Riparian Vegetation on the Santa Fe River at Cañon, Santa Fe County, New Mexico

2013 Survey Report
Prepared for New Mexico Forestry Division

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INTRODUCTION

The Santa Fe River Canyon at and near the historic settlement of Cañon has been acquired by the U.S. Department of Interior – Bureau of Land Management and will be managed by that agency for its riparian, wildlife and scenic values. The Taos Field Office of the Bureau of Land Management (BLM) via the New Mexico Forestry Division initiated a vegetation assessment of this particular reach of the Santa Fe River to monitor the vegetation response to the change in land use and restoration activities to reclaim portions of the riparian area to native vegetation.

The study area is located in Santa Fe County on an approximately 1-mile reach of Santa Fe River Canyon below Cieneguilla and northwest of La Cienega. It begins four river miles below the City of Santa Fe waste water treatment plant and ranges in elevation from 1,820 m to 1,850 m above mean sea level. Figure 1 shows the outline of the study area selected by the BLM Taos Field Office, which is defined by the FEMA 100-year event floodplain and/or adjacent private property boundaries. This study area has a long history of human occupation and use and has been especially impacted by continuous livestock grazing over the last century. Livestock use was curtailed in 2012 (Ryan Besser, BLM Fisheries Biologist, personal communication). This valley stretch also has abandoned agricultural fields on both sides of the river that were serviced by two hillside acequias – one of which is still active. Eighteen permanent transects were established by the authors across the valley bottom in late June 2013 to measure vegetation cover and woody stem densities of trees and shrubs, as well as forbs and grasses and native versus non-native species. These transects can be read in subsequent years to show the effects of any restoration efforts or management prescriptions. The data in this report is a 2013 baseline for future comparisons.

METHODS

Eighteen vegetation survey transects were established across the valley bottom at intervals of approximately 100 meters starting in the south end of the study area (Figures 2, 3, 4 and 5). Each transect begins on the terrace above the channel terrace and runs perpendicular across the river channel to the opposite side of the valley. Transect lengths vary with the width of the valley at each location and average 32.6 meters. Transect end points are marked with steel rebar with an orange plastic cap and aluminum tags identifying the transect number. Location coordinates for each rebar were obtained with a Garmin 62s GPS unit (Table 1). GPS accuracy ranged between 2-7 meters depending on tree cover and canyon morphology. Four digital reference photos were taken at each transect – two looking across the valley at the opposite rebar, and one looking upstream and one downstream where the transect line crosses the river channel (Appendix C).

The line intercept method was used to determine vegetation cover and species composition along a metric transect tape stretched between the rebar stakes at the ends of the transect line. Herbaceous ground cover was recorded by species for each centimeter intercept of current year's growth. Submerged aquatic plants within the river itself were not measured. Woody shrub cover was also measured by centimeters of intercept for each species and tree canopy cover was measured by each decimeter of intercept. Woody stem densities for shrubs and trees were assessed with a belt transect the length of each transect and four meters wide (two meters each side of the tape). Five size classes for assessing woody plant stems are adopted from a previous riparian vegetation study of another part of the Santa Fe River by Milford, et al (2011). These are: <2"/<4.5' (less than two inches diameter, less than four and a half feet tall), <2"/>4.5' (less than two inches diameter, greater than four and a half feet tall), 2-4" (two to four inches diameter, any height), 4-6" (four to six inches diameter any height), >6" (greater than six inches diameter). For individuals and stems >6" an exact measurement of diameter was obtained at the root crown using a DBH tape. Sediment deposition in the valley bottom has caused many individual trees and shrubs to have multiple stems separated by at least 6" of soil. Therefore, the count of individuals for a species in a particular transect is often lower than the total count of woody stems for that species.

A few plants that could not be readily identified in the field were vouchered and identified at the University of New Mexico Herbarium. Those voucher specimens were given to the UNM Herbarium and will reside there. Appendix A is a plant species list with abbreviation codes.

RESULTS

Visual inspection and data analysis of the vegetation in the study area reveals a highly degraded and relatively un-natural riparian ecosystem. Tree canopy is predominantly composed of exotic Russian olive (*Elaeagnus angustifolia*) and to a lesser extent Siberian elm (*Ulmus pumila*) (Table

2, Figure 6). Fortunately, the non-native salt cedar (*Tamarix chinensis*) is relatively rare in this study area compared to riparian cover in the Santa Fe River canyon further downstream (Milford et al. 2011). Only one salt cedar sapling was encountered in just one of eighteen transects (Table 2). Russian olive is continuous along both sides of the river while Siberian elm is a conspicuous riparian woodland species in the vicinity of the old settlement and less abundant at the north and south ends of the study area (Table 2). Siberian elm, however, has taken advantage of the active hillside acequia and is abundant on those ditch banks and the slopes below the acequia. There are several very large Siberian elms in the study area, but most are small saplings – many of which appear to be stunted by browsing animals.

One-seed juniper (*Juniperus monosperma*) has the greatest amount of cover of any native tree/large shrub in the Santa Fe River canyon, but on the drier edges of the riparian woodland (Figure 6). It is rare in the valley bottom near the river channel. Rio Grande cottonwood (*Populus deltoides* var. *wislizeni*) and Goodding's willow (*Salix gooddingii*) are remnant native trees that persist as old individuals surviving decades of abusive livestock grazing. Goodding's willow is very rare in the study area, but Rio Grande Cottonwood persists as several very large, old trees. Neither has been able to produce a sapling or younger cohort in the presence of continuous grazing. Surprisingly, there is a population of native netleaf hackberry (*Celtis reticulata*) in the canyon that might increase if the Russian olive cover were to decrease. This species is near the northern edge of its range. There are a few large netleaf hackberry trees in the study area and several saplings being suppressed under Russian olive canopy.

Shrub species in the riparian woodland margins and understory are all native plants. Rubber rabbitbrush (*Ericameria nauseosa*) and Apache plume (*Fallugia paradoxa*) are common on the drier soils of the upper floodplain bench. Trumpet gooseberry (*Ribes leptanthum*) is common in shade under juniper and Russian olive in the northern part of the study area (Figure 7). New Mexico olive (*Forestiera pubescens*) is present, but very rare and was not detected in any transect samples.

Herbaceous vegetation is very dense and well developed on the wet lower sediment benches of both river banks. This verdant area is often a 5- to 8-meter wide swath of 100% ground cover and is highly productive – possibly due to the recent rest from livestock grazing. It is, however, dominated by non-native species (Figure 8). The wet river bank is most often covered with creeping bentgrass (*Agrostis stolonifera*) while the adjacent, less saturated soils support a dense thatch of meadow fescue (*Festuca pratensis*). Both are introduced pasture grasses from Europe that are now fully naturalized in the riparian areas of New Mexico.

Common, but much less abundant, native grasses on the streamside and under riparian woodland include western wheatgrass (*Pascopyrum smithii*), alkali muhly (*Muhlenbergia asperifolia*), inland saltgrass (*Distichlis spicata*), foxtail barley (*Hordeum jubatum*) and sand dropseed

(*Sporobolus cryptandrus*). Native grass-like sedges and rushes along the wet river bank include common threesquare (*Schoenoplectus pungens*), common spikerush (*Eleocharis palustris*) and Baltic rush (*Juncus articus* var. *balticus*). These would naturally dominate the wet river bank, but are now struggling remnants in the dense growth of exotic pasture grasses.

