

**Comprehensive Tamarisk Survey and Treatment Project
Saguaro National Park-Rincon Mountain District
2010-2011**

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Tamarisk in Upper Wildhorse Canyon

Tamarisk grows in suitable habitat west of the Great Plains, north into Montana, and south into northwestern Mexico. It thrives where surface or subsurface water is available for most of the year, growing along stream banks, lake and pond margins, canals, ditches, springs, washes, and disturbed and burned sites. Tamarisk has invaded nearly every drainage system occurring in the arid and semi-arid areas of the American West. In Arizona, tamarisk grows between 100 and 5,000 ft in elevation, and reaches up to 6,000 ft in northern Arizona (Halvorson and Guertin, 2003). It invades riparian areas, one of Arizona's most fragile ecosystems. In the Southwest, riparian areas account for less than two percent of the land, yet over 65 percent of wildlife in the southwest depend on riparian habitats. They are the most productive, most valuable, and the most threatened habitats in the American Southwest (Johnson, et al., 1985).

Tamarisk has become so invasive because it is a relatively long-lived woody plant that can tolerate a wide range of environmental conditions once established. Tamarisk has a broader temporal range for germination and often establishes before native riparian tree species like cottonwood. Its reproductive success is ensured through the production of a massive numbers of small seeds as well as the ability to propagate vegetatively. Tamarisk can displace native woody species especially when peak water discharge, timing, and amount have been changed, along with changes in salinity, temperature, and substrate texture as a result of human activity or fire (Halvorson and Guertin, 2003). Tamarisk is an aggressive competitor, often developing monoculture stands, which block out sunlight, reduce space, deplete soil nutrients, and lower water tables. This overwhelming competition for resources can negatively affect plant and wildlife communities, altering entire ecosystems. *Tamarix aphylla* is considered far less invasive because it produces sterile seeds and only propagates vegetatively (Halvorson and Guertin, 2003). However, it has recently been noted that *T. aphylla* has been hybridizing with other *Tamarix sp.* and producing viable seeds (Gaskin and Shafroth, 2005).

Tamarisk in Saguaro National Park

Although Saguaro National Park (Saguaro) is a desert park with no perennial streams, there is suitable habitat for tamarisk as evidenced by a few mature trees that were first observed in the 1980's (Tamarisk Eradication Efforts at Saguaro National Monument). Over the last two decades, Saguaro has identified approximately 50 individual tamarisk while conducting other natural resource projects. These individuals were either removed by hand if small enough or treated with herbicide (Triclopyr) using the cut stump method. Following treatment, these individuals were periodically revisited to ensure there were no re-sprouts or new seedlings.

At the Freeman Homestead there is a mature *T. aphylla* that was planted before Saguaro was established. This tree, though non-native, has remained in the park due to its cultural significance.

In 2006, Saguaro experienced the largest flood event in the history of the park, what the Pima County Flood Control District referred to as a 100 year event. This event was best observed in Rincon Creek, the only creek in the park with a stream gauge, where peak flows were recorded up to 15,000 cubic feet per second (cfs). The flood was the highest recorded in more than 50 years of USGS monitoring; indeed, typical flows are very low and no previous flood had exceeded 10,000 cfs. This rare event caused alterations in many of the streams throughout the Rincon Mountain District of the park. Unfortunately, it also resulted in a flush of tamarisk seedlings in Rincon Creek (**Figure 1**)

The NPS Management Policies (National Park Service, 2006) clearly define the need for managing exotic species, "exotic species will not be allowed to displace native species if displacement can be prevented" and "high priority will be given to managing exotic species that

the distribution, abundance, and demographics of tamarisk in the park, as well as eliminating future sources for germination events.

Because this project presented a unique opportunity to explore areas of the park that are rarely if ever visited by humans, the survey also included basic data collection on cottonwoods (*Populus fremontii*), cattails (*Typha domingensis*), junipers (*Juniperus deppeana*) below 3500 ft, lowland leopard frogs (*Rana yavapaiensis*) and their habitat, as well as any notable human disturbances, both historical and current. Other non-native plants were mapped and treated including African sumac (*Rhus lancea*), tree tobacco (*Nicotiana glauca*), horehound (*Marrubium vulgare*), and oleander (*Nerium oleander*) because they are believed to be at management levels and they can be effectively treated with the same methods used to treat tamarisk. The extent and abundance of the invasive non-native grasses buffelgrass (*Pennisetum ciliare*), fountain grass (*Pennisetum setaceum*), and tick grass (*Eragrostis echinochloidea*) were also documented.

