Paria River Exotic Removal Phase I
Task 5 – Exotic Vegetation Removal Report

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Overview of project background and goals

The Paria River originates in Bryce Canyon National Park and traverses the westerly edge of the Grand Staircase before entering Paria Canyon in Vermilion Cliffs National Monument, and ultimately, Glen Canyon National Recreation Area and the Colorado River at Lee's Ferry. The Paria Canyon is a designated wilderness area and is eligible for Wild and Scenic River designation due to its spectacular scenery, rugged terrain, and remoteness. It is also an area well known to hikers and backpackers and includes such places as the "narrows" and Buckskin Gulch, indisputably the two most popular slot canyons in the Grand Canyon region.

Many of the terraces along the Paria River have become invaded by non-native tamarisk (*Tamarix ramosissima*) and Russian olive (*Elaeganus angustifoli*a) trees, and these species are becoming especially well established along the lower reaches of the river, near the confluence with the Colorado River. The highly invasive tamarisk and Russian olive were introduced into the southwestern United States in the late 19th century to help control stream bank erosion. Since that time, both plant species have spread throughout the west and caused major changes to rivers and streams. In the Paria River, their spread has been facilitated by historical land use, changes in climate, and by their ability to out-compete native species. The high competitive and reproductive success of tamarisk and Russian olive often results in dense stands, in some places choking out native vegetation to the point of creating a mono-cultural streamside habitat that reduces the diversity of other plants and wildlife species, increases fire hazard, and ultimately, results in the alteration of stream hydrology. The active removal of tamarisk and Russian olive from the Paria River will facilitate the recovery of native vegetation, restore critical habitat and support a diversity of critical plant, bird and wildlife species.

In 2008 the Grand Canyon Trust's (GCT) well established volunteer program received a grant from the Arizona Water Protection Fund (AWPF) to support a five-year effort to remove tamarisk and Russian olive from a 17 mile stretch located just below the Paria River- Buckskin Gulch confluence to Wrather Canyon. The objective of the Paria Exotic Removal Phase I project is to restore and preserve natural conditions in the Paria River Canyon by decreasing the negative impacts of non-native trees such as tamarisk and Russian olive and to enhance wildlife habitat by protecting and restoring native riparian vegetation through natural recruitment following treatment. This project also provides an excellent opportunity for stewardship through the GCT's volunteer program.

Methods and Discussion of Treated Sites

The extremely remote nature of the project site required a tremendous amount of planning and logistical coordination in order to move the project from a paper proposal to our on-the-ground efforts this fall. The initial exotic removal work brought many new insights as well as lessons learned that will be reflected in our future efforts. However, overall the implementation timeline has been relatively swift for a project of its size and scope. GCT volunteer crews mapped tamarisk and Russian olive distribution in the project area in the fall of 2006 and the Vermillion Cliffs National Monument/Arizona Strip District of the Bureau of Land Management (BLM) and GCT developed an environmental assessment (EA) (AZ-120-2007-0021, August 2007) for the project that

was reviewed by the public with a record of decision signed in September of 2007. Meanwhile, over this two year period, there was significant turnover of GCT and BLM staff involved with the project, which made for an adjustment period. Additionally, all parties readily acknowledge that the EA imposed several difficult parameters, which reduce the efficiency of project implementation, including restrictions limiting backcountry trips to seven days, prohibitions against the use of pack animals to transport supplies, and herbicide storage.

During the spring of 2008, crews completed a site assessment that included long-term photo-points, Southwest willow flycatcher habitat assessments, and a risk management plan. During the baseline assessment in March and April, field crew leaders and volunteers established 500 meter-long segments throughout the project area to allow for standard comparison of data units between areas. In May and June field technicians and volunteers established and collected baseline data at 32 transects, with 16 transects representing reference conditions and 16 transects representing treatment (tamarisk and/or Russian olive present). The fall 2008 exotic removal season began with a 2-day field crew leader training session; the topics included a project overview, data collection updates, control methods, herbicide application and safety. Field crews completed the 2008 exotic removal work in three 7-day backpacking trips in October and November. It is important to mention that GCT volunteers participated in every aspect of the project from site assessment to on-the-ground removal and ultimately data entry. This project literally would be impossible without the incredible commitment of many generous and talented volunteers. To date, 35 volunteers have donated a total of 3,000 hours.

