Salinas River Wildlife Monitoring Study 2019-2021
Effectiveness of Arundo donax removal on increasing the permeability for wildlife movement in the Salinas River.

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For the Resource Conservation District of Monterey County

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Table of Contents

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1.0 EXECUTIVE SUMMARY

The purpose of the Salinas River Wildlife Monitoring Study is to determine if clearing arundo (*Arundo donax)* improves the ability for wildlife movement through various sites within the Salinas River. Our study focused on areas that are highly constricted by arundo. Remote motion-activated cameras were set up in August 2019 for a 24-month monitoring period. This timeline was selected so that we were able to collect baseline data on wildlife movement before two treatments to remove arundo were performed. These two treatments included mowing and spraying. We used the wildlife movement data collected before the arundo treatments were performed to compare to wildlife movement data post treatments to assess if the arundo removal resulted in increasing the permeability of the landscape for wildlife movement.

We found that the treatments resulted in improving the permeability of the study sites as there was an increase in wildlife movement at the camera stations. Our data indicate mowing to be more effective as it removed the physical barrier of the arundo stalks resulting in higher rates of wildlife movement, compared to treatment spraying where the stalks remained even though the arundo stalks were dead. At three of the four study sites, we set up four camera stations, two cameras were placed within dense stands of arundo, and two cameras were placed within native vegetation that were void of the arundo stands. We found multiple species movement throughout the study period within the native study sites versus the arundo sites. The arundo sites had very little wildlife movement within them before the first treatment mowing occurred. After the mowing and spraying treatments, the patterns of wildlife movement resembled the wildlife movement within the native vegetation sites until the arundo grew back into dense stands.

Sites 4 and 5, consisted of a section of the river that had been treated multiple times over the past several years. These sites were selected to compare to Sites 1,2, and 3 to compare with sites that had multiple treatments and less arundo in comparison to sites with less treatments and were inundated with arundo. For Sites 4 and 5, the multiple treatments over several years resulted in the successful restoration of the habitat within the study sites. The majority of these sites consisted of native vegetation such as chaparral, coyote brush, annual grasses, and native shrubs with sparse arundo.

We found that for Sites 4 and 5, unlike Site 1, 2, and 3, the trends for the control and the treated sites are very similar. For Sites 1,2, and 3, the only spikes, an increase in wildlife movement, that correlate with the control are after the mowing occurred. However, for Sites 4 and 5, the spikes in wildlife movement correlate with each other. The spikes of movement in a healthy restored landscape are usually a reflection of typical mammal species movement patterns which include searching for food and water during different seasons, males looking for mates in early spring, and juveniles dispersing in fall and winter to establish their own home range and facilitate movement between habitat patches for wildlife to find viable mates (Soulé & Gilpin 1991, Beier 1995, Hilty et al. 2012). Both Sites 4 and 5 are good representatives and case studies for the long-term benefits of treatments in resorting native habitat and wildlife movement patterns.

There were two special status species recorded and documented at one of the study sites. At Site 4 Greenfield, an American badger and burrowing owl, were both recorded. Interestingly, both these species are grassland specialist, which means they are typically not found in other types of habitats and need grassland habitats to reside in (Long 1983). Site 4 Greenfield has been treated five times over the duration of five consecutive years (2014, 2015, 2016, 2017, and 2018). The result is that the arundo is very sparse with just a few small stands compared to Sites 1, 2, and 3, in which arundo is the most abundant and dominant plant species.

The treatments have resulted in successfully restoring native habitats and allowed for the regeneration of grassland and chaparral habitats at Site 4. The restoration of this site is most likely correlated with why there was both a badger and burrowing owl utilizing this site. These species and sign, such as older badger burrows, were not documented at any of the other three sites. Sites 1, 2, and 3 have been treated less than Site 4 and could highly benefit from several more treatments in the coming years.

Figure 1. Bobcat traveling through a recently mowed arundo stand.

2.0 INTRODUCTION

2.1 BACKGROUND & PURPOSE

The purpose of the Salinas River Wildlife Monitoring Study is to determine if the clearing of *Arundo donax* improves the ability for wildlife movement through various sites within the Salinas River. Arundo grows into very thick, large, and high-standing groves. Arundo outcompetes most other native plant species resulting in entire channels of the Salinas River consisting mostly of arundo.

Our study focused on areas that are highly constricted by tall and dense arundo stands, that may restrict species movement along the Salinas River. We set up field cameras to document if the removal of arundo improved the ability for wildlife to travel through the study sites by comparing camera data before and after arundo treatments.

This work was done to evaluate the effects of arundo removal as part of the RCD's Salinas River Arundo Eradication Program, which focuses on eradicating all the woody nonnative species (mostly arundo) in the floodplain. This study was funded by the California Wildlife Conservation Board (WCB), which provided most of the funding for the arundo control that occurred during the study period.

3.0 STUDY AREA

3.1 CAMERA MONITORING SITES

3.1.0 STUDY AREA

The study focused on areas that are highly constricted by dense *Arundo donax* groves and stands, that may restrict and hinder the ability for wildlife movement along the Salinas River. These areas were monitored before being cleared to create a baseline data set of wildlife movement through an untreated site. This data was used to compare whether clearing Arundo effectively improves the ability for wildlife movement by increasing the permeability through these constricted areas.

Within the study area, five study sites were chosen (Figure 2). Within Sites 1, 2, and 3, we set up four cameras, two cameras within dense stands of arundo and two cameras within native vegetation that was more permeable for wildlife movement than arundo. Sites that were to be treated were titled by site number and labeled as treated (T) and sites with more native vegetation that were not mowed or sprayed were considered control sites and labeled as C. Sites 4 and 5, consisted of a section of the river that had been treated multiple times over the past several years. Arundo in these sites was masticated in 2014, initially treated with herbicide in 2015, and sprayed again in 2016, 2017, and 2018. These sites were selected to compare to Sites 1,2, and 3 to compare with sites that had multiple treatments and less arundo in comparison.

