
**MUSTARD REMOVAL AT THE
DESERT TORTOISE RESEARCH NATURAL AREA,
KERN COUNTY, CALIFORNIA**

Prepared for

**Desert Tortoise Preserve Committee, Inc.
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Prepared by

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28 July 2006

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ABSTRACT

To protect, conserve, and enhance habitat in the Desert Tortoise Research Natural Area (DTRNA) for native species and to eliminate sources of deterioration and loss, the Desert Tortoise Preserve Committee initiated a mustard removal program in an attempt to eradicate the invasive, exotic Mediterranean mustard (*Hirschfeldia incana*). During the first effort, 5,410 Mediterranean mustard plants, weighing about 1,488 kg (wet weight) were removed from the Cache Creek area in the northern portion of Section 6, Township 32 South, Range 38 East. A complete removal of this mustard was not possible during allotted time, and thousands of plants still remained along Cache Creek in the southern portion of Section 6. I recommend that an effort to remove Mediterranean mustard occur every year until it is eradicated.

During the removal effort, the western and northwestern boundaries of the DTRNA were assessed for additional infestations of Mediterranean mustard and for infestations of other exotic species. Mediterranean mustard was observed throughout Cache Creek. Tumble mustard (*Sisymbrium altissimum*) was scattered throughout the area but was concentrated along the boundary fence in Section 18, Township 31 South, Range 38 East. Russian thistle (*Salsola tragus*) was mainly concentrated along the western edge of Section 5, Township 31 South, Range 38 East. Both of these species have the potential to infest the interior sections of the DTRNA, if left unchecked. I recommend that these species be eradicated along with the Mediterranean mustard.

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INTRODUCTION

BACKGROUND

The Desert Tortoise Preserve Committee (DTPC) works with Federal and State agencies to implement the *Sikes Act Management Plan for the Desert Tortoise Research Natural Area and Area of Critical Environmental Concern* (DTRNA ACEC Plan) at the Desert Tortoise Research Natural Area (DTRNA). Goal 3 of the DTRNA ACEC Plan is “to protect, conserve, and enhance habitat in the DTRNA for native species and to eliminate sources of deterioration and loss”. Recently, occurrences of the invasive exotic Mediterranean mustard (*Hirschfeldia incana*) have been observed at locations within and around the DTRNA. In spring 2006, the Mediterranean mustard was particularly prevalent along Cache Creek, in the southwestern portion of the DTRNA.

SPECIES ACCOUNT

Mediterranean mustard, as the name implies, is native to the Mediterranean region. It has invaded the western United States and is now common throughout Southern California, occurring in disturbed areas, fields, along roadsides, and in creek bottoms below 1,524 m in elevation. It is an erect, canescent annual, biennial or short-lived perennial that can grow up to one meter tall. Stems branch from the base; the leaves are both cauline and basal. The basal leaves form a rosette and are 2.5 to 10.2 cm long. They are lyrate-pinnatifid, each having a large terminal lobe and several pairs of somewhat separated, smaller leaflets or lobes. The cauline leaves are reduced, non-clasping, sessile, and dentate to lobed. The Mediterranean mustard blooms from May to October. The flowers are in terminal racemes; the fruits are short-beaked siliques, 1.3 cm long, erect, and appressed to the stem. The seeds are one row per chamber, spherical, and reddish brown (Charters 2006, Hickman 1993).

OBJECTIVES

In spring 2006, a mustard removal program was initiated at the DTRNA. One objective of this program was to fulfill Goal 3 of the DTRNA ACEC plan by hand removing

Mediterranean mustard from the Cache Creek area with the aim of its eventual elimination from the DTRNA and adjacent DTPC lands. This action is covered under the Bureau of Land Management's National Environmental Policy Act document (EA CA-650-2005-08, ROD/FONSI signed on 21 February 2006). A second objective of the program was to assess the western and northwestern boundaries of the DTRNA for additional infestations of Mediterranean mustard and for infestations of other exotic mustard species (e.g., *Sisymbrium* spp.) and Russian thistle (*Salsola tragus*).

STUDY SITE LOCATION

The project site for the removal of the Mediterranean mustard is located along Cache Creek where the wash passes through the DTRNA in the western portion of Section 6, Township 32 South, Range 38 East MDBM (Figure 1). The elevation ranges from 683 to 692 m. Mediterranean mustard occurs in the creek bed as well as along its banks. Most plants are confined to the banks of the creek, out 20 m from its center. However, in some locations, they extend out 50 m or more from the center of the wash, especially in the southern portion of Section 6. For this initial removal effort, the primary work area is defined as the bottom of the wash out 50 m on either side of the wash in Section 6. The length of the wash in Section 6 is approximately 2.3 km; therefore the study area encompassed 23 ha.

The project area for the assessment of other infestations of other exotic species included the western and northwestern boundaries of the DTRNA, in Sections 5, 8, 18, 19, 30, and 31, Township 31 South, Range 38 East.