The removal work began at the upstream end of the project area at segment 11.5 (which did not have tamarisk or Russian olive) and work continued downstream to a central base camp in the middle of segment 15.5. Crews completed three backpacking trips and removed tamarisk and Russian olive from 8 stream segments, for a total of 2.8 miles of the project area.

The backpacking trips consisted of 5-6 volunteers and two GCT field crew leaders from the volunteer program staff. Trips were eight days long including travel to the trailhead and hiking time to the project site, which allowed for only four to five solid days of work. The long workdays and extensive trail commutes did not hamper the spirits of the volunteer participants, as they are a stalwart, dedicated crowd of individuals.

The extreme remote nature of the project site is one of the main challenges of the project - tools and herbicide must be carried 10 miles into the backcountry to the first base camp. This is in addition to the 35-40 pounds of gear needed for a standard backpacking trip. To cut down on the weight that participants were required to carry, GCT recruited two additional volunteers or staff members to carry 3 gallons of herbicide and sprayers (weighing about 30 pounds) the 10 miles to the base camp, then stay the night with the group and hike out the next day.

Despite efforts to cut down on tools and gear, the main challenge of the project is the extremely heavy packs that field crew leaders and volunteers must carry and the remote nature of the project area. GCT crews practice “leave no trace” when in the Paria Canyon, which involves carrying out all human waste. This also adds to the pack weight. Another aspect of the removal work that

sometimes hampers productivity is the availability of quality handsaws with blades that will stay sharp and not break or bend after minimal use. We will continue to solicit feedback from volunteers about saw quality and preference and search for a saw that does the job efficiently and cost effectively.

Weather conditions posed safety concerns with the potential for flash floods in the narrows, and had to be taken very seriously. The first trip of the season was delayed by storms that raised the water level to a dangerous level. The field crew leaders and volunteers were able to utilize this time to do a project orientation and training in the upper section of the canyon above the narrows, in Utah. GCT has outlined protocols in the risk management plan for monitoring weather in the Paria watershed to help make appropriate decisions.

The herbicides used for control were triclopyr-based general use herbicides. Crews used Garlon® 4 Ultra in a mixture of 25% with 75% methylated soybean oil (MOC) on riparian terraces. They used Garlon® 3a mixed with 50% water when removing trees in the floodplain due to the sensitivity of aquatic life. The Garlon® was mixed with blue marker dye that colored the treated stumps and fades with exposure to light over time. The use of dye ensures that cut stumps are not missed and will hopefully increase the success rate. The herbicide application tool is a 32-ounce stainless steel sprayer, pressurized with bicycle pumps. These sprayers are well suited for the backcountry conditions the Paria Canyon offers as they are virtually indestructible, easy to repair in the field, and are relatively light. During the fall of 2008 crews used a total of 8.8 gallons of mixed herbicide and only 3.54 gallons of actual herbicide concentrate in the project sites (Table 1. Herbicide Use).

Table 1. Herbicide Use

Segment	Date	Garlon® 3a (oz)	Garlon® 4 Ultra (oz)
12	08-Oct-08	30	40
12.5	08-Nov-08	49	75
13	09-Oct-08	0	48
13.5	20-Oct-08	57	0
14	20-Oct-08	48	28
14.5	21-Oct-08	209	263
15	05-Nov-08	48	60
15.5	07-Nov-08	90	92
	Total Mixed Herbicide	**531 (oz)**	**606 (oz)**

The BLM requires that one leader on the project site obtain certification through a week-long BLM Pesticide Applicator training. The second leader obtained Arizona State pesticide certification and worked under the supervision of the GCT staff trained as a BLM certified sprayer. On backpacking trips, herbicide containers are carried in heavy duty plastic dry bags designed for river trips which are then strapped to the outside of backpacks. All herbicide containers were leak-

and spill resistant. The project purchased fluorinated high density polyethylene plastic jugs in various sizes to cut down on the chance of leaks and spills, especially since the containers are hauled in backpacks in the backcountry. All application equipment and chemicals were stored in sealed ammunition cans during transport in vehicles and all storage containers had the product's specimen label and the Material Safety Data Sheet (MSDS) clearly displayed underneath a waterproof plastic sheet. The MSDS contains fire and explosive hazard data, environmental and disposal information, health hazard data, handling precautions, and first aid information. All trip participants reviewed the MSDS with the project leader and understood the first aid instructions described on the MSDS.

