

# **TONTO NATIONAL FOREST**

**Final Report for Agreement 07-IA-11031200-029**



*Mirabilis albida*

**Prepared by**

**The Natural Resources Conservation Service**

**Plant Materials Center**

**Tucson, Arizona**

## **INTRODUCTION:**

This report discusses the production and split delivery (spring and fall) of 1500 containerized plants for the revegetation of areas within Tonto National Forest. The original agreement (07-IA-11031200-029) was signed the 24th of August, 2007 with the project ending the 31st of December, 2009. In August of 2009, an amendment was signed extending this agreement until August 24, 2012, to allow additional time for invasive weed control in the areas targeted for revegetation.

## **BACKGROUND:**

In July of 2005, a fire burned through Tonto National Forest's Cave Creek Complex scorching 243,800 acres. This fire would end up being the third largest wildfire in the state. Within the scope of the fire was the historic Camp Creek Recreation Area. The Camp Creek area first saw use as a recreation area sometime prior to 1920 and by the 1930's had transformed from a recreational area to a residential area. Residents planted many types of non-native vegetation near their cabins.

In fiscal year 2006, the Cave Creek Ranger District conducted a survey for invasive plants in the Camp Creek drainage. Of primary concern were large patches of periwinkle (*Vinca major*) growing on the lots of homeowners. Removal of the extensive patches of periwinkle could have left large areas of open ground near streambanks open to erosion. To alleviate this concern, Tonto National Forest personnel developed a plan to revegetate areas where periwinkle removal (mechanical or chemical) occurred with native plants. The plan called for the grow-out and split delivery of 1500 containerized plants.

In 2007 and 2008, seed collections of several species were gathered in areas surrounding Camp Creek Recreation Area. The collections were sent to the Tucson Plant Materials Center (TPMC) and catalogued. Before chemical treatment of the periwinkle could occur, an environmental assessment had to be completed by Forest Service personnel. Due to delays in accomplishing the environmental assessment, the PMC did not begin producing containerized plants for the revegetation of Camp Creek until February 2011.

## **MATERIALS & METHODS:**

There were a total of 75 seed collections of 31 different species received at the TPMC. Each seed collection was cleaned and weighed in 2008. In most cases, the seed was hand cleaned on rubbing boards and sifted through various sizes of screens in order to reach bare caryopsis. In the cases of the species that produce fruit (*Rhus spp.*, *Solanum xantii*, *Vitis arizonica*), dried fruits were placed in a seed scarifier to remove the outer seed coat before being sifted through screens.

On the 8<sup>th</sup> of February 2011, the first germination trials were conducted to determine appropriate propagation protocols of several species. Various factors were considered in choosing which species to germinate for the first delivery of plants scheduled for fall 2011. Some of the factors included amount of seed available, life cycle of the species and perceived difficulty to germinate. Initial germination tests involved placing very small quantities of cleaned seed on moist filter paper in petri dishes. Petri dishes were then placed under UV lights. *Mirabilis coccinea* is the only species that received any additional treatment. One five seed set of *Mirabilis coccinea* was scarified by hand with a fine grain sand paper. The other five seed set of *Mirabilis coccinea* received no treatment. Germination of species was monitored for two weeks (table 1).

**Table 1: 2011 Germination tests species and results**

Date collected	Latin Name	Common Name	Number of seeds	Start Date	Number germinated	Germ date	% germination
6/29/2007	<i>Aquilegia chrysantha</i>	Golden columbine	10	8-Feb-11	0		
6/25/2008	<i>Aristolochia watsonii</i>	Watson's dutchman's pipe	5	8-Feb-11	0		
10/8/2007	<i>Clematis drummondii</i>	Drummond's Clematis	6	9-Feb-11	0		
8/27/2007	<i>Janusia gracilis</i>	Slender janusia	5	9-Feb-11	3	14-Feb	60
6/8/2008	<i>Mirabilis multiflora</i>	Colorado four o'clock	5	8-Feb-11	3	11 Feb/18 Feb	60
6/25/2008	<i>Rhynchosia senna</i>	Texas snoutbean	5	8-Feb-11	1	18-Feb	20
7/3/2007	<i>Phaseolus angustissimus</i>	Slimleaf bean	5	9-Feb-11	3	11 Feb/23 Feb	60
5/16/2007	<i>Sphaeralcea coccinea</i>	Globemallow	10	9-Feb-11	1	11-Feb	10
6/1/2007	<i>Mirabilis albida</i>	White 4 o'clock	5	8-Feb-11	0		
5/16/2007	<i>Northoscordum texanum</i>	Texas false garlic	5	9-Feb-11	0		
7/5/2007	<i>Oenothera caespitosa</i>	Tufted evening primrose	6	8-Feb-11	0		
4/4/2007	<i>Oligoneuron sp.</i>	Goldenrod	10	9-Feb-11	0		
7/5/2007	<i>Penstemon pseudospectabilis</i>	Desert penstemon	5	9-Feb-11	0		
6/1/2007	<i>Mirabilis coccinea (no trt)</i>	Scarlet four o'clock	5	8-Feb-11	3	11-Feb	60
6/1/2007	<i>Mirabilis coccinea (trt)</i>	Scarlet four o'clock	5	8-Feb-11	3	11-Feb	60

The species that germinated most readily using this method (*Janusia gracilis*, *Mirabilis multiflora*, *Phaseolus angustissimus* and *Sphaeralcea coccinea*) were selected for increase and propagation in the greenhouse. *Mirabilis coccinea* was not propagated for the fall 2011 delivery because of its annual life cycle. The remaining species received further germination testing.



