TECHNICAL NOTES

WOODLAND TECHNICAL NOTE OK-12 **April 15, 2013**

TO: All Offices

FROM: Steven J. Glasgow
State Resource Conservationist

Re: Determining Tree Survivability Following Tree Planting

The purpose of this technical note is to describe the transecting methods for determining the survival rate of a newly planted stand of trees. A post planting evaluation of the tree stand is necessary to determine whether the planting survival level is adequate to meet the landowner's objectives and address the resource concerns for which the conservation practice was installed.

The evaluation is an important step in the conservation planning process. For tree and shrub establishment, it will help determine the need for replanting; additional weed control; protection from deer, rabbits or other herbivores; or management of insect or disease problems.

The procedures listed below can be used to evaluate any tree and shrub planting practice, e.g., Tree/Shrub Establishment (612), Riparian Forest Buffer (391), Windbreak/Shelterbelt Establishment (390), etc.

This process can also be used to determine the amount of trees/acre within an existing naturally regenerated stand of trees.

Evaluation Methods

There are two basic methods described in this document for evaluating the survival of a tree/shrub planting:

1. Circular plot method - Appropriate for most field plantings including random spacing layouts, direct seeding plantings or natural regeneration.

2. Linear plot method - Appropriate for evaluating any plantings where trees were installed with straight, uniform rows with evenly spaced trees. It is the recommended method for windbreaks and other similar linear plantings.

Both methods consist of taking a series of inventory transects throughout the stand and basing the estimates on the proportion of live trees found compared to the total number of trees planted.

Survival counts are usually conducted 4-5 months after planting, and again after the third year.

Begin by reviewing the map of the planted area to determine size of the planted stand, boundaries, and areas not planted. Choose a sampling grid that will cover the entire area and produce the recommended number of plots.

For both methods, sample enough plots to gain a level of confidence that the determined survival percentages will provide an accurate estimate for the entire field.

1. Circular plot method:

Conducting a tree survivability transect using the circular plot method basically involves randomly selecting plots within the tree planting area and counting the amount of live seedlings within a circle of a predetermined size. The inventory data is then recorded on the appropriate Tree Seedling Survival Survey worksheet (see attachments).

A minimum of 1 plot per acre, with usually no more than 30 plots evenly distributed throughout the planting area shall be taken.

The plot size for pine plantations are generally 1/100th acre in size due to the closer planting spacing. The radius of the circular plot for 1/100th acre equals 11.8 feet.

The plot size for most hardwood plantings are generally 1/50th acre in size due to the wider planting spacing. The radius of a circular plot for 1/50th acre equals 16.7 feet.

Circular Plot Size		
Type of Trees	**Size of Plot**	**Radius of Circle**
Pine	1/100th acre	11.8 feet
Hardwood	1/50th acre	16.7 feet

Procedure:

Step 1 – Cut a cord, rope or string to the appropriate length of the circles radius (11.8' or 16.7'). Be sure to allow extra length to tie a knot in the end.

Step 2 – Tie one end of the cord to a stake, chaining pin, sharp shooter or anything similar that will remain upright when placed in the center of the plot.

Step 3 – Select a transect route through the planting area so that a good cross section can be sampled (refer to example 1a). A compass can be used to travel in a cardinal direction or a visible landmark can be used as a direction marker. A diagonal transect zigzagging through the area or two diagonal lines forming an "X" is recommended.

Step 4 – Select a random starting point and place the stake into the ground to represent the plot center.

Step 5 – Extend the cord and walk in a complete circle around the plot center, counting and inspecting all live trees within the plot (refer to example 1b). Record the inventory data on the appropriate attached evaluation form (refer to example 1c).

Step 6 – When data collection is complete for the 1st plot, pace a predetermined distance, such as 200 feet, along the transect line and repeat the process outlined in Step 5.

Step 7 – Document the location of each plot on an aerial photograph and attach to the completed evaluation form.

2. Linear Plots

Conducting a tree survivability transect using linear plots basically involves selecting random points within each tree row and counting the amount of live seedlings within that row segment. A total of 10 seedlings or planting places will be evaluated at each plot section. The inventory data is then recorded on the attached "Tree Seedling Survival Survey – Linear Plots" worksheet.

A minimum of 3 randomly distributed plots per row shall be taken.

Procedure:

Step 1 – Determine the number or tree rows planted, location of the rows, tree species, row spacing and within-row tree spacing so that the amount and location of transects to be taken can be determined.

Step 2 – Each tree row will be sampled at random locations within the row (refer to example 2a).

Step 3 – Evaluate 10 tree seedlings (or planting spaces) at each inventory plot along that row (refer to example 2b).