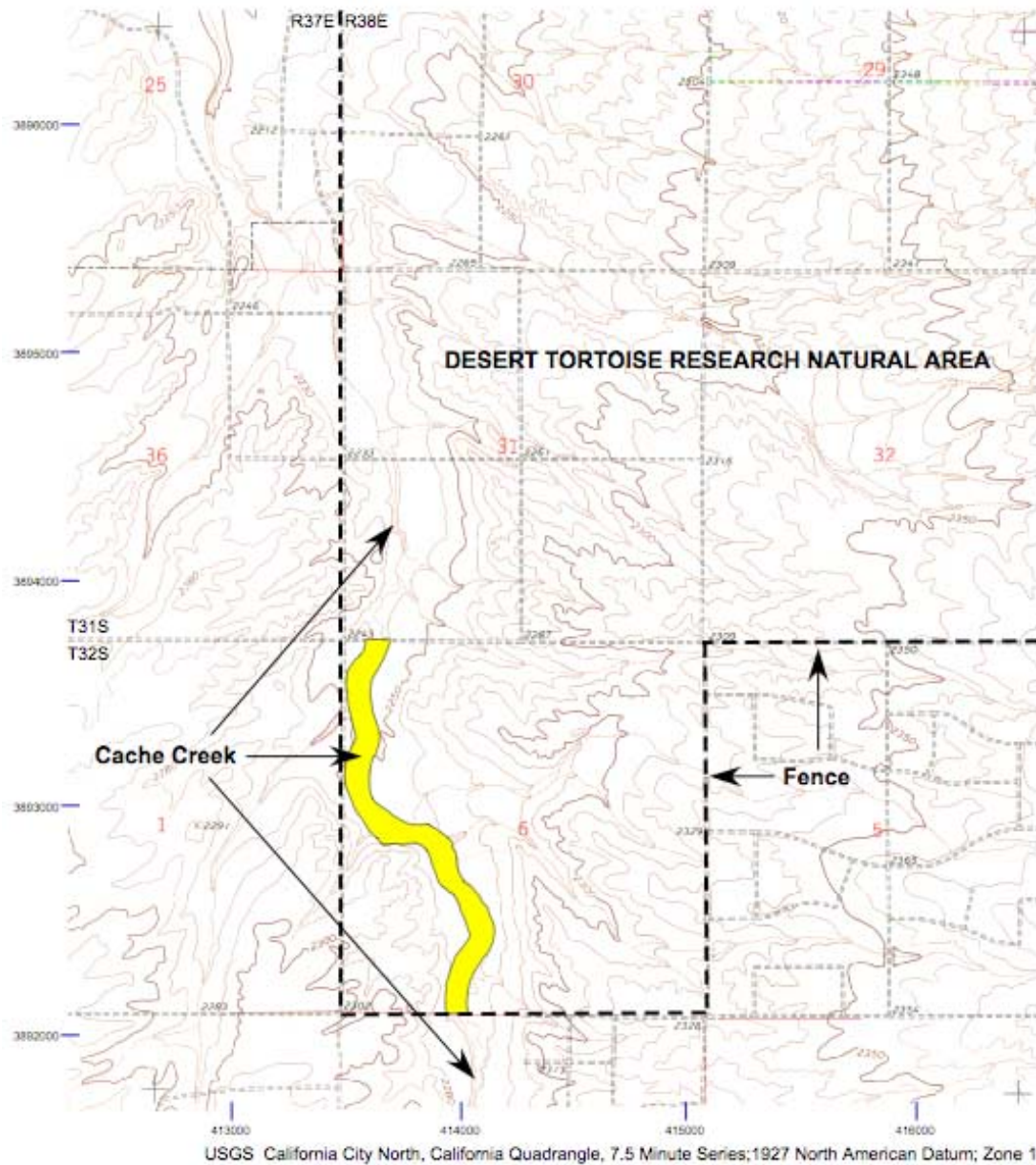
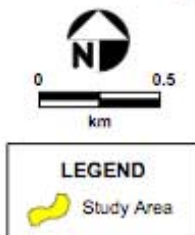


Figure 1. Study area for the 2006 mustard removal effort along Cache Creek at the Desert Tortoise Research Natural Area, Kern County, California



METHODS

MUSTARD REMOVAL

Mustard removal at the DTRNA was conducted by biological technician Mr. Ashley Sutton. Prior to initiating the mustard removal program, I conducted a worker education program for Mr. Sutton, identifying the mustard problem and the work areas and discussing the distribution, general behavior, and ecology of the desert tortoise (*Gopherus agassizii*), its sensitivity to human activities, the protection afforded the desert tortoise by both the federal and State Endangered Species Acts, and the procedures for reporting contacts with desert tortoises. Mr. Sutton was instructed to examine areas for tortoises, tortoise burrows, and other wildlife before extracting mustards and to check under his vehicle for tortoises before driving.

Mediterranean mustard was removed along Cache Creek, beginning at the northern end of Section 6, Township 32 South, Range 38 East and continuing southward (Figure 1). The beginning and ending locations of each day's effort were recorded using a hand-held Global Positioning System unit. Photographs of the work area, before and after mustard removal, were also taken.

Mediterranean mustard was removed by hand or by using a shovel. At the time of the removal effort, the mustards were mostly in flower and had not yet set seed. Therefore, each plant, in its entirety and including the taproot, was removed, disturbing as little of the soil as possible, and placed in a large, heavy-duty plastic garbage bag. If the plants had set seed, then the flowering and fruiting heads were cut off and bagged prior to digging up the taproot to reduce seed dispersal. When bags were full, they were carried to a truck or truck and trailer parked outside the DTRNA boundary. They were then taken to a landfill, either in Mojave or in Ridgecrest.

During the removal effort Mr. Sutton kept a journal, recording work hours, weather conditions at the start and end of each workday, the coordinates of the daily work area, estimates of the number and weight of plants removed, and any encounters with state and/or federally listed species or other sensitive species.

After Mr. Sutton expended his allocated time on this project, I visited the study site to assess the completeness of the removal effort.

ASSESSMENT OF OTHER INFESTATIONS OF EXOTIC SPECIES

To identify other potential problems with invasive species on the west side of the DTRNA, I walked along both sides of Cache Creek in Sections 18 and 31, Township 31 South, Range 38 East as well as 2 transects inside the western and northwestern boundaries in Sections 5, 18, 19, and 30, Township 31 South, Range 38 East (Figure 2). The first transect was 15-20 m inside the boundary fence; the second transect was between 50 and 100 m inside the boundary fence. To evaluate Section 8, Township 31 South, Range 38 East, I drove along the edge of the section. Species of concern included any invasive exotic species, except for the bromes (*Bromus* spp.), Mediterranean grass (*Schismus* spp.), and red-stemmed filaree (*Erodium cicutarium*), which are abundant and widespread on the DTRNA. Each species was identified and the extent of infestation was outlined on a topographic map. Population densities were not determined.

If any state and/or federally listed species or other sensitive species was observed on the study site during the work effort, then a California Native Species Field Survey Form was completed and sent to the California Natural Diversity Data Base.

RESULTS

MUSTARD REMOVAL

The mustard removal program at the DTRNA was conducted from May 4 to May 26, 2006. The time expended on the removal of Mediterranean mustard along Cache Creek in Section 6, Township 32 South, Range 38 East, totaled 80.5 person-hours. Mediterranean mustards were removed from an area along Cache Creek measuring approximately 1,200 m long by 100 m wide, or 12 ha (Figure 2). The estimated number of plants totaled 5,410, with a wet weight of about 1,488 kg (3,280 lbs). Daily notes for the effort appear in Appendix A. A daily summary of effort is in Table 1. Photographs of the removal effort are provided in Appendix B.