Project participants understood and abided by the established Personal Protective Equipment (PPE) requirements and rules outlined in the risk management plan for the project. Rubber gloves, long sleeve shirts, long pants, and eye protection were part of the PPE necessary for this project. (See Appendix A. Representative Project Photographs for photos of herbicide use and removal methods).

Brush and debris from cut trees were scattered in those areas where only small amounts of material was removed. In areas of heavier concentrations, crews piled cut material along the banks of the Paria River (above high water mark) in the anticipation that piles will be moved to below the high water mark immediately prior to burning, and burned in accordance with the BLM approved pile burn plan. Patrick Flemming, the Arizona Strip BLM fuels manager serves as the project liaison and will be responsible for burning the piles. He was not able to join crews in the field until the second trip, but was able to give constructive feedback on the placement and structure of piles so as to make burning most effective and efficient. Due to his commitment to other BLM projects, he was not able to join crews in the inner reaches of the canyon while cutting was taking place, so piles were placed as close to his description as possible. There were many riparian terraces that were heavily infested with tamarisk in the narrows and sometimes very small amounts of space to make piles above the high water mark so they are not extremely visible. The piles should be burned before the spring recreational season begins in order to cut back on negative impacts to recreational users. Many volunteers have also expressed interest in helping with this phase of the project.

Results

During fall 2008, GCT crews removed 5,039 tamarisk trees including 772 seedlings, 3292 saplings, and 975 mature trees. Crews also removed Russian olive trees including 1 seedling, 35 saplings and 17 mature trees. (Table 2. Tamarisk and Russian Olive Removal Summary, Figure 1. Exotic Removal Summary by Geomorphic Surface Type). At each site in the project area, field crew leaders analyzed the site and determined which removal method would be most appropriate (Figure 2. Tamarisk and Russian Olive Removal by Method). Crews removed 4,031 square meters of tamarisk canopy cover and 338 square meters of Russian olive canopy cover within the 8 segments where work occurred this fall. Appendix C. Project Mapping, contains the removal locations for the project sites in which crews have completed work.

GCT field crews recorded total tamarisk and Russian olive trees removed distinguishing between the floodplain and riparian terrace. The floodplains are inundated at high flows and support a mix of woody and herbaceous vegetation, including saplings and mature cottonwood, willow, Russian olive, and tamarisk. Higher elevation riparian terraces are rarely inundated and contain a mix of legacy cottonwood trees, grasses, shrubs, and mature tamarisk and Russian olive trees. The data illustrated that the majority of the exotic trees and cover removed was associated with the riparian terrace geomorphic surface type (See Figure 1. Exotic Removal Summary by Geomorphic Surface Type).

Table 2. Tamarisk and Russian Olive Removal Summary

Segment	Tamarisk Seedlings	Tamarisk Saplings	Tamarisk Mature	Tamarisk Cover (sq m)	Russian Olive Seedlings	Russian Olive Saplings	Russian Olive Mature	Russian Olive Cover
11.5	0	0	0	0	0	0	0	0
12	3	76	109	317	0	0	0	0
12.5	11	89	68	630	0	3	0	0
13	53	120	82	435	0	0	0	0
13.5	40	83	23	130	0	0	0	0
14	45	111	91	206	0	0	0	0
14.5	324	1942	365	910	0	2	4	20
15	152	354	111	645	1	30	13	318
15.5	144	517	126	758	0	0	0	0
Total	**772**	**3292**	**975**	**4031**	**1**	**35**	**17**	**338**

