



MEMORANDUM

Department of Transportation



DATE: July 6, 2010

TO: Consultants with current or future DOT contracts

FROM: Ellen Barth Alster, RLA, LEED AP, Senior Landscape Architect

SUBJECT: Update to Step 1 of Appendix 4D of the Environmentally Sensitive Roadway Design Guidelines, Pima County DOT Roadway Design Manual

This memo is an update to both the Introduction and Step 1: Inventory of Protected Plant Species in Appendix 4D of the Environmentally Sensitive Roadway Design Guidelines. It shall substitute for the existing sections. The new name for this section shall be “Step 1: Inventory and Mitigation Calculations for Protected Plant Species”

Introduction

ESR roadways are designed and maintained to preserve the natural character and vegetation density of the area and provide habitat for specific species. The objective is to leave the landscape as natural appearing as possible. Every effort should be made to revegetate with plant species that were removed and/or are commonly found in the project environment, matching density, relative location patterns (e.g. small cactus under shrubs), slope and soil preferences. This process involves inventorying and measuring existing vegetation. The next step is calculating mitigation requirements based on the inventory. These inventories shall be used as a basis for recreating the existing plant communities in new roadway landscaping. They are not intended to be used for plant salvage.

The two types of required Vegetation Measurement are listed below. The first inventory is of all saguaros and Pima County Protected Trees over 3” in caliper (the only exception to the 3” requirement is acacias - only acacias over 8” caliper are required to be inventoried). This inventory is done for the entire project area to be disturbed by construction. The second type of inventory is a sampling which is used to determine densities and types of shrubs, cacti, succulents, and seed mixes.

Inventory Type	What to Inventory	Inventory Area	Inventory Purpose
Saguaros and Pima County Protected Trees	<ul style="list-style-type: none"> ○ All Saguaros ○ All Pima County Protected Trees > 3” caliper (see list under Step 1 below) 	Entire disturbed project area of site (cut and fill limits) plus 10’ beyond these limits	<ul style="list-style-type: none"> ○ To determine number and sizes of saguaros that should be replaced ○ To determine replacements for Pima County protected tree species
All Other Plants	All plants in determined sampling area. Shall include each specific type of plant community in the project area.	Circular sampling areas (relevés). These vary in size and quantity according to the project.	<ul style="list-style-type: none"> ○ To determine seed mix ○ To determine replanting density of Pima county protected cactus and shrub species. This value shall be used as a guide in replanting the remainder of the species.

Step 1: Inventory of Protected Plant Species

A. Determine ESR Multiplier by the following method:

- Calculate disturbed area of project. Disturbed area of project is defined as 10' offset from the project cut and fill limits.
- Calculate the plantable area. Plantable area is defined as the disturbed project area that can be planted with trees and saguaros. It excludes the following:
 - Road
 - Unpaved area between and curb and sidewalk
 - 10' offset from water and sewer lines and manholes
 - Medians
 - 10' offset from pavement edge if no curb
 - Sight Visibility Triangle (SVT)
 - Drainage structures
- ESR multiplier = plantable area / disturbed project area

B. Complete a full inventory of the entire disturbed project area for saguaros and Pima County protected tree species. These plants include:

Scientific Name	Common Name	Minimum Size
Acacia constricta	Whitethorn Acacia	8" Caliper
Acacia greggii	Catclaw Acacia	8" Caliper
Carnegieia gigantea	Saguaro	All
Chilopsis linearis	Desert Willow	3" Caliper
Celtis reticulata	Canyon Hackberry	3" Caliper
Olneya tesota	Ironwood	3" Caliper
Parkinsonia floridum	Blue Palo Verde	3" Caliper
Parkinsonia microphyllum	Foothills Palo Verde	3" Caliper
Prosopis velutina	Velvet Mesquite	3" Caliper
Prosopis pubescens	Screwbean Mesquite	3" Caliper

Notes:

- Only the species listed above are required to be inventoried and only the disturbed area needs to be inventoried.
- If the entire site happened to be inventoried including non-disturbed areas, the trees in the non-disturbed areas should not be included in the total caliper inches.

Assess and document the following for each tree:

1. Caliper
 - Measure 24" above ground with forestry caliper
 - For multi-trunked species, the largest 3 trunks are measured. The species is included if the sum of the trunks is greater than or equal to 3"
2. Location
 - GPS coordinate points should be recorded for each tree species.