Methods

Safety

The park has a comprehensive safety and job hazard assessment program. The Science and Resource Management Division has a more detailed safety program and a formal Safety Plan, with components regularly reviewed by all staff and volunteers. Saguaro also has a backcountry safety protocol when traveling in remote locations of the park. Personnel working with herbicides were either certified herbicide applicators or were working under the supervision of a certified applicator.

The Tamarisk Project Safety Plan (**Appendix A**) was created to specifically address the potential hazards encountered while hiking in drainages and off trail in the backcountry. All project participants were required to read the safety plan as well as relevant Job Hazard Analysis (i.e., backcountry travel and off trail hiking) and the herbicide label. Backcountry safety protocols and remoteness of some of the drainages warranted working in pairs. Group surveys were also employed to cover multiple drainages simultaneously. On rare occasions, solo surveys were conducted in front country drainages.

Survey Parameters and Priorities

The 2010/2011 Tamarisk Project captured all of the mapped drainages in the Saguaro's Rincon Mountain District up to 6000 ft. In circumstances where the drainages became inhabited with pine or upper woodland habitat that provides neither suitable substrate nor adequate sunlight for tamarisk, the survey was considered complete for that drainage. The Tucson Mountain District was not surveyed as part of this project because it does not contain riparian habitats.

Secondary to tamarisk, the project targeted African sumac, tree tobacco, horehound, oleander, and any other plants that are not native to Saguaro. Invasive non-native grasses such as buffelgrass, fountain grass, and tick grass were documented in the drainages to capture their abundance and distribution throughout the park. Native species, primarily those that are unique to riparian areas including cottonwoods, cattails, junipers below 3500 ft, and lowland leopard frogs were also of interest as indicator species for the presence of surface water, suggesting potential tamarisk habitat. Because the National Park Service is concerned with protecting its natural resources, any notable human disturbances, both historic and current were also documented.

locations and were treated with this mixture. Follow-up will be necessary to determine the efficacy of this treatment.



Image 3: Tamarisk treated using the cut-stump method

Results

Tamarisk

Over the course of the project a total of 225.9 miles were surveyed, 214.5 miles were in the Rincon Mountain District of Saguaro National Park and 11.6 miles on Forest Service land. A total of 77 tamarisk were mapped and treated, including 3 *Tamarix aphylla*, (Table 1). The *T. aphylla* were all located in the East Hope Camp and Chimenea drainages on the southern slope of the Rincon Mountains.

Thirteen tamarisk (five saplings and eight mature) were discovered above 5000 ft, all of which were found on the north slope of the Rincon Mountains, in the upper Tina Larga and Canyon del Pino drainages. The highest elevation tamarisk was a mature tree growing at 5320 ft in the Tina Larga drainage, 320 ft above the previously determined range for Arizona (**Figure 4**).

Of the 16 tamarisk seedlings and saplings manually removed, 3 require re-visits because the root system was not entirely removed. The remaining 13 tamarisk plants are considered successfully treated. All 61 tamarisk treated with herbicide require re-visits to ensure the success of their treatment (**Table 1**). An additional seven previously treated tamarisk require follow-up visits. Excluding Rincon Creek proper, there are 70 tamarisk that need re-visiting (**Figure 5**). A total of 10.4 oz of Remedy, 3.0 oz in 2010 and 7.4 oz in 2011, were used in the treatment process.

Other Non-Native Plants

Other non-native plants that were mapped and treated include one African sumac, eight tree tobacco, six common horehound, and two oleander, a species previously thought to have been eradicated from the park. The African sumac and horehound were found in lower elevations west of the Rincon Mountains, in the Loma Verde South and Javelina Rocks drainages, respectively. The tree tobacco plants were found at a variety of elevations on the south and west facing slopes of the E. Hope Camp, Chimenea, and Three Saguaros Cave drainages. The oleanders were growing on a north slope, in the upper Steel Tank and Tina Larga drainages (**Table 3 and Figure 9**).

