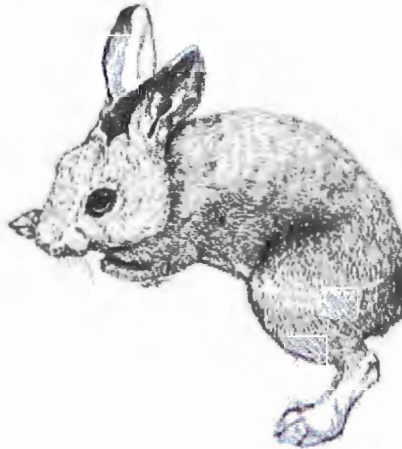


FINAL REPORT

CONTROLLED PROPAGATION AND RELEASE OF RIPARIAN BRUSH RABBITS IN THE NORTHERN SAN JOAQUIN VALLEY, CALIFORNIA

(8 JUNE 2011 – 31 DECEMBER 2012)



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BACKGROUND

We report here on activities related to the controlled propagation, release, and monitoring of captive-born riparian brush rabbits (*Sylvilagus bachmani riparius*) and reintroduced riparian brush rabbit populations between June 2011 and December 2012. Recovery of the riparian brush rabbit is moving into a new phase with support from the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Bureau of Reclamation, work that will result in additional analyses and reports for the agencies.

Three controlled propagation enclosures located west of Lodi, San Joaquin County, California were operated to produce offspring for translocation to protected release sites. Two breeder rabbits (2M) were trapped in the wild in the South Delta, San Joaquin County, and were incorporated into the propagation program in the early winter and spring depending on our trapping success. We also held female breeders from previous years if we were unsuccessful in capturing females during our breeder trapping efforts, which would account for the different ratio of males to females.

In all, 475 offspring were captured at the controlled propagation facility. Of these, 273 were hard-released (i.e., without using fenced enclosures = soft-release) at either the San Joaquin River NWR – West Unit, the San Joaquin River NWR – East Unit (Buffington Tract), or the privately-owned Faith Ranch; 24 died while in captivity; and we estimate 34 offspring were remaining in the pens and awaiting translocation at the end of this reporting period.

Ten radio-collared brush rabbits were monitored at the San Joaquin River NWR – West Unit. Survivorship of these collared rabbits was relatively poor compared to rabbits released in previous years, with approximately 22% surviving 90+ days post-release (average post-release survival time = 58 days). This may be due to rabbit releases being concentrated in restored habitat and relatively narrow/marginal habitat due to the abundance of rabbits at previous release sites. The population of rabbits on Christman Island (northeast section of San Joaquin River NWR – West Unit) has shown signs of being self-sustaining so no rabbits have been released there since late 2009 to evaluate the health of the population. Seventeen radio-collared brush rabbits were monitored at the San Joaquin River NWR – East Unit (Buffington Tract). Survivorship of these rabbits has improved in recent years, with 57% surviving 90+ days post-release (average post-release survival time = 118 days). Increased survival time is attributed to improved habitat conditions for brush rabbits due to active habitat restoration at the refuge's East Unit. The currently longest lived collared rabbit (Sb #40436) was released into restored habitat (field B2) where he has survived for 552 days. Eight radio-collared brush rabbits were monitored at the Faith Ranch. Fewer numbers of collared rabbits have been released in recent years, but survivorship has improved with 50% surviving 90+ days post-release (average post-release survival time = 78 days).

Amongst all release sites, predation appeared to be a significant source of mortality for radio-collared rabbits. Although the cause of death was undetermined for many of the mortalities, these too were generally attributable to predation, but when only an unmarked radio-collar is recovered, predation cannot be inferred with a high level of confidence.

Biannual censuses at the San Joaquin River NWR – West Unit were conducted in October – November 2011, May 2012 and October – November 2012, and a total of 20 riparian brush rabbits were captured between these three efforts. All rabbits captured were native-born rabbits (no captive-bred rabbits have been released on Christman Island since late 2009). All rabbits captured in 2011 are presumed to have survived the Spring 2011 flooding (see section Flooding & rabbit rescue) by using constructed high-ground flood refugia (*bunny mounds*) or other pockets of higher ground on Christman Island.

POND 6 BREEDING ENCLOSURES

REPRODUCTIVE ASSESSMENT TRAPPING

We trapped for a total of 57 days within the three breeding enclosures at Pond 6. We captured a total of 464 individuals during this effort (882 total captures; Table 1).

Table 1. Number of individual brush rabbits captured at the Pond 6 breeding enclosures.

Age	Males	Females	Totals
Offspring	204	271	475
Breeders	9	10	19
Totals	213	281	494

Of the 475 individual offspring captured, 291 were first identified during this period and 184 were identified prior to this reporting period. Eighteen of the 19 captured breeders were observed to be reproductive at some point during the year (e.g., pregnant, lactating, or scrotal).

There were 24 known rabbit mortalities at the breeding facility during this reporting period (1 breeder, 23 offspring). Causes of mortality included trap injury (7), trauma (3), predation (2), and unknown causes (12). The specimens of seven mortalities of unknown causes were too desiccated to perform necropsies. Necropsies were performed on two rabbits that died of unknown causes. While results of these necropsies were not diagnostic, possible causes of death included skull trauma in the case of one juvenile rabbit, and pneumonia in the case of one adult rabbit.

TRANSLOCATION OF YOUNG RABBITS

We translocated a total of 273 offspring rabbits to the San Joaquin River NWR – West Unit, the San Joaquin River NWR – East Unit (Buffington Tract), and the privately owned Faith Ranch (Table 2). Each translocated rabbit weighed a minimum of 450 g and passed a health examination administered by Dr. Ray Wack (UC Davis Wildlife Health Center). Additionally, 27 of the 273 translocated rabbits were fitted with HolohilTM radio-collars. Our objective was to radio-collar a small ratio of the translocated rabbits, allowing us to monitor their movements and survival at the release sites.

