Roadside Vegetation Management Manual

Texas Department of Transportation

Revised September 2013

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Manual Notice 2013-1

From: F. Howard Holland, P.E., Director, Maintenance Division

Manual: *Roadside Vegetation Maintenance Manual*

Effective Date: September 01, 2013

Purpose

The *Roadside Vegetation Management Manual* was revised by deleting Chapter 3, Herbicide Operations, and including a link to an online document that contains the same information but that can be updated quickly to include new herbicides and application rates as needed.

Contents

Chapter 3, Herbicide Operations. Entire chapter deleted. Links within the manual referring to Chapter 3 will now take the reader to a separate online document, "Herbicide Operations," that will contain the same information but will allow the currency of herbicides and application rates to be updated faster than the usual manual revision process. No policy changes will be reflected in this separate document. Subsequent remaining chapters renumbered.

Contact

Address questions concerning information contained in the Manual Notice to Randy Ormsby at (512) 416-3196 or randy.ormsby@txdot.gov.

Archives

Past manual notices are available in a PDF archive.

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Chapter 1 — Vegetation Management Guidelines

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Section 2 — Determining Levels of Vegetation Management

Section 3 — Guidelines for Levels of Vegetation Management

Section 4 — Special Situations

Section 1 — Introduction

Background

Executive Order 1-92 states:

> The department will maintain highway vegetation in an environmentally sensitive and uniform manner consistent with the special conditions presented by local climate, topography, vegetation, and level of urbanization.

This manual was conceived in the spirit of that policy.

Purposes of Guidelines

The purposes of the vegetation management guidelines contained in this manual are to:

- enhance the safety of the traveling public
- enhance environmental protection
- promote and preserve native wildlife habitats and native flora throughout the state
- mitigate erosion while providing adequate drainage
- promote coordination and efficiency in maintenance activities.

These principles must be held above all other considerations, with safety being most important.

Section 2 — Determining Levels of Vegetation Management

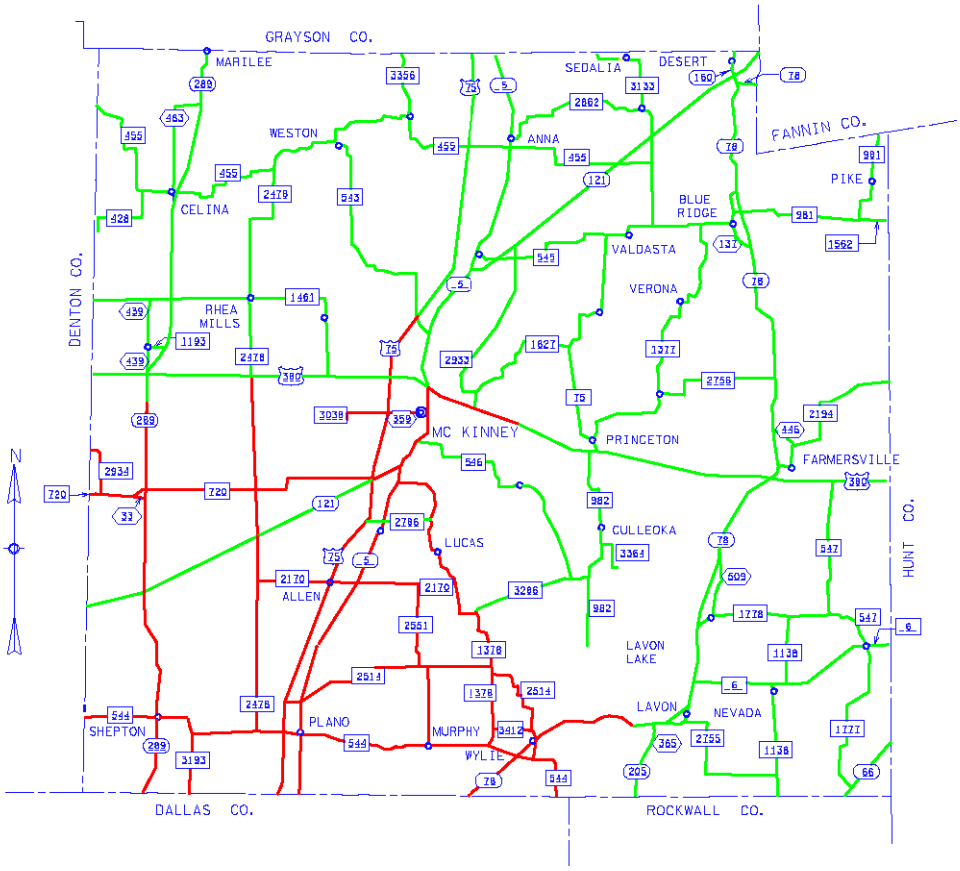
Purpose of Levels

To aid maintenance planners, vegetation managers and workers, the Texas Department of Transportation (TxDOT) has established two levels of vegetation management. Each level sets forth a special set of guidelines for vegetation management. The Developed Urban and Rural level types are both described in detail in Section 3 of this chapter.

Who Determines the Levels?

District engineers will use the level of development of the adjacent property to determine the level of vegetation management for each segment of state maintained right of way within his or her district.

Following is an example of the two vegetation management levels.



LEVELS OF VEGETATION MANAGEMENT	
LEVEL TYPE	COLOR
DEVELOPED URBAN	RED
RURAL	GREEN

Figure 1-1. Two levels of right of way vegetation management, Developed Urban and Rural.

Section 3 — Guidelines for Levels of Vegetation Management

Overview

There are two levels of vegetation management along Texas highways:

1. Developed Urban Highways
   - highly maintained areas which are predominantly residential, commercial, or services development within major metropolitan areas; includes rights of way within smaller cities, towns and villages
2. Rural Highways
   - surrounding land use is rural only

Developed Urban Highways

Conduct vegetation management on roadways designated as Developed Urban according to the following guidelines for each activity or situation.

Mowing and Trimming

Follow these guidelines for mowing and trimming along Developed Urban highways.

Establish non-mow or natural areas at appropriate locations within the right of way, to provide for wildflower preservation, regeneration of native plant species and establishment of nesting habitat for wildlife. Clearly mark these areas to prevent accidental mowing during modified full-width mowing.

After maximizing the use of non-mow areas, use modified full-width mowing on the remaining right of way.

Set cutting height at five inches as determined for strong regeneration of grasses.

Limit the frequency of modified full-width mowing cycles in developed areas to the fewest number of cycles practical.

Mechanically trim.

In those areas where herbicides have been applied for the control of taller, weedy plant species, delay mowing for a minimum of 14 days after herbicide application for maximum control of unwanted plant species.

Herbicide Application

Apply herbicide to isolated pockets of noxious weedy plant species, if present, in accordance with procedures contained in Herbicide Operations.

Wildflowers

Large stands of wildflowers should be avoided when mowing unless safety concerns arise.

Ornamental Plantings

Maintain ornamental landscape plantings and irrigation systems in an acceptable condition. (See Chapter 4, Landscape Inspection Guide.)

Erosion Control

Implement erosion control measures as necessary (slope stabilization, seeding, mulching, soil retention blankets, etc.). Refer to 2004 Edition of A Guide to Roadside Vegetation Establishment**, Chapter 5.**

Wildlife Habitat and Native Plant Conservation

Areas which receive frequent mowing seldom support the establishment of significant wildlife habitat or provide for the regeneration of native plants. This is common in urban areas.

In those areas which may be designated as non-mow or natural areas, significant nesting cover for wildlife and strong regeneration and preservation of native plant species can be achieved.

Endangered and Threatened Plants and Animals

Contact the District Environmental Coordinator, the Vegetation Management staff of the Maintenance Division (MNT), or the Environmental Affairs Division (ENV) for information concerning the location of protected species of plants and animals in each county.

Protected species of plants and animals known to exist in or adjacent to TxDOT right of way may require special mowing and trimming procedures.

Invasive Species

Follow the mowing guidelines as outlined in Special Provision 730-003 (Roadside Mowing) for areas containing invasive species, which calls for pressure washing of mowing equipment before the equipment enters or leaves designated areas.

Targeted plants may require treatment with selected herbicides. Contact the Vegetation Management staff, MNT, before treating these areas.

Rural Highways

Conduct vegetation management on roadways designated as Rural according to the following guidelines for each activity or situation.

Mowing and Trimming

Follow these guidelines for mowing and trimming along Rural highways.

Establish non-mow or natural areas at appropriate locations (see Chapter 2, Section 7, "Non-Mow or Natural Areas and Acreage Evaluations") within the right of way. These areas offer the best opportunity for wildflower propagation, native grass regeneration, and establishment of nesting cover for wildlife. Clearly mark these areas to prevent accidental mowing during modified full-width mowing.

After maximizing the use of non-mow areas, use modified full-width mowing on the remaining right of way. Generally, non-mow areas would begin at the toe of the slope in fill areas of the back of the ditch for cut sections, as long as clear zone requirements are met.

Use two modified full-width cycles per year. The first modified full-width cycle should be scheduled to allow wildflower seeds to mature and reset in the late spring. The second modified full-width cycle should be scheduled for the late fall to provide maximum regeneration of native grasses, maintain nesting cover for wildlife and reduce vegetative competition with spring-blooming wildflowers. Strip mowing may be used in lieu of modified full-width mowing cycles.

Set cutting height no lower than seven inches to preserve wildflowers, create residual nesting cover, and to provide for strong regeneration of native grasses.

Mechanically trim if necessary.

In those areas where herbicides have been applied for the control of taller, weedy plant species, delay mowing for a minimum of 14 days after herbicide application for maximum control of unwanted plant species.

Perform strip or spot mowing during the year when necessary for safety or control when taller vegetation is present.

Herbicide Application

Target isolated pockets of noxious weed species, if present, with appropriate types and rates of herbicides as stipulated in Herbicide Operations. Coordinate mowing and herbicide operations for maximum effect.

Wildflowers

Delay mowing until mature seeds are set. Reseed all suitable areas with wildflowers as appropriate.

The establishment of non-mow or natural areas provide excellent opportunities for the establishment of significant fall or perennial wildflower displays.

Ornamental Plantings

Maintain ornamental landscape plantings and irrigation systems in an acceptable condition. (See Chapter 4, Landscape Inspection Guide).

Erosion Control

Implement erosion control measures as necessary (slope stabilization, seeding, mulching, soil retention blankets, etc.). Refer to 2004 Edition of A Guide to Roadside Vegetation Establishment**, Chapter 5.**

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Areas which receive frequent mowing seldom support the establishment of significant wildlife habitat or provide for the regeneration of native plants.

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Contact the District Environmental Coordinator, the Vegetation Management staff of MNT, or ENV for information concerning the location of protected species of plants and animals in each county.

Protected species of plants and animals known to exist in or adjacent to TxDOT right of way may require special mowing and trimming procedures.

Invasive Species

For areas containing invasive species, follow the mowing guidelines outlined in Special Provision and Special Specification 7445-007 (Roadside Mowing).

Targeted plants may require treatment with selected herbicides. Contact the Vegetation Management staff of MNT before treating these areas.

Section 4 — Special Situations

Overview

This section covers special situations that may be encountered on the right of way.

Manicured Areas

Manicured areas are generally maintained under separate landscape maintenance contracts.

Grass Establishment

In areas of new construction or anywhere newly seeded, sprigged, plugged, or turfed right of way is being established, frequent mowing may be necessary to reduce competition from weeds and noxious grasses. However, native grasses must be managed somewhat differently from the more conventional introduced species like fescues and bermudagrass.

Native Grasses

To avoid weakening a stand of native grasses, it is important that they not be cut too short or too often. Frequent mowing of native grasses would allow noxious weeds to invade. Once established, native warm season grasses (bluestems, gramas, green sprangletop, and plains bristlegrass) should be cut no lower than seven inches to ensure survivability.

Chapter 2 — Mowing Standards

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Section 3 — Special Mowing Situations

Section 4 — Mowing and Herbicide Application

Section 5 — Mowing and Litter Pickup

Section 6 — Other Precautions

Section 7 — Non-Mow or Natural Areas and Acreage Evaluations

Section 1 — Types of Mowing

Overview

Each of the two levels (Developed Urban or Rural) as described in Chapter 1 contains specific guidelines for when to perform modified full-width, strip and spot mowing for safety. This section describes each of these three types of mowing and provides standards for how the work is to be done.

Modified Full-Width Mowing

Modified full-width mowing includes all unpaved right of way, except for delineated non-mow or natural areas. Generally, non-mow or natural areas would begin at the toe of the slope in fill areas or the back of the ditch for cut sections, as long as clear zone requirements are met.

The frequency of modified full-width mowing for a given roadway will depend on the level of vegetation management assigned to that segment of roadway.

Figure 2-1. Modified Full-Width Mowing in Llano County.

Strip Mowing

Mowing the area 14 to 15 feet from the edge of the shoulder (whether paved or unpaved) is called strip mowing. In addition to the strip along the shoulder, all strip mowing operations will include:

- mowing from the pavement edge or shoulder to the right-of-way line to developed areas (cemeteries, schools, churches, private dwellings, community centers, etc.)
- all mowing necessary to maintain adequate sight distances for intersections, private entrances, curves, off-ramps, on-ramps, signs, delineators and other appurtenances
- mowing around all appurtenances (signs, delineators, guardrail, culvert headwalls, etc.) that are within the designated strip width
- mowing the entire width of narrow medians of 15 feet or less and outer separations
- mowing full-width, from right of way to right of way for drainage where appropriate
- mowing a smooth and gradual transition that will blend the designated strip width with other areas that require a greater or lesser mowing width.

(Special situations, such as rural medians, intersections and transitions, are further explained in the following two sections.)

Figures 2-2 to 2-6 show examples of typical strip mowing operations.

Figure 2-2. Strip Mowing in Austin District.