Table 3: Other non-native plant species

Other Non-Native Plants			
Species	# of Plants	Life stage	Treatment
African Sumac	1	Sapling	Chemical
Oleander	2	Mature	Chemical
Tree Tobacco	2	Mature	Chemical
Tree Tobacco	4	Dead	Manual
Tree Tobacco	2	Mature	Manual
Horehound	6	Mature	Manual

Native Obligate Riparian Plants

A total of 805 cottonwoods and 102 patches of cattails were documented. The life stage distribution of cottonwoods was 3 seedlings, 54 saplings, 473 poles, and 275 mature trees. Cattails were recorded as patches because it was too difficult to determine the number of individuals within a patch. Cattail lines were dropped from the Native Obligate Riparian Plant map because there were only three short lines symbolized and they were masked under layers of cattail points (**Figure 10**). Four junipers were documented growing below 3500 ft in Rincon Creek proper. Junipers were excluded from the Native Obligate Riparian Plant map.

Wildlife

A diverse array of wildlife was encountered during the project. Several new pools containing lowland leopard frogs were discovered upstream from currently surveyed pools in the Rincon North drainage. Leopard frogs were present up to 5049 ft. Other notable wildlife were two ground snakes, a mountain lion, two black bears, and a previously undiscovered golden eagle's nest. All wildlife was documented in the wildlife database with links to associated pictures.

Human Impacts

Human impacts documented in the park consisted of remnants of a marijuana farm that had already been reported to park officials. The materials from a marijuana farm were found in one of the Deer Camp drainages and included some garden hose, a large wire cage, and fragments of a tarp. Coordinates and photos of the findings were reported to park law enforcement.

New observations included rock cairns in association with a mine, a check dam, and an old trapper's camp. The rock cairns and mine were discovered on a north facing slope in the Rincon 2 Auxiliary drainage. The stone check dam was found in the main Rincon drainage, at 4347 ft. It is believed to have been built by Civilian Conservation Corps. The old trapper's camp was discovered in the upper portion of the Chimenea drainage, just south of Cow Head Saddle. The

collaborative effort with the land owners involving education, treatment, and prevention can we truly manage tamarisk in Rincon Creek.