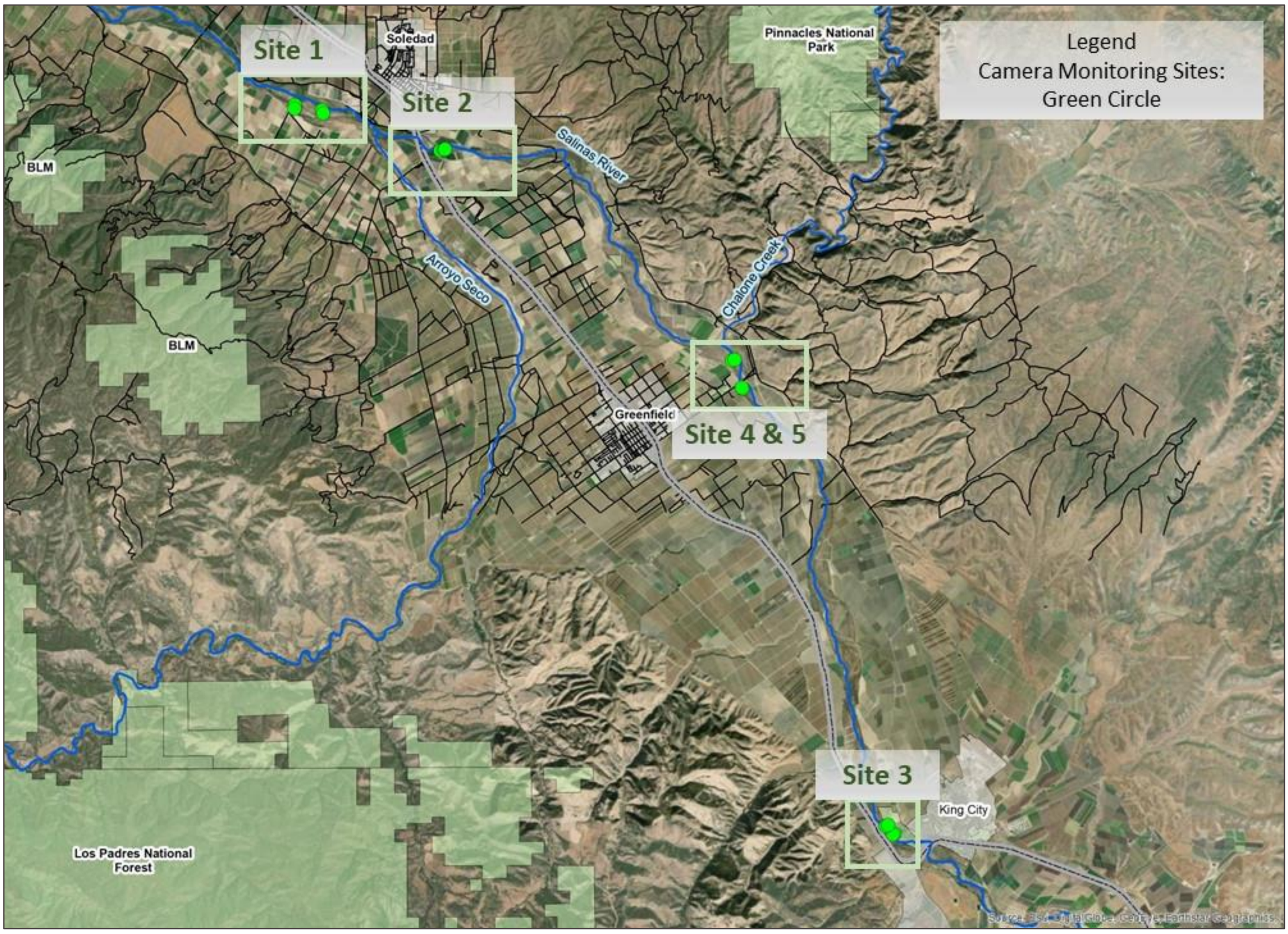

Figure 2. Camera monitoring sites (green circles).

4.0 METHODS

4.1 METHODS OVERVIEW

At each study site, we placed four passive infrared motion activated cameras, which come equipped with an Infrared LED flash for unobtrusive night detections (as opposed to the standard “white light flash” typically used on cameras). Two cameras were set up within thick arundo stands, and two were set up at areas with less arundo and more native vegetation (Figure 2). The cameras were set up in July and August 2019 and were monitored for two years until July 2021. The camera data were entered into a database by Pathways for Wildlife, which includes information on species recorded, number of animals, direction of travel, identification of individual animals and repeats of individuals, juveniles traveling with parents, date, time, temperature, moon phase, and relevant behavioral or ecological information. The study focused on documenting and recording mammals but did include relevant information on avian species, such as burrowing owls, which is a Species of Special Concern along with recording road runners, red-shoulder and red-tailed hawks.

It is important to note that the term "detection" is defined as the image of an animal captured by a motion activated camera and recorded into the database. For example, if a camera is programmed to capture a series of 9 images, and a deer triggers the camera and is captured in anyone (or all) of the 9 images, then that would equal one detection after it was entered into the database. If the same individual was recorded within the same time period, for example multiple set of 9 images of a deer browsing or bedded down, that individual was only recorded as one detection in the database. However, if that individual was recorded later in the same day traveling by the camera, that was recorded as a separate detection. Additionally, if a female deer with a fawn were to trigger the motion sensor of a camera, then that would equal two detections: one for the female, and one for the fawn. Also, if the same individual was recorded later in the week, it was recorded as a separate detection, but it is noted as the same individual within the notes section.

5.0 DATA RESULTS

5.1 TOTAL DETECTIONS BY SPECIES FOR THE STUDY AREA

The total detections recorded by the sixteen camera stations for all the study sites combined resulted in 5,451 animal detections (Table 1). The study sites with the highest rates of detections include Site 5B-C (721), Site 4B-C (653), and Site 3D-C (652). Site 5B-C and Site 4B-C were sites that were near arundo treatment areas that have undergone multiple treatments over several years.

Control Site	Total Number of Detections	Treatment Site	Total Number of Detections
Site 1A-C	584	Site 1B-T	100
Site 1C-C	488	Site1D-T	88
Site2A-C	140	Site 2B-T	51
Site 2C-C	290	Site 2D-T	40
Site 3B-C	400	Site 3A-T	208
Site 3D-C	652	Site 3C-T	304
Site 4B-C	653	Site 4A-T	166
Site 5B-C	722	Site 5A-T	565
Grand Total	**5451**		

Table 1. Total numbers of animals recorded at each study site.

The species with the highest rates of detections for all sites combined are, deer (1,865), wild pig (1,224), coyote (954), and bobcat (494) (Chart 1).

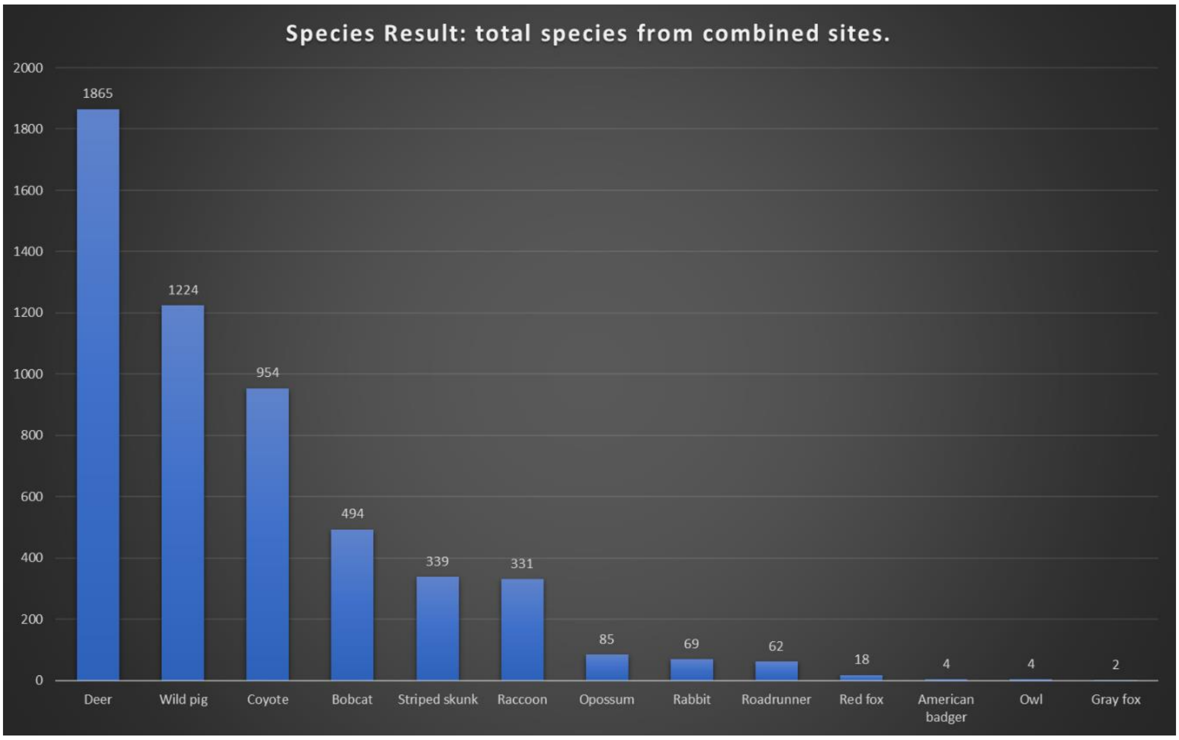

Chart 1. Total species recorded from all sites combined.