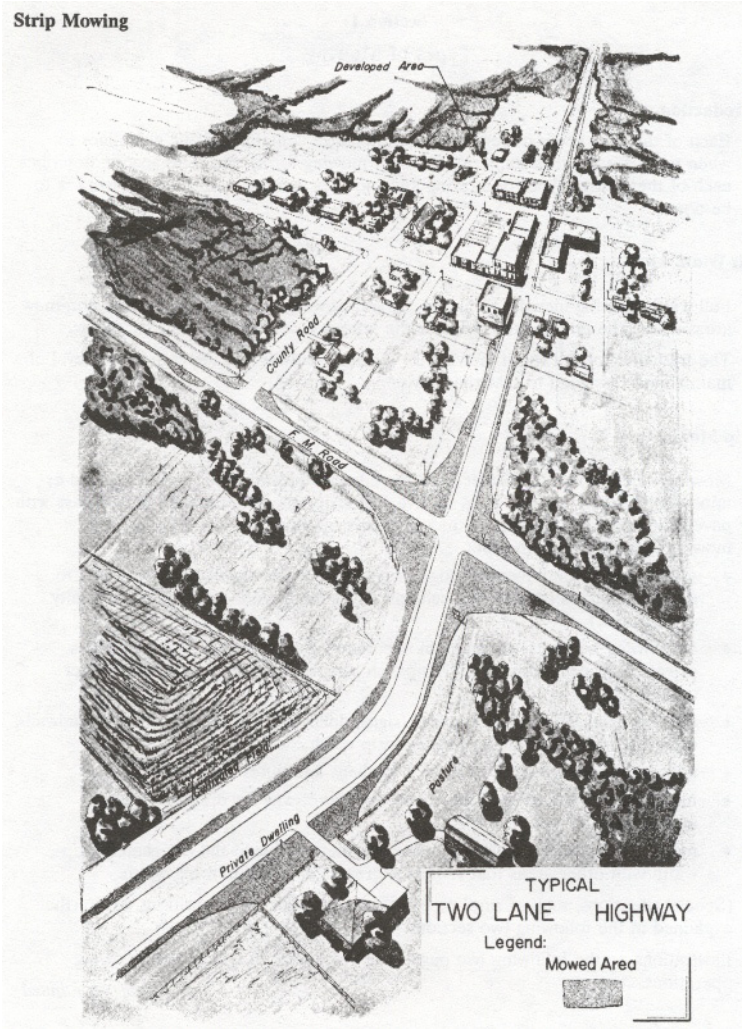

Figure 2-3. Strip Mowing.

Strip Mowing (continued)

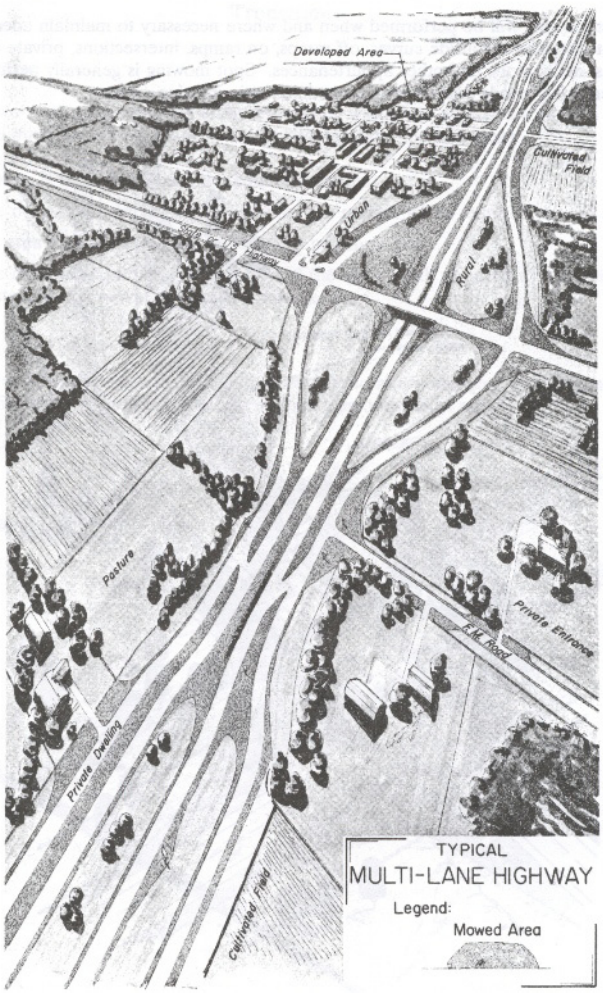

Figure 2-4. Strip Mowing.

Figure 2-5. Strip Mowing in Llano County.

Figure 2-6. Strip mowing in Llano County.

Spot Mowing for Safety

Spot mowing will be performed when and where necessary to maintain adequate sight distances for inside curves, off-ramps, on-ramps, intersections, private entrances, signs, delineators, and other appurtenances. Spot mowing is generally performed when safety needs arise between scheduled strip mowing cycles.

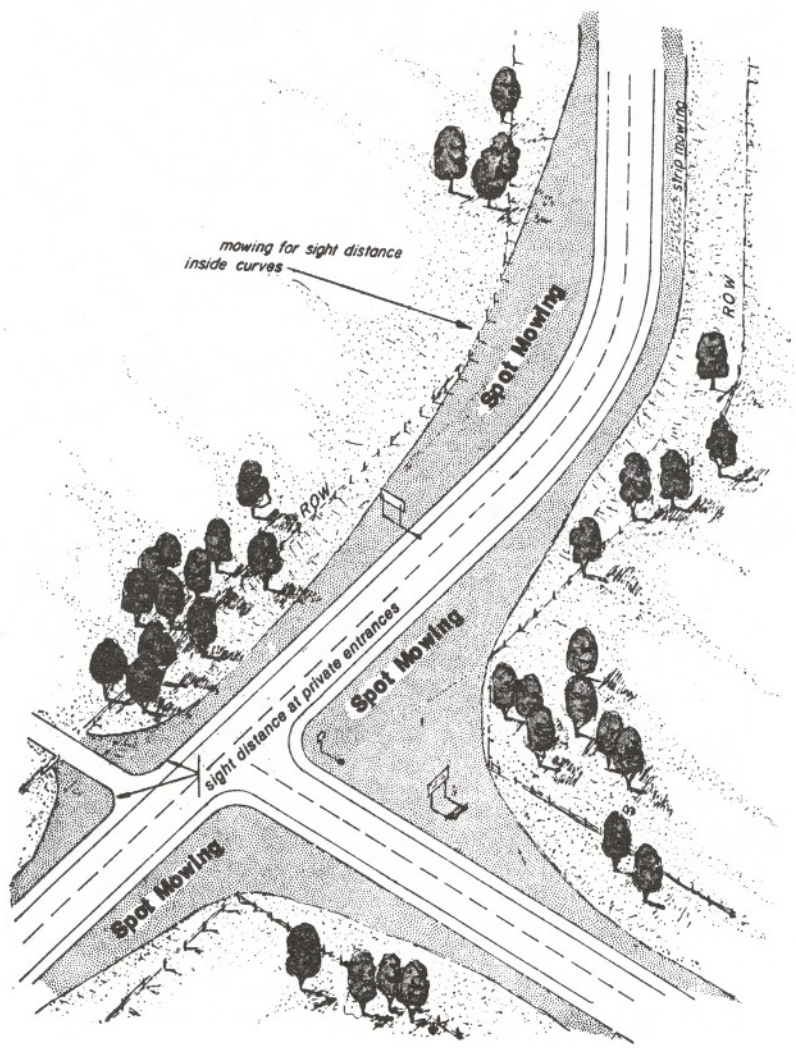

Figure 2-7. Spot Mowing.

Section 2 — Transitions

When Required

Wherever two areas requiring different mowing widths are adjacent, a smooth and gradual **transition** should be achieved to visually blend the two areas.

Examples: A transition would be required between:

- the designated strip mowing width and the greater width required around a sign
- an area that is mowed full width and a non-mow area
- the designated strip mowing width and the extra width required to maintain sight distances at a curve, driveway or intersection.

Rate

The rate of transition should be gradual enough to allow adequate sight distances for prevailing traffic conditions and also provide a smooth visual effect.

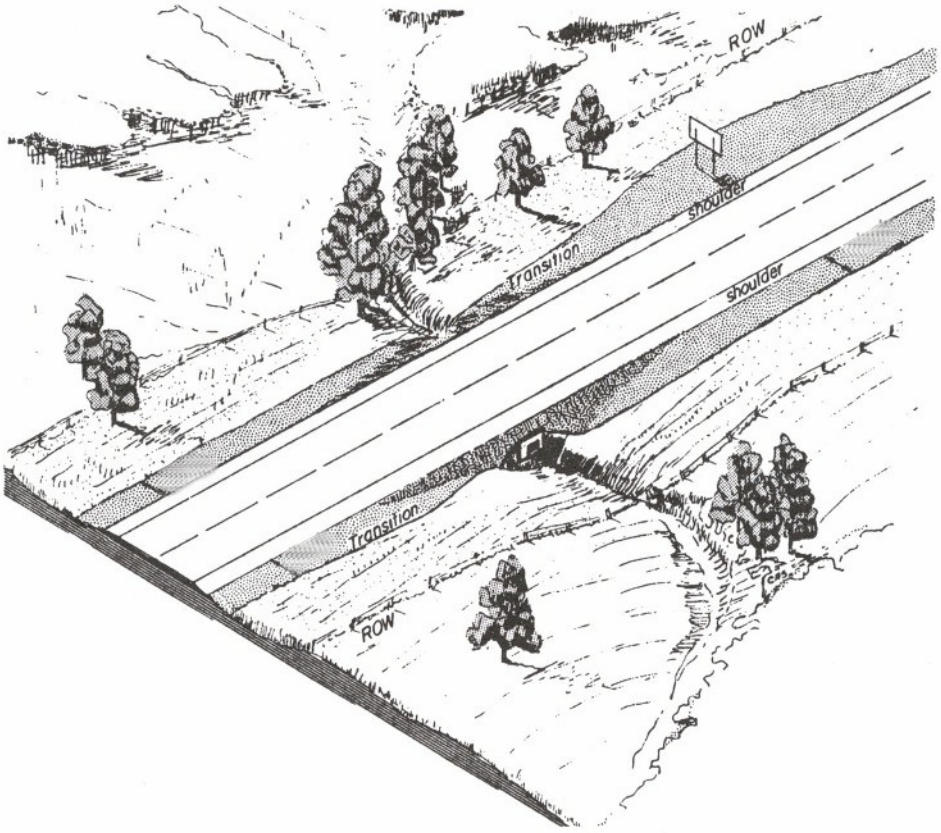

Figure 2-8. Transition.

Section 3 — Special Mowing Situations

Rural Medians and Outer Separations

The entire area of rural medians and outer separations should be mowed during spot and strip mowing operations, unless the grade is too steep or the area is covered with trees, shrubs or other vegetation desirable for wildlife benefit or erosion mitigation. On extremely wide medians and outer separations, normally only transition and shoulder strip mowing should be performed. This applies to all divided highways including state, U.S. and interstate highways.

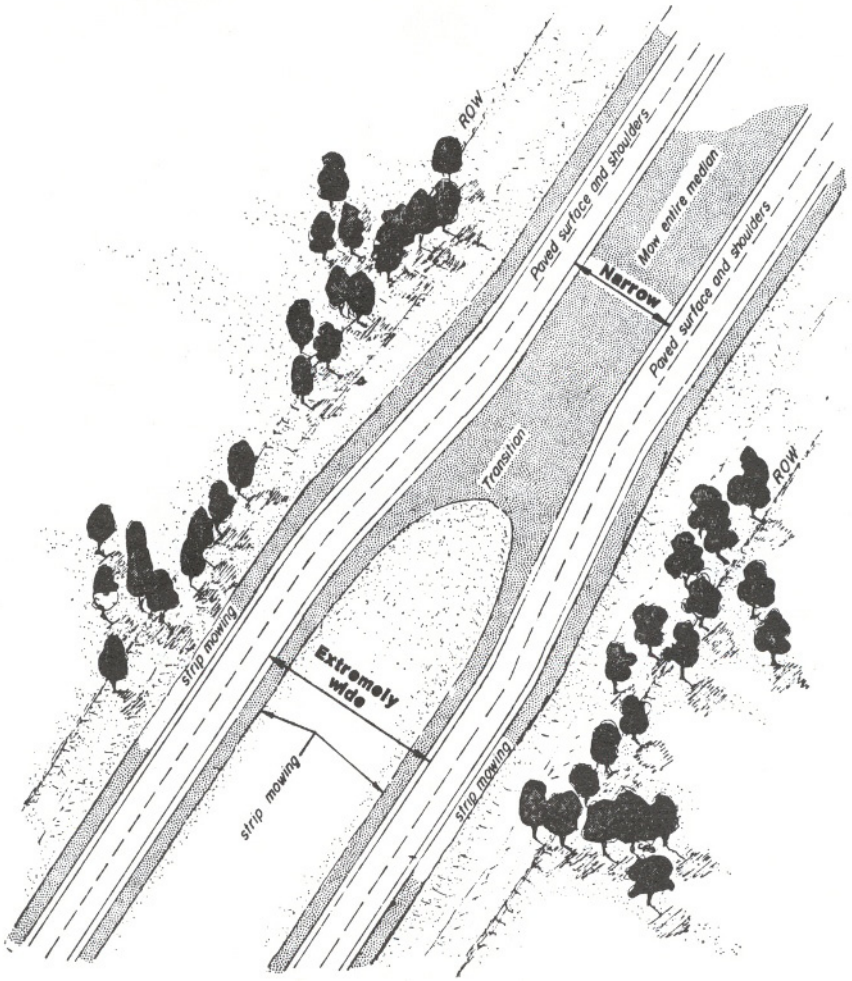

Figure 2-9. Rural Medians.

Rural Intersections

During spot and strip mowing operations, the area around rural intersections or interchanges will be mowed as necessary to provide adequate sight distances.