Figures

Figure 1

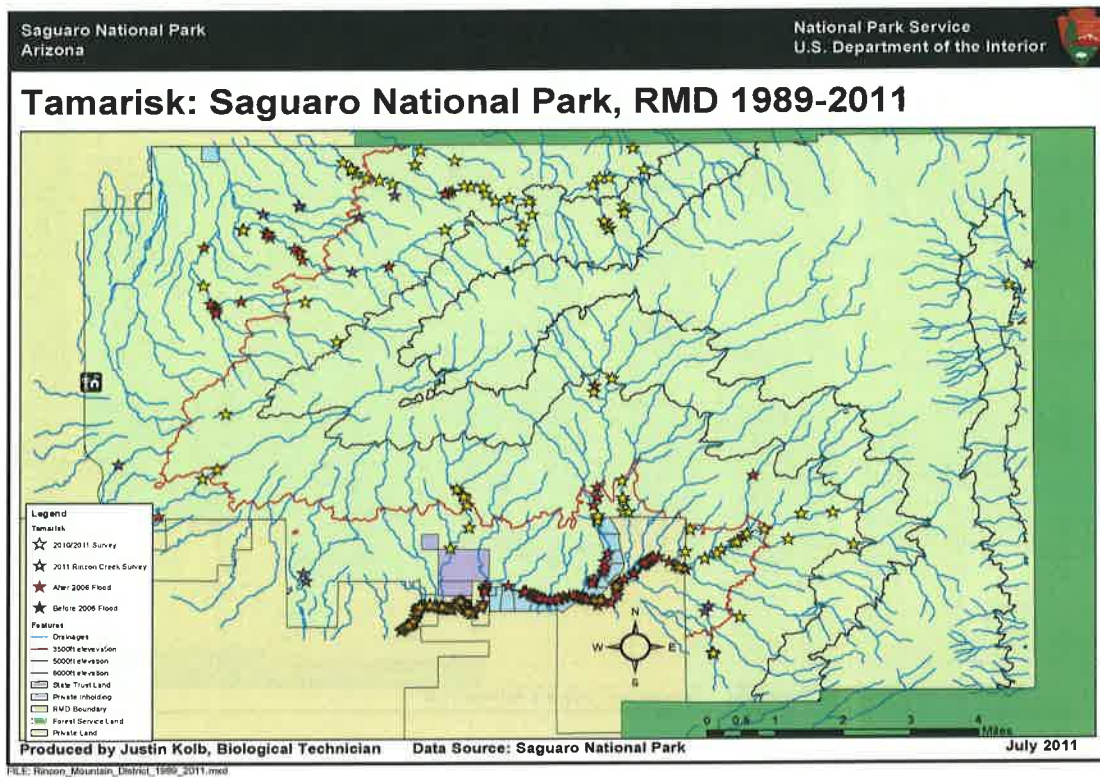


Figure2

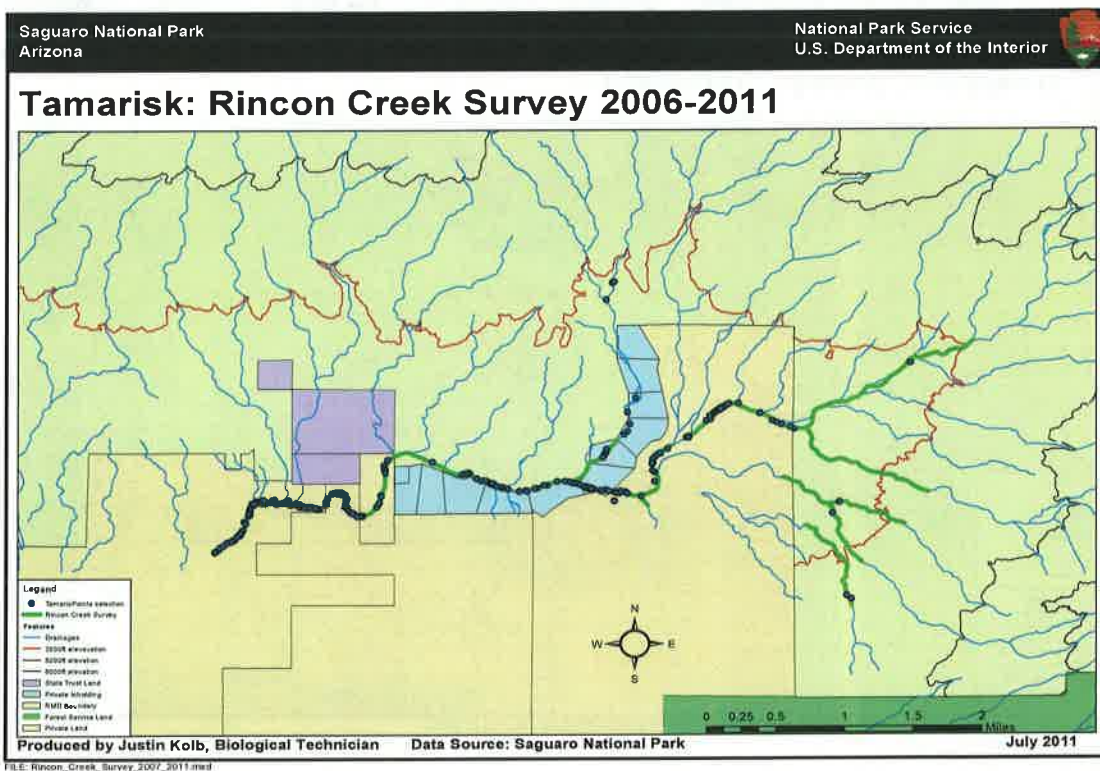