The sites with the highest biodiversity of species recorded are Sites 3, 4, and 5 (Chart 2). At Site 4, an American badger(*Taxidea taxus*) was recorded, which is a Species of Special Concern. Sites 4 and 5 were the sites that had multiple treatments over the past several years. These sites have a smaller percentage of arundo growing versus the other sites and consist mostly of native vegetation. This could account for the higher biodiversity recorded at these sites.

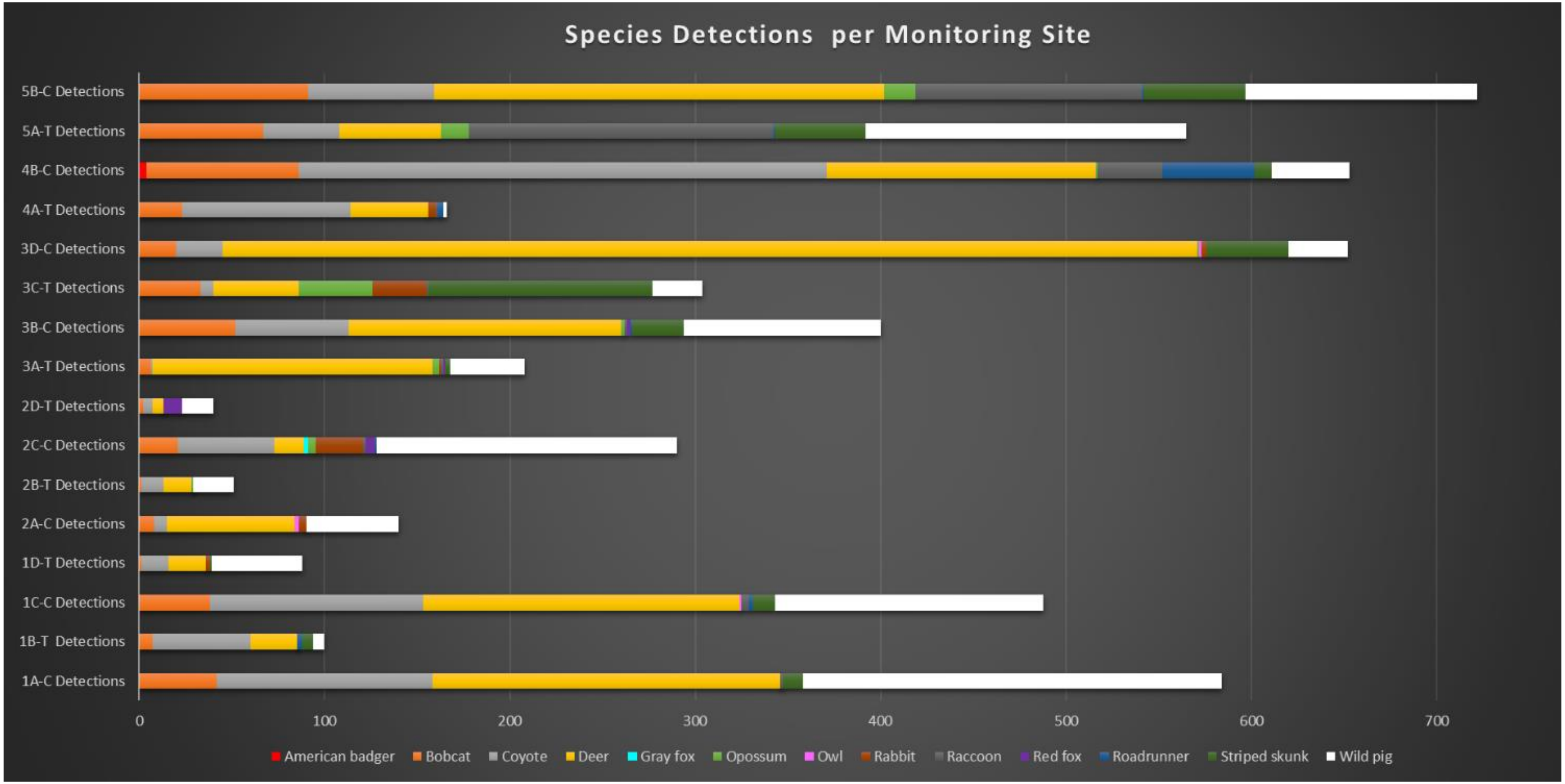

Chart 2. Species detection per site.

5.2 TOTAL DETECTIONS BY STUDY SITES

To note, there were some camera malfunctions and camera theft that is reflected as data gaps in several of the control versus treated charts. We took that into consideration when analyzing these data and interpreting the data. These data gaps also resulted in influencing some of the trends. Only the trends that had adequate data were reported on, while some data gaps were too large to be able to interpret the data or report any findings.

5.2.1 SITE 1 DATA RESULTS

Figure 3. Site 1 monitoring locations.

Site 1 had a total of 1,260 records (Table 2). The camera station with the highest rate of detections was Site 1A-C (584). The species with the highest rates of detections are wild pig (426), deer (404), and coyote (299).

Mowing occurred in October 2019. There was very little wildlife movement occurring in treated areas until the mowing occurred (Chart 3). After mowing there was an increase in wildlife movement in both the treated sites (Chart 3, and Figure 4).

However, there was a decline in detections as the arundo grew back (Chart 3, and Figure 5). There was a small spike in wildlife detections after treatment spraying. However, as the arundo grew back up to several feet high there were no detections recorded throughout the end of the study period in July (Chart 3).

Species	1A-C Detections	1B-T Detections	1C-C Detections	1D-T Detections	Species Grand Totals
American badger	0	0	0	0	0
Bobcat	42	7	38	1	88
Coyote	116	53	115	15	299
Deer	188	25	171	20	404
Gray fox	0	0	0	0	0
Opossum	0	0	0	0	0
Owl*	0	0	1	0	1
Rabbit	0	0	0	2	2
Raccoon	1	0	4	0	5
Red fox	0	0	0	0	0
Roadrunner	0	3	2	0	5
Striped skunk	11	6	12	1	30
Wild pig	226	6	145	49	426
Total	**584**	**100**	**488**	**88**	**1260**
Grand Total	**1260**				

Table 2. Site 1 species totals. Note that camera theft/malfunction resulted in missing data from Sites 1A-C, 1B-T, and 1C-C (see Chart 3). *Owl may be a barn owl but species could not be confirmed