C. Calculate mitigation requirements for protected trees and saguaros

Trees:

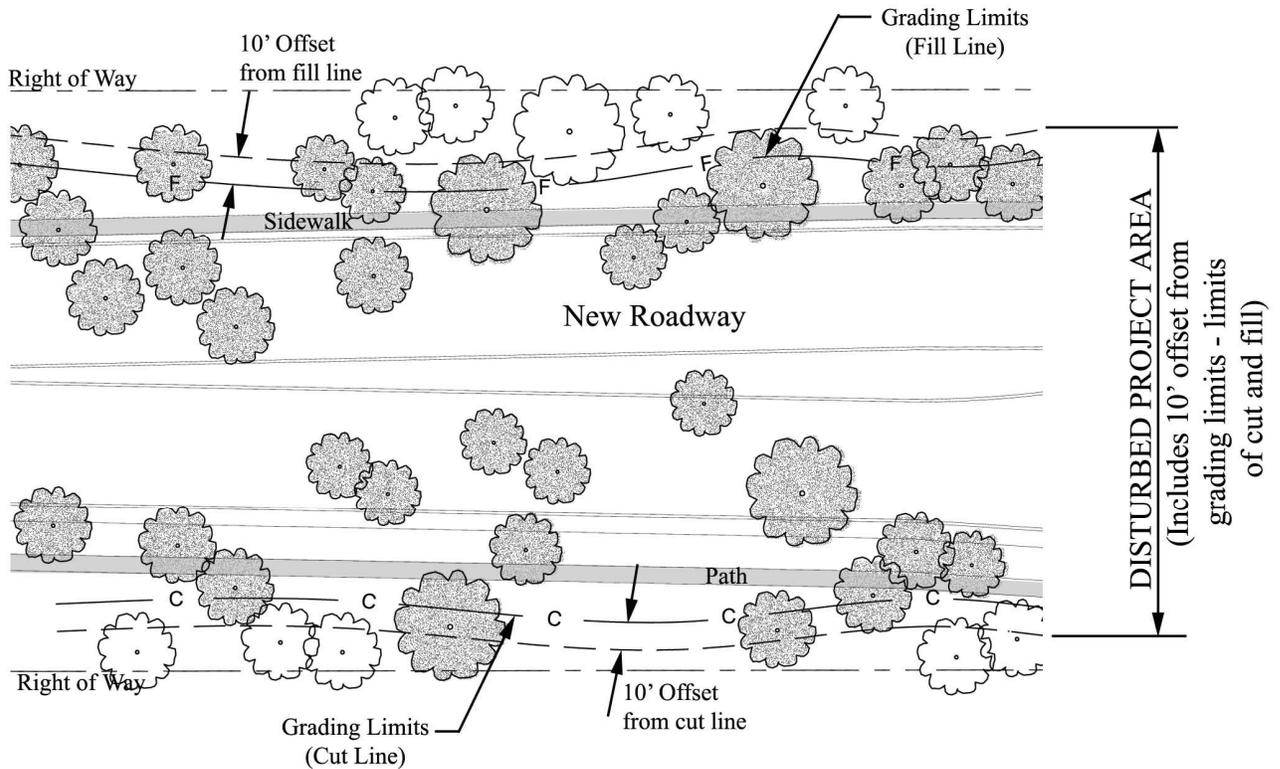
- Add up total caliper inches for each species of tree in the project area that will be disturbed only. Do not include caliper inches for trees in undisturbed areas that will not be impacted by development. (SEE DIAGRAM BELOW)
- Mitigation/species = Total Caliper inches x 125% x ESR ratio

Example:

- 100 caliper inch of palo verde in a disturbed site area of 10 acres. (The overall project area r/w to r/w may be larger than these 10 acres, but **only** the caliper inches in the *disturbed area* are counted).
- Only 2.5 acres of the 10 acres are plantable (the rest is roadway, clear zone, drainage, etc.)

Result: 100 cal inch x 125% x ESR multiplier = 31.25 cal inches that must be replaced in the 2.5 acres of disturbed acres

NOTE: ESR Multiplier = Plantable Area/Disturbed Project Area or 2.5 acres/10 acres = 25%



Tree Legend

-  Tree within limits of disturbed project area (caliper of this tree to be counted in total caliper inches)
-  Tree outside of limits of disturbed project area (caliper of this tree is NOT counted)

Saguaro:

- Mitigate saguaros at 1:1
- Saguaros will be replaced with replacement saguaros that are as close in height to the original saguaro being removed up to an 8' maximum height for replacement saguaros.
- Replacement standards will be as follows:

Inventoried Saguaro	Minimum Replacement Size
0-2'	1-2'
2-4'	2-4'
4-6'	4-6'
6-8'	6-8'
Over 8'	8' maximum ht.

