Live Staking Methodology Review
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Abstract

This year, 2014, is the year of this study. We expected to evaluate survival of the live stakes this spring but have not been able to collect the data this year. This fall or next spring we will attend to our sites to evaluate success of the study and collect data. At that point it is expected that the study will be terminated and a brief review will be written up. If the study is determined to be complete any equipment deployed will be removed.

Introduction

Revegetation of stream banks for stabilization, habitat, water quality, and aesthetics is a common practice. The cost and success of such a practice can vary based on types of plants, size of plants, method of planting, irrigation and environmental conditions. Potted plants like those acquired from a commercial nursery commonly need irrigation to survive the first few years. Irrigation requires a water source and can be a very expensive and resource intensive system to install and run. For many projects the inability to access a regular source of water will dictate the planting technique. Without water for irrigation, methods such as live staking become more ideal.

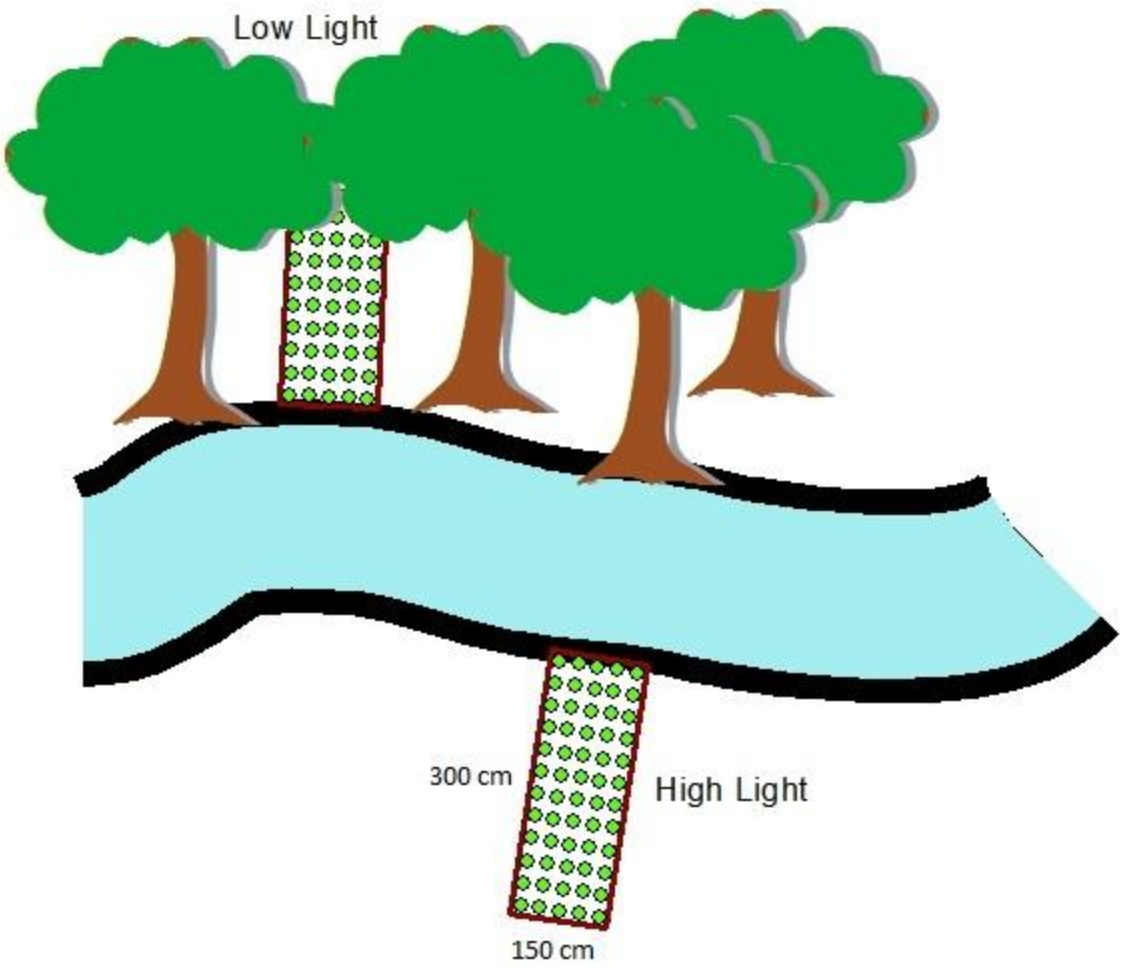
A recent literature review indicates that live staking "can be a low cost highly successful alternative to conventional methods" (Duncan and Klingshrin 2012). The review offers insight into the plant species selection, harvesting, storage, and planting methods for greater plant survivability. We know from a previous City of Austin project that light availability, distance from stream, and ecological region affect the success of different species of bare root plantings (Duncan and Richter 2012). The goal of this research is to better understand the species and conditions that lead to success when using the live staking method of riparian revegetation.