The most abundant forbs along the river bank and under the riparian woodland are also non-native species. These include white and alsike clovers (*Trifolium repens* and *Trifolium hybridum*), dandelion (*Taraxicum offincinale*), water speedwell (*Veronica anagalis-aquatica*) and watercress (*Rorripa nasturtium-aquaticum*) on the wet river banks. Cover by individual forb species was <1% in 2013 except for alsike clover, which had 1.5% cover. Drier soils should have had a more dense cover of annual weed species, but 2011 to the June 2013 survey was a severe period of drought that curtailed the production of exotic and native forb ground cover.

The nutrient-rich treated sewage effluent that makes up the Santa Fe River through the study area is filled with dense patches of filamentous algae and two submerged native flowering plants: leafy pondweed (*Potamogeton foliosus*) and horned pondweed (*Zannichellia palustris*).

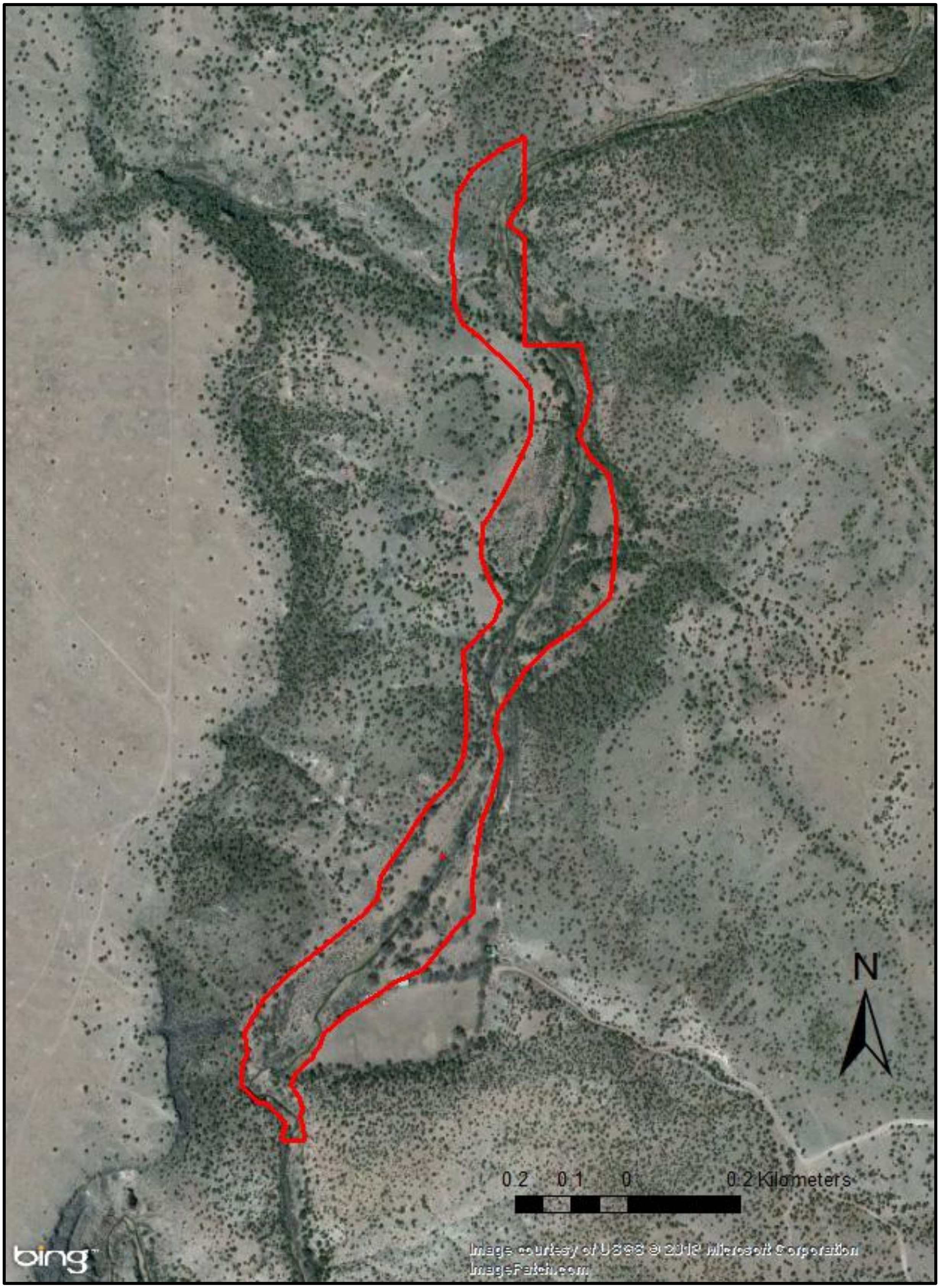

Figure 1. Study area in the Santa Fe River canyon below Cieneguilla, New Mexico.

Table 1. Santa Fe River vegetation transect locations and lengths.

Transect No.	Length (m) between end points	Plot Area (m^2) Length x 4 m	End Point UTM Coordinates (NAD83) Zone 13
1	28.8	115.2	Point 1A - 396743 3937713 Point 1B - 396759 3937692
2	56.8	227.2	Point 2A - 396711 3937819 Point 2B - 396753 3937787
3	37.5	150	Point 3A - 396801 3937890 Point 3B - 396829 3937862
4	23.6	92	Point 4A - 396860 3937967 Point 4B - 396874 3937949
5	30	120	Point 5A - 396920 3938031 Point 5B - 396943 3938025
6	30	120	Point 6A - 396977 3938097 Point 6B - 397008 3938085
7	60	240	Point 7A -397003 3938197 Point 7B - 397032 3938160
8	36.2	144.8	Point 8A - 397040 3938267 Point 8B - 397067 3938264
9	30	120	Point 9A - 397040 3938347 Point 9B - 397066 3938349
10	30	120	Point 10A - 397080 3938435 Point 10B - 397107 3938424
11	30	120	Point 11A - 397119 3938520 Point 11B - 397145 3938508
12	44	176	Point 12A - 397148 3938598 Point 12B - 397191 3938588
13	30	120	Point 13A - 397162 3938682 Point 13B - 397191 3938680
14	30	120	Point 14A - 397154 3938766 Point 14B - 397182 3938779
15	29.3	117.2	Point 15A - 397139 3938799 Point 15B - 397157 3938821
16	18.4	73.6	Point 16A - 397093 3938876 Point 16B - 397105 3938887
17	24	96	Point 17A - 397061 3938953 Point 17B - 397087 3938963
18	18	72	Point 18A - 397078 3939048 Point 18B - 397087 3939044
TOTAL	586.6	2344	