Table 2. Brush rabbit progeny translocated from the Pond 6 breeding enclosures (number radio-collared in parentheses).

Release location	Males	Females	Total
San Joaquin River NWR – West Unit	42 (2)	43 (8)	85 (10)
San Joaquin River NWR – East Unit	46 (2)	42 (7)	88 (9)
Faith Ranch	43 (2)	57 (6)	100 (8)
Totals	131 (6)	142 (21)	273 (27)

REPATRIATION OF BREEDER RABBITS

We repatriated two breeders to their original capture locations in the South Delta (see *South Delta* section for more information).

ADDITION OF BROOD STOCK

We added 2 new breeders from locations in the South Delta into enclosure #3 at Pond 6 (see *South Delta* section for more detailed information).

MAINTENANCE OF VEGETATION

We trimmed/removed vegetation inside and outside of the breeding enclosures using gas-powered trimmers, an ATV-pulled mower, and various hand tools. Prioritized activities included trimming blackberry bushes to prevent them from becoming entangled in the netting; maintaining existing discreet clumps of blackberry within each enclosure; mowing paths around the perimeters of the vegetation; maintaining firebreaks along the inside and outside of each enclosure; inspecting the fencing and netting for breaches; and maintaining permanent trapping stations by trimming back blackberry vines.

We cleared vegetation to bare dirt in selected areas of all three enclosures. Approximately 75% of the vegetation was removed from each of pens 1 and 2, and about 25% of vegetation removed from pen 3. Vegetation removal will be ongoing as captive rabbits are trapped and translocated to release sites, allowing the remaining blackberry bushes to be cleared to bare dirt in pens 1 and 2 as we halt breeding activities in these two pens and maintain pen 3 as the only breeding pen per the recommendations from the Riparian Mammals Technical Group.

SAN JOAQUIN RIVER NWR – WEST UNIT***RABBIT RELEASES***

Between 1 July 2011 – 31 December 2012, we hard-released a total of 85 rabbits (42M, 43F) at numerous locations throughout the San Joaquin River NWR – West Unit (Figure 1). Of these, 10 were radio-collared to allow for monitoring of survival and movements. All translocatees were progeny born at the controlled propagation facility at Pond 6.



Figure 1. Brush rabbit hard-release sites at the San Joaquin River NWR – West Unit (29 November 2011 – 5 October 2012).

TELEMETRY & MORTALITY RECOVERY

At the beginning of this reporting period, no radio-collared rabbits were being monitored for survival and locations at the San Joaquin River NWR – West. Between 1 July 2011 – 31 December 2012, we released ten radio-collared rabbits (2M, 8F) at the San Joaquin River NWR – West Unit.

Out of the 10 radio-collared rabbits being monitored at the San Joaquin River NWR – West Unit, 9 were determined to be mortalities by December 31, 2012. The average survival time for these rabbits was approximately 58 days, with a minimum post-release survival time of 19 days and a maximum of 153 days. The cause of mortality was attributed to predation for 6 of 9 radio-collared individuals, and unknown for the other 3 individuals.

FLOODING & RABBIT RESCUE

In early January 2011, flooding began at the San Joaquin River NWR – West Unit due to increased runoff from recent storms. The river stage reached approximately 22 feet and began flowing into the old river channel, which in turn flooded much of the lower lying areas at the refuge. The higher flows lasted only a few days but the old river channel remained full.

Due to increased reservoir releases and runoff from additional storms, the river again started to rise around 22 March 2011. We began monitoring the water levels at the

refuge on 24 March and saw significant flooding by 28 March with the river stage eventually reaching 27 feet. On 29 March, we initiated rescue efforts to move stranded rabbits from areas of impending inundation to areas of higher ground (primarily constructed flood refugia mounds and vegetated levees).

Between 29 March – 1 April, we moved 125 brush rabbits and 23 desert cottontails from inundated areas to areas of higher ground. A follow-up survey of the peninsula bunny mounds on 14 April indicated that the animals had exhausted their resources so it was decided that supplemental food items would be added. Alfalfa and rabbit pellets were added to the peninsula bunny mounds at the advice of our veterinarian and other staff members. In addition, the decision was made to trap the bunny mounds in an effort to move some of the remaining animals to permanent high ground to reduce the further loss of resources on the bunny mounds. Trapping occurred from 19-21 April and an additional 12 brush rabbits were moved to permanent high ground on the Hagemann Tract. Flood waters remained at high levels for about a month and had receded from most areas by early May 2011.

POST FLOOD TRAPPING

During the flood we accessed flood refugia mounds by boat and observed surviving rabbits on each mound. From 16 – 18 August, approximately three months after flood waters had receded, we trapped in areas where we suspected rabbits could have survived the flood and dispersed into the surrounding habitat. In all, we trapped for 120 trap-nights and captured three female refuge-born brush rabbits (Figure 2, Table 3). The reproductive status of two of the captured female rabbits suggested that there was at least one male rabbit in the immediate vicinity. Incidental captures included desert cottontails (*Sylvilagus audubonii*) and an American mink (*Neovison vison*).



Figure 2. Capture locations and trap-lines at the San Joaquin River NWR (16 – 18 August 2011).

Table 3. Brush rabbits captured during post flood trapping at the San Joaquin River NWR – West Unit (16 – 18 August 2011).