Mediterranean mustard could not be eliminated from the remainder of the study site in the 80 person-hours allotted for this project. As a result, approximately 1,100 m of Cache Creek and both banks went untreated (Figure 2).

ASSESSMENT OF OTHER INFESTATIONS OF EXOTIC SPECIES

The western and northwestern boundaries of the DTRNA were evaluated for the presence and extent of other invasive species on May 4 and May 12, 2006. An area measuring approximately 11,550 m by 100 m, or 115.5 ha, was covered during the evaluation. Time expended for this effort totaled 12.75 person hours. A summary of effort is in Table 2. Daily field notes are provided in Appendix C. Exotic species [other than red-stemmed filaree, brome, and Mediterranean grass] that were observed, and their abundances in each section, are listed in Table 3. The locations of these species are mapped in Figures 3 and 4.

The most abundant exotic species along the western and northwestern boundaries of the DTRNA were the Mediterranean mustard and tumble mustard (*Sisymbrium altissimum*). The Mediterranean mustard was mainly confined to the banks of Cache Creek in Sections 18 and 31 (Figures 3 and 4). In both of these areas this mustard extended out 15-20 m from the center of the creek on each side. In Section 18, hundreds of plants were noted, while in Section 31,

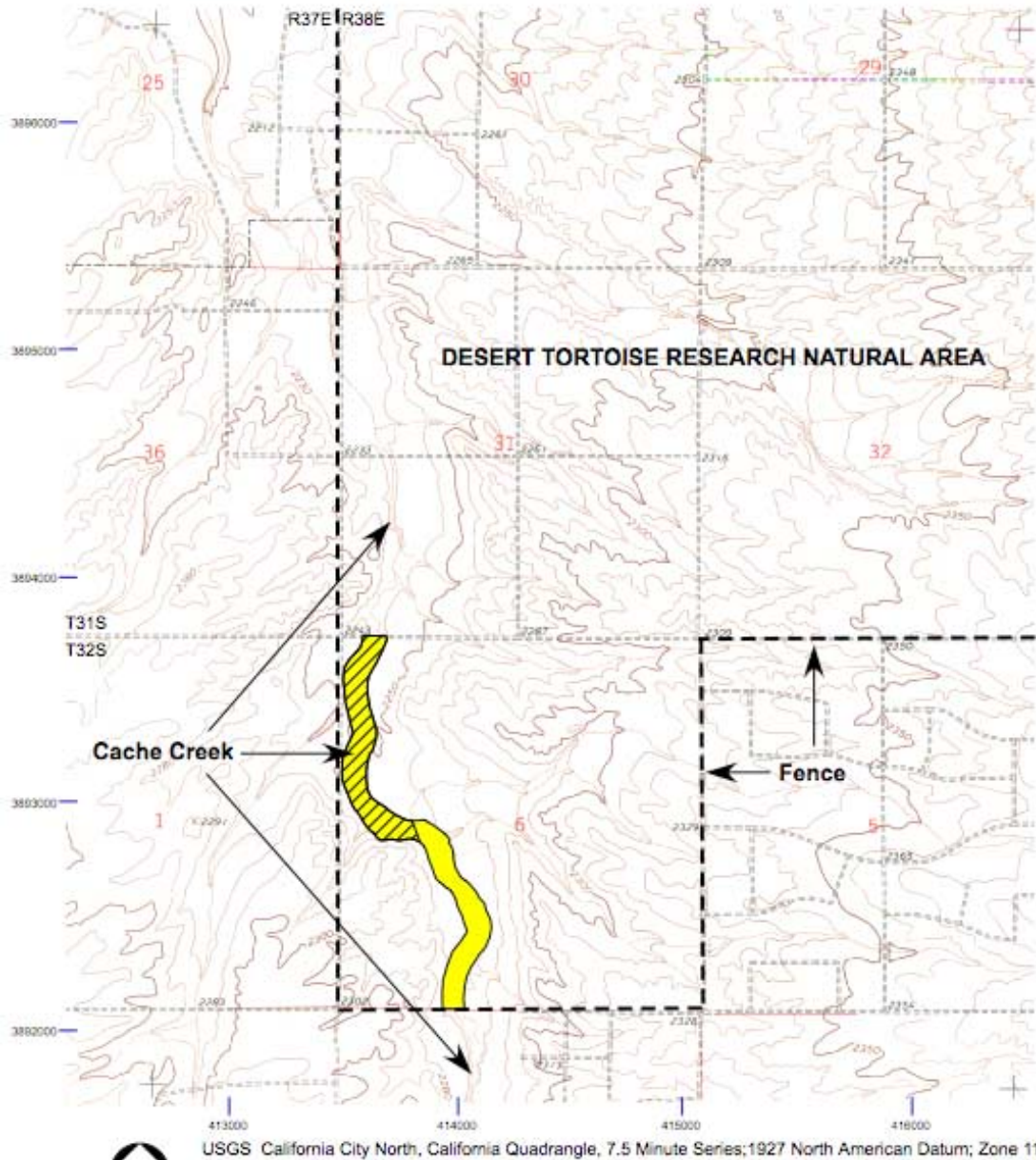


Figure 2. Portion of the study area where Mediterranean mustard was removed in 2006, Desert Tortoise Research Natural Area, Kern County, California



Table 1. Daily summary of effort during the mustard removal program at the Desert Tortoise Research Natural Area in 2006.