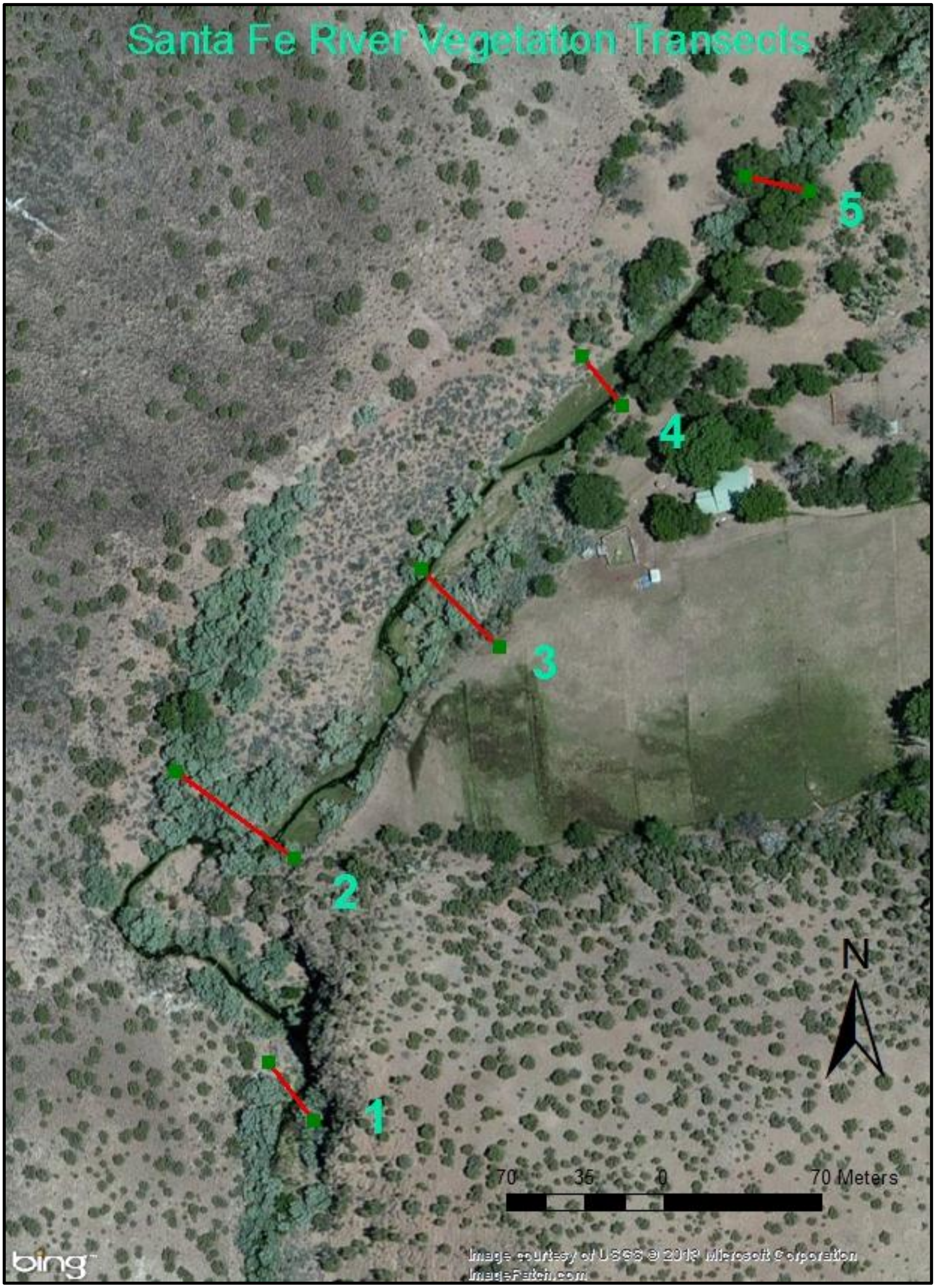

Figure 2. Locations of vegetation transects 1 to 5.

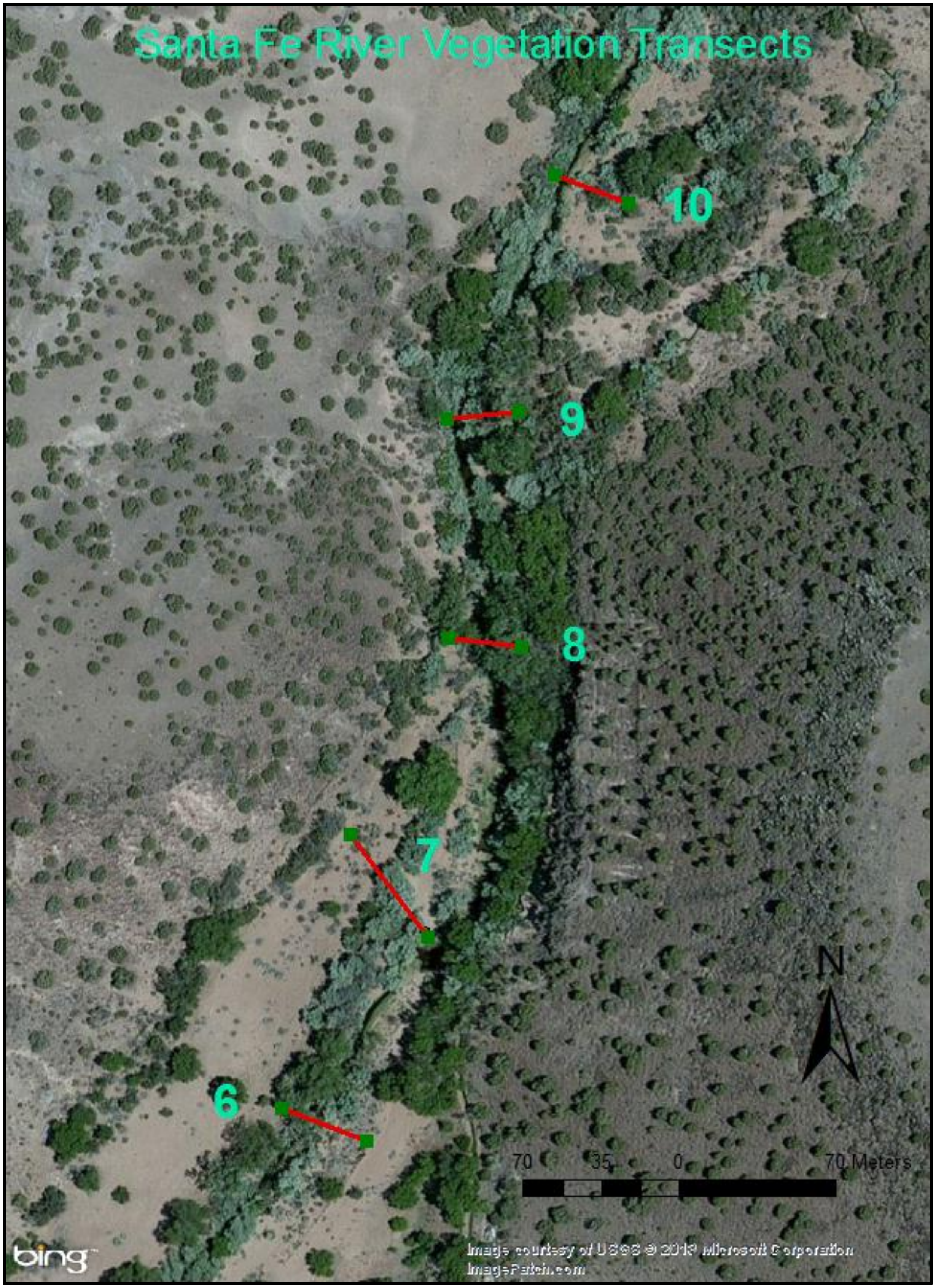

Figure 3. Locations of vegetation transects 6 to 10.