Ear tag	Origin	Sex	Reproduction	Weight (g)	Days since translocation or first capture
40539	SJRNWR	F	Lactating	810	N/A
40540	SJRNWR	F	Non	610	N/A
40543	SJRNWR	F	Lactating	715	N/A

FLOOD REFUGIA MOUND TRAPPING

Between 3-7 July 2012, we live-trapped flood refugia mounds that were previously trapped in 2010 to assess the post-flood health of the Christman Island brush rabbit population.

Trapping surveys were conducted at five mounds on Christman Island for 5 consecutive nights. At each mound 10 traps were placed along a transect that began at the base of one side, continued up and over the mound, and extended into the most highly suitable

riparian habitat adjacent to the mound (Figure 3). Traps were spaced at intervals of 15-20 meters and were placed wherever possible along runways or in areas with appropriate rabbit sign (e.g., fecal pellets). The vegetation directly adjacent to a mound was trapped if none were being captured on the mounds.



Figure 3. Aerial image of a Christman Island mound with approximate trap distribution (◇ = trap location).

We captured two brush rabbits: one at the center of Christman Island (mound B) and one at the north end of the island (Mound D; Figure 4; Table 4). Both of these rabbits were captured at the bases of mounds. Incidental captures included black rats (*Rattus rattus*), California voles (*Microtus californicus*), and a house mouse (*Mus musculus*). There was a fairly high trap disturbance rate (38.2%).



Figure 4. Brush rabbit capture locations at the San Joaquin River NWR – West Unit (3 – 7 July 2012).

Table 4. Brush rabbit captures on Christman Island mounds (3 – 7 July 2012).

Mound	Ear tag	Sex	Weight (g)	Reproduction
B	40707	F	745	Lactating
D	40789	F	440	Non

BIANNUAL CENSUSES

During October – November 2011, May 2012 and October – November 2012, we conducted 2-week censuses at the San Joaquin River NWR – West Unit. These surveys had multiple objectives that included assessment of the reproductive condition of translocated rabbits, evaluation of the general health and appearance of all captured individuals, and identification of refuge-born rabbits. These data were to be used to determine the distribution of the established riparian brush rabbit population at the San Joaquin River NWR – West Unit, as well as to estimate the relative abundance of riparian brush rabbits in general vegetation types.

Prior to the original census in November 2005, vegetation classes were categorized using satellite imagery and knowledge of the site. These vegetation classes were:

- 1) Open water
- 2) Bare ground and/or short grasses
- 3) Pepperweed (*Lepidium latifolium*) and/or Johnson grass (*Sorghum halepense*)
- 4) Riparian/grass transition; dominated by willows (*Salix* spp.)
- 5) Dense riparian; dominated by wild roses (*Rosa* spp.), blackberries (*Rubus* spp.), Fremont cottonwoods (*Populus fremontii*), and/or valley oaks (*Quercus lobata*)

The “open water” and “bare ground and/or short grasses” classes were discarded due to their irrelevance to brush rabbit censuses. Within each of the remaining three vegetation classes (grassy, transitional, and riparian), we placed six permanent transects consisting of 15 trap stations (spaced at approximately 15 meter intervals; 18 transects total; Figure 5). Each trap station consisted of one Tomahawk™ trap (model 203), which was baited with a combination of oats, barley, corn, molasses, and applesauce (prepared fresh daily).

Traps were operated for approximately 13 hours per day, opening them at ~1800 h and closing them at ~0700 h the following morning. Traps were closed during the daytime hours. Accounting for trap disturbance, we trapped for 975 trap-nights in 2011 and 1408 trap-nights in 2012 (trap-nights = number of traps × number of nights in operation). Captured rabbits were processed according to the standard protocol, which included measuring foot length, ear length, and weight; assessing sexual reproduction; and permanently marking them with metal ear tags and/or passive-integrated transponder tags. In addition, two 3-mm diameter plugs of ear tissue were taken with a biopsy punch from brush rabbits and preserved in 95% ethanol (reagent grade).

A total of 20 individual riparian brush rabbits were captured between the three censuses (36 total captures; Table 5; Figure 6). All were refuge-born rabbits first captured and marked after the Spring 2011 flood. Eighteen of the 20 brush rabbits were of adult size when first captured (> 500 g), one was a sub-adult (400-499 g), and one was a juvenile (< 400 g).