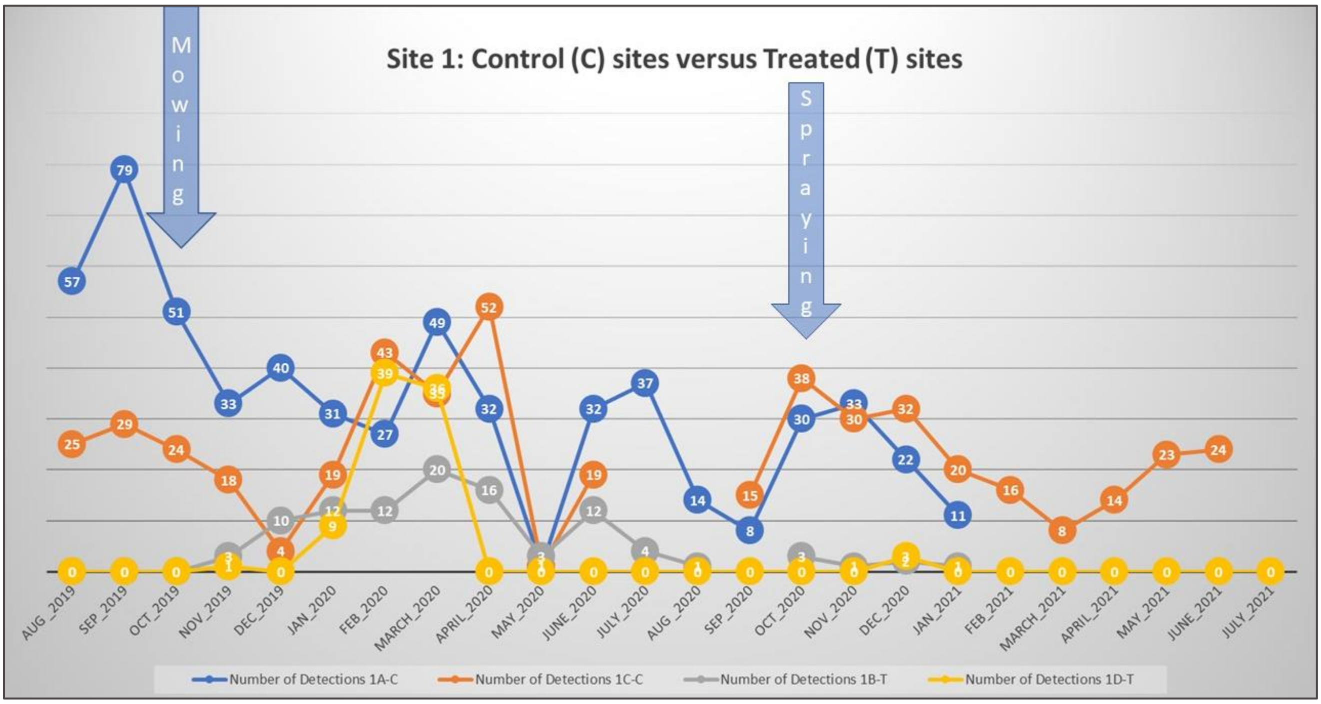

Chart 3. Site 1 control combined versus treated combined.

Figure 4. Site 1 Treated camera data results.

Figure 5. Site 1 Treated camera data results.

5.2.2 SITE 2 DATA RESULTS

Figure 6. Site 2 monitoring locations.

Site 2 had a total of 1260 records (Table 3). The camera station with the highest rate of detections was Site 2C-C (290). The species with the highest rates of detections include wild pig (251), deer (106), and coyote (76).

In October 2019, we had set up a stake with red tape at 1-foot intervals to measure the arundo growth at Site 2D-T (Figure 7). Mowing occurred in October 2019. There was very little wildlife movement occurring in treated areas until the mowing occurred (Chart 4). After mowing there was an increase in wildlife movement in both the treated sites from November to April 2020. (Chart 4, and Figure 7).

The arundo grew up to several feet tall over the following year post mowing at Sites 1, 2 and 3. Figures 4, 7, and 10 include examples of pre-mowing and post mowing. Within the camera photos, include the time and date stamps that document the rate of the arundo regrowth.

Species	2A-C Detections	2B-T Detections	2C-C Detections	2D-T Detections	Species Grand Totals
American badger	0	0	0	0	0
Bobcat	8	1	21	2	32
Coyote	7	12	52	5	76
Deer	69	15	16	6	106
Gray fox	0	0	2	0	2
Opossum	0	1	4	0	5
Owl*	2	0	0	0	2
Rabbit	4	0	26	0	30
Raccoon	0	0	1	0	1
Red fox	0	0	5	10	15
Roadrunner	0	0	1	0	1
Striped skunk	0	0	0	0	0
Wild pig	50	22	162	17	251
Total	**140**	**51**	**290**	**40**	**521**
Grand Total	**521**				

Table 3. Site 2 species totals. Note that camera theft/malfunction resulted in missing data from Sites 2A-C, 2B-T, and 2C-C (see Chart 4). *Owl may be a barn owl but species could not be confirmed

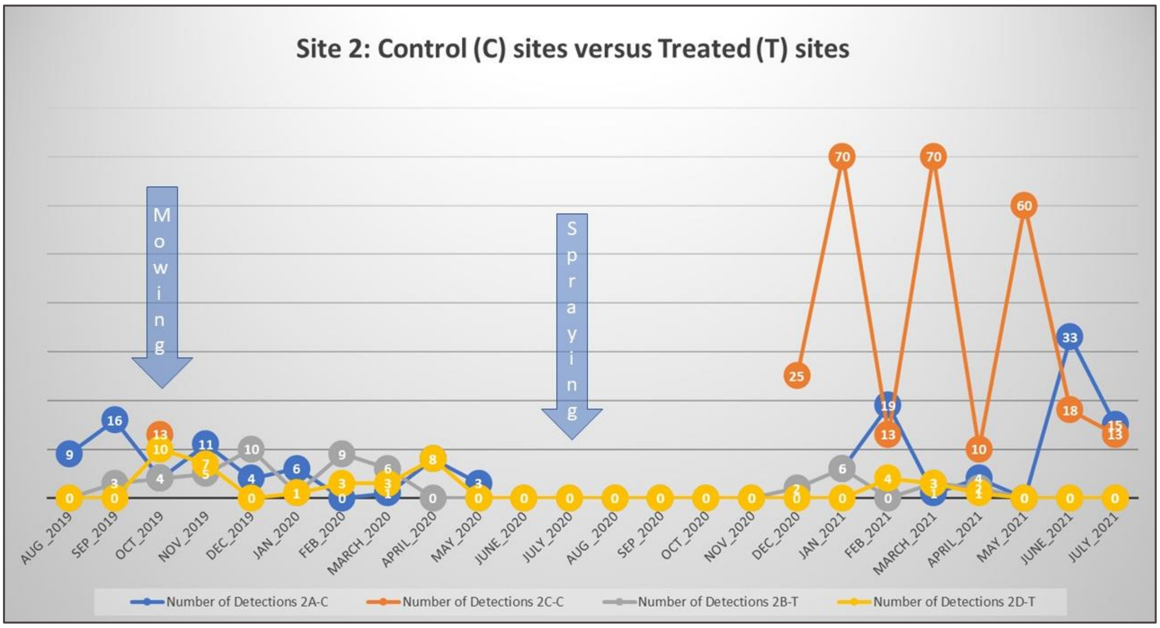

Chart 4. Site 2 control combined versus treated combined.

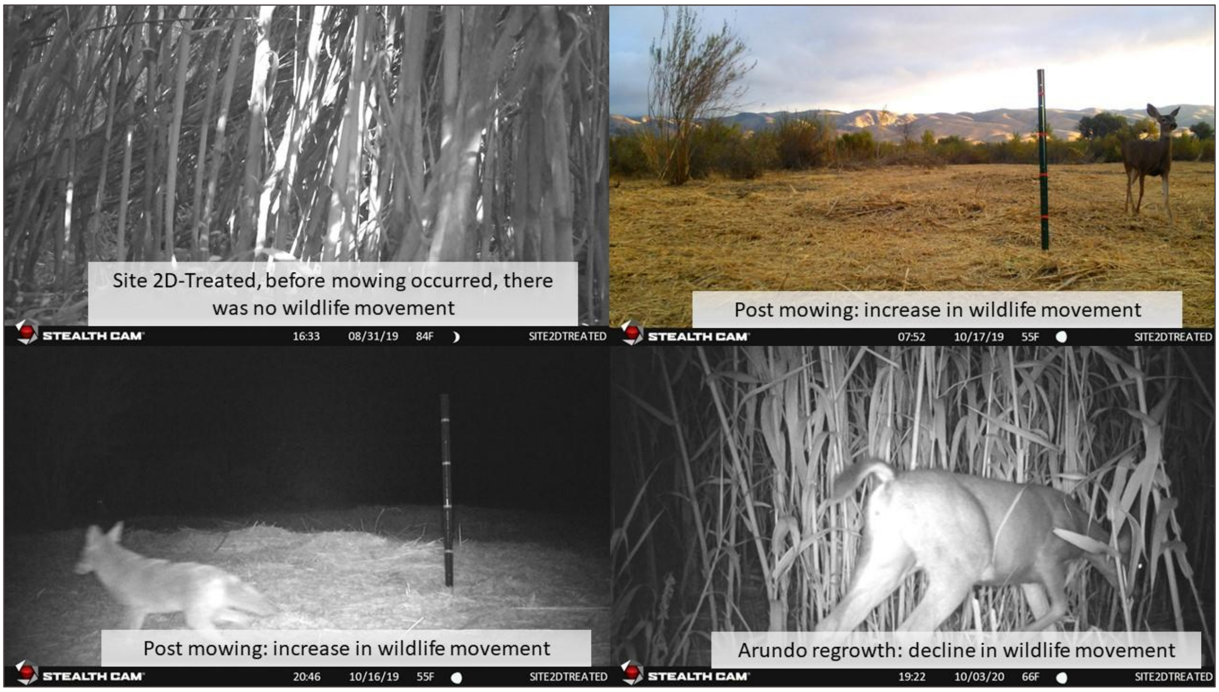

Figure 7. Site 2 Treated camera data results.