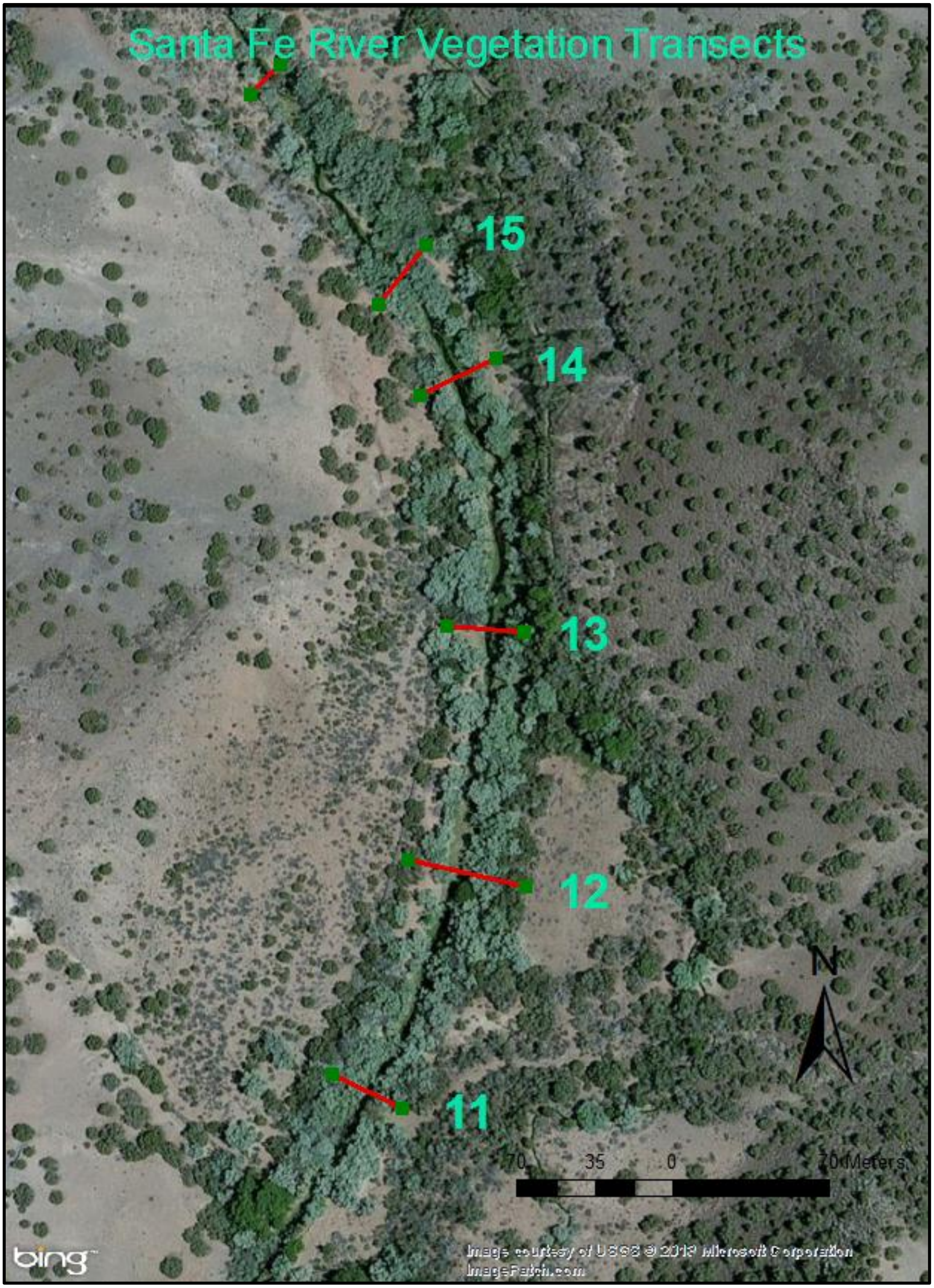

Figure 4. Locations of vegetation transects 11 to 15.

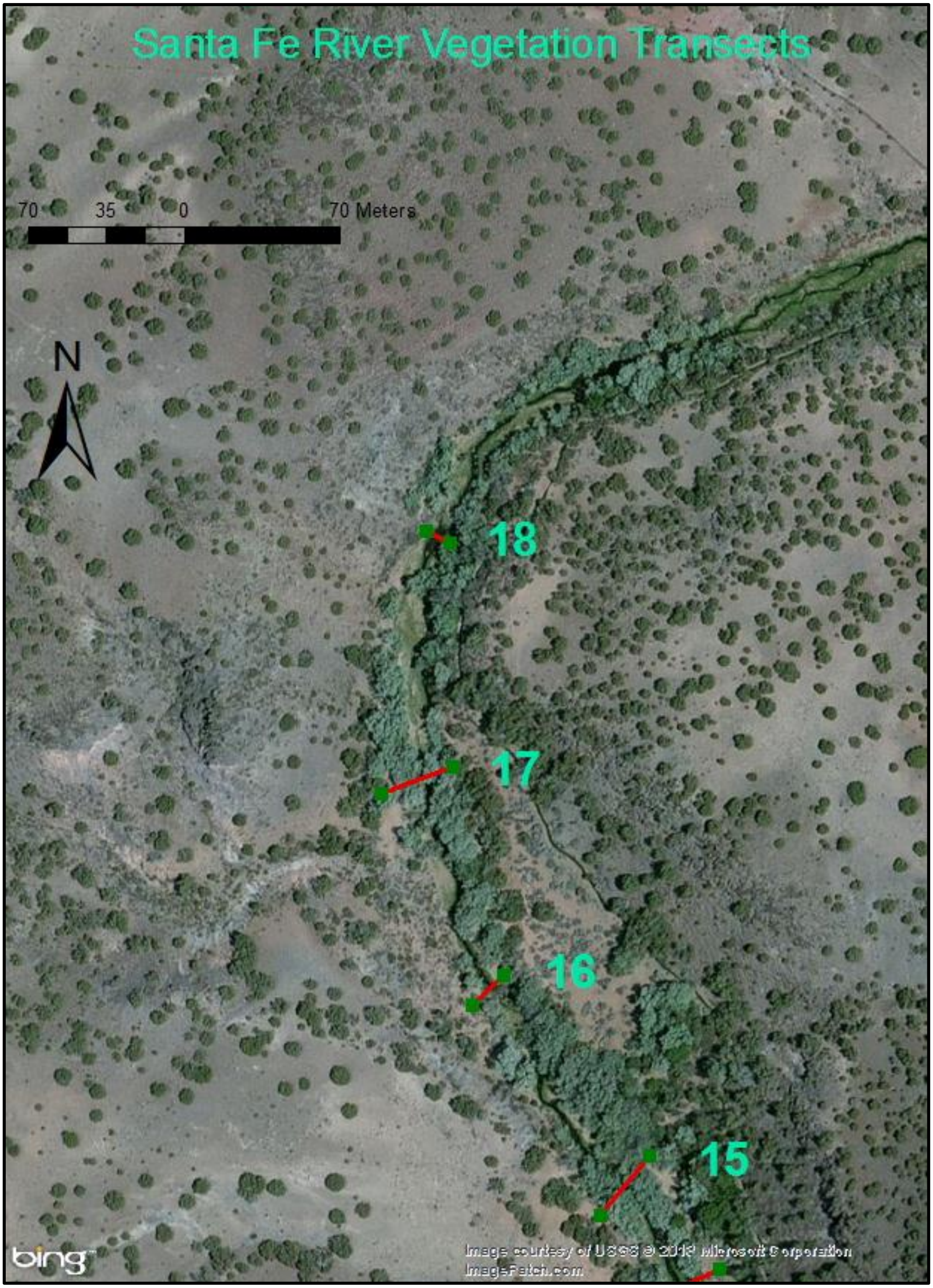

Figure 5. Locations of vegetation transects 15 to 18.