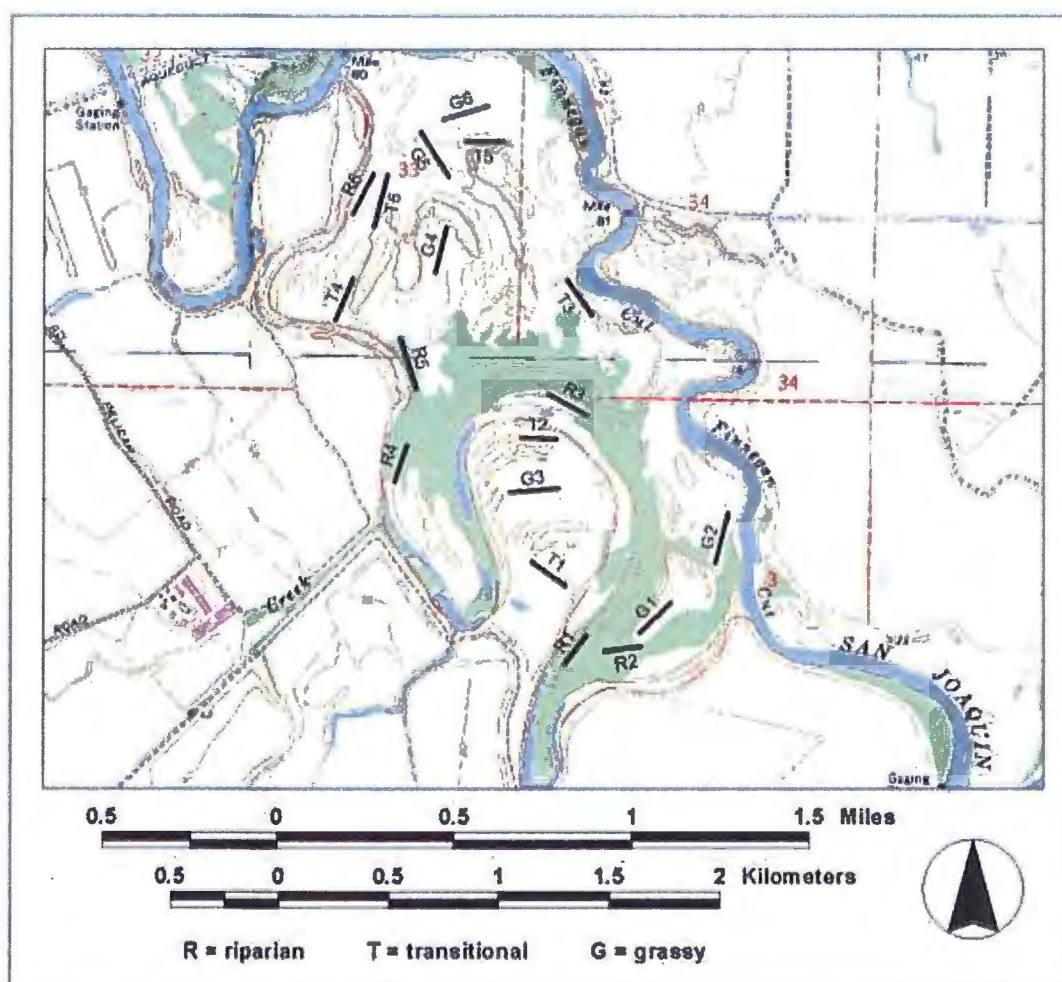


Figure 5. Locations of census transects at the San Joaquin River NWR – West Unit.

Table 5. Number of brush rabbits captured during censuses at the San Joaquin River NWR – West Unit.

Origin ¹	Fall 2011			Spring 2012			Fall 2012		
	Rip.	Trans.	Grass	Rip.	Trans.	Grass	Rip.	Trans.	Grass
Captive-bred (at Pond 6)	0	0	0	0	0	0	0	0	0
Native to refuge	6	2	1	5	2	0	7	3	0
Totals	6	2	1	5	2	0	7	3	0

Rip = Riparian, Trans. = Transitional.



Figure 6. Riparian brush rabbit and riparian woodrat capture locations during Fall 2011, Spring 2012 and Fall 2012 censuses at the San Joaquin River NWR – West Unit.

The results of the previous three censuses show positive indications that the brush rabbit population on Christman Island may be able to recover from a significant flood event, without need for additional translocations, in part due to the construction of high-ground flood refugia. Considering that all the census lines were underwater during Spring 2011, and that Christman Island is not connected to a levee, all the rabbits captured during the past three censuses are presumed to have survived the flood utilizing high-ground flood refugia constructed after the 2006 flood, or on other naturally high ground on Christman Island. The juvenile (200 g) rabbit captured during the Fall 2011 census was either born during the flood on a mound, or after floodwaters receded. By contrast, we did not capture a single brush rabbit during the two censuses following the Spring 2006 flood (Figure 7). In the spring and summer of 2007 through Fall 2009, we released significant numbers of rabbits at locations on the San Joaquin River NWR – West Unit where the riparian habitat had recovered from the flood. During the Fall 2007 census, we again captured brush rabbits, however the majority of these were rabbits that we had released earlier that year. No rabbits have been released on Christman Island since late 2009. These factors indicate that survivors of the flood dispersed after floodwaters receded from high ground to surrounding habitat, successfully reproduced, and began repopulating previously flooded habitat.

Incidental captures included an American mink, black rats, California voles, deer mice (*Peromyscus maniculatus*), desert cottontails, house mice, Virginia opossums (*Didelphis virginiana*), and a riparian woodrat (*Neotoma fuscipes*; Table 6). This was the first woodrat captured on the refuge since August 2010 and provides hope that the population

may be rebounding from the Pelican Fire (2004) and repeated floods (2005, 2006 and 2011) that seriously impacted its habitat.