**Figure 1: *Phaseolus angustissimus* seed**



Figure 2: *Phaseolus angustissimus* seedling

On April 12<sup>th</sup> of 2011, seed of *Janusia gracilis*, *Mirabilis multiflora*, *Phaseolus angustissimus* and *Sphaeralcea coccinea* were scattered across the top of a 1:1 mix of [SunGro Horticulture](#) Sunshine Mix #1 and perlite in 1020 propagation trays. These trays were placed in the greenhouse and maintained at temperatures of approximately 68°F at night and 75°F during the day. Watering frequency in the greenhouse consisted of three, five minute watering periods per day. On the 28<sup>th</sup> of April, 240 seedlings of *Janusia gracilis*, 192 seedlings of *Mirabilis multiflora* and 64 seedlings of *Phaseolus angustissimus* were transplanted to heavy 10"x3"x3" [Zipset Plant Bands](#). One seedling of *Sphaeralcea coccinea* emerged. However, it did not survive. By the 24<sup>th</sup> of May, sufficient growth of the seedlings had been obtained to move them to the shadehouse.



Figure 3: *Phaseolus angustissimus* plants approximately one month after germination

On the 9<sup>th</sup> of June, seed of *Vitis arizonica*, *Clematis drummondii*, *Oenothera caespitosa*, *Mirabilis albida* and *Penstemon pseudospectabilis* were also planted using the same soil medium and watering frequency previously discussed. All species had germinated by the 21<sup>st</sup> of June. Transplanting of species from their germination flats into Zipset Plant Bands was a continual process, depending on seedling size, from the 13<sup>th</sup> of July until the 3<sup>rd</sup> of August (table 2). Freshly transplanted seedlings spent approximately two weeks in the greenhouse before being moved into the shadehouse.



Figure 4: *Vitis arizonica* seedlings, June 21, 2011

In the shadehouse, all transplants received 20 minutes of water daily and were fertilized with a 200 parts per million (ppm) solution of Peter's Professional® Soluble Plant Food 20-20-20 approximately every two weeks. Additional care for the transplants included occasional trimming and training of vine species. In mid-October, the watering frequency was reduced to once per week and application of fertilizer was ceased. Most of the transplants had entered dormancy by early November.



Figure 5: *Vitis arizonica* transplants, August 16, 2011



Figure 6: *Mirabilis albida* in the shadehouse, Sept. 2011



Figure 7: *Oenothera caespitosa*, October 2011

TPMC personnel contacted Tonto National Forest personnel in mid-September 2011 to report the status of containerized plant production. A site visit to the Camp Creek Recreation Area was scheduled for December 2nd. During the site visit, TPMC and Forest Service personnel met with the recreation area residents and discussed transplanting techniques and appropriate placement of the individual species. A winter delivery was scheduled and conducted on the 5<sup>th</sup> of January, 2012. Of the 1153 plants propagated, 463 were delivered to the site (table 2). In some cases (*Clematis drummondii*), many of the individual plants had not developed enough root mass for successful off-site planting by the January delivery date. In other cases (*Janusia gracilis*, *Mirabilis multiflora*), there was significant mortality of seedlings after transplanting.

**Table 2: 2011 dates and total numbers of species available for first delivery to Camp Creek Recreation Area**

Species	Date seeded	Transplant Date							Total Transplanted	Number Delivered on 5 Jan 2012
		28-Apr	13-Jul	18-Jul	26-Jul	2-Aug	3-Aug	7-Nov		
<i>Vitis arizonica</i>	9-Jun		19				24		43	43
<i>Janusia gracilis</i>	12-Apr	240	160			160			560	117
<i>Oenothera caespitosa</i>	9-Jun		48	14	10		4		76	73
<i>Rhynchosia senna</i>	8-Feb						1		1	1
<i>Clematis drummondii</i>	9-Jun			7	25		50	72	154	50
<i>Mirabilis albida</i>	9-Jun		50				1		51	50
<i>Mirabilis multiflora</i>	12-Apr	192					4		196	60
<i>Phaseolus angustissimus</i>	12-Apr	64							64	63
<i>Penstemon pseudospectabilis</i>	9-Jun						8		8	6
<b>TOTAL # of plants</b>									1153	463

Germination testing and propagation began in early December and continued until early February for the second set of plants to be delivered (table 3). The majority of the species for the second delivery were germinated in a Hoffman Germination Chamber. Seeds were scattered on top of a moist 1:1 peat/perlite mix in propagation containers and placed in the chamber. Chamber settings were 12 hours of light at a temperature of 77°F and 12 hours of dark at a temperature of 68°F. As seedlings reached sufficient size, they were transplanted into Zipset Plant Bands and moved to the greenhouse. Maintenance of the transplants followed the same protocols as the previously grown plants.