Table 2. Santa Fe River 2013 woody plant survey.

	Species	No. Individual Plants	Stems <2" basal diameter and <4.5' height	Stems <2" basal diameter and >4.5' height	Stems 2"-4" basal diameter	Stems 4"-6" basal diameter	Stems >6"	Diameter Measurements (>6")
Plot 1	ELAANG	8	6		9	2		
	ERINAU	4	4					
	FALPAR	1	1					
Plot 2	ELAANG	20	10	11	4	3	4	20.9, 9.5, 6.6, 6.8
	ERINAU	13	11	4	4			
	JUNMON	4	3	1	1	1		
Plot 3	ELAANG	6	12	2		1		
	SALGOO	3		3				
	ERINAU	5	5	2	3			
	CYLIMB	3	3	1				
Plot 4	ELAANG	6	6					
	ULMPUM	8	4	2	1	1		
	JUNMON	1	1					
	ERINAU	18	14	2	13	1		
	CYLIMB	1			1			
Plot 5	ELAANG	2		2	2			
	ULMPUM	2	6				2	32.4, 28.3
	JUNMON	9	10		5	1		
Plot 6	ELAANG	14	7	5	2		2	11.2, 6.5
	POPDELW	1					1	22
	ULMPUM	88	91	2	1			
	JUNMON	4	1		2	4		
	ERINAU	13	10	6	5			
	FALPAR	3	3					
	CYLIMB	1	1					
Plot 7	ELAANG	2	3				1	20.8
	ULMPUM	58	57	3				
	CELRET	4	4					
	JUNMON	1					1	6.6
	ERINAU	26	26		6			
Plot 8	ELAANG	6	3	5	3			
	POPDELW	1					1	28.6
	ULMPUM	5	5					
	MORALB	1	1					
	JUNMON	5	3	2	2			
	ERINAU	2	2					
Plot 9	ELAANG	8	4	8	3		1	7.6
	ULMPUM	38	34	3	1			
	JUNMON	4	3	1				
	ERINAU	2	2					
Plot 10	ELAANG	7	7	4	2		1	7.8
	ULMPUM	9	7			1	1	7.1
	CELRET	1					1	6.7
	JUNMON	2	1				1	6.1
	ERINAU	4	3	1	1	1		

	Species	No. Individual Plants	Stems <2" basal diameter and <4.5' height	Stems <2" basal diameter and >4.5' height	Stems 2"-4" basal diameter	Stems 4"-6" basal diameter	Stems >6"	Diameter Measurements (>6")
Plot 11	ELAANG	4	1	4	3		1	6.1
	CELRET	1	1					
	JUNMON	1	1					
	RIBLEP	55	55					
Plot 12	ELAANG	15	11	6	4	3	3	15.5, 12.4, 6.6
	ULMPUM	1		1				
	CELRET	1			1			
	JUNMON	15	4	5	6		1	9.6
	FALPAR	26	26					
	ERINAU	2	2		5			
	RIBLEP	55	52	6				
Plot 13	JUNMON	3		1		2		
	ERINAU	3	10	1				
	FALPAR	22	18	4		1		
	RHUTRI	1		9				
Plot 14	ELAANG	17	13	4	4		2	6.2, 6.7
	JUNMON	3	3					
	ERINAU	1		3	1			
	TAMCHI	1	1					
Plot 15	ELAANG	18	2	9	7	3	3	6.1, 8.8, 9.2
	JUNMON	2		1	1			
	FALPAR	29	27	2				
Plot 16	ELAANG	14	5	7	5	2		
	ERINAU	1	1					
	FALPAR	14	5	7	5	2		
Plot 17	ELAANG	21	25	12	7	5	2	6.7, 8.5
	JUNMON	1	1					
Plot 18	ULMPUM	1	1					
	FALPAR	12	12					
	RIBLEP	12	10	2				

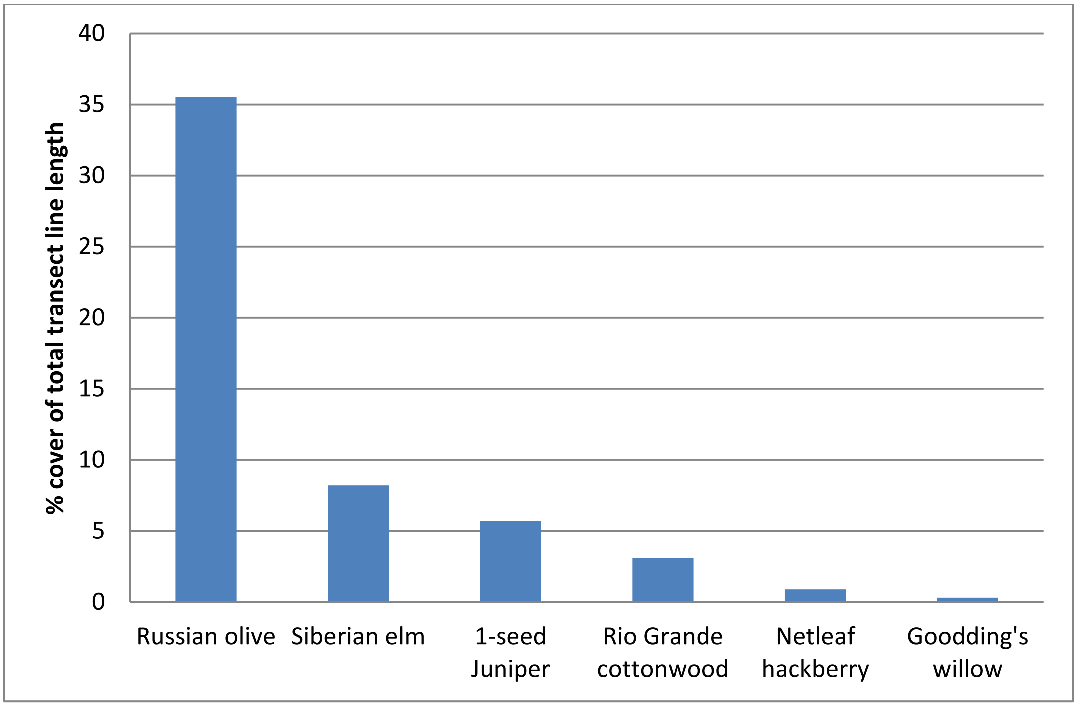

Figure 6. Foliar cover of tree species on the Santa Fe River near Cañon in 2013.