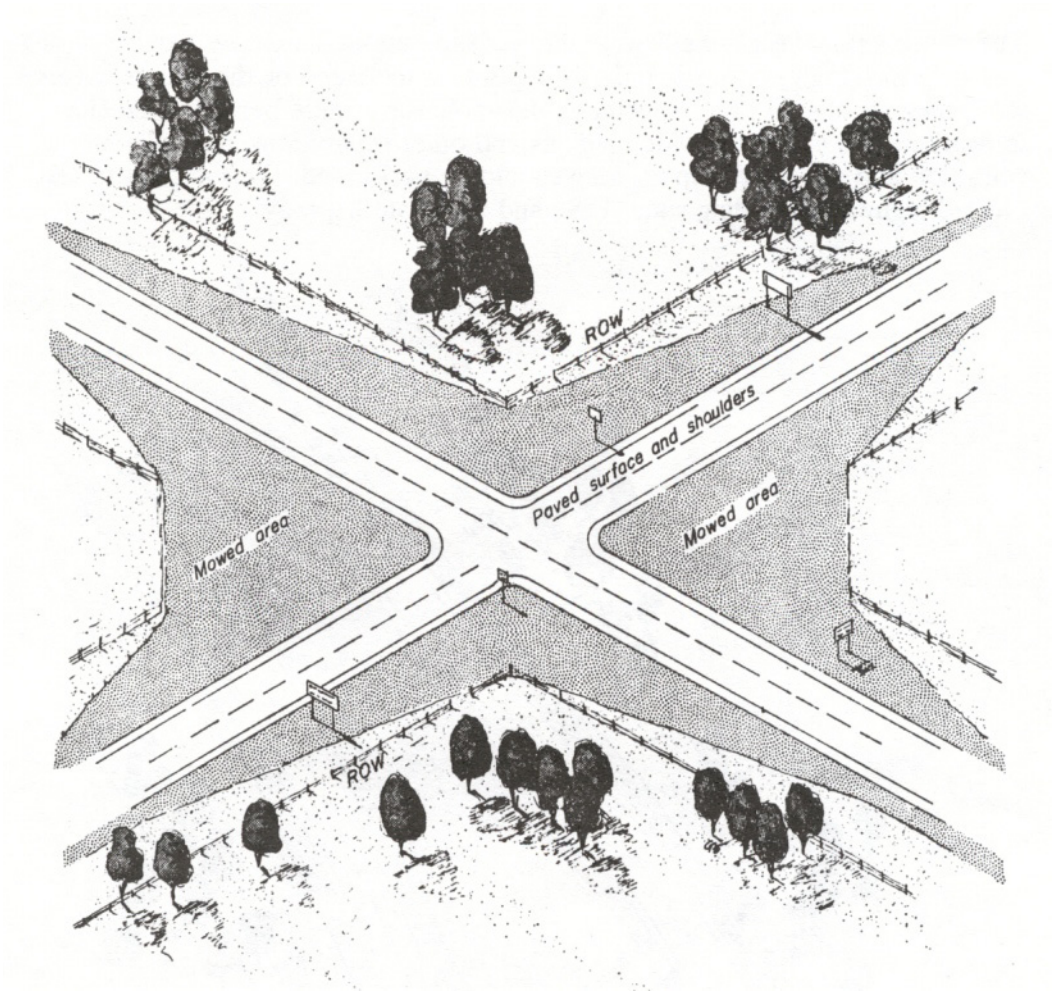

Figure 2-10. Rural Intersections.

Urban Intersections

Urban intersections can sometimes be sparsely landscaped or they can be formally landscaped with turf grass, tree and shrub beds, which can be irrigated or non-irrigated. Often, as in Figure 2-11, the interior areas of these intersections include natural, brush or wooded areas. Because Texas is a diverse state with 11 vegetative regions (see Figure 2-12, below) intersections are landscaped differently within the districts and maintained with various maintenance levels.

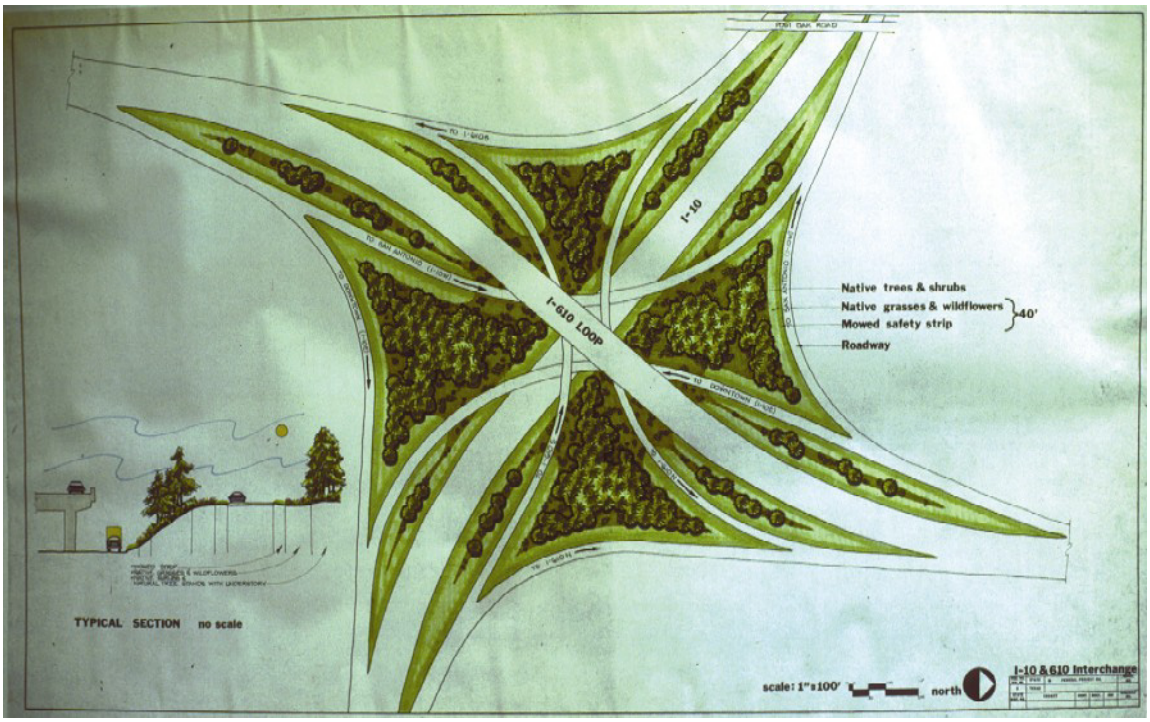

Figure 2-11. Urban Intersection, Houston District.

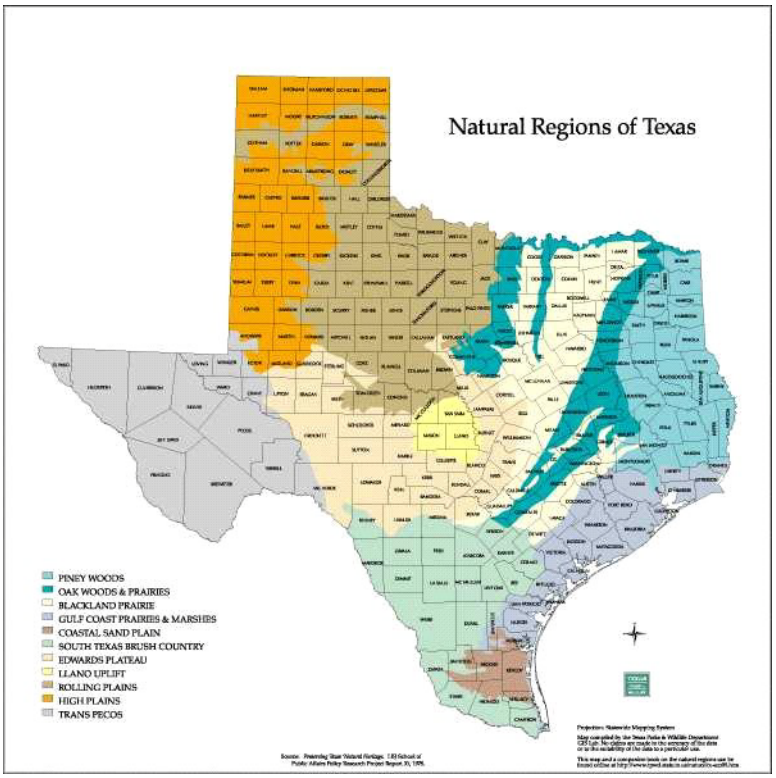

Figure 2-12. The 11 natural vegetative regions of Texas.

Cut and Fill Sections

Normally, on fill sections, only strip mowing will be necessary. Strip mowing will also be adequate in cut sections; however, at deep cuts, mowing must extend across the ditch line to the beginning or base of the backslope.

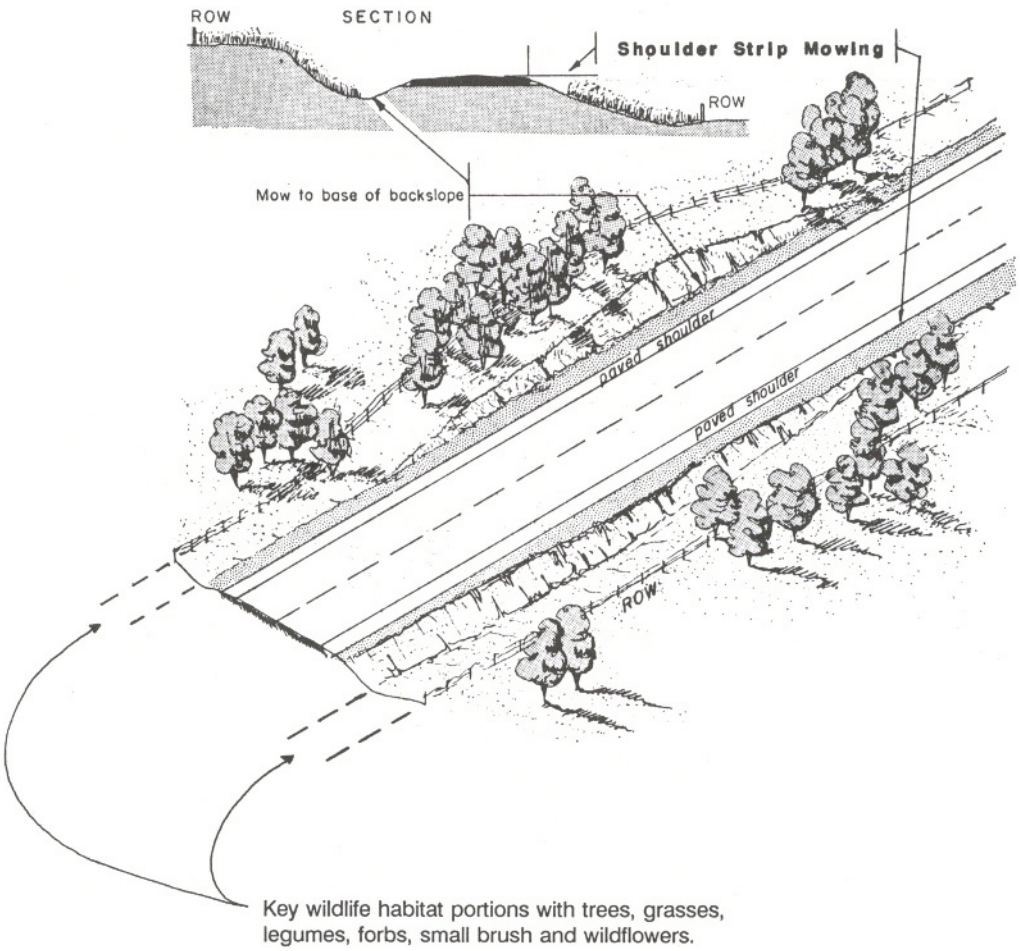

Figure 2-13. Cut and Fill Sections.

Rest Areas and Picnic Areas

Rest areas and picnic areas should be maintained in a lawn-type condition with frequent mowing.

Section 4 — Mowing and Herbicide Application

Need for Coordination

Overspray herbicide applications must be coordinated with mowing operations to:

- ensure effective control of target plant species
- avoid damage to desirable plant species such as wildflowers, legumes and forbs beneficial to wildlife (examples include Illinois bundleflower, Engelmann daisy, Plains Coreopsis, Texas Bluebonnet, etc.).

How Overspray Herbicide Works

Overspray herbicide applications target noxious weeds. For the herbicide to be effective, **both** of the following conditions must be met:

- The target species must be in a correct growing condition. (See Herbicide Operations.)
- The herbicide must have about 14 days to translocate from the leaf surface to the root system of the target species.

Guidelines

To coordinate mowing and herbicide operations, observe the following guidelines:

- Do **not** apply overspray herbicide after a mowing operation or before the target species attains a correct growing condition. **(To do so would be ineffective and cause damage to desirable species.)**
- Allow a **minimum of 14 days** before mowing in overspray areas.

More Information

Details on herbicides are covered fully in Herbicide Operations and also available in separate published form from MNT, Vegetation Management Section.

Section 5 — Mowing and Litter Pickup

Guideline

Litter pickup operations should be conducted **before** mowing operations.

Explanation

Mowing a littered portion of right of way would:

- increase the risk of the mowers striking unseen objects and causing harm to people, machinery and passing traffic
- cause shredding of large pieces of litter, resulting in more time consuming litter pickup operations
- expose more litter to view.

Figure 2-14. Adopt A Highway Program volunteers from Tyler Civitan Club.

Section 6 — Other Precautions

Overview

The main purpose of the vegetative cover on the right of way is to protect the roadside from erosion. Left unprotected, deterioration would occur, threatening the paved surface of the roadway. Mowing is an important component of roadside vegetation management, but it must be conducted with care to preserve the vegetative cover. Observing the precautions contained in this section will help:

- ensure efficient and environmentally sound mowing operations
- promote wildlife habitat
- maintain seed sources for the state's native flora.

Delay Mowing When Soil Is Wet

When the soil is wet, delay mowing. Tractor tires cause severe rutting in wet soil as shown in Figure 2-15. Rutting, especially on slopes, causes erosion and leads to the spread of noxious weeds. Erosion leads to deterioration of the roadside and threatens the paved surface of the roadway.

Avoid Mowing Steep Slopes

Avoid mowing steep slopes (3:1 ratio or steeper), even in urban areas, whenever possible. Mowing steep slopes increases compaction, causes slope failure and rutting and decreases the vigor of the vegetation. Loss of plant growth results in slope erosion.

Figure 2-15. Mowing steep slope (rutting and slope failure).

Use Appropriate Cutting Height

Never set mower cutting height lower than seven inches in rural areas and five inches in urban areas.

Low cutting (also called "scalping") is undesirable because it:

- produces stress in the vegetation, especially during dry, hot conditions, resulting in loss of desirable vegetative cover
- deprives ground-nesting wildlife of cover
- increases the number of objects thrown by mowers (objects thrown by mowers represent about 12 percent of all claims against the department each year).