Figure 5

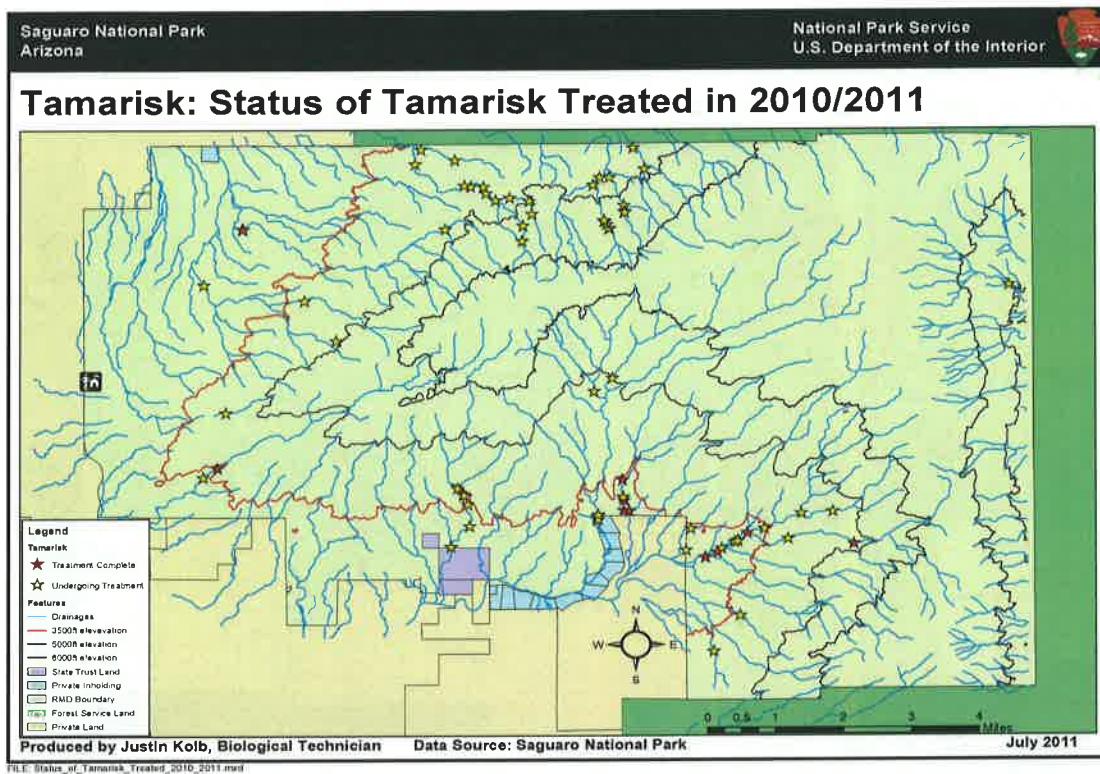


Figure 6

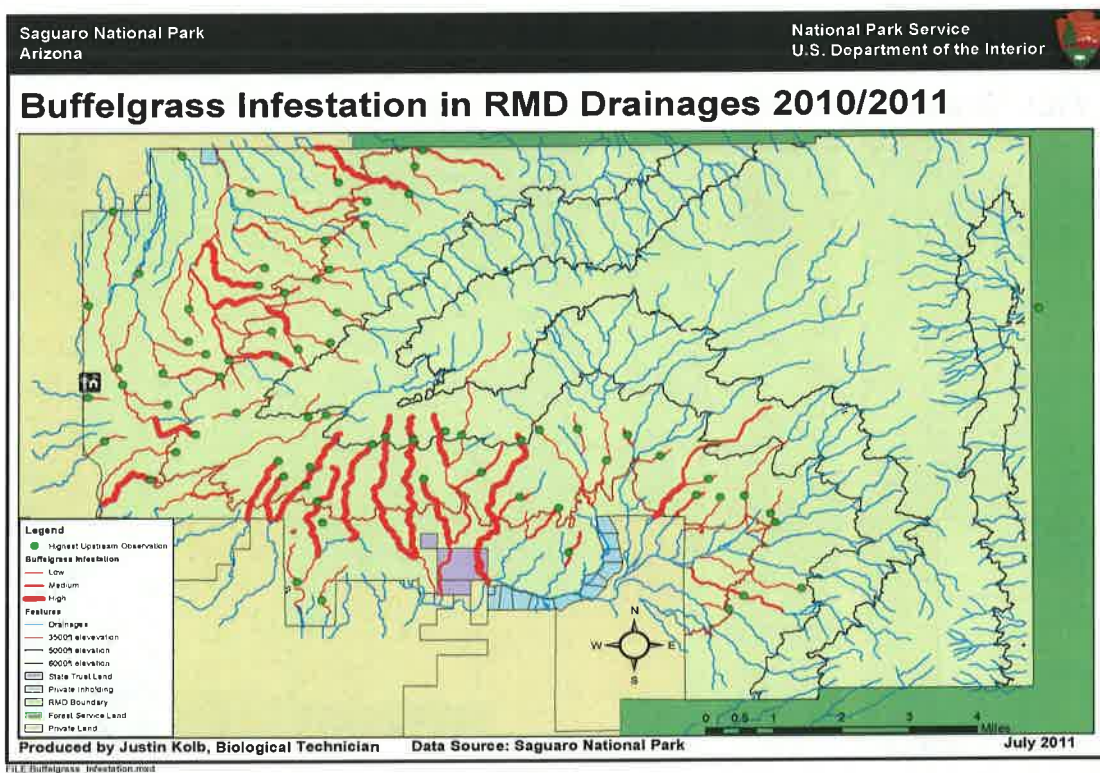