5.2.3 SITE 3 DATA RESULTS

Figure 8. Site 3 monitoring locations.

Site 3 had a total of 1,564 records (Table 4). The camera station with the highest rate of detections was Site 3D-C (652). The species with the highest rates of detections are deer (870), wild pig (205), and striped skunk (196).

Mowing occurred in September 2019. There was minimal wildlife movement occurring in treated areas until the mowing occurred (Chart 5). After mowing there was an increase in wildlife movement in both the treated sites (Chart 5 and Figure 10).

However, there was a decline in detections as the arundo grew back (Chart 5 and Figure 10). There was a small spike in wildlife detections after treatment spraying in August 2020. However, there was no detection recorded throughout the end of the study period in July 2021 (Chart 5). After the arundo was sprayed, the stands are dead but are also still standing tall and dense. The data indicate that mowing is more effective for creating permeability for wildlife movement.

Species	3A-T Detections	3B-C Detections	3C-T Detections	3D-C Detections	Species Grand Totals
American badger	0	0	0	0	0
Bobcat	6	52	33	20	111
Coyote	1	61	7	25	94
Deer	151	147	46	526	870
Gray fox	0	0	0	0	0
Opossum	4	2	40	1	47
Owl*	0	0	0	1	1
Rabbit	1	0	29	3	33
Raccoon	1	1	1	0	3
Red fox	1	2	0	0	3
Roadrunner	0	1	0	0	1
Striped skunk	3	28	121	44	196
Wild pig	40	106	27	32	205
Total	**208**	**400**	**304**	**652**	**1564**
Grand Total	**1564**				

Table 4. Site 3 species totals. Note that camera theft/malfunction resulted in missing data from Sites 3A-T, 3B-C, and 3D-C (see Chart 5). *Owl may be a barn owl but species could not be confirmed

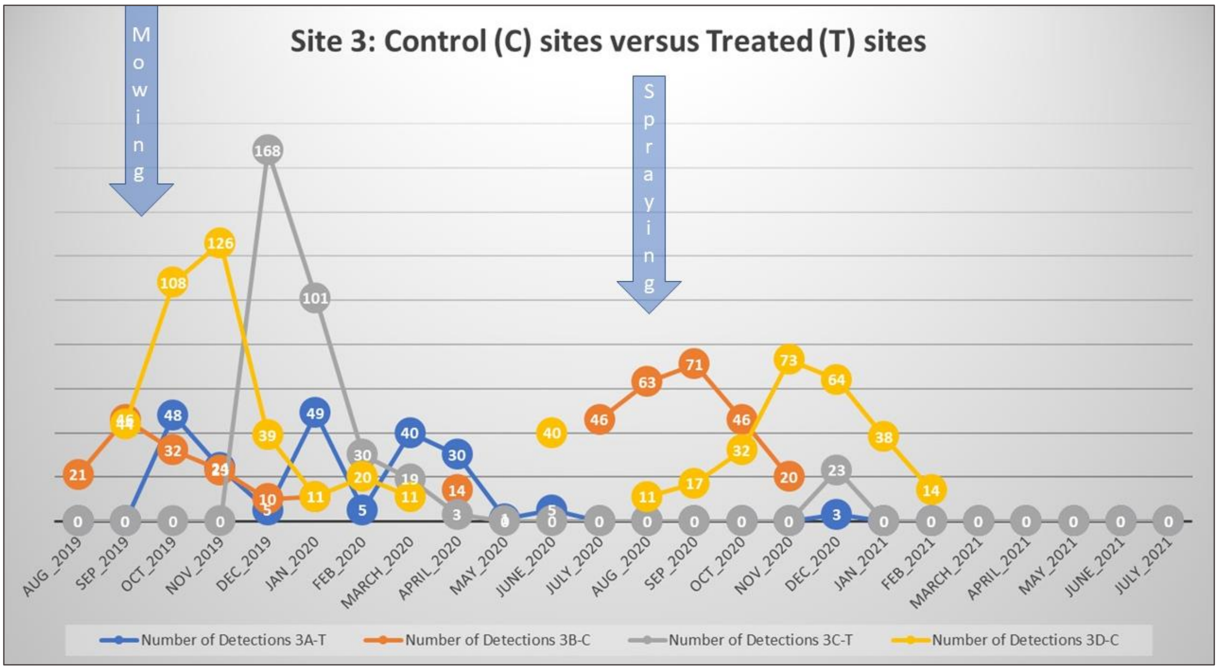

Chart 5. Site 3 control versus treated.

Figure 9. Site 3A-T in August 2019, before mowing occurred.

Figure 10. Site 3 Treated camera data results.

5.2.4 SITE 4 DATA RESULTS

Figure 11. Site 4 and 5 monitoring locations.

Site 4 had a total of 819 records (Table 4). The camera station with the highest rate of detections was Site 4B-C (652). The species with the highest rates of detections are coyote (376), deer (187), and bobcat (105).

As noted in the site selection process, Site 4 had previously gone through several treatments. These treatments included being mowed in fall 2014 and then sprayed in Spring 2015, Summer 2016, Summer 2017, and Summer 2018. The treatments resulted in successful restoration of the habitat within the study site (Figures 12 and 13). The majority of this site consisted of native vegetation such as chaparral, coyote brush, annual grasses, and native shrubs with a few and sparse arundo resprouts.

Species	4A-T Detections	4B-C Detections	Species Grand Totals
American badger	0	4	4
Bobcat	23	82	105
Coyote	91	285	376
Deer	42	145	187
Gray fox	0	0	0
Opossum	0	1	1
Owl	0	0	0
Rabbit	4	0	4
Raccoon	1	35	36
Red fox	0	0	0
Roadrunner	3	50	53
Striped skunk	0	9	9
Wild pig	2	42	44
Total	**166**	**653**	**819**
Grand Total	**819**		

Table 5. Site 4 species totals. Note that camera theft/malfunction resulted in missing data from Site 4A-T (see Chart 6)

For Site 4, unlike Site 1, 2, and 3, the trends for the control and the treated sites are very similar (Chart 6). For Sites 1,2, and 3, the only spikes in wildlife movement that correlate with the control is after the mowing occurred. However, for Site 4, the spikes in wildlife movement correlate with each other. The spikes of movement in a healthy restored landscape are usually a reflection of typical mammal species movement patterns which include searching for food and water during different seasons, males looking for mates in early spring, and juveniles dispersing in fall and winter to establish their own home range and facilitate movement between habitat patches for wildlife to find viable mates (Soulé &

Gilpin 1991, Beier 1995, Hilty et al. 2012). Both the control and treated sites in Site 4 are a good reflection of those types of animal movement patterns throughout the year (Chart 6).