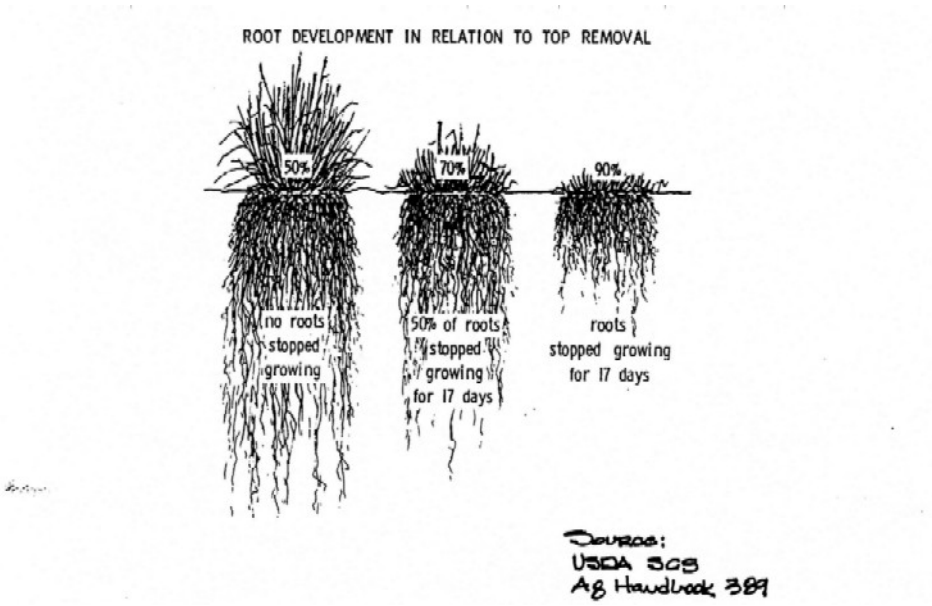

Figure 2-16. Example of root development in relation to top removal.

Coordinate Mowing with Grass Seed Production

Effective mowing operations require coordination with seasonal cycles, as well as with other roadside maintenance activities.

In late summer and early fall, grasses produce seed-heads. Seed-heads develop very rapidly and, if cut, will regenerate in eight to 12 days. Mowing operations during seed-head production result in wasted time and money.

After seed-heads mature in October and November, grasses will become dormant. Mowing after this period will result in a clean right of way until spring.

NOTE: Where K.R. bluestem, Little Bluestem, Sideoats Grama, Indian Grass, Switchgrass, Green Sprangletop, Sand Bluestem, Western Wheatgrass, or Plains Bristlegrass are the predominant grass, they should be mowed in the late fall.

NOTE: Remember to cut grass no less than seven inches high to provide residual material to protect next year's early ground-nesting wildlife and ensure healthy grass regeneration. Panhandle roadsides, for example, provide much needed protective cover for pheasants with proper management of key backslopes. (The backslope is the area of right of way beyond the drainage ditch that slopes away – either up or down – from the plane of the roadway.)

Figure 2-17. Beautiful right of way, mowing operations coordinated in Waco District.

Section 7 — Non-Mow or Natural Areas and Acreage Evaluations

Introduction

Each district maintenance engineer, vegetation manager or designated representative must evaluate all unpaved sections of right of way to establish non-mow or natural areas and calculate acreage to be mowed. The department encourages consultation with the Texas Parks and Wildlife Department (TPWD) field biologists to maximize the wildlife habitat benefits on a local basis.

Establishing Non-Mow or Natural Areas

Maximize the designation of non-mow or natural areas throughout the right of way. Suitable non-mow or natural areas may include steep slopes, wide rights of way, and other areas which are covered with desirable vegetation. Clearly mark these areas to prevent accidental mowing during modified full-width mowing.

Calculating Acreage to be Mowed

In addition to the establishment of non-mow areas, the amount of modified full-width and strip acreage to be mowed must be calculated in whole acre units for each section of roadway. These figures will be used in drawing up contact bid proposals and determining maintenance costs.

The Maintenance Management Information System (MMIS) Users Manual, Chapter 2, Section 2 ("Acre Calculation Chart") contains a table for calculating mowing area, shown here as Figure 2-18.

ACRE CALCULATION
WIDTH IN FEET

LENGTH FEET	MILES	1	5	10	15	20	30	40	50	60	70	80	90	100
100	0.02	1	1	1	1	1	1	1	1	1	1	1	1	1
500	0.09	1	1	1	1	1	1	1	1	1	1	1	1	1
1,000	0.19	1	1	1	1	1	1	1	1	1	2	2	2	2
1,320	0.25	1	1	1	1	1	1	1	2	2	2	2	3	3
1,500	0.28	1	1	1	1	1	1	1	2	2	2	3	3	3
2,000	0.38	1	1	1	1	1	1	2	2	3	3	4	4	5
2,500	0.47	1	1	1	1	1	2	2	3	3	4	5	5	6
2,640	0.50	1	1	1	1	1	2	2	3	4	4	5	5	6
3,000	0.57	1	1	1	1	1	2	3	3	4	5	6	6	7
3,500	0.66	1	1	1	1	2	2	3	4	5	6	6	7	8
3,960	0.75	1	1	1	1	2	3	4	5	5	6	7	8	9
4,500	0.85	1	1	1	2	2	3	4	5	6	7	8	9	10
5,000	0.95	1	1	1	2	2	3	5	6	7	8	9	10	11
5,280	1.0	1	1	1	2	2	4	5	6	7	8	10	11	12
10,560	2.0	1	1	2	4	5	7	10	12	15	17	19	22	24
13,200	2.5	1	2	3	5	6	9	12	15	18	21	24	27	30
15,840	3.0	1	2	4	5	7	11	15	18	22	25	29	33	36
18,480	3.5	1	2	4	6	8	13	17	21	25	30	34	38	42
23,760	4.5	1	3	5	8	11	16	22	27	33	38	44	49	55
26,400	5.0	1	3	6	9	12	18	24	30	36	42	48	55	61
31,680	6.0	1	4	7	11	15	22	29	36	44	51	58	65	73
36,960	7.0	1	4	8	13	17	25	34	42	51	59	68	76	85
42,240	8.0	1	5	10	15	19	29	39	48	58	68	78	87	97
47,520	9.0	1	5	11	16	22	33	44	55	65	76	87	98	109
52,080	10.0	1	6	12	18	24	36	48	61	73	85	97	109	121
58,080	11.0	1	7	13	20	27	40	53	67	80	93	107	120	133
63,360	12.0	1	7	15	22	29	44	58	73	87	102	116	131	145
68,640	13.0	2	8	16	24	32	47	63	79	95	110	126	142	158
73,920	14.0	2	8	17	25	34	51	68	85	102	119	136	153	170
79,200	15.0	2	9	18	27	36	55	73	91	109	127	145	164	182
84,480	16.0	2	10	19	29	39	58	78	97	116	136	155	175	194
89,760	17.0	2	10	21	31	41	62	82	103	124	144	165	185	206
95,040	18.0	2	11	22	33	44	65	87	109	131	153	175	196	218
100,320	19.0	2	12	23	35	46	69	92	115	138	161	184	207	230
105,600	20.0	2	12	24	36	48	73	97	121	145	170	194	218	242

Figure 2-18. Acre Calculation Chart from the MMIS Users Manual.

Chapter 3 — Native and Introduced Grasses, Wildflowers and Legumes

Contents:

Section 1 — Overview

Section 2 — Native and Introduced Grasses

Section 3 — Obtaining Seeds

Section 4 — Wildflower Propagation

Section 5 — General Wildflower Planting Guidelines

Section 6 — Bluebonnets and Other Legumes

Section 7 — Selecting Wildflowers by Natural Vegetative Region

Section 8 — USDA Hardiness Zone Map

Section 1 — Overview

Background

The Texas Department of Transportation has received national recognition for its roadside wildflower program. Since 1929, the department has maintained the practice of withholding mowing until wildflowers have set mature seed and expanding the range of wildflower species.

In addition to beautifying the right of way, wildflowers – along with native and introduced grasses and legumes – contribute to the overall health of the plant community by providing specific soil nutrients. Preservation and propagation of these plants continues to be an important part of the department's vegetation management strategy.

Planting roadsides with mixtures of native and introduced grasses, legumes and wildflowers adheres to the department's policy of:

- providing a safe and comfortable road network for the traveling public
- enhancing environmental protection and developing over 800,000 acres of roadside wildlife habitat
- reducing erosion losses of topsoil and borrow material
- providing cost-efficient maintenance activities.

Benefits

The use of wildflowers with a specific grass mixture for a localized area (**Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, Item** 164) will:

- help blend highway right of way into adjacent lands
- reduce maintenance costs
- reduce erosion rates
- improve aesthetic beauty
- add to the value of roadsides as wildlife habitat.

General Nature of Information

The information contained in this chapter is very general and may not apply to all species. Additional research may be necessary to obtain information on specific species.

Section 2 — Native and Introduced Grasses

Introduction

Native grasses have had thousands of years to adapt to various Texas climates and soils and they offer a definite advantage in highway right of way environments. Texas is a diverse state with varying climates and vegetative regions, so there is a definite need for selected introduced species of grasses to be included in our seed mixes to ensure quick vegetation coverage and to prevent erosion on the rights of way. Native grasses will prevail eventually, covering and stabilizing the right of way. Benefits of native grasses include:

- excellent erosion control when established and maintained properly
- long lived (up to 100 years)
- excellent wildlife habitat (food and cover)
- highly resistant to invasions of noxious weeds
- low maintenance costs
- well adapted to Texas soils and climates
- resistant to agricultural chemical runoffs
- aesthetically pleasing
- part of our natural heritage.

Establishment and Growth

Native grasses are usually slow to establish and plantings may appear to have failed after the first growing season. Although the inspector may see weed-infested areas with only spindly and scattered individual grass plants, the stand is probably well on its way to becoming established. There are several reasons for this slow establishment:

- Native grasses commonly have more extensive root development than above-ground growth during the first year.
- Many native grasses do not begin growing until late spring or early summer, making their first year growing season short.
- A stand of native grasses generally requires about three years to reach maturity. Once native grasses become established, however, very few weeds can compete with them for essential nutrients and water in the soil. At maturity, native grasses may have a fibrous root system extending to a depth of five feet or more.

Maintenance

To reduce competition from weeds after planting, mow sites planted with native and introduced grasses in late fall at a height not less than seven inches.

On slopes where mowing is not appropriate, herbicides may be used to control competing weeds.

Erosion Control and Soil Stabilization

With their deep, fibrous root systems, established stands of native grasses provide excellent long term erosion control and soil stabilization. Because the root systems of native grasses extend deeper, they can obtain access to essential soil moisture that shallower rooted introduced grasses cannot. This allows native grasses to grow on poorer soils and resist drought.

Wildlife Habitat

Many of the game birds, songbirds, deer, rabbits and other small mammals that play an important role in the natural heritage of Texas depend on established stands of native grasses for nesting cover, den cover and food. Properly maintained highway rights of way covered with native grasses provide highly productive wildlife habitats. Research indicates that unmowed roadsides with native plant cover support two to three times the number of bird nests as those that are mowed annually.

Many species of birds and mammals depend on roadsides during at least a part of their life cycle. The following table shows some of the species that will benefit from rights of way planting with native grasses intermixed with wildflowers.

Birds and Mammals in ROW

Birds	Birds	Mammals	Mammals
Ring-necked Pheasant	Dickcissel	Deer	Harvest Mouse
Bobwhite Quail	Mourning Dove	Coyote	Cotton Rat
Scaled Quail	Lark Bunting	Cottontail Rabbit	Ground Squirrel
Meadowlark	Horned Lark	Blacktailed Jackrabbit	Least Shrew
Scissor-tailed Flycatcher	Several species of sparrow	Whitefooted Deer Mouse	Gopher

Section 3 — Obtaining Seeds

Introduction

There are several different ways to obtain grass and wildflower seeds. Typically, seeds are grown by a nursery, harvested and marketed for commercial sale. This section discusses several sources and methods of obtaining native plant and wildflower seed.

Nursery Grown Seed

Nursery grown native plant seed are available through commercial sources. Select seed from species adapted to the local growing season, soils and moisture conditions. Select seed that originate within 150-200 miles of the area to be planted, so that they are adapted to local conditions. The TxDOT publication, **"Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges," Item number** 164, contains grass seed recommendations for all districts.

Seed must be of the previous season's crop, with date of analysis shown on each bag. The date must be within 12 months of the time of use.

All grass and wildflower seed must meet the requirements of the Texas Seed Law [Agricultural Code; Title 5, Production, Processing and Sale of Horticultural Products; Subtitle A, Seed and Fertilizer; Chapter 61, Inspection, Labeling and Sale of Agricultural and Vegetable Seed (1981)], including the labeling requirements for showing pure live seed (PLS), name and type of seed. See Section 5, "General Wildflower Planting Guidelines" of this Chapter for a full explanation of Pure Live Seed.

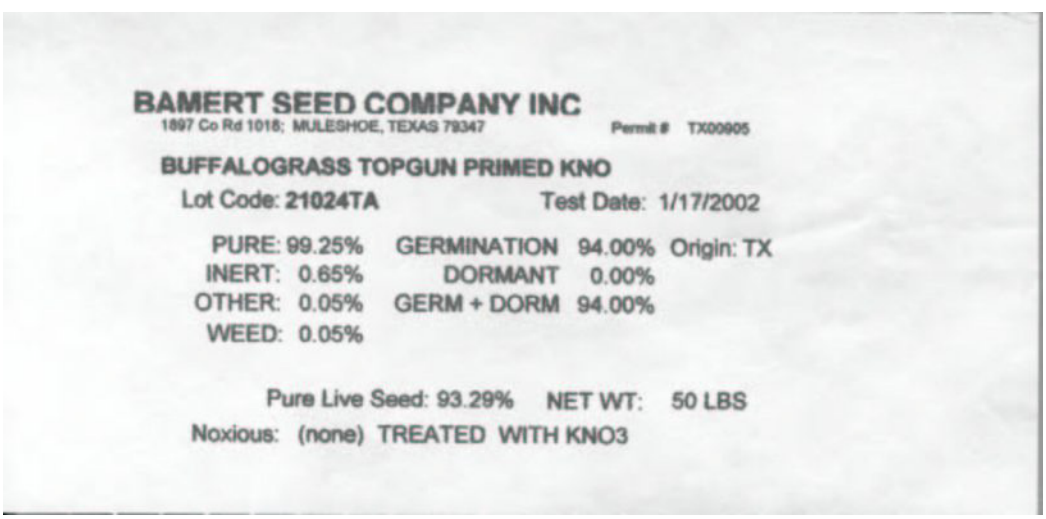

Figure 3-1. Texas Seed Law required Buffalograss seed tag. Courtesy Bamert Seed Co.