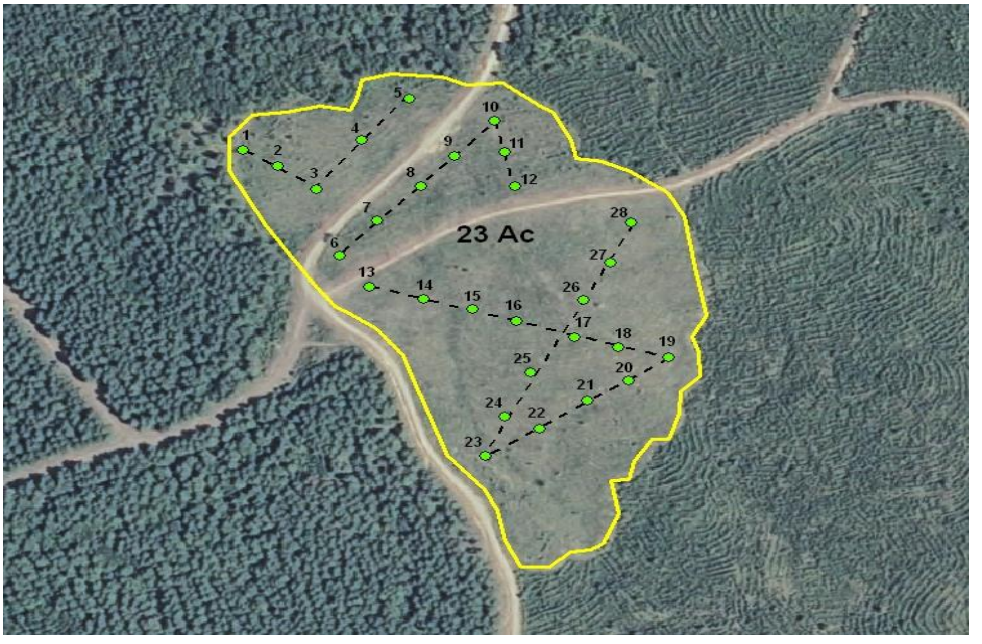
Step 4 – Tally all live seedlings within each inventory plot and record on the attached evaluation worksheet (refer to example 2c).

Step 5 – Document the location of each plot on an aerial photograph and attach to the completed evaluation form.

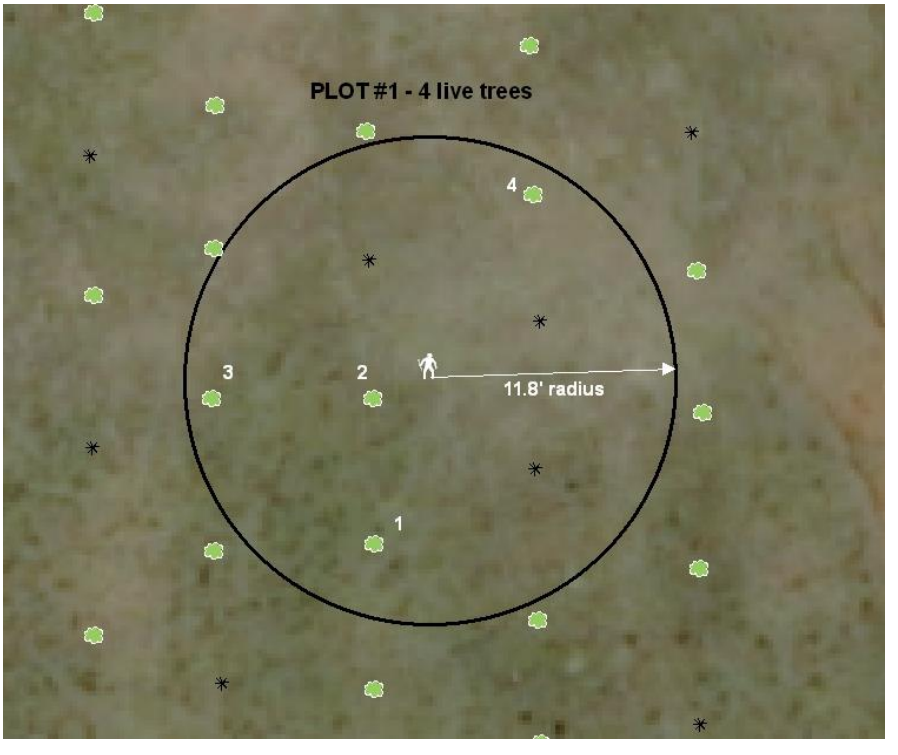
This evaluation method will determine the percent survival within each tree row. This information can then be used to make sound technical recommendations so that the practice (e.g. windbreak) will maintain its integrity and function as planned and designed.

Developed by: John W. Mustain, Oklahoma NRCS State Forester

Example 1: Tree survivability transect for a pine plantation using the circular plot method.



1a - Select a transect route through the planting area so that a good cross section can be sampled



1b - Extend the cord and walk in a complete circle around the plot center, counting and inspecting all live trees within the plot.