Figure 9

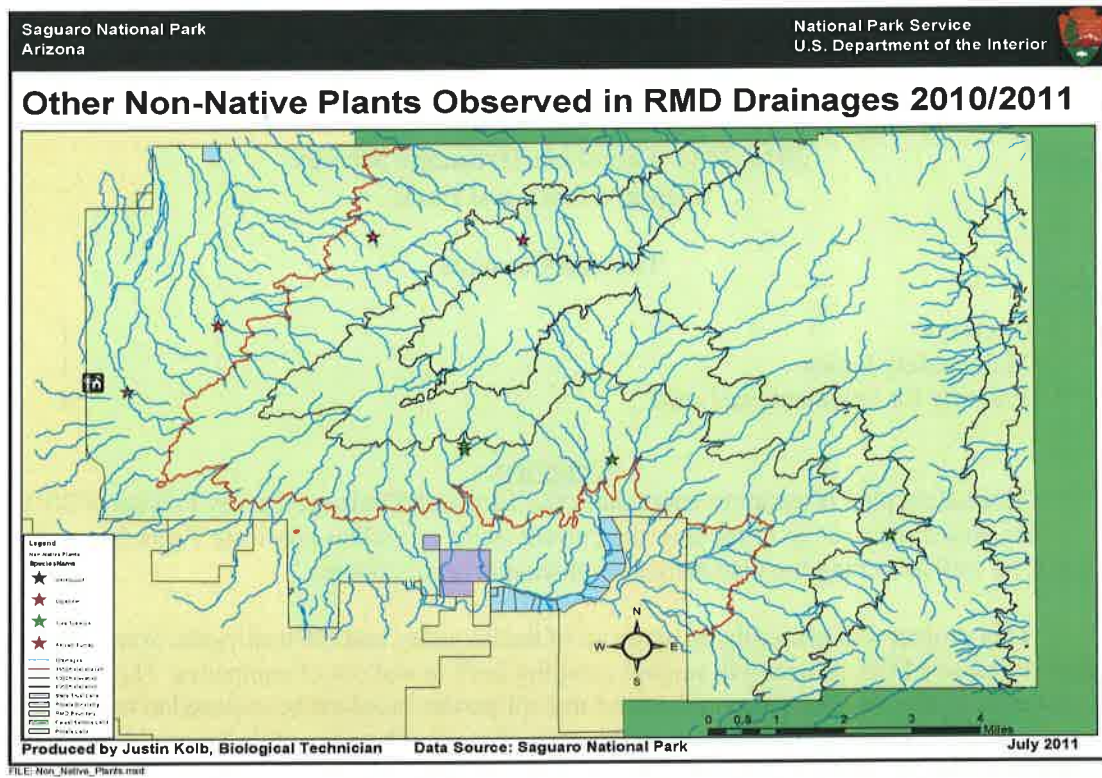
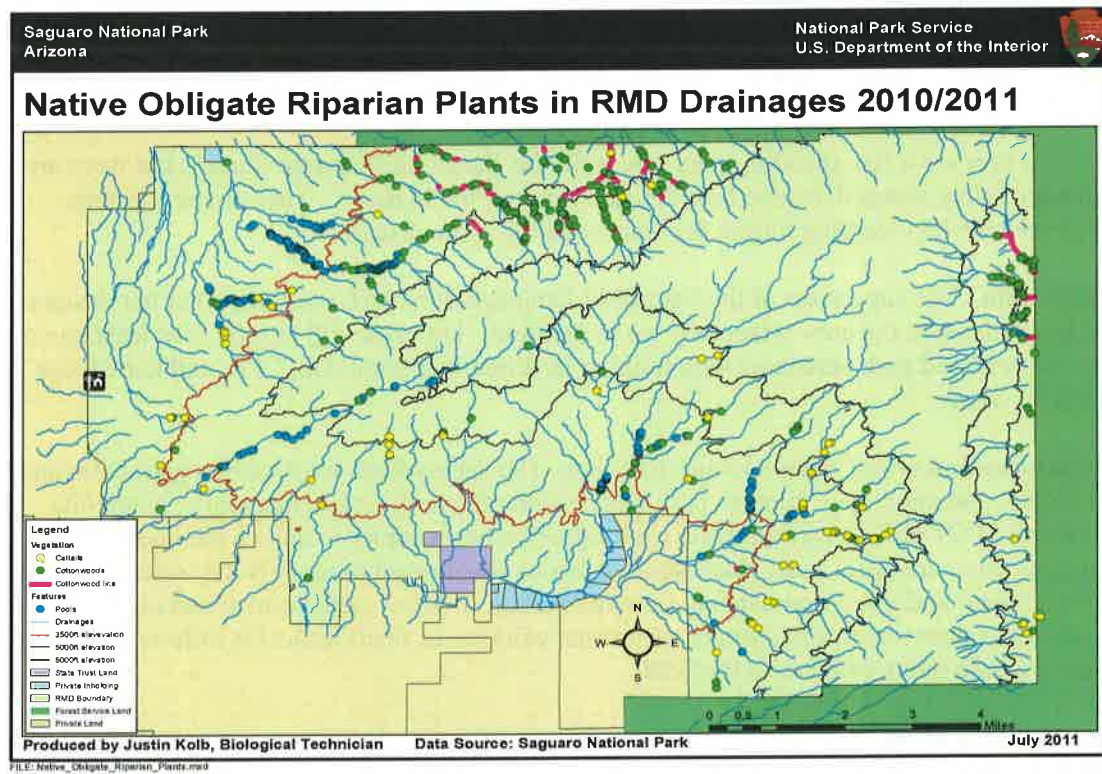