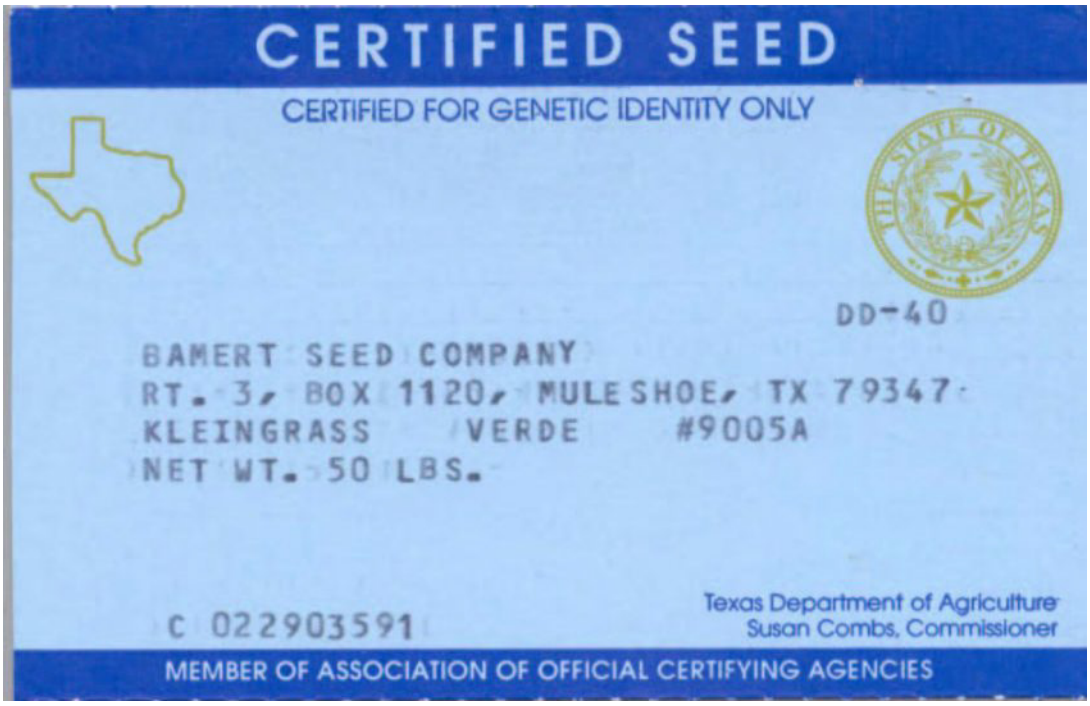

Figure 3-2. The certified seed tag indicates that the seed in the corresponding lot has been tested by a Texas Department of Agriculture seed tab. Courtesy Bamert Seed Co.

Stockpiling Topsoil from Roadway Construction Sites

When roadway maintenance and construction activities require the movement of earth, one of the first steps is to remove and stockpile a layer of topsoil. This topsoil contains wildflower, native and introduced grass seeds with viable sprigs of grasses and vegetation from previous seasons. When the construction or maintenance work nears completion, the stockpiled topsoil is then replaced over the right of way to provide native plant, grass and wildflower establishment. Since this method is not a guarantee for vegetation establishment the project area should be seeded with the appropriate seed mix for the district by using, **"Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges", Item number** 164. This is the most feasible method used today for a low cost replacement of topsoil and native vegetation for the right of way.

NOTE: Removal of topsoil from ecologically sensitive areas or endangered species sites may not be permissible.

The Outdated use of making "Flower Hay"

In years past, seed were gathered from prominent areas of the right of way where native plants and wildflowers were established by cutting the area with a sickle mower. This practice was conducted after the peak blooming period, but before seeds had dropped. The mowed "flower hay" was then transported to the desired location and simply scattered over the ground. This method was once

used to spread wildflowers at a cheap cost. Presently, this practice is not a feasible method because of labor costs and hours involved.

Section 4 — Wildflower Propagation

Introduction

Successful wildflower propagation depends on understanding the conditions under which various species thrive. The following are some of the factors influencing wildflower growth. Remember that some species of wildflowers may require additional research to determine the optimum conditions for growth.

Sun or Shade

Most wildflowers prefer full sun, but some can grow in either full sun or partial shade, including such species as Black-eyed Susan, Crimson Clover, Lanced-Leaf Coreopsis, Mexican Hat and Standing Cypress.

Soil Condition

Most wildflowers have a wide tolerance of soils and pH (acid/alkaline) conditions. Bluebonnets (Lupinus texensis) prefer a well-drained calcareous (alkaline) soil, such as that of central Texas.

Moisture

All wildflower seeds need moisture for germination and growth, but it is important to provide proper drainage. Moisture and drainage requirements vary according to species. Some types of wildflowers, such as Clasping Coneflower and Plains Coreopsis can tolerate wet or dry soil conditions and some, like the Bluebell Gentian, prefer moist areas.

Germination Time

Germination will vary from species to species and also from seed to seed within the same species. The germination period may range from as little as several days to as much as several years.

Section 5 — General Wildflower Planting Guidelines

When to Plant

Plant most Texas wildflowers (bluebonnets in particular) in late summer or early fall.

Selecting Seeds

Select wildflower seed species appropriate for the area. See Section 7, "Selecting Wildflowers by Natural Vegetative Region," for wildflowers acclimatized for specific vegetative regions to provide a variety of spring and summer color.

Mixtures of wildflower seed may be obtained:

- premixed from commercial suppliers
- by mixing the seeds of different species in specifically desired ratios
- by planting various selections individually.

See Section 3, "Obtaining Seeds," for more information.

Determining Planting Rate

After the selection is made, call the Vegetation Management Section for assistance in determining the planting rate or use charts in the Wildflower Guide. The planting rate (number of seeds to be planted per acre) is based on the following factors:

- type(s) of flowers being seeded
- effect desired in the area being planted
- percent of pure live seed (PLS) (see information on PLS in this section).

The effect desired in the area being planted will depend on whether the landscape is meant to be observed at long range (such as highway rights of way) or subject to closer scrutiny (such as walk-through gardens).

The department requires that seed vendors provide the current year PLS for each batch of seed. If the seed purchased was tested more than 12 months ago, it will need to be retested. (The Vegetation Management Section staff will provide assistance, if necessary.)

Pure Live Seed (PLS)

All wildflower and grass seeding rates are specified in terms of "pounds, pure live seed." The total weight of the seed bag is not the pounds of pure live seed. This is not a reflection of poor business practices by the seed industry, but more a "nature of the beast" which can't be changed. A certain amount of impurities (tiny pebbles, bits of stalk, etc.) inevitably find their way into each batch of seeds.

Assume that you went to the store and bought a one-pound bag of Bermuda grass seed. After getting home, you carefully read the seed tag and see the following information:

Purity: = 85%, Germination: = 75%

To figure the amount of Pure Live Seed (PLS), use the following formula:

%Purity x %Germination = %PLS

Using that formula with our bag of Bermuda grass, let's see what we've got:

0.85 x 0.75 = 0.64 PLS

That means that your one-pound bag of Bermuda grass actually contains only 64 percent (or less than two-thirds of a pound in our case), of pure, live seed. (It also means that 36 percent or more than one-third of a pound of that one-pound bag is just useless material!)

So, in order to get one pound of pure live seed, you need to set up your basic proportion equation which says ".64 pounds pure live seed is to one pound, as one pound is to x pounds pure-live-seed." Or in standard math notation...

0.64:1 = 1:x

Solving for "x," you get...

0.64x = 1

...then finally...

...this means that you would need 1.56 pounds of bulk seed in order to get one pound of pure live seed (with the percentage purity and germination stated on the bag in this example).

The experts have recommended that you seed Bermuda grass at 1.2 PLS per acre and you have one acre to seed. How much of the bulk seed product do we need? Here's the formula:

1.56(LbsBulk) x 1.2(LbsPLS/AC) = 1.88 bulk pounds needed.

Preparing the Soil

Most species of wildflower seed can be drilled or broadcast over undisturbed soil; so soil preparation is not always necessary. However, there may be some delay in germination if the soil is not prepared, because seed-to-soil contact is essential. When sowing wildflower seed in turf areas, scalp the grass as low as possible with a mower before sowing to hasten seed-to-soil contact.

Sowing the Seed

The method of sowing will be determined by the size of the area:

- Small areas can be sown by hand or a mechanical hand device.
- Large areas require a seed drill or other mechanical means that can be calibrated for the seeding rate.

After sowing, drag the area with a weighted section of chain-link fence or other rough flat object. This practice increases soil-seed contact.

Watering

Watering newly sown wildflower seeds is not necessary, but may hasten sprouting.

If you apply an initial watering at sowing, wet the area thoroughly but gently. Follow the first watering with additional short waterings every three days for about three weeks. The additional waterings are necessary to keep sprouts started by the initial watering alive.

Section 6 — Bluebonnets and Other Legumes

Introduction

Information about bluebonnets is frequently requested. This section should help answer the most frequently asked questions and will generally pertain to other legumes included in the wildflower list in Section 7, "Selecting Wildflowers by Natural Vegetative Region." Other legumes include Partridge Pea, Illinois Bundleflower and White Sweet Clover.

Blooming Date

Blooming date is influenced to some degree by the weather. In general, the first flowers open about March 15 in southern regions but may not show before May 1 in the more northern regions. The length of the flowering period is about one month for bluebonnets, longer for other legumes mentioned.

Obtaining Seed

The department does not sell seed to the public, but does have a list of seed suppliers located at http://crossroads/org/mnt/VM/wflower2/seed_sup.htm. An order should be placed with a supplier well before the planned sowing date to ensure seed availability.

Seeds may be obtained from mature plants about six weeks after the last flowers fade. These should be harvested before the seed pods explode and scatter the seed. Seed may be sown at harvest or stored for future planting.

Where to Plant

Bluebonnets grow best in soils that are sweet (containing lime), of moderate infertility, and, most important, well-drained. Bluebonnets and other legumes like plenty of sunshine.

Planting Time

Plant seeds in late summer or fall (no later than November 1), so they germinate and develop a heavy root system and a sturdy plant throughout the winter, and will produce an abundance of flowers in the spring.

How to Plant

Soil preparation is not always necessary. Seed-soil contact, however, is essential. Seeds can be broadcast over undisturbed soil. Small areas can be sown by hand or a mechanical hand device. Large areas require a seed drill or other mechanical means that can be calibrated for the seeding rate.

Watering may hasten sprouting, but is not necessary. When watering, wet the area thoroughly but gently. Follow the first watering with additional short waterings every three days for about three weeks. The additional waterings are necessary to keep sprouts started by the initial watering alive.

Special Precautions

Do not soak bluebonnet seed or prick with pins or in any way disturb the seed coat. Soaking in water can spoil the seed.

Need for Rhizobium

One of the reasons bluebonnets fail to bloom is lack of essential bacteria in the soil. These bacteria, known as Rhizobium, form nodules on the roots and are able to fix atmospheric nitrogen. This nitrogen fixation is needed for the bluebonnets to bloom.

If bluebonnets have not previously grown in the area, it is unlikely that they will bloom. In this case, planting a wildflower mix is preferable to planting strictly bluebonnets. (See Section 7, "Selecting Wildflowers by Natural Vegetative Region.")

Important Points

To establish successful bluebonnet stands, remember these important points:

- Order seed early.
- Sow seed before the first of November.
- Plant in soil that is well-suited for bluebonnets.

Section 7 — Selecting Wildflowers by Natural Vegetative Region

Natural Vegetative Regions

The following tables list the selected wildflowers for each district according to their Natural Vegetative Region. The table also provides the colors of each flower, mixture rates, single seeding rates and the area of the state where each variety thrives.

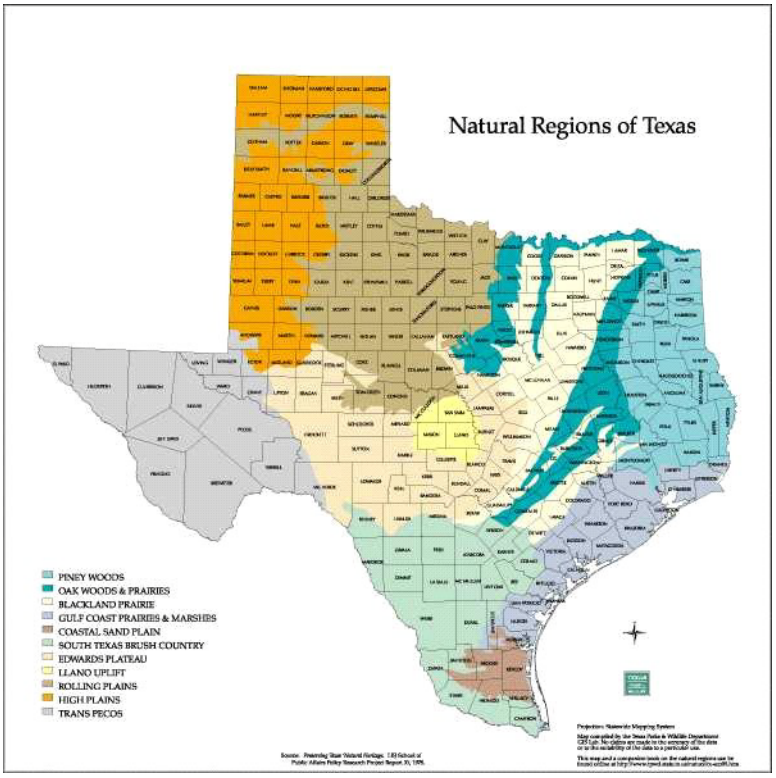

Figure 3-3. Natural Vegetative Regions of Texas. Courtesy Texas Parks & Wildlife.

Blackland Prairie Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnet (Lupinus texensis)	46%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.
Indian Blanket (Gaillardia pulchella)	20%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.

Blackland Prairie Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Missouri Primrose (Oenothera missouriensis)	9%	5 lbs.	Hardy perennial. Heavy bloomer with large yellow four petalled flowers. Likes dry soil and full sun. Blooms from May-September. 6-14 inches. 80,700 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	7%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	5%	3 lbs.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	4%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	4%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Black-Eyed Susan (Rudbeckia hirta)	3%	2 lbs.	Annual or short-lived perennial. Yellow with large brown domed center. Partial shade to full sun. Blooms from April-November. 2-3 feet. 1,710,000 seeds per pound.
Mexican Hat (Ratibida columnaris)	2%	2 lbs.	Annual or perennial. Red and yellow bordered flowers look like little Mexican hats. Full sun to partial shade with well drained soil. Blooms from April-September. 2-3 feet. 1,230,200 seeds per pound.
	100%		

Coastal Sand Plain Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnets (Lupinus texensis)	44%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.

Coastal Sand Plain Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	19%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.
Annual Phlox or Drummond Phlox (Phlox drummondii)	19%	8 lbs.	Hardy annual. Blooms are red, pink, white and shades of rose. Likes dry soil and full sun. Blooms from February-June. 8-24 inches. 234,000 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	6%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Clasping Coneflower (Rudbeckia amplexicaulis)	4%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	4%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	3%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	1%	¼ lbs.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
	100%		

Edwards Plateau Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnets (Lupinus texensis)	45%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.