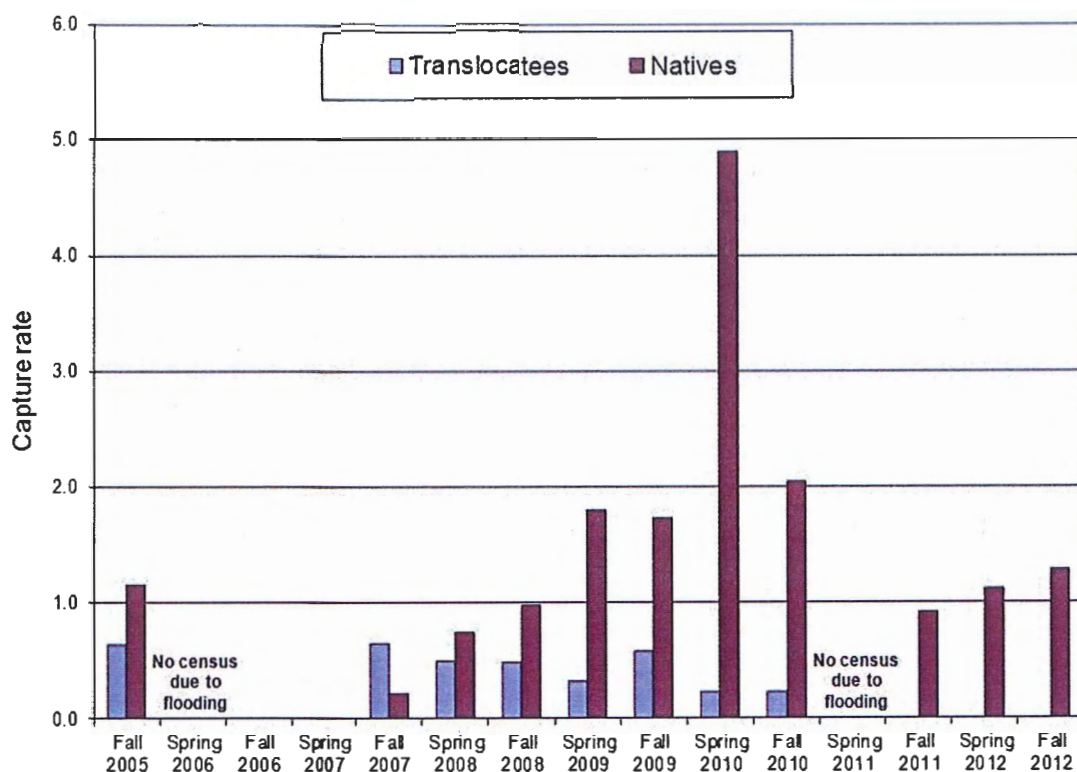


Figure 7. Overall capture rates of brush rabbits during censuses at the San Joaquin River NWR – West Unit (Fall 2005 – Fall 2012).

Table 6. Capture rates of mammalian species during brush rabbit censuses at the San Joaquin River NWR – West Unit.

Species	Fall 2011			Spring 2012			Fall 2012		
	Rip.	Trans.	Grass	Rip.	Trans.	Grass	Rip.	Trans.	Grass
<i>Didelphis virginiana</i>	--	--	--	4.35	--	--	2.43	--	--
<i>Microtus californicus</i>	--	--	0.23	5.43	8.94	--	1.46	1.58	0.63
<i>Mus musculus</i>	--	--	--	--	--	--	--	--	0.31
<i>Neotoma fuscipes</i>	--	--	--	0.54	--	--	--	--	--
<i>Neovison vison</i>	--	--	--	0.54	--	--	--	--	--
<i>Peromyscus maniculatus</i>	--	--	--	--	--	1.50	--	--	--
<i>Rattus rattus</i>	11.52	0.66	--	20.12	12.29	--	7.28	2.37	--
<i>Sylvilagus audubonii</i>	--	0.66	--	--	0.56	0.75	--	0.40	--
<i>Sylvilagus bachmani</i>	2.47	0.66	0.23	2.71	1.12	--	3.40	1.19	--

Capture rate = (number of captures / trap-nights) × 100

SAN JOAQUIN RIVER NWR – EAST UNIT

RABBIT RELEASES

Between 1 July 2011 and 31 December 2012, we hard-released a total of 88 rabbits (46M, 42F) at several locations on the San Joaquin River NWR – East Unit (Figure 8). All translocatees were progeny born at the controlled propagation facility at Pond 6 and 9 were radio-collared.

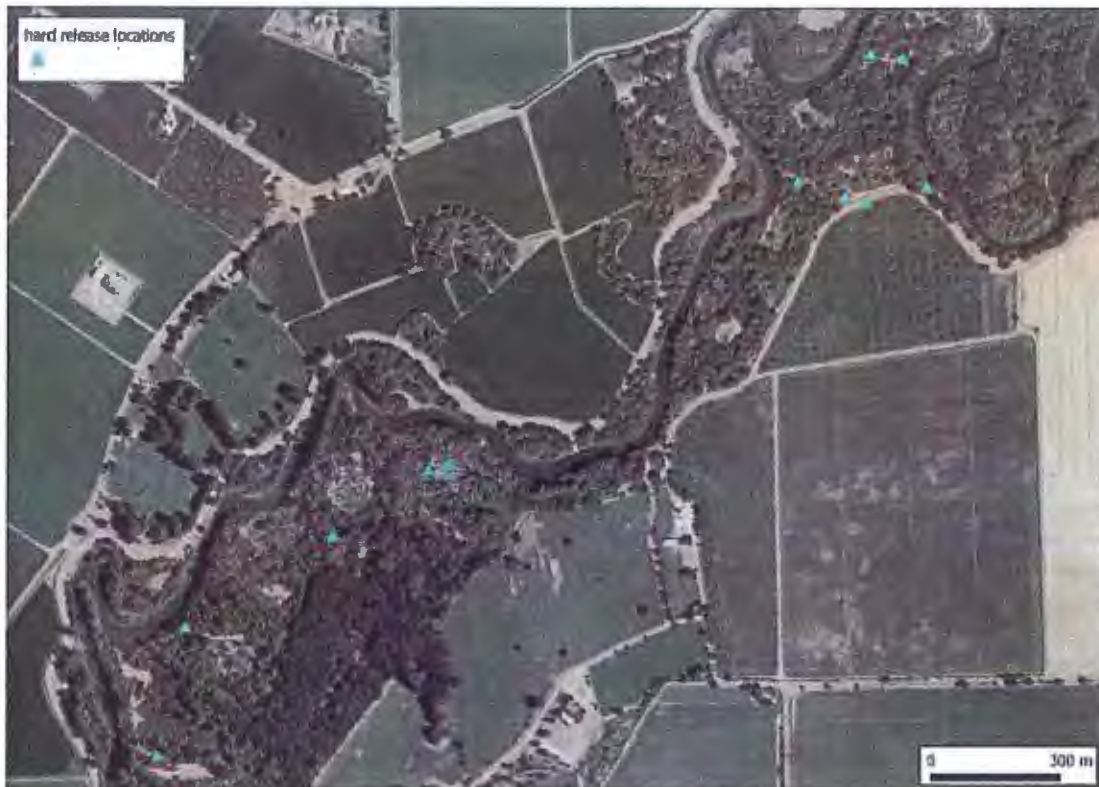


Figure 8. Brush rabbit hard-release sites at the San Joaquin River NWR – East Unit (19 July 2011 – 20 September 2012).