Methods and Materials

1. Describe the sampling. What sites will be sampled? In addition to the core parameter list in the SOP manual, what other parameters will be collected? When will sampling occur?

Plot Design

There will be 8 plots, one in each of 5 different locations, with some locations having two plots. The 150 cm by 300 cm plots will begin within 30 cm of the bankful edge of the stream and extend 300 cm inland. The four different species will be represented in each plot by 10 stakes planted in parallel rows 30 cm apart with 30 cm spacing between stakes. Each plant species will be randomly assigned a column in each row to reduce planting bias in growth. Plot locations will be recorded using GPS.



Species Selection

For success in live staking species selection is a major factor. Not all species of plants can be propagated using this method. Three of the species selected for this study were identified as appropriate species for live staking in the Austin, Texas area (Duncan and Klingshrin 2012) and a fourth species, *Acer negundo*, not on their list but commonly found in riparian areas, will also be used (Table 1). These species were chosen because they are native to Texas, are found growing in both of Austin's primary ecoregions, are common in urban riparian areas, and have been successful in previous live stake plantings (Duncan and Klingshrin 2012).

Table 1. The selected species for this study including their shade tolerance, growth rate, height at maturity, and federal wetland indicator status (USDA 2013).

Common Name	Scientific Name	Shade Tolerance	Growth Rate	Mature Height (ft.)	Wetland Indicator
Roughleaf dogwood	*Cornus drummondii*	Intermediate	Rapid	20	FAC
American Sycamore	*Platanus occidentalis*	Intermediate	Rapid	100	FAC+
Eastern Cottonwood	*Populus deltoides*	Intolerant	Rapid	190	FAC
Boxelder	*Acer negundo*	Tolerant	Rapid	60	FACW-

Stake Harvesting and Storage

Building on the ideas of Allen and Leech 1997, Landphair and Li 2002, Polster 1999, Pezeshki et al 2007, Shafer and Lee 2003, Solano 2005, and Crowder 1995; the BMPs outlined by Duncan and Klingshrin 2012 will be utilized for collecting 80 stakes for each species. Cuttings from 2-5 year old growth will be collected and stored during the dormant period of December 15th to March 15th. The diameter and size of the stakes will vary based on the species and location of planting. The diameters should have a range of 1.25cm to 7.6 cm and be from 45 cm to 150 cm long depending on depth to water table. Cuttings will be collected from as close to the planting sites as possible. The top end will have a flat cut perpendicular to the stem and the bottom will be cut at an angle of 45 degrees.

Cuttings will be stored in a container of water for a minimum of 24 hours but no longer than 14 days. It is best if the water is below 50 degrees Fahrenheit and kept in the shade. Soaking the cuttings in a stream is sufficient. Whatever method of soaking is used the cuttings should be planted the day they are removed from the water and not allowed to dry out.

Stake Planting

Like harvesting and storage, the planting method is taken from Duncan and Klingshrin 2012. Prior to planting the live stakes a pilot hole should be created using rebar, auger, or other appropriate device. Once the hole has been created gently hammer the butt end into the hole, twisting as necessary until the live stake is 75% - 80% in the ground (Figure 1). Trim the top of the live stake if it was damaged during insertion. After tamping soil around the live stake heavily water to remove air pockets.