Edwards Plateau Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	18%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.
Missouri Primrose (Oenothera missouriensis)	12%	5 lbs.	Hardy perennial. Heavy bloomer with large yellow four petalled flowers. Likes dry soil and full sun. Blooms from May-September. 6-14 inches. 80,700 seeds per pound.
Clasping Coneflower (Rudbeckia amplexicaulis)	8%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	6%	3 lb.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	5%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	3%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	3%	2 lbs.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
	100%		

Gulf Coast Prairies and Marshes Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnet (Lupinus texensis)	43%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.

Gulf Coast Prairies and Marshes Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	16%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.
Annual Phlox or Drummond Phlox (Phlox drummondii)	16%	8 lbs.	Hardy annual. Blooms are red, pink, white and shades of rose. Likes dry soil and full sun. Blooms from February-June. 8-24 inches. 234,000 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	6%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Winecup (Callirhoe involucrata)	5%	5 lb.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Clasping Coneflower (Rudbeckia amplexicaulis)	5%	3 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	3%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	3%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Black-Eyed Susan (Rudbeckia hirta)	2%	2 lbs.	Annual or short-lived perennial. Yellow with large brown domed center. Partial shade to full sun. Blooms from April-November. 2-3 feet. 1,710,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	1%	1ž4 lb.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
	100%		

High Plains Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	27%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½ - 2 feet. 153,000 seeds per pound.
Purple Coneflower (Echinacea purpurea)	22%	12 lbs.	Hardy perennial. Purple petals with red-orange cone in center. Partial shade to full sun and needs well drained soil. Blooms from April-June. 2 feet. 117,000 seeds per pound.
Purple Prairie Clover (Petalostemum purpureum)	22%	8 lbs.	Perennial. Purple blooms. Legume family (nitrogen fitting). Dry soil and full sun. Blooms from June-July. 1-3 feet. 293,000 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	8%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	7%	3 lbs.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	6%	1 lb.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	5%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Mexican Hat (Ratibida columnaris)	3%	2 lbs.	Annual or perennial. Red and yellow bordered flowers look like little Mexican hats. Full sun to partial shade with well drained soil. Blooms from April-September. 2-3 feet. 1,230,200 seeds per pound.
	100%		

Llano Uplift Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnets (Lupinus texensis)	45%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.
Indian Blanket (Gaillardia pulchella)	20%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound. .
Missouri Primrose (Oenothera missouriensis)	11%	5 lbs.	Hardy perennial. Heavy bloomer with large yellow four petalled flowers. Likes dry soil and full sun. Blooms from May-September. 6-14 inches. 80,700 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	7%	3 lbs.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound.
Clasping Coneflower (Rudbeckia amplexicaulis	7%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	6%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	3%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	1%	1/4 lb.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
	100%		

Oak Woods & Prairies Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnet (Lupinus texensis)	40%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.
Indian Blanket (Gaillardia pulchella)	15%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per lb.
Crimson Clover (Trifolium incarnatum)	12%	15 lbs.	Annual. Scarlet to deep red flowers. Partial shade to full sun. Blooms from March-Jay. 6-12 inches. 160,000 seeds per pound.
Lance-Leaved Coreopsis (Coreopsis lanceolata)	8%	10 lbs.	Perennial. Bright yellow blooms. Partial to full sun. Blooms from May-July. 2-3 feet. 221,000 seeds per pound.
Annual Phlox or Drummond Phlox (Phlox drummondii)	8%	8 lbs.	Hardy annual. Blooms are red, pink, white and shades of rose. Likes dry soil and full sun. Blooms from February-June. 8-24 inches. 234,000 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	6%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	4%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	3%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Black-Eyed Susan (Rudbeckia hirta)	3%	2 lbs.	Annual or short-lived perennial. Yellow with large brown domed center. Partial shade to full sun. Blooms from April-November. 2-3 feet. 1,710,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	1%	1/4 lb.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
-	100%	-	-

Piney Woods Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Crimson Clover (Trifolium incarnatum)	24%	15 lbs.	Annual. Scarlet to deep red flowers. Partial shade to full sun. Blooms from March-May. 6-12 inches. 160,000 seeds per pound.
Lance-Leaved Coreopsis (Core-opsis lanceolata)	24%	10 lbs.	Perennial. Bright yellow blooms. Partial to full sun. Blooms from May-July. 2-3 feet. 221,000 seeds per pound.
Purple Cone-flower (Echinacea purpurea)	20%	10-12 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 117,000 seeds per lb.
Clasping Cone-flower (Rudbeckia amplexicaulis)	10%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Pink Evening Primrose (Oeno-thera speciosa)	10%	1 lb.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	6%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Black-Eyed Susan (Rudbeckia hirta)	3%	2 lbs.	Annual or short-lived perennial. Yellow with large brown domed center. Partial shade to full sun. Blooms from April-November. 2-3 feet. 1,710,000 seeds per pound.
Mexican Hat (Rat-ibida columnaris)	3%	2 lbs.	Annual or perennial. Red and yellow bordered flowers look like little Mexican hats. Full sun to partial shade with well drained soil. Blooms from April-September. 2-3 feet. 1,230,200 seeds per pound.
	100%		

Rolling Plains Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	30%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.

Rolling Plains Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Purple Prairie Clover (Petalostemum purpureum)	24%	8 lbs.	Perennial. Purple blooms. Legume family (nitrogen fitting). Dry soil and full sun. Blooms from June-July. 1-3 feet. 293,000 seeds per pound.
Missouri Primrose (Oenothera missouriensis)	17%	5 lbs.	Hardy perennial. Heavy bloomer with large yellow four petalled flowers. Likes dry soil and full sun. Blooms from May-September. 6-14 inches. 80,700 seeds per pound.
Clasping Coneflower (Rudbeckia amplexicaulis)	10%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	10%	3 lbs.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound. .
Plains Coreopsis (Coreopsis tinctoria)	6%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Mexican Hat (Ratibida columnaris)	3%	2 lbs.	Annual or perennial. Red and yellow bordered flowers look like little Mexican hats. Full sun to partial shade with well drained soil. Blooms from April-September. 2-3 feet. 1,230,200 seeds per pound.
	100%		

South Texas Brush Country Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Bluebonnets (Lupinus teqxensis)	42%	20 lbs.	State flower of Texas. Blue with white trim on spikes. Most common wildflower on roadsides and pastures. Legume family (nitrogen fitting). Needs well drained soil and prefers full sun. Blooms from March-May. 12-24 inches high. 13,500 seeds per pound.
Indian Blanket (Gaillardia pulchella)	19%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.

South Texas Brush Country Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Annual Phlox or Drummond Phlox (Phlox drummondii)	18%	8 lbs.	Hardy annual. Blooms are red, pink, white and shades of rose. Likes dry soil and full sun. Blooms from February-June. 8-24 inches. 234,000 seeds per pound.
Prairie Verbena (Verbena bipinnatifida)	6%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Clasping Cone-flower (Rudbeckia amplexicaulis)	6%	3 lbs.	Hardy annual. Yellow flower petals clasp around stem with black cone center. Likes dry or wet soils with full sun. Blooms from April-June. 1½-2 feet. 800,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	5%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Pink Evening Primrose (Oenothera speciosa)	3%	1-3 lbs.	Hardy perennial. Soft pink four petalled flower. Popularly planted with Prairie Verbena. Blooms from March-November. 8-16 inches. 864,000 seeds per pound.
Indian Paintbrush (Castilleja indivisa)	1%	1/4 lb.	Annual, perennial or biennial. Blooms red with color variations of purple, orange, pink, yellow, white, etc. throughout the state. Needs well drained soil and full sun. Blooms from March-May. 6-18 inches. 5,100,000 seeds per pound.
	100%		

Trans Pecos Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Indian Blanket (Gaillardia pulchella)	45%	10 lbs.	Hardy annual that is easily established. Red flowers with yellow trim. Needs well drained soil and full sun. Blooms from May-July. 1½-2 feet. 153,000 seeds per pound.
Purple Prairie Clover (Petalostemum purpureum)	24%	8 lbs.	Perennial. Purple blooms. Legume family (nitrogen fitting). Dry soil and full sun. Blooms from June-July. 1-3 feet. 293,000 seeds per pound.

Trans Pecos Region

Common and Scientific Names	Percent Per Mix	Individual Rates Per Acre	General Information
Prairie Verbena (Verbena bipinnatifida)	7%	6 lbs.	Annual or short-lived perennial. Purple blooms. Prefers full sun. Popularly planted with Pink Evening Primrose. Blooms from April-November. 4-12 inches. 450,000 seeds per pound.
Purple Horsemint or Lemon Mint (Monarda citriodora)	12%	3 lbs.	Hardy annual or perennial. Blooms are purple-lavender. Likes dry soil and full sun. Blooms from April-October. 1-3 feet. 819,000 seeds per pound.
Plains Coreopsis (Coreopsis tinctoria)	8%	2 lbs.	Hardy annual. Heavy bloomer. Prefers full sun, but will tolerate wet or dry soil. Blooms from March-July. 1-3 feet. 1,400,000 seeds per pound.
Mexican Hat (Ratibida columnaris)	4%	1-2 lbs.	Annual or perennial. Red and yellow bordered flowers look like little Mexican hats. Full sun to partial shade with well drained soil. Blooms from April-September. 2-3 feet. 1,230,200 seeds per pound.
	100%		

Section 8 — USDA Hardiness Zone Map

USDA Hardiness Zone Map with Districts Outlined

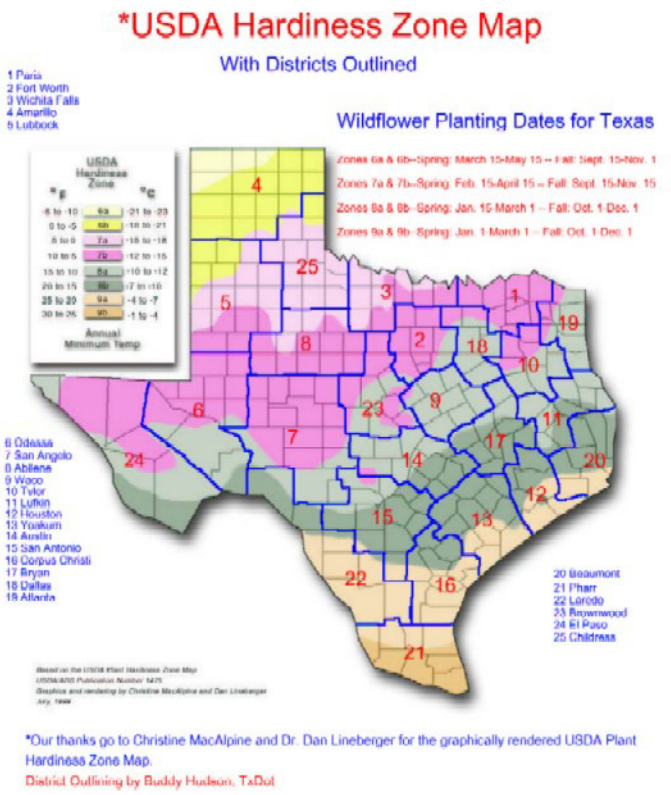

Figure 3-4. USDA Hardiness Zone Map with Districts.

Chapter 4 — Pruning Guidelines

Contents:

Section 1 — Reasons for Pruning

Section 2 — Pruning Guidelines

Section 3 — Oak Wilt

Section 4 — Trees and Utility Lines

Section 5 — Texas Administrative Code for Utility Accommodation

Section 1 — Reasons for Pruning

Safety

Safety is always the first consideration in pruning and takes precedence over all other considerations. Pruning for safety includes:

- maintaining required sight distances
- maintaining adequate clear zones on either side of and above the roadway
- removing low branches that may be hazardous to equipment operated on the right of way, such as mowers.

To Accommodate Utilities

Utility companies permitted to construct lines on the right of way are allowed to maintain them accordingly, including vegetation pruning. However, utility companies are required to follow the Texas Department of Transportation's Pruning Guidelines and observe recognized tree surgery practices.

Health of the Vegetation

Dead or diseased branches should be removed to maintain the health of the vegetation.

Aesthetic Considerations

Pruning may be done to enhance the appearance of trees and ornamental plants, if it does not interfere with the health of the vegetation.

Tree-Specific Reasons

shows several tree-specific reasons for pruning, including:

- to remove suckers
- to remove branches that are too close together or branches with weak crotches
- to remove dead or broken branches (dead or broken branches on oak species can attract sap beetles that spread Oak Wilt fungus)
- to remove water sprouts and branches that cross and rub one another.

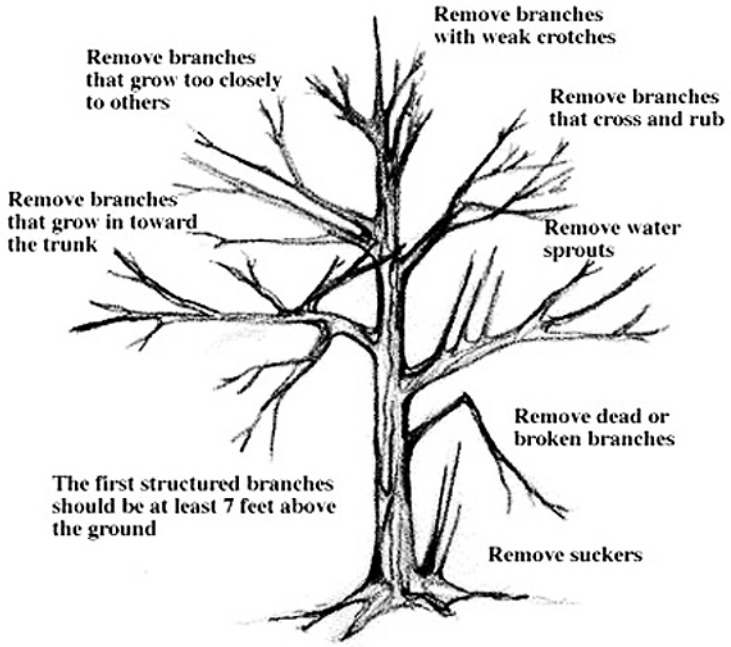

Figure 4-1. Tree-specific reasons for pruning.