Tree Seedling Survival Survey - PINE

Landowner: James Forest	Field #: 2A	Acres: 23
Legal Description: Pt. of 14-7-7	Date planted: FEB 2012	Date checked: 12/3/12
Evaluation Crew: G. Allen		
Spacing: 6' x 10'	Total Amount planted: 726/Ac = 16,698	

Plot Size: 1/100 acre (11.8'radius)

Plot #	Tally	Comments
1	IIII - 4	
2	III - 3	
3	IIII - 4	
4	IIII - 4	
5	IIII - 4	
6	~~HH~~ I - 6	
7	IIII - 4	
8	~~HH~~ II - 7	
9	IIII - 4	
10	~~HH~~ I - 6	
11	IIII - 4	
12	III - 3	
13	III - 3	
14	~~HH~~ - 5	
15	~~HH~~ - 5	
16	IIII - 4	
17	~~HH~~ II - 7	
18	IIII - 4	
19	~~HH~~ - 5	
20	IIII - 4	
21	~~HH~~ - 5	
22	~~HH~~ I - 6	
23	III - 3	
24	~~HH~~ - 5	
25	~~HH~~ I - 6	
26	~~HH~~ - 5	
27	IIII - 4	
28	~~HH~~ I - 6	
Total	Total	
28	130	

Example

(Total Tally x 100 = Total Trees ÷ Total Plots = Trees/acre)

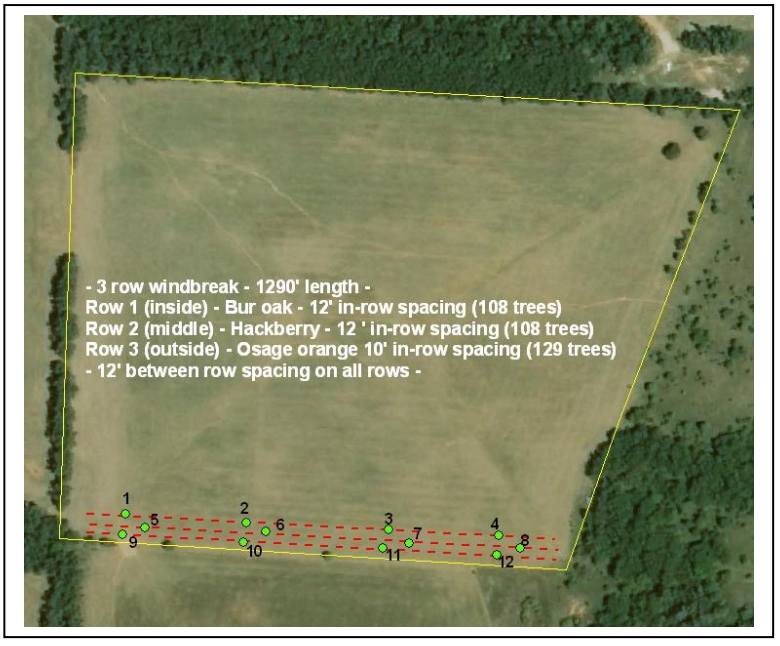
130 X 100 = 13,000 ÷ 28 = 464 Trees/Ac

Comments: This field was ripped prior to planting and followed with a herbaceous release herbicide application. Weed competition is currently not an issue

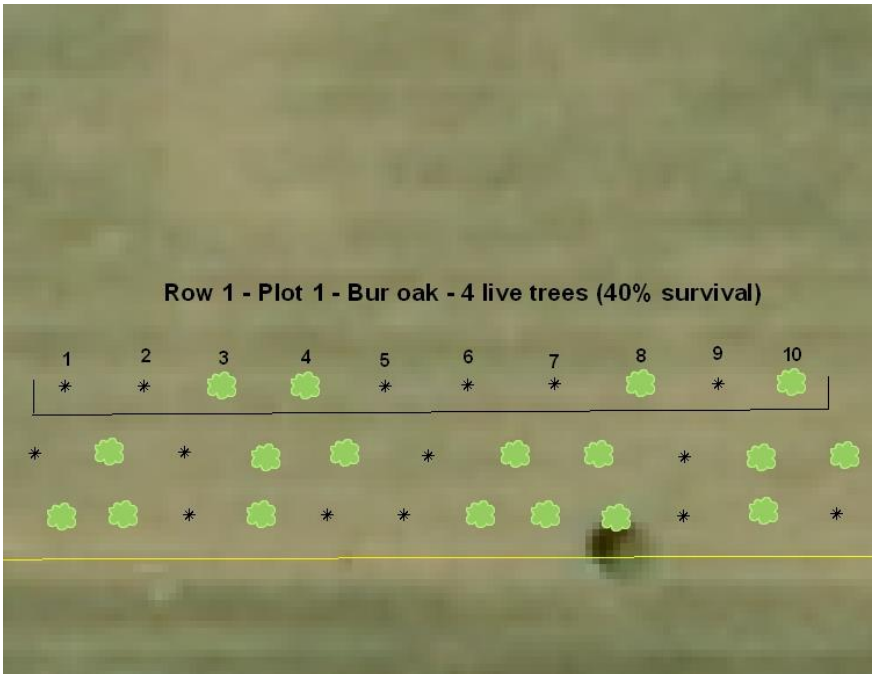
This stand is considered a success with an ave. of 464 surviving seedlings/acre. Replanting would be necessary if <50% survival of original planting existed (726 x .50 = 363 trees/ac)