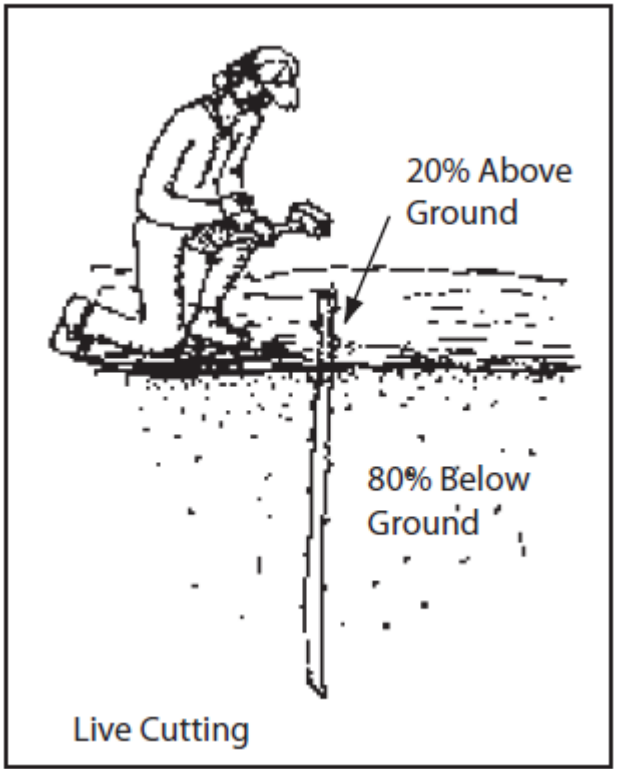


Figure 1. After creating a pilot hole pound live stake 75% - 80% into the ground.

B	R	A	C
A	C	E	B
E	B	R	A
C	E	B	R
A	C	E	B
E	B	R	A
C	E	B	R
A	C	E	B
R	A	C	E
C	E	B	R

Figure 2 The sampling plots will be planted in random row dispersals with stakes 10 deep and 30 cm apart.

Stake Measurements

The following parameters will be measured when the stakes are planted:

- Depth into ground
- Height above ground
- Diameter at 2.5cm above ground
- Soil moisture 6" below the surface at the 0cm (closest to the creek) and 300cm (farthest from the creek) edge of the plot.
- Light levels measured with a photometer and densiometer

The following parameters will be measured for each plot during subsequent visits:

Annually

- Number of live species
- Height of each individual
- Diameter at 2.5cm above ground
- Soil moisture 6" below the surface at the 0cm (closest to the creek) and 300cm (furthest from the creek) edge of the plot.
- Light levels measured with a photometer and densiometer

Bi-Annually

- Soil moisture 6" below the surface at the 0cm (closest to the creek) and 300cm (furthest from the creek) edge of the plot.
- Light levels measured with a photometer and densiometer

Field Methods

At yearly sampling events collect the species name, indicate if each individual is alive, height (cm) using a tape measure, diameter at 2.5 cm above ground, soil moisture from a probe at the top, and bottom of the plot, and the light level at the center of the plot with a densiometer and at the ground using a photometer 30cm in from all corners and the center. March-April

At bi-annual sampling events soil moisture at the top and bottom of the plot as well as the light level at the center of the plot with a densiometer and at the ground using a photometer 30cm in from all corners and the center. September - October

Stakes are considered alive if they have leaves or buds on them. If necessary scrape some bark off to see if there is any green underneath. The height is measured from the ground to the highest point of growth. The diameter is measured with calipers to the nearest ½ millimeter. Soil moisture refers to surface soil and is measured as a percent. Light levels are measured on the ground 30 cm inside the corners and at the center of the plot.

Results

The data has not yet been analyzed. Based on observation most if not all of the live stakes do not look to have survived the summer. Attached are the field sheets with the data that has been collected so far.

Discussion

Given the extreme weather we have been experiencing, the date at which the live stakes were planted might have been a detriment to their survival. In spring we will see how many if any survived the first year.