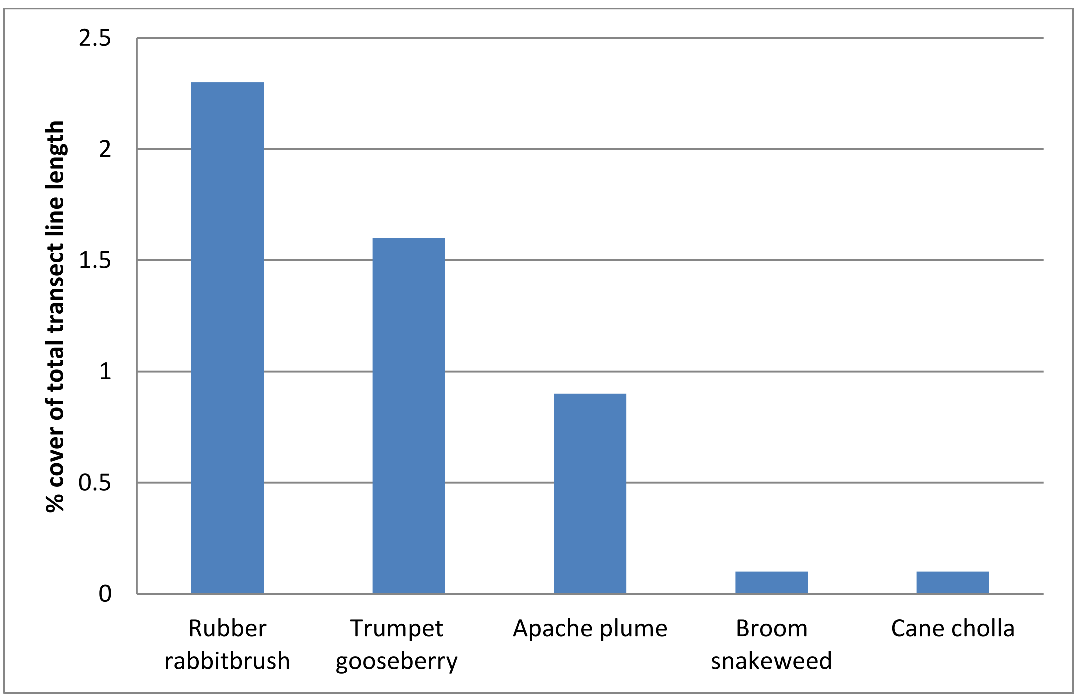

Figure 7. Foliar cover of shrub species on the Santa Fe River near Cañon in 2013.

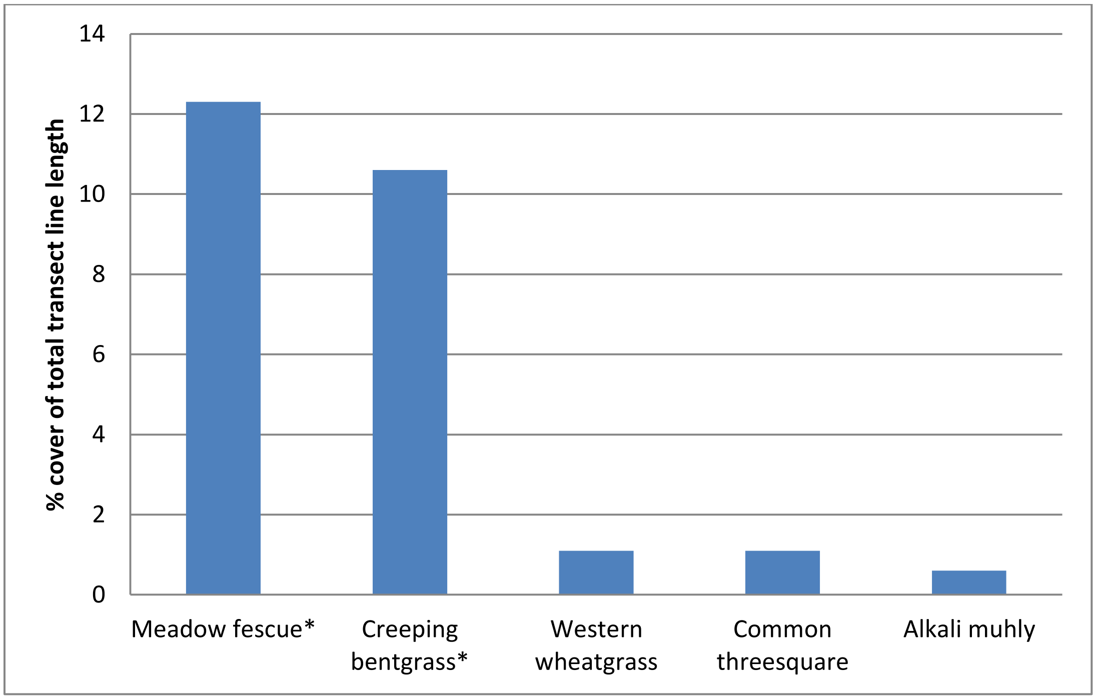

Figure 8. Cover of common graminoids on the Santa Fe River near Cañon in 2013 (*non-native grass).

SPECIAL STATUS PLANTS

No plant species considered threatened, endangered or sensitive by the state of New Mexico, any federal agencies, or the New Mexico Rare Plant Technical Council (1999), were observed in the study area. Great Plains lady's tresses orchid (*Spiranthes magnicamporum*) is listed as endangered by the State of New Mexico (19.21.2.8 NMAC) and occasionally inhabits the wet grassy margins of rivers in northern New Mexico below 1,900 m elevation (Coleman 2002, Sivinski – personal observations). Degradation of this habitat, however, makes it unlikely this orchid would have persisted in the study area, if it ever did occur on the Santa Fe River.

The dominant plant species in the study area are non-native plants and a few are listed as noxious weeds by the New Mexico Department of Agriculture (2009). Bull thistle (*Cirsium vulgare*) and cheatgrass (*Bromus tectorum*) are Class C weeds that are well established in the state and managed at local levels according to need and feasibility. Both species are fully naturalized, but not currently abundant in the study area. Chicory (*Cichorium intybus*) is a Class B weed, which should be controlled when severe infestations threaten further spread. Only a few individuals of chicory were observed along the river adjacent to abandoned farm fields. A few individuals of spiny cocklebur (*Xanthium spinosum*) were also observed between farm fields and the river. Spiny cocklebur is on the NMDA 'watch list' for noxious weeds.

Russian olive, Siberian elm and salt cedar are also listed as Class C weeds and first two are the most problematic for land management in the study area. Russian olive has an average density of 0.079 individuals per square meter in the study area (790/hectare; 319/acre). Several parts of the riparian woodland are a closed canopy of Russian olive and some are old enough to have trunks nearly two feet in diameter. Russian olive often has a bushy growth form so there are many more woody stems than individuals (Figure 9). The 2013 survey sampled all Russian olive stems coming from the ground and found stems less than 2” in diameter to be 900/hectare (364/acre) and stems greater than 2” in diameter to be 440/hectare (178/acre).