DATE 2006	WORKER	ACTIVITY	TIME PERIOD	TOTAL HOURS	WEATHER CONDITIONS	START COORDINATES (11S NAD83)	END COORDINATES (11S NAD83)	ESTIMATED NUMBER OF PLANTS	ESTIMATED WEIGHT OF PLANTS
May 4	Sutton & LaBerteaux	worker education	0730-0830	2.0					
May 4	Sutton	removal	0830-1630	8.0	21.1-24.2°C wind 0.8-1.1 kph 0-70% cloud cover	0413647E 3893883N	0413573E 3893569N	430	90.7 kg (200 lbs)
May 6	Sutton	removal	1030-1630	6.0	26.4-27.5°C wind 1.8-3.4 kph 15-20% cloud cover	0413574E 3893599N	0413610E 3893411N	440	127.0 kg (280 lbs)
May 7	Sutton	removal	1030-1630	6.0	26.8-32.7°C wind 1.0-1.3 kph 0% cloud cover	0413610E 3893411N	0413555E 3893352N	400	113.4 kg (250 lbs)
May 10	Sutton	removal	0730-1230 1445-1745	8.0	24.4-35.6°C wind 0.0-0.9 kph 0-60% cloud cover	0413610E 3893411N	0413553E 3893377N	400	181.4 kg (400 lbs)
May 11	Sutton	removal	0730-1200 1745-1945	6.5	28.3-34.9°C wind 0.0-1.5 kph 10-40% cloud cover	0413555E 3893352N	0413570E 3893236N	1200	317.5 kg (700 lbs)
May 12	Sutton	removal	0630-1230 1630-1930	9.0	16.1-37.2°C wind 0.7-1.3 kph 10-60% cloud cover	0413570E 3893352N	0413585E 3893163N	400	113.4 kg (250 lbs)
May 13	Sutton	removal	0700-1500	8.0	min. 21.2°C wind 1.7 kph 0% cloud cover	0413570E 3893236N	0413570E 3893236N	300	113.4 kg (250 lbs)
May 18	Sutton	removal	0630-1130 1500-1900	9.0	max. 37.9°C wind 1.3 kph 0% cloud cover	0413667E 3893108N	not recorded	400	90.7 kg (200 lbs)
May 24	Sutton	removal	0600-1300 1400-1700	10.0	not recorded	0413679E 3893152N	0413720E 3893014N	920	204.1 kg (450 lbs)
May 25	Sutton	removal	0600-1600	10.0	not recorded	0413720E 3893014N	0413811E 3893046N	520	136.1 kg (300 lbs)
May 26	LaBerteaux	assessment of effort	0900-1200	3.0	24.0-30.0°C wind 8.3-13.5 kph 2-10% cloud cover				

Table 2. Daily summary of effort during the assessment of other infestations of exotic species at the Desert Tortoise Research Natural Area in 2006.

DATE 2006	WORKER	ACTIVITY	TIME PERIOD	TOTAL HOURS	WEATHER CONDITIONS	START COORDINATES (11S NAD83)	END COORDINATES (11S NAD83)	SECTIONS EVALUATED (T31S, R38E)	WIDTH OF AREA COVERED
May 4	LaBerteaux	weed assessment	0845-1630	7.75	20°C wind 7.5 kph 2% cloud cover	0413647E 3893883N	0413701E 3899901N	30, 31, 19, 18 (western edges)	100 m (out to 250 m in some locations)
May 12	LaBerteaux	weed assessment	0730-1230	5.0	24.0-35.0°C wind 1.0-1.2 kph 35-50% cloud cover	0413701E 3899901N	0416313E 3902838N	18 (western and northern edges), 8 (western edge), 5 (western and northern edges of SW1/4)	100 m in Sections 5 and 18 (out to 200 m in some locations); 25 m in Section 8

Table 3. Exotic species observed and their abundance, by Section, at the Desert Tortoise Research Natural Area on May 4 and May 12, 2006¹.

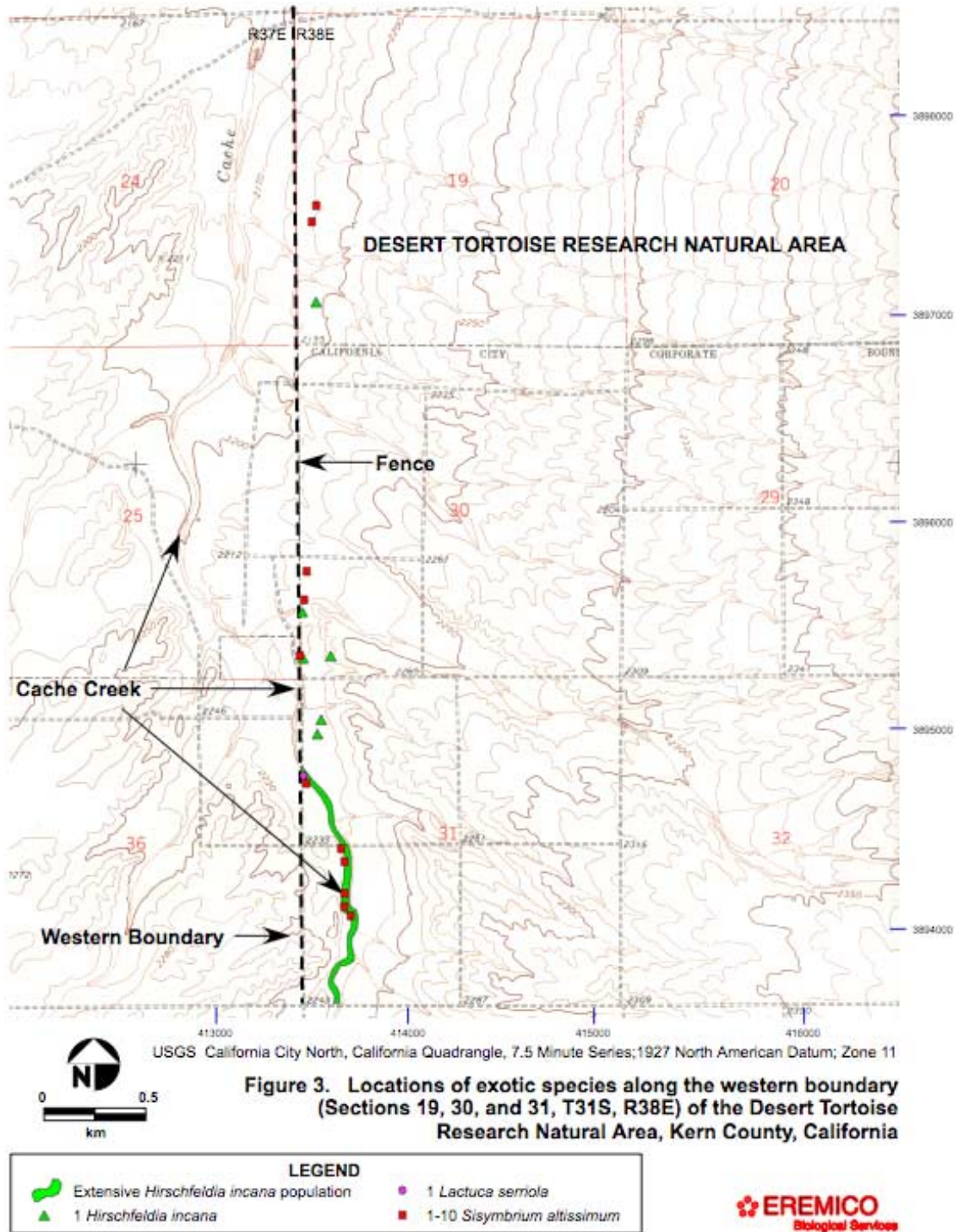
FAMILY SCIENTIFIC NAME	FAMILY COMMON NAME	SECTION, T31S, R38E					
		5	8	18	19	30	31
ASTERACEAE	SUNFLOWER FAMILY						
<i>Lactuca serriola</i>	prickly lettuce	-	-	-	-	-	R
BRASSICACEAE	MUSTARD FAMILY						
<i>Hirschfeldia incana</i>	Mediterranean mustard	-	-	C	R	R	C
<i>Descurainia sophia</i>	flixweed	-	-	R	-	-	-
<i>Sisymbrium altissimum</i>	tumble mustard	R	R	C	R	O	O
CHENOPODIACEAE	GOOSEFOOT FAMILY						
<i>Salsola tragus</i>	Russian thistle	C	R	-	-	-	-