Example:

- Site contains 10 saguaros. See the table below for replacement sizes.

Inventoried Saguaros	Height of Inventoried Saguaros	Minimum Replacement Size
1	10'	8'
2	12'	8'
3	6'	4-6'
4	4'	4-6'
5	4'	4-6'
6	8'	6-8'
7	2'	2-4'
8	5'	4-6'
9	7'	6-8'
10	15'	8'

D. Convert Total Caliper Inches for Required Tree Mitigation

The final caliper inch value for protected tree species is to be distributed into appropriately sized trees to the extent possible, based on plant availability. A demonstrated effort must be made to mitigate using a variety of plant sizes.

Example:

For a given project, it is determined that 31.25" of caliper inches for *Parkinsonia floridum* (Blue Palo Verde) need to be replaced. The total inventoried plants = 100 caliper inches. They are originally distributed as follows:

ORIGINAL TREE INVENTORY

Tree #	Tree Species	Caliper Inches
1	Parkinsonia floridum	18
2	Parkinsonia floridum	16
3	Parkinsonia floridum	12
4	Parkinsonia floridum	9
5	Parkinsonia floridum	9
6	Parkinsonia floridum	8
7	Parkinsonia floridum	7
8	Parkinsonia floridum	6
9	Parkinsonia floridum	5
10	Parkinsonia floridum	4
11	Parkinsonia floridum	3
12	Parkinsonia floridum	3

Total Caliper Inches = 100

In order to distribute the replacement mitigation trees into a variety of sizes, determine the original distribution of sizes:

DISTRIBUTION OF TREE SIZES IN ORIGINAL INVENTORY

Size ranges	# of Trees	Percentage as Total # of Trees	Total # Required Caliper Inches
> 12"	2	2 trees/12 trees = 17%	17% x 31.25 = 4.8
8-12"	3	3 trees/12 trees = 25%	25% x 31.25 = 7.2
6-8"	3	2 trees/12 trees = 25%	25% x 31.25 = 7.2
< 6"	5	5 trees/12 trees = 42%	42% x 31.25 = 12.0
Totals		100%	31.3

The next step, once it is determined how many caliper inches are in each size range, is to translate these ratios into sizes of plants that are commercially available. The largest size container available is assumed to be 48" box, with (4) different sizes of plants to be used.

CALCULATING DISTRIBUTION OF TREE SIZES*

Original Caliper Size of Tree	Replacement Container Size	Caliper Inches per Container	Required Caliper Inches/Caliper Inches per Container	Actual # of Trees per each container size
>12"	48" Box	6	4.8/6 = .8	1
8-12"	36" Box	4	7.2/4 = 1.8	2
6-8"	24" Box	2	7.2/2.5 = 2.9	3
<6"	15 Gal.	1	12/1 = 12.0	12

***The largest caliper tree sizes shall be planted 100' within either side of wash areas**

In the process of distributing the required caliper inches among container grown plants, use the standards specified below:

Container Size Tree	Caliper Inches per Container
15 Gal.	1
24"Box	2.5
36" Box	4
48" Box	6

This method assumes a variety of sizes is commercially available. In the event that the required tree species and saguaros cannot be found in the required sizes, the consultant shall proceed by doing the following:

1. Submit a list of nurseries contacted to Pima County's Landscape Architect.
2. Upon reviewing this list, the landscape architect may require additional plant sources be contacted
3. The County Landscape Architect will make a final determination that all possible tree sources have been contacted before allowing smaller tree sizes to be used to meet the ESR requirement or to allow substitution of tree species
4. It is recognized that plant availability may change between the time construction plans are done and the time the project is built. Therefore, if the tree species and sizes specified on the plans are not available at the start of construction, the contractor must verify this by submitting a list of nurseries contacted to the county landscape architect. The county landscape architect may advise one of the following:
 - a) Require additional nurseries to be contacted
 - b) Make an adjustment to the trees required based on caliper sizes available
 - c) Allow alternate species to be used for tree mitigation. Under no circumstance will alternate species be allowed to be used to mitigate for ironwood trees (*Olneya tesota*).

E. Allow for Plant Salvage:

For plants in the right of way that will conflict with new construction, PCDOT is providing the opportunity for them to be salvaged by other government agencies and non-profit native plant organizations. Permits will be required from the Arizona Department of Agriculture for transplanting all plant material protected by the Arizona Native Plant Law. PCDOT Right of Way Use Permits will need to be obtained prior to any work being performed in the right of way.