. This species was introduced from Eurasia and has become naturalized in eastern United States. Growth rate is rapid and it spreads aggressively by root sprouts which form colonies. Often considered to be a "weed" tree.

Soil & Site: Grows best on deep, fertile, well-drained soils, but is not very exacting and will grow on poor, sterile sites. Requires full sunlight for best growth.

Use: Erosion control on sandy beach areas, gullies, mine spoils and other disturbed areas when its tall growth and spreading habit would not be detrimental. It is tolerant of city smoke and can be used as shade tree where smog is a problem. Spacing: Erosion control – 4 x 4' to 5 x 5'.

Black Locust– Robinia pseudo-acadia (Other common names: Yellow locust, locust)

Description: Small to medium-sized, short-lived tree of the legume family which reaches a height of 75 to 80 feet or better, fertile soils. Black locust has deeply furrowed, thick bark and somewhat angled to almost terete branches, finely pubescent when young, but soon becoming glabrate. Leaves are alternate, pinnately compound, leaflets oval or oblong, and entire on the margins. Short, spinelike stipules are found at the base of the leaf stalk. Flowers are showy, white, and very scented, forming elongated racemes that appear in mid-spring to early summer. Pods are broadly linear and mostly flat, about 4-5 inches (10-12 cm) long with several seeds. This tree is upright and usually open at maturity.

Soil & Site: Black locust is very adaptable and will grow on a wide range of soils. It grows on very infertile and shallow, dry soils which make it a plant of erosion control value on gullied land. Locust does best on neutral soils but will tolerate slightly acid or alkaline conditions. It is intolerant of shade, requiring full sunlight for best growth. Although black locust can be found in most any area of the state, it is best adapted to the Mountain and Piedmont areas of the state.

Use: Ornamental, wildlife (seeds for food primarily) and erosion control. Important tree for production of fence post because of its characteristic of slow deterioration when in contact with soil.

Propagation and Spacing: For erosion control, plant cuttings or seedlings 4' x 4'. Scarified seed should be seeded in 4' rows, 2' in drill.