Figure 10



the work in the winter, there is the potential for warm and even hot days. Individuals should also hydrate, eat salty snacks (to keep salt/electrolyte intake up) throughout the day. At times it can be easy to get distracted by the field work and not hydrate well enough; as a result, it is important to watch out for yourself and those around you for signs of heat exhaustion, heat stroke, and hyponatremia.

Hazardous animals. All participants should be aware of the wildlife they might encounter.

Africanized bees- Hives are found throughout the Park, and individuals must know the signs of a possible bee attack. Those include “bumping” and the intense buzzing of a swarm. The hive does not have to be disturbed for bees to become agitated. Bees can become agitated from noises and even vibrations (from vehicles, equipment and pedestrians). Avoid hives as much as possible. It is important to keep both an eye and an ear out for signs of bees.

Rattlesnakes- Though the project is taking place in the seasons when rattlesnakes are at their least active state, they still pose a dangerous hazard. They occupy the entirety of the park, and their bites are extremely serious. It is important to make sure that you are watching where you place your hands and feet.

Black bears- In the park, bears generally wish to avoid contact with humans. Dangerous situations occur when surprising a bear, encountering a bear in which it feels cornered, and any encounter with a mother and her cubs. To avoid these situations, remain alert while traveling through areas where visibility is low, making noise (i.e. bear bells), keeping a campsite clean and storing food and items with odors in bear-proof containers.

Mountain Lions- In general mountain lions will avoid you or you won’t see them. In the event of an encounter follow the basic rules: remain calm, do not turn your back, do not run, do not bend or crouch, make yourself appear large, throw objects.

Bobcats, coyotes, foxes, skunks, scorpions and other potentially dangerous animals also may be encountered. Rabies is possibility in many of these species. Keep an eye out for strange behavior in animals and make sure to give those animals a wide berth, as rabies is a serious medical situation.

Hazardous plants. Much of the vegetation in the desert seems to have been designed to be as unfriendly to humans as possible. Encounters with cacti should be avoided, especially concerning cholla, prickly pear, and even saguaros. Incidents with cacti, such as falling into a cholla, should be considered a serious medical issue that requires immediate attention; rangers should be notified, and precautions should be taken against shock. Other thorny and prickly plants, like cat claws, acacias, mesquites, wait-a-minute bushes, agaves, shin-daggers should also be avoided to the greatest extent possible. Vines like janusia should be noticed as they provide a huge tripping hazard. Individuals will have tweezers/ multi-tool for thorn and spine removal.

Herbicide. The treatment of tamarisk and other invasives will often require herbicide. Labels and MSDS sheets will be on hand at all times. Proper PPE as designated by the label will be worn whenever applying the herbicide. A licensed applicator will present during treatments. Special care should be taken to avoid spills as well as contaminating yourself and others.

Hypothermia is a concern during winter field work. Desert temperatures have a tendency to fluctuate dramatically. This risk can be intensified when coupled with the exposure to water (either rain or flowing or standing water in the drainages) or wind. Crew members should ensure

Appendix B

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Appendix C

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