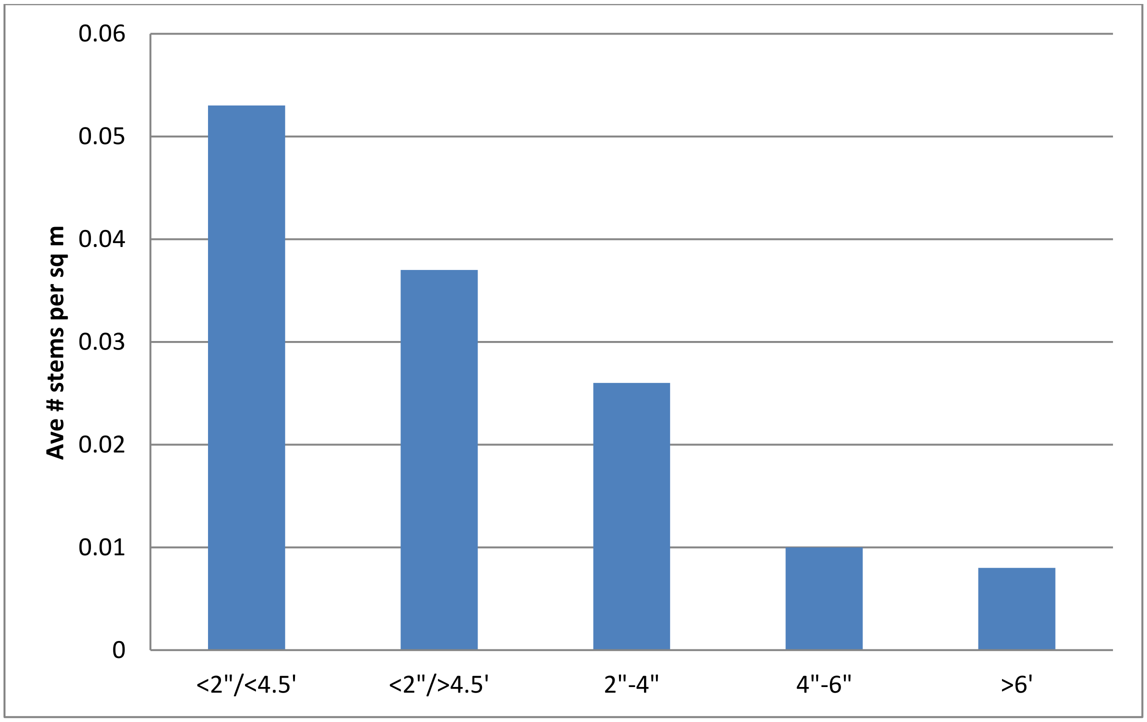

Figure 9. Stem densities of Russian olive size classes on the Santa Fe River near Cañon in 2013.

Siberian elm has an average density of 0.085 per square meter (850/hectare; 344/acre). It can also have multiple stems per individual and grow to large trees, but there are relatively few of the old, large size classes in the study area compared to an abundance of seedling and sapling trees. The 2013 survey sampled all Siberian elm stems coming from the ground and found stems less than 2” in diameter to be 870/hectare (352/acre) and stems greater than 2” in diameter to be only 30/hectare (12/acre)(Figure 10). Most of the large trees in the valley are around abandoned farm fields close to the old settlement. The numerous large Siberian elms growing on or below the active hillside acequia were not counted in this survey.

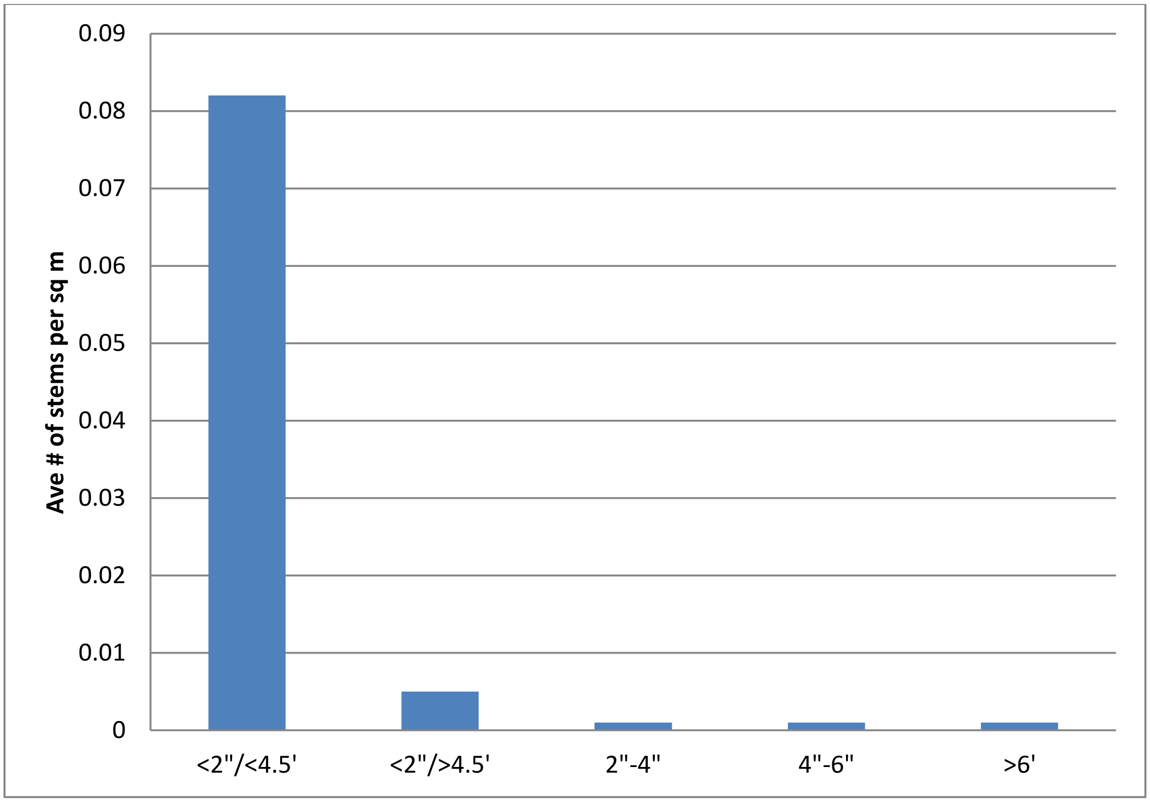

Figure 10. Stem densities of Siberian elm size classes on the Santa Fe River near Cañon in 2013.

MANAGEMENT RECOMMENDATIONS

The Santa Fe River is unique in that it flows year round and supports a variety of birds, small mammals, amphibians (bull and leopard frogs), insects and freshwater crustaceans to name a few. Over a period of years, the Santa Fe River riparian area has been invaded and overtaken by Russian olive and Siberian elm trees and many other non-native herbaceous plants. Proposed management of the federal land in the Santa Fe River canyon focuses upon replacing the existing non-native riparian woodland with native woody plants to restore ecological function of the aquatic and riparian habitat.

The *Santa Fe River Canyon Riparian Forest Restoration Project EA* (BLM 2010) prescribes the use of a trackhoe to tear up the root balls of exotic trees (Russian olive, salt cedar and presumably Siberian elms) and lay them at the sides of the valley bottom. Chainsaws and hand tools would be used to remove smaller specimens. The treated area would be planted with native woody species such as Rio Grande cottonwood, Goodding's willow, coyote willow (*Salix exigua*), New Mexico olive, etc. The use of herbicides to control seedling and resprouts of the exotic trees was dismissed because of some negative public comments.

This plan has two serious flaws that can contribute to a costly failure. First – all three exotic trees readily resprout from stem stumps and any severed roots when the root ball is pulled up (Caplan 2002, TNC 2003, USDA-Forest Service 2012b, Sivinski and Marks – personal observations). It is not uncommon to have a half-dozen new bushy saplings spring up around a hole where the root ball of a Russian olive was removed. These can become 5-7 feet tall in one season, but are easily killed by spot spaying the lower six inches of the stems with herbicide from a backpack sprayer in early autumn just before the leave turn. These resprouts can be manually removed with a pulaski, but that is labor intensive, less effective and must repeated for a period of at least 3 three years. Dismissing the use of herbicide creates a serious handicap. Second – the trackhoe tracks and bucket will cause severe soil disturbance throughout the valley floor. This disturbance will be excellent substrate for the establishment of weedy, non-native species – including exotic trees. This can be mitigated only by covering the disturbance with a dense layer of masticated wood, which will also suppress any residual native species.