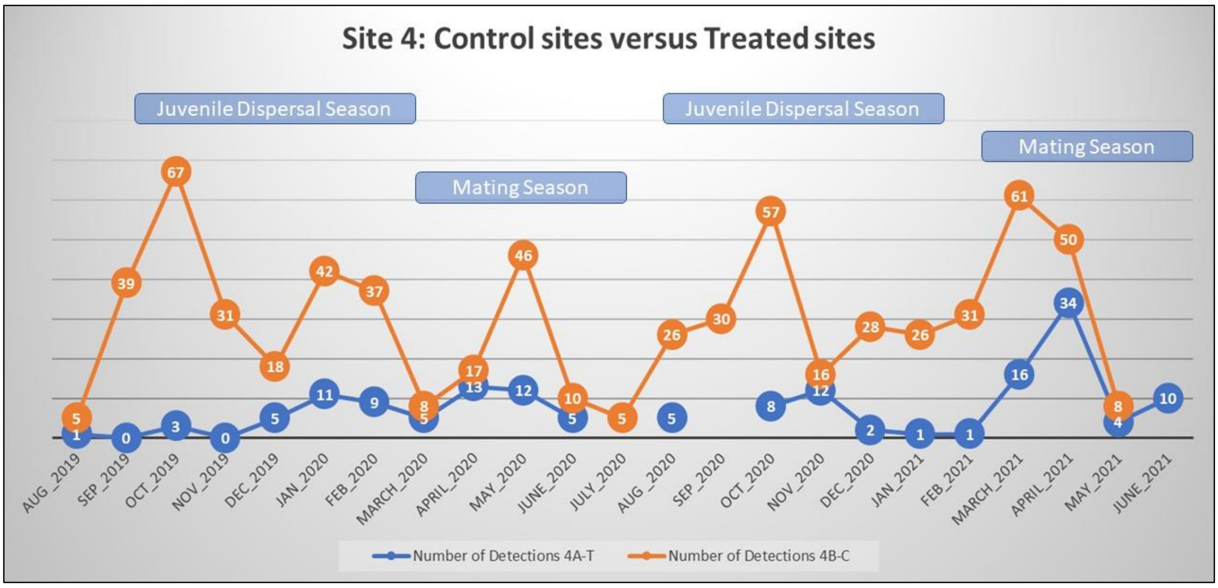

Chart 6. Site 4 control combined versus treated combined.

Figure 12. Site 4 landscape photo illustrating the effectiveness of the arundo removal with mostly native vegetation growing.

Figure 13. Site 4 Treated camera data results.

5.2.5 Site 5 Data Results

Site 5 had a total of 1,287 records (Table 6). The camera station with the highest rate of detections was Site 5B-C (722). The species with the highest rates of detections include wild pig (298), deer (298), and raccoon (286).

Site 5 also underwent the same multiple treatments as Site 4. These treatments included being mowed in Fall 2014 and then sprayed in Spring 2015, Summer 2016, Summer 2017, and Summer 2018.

Although there are some data gaps, the data which were collected also follows a similar pattern of the type of wildlife movements that occur throughout the year (Chart 7). There are an increase in wildlife detections during Fall, when juveniles disperse out of their home range to establish their own and then again in Spring when males expand their territories to look for mates (Chart 7). Both Sites 4 and 5 are good representatives and case studies for the long-term benefits of treatments in resorting native habitat and wildlife movement patterns (Figure 14).

Species	5A-T Detections	5B-C Detections	Species Grand Totals
American badger	0	0	0
Bobcat	67	91	158
Coyote	41	68	109
Deer	55	243	298
Gray fox	0	0	0
Opossum	15	17	32
Owl	0	0	0
Rabbit	0	0	0
Raccoon	164	122	286
Red fox	0	0	0
Roadrunner	1	1	2
Striped skunk	49	55	104
Wild pig	173	125	298
Total	**565**	**722**	**1287**
Grand Total	**1287**		

Table 6. Site 5 species totals. Note that camera theft/malfunction resulted in missing data from both Sites 5A-T and 5B-C (see Chart 7)

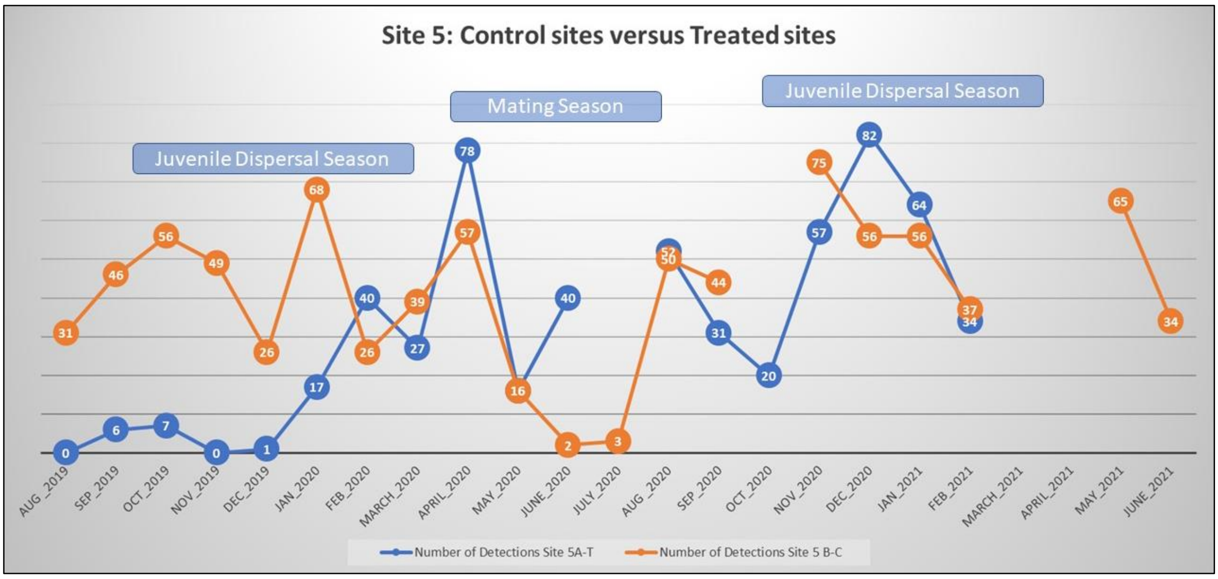

Chart 7. Site 5 control combined versus treated combined.