¹Abundance: - = not observed

R = rare, only a few plants present at a few locations;

O = occasional, several plants present at a few locations or a few plants present at several locations;

C = common, several plants present at several locations or many plants at a few locations



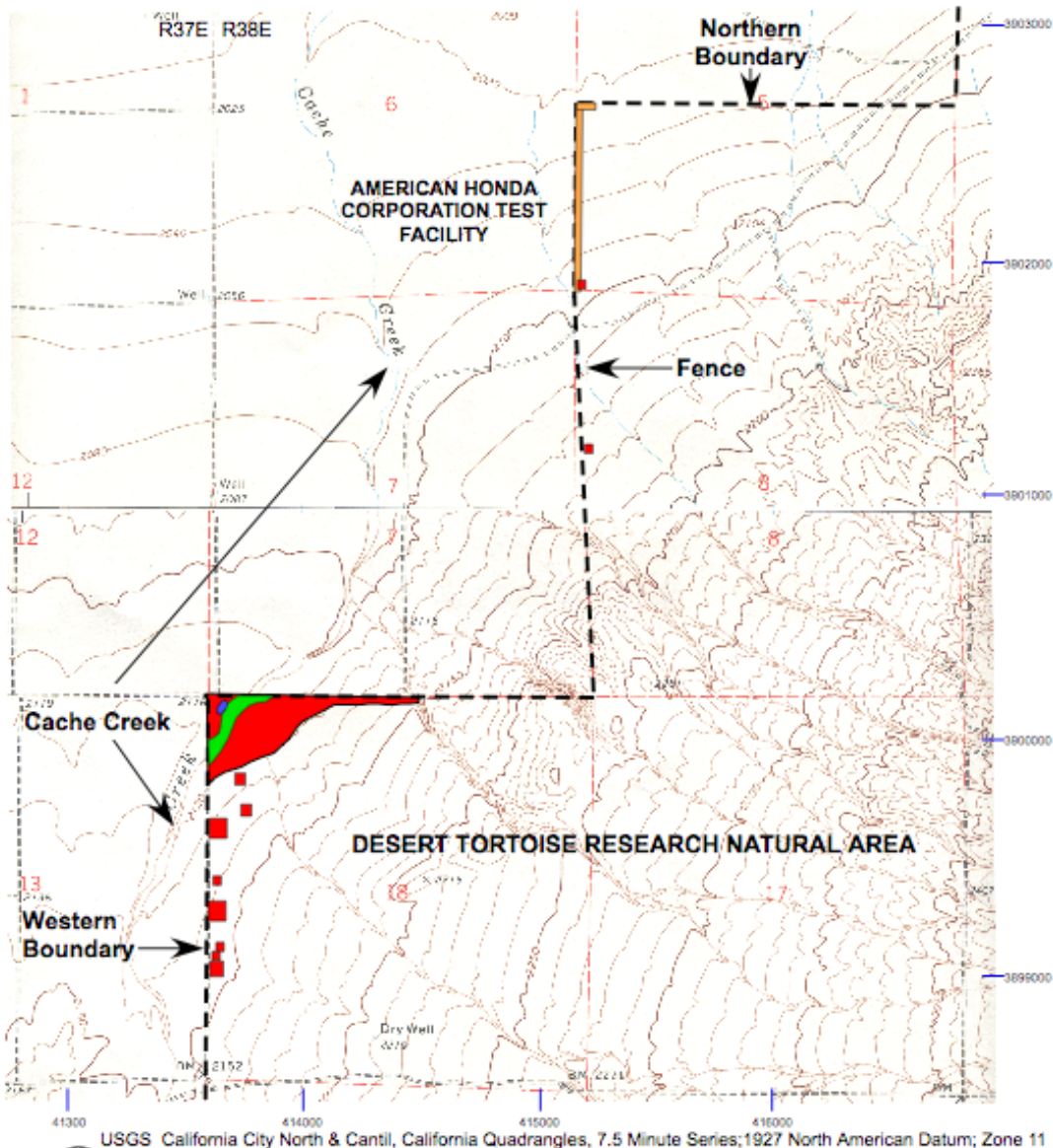
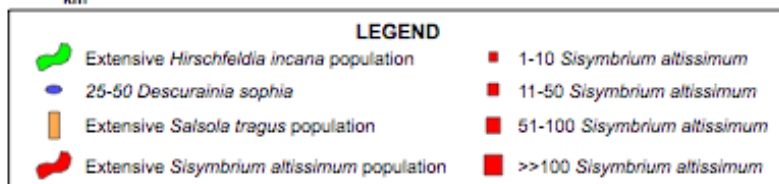


Figure 4. Locations of exotic species along the western and northwestern boundaries (Sections 5, 8, and 18, T31S, R38E) of the Desert Tortoise Research Natural Area, Kern County, California



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thousands of plants were present. Individual Mediterranean mustards occurred at a few locations in Sections 19 and 31. Photographs appear in Appendix D.