Conclusions

Live staking has the potential to be a resource-effective way of revegetating along riparian zones. If done properly, it does not require any infrastructure to be set up for survival. The survival of the live stakes used in this study will not be evaluated until spring of 2014 and then for the following two years. At that time we will have an idea on the success of the live staking performed for this study.

Literature Cited

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Appendix

WPD
Live Staking

	E ☐	P ☐	F ☐
Date:			
By:			

Ref. No:

Database No.: _____

Site Name: Barton 71 #2 Project #: _____

Date: 3/14/13 Watershed: _____

Time: 15:30

Personnel: SW, LW, EY, TJ

Soil Moisture _____ %

Plot 8 Stream

B 8.22	31.0 6.2	C 12.53	32.8 13.4	S 13.44	27.6 6.8	D 14.53	24.2 5.0	Total Length Above Ground measurements in centimeters
C 8.61	30.9 7.8	B 17.89	28.4 7.5	D 9.32	24.6 4.2	S 21.40	25.8 6.0	
C 13.26	37.6 6.6	S 9.57	29.2 8.0	B 18.78	31.5 7.3	D 5.99	26.9 7.1	
S 4.15	36.0 6.0	B 11.97	19.7 4.8	C 16.51	30.0 6.5	D 9.80	27.2 6.2	
B 5.06	28.2 9.0	S 10.93	25.6 4.4	D 3.41	32.6 5.9	C 30.34	29.6 11.1	
C 13.14	29.6 3.2	D 5.13	29.1 10.5	B 8.39	24.7 5.2	S 10.54	29.4 8.7	
D 5.55	25.0 4.6	B 10.99	28.8 7.8	C 23.65	28.7 6.3	S 15.42	27.6 6.5	
S 6.95	31.5 5.3	C 9.41	31.1 9.0	D 3.96	28.0 13.1	B 13.18	32.8 5.3	
B 8.90	37.9 4.9	D 4.57	24.6 6.9	C 17.33	30.4 9.1	S 9.95	37.7 6.5	
C 5.79	30.4 14.0	B 4.88	31.0 7.9	S 14.21	28.4 6.4	D 6.19	24.7 6.5	

Diameter at 2.5cm

Soil Moisture _____ %

Densiometer in center of plot facing north

Photometer readings taken 30cm in from each corner and in the center

Stream



WPD
Live Staking

	E ☐	P ☐	F ☐
Date:			
By:			

Ref. No:

Database No.: _____

Site Name: BCP @ HWY 71 Project #: _____

Date: 10/25/13 Watershed: Barton

Time: 11:30

Personnel: SW, EY

Soil Moisture 11 % Temp °F 49

Plot 8 Stream

B		C		S		D		Total Length Above Ground measurements in centimeters
C		B		D		S		
C		S		B		D		
S		B		C		D		
B		S		D		C		
C		D		B		S		
D		B		C		S		
S		C		D		B		
B		D		C		S		
C		B		S		D		

Diameter at 2.5cm

Soil Moisture 13 % Temp °F 50

Densiometer in center of plot facing north

98

1/4" - 1/4" red. dogwood

Photometer readings taken 30cm in from each corner and in the center

Stream

15		19
	20	
12		41

Plot	Shaded	State83_X	State83_Y	
Bartholemew 2	No	3130342	10083728	
Walnut SPRR 1	No	3141341	10072708	x 6 - Sun
Walnut SPRR 2	No	3141100	10072806	
BBS Greenbelt 1	~~No~~ Yes	3107890	10046810	~~x 3~~ → Shade
Parker Park 1	Yes	3116088	10058774	~~x 1~~ shade
Parker Park 2	No	3116136	10058755	~~x 2~~ sun
LBL 1	No	3119642	10063436	~~x 4~~ → Sun
Bartholomew 1	No	3128954	10083634	x 5 - Sun
barton 71 1	Yes	3057076	10079713	
barton 71 2	Yes	3057214	10079694	x 8 - shade
Dottie Jordan	Yes			x 7 - Shade
LBL 2	Yes			x 9