TELEMETRY & MORTALITY RECOVERY

At the beginning of this reporting period, we were monitoring eight radio-collared rabbit for survival and movement at the San Joaquin River NWR – East Unit. Between 1 July 2011 and 31 December 2012, we released an additional nine radio-collared rabbits (2M, 7F) on this parcel, bringing the total number of monitored rabbits to 17 individuals. Of the 17 radio-collared rabbits, seven were determined to be mortalities and 9 lost contact by 31 December 2012. The average survival time for these rabbits was approximately 117 days. Minimum and maximum survival times were 10 days and 184 days, respectively. Predation was likely to be the cause for 6 of 7 mortalities. Avian predation was possibly the cause of death for two rabbits – one collar was found under a tree with whitewash in the vicinity, and a second collar was recovered from across the Stanislaus River. Several collars were recovered from small dens under dense blackberry vegetation

indicating small mammalian predators. Gnaw marks on some of these collars indicated mustelids (such as mink or weasel) as likely predators. Lost contact rabbits whose signals could not be heard following release but before the anticipated end of battery life are possibly due to premature collar failure.

RADIO-COLLAR EVALUATION TRAPPING

Between 12 July – 16 September 2011, and between 26-29 March 2012, we conducted periodic trapping in areas where radio-collared rabbits were known to reside in an effort to evaluate their health and replace/remove their radio-collars. Simultaneously, we surveyed areas of highly suitable brush rabbit habitat in an effort to capture non-collared translocatees and/or brush rabbits native to Buffington. In all, we targeted four brush rabbits, trapped for 737 trap-nights, and captured two of the four targeted rabbits. The transmitters of the two targeted rabbits were replaced as their batteries were anticipated to fail. Collar size appeared to be appropriate for each of these individuals and they appeared to be reproductive and in good physical condition. Unlike some previous years, none of the captured rabbits had collar-related neck wounds.

Incidental captures included black rats, California voles, Virginia opossums, a striped skunk (*Mephitis mephitis*), desert cottontails, and 30 non-targeted brush rabbits (Table 7). Fifteen of the non-target brush rabbits were previously marked translocatees, and fifteen were natives captured for the first time. It should be noted that only one native brush rabbit had been captured at Buffington prior to the July 2011 trapping effort.

Eight of the 32 rabbits captured were residing in restored habitat, while the other 24 were captured in remnant riparian habitat. The restored field where these rabbits were captured (field B2) appears to have suitable species and structure of vegetation to support a riparian brush rabbit population. The relatively high number of recently captured native rabbits indicates that remnant habitat conditions have improved since cattle grazing ended at Buffington in 2006, and that recent restoration efforts have been successful.

Table 7. Brush rabbits captured during radio-collar evaluation trapping at Buffington from July 2011 – December 2012.

Ear tag	Origin	Sex	Reproduction	Weight (g)	Days since translocation or first capture	Habitat type
40446	Buffington	F	Non	720	N/A	Remnant
40491	Buffington	F	Non	560	N/A	Remnant
40492	Buffington	M	Non	530	N/A	Remnant
40493	Buffington	F	Non	590	N/A	Remnant
40494	Buffington	M	Scrotal	735	N/A	Remnant
40495	Buffington	M	Scrotal	605	N/A	Remnant
40496	Buffington	M	Non	545	N/A	Remnant
40662	Buffington	F	Lactating	735	N/A	Remnant
40671	Buffington	F	Non	275	N/A	Restoration
40673	Buffington	M	Scrotal	520	N/A	Remnant
40674	Buffington	M	Scrotal	740	N/A	Restoration
40675	Buffington	M	Non	285	N/A	Restoration
0A130A1269	Buffington	F	Non	156	N/A	Restoration
4C1D331D7C	Buffington	M	Non	220	N/A	Remnant
4C1D43322E	Buffington	F	Non	180	N/A	Remnant
40117	Pond 6	F	Lactating	820	282	Remnant
40174	Pond 6	F	Lactating	810	25	Remnant
40364	Pond 6	M	Scrotal	620	282	Remnant
40369	Pond 6	F	Lactating	860	283	Remnant
40370	Pond 6	F	Lactating	790	283	Remnant
40371	Pond 6	M	Scrotal	?	384	Restoration
40413	Pond 6	F	Lactating	720	282	Remnant
40422	Pond 6	F	Lactating	855	384	Restoration
40424	Pond 6	F	Pregnant	870	384	Restoration
40434	Pond 6	M	Scrotal	620	270	Remnant
40450	Pond 6	M	Non	550	35	Remnant
40478	Pond 6	M	Scrotal	650	57	Remnant
40488	Pond 6	F	Non	530	10	Remnant
40513	Pond 6	M	Scrotal	720	79	Remnant
40544	Pond 6	M	Non	510	9	Remnant
40436*	Pond 6	M	Scrotal	785	270	Restoration
40533*	Pond 6	F	Lactating	830	191	Remnant

* Rabbit targeted for radio-collar assessment

FAITH RANCH

RABBIT RELEASES

Between 1 July 2011 and 31 December 2012 we hard-released a total of 100 rabbits (43M, 57F) at multiple locations on the Faith Ranch (Figure 9). All translocatees were progeny born at the controlled propagation facility at Pond 6 and 8 were radio-collared.