1c - Record the inventory data on the appropriate evaluation form.

Example 2: Tree survivability transect for a windbreak planting using the linear plot method.



2a - Each tree row will be sampled at random locations within the row



2b - Evaluate 10 tree seedlings (or planting spaces) at each plot along that row.

Tree Seedling Survival Survey – LINEAR PLOTS

Landowner: James Windblown	**Field #:** 1	**Acres:** 47
Legal Desc: S NW 7-7-7	**Date Planted:** Mar 2012	**Date Checked:** 9-28-12
Evaluation Crew J. Shaffer		
Conservation Practice: 380 - Windbreak/shelterbelt Establishment		

Planting Information

Row #	Species	In-Row Spacing	Between Row Spacing	Length	Amount planted
1	Bur oak	12	-	1290'	108
2	Hackberry	12	12	1290'	108
3	Osage orange	10	12	1290'	129

Transect Information

Plot Number	Row #	Species	# of Live Trees	% Survival	Observations
1	1	Bur oak	IIII - 4	40	
2	1	Bur oak	III - 3	30	AVE. = 40% survival
3	1	Bur oak	𝍸 - 5	50	
4	1	Bur oak	IIII - 4	40	
5	2	Hackberry	𝍸 I - 6	60	
6	2	Hackberry	𝍸 I - 6	60	AVE. = 55% survival
7	2	Hackberry	𝍸 - 5	50	
8	2	Hackberry	𝍸 - 5	50	
9	3	Osage orange	𝍸 - 5	50	
10	3	Osage orange	𝍸 III - 8	80	Ave. = 65% survival
11	3	Osage orange	𝍸 II - 7	70	
12	3	Osage orange	𝍸 I - 6	60	
13					
14					Moderate summer drought resulted in unacceptable potential mortality in each row. Weed competition was insignificant although control will be needed this coming spring.
15					
16					
17					
18					
19					
20					

Example

Comments:

Recommendation is to re-evaluate the planting next Fall in case resprouting occurs, and make a Final re-planting decision at that time.

Instructions: Each row will be sampled at random locations. Evaluate 10 seedlings (or planting spaces) at each plot along the row(s). Tally all live trees within each plot and record above. Record decisions in "Comments" box

2c - Tally all live seedlings within each plot on the attached evaluation form.

Tree Seedling Survival Survey - PINE

Landowner:	Field #:	Acres:
Legal Description:	Date planted:	Date checked:
Evaluation Crew:		
Spacing:	Total Amount planted:	

Plot Size: 1/100 acre (11.8'radius)

Plot #	Tally	Comments
Total	**Total**	

(Total Tally x 100 = Total Trees ÷ Total Plots = Trees/acre)

_____ X 100 = _____ ÷ _____ = _____ Trees/Ac

Comments:

Tree Seedling Survival Survey - HARDWOOD

Landowner:		Field #:	Acres:
Legal Description:		Date planted:	Date checked:
Evaluation Crew:			
Spacing:	Trees/Ac:	Total Amount Planted:	

Plot Size: 1/50 acre (16.7'radius)

Number of Plots:

Species	**Tally**	**Trees/Plot** (Tally ÷Total Plots)	**Trees/AC** (Trees/Plot x 50)
Totals			

Comments:

Instructions: Set up a systematic sampling system using 1/50th acre plots across the entire planting area. Tally all trees within the plot, by species. Record the total number of plots. After all plots have been tallied, complete the Trees/Plot and Trees/AC columns.

Tree Seedling Survival Survey – LINEAR PLOTS

Landowner:	**Field #:**	**Acres:**
Legal Desc:	**Date Planted:**	**Date Checked:**
Evaluation Crew		
Conservation Practice:		

Planting Information					
Row #	**Species**	**In-Row Spacing**	**Between Row Spacing**	**Length**	**Amount planted**
			-		

Transect Information					
Plot Number	**Row #**	**Species**	**# of Live Trees**	**% Survival**	**Observations**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

Comments:

Instructions: Each row will be sampled at random locations. Evaluate 10 seedlings (or planting spaces) at each plot along the row(s). Tally all live trees within each plot and record above. Record decisions in "Comments" box