Tumble mustard was observed in every section evaluated but was most abundant in the northwest portion of Section 18, where a few thousand individuals occurred. This species inhabited disturbed areas along Cache Creek and along the boundary fence, in small washes, and in areas where the soil had been disturbed by rodents. The majority of plants were along Cache Creek and along the boundary fence. However, individuals and small clumps of plants occurred up to 230 m east and south of the boundary fence in the northwest corner of Section 18 (Figure 4). Photographs of this species appear in Appendix D.

Less abundant exotic species that were noted during the evaluation were prickly lettuce (*Lactuca serriola*) and flixweed (*Descurainia sophia*). Prickly lettuce was noted only in Section 31, where one individual occurred in Cache Creek (Figure 3). The flixweed only occurred on the north bank of Cache Creek in Section 18, where plants were scattered and in low numbers (Figure 4).

Russian thistle (*Salsola tragus*) was also noted on the DTRNA but was limited to the extreme northwest corner of Section 8 and along the western boundary of the southwest quarter of Section 5, Township 31 South, Range 38 East (Figure 4). It was most prevalent in a 10-m wide strip along the western edge of Section 5. This area is immediately adjacent to the security fence of the American Honda Corporation testing facility in eolian sand. The source of the Russian thistle problem is probably the testing facility and the adjacent fallow fields that are west of the DTRNA.

NOTES ON VERTEBRATE SPECIES OF INTEREST

Mohave ground squirrels (*Spermophilus mohavensis*) were observed at two locations, in the northwest quarter of Section 31 and in the southwest quarter of Section 19, Township 31 South, Range 38 E on May 4, 2006. A Loggerhead Shrike (*Lanius ludovicianus*) and a Le Conte's Thrasher (*Toxostoma lecontei*) were also seen at the first location on May 4, 2006. Completed California Native Species Field Survey Forms for the Mohave ground squirrels are provided in Appendix E.

DISCUSSION

During the last 2-3 years the Mediterranean mustard population has exploded in many areas of western Mojave Desert, including the DTRNA. In Spring 2003, during a plant collection project conducted throughout the DTRNA, I observed very few (< 5) plants in Cache Creek, although the entire creek area was not surveyed. At least 2 major flooding events in Cache Creek since that time probably carried seeds from upstream into the DTRNA. These events and above normal rainfall in the last few years likely has helped proliferate the species. This mustard will continue to be a problem along Cache Creek as long as it continues to persist upstream, and rainfall is at or above the long-term annual norm. If left unchecked, Mediterranean mustard may continue to spread farther from the banks of Cache Creek and into the DTRNA, negatively affecting the native vegetation.

In spring 2006, a mustard removal program was initiated by the DTPC. This year's effort focused on Mediterranean mustard inhabiting the Cache Creek area in Section 6, Township 32 South, Range 38 East, where the infestation was the most severe. The 80.5-hour effort, however, could only eliminate the mustard in approximately 52% of the infested area in Section 6. Because the infestation is broader along the southern portion of the creek, it is estimated that only about one-third of total number of plants in Section 6 was removed. Therefore, an estimated 160 person hours would have been necessary to complete the job.

Downstream of Section 6, Mediterranean mustard continues into Section 31, Township 31 South, Range 38 East, to the point where Cache Creek exits the DTRNA in the northwest corner of the section. In this area the width of infestation is 30 to 40 m. The creek reenters the DTRNA in the northwest corner of Section 18, Township 31 South, Range 38 East, and additional Mediterranean mustards occur. The width of infestation is, again, 30 to 40 m. Future mustard removal efforts should address the entire length of Cache Creek that runs through or adjacent to the DTRNA.

During the assessment along the western and northwestern boundaries of the DTRNA, other potential problems were identified. Tumble mustard and Russian thistle are encroaching onto the DTRNA from the west. Both species are annuals that disperse their seeds when the

plants break away from their crowns and tumble with the wind. They seem to be able to germinate in soils with varying degrees of disturbance. Because the prevailing wind direction is from the west and southwest during the fruiting periods for these plants, they could potentially infest the interior portions of the DTRNA and become a more widespread problem.

CONCLUSION AND RECOMMENDATIONS

During the 2006 mustard removal effort at the DTRNA, EREMICO staff bagged approximately 5,410 Mediterranean mustard plants, weighing about 1,488 kg (wet weight) in a 10-day period. An enormous amount of biomass remains to be removed, however. The removal program should continue as long as the problem persists. An effort should be initiated immediately to remove, at a minimum, this year's fruiting stalks of the remaining Mediterranean mustards in Section 6, Township 32 South, Range 38 East. Then, next spring, annual removal efforts should commence. Work should be completed in Section 6 before moving downstream into Sections 18 and 31, Township 31 South, Range 38 East. Work should be completed from March through mid May, when the plants are in the vegetative stage or in flower and when the entire plant can be extracted and bagged without cutting off fruiting stalks. Teams of 2 should work together, one to dig and the other to bag. The DTPC should rent a large dumpster from a waste management company and have it placed near or on the DTRNA for mustard disposal. The waste management company should be called when the dumpster needs servicing. Renting a dumpster would eliminate the need to make daily dump runs, saving valuable time that could be used to remove more mustards.

Subsequent to the springtime removal effort, the cleared areas should be re-examined in late summer or fall, after it rains, to determine presence of new growth of Mediterranean mustard. If plants are found, the DTPC should consider a fall removal effort to eliminate these plants.

Once the Mediterranean mustard invasion is brought into control, the removal efforts should focus on tumble mustard and Russian thistle, first, then other exotic species such as flixweed and prickly lettuce. The optimum time of year to remove all of these species, except for Russian thistle, is March to April. For Russian thistle it is June to July.