Figure 9. Brush rabbit hard-release sites at the Faith Ranch (October 18, 2011 – December 12, 2012).

TELEMETRY & MORTALITY RECOVERY

At the beginning of this reporting period, we were not monitoring any rabbits for survival and movement at the Faith Ranch. Between 1 July 2011 and 31 December 2012, we released eight radio-collared rabbits (2M, 6F) at the Faith Ranch. Of the eight radio-collared rabbits, six were determined to be mortalities by 31 December 2012. The average survival time for these rabbits was 78 days. Minimum and maximum survival times were 13 days and 146 days, respectively. Predation was the probable cause for 5 of 6 of those mortalities.

RADIO-COLLAR EVALUATION TRAPPING

Between 9-12 January 2012, we conducted trapping in areas where radio-collared rabbits were known to reside in an effort to evaluate their health and replace/remove their radio-

collars. We targeted one brush rabbit and trapped for 180 trap-nights, but were unable to capture the targeted rabbit. The overnight temperatures dropped below our minimum standard of 40 degrees Fahrenheit, so we were only able to trap during the daylight hours. This could account for our lack of trapping success. Incidental captures included black rats and a desert cottontail.

SOUTH DELTA

REPATRIATION OF BREEDER RABBITS

Between 1 July 2011 and 31 December 2012, we repatriated two breeders to their original capture locations in the South Delta (2M). One of the rabbits was returned to Paradise Cut and the other to Mossdale Oxbow Preserve.

TRAPPING FOR POND 6 BREEDER RABBITS AT PARADISE CUT

Between 13 – 15 and 20 – 21 February 2012, we trapped at three locations at the Paradise Cut island area in an effort to capture two male breeders for the controlled propagation facility at Pond 6



Figure 10). We set 30 traps according to standard protocol and trapped continuously for two days, and due to lack of captures trapped for one more night the following week.

Captured rabbits were processed according to the standard protocol, which included ear and passive-integrated transponder tagging, measuring foot and ear length, weighing, and

assessing sexual reproduction. During this effort, we captured three brush rabbits (2M, 1F), one of which (#40676M) was examined by Dr. Ray Wack and released into controlled propagation enclosure #3 on February 21. Incidental captures included black rats, desert cottontails, and various birds.



Figure 10. Locations surveyed for Pond 6 breeders at Paradise Cut (13 – 21 February 2012).

TRAPPING FOR POND 6 BREEDER RABBITS AT MOSSDALE OXBOW

Between 20 – 24 February 2012, we trapped at the Mossdale Oxbow in an effort to capture one adult male brush rabbit to introduce to the controlled propagation facility at Pond 6 (Figure 11). The inclusion of a Mossdale rabbit was desired to further increase the genetic diversity of the breeding stock (Table 1). We set 50 traps according to standard protocol and trapped continuously for 5 days. Captured rabbits were processed according to the standard protocol. Traps were operated continuously, with the exception of 1 night when cold overnight temperatures required that they be closed. Traps were checked and re-baited twice daily at approximately 0800 h and 2000 h.

During this effort, we captured eight brush rabbits (2M, 6F), one of which (#40651M) was examined by Dr. Wack and released into controlled propagation enclosure #3 on February 22. Incidental captures included black rats, California vole, and various birds.



Figure 11. Locations surveyed for Pond 6 breeders at the Mossdale Oxbow Preserve (20 – 24 February 2012).

CASWELL MEMORIAL STATE PARK

ANNUAL CENSUS

Between 30 January and 11 February 2012, we conducted an annual census of riparian brush rabbits and riparian woodrats at Caswell Memorial State Park (MSP). During this effort, 120 traps were operated for 5 days in each of two different areas of the park (Fenceline Trail and Crow's Loop). We also operated a total of 30 woodrat traps in the Campground area for 5 days. Only two brush rabbits and six woodrats were captured during this effort (Table 8; Figure 12). Incidental captures included Virginia opossums, California voles, black rats, various birds, and a raccoon (*Procyon lotor*) (Table 9).

Table 8. Individual riparian brush rabbits and riparian woodrats captured at Caswell MSP in 2012.

Location	<i>Sylvilagus bachmani riparius</i>	<i>Neotoma fuscipes riparia</i>
Fenceline Trail	2	2
Crow's Loop	0	0
Campground	0	4
Totals	2	6