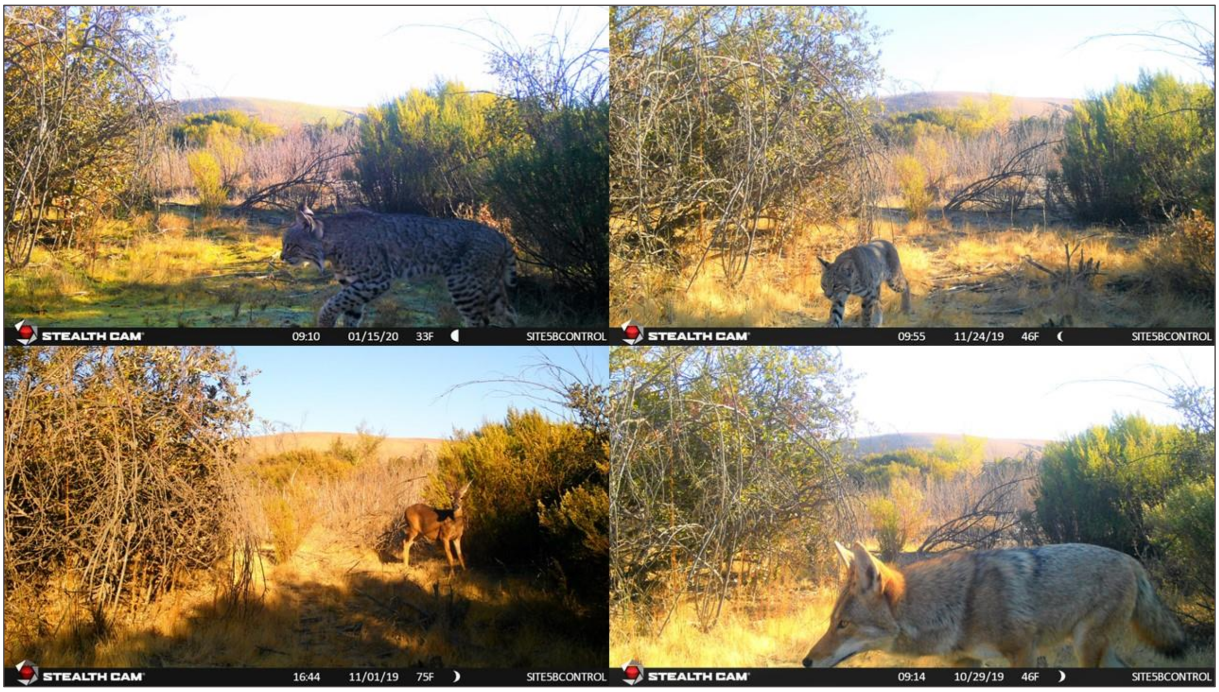

Figure 14. Site 5 Control camera data results.

Figure 15. Site 5 Treated camera data results.

5.3 CONTROL VERSUS TREATED: SITES 1-3.

We combined the data results of all the control and treated sites (Chart 8).

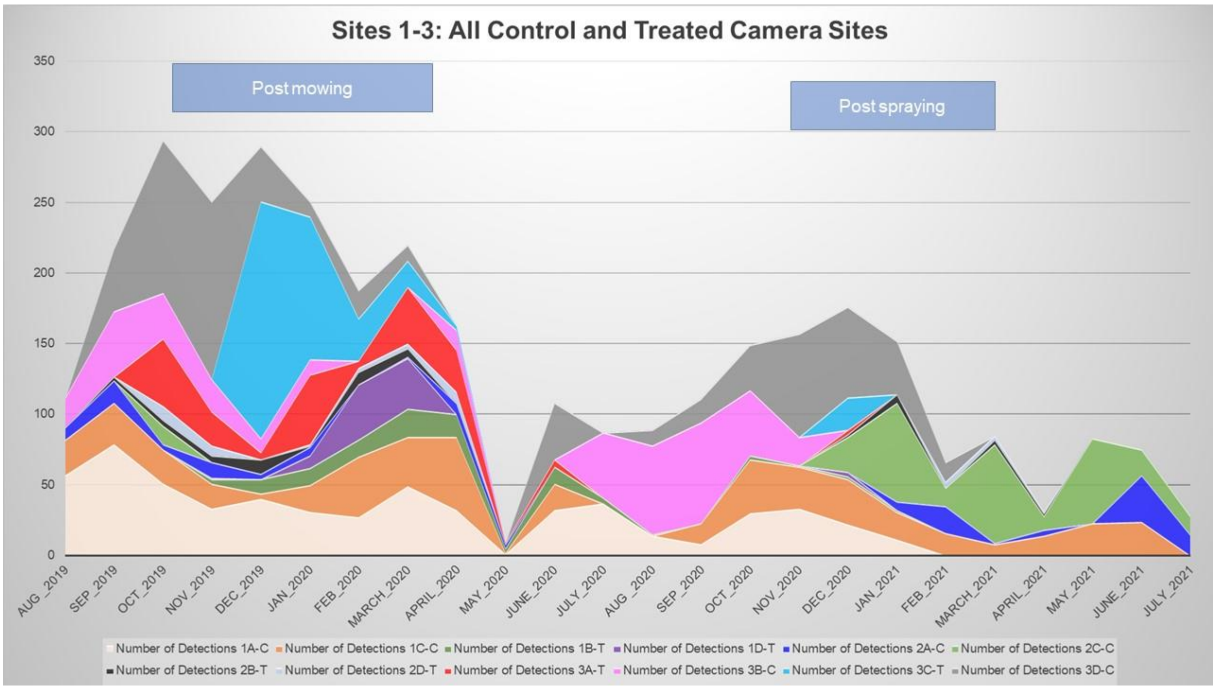

Chart 8. Sites 1-3 control combined versus treated combined camera sites.

When comparing the two treatment methods, it seems that mowing might be the most optimal solution for enhancing wildlife movement, as well as promoting natural vegetation regrowth. The reason is because after treatment spraying, the stalk of the arundo is left standing, even though it may no longer be able to grow or spread seed. Having the dead arundo stalk presents a natural barrier which obstructs wildlife movement. With this obstruction, wildlife must navigate around the arundo stalks.

However, after mowing, the arundo is not left standing. This creates a more open landscape enhancing visibility. Moreover, wildlife aren't faced with the vegetation barrier the arundo creates with their stalks, and as a result, wildlife are left with a more navigable terrain.

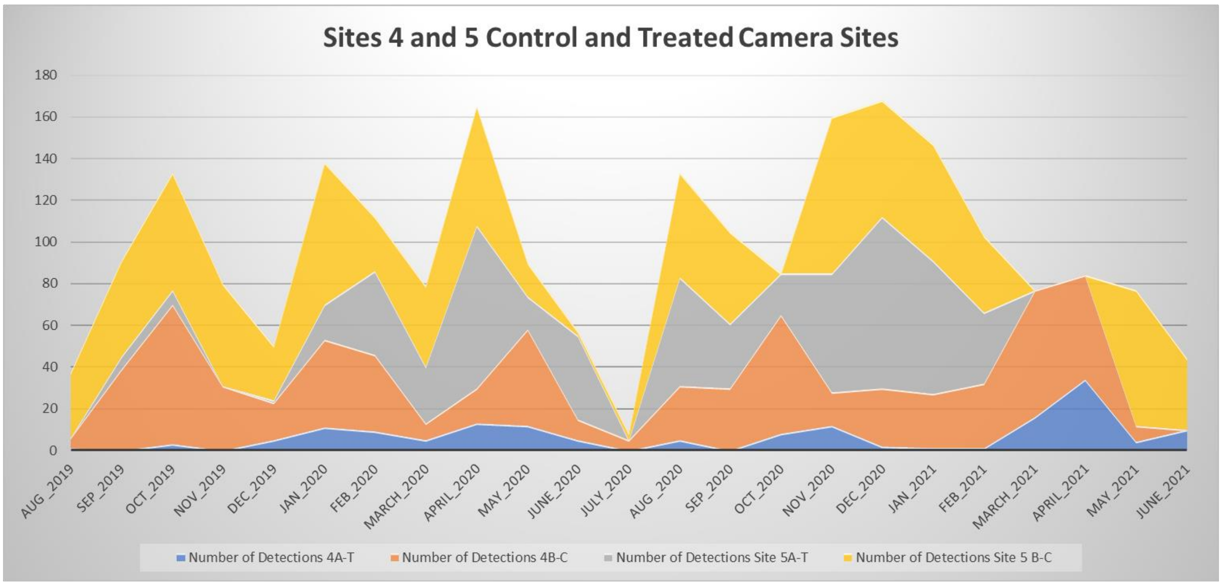

Chart 9. Sites 4 and 5control combined versus treated combined camera sites.

The RCDMC may want to consider mowing after spraying. However, the data show that after several years of treatment (Sites 4 and 5) arundo stalks break down and the problem of standing dead canes restricting movement diminishes (Chart 9).