LITERATURE CITED

Charters, M. L. 2006. Wildflowers and other plants of Southern California. Web site: www.calflora.net.

Hickman, J. C., ed. 1993. The Jepson manual: higher plants of California. Univ. of Calif. Press, Berkeley, Calif. 1400 pp.

APPENDIX A

DAILY NOTES DURING MUSTARD REMOVAL

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

START & FINISH TIMES 5/4/06

5/4

ACTIVITY Mustard Removal / Dump Run

FIELD TIME 0830 1630 Stop 8 hrs.

WEATHER AIR TEMP WIND SPEED DIRECTION CLOUD COVER

Pg 1 of

START 70.0 .8 K/H SSE 0

END 75.5 1.1 K/H VARIABLE 70%

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

11S 0413647 3893883 - 11S 0413573 3893569

No. of Bags: 13 Est. No. of Plants: 430 Est. Total Weight: 200

TIME

NOTES: 0342 - Photos ~~100-0381, 100-0382~~ beyond of work area 0413647

1126 - Photo ~~100-0381~~ 0380 0413551 3893707 (bag 5) 3893887

1402 - Photo 0384 after 3893767 0413551 (bag 5)

1402 - Photo 0385 after 812 post (bag 5)

1449 - Photo 0388 after end post (bag 5)

No sightings of Desert Tortoise or Mojave Ground Squirrel

Load wt. 4800 lbs.

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006) START & FINISH TIMES

5/6

ACTIVITY	weed Pulling / Dump			
FIELD TIME	1030	1630	6hrs	

Pg 2 of

WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	81.5	1.8 K/T	S	20%
END	79.5	3.4 K/T	SE	15%

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

Sta -0413574 3893579

No. of Bags: 12 Est. No. of Plants: 440 Est. Total Weight: 280 lbs

TIME

NOTES: Photo-1045 # 4/6 0413574 3893579

417 - 11 11

1141 Photo 418 0413600 3893497 422-Photo

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

START & FINISH TIMES

5/7

ACTIVITY DTNA MUSTARD

FIELD TIME 1030 1630 6hrs

WEATHER AIR TEMP WIND SPEED DIRECTION CLOUD COVER

Pg of

START 80.2 1.3 S 0% -hazy

END 90.8 1.0 S 0% -hazy

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

0413610 3893411

0413555 3893552

No. of Bags: 10 Est. No. of Plants: 400 Est. Total Weight: ~250kg

TIME

NOTES: 1030 photo 423,422 0413610 3893411

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

5/10

START & FINISH TIMES

ACTIVITY	DTNA			
FIELD TIME	0730 - 1200	1445 - 1745	8 hrs	
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	76 / 94.2	0 / 64T	- / W	0 / 0
END	96 / 76.4	.16 / 10	ESE / -	0 / 60%

Pg 1 of 1

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

0413610-3893411 - 0413553 3893277
other side of wash

No. of Bags: 16 Est. No. of Plants: 400 Est. Total Weight: ~400/60

TIME

NOTES: photo - 0413553 3893352 #432
photo 0413610 3893411 #431

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

START & FINISH TIMES

5/11

ACTIVITY	DCA		
FIELD TIME	0730-1200 4.5hr	1245-1445	2hr - 6.5hr

Pg 1 of

WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	83 / 94.8	0 / 1.5	- / W	40% / 15%
END	93 / 83.8	1.4 / .9	S / W	30% / 10%

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

0413555 3993352

0413570 3893236

No. of Bags: 20 Est. No. of Plants: 1200 Est. Total Weight: 300

TIME

NOTES: Photo

80

Photo 436 - 0413570 - 3993236

NAME:
ASHLEY
SUTTON

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

5/13

START & FINISH TIMES

ACTIVITY DTNA

FIELD TIME 0700 1500 hrs.

WEATHER AIR TEMP WIND SPEED DIRECTION CLOUD COVER

Pg 1 of

START 70.2 1.7 SW 0

END

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

0413570 3093263

No. of Bags: 15 Est. No. of Plants: 300 Est. Total Weight: 2596

TIME

NOTES: only bagging plants dug in the previous days.

NAME:
ASHLEY
SUTTON

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KERN COUNTY, CALIFORNIA

DATE: (2006)

9/21

START & FINISH TIMES

ACTIVITY	DINA			
FIELD TIME	0600-1300	14-1700	10 hrs	

WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	—			
END	—			

Pg of

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

— 0413679 + 0413720
3893152 + 3893014

No. of Bags: 26 Est. No. of Plants: 920 Est. Total Weight: 450 lbs

TIME

NOTES: Morning hours were dump runs, afternoon, digging

NAME:
ASHLEY
SUTTON

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START & FINISH TIMES

Pg of	ACTIVITY	DNA			
	FIELD TIME	0600-1600	0600-1600	1hr2	
TIME	WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
	START				
	END				

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

0413720 389344

0413 811 389346

No. of Bags: 32 | Est. No. of Plants: 520 | Est. Total Weight: 300lbs

NOTES: most of the day just bagging and one attempted dump run.

NAME:
DENISE
LaBERTEAUX

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START & FINISH TIMES

26 May

ACTIVITY	evaluate completeness			
FIELD TIME	0900 - 1200			
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	24°	13.5 Kph	W	2% 2%
END	30°	8.3 Kph	W	10%

Pg 1 of 1

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

NOTES:

0900

I arrive on site to evaluate the completeness of the *Hirschfeldia incana* removal in Section 6, T32S, R38E of the DTNA. Ashley Sutton was not able to complete entire removal of this mustard in the 80 hours allocated for this project.

Wyp. 35 0413980E, 3892268 - southern boundary of DTNA at Cache Creek, Sec. 6

The HINN is in fruit & flower. None of the fruit seems to be mature yet. The leaves are drying, so the plant is a bit more difficult to spot.

Wyp. 36 413698E, 3893100 - point along eastern edge of wash at which HINN was removed. Wash area is broad in this area.

Wyp. 37 413832E, 3893023 - point where HINN removal stopped on s + w side of Cache Creek.

1030

I track back through the wash to the southern boundary to estimate length of Cache Creek that still needs HINN removal.

1045

I'm to the southern boundary & distance is, ~~not~~ ~~GPS~~, that didn't work on GPS. The straight line distance is 770 m. There's enormous amount of biomass yet to be removed.