**Figure 8: *Maurandella antirrhiniflora* seedlings**



**Figure 9: *Mimulus guttatus* seedlings**

Exceptions to the Hoffman Germination Cabinet protocol included *Muhlenbergia rigins* and *Rhus trilobata*. *Muhlenbergia rigins* seed was planted directly into [Zipset Plant Bands](#). *Rhus trilobata* seeds were scarified with concentrated sulfuric acid for approximately 1 hour on 18 January. After scarification, the seed was rinsed and planted into a 1:1 mix of [SunGro Horticulture](#) Sunshine Mix #1 and perlite in 1020 propagation trays. The trays were then placed into a cold germination chamber set for a constant temperature of 40°F. The trays were moved to the Hoffman Germination Cabinet on March 2nd. *Rhus trilobata* seedlings were emerged by the 5<sup>th</sup> of March.

**Table 3: 2011-2012 dates and total numbers of species available for second delivery to Camp Creek Recreation Area**

Species	Date Seeded	Transplant Date										Total transplanted	Number Delivered on 3 May	
		3-Aug	7-Nov	28-Dec	3-Jan	14-Feb	1-Mar	14-Mar	15-Mar	16-Mar	12-Apr			
<i>Mirabilis coccinea</i>	6-Dec			42									42	32
<i>Datura inoxia</i>	6-Dec			54	30								84	79
* <i>Clematis drummondii</i>	9-Jun	50	72	4									126	96
* <i>Aquilegia chrysantha</i>	9-Jun	32	34										66	64
<i>Maurandella antirrhiniflora</i>	27-Jan					32							32	29
<i>Penstemon pseudospectabilis</i>	10-Feb						64	32	288	45			429	416
<i>Mimulus guttatus</i>	27-Jan									144	80		224	224
<i>Rhus trilobata</i>	18-Jan								144	77			221	192
* <i>Oenothera caespitosa</i>	9-Jun			9									9	4
<i>Muhlenbergia rigins</i>	6-Dec												256	254
<b>TOTAL # of plants</b>													1489	1390

\*species held over from first delivery propagation work



Figure 10: *Rhus trilobata* seeds after scarification



Figure 11: *Rhus trilobata* transplant, April 2012

In mid-April, Tonto Forest personnel were notified of the quantities of plants available for the second delivery. The final delivery was completed on May 3<sup>rd</sup>. Of the 1489 plants transplanted, 1390 plants were delivered. In total, the TPMC delivered 1853 plants to Tonto National Forest personnel for the revegetation of the Camp Creek Recreation Area.



Figure 12: *Vitis arizonica* outplanted to Camp Creek Recreation Area

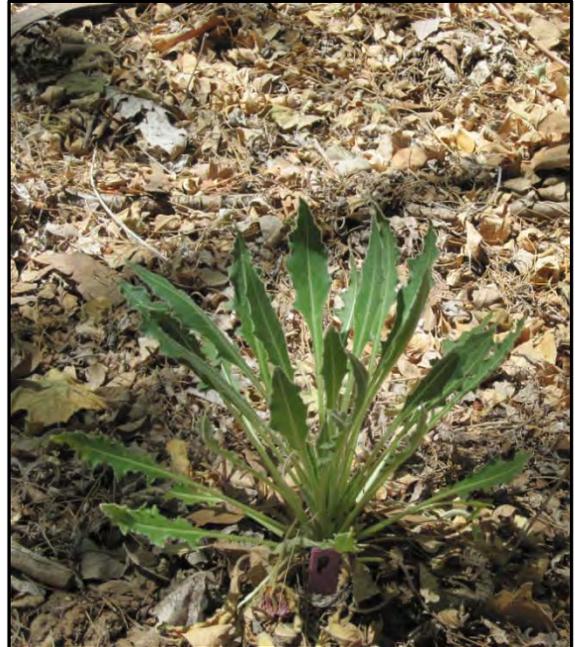


Figure 13: *Oenothera caespitosa* outplanted to Camp Creek Recreation Area

#### **TECHNOLOGY/PRODUCT DEVELOPMENT:**

The propagation protocol used to develop containerized *Vitis arizonica* for this project was published in the [Native Plant Network Propagation Protocol Database](http://www.nativeplantnetwork.org) in July of 2012. The citation is:

Dial , Heather Lynn 2012. Propagation protocol for production of plug + transplants of *Vitis arizonica* Engelm. plants (3" x 10" Plant Bands); USDA NRCS - Tucson Plant Materials Center, Tucson, Arizona. In: Native Plant Network. URL: <http://www.nativeplantnetwork.org>. Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

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