In 2012, BLM deviated from the proposed methodology in the EA by bringing a tree masticator into the riparian woodland to treat small areas near the Cañon settlement. Many Russian olive and Siberian elm trees were reduced to wood chips, but the stumps were not treated with herbicide. All the stumps and surrounding roots proliferated respouts in 2013 that will rapidly increase the overall density of weed trees well above the original density before the masticator was allowed on site (Figure 11).

In contrast, there are several publications that offer management guidelines for invasive species in the Southwest Region. Three such publications, *The Field Guide for Managing Russian Olive in the Southwest* (USDA-Forest Service 2012a), *The Field Guide for Managing Siberian Elm in the Southwest* (USDA-Forest Service 2012b) and the New Mexico Forest Practices Guidelines (NMFD 2008) offer the most practical advice for control of invasive species. The New Mexico Forest Practices Guidelines identify several best management practices (BMP) requirements that protect water quality by limiting excessive soil and vegetation disturbance caused by management activities.

All treatment recommendations prescribe the following for each option:

- All cut stumps should be spot-treated with herbicide applied with backpack sprayer within 5-15 minutes of cutting (USDA Forest Service 2012a and 2012b). If herbicide is not utilized, we recommend leaving the non-native trees and planting native woody species in a few open areas where they may compete with the weed trees. Root ball extraction and cutting small stems without herbicide treatment will not control the weed trees (USDA-Forest Service 2012a and 2012b). The Nature Conservancy (2003) states: "Pulling or digging out larger plants is both extremely labor intensive and not recommended, since it can leave behind root fragments that can resprout. Seedlings can also be continually mowed for good control, but larger plants respond to cutting or girdling by vigorously resprouting, resulting in thicker, denser growth, unless herbicide is immediately applied to cut surfaces after cutting". Figure 11 illustrates this in the study area where a masticator without follow-up herbicide treatment made the situation many times worse. .

- A "one time" application of herbicide to cut stumps will not be completely effective as referenced in the above publications, which recommend annual monitoring with permanent plots or transects for treatment response. After BLM initially treats the project area, there should to be follow-up herbicide treatments on invasive species re-sprouting for at least 1-3 years with periodic follow-up treatments based on results of monitoring required by various BLM policies (BLM 2007).

Figure 11. Russian olive and Siberian elm resprouts from stumps and roots after mastication.

- Tree removal in and adjacent to the riparian areas should be accomplished with chainsaws to reduce soil disturbance in the floodplain. We do not recommend total tree removal by machine because tearing trees out of the ground will result in severe soil disturbance and compaction as the machine works in and around the riparian area.

Treatment Options

1. **Chainsaw cut and stack woody material out of the stream management area (SMA)**. This treatment focuses on the prescriptive cut and removal of all woody material over a specified diameter and length (usually 6" DIB by 4' length) into piles above the SMA. The Project Manager should determine the width of the SMA which can include the 100 year floodplain. At a minimum, the SMA should include the immediate wetlands and riparian area. Project benefits would include: cost savings through less labor to cut and remove all woody material to local piles which would also create wildlife habitat for small mammals. Project disadvantages would include: too much woody biomass left on site; poor aesthetics; flood events could cause transportation of woody debris down river; and increased fire risk due to a large number of piles left. Some or all of the residual piles could be burned after a period of time when feasible but the possible sterilization of topsoil and smoke output near Santa Fe would have to be weighed against reducing biomass levels.

2. **Chainsaw cut and chip out of the SMA**. This treatment focuses on the prescriptive cut and removal of all woody material by chipping and spreading chips out of and away from the SMA to a shallow depth so chips do not prevent the natural regeneration of native vegetation. Project benefits a decrease in erosion potential by spreading into a thin layer of chips above the SMA. This option would still need to stack large stems that exceed chipping capabilities. Project disadvantages would include: too much woody biomass left on site which would interfere with the SMA carbon nitrogen cycle causing nitrogen deficiencies for a number of years until the chips degraded; suppression of herbaceous vegetation chip depth is too deep; poor aesthetics; and flood events that transport chips downstream.

3. **Chainsaw cut, remove chips or fuelwood as practicable (preferred option)**. This treatment focuses on the prescriptive cut and removal of a majority of woody material from the project site as practicable. Large stems and unreachable portions of the project area would still require stacking outside of the SMA. Accessible cut wood would be removed by chipping into chip vans for transport out of project area for disposal. Removal of fuelwood lengths from the project area is also feasible. Project costs may be mitigated by allowing the contractor to sell fuelwood generated by the project. Project benefits would include: total removal of a majority of the woody biomass from the SMA; good aesthetics; and quicker recovery of the project area through less impact in the SMA. Project disadvantages would mostly be economical through an increase in the cost of

cutting or chipping then transporting a majority of all woody material out of the project area.

Other Treatment Considerations and Best Management Practice Recommendations

1. There are three existing stream crossings associated with the previous settlement use of the area north of the BLM house that could be used to move chippers or chip/fuelwood trailers to that part of the project. It may not be possible to move them all the way to the end of the project as the canyon narrows significantly. To meet BMPs for the SMA, we do not recommend that trucks, trailers and chippers be allowed to transit or park on any grassy flats in the river's SMA as rutting (soil disturbance) will occur in wet and fragile riparian soils. Truck and trailer turn-arounds will need to be designated in wide areas outside of SMA areas so that resource damage is kept to a minimum. If no wide areas are available, backing should be made mandatory up into the upper reaches of the project area. There are two main benches that exist above each river bank that are mostly devoid of riparian vegetation. Once Russian olives and Siberian elms are removed, there should enough room to allow vehicle and trailer access.

2. If additional stream crossings are required to access the project area, meeting project objectives should be heavily weighed against potential resource damage that a new crossing could create. Additional stream crossing sites should be identified and designated on the ground by the project administrating official. A new crossing site should be chosen that crosses the river as close to 90° as possible.

3. There are many junipers growing in or near the river. We feel that they are a natural part of the river ecosystem and there should be selectively cut only if they are damaged, diseased or in an overcrowded condition.

4. There are also many large Siberian elm in and around the buildings and fields associated with a small settlement that existed there in the past. We do not feel that all (if any) of them needed to be removed especially if BLM intends to open this area up to forest user groups. We feel that only those elms invading the riparian area should be eliminated. Girdling is identified in the reference *Field Guide for Managing Siberian Elm in the Southwest* (USDA-Foresst Service 2012) as an effective tool to kill large elm trees. Some of the more remote large elms could be girdled and left as dead snags for wildlife habitat

5. There are many Russian olive and Siberian elm trees that exist up along the sides of the canyon along the hillside acequias. These may be a problematic seed source for renewed infestations to the valley bottom, but are secondary to the primary effort and expense of restoring the riparian woodland. These may be subject to eradication after the valley bottom restoration has been accomplished.

6. There is an old orchard located on the West side of the river. Several apple and pear along with some large hackberry trees exist there. These trees should be designated to leave as they are beneficial to wildlife. Cutting crews may not know tree species so these trees should be tagged, flagged or painted to leave. All cottonwood, willow and hackberry trees should also be designated as leave trees.

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