Figure 1. Exotic Removal Summary by Geomorphic Surface Type

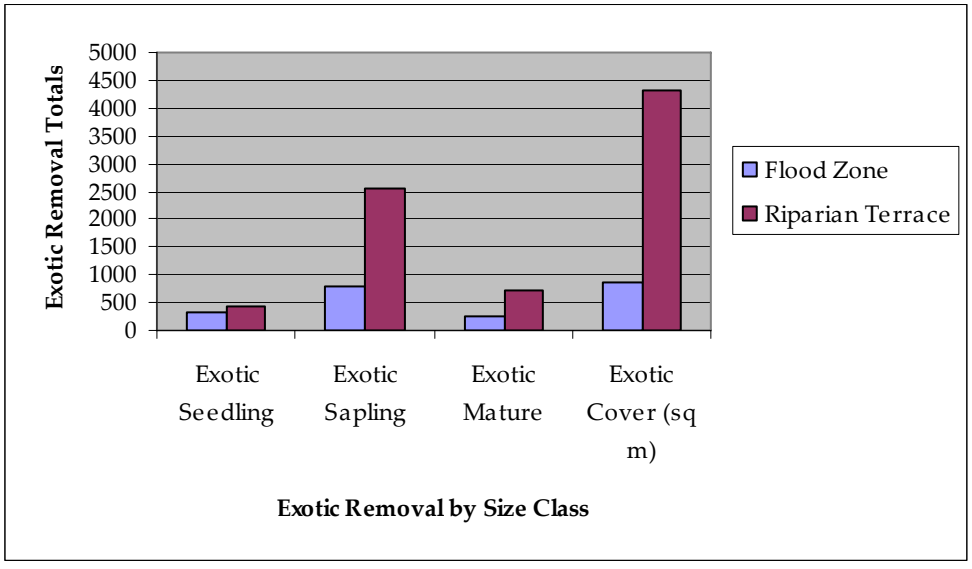
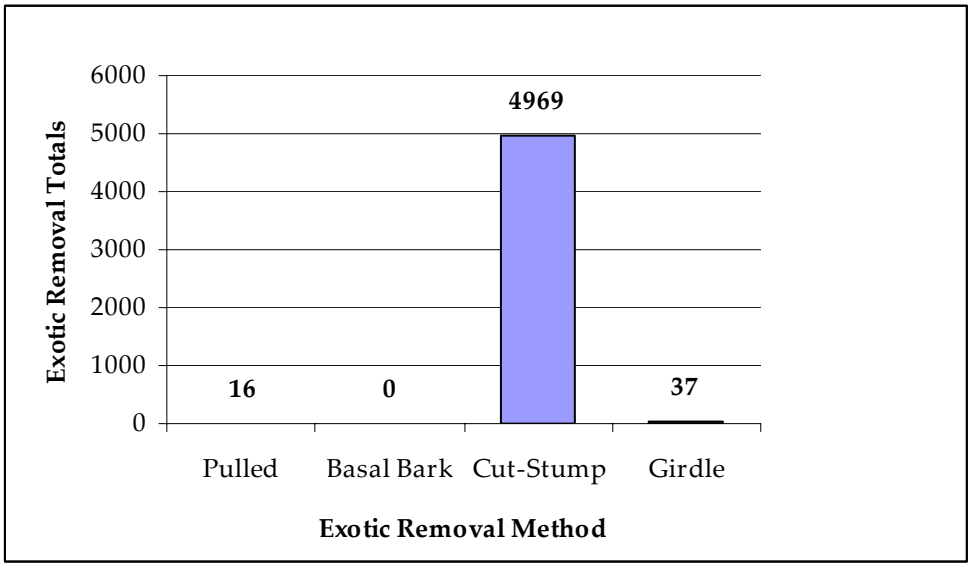


Figure 2. Exotic Removal Totals by Method



Removal methods included pulling, basal bark, cut stump and girdling (See Figure 2.). These methods, with the exception of girdling, are outlined in the GCT Exotic Removal Plan. The dominant method used by GCT crews this fall was cut stump. This method is documented as being most effective, and in most cases was the preferred method. Where it was possible, crews pulled the younger trees, in order to cut down on the use of herbicide. However, even the young trees have well-established root systems, so this method is only effective when the entire root below the crown can be removed. Field crew leaders also employed the girdling method in a few selective areas where it was impossible to cut down a tree to stump level for safety reasons, or when the visual scar of a cut stump would decrease recreational experience or wildlife habitat. The girdling method uses hand saws and bow saws to cut several centimeters into the water-conducting tissue (xylem) of standing trees. The cut is within one meter of the ground surface (usually within 20 cm) and forms a concentric circle at the ends. Using hand-pressurized sprayers, herbicide applicators then apply the chemical directly into the cut and onto the bark from the cut to the base of the tree. Basal bark method was not utilized as this requires the use of more herbicide to cover the lower portion of the stem, and since crews carried in a limited amount, they used it as sparingly as possible.