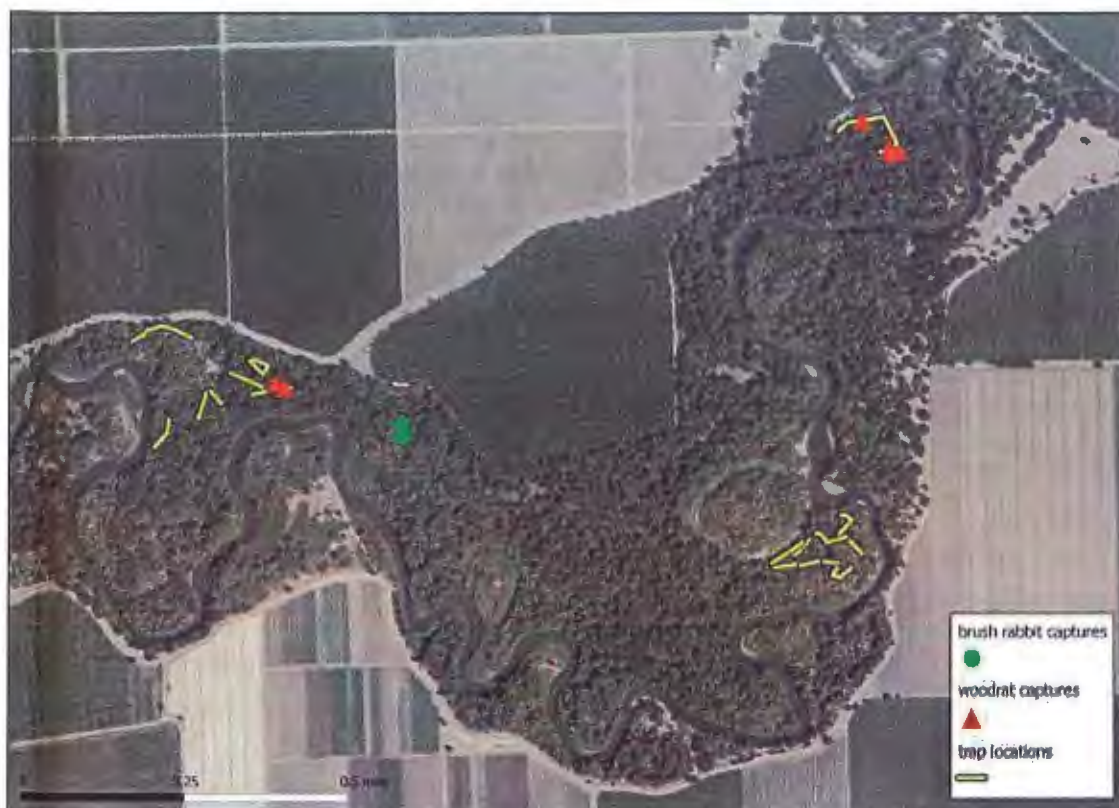


Figure 12. Brush rabbit and woodrat capture locations and trap locations at Caswell MSP in 2012.

Table 9. Incidental captures at Caswell MSP in 2012.

Location	<i>Didelphis virginiana</i>	<i>Microtus californicus</i>	<i>Procyon lotor</i>	<i>Rattus rattus</i>	Various birds
Fenceline	3*	1	0	78	9*
Crow's Loop	7*	1	1	18	2*
Campground	0	3*	0	16	0
Totals*	10*	5*	1	112	11*

* unmarked captures (may include recaptures of the same individuals)

One of the two brush rabbits captured, (#40598M) had been captured as a 220 g juvenile on the south side of the river in the San Joaquin River NWR – East Unit (Buffington Tract) in July of 2011. This is the first instance of a rabbit being captured on both sides of the Stanislaus River. We also captured a woodrat (#7926F) that was first captured in February of 2008.

Sign of rabbits elsewhere was scarce or absent. Brush rabbit and woodrat populations were found to be high in 1993, but very low in 1997 through 2012.

The capture of RBR #40598 during the census provided an opportunity to get valuable movement data on this river-crosser. We decided to trap at and around its last capture location in the hope that we could radio collar this animal and better understand its movements. We trapped for five days but were unable to recapture the target animal.

We did capture two brush rabbits, one a recapture from the census (#40648M) and the other was a newly captured female (#40659F). Incidental captures included black rats, California voles and various birds.

DURHAM FERRY

HABITAT ASSESSMENT

We collaborated with David Meade, an Ecology Instructor at the Durham Ferry School of Agriculture, on a project to provide additional educational opportunities for his students (grades 6-12), especially with regard to the riparian habitat along the San Joaquin River at the Durham Ferry school.

Mr. Meade hosted a tour of the Durham Ferry property on 6 August 2012, during which a walking survey was conducted for riparian brush rabbit habitat and sign. The tour was attended by Matthew Lloyd (San Luis National Wildlife Refuge Complex Easement Program Manager), Jeff Holt (River Partners Central Valley Biologist), Julie Rentner (River Partners Central Valley Regional Director), Kim Forrest (SLNWRC Refuge Manager), Patrick Kelly (CSU Stanislaus Prof. of Zoology and ESRP Coordinator), and Tristan Edgarian (ESRP Wildlife Biologist).

Large patches of suitable habitat were found (e.g., wild rose, blackberry, willows, sedge, mugwort). Four rabbits were seen and two appeared to be riparian brush rabbits; the others appeared to be desert cottontails. Without handling the animals, distinguishing between the two species is difficult, so plans were made to return for a live-trapping survey.

TRAPPING SURVEY

On 9 October 2012, we gave an hour-long presentation to Mr. Meade's class on Central Valley ecology and the native species of plants and animals that may be encountered in riparian habitat. After the lecture, we walked to the riparian area and showed the students how to identify various types of animal sign, including rabbit runways, scat, and vegetation clippings. Mr. Meade and the students took a hands-on role in the survey by helping place 60 live-traps (30 Shermans and 30 Tomahawks) for small to medium-sized mammals along three transects through appropriate habitat. Traps were operated between sunset and sunrise, and checked with Mr. Meade and his class on the mornings of 10 – 12 October 2012.

One riparian brush rabbit was captured on the morning of 11 October 2012 (Figure 13). The species was distinguished from desert cottontail by the smaller body and tail size, darker colored fur, and lack of black on ear tips. The adult female captured was marked with a metal ear tag (#40723), implanted with a PIT tag, weighed, measured and checked for reproductive condition. Tissue samples were collected for later genetic analysis, and the rabbit was released at the site of capture. No other rabbits or incidental species were captured during the trapping survey.



Figure 13. Location of riparian brush rabbit capture (Sb #40723F) at Durham Ferry on 11 October 2012.