6.0 SPECIAL STATUS SPECIES AT SITE 5 GREENFIELD

There were two special status species recorded and documented at one of the study sites. At Site 4 Greenfield, an American badger and burrowing owl, were both recorded (Figures 16-19). Interestingly, both these species are grassland specialist, which means they are typically not found in other types of habitats and need grassland habitats to reside in (Long 1983). Site 4 Greenfield has been treated five times over the duration of five consecutive years (2014, 2015, 2016, 2017, and 2018). The result is that the arundo is very sparse with just a few small patches compared to Sites 1, 2, and 3, in which arundo is the most abundant and dominant plant species. Sites 1, 2, and 3 have been treated less than Site 4 and could highly benefit from several more treatments in the coming years.

The treatments have resulted in successfully restoring native habitats and allowed for the regeneration of grassland and chaparral habitat at Site 4 (Figures 12 and 13). The restoration of this site is most likely correlated with why there was both a badger and burrowing owl utilizing this site. These species and sign, such as older badger burrows, were not documented at any of the other three sites (Chart 12).

Figure 16. Site 4 American badger camera data results.

Figure 17. Site 4 American badger burrows.

Figure 18. Site 4 American badger burrows.

Figure 19. Site 4 Burrowing owl, live sighting and recording. Note this was not captured at one of the monitoring sites but was seen in a nearby area, so data is not recorded in the tables and charts.

7.0 DISCUSSION

The long-term treatments and habitat restoration at Sites 4 and 5 Greenfield are most likely attributing to the presence of sensitive species such as badgers and burrowing owl. Both these species have low densities throughout the Central Coast due to habitat loss and fragmentation (Quinn 2008). Habitat restoration within the Salinas River is critical to help maintain these species' ability to find suitable habitat to reside, forage, and travel through for finding viable mates and juvenile dispersal out of natal home ranges.

In the Salinas River, the arundo grows into very thick large stands, which we found through this study act as a natural barrier and restricts the ability for wildlife to move along the Salinas River. This is evidenced by the low wildlife detections in the treated sites before mowing, followed by increases after mowing, and subsequent decreases as arundo regrew.

The ability for wildlife to move along the Salinas River is essential as much of the river is surrounded by wildlife-exclusionary fenced agricultural fields. Wildlife must have the ability to travel through landscapes as species need to access necessary resources such as food and water (Soulé & Gilpin 1991), provide access for juvenile dispersal (Beier 1995), and facilitate movement between habitat patches for wildlife to find viable mates (Hilty et al. 2012).

By creating more permeability for wildlife movement through the Salinas River, this increases the ability for wildlife to find suitable mates and for juveniles to disperse out of their parental home ranges, which is especially critical for carnivores who tend to defend their home ranges. We recorded families of coyotes, bobcats with kittens, and deer with juveniles in the treated sites, which may be a reflection of the benefits of creating better conditions by increasing the amount of available habitat beyond animals traveling in search of food and water.

The Salinas River plays a critical role as a wildlife and habitat linkage by connecting the surrounding mountain ranges. As the Salinas Valley becomes increasingly fragmented due to human development and land use, the remaining habitat and linkages connecting them are necessary to identify in order to conserve animal populations and prevent local extinctions (Soulé & Terborgh 1999).

Currently, the Central Coast mountain lion population is under review as a candidate species for listing. This is due to the population having a very low effective genetic population size. An effective population size of 50 is needed to prevent inbreeding depression in the short term. The Central Coast North (CC-N) which includes the counties of Santa Cruz and Santa Clara has a very low effective population size of Ne 16.6 and are at risk (Gustafson et al. 2018). Habitat fragmentation due to wildlife exclusionary fencing along with Salinas River is greatly attributed to the fragmentation of the Central Coast. While we did not capture mountain lion on the wildlife cameras during this study, mountain lions and their sign have been observed recently in the Salinas River riparian corridor. Ensuring the ability for mountain lion movement through the Salinas River watershed is critical.

This illustrates the importance of RCDMC's work in continuing removal of the arundo to increase the permeability of the Salinas River watershed as we have documented 1) mowing and multiple years of follow-up treatments are highly effective in increasing the permeability for wildlife movement, 2) multiple species were documented at each site, and 3) Wildlife are traveling and breeding within the watershed.

8.0 ACKOWLEDGMENTS

We would like to thank the Resource Conservation District of Monterey County for funding this study and their partnership on the project. We deeply appreciate all the excellent work that the RCD of Monterey County is doing to restore this critical watershed in the Central Coast. Thank you also to the Wildlife Conservation Board for funding and supporting this study.

We would also like to thank our project manager, Emily Zefferman, for designing this study and working together in ensuring the success of the project. We also want to thank Emily for working with the various landowners to access the properties and set up the study sites. Many thanks to all the landowners who gave us access and collaborated on the project, we very much appreciate it.

Figure 20. Site 2 in October 2019 after the mowing occurred.

9.0 LITERATURE CITED

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10.0 APPENDIX A: SITE 1-4 CONTROL SITE CAMERA DATA

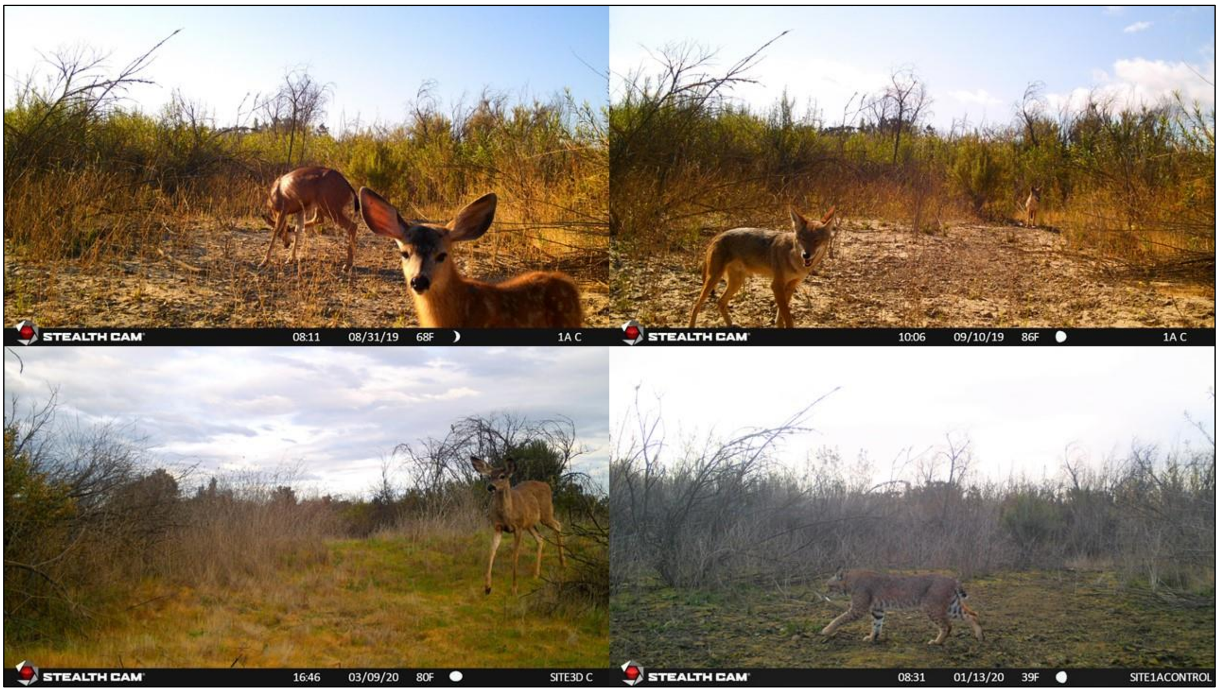

Figure 21. Site 1 Control Camera Data

Figure 22. Site 2 Control Camera Data

Figure 23. Site 3 Control Camera Data

Figure 24. Site 4 Control Camera Data

Figure 25. Site 4 Control Camera Data