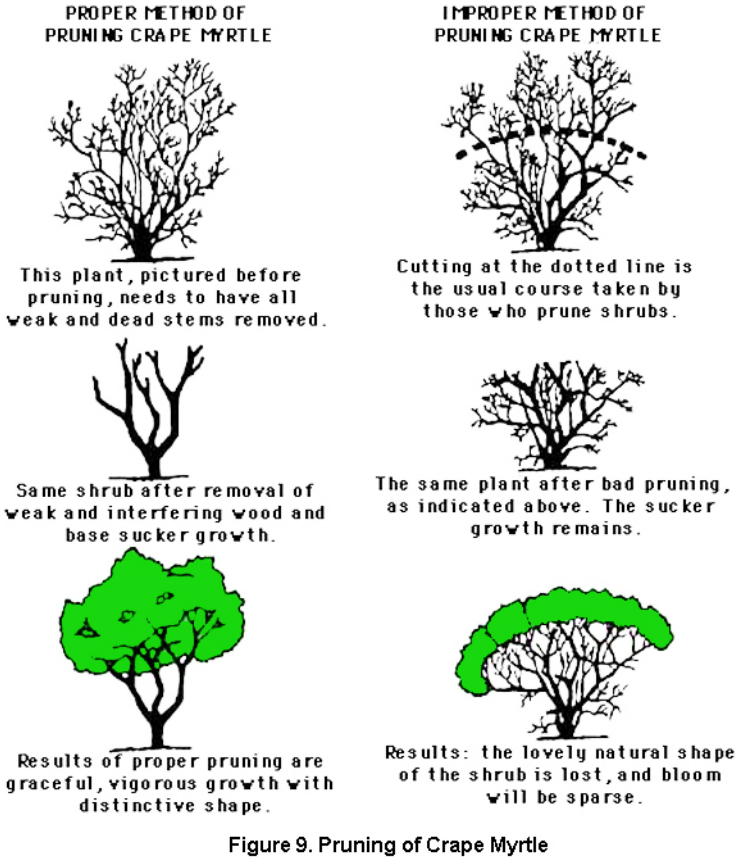

Figure 4-2. Proper and improper methods for pruning a crape myrtle.

Section 2 — Pruning Guidelines

Introduction

No matter what the reason for pruning, the tree's health and appearance should always be considered. Recognized tree surgery practices provide for pruning with a minimum of harm to a tree's health and appearance.

All right-of-way pruning practices by TxDOT employees, contractors, or utility companies with lines on state rights of way will conform to the guidelines of ANSI A300 Part 1-2001, Tree, Shrub and Other Woody Plant Maintenance – Standard Practices (Pruning). These guidelines represent the nationally used standards by the American National Standards Institute, Inc. The guidelines set forth in this chapter conform to these new standards.

Aesthetic Principles

When pruning, strive to: **Preserve the natural character of the tree and remove the minimum number of branches necessary to provide adequate clearance for safety or utility lines.**

Trees which remain unsightly because of repeated pruning for clearance should be removed.

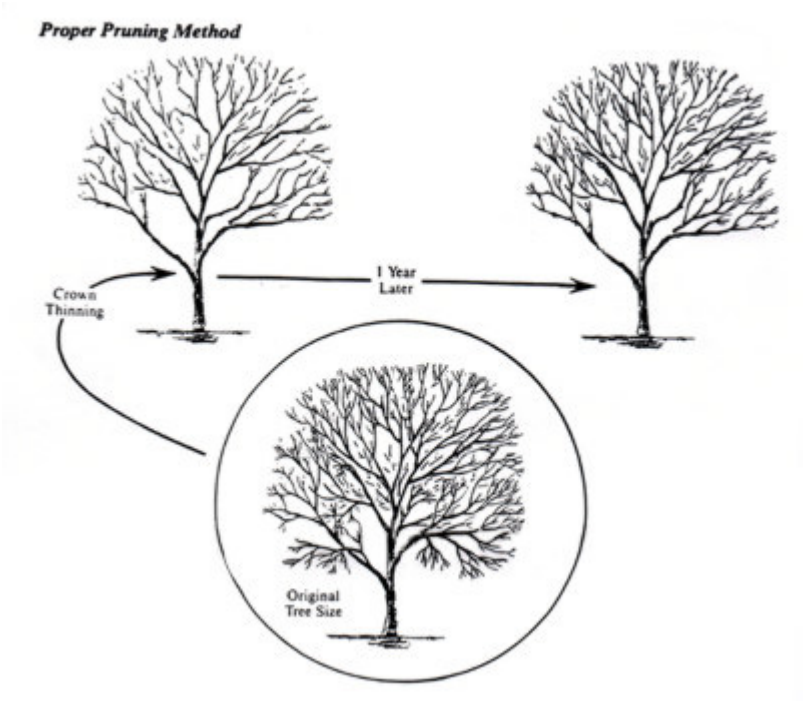

Figure 4-3. Proper pruning methods.

Determining Amount of Clearance

When pruning for safety or clearance around utility lines, consider the rate of tree growth in determining the amount to be removed from a tree. A slow growing tree will require less clearance than a fast growing tree.

Maintain adequate clearance – not excessive clearance.

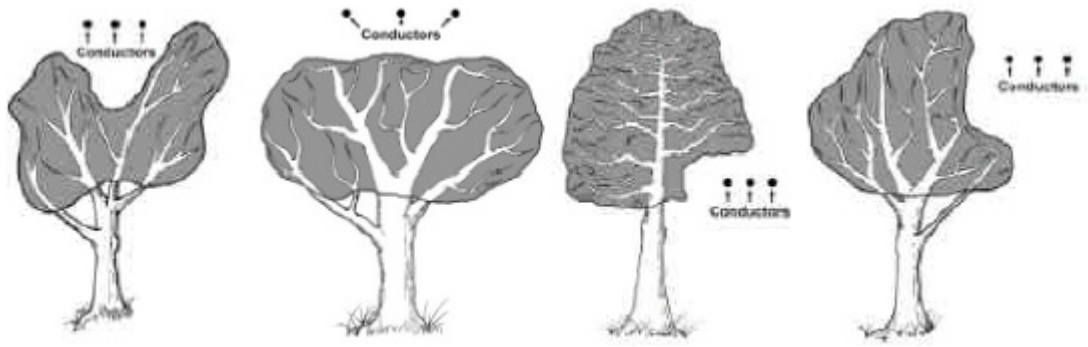

Figure 4-4. Acceptable pruning practices by utility companies.

Where to Cut and How to Remove a Limb

In removing a limb, the cut should be made at a fork where the remaining branch will be at least one third the diameter of the one removed. In most cases you can skip the first two steps and proceed to the last cut if the branch is less than two inches in diameter.

Use the following guidelines when cutting a limb two inches in diameter or larger:

- Pruning tools must be sharp.
- Undercut one-third of the way through the limb, eight to 12 inches from the main stem.
- Remove limb four to six inches out from the first cut.
- Remove stub with an even cut so that the branch bark collar is still protruding.
- Paint the cut with approved tree wound paint.

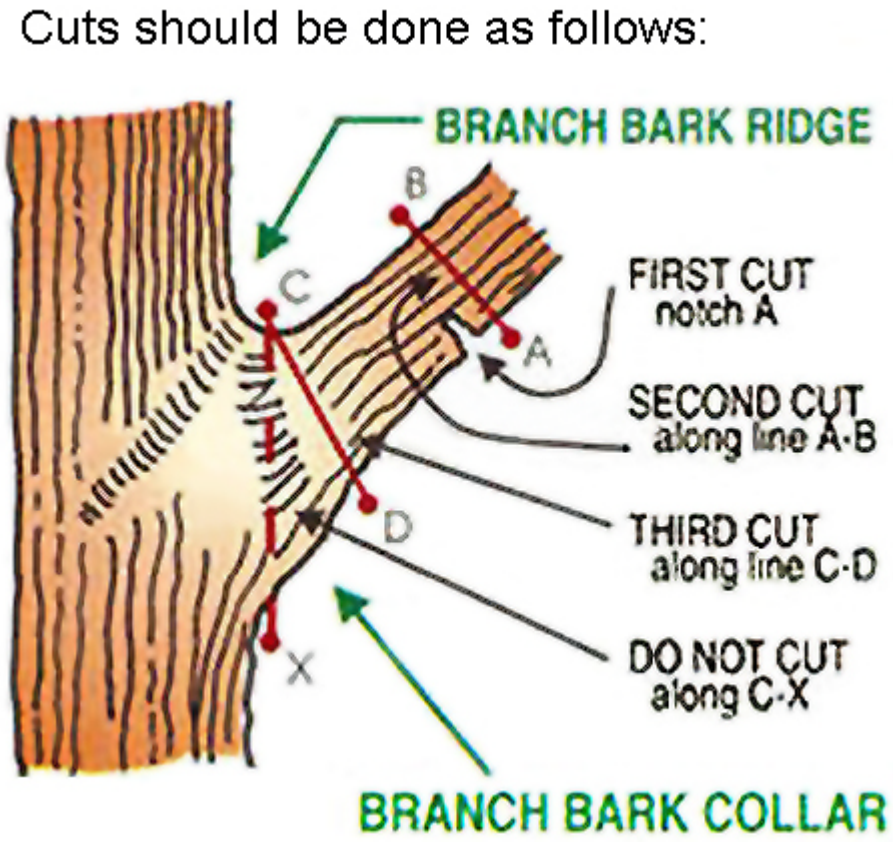

Figure 4-5. The three step method in proper limb pruning.

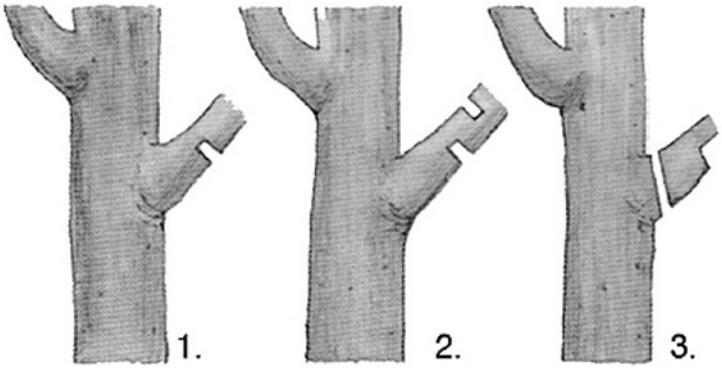

Figure 4-6. Another illustration of proper limb pruning.

Figure 4-7. What happens when the guidelines are not followed.

Disposal of Cuttings

All pruned wood and brush must be removed from the right of way and disposed of in accordance with the laws and regulations of the community, county and state.

Diseased branches (especially those infected with oak wilt) must be properly disposed of to prevent the further spread of the disease. (See Section 3, "Oak Wilt," for more information.)

Section 3 — Oak Wilt

Background

Oak Wilt is caused by the fungus Ceratocystis fagacearum. The first confirmed case of Oak Wilt was in Wisconsin in the early 1940s. It was not confirmed in Texas until 1960. It is comparable to Dutch Elm Disease, a fungal infection that has destroyed entire elm populations in the Midwest and Northeast United States. Although all oak species can contact Oak Wilt, Red or Spanish Oak and Live Oak are the two most susceptible.

Oak Wilt should not be confused with Oak Decline. Decline is a catch-all term used when a tree under stress falls prey to any number of diseases or insects. Oak Wilt invades the water and food tissues of oak roots and limbs. It is a true wilt disease.

Affected Area

Oak Wilt has been found in more than 60 counties, mostly in the central part of the state.

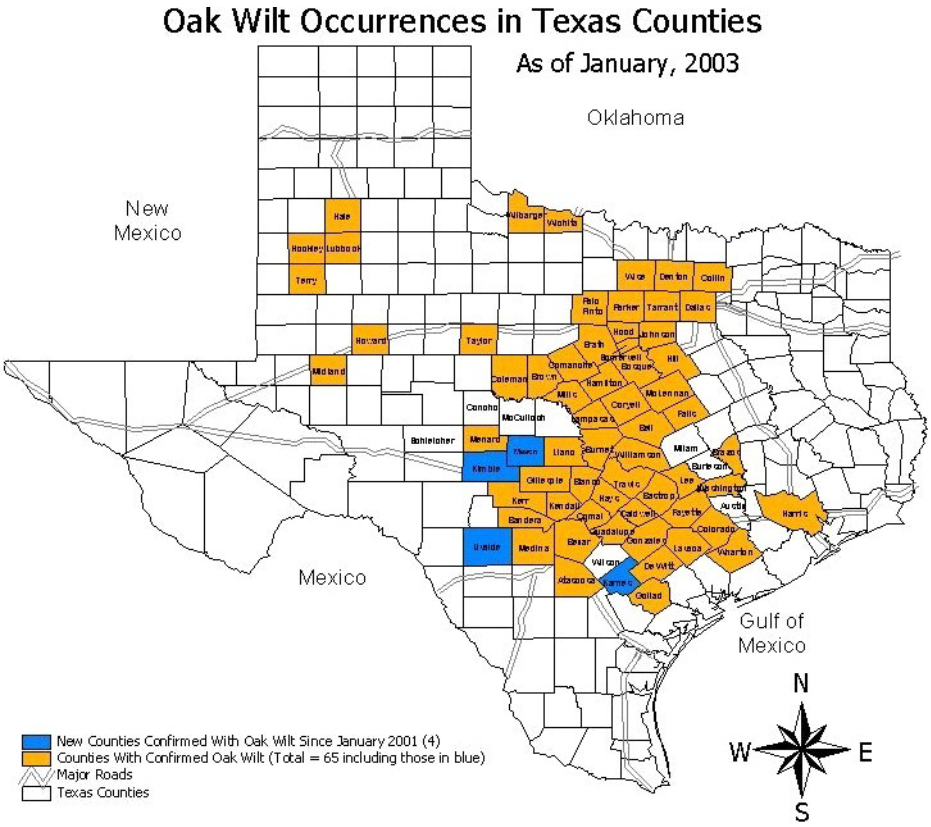

Figure 4-8. Oak Wilt occurrences in Texas counties.

How it Spreads

The Oak Wilt fungus most often spreads underground from infected trees to adjacent healthy trees through interconnecting roots. Sap beetles also carry fungal spores from infected trees to open cuts or wounds on healthy trees. The fungus can also be spread by pruning tools. Since fungal mats only appear on diseased Red Oaks or Spanish Oaks these trees must be removed immediately and chipped, burned or buried. Firewood can be used from infected Live Oaks if the wood is seasoned and properly dried.

Figure 4-9. Live Oak roots from separate trees grafted together. This is the primary way that Oak Wilt spreads from tree-to-tree.