In each project segment, crews installed permanent photo-points. To date, crews have installed 40 distinct photo-points (in addition to the transect photo-points) in the project areas, with pre- and post-work photographs taken from each point. On the fall 2008 trips, crews retook these photo-points. Appendix B includes the photo documentation for the project areas that were visited in the fall of 2008.

Discussion and Conclusion

The area of the Paria River associated with the 2008 exotic removal activities is difficult to access, however, it contains intermittent dense patches of tamarisk and Russian olive trees scattered between healthy stands of native riparian vegetation. As the crews move downstream access

issues become more complex, with increased travel time and tamarisk and Russian olive densities. Lessons learned from the initial project implementation bring up several issues that will become increasingly challenging as the project continues. Crews made great strides this fall, with exotic removal complete in 9 of the 42 segments in the project area. Despite the challenges, in a short period of time crews were able to remove a very significant number of exotic plants from a very remote place. It is our hope that we will be able to cover the entire extent of the project area with AWPF funding for nine more removal trips.

AWPF funding and support for this project has been essential to getting this project off the ground and protecting and restoring this valuable riparian ecosystem. The partnership between GCT and the BLM has been integral to the success of the project. Suggestions to improve the project efficiency, effectiveness and ultimate success include addressing the shortcomings of the current EA with the BLM in light of progress made thus far and lessons learned on the ground this fall. As mentioned above, these issues include the current restraints on trip length, the use of pack animals to transport supplies, and herbicide storage. Closer coordination with our BLM project liaison on burn pile placement will help make the implementation of the burn plan easier for the BLM, so piling methods are clear and piles are burned in a timely fashion to cut down on visual impacts and use as firewood by recreational users. Throughout project implementation, GCT crews had very positive interactions with visitors while living and working in the Paria Canyon, however, many users were not aware that the project was underway. Brochures and interpretive signs at the Paria Canyon trailheads and visitor centers will be crucial to inform both day and overnight visitors about the project for the long term and educate the public about the importance of exotic removal for the health riparian ecosystems.

GCT has applied for $35,000 in funding through the Conservation Alliance to complete exotic removal in the 5 miles of river in the Utah section of the Paria Canyon from the wilderness boundary to Buckskin Gulch that is currently out of the scope of AWPF funding. If awarded, this grant will help further the effort to restore the Paria River with the valuable help of volunteer stewards.

APPENDIX A

Representative Project Photographs – 2008 Exotic Vegetation Removal Report: *Paria River Exotic Removal Project: Phase I*

Picture 1. The hard working Paria crew at the trailhead

Picture 2. The crew watches a small flash flood from higher ground

Picture 3. Getting there is half the battle

Picture 4. GCT project staff training

Picture 5. Volunteers surveying the lunch spread

Picture 6. Stacking tamarisk debris for burning

APPENDIX A

Representative Project Photographs – 2008 Exotic Vegetation Removal Report: *Paria River Exotic Removal Project: Phase I*

Picture 7. Volunteer measuring canyon width

Picture 8. Tackling a giant Russian olive

Picture 9. Field leader replenishing herbicide

Picture 10. Volunteer poses with the tools of the trade, the folding handsaw

APPENDIX A

Representative Project Photographs – 2008 Exotic Vegetation Removal Report: *Paria River Exotic Removal Project: Phase I*

Picture 11. Volunteer sawyer poses with his personal slash pile

Picture 12. Targeted cut stump method spares native rabbitbrush to recover

Picture 13. The array of tools needed for the job

Picture 14. Employing the bow saw for a mature tree

Picture 15. Field leader spraying stumps with herbicide

Picture 16. Using dye ensures that no stump is missed

Appendix C. Project Mapping