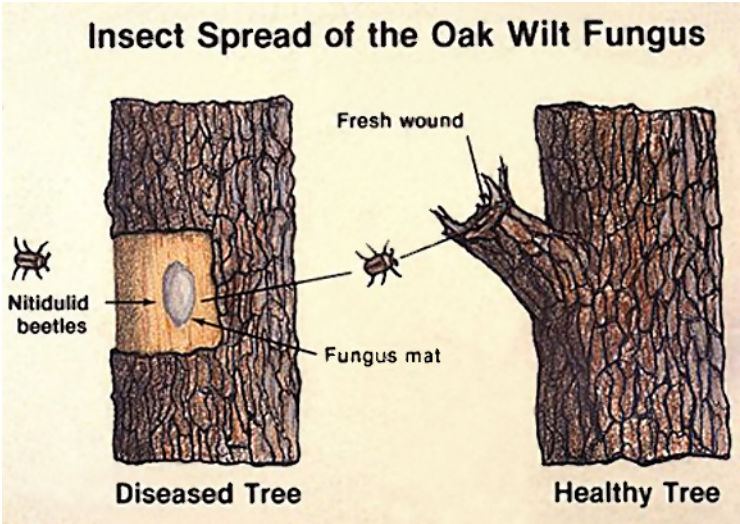

Figure 4-10. Sap Beetles (Nitidulid Beetles) spreading Oak Wilt Fungus. Secondary vector of Oak Wilt fungus.

Symptoms

Spanish or Red Oaks infected with the Oak Wilt fungus will often form fungal mats on the trunk area and often die within one to four weeks, while Live Oaks may die within a period ranging from one month to two years. Infected Live Oak trees show browning of the leaves on individual limbs. Also, leaves on infected limbs will show specific patterns of chlorosis or yellowing. Defoliation occurs quickly after symptoms are observed.

Figure 4-11. Veinal leaf necrosis of Live Oak leaves infected with the Oak Wilt fungus.

Figure 4-12. Veinal leaf necrosis of Red Oak leaves infested with the Oak Wilt fungus.

What Can Be Done?

There is no cure for Oak Wilt. Two fungicides have been developed that will control the disease if detected in the early stages. (Contact the Vegetation Management Section staff at (512) 416-3093 for information.)

Therefore, the following preventive measures offer the only means of control:

- Perform necessary pruning and cutting of healthy trees during the winter months of January and February when Sap Beetles are least active.
- Treat wounds with pruning paint in Oak Wilt infected counties to discourage insects, especially during warm weather.
- Sterilize all pruning tools in either Lysol™ spray or a 70 percent rubbing alcohol solution. The use of chlorine bleach solutions to sterilize pruning tools is discouraged due to premature oxidation or rusting of steel parts.
- Destroy the tree cuttings by burning or burying the wood.

Once Oak Wilt has been confirmed, steps can be taken to prevent spread, including:

- trenching around and removal of infected trees
- injection of approved fungicide.

Be sure to get positive identification of the Oak Wilt fungus before taking these drastic actions.

Figure 4-13. Hose harness, injectors and pressurized application tank for Alamo fungicide.

Figure 4-14. Pressurized injectors of Mauget Tebuject fungicide for Oak Wilt suppression.

Figure 4-15. Oak wilt infested trees dying in a circular pattern.

Figure 4-16. Oak Wilt infested trees dying.

More Information

More information on Oak Wilt may be obtained from the following sources:

- Maintenance Division, Vegetation Management Section (512) 416-3093
- Texas Forest Service
- Texas Agricultural Extension Service.

Section 4 — Trees and Utility Lines

Locating Utility Lines

Utility lines should be located so they will cause the least possible interference with major plantings and individual plants of ornamental value.

Texas Administrative Code

See Section 5, "Texas Administrative Code for Utility Accommodation." This rule applies to all utility companies performing construction and pruning maintenance of trees and bushes on state rights of way.

When Trees Are Not Pruned on the Right of Way

Trees are one of the major causes of power outages in areas of overhead utility lines due to direct tree contact with lines, or to trees or tree limbs falling on the lines. When trees contact live wires, they become conductors of electricity, causing power outages or creating dangerous situations for anyone coming into contact with the trees. Figure 5-17 shows what can happen when tree limbs and utility lines meet.

Figure 4-17. Tree limb in contact with high-voltage utility conductor line.

Examples of Severe, But Acceptable Tree Modifications by Utilities

Acceptable tree modifications preserving aesthetic quality and health of tree:

Figure 4-18. Severe, but acceptable pruning practices.

Figure 4-19. Severe, but acceptable pruning practices.

Examples of Unacceptable Tree Modifications

Unacceptable tree modifications damage trees, are not aesthetic to the right of way landscape and may be unsafe if unbalanced. Trees which remain unsightly because of repeated pruning for clearance should be removed.

Unacceptable tree pruning performed by utility companies will not be tolerated on state rights of way. Utility companies will correct pruning issues within a predetermined time agreed upon during the reconciliation process. The following figures show unacceptable pruning practices.

Figure 4-20. Unbalanced, unsafe and unsightly tree pruning by utility company. Trees should have been removed by utility company for safety and aesthetic reasons.

Figure 4-21. Unsightly tree pruning by utility company. Sycamore tree on property line serving no purpose, but a constant eyesore and maintenance issue. Tree should be removed by utility company for safety and aesthetic reasons.

Figure 4-22. Unacceptable pruning by utility. Limb stubs left unpruned.

Figure 4-23. Unacceptable pruning by utility. Sycamore trees pollarded to prevent contact with utility lines. Trees should be removed and shorter-growing trees or large shrubs should be planted in their place.

Figure 4-24. Pruning debris not removed and right of way damage by utility.

Section 5 — Texas Administrative Code for Utility Accommodation

Texas Administrative Code §21.38

Title 43, Texas Administrative Code, §21.38, was adopted to be effective March 17, 2005.

In general, all utility companies and utility contractors will comply with the rules of the Texas Administrative Code and Pruning Guidelines listed in this chapter before any construction or maintenance will commence on state rights of way.

Chapter 5 — Vegetation Management and Wildlife Habitat

Contents:

Section 1 — Overview

Section 2 — Preserving and Enhancing Habitat

Section 3 — Changing Attitudes

Section 1 — Overview

Background

More than 800,000 acres of roadsides associated with Texas highways are vegetated. Most of these acres will be under vegetation management level 2 (as described in Chapter 1). These rights of way include all ecological regions of Texas and represent a cross-section of the state's varying landscapes. They range from humid prairies and forests in the southeast and east to desert shrub, grassland and forests in the mountainous region of west Texas.

These landscapes support more than 900 species of wildlife and about 5,500 species of vascular plants including 2,000 different wildflowers. Because roadsides within these landscapes provide habitat for a wide variety of plants and wildlife, they are vital to their continued existence.

This section explains why the rich natural resource heritage found along roadsides should be conserved and managed as a part of the Texas highway system.

Threat of Habitat Degradation

Habitat degradation and loss is now the most significant problem associated with maintaining healthy populations of wildlife and plant resources. The adverse effects of habitat destruction have become a national and global concern.

Extent of Habitat Degradation

More than one-half of the wetland habitats in the continental United States have disappeared. Land use changes have resulted in similar losses of coastal wetlands in Texas. Almost two-thirds of hardwood bottomlands (one of the more important habitats) are now gone. In the lower Rio Grande Valley, more than 95 percent of native brush has vanished. Native longleaf pine forests have declined from an estimated six million acres to less than one million acres. Some 95 percent of the originally occurring native prairies have also disappeared.

Remaining habitats have suffered too. Human development has fragmented them. Poor land management practices have modified them. And the introduction of exotic plants and animals has displaced native species.

Significance of Roadsides

As native wildlife and plant habitats continue to decline, those that do remain gain importance. Remaining habitats are important both to the resources dependent on them and to the public. Increasingly, the public views natural resources as part of our Texas heritage. Thus roadsides,

through their permanence and statewide distribution, have gained importance as plant and wildlife habitat.

Section 2 — Preserving and Enhancing Habitat

Strive for Diversity

Any vegetated area provides food and cover for at least some wildlife species. If plant diversity is restricted, however, wildlife diversity will also be limited. Different animals require different habitats. Plant diversity is essential to maintaining an abundant and varied wildlife population.

Growth structure is another important factor affecting the quality of wildlife habitats. "Growth structure" simply refers to the height and coverage of the vegetative canopy. Promoting a diverse vegetative growth structure will also encourage wildlife diversity.

Diversity – both in plant variety and growth structure – is the key to preserving and enhancing wildlife habitat. Roadside vegetation management efforts, therefore, should focus on encouraging a **diverse** native plant population that will provide abundant food and cover for a variety of wildlife.

Mow Wisely

Intensive Agricultural Areas: In intensive agricultural areas, monocultural row crops dominate. These areas include the Texas panhandle, middle Gulf coast and blackland prairie regions. In these areas, the only suitable nesting habitat for upland birds is within highway rights of way. The timing and frequency of mowing schedules in these areas dramatically affects nesting success. Studies have shown that infrequent mowing (or not mowing at all in some cases) increases the value of the roadsides to nesting wildlife, especially birds and small mammals.

Wetlands: Roadsides prone to inundation or saturation during the spring and summer can serve as valuable habitat when managed properly. Allowing the growth of wetland vegetation in these areas will contribute to the nesting success of waterfowl and also provide feeding habitat and escape cover for shorebirds, wading birds and many reptiles and amphibians.

Rangelands: Roadsides are especially important to wildlife in rangeland areas subjected to continuous livestock grazing. Since boundary fences normally keep domestic livestock off the right of way, the roadsides in these areas usually provide a higher diversity of grasses and forbs than the heavily-grazed adjacent lands.

During late fall and winter, heavily grazed pastures and cultivated farmlands don't provide suitable food and cover for species of birds and small mammals. However properly maintained rights of way can provide some cover to wildlife species (such as pheasants) that have narrow food and cover requirements.

Bottom Line: Establish non-mow areas and adjust schedules to accommodate wildlife whenever possible.

Use Trees and Shrubs

Incorporating woody shrubs and trees into the roadside environment will provide additional sources of food, escape cover, nesting cover and roosting areas for wildlife. Texas roadsides present many opportunities for habitat enhancement in areas where such vegetation has been cleared or is otherwise lacking.

In the high plains of the Texas panhandle or rolling plains of north Texas, woody species along roadsides will also serve as living snow fences and windbreaks to help prevent drifts across roadways.

In areas with highly erodible soil or blowing sand and dirt, woody plants can also provide superb erosion control.

Nurture Seeds

Over the years in many areas, land use practices have inhibited the growth of specific native plants. One reason this happens is because plants are not allowed to die off naturally and provide seed for the next generation. This process is particularly important in maintaining grass and forb species that depend on seed dispersal.

Roadsides, which have been free of intensive farming, human habitation and domestic livestock grazing, typically harbor more diverse plant communities than adjacent lands. With proper management, roadsides will serve as a source of seeds. These seeds will be windblown or distributed by wildlife into adjacent lands to support natural plant regeneration. In many areas of Texas, roadsides represent the **only possible source** for natural regeneration.

Roadside vegetation management practices should encourage seed production and proper dispersal by:

- properly selecting native and introduced plants and
- adjusting mowing schedules to allow for seed production and dispersal.

Encourage Wildflowers

We all know how popular wildflowers have become among the traveling public. Our colorful roadsides have brought on a real public relations success. They've generated favorable media coverage and prompted requests from motorists for routes and locations for best viewing.

What may be less understood about our native wildflowers is how beneficial they are to wildlife. Wildflower seeds provide food for many wildlife species, including birds and small mammals. The plants also participate in an intricate food web, supporting many insects and other invertebrates that other wild animals depend upon.

Roadsides typically sustain a greater density and variety of wildflowers than adjacent pastures and fields. So wildflowers represent just one more reason why roadsides are important in our efforts to enhance biological diversity.

Encouraging roadside wildflowers strengthens wildlife diversity.

Roadsides and Endangered Species

Roadsides free from disturbances occurring on adjacent lands can be managed as refuges for the preservation of threatened or endangered plants and sensitive ecosystems. TxDOT and the Texas Parks and Wildlife Department (TPWD) have interagency agreements to identify sensitive plants and develop appropriate management plans. Roadsides can also be managed to enhance habitat for threatened or endangered wildlife. Such roadsides would be particularly valuable in regions where existing potential habitat is scarce.

Section 3 — Changing Attitudes

Wildlife Density and Safety

Studies suggest that roadside management practices have little influence on roadkill. The main factors are the types and conditions of habitats on adjacent lands and associated wildlife population densities on those lands. Deer prefer established travel corridors. Their movement patterns are based on the available cover and the juxtaposition of favored habitats. A greater frequency of road crossings will occur where a highway intersects these preferred habitats. Other species of wildlife that typically use established corridors include raccoons, skunks, opossums, squirrels, coyotes, bobcats and some songbirds. These animals are likewise vulnerable to roadkill. Road crossings at creek and river drainages are good examples of this relationship. A greater frequency of auto collisions would occur in this situation **regardless** of the roadside vegetation management practices.

Consider placing signs to warn motorists at known or expected wildlife-vehicle collision locations.

Public Perceptions of Unmowed Roadsides

An interview of motorists conducted at a rest stop along an interstate highway in North Dakota in 1971 (Oetting and Cassel) provided some insight into public perceptions of unmowed roadsides. The rest area was at the end of a segment of highway featuring both mowed and unmowed roadsides. Most of the motorists (82 percent) did not notice any difference between the areas. When interviewers pointed out the two conditions, 72 percent stated they preferred the mowed strips, because they were neater. However, when briefed on the effects the mowed roadsides had on wildlife, many respondents wanted to change their answer, because of their positive feelings toward wildlife.

This research suggests that publicity programs and highway signs can increase support of roadside management programs.

Sample News Release

The sample news release (following page) shows one way to explain new mowing practices to the public.

Texas Department of Transportation

news

Yoakum District
403 Huck Street, Yoakum, Texas 77995
512/293-3512

93-2 FOR IMMEDIATE RELEASE

BACK TO NATURE POLICY ADOPTED BY TXDOT

YOAKUM---The rights of way on Texas highways will have a "return to nature" appearance under the new mowing policy adopted by the Texas Department of Transportation (TxDOT).

When the mowing season begins in late May, the only fence to fence mowing will take place in late Fall. Mowing only 15 feet strips along the pavement edge for safety reasons will help protect the environment and encourage the growth of vegetation such as wildflowers and grasses. In areas where unwanted plants grow, herbicides will be carefully applied to control their growth. Other areas, such as slopes and wide tracts covered with desirable trees, shrubs, and grasses will be declared non-mow areas.

Benefits expected from this new policy will be reduced mowing costs, less soil erosion, and providing wildlife habitat areas during the nesting season.

"As vegetation increases in areas formerly mowed, the appearance along the roadsides will improve and become more pleasing to the eye and the environment," stated Vegetation Manager Tony Perez.

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Figure 5-1. Back to Nature Policy Adopted by TxDOT.