1100

I leave site. I drive up to north end of Sec. 6 to check area where removal occurred.

The removal in this area appears to be complete.

1200

Leave DTNA.

APPENDIX B

PHOTOGRAPHS OF THE REMOVAL EFFORT



Before (top) and after (bottom) mustard removal. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. UTM, NAD83, Zone 11 0413647E, 3893887N. View towards south. May 4, 2006. Photographs by Ashley Sutton.



Before (top) and after (bottom) mustard removal. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. UTM, NAD83, Zone 11 0413551E, 3893707N. View towards south. May 4, 2006. Photographs by Ashley Sutton.



Before (top) and after (bottom) mustard removal. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. UTM, NAD83, Zone 11 0413574E, 3893579N. View towards south. May 6, 2006. Photographs by Ashley Sutton.



Before (top) and after (bottom) mustard removal. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. UTM, NAD83, Zone 11 0413600E, 3893497N. View towards south. May 6, 2006. Photographs by Ashley Sutton.



Ashley Sutton removing mustards. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. UTM, NAD83, Zone 11 0413583E, 3893158N. Top: view towards east. Bottom: view towards west. May 12, 2006. Photographs by Denise LaBerteaux.



Top: Ashley Sutton removing mustards. UTM, NAD83, Zone 11 0413583E, 3893158N. View towards NE. Bottom: Bags of mustards. View NNW. UTM 0413493E, 3893275N. T32S, R38E, Sec. 6, DTRNA, Kern Co., CA. May 12, 2006. Photographs by Denise LaBerteaux.

APPENDIX C

DAILY NOTES DURING ASSESSMENT OF OTHER INFESTATIONS

NAME:
DENISE
LaBERTEAUX

JOURNAL - MUSTARD REMOVAL PROJECT
DESERT TORTOISE NATURAL AREA
KERN COUNTY, CALIFORNIA

DATE: (2006)

START & FINISH TIMES

ACTIVITY	Orientation	weed assessment		
FIELD TIME	0730-0845	0845-1630		
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	20°C @ 0900	7.5Kph	S	29%
END				

Pg 1 of 3

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

NOTES:

- 0730 I meet Ashley Sutton at the southwest corner of Sec. 6, T32S, R38E for orientation and tortoise briefing.
- 0830 We drive up to the northwest corner of Sec. 6, T32S, R38E and walk into the project area (Primary Work Area) along Cache Creek. Ashley will start removing *Hirschfeldia incana* along Cache Creek in Sec. 6, starting in the north & working southward.
- 0845 I drive up to the northwest corner of Sec. 31, T31S, R38E to begin my assessment of exotic invasions along western boundary of the DTNA
- wypt002 GPS 413501E, 3895050W - point where Cache Creek exits the DTNA in Sec. 31, T31S, R38E. *Hirschfeldia incana*, mainly on edges of creek bed. # on bank ~15m on either side at this location
- wypt003 413519E, 3895031N - *Bromus diandrus*, in Cache Creek, 1 plant.
- wypt004 413506E, 3895035N - *Lactuca* sp., in Cache Creek, 1 plant
- wypt005 413507E, 3895027N - *Sisymbrium altissimum*, s. bank of Cache Creek, 1 plant
- wypt006 413702E, 3894684N At 1/2 Sec. in Sec 31 + Cache Creek, *HIIN* extends ~15m on south bank of creek at this location, scattered. *HIIN* (flw) are along N bank in this area
- wypt007 413698E, 3894675N 1 *SIAL* in s. bank of Cache Creek.
- wypt008 413700E, 3894656N 6 *SIAL* in small patch (2' x 2') on S. bank of Cache Creek.
- wypt009 413745E, 3894356N. At this point in Cache Creek, *HIIN* extends out 15m on both sides of center of creek bed. Also, there are scattered *SIAL* all along area from 1/2 Sec. Rd. There are fewer *HIIN* on north & east banks of creek

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START & FINISH TIMES

4 May

Pg 2 of 3

ACTIVITY	FIELD TIME	WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START						
END						

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

NOTES:

then they are the west and south banks

Wyp010

At this pt in creek, HIIN extends out to 20m on west bank from ^{center of} creek bed. 413722E, 3894168N. Very few HIIN on east bank at this location

1020

I make it down to the section line between S. 31 + 36, and turn around heading back towards the north. Within the same zone along the creek where the mustards occur, there ~~is~~ also dense *Burnus*, both *B. madutensis* ssp. *subens* + *B. tectorum*.

Wyp011

1100

Wyp012

413557E, 3895046N, isolated HIIN ~ 58m from creek towards E. 413585E, 3895076N - Mohave ground squirrel (heard) - at least 3. NW 1/4 of Sec. 31. Also heard from this location: Longhead Shrike and DeConto's Thrasher. MCBS with LATR, ACASPH, HUSA, LYCO, LYAN, KRLA

Wyp013

1115

413587E, 3895129N - isolated HIIN, 117m NE of creek I continue onto Sec. 30, T31S R38N, heading north.

Wyp014

0412491E, 3895526 - 2 HIIN, 2 SIAL along fence

Wyp015

15 412492E, 3895539 - 1 HIIN

As I walk north, I keep within 15m of fence

Wyp016

16 413500E, 3895645N 1 SIAL

Wyp017

17 413494E, 3895719N 10 SIAL, 10 m²

1153

I arrive at north end of Sec. 30. I head back south along a transect that's ~ 50m from fence

1220

Wyp018

018 413564E, 3895838N - Desert tortoise pellet with fresh tracks in WSW-facing hillside

Wyp019

019 413573E, 3895846N - isolated HIIN, ~ 130m NE of Cacho Creek I finish up sec. 30 and take a lunch break.

1240

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START & FINISH TIMES

4 May	ACTIVITY				
	FIELD TIME				
Pg 3 of 3	WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
	START				
	END				

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

NOTES:

1310		I drive up to the NW corner of Sec 19, T31S, R38E. I begin walking along fence in Sec. 19			
wypt	20	413525E, 3897686N	- Clump of 3 SIAL (1 m ² area)		
wypt	21	413516E, 3897662N	- 2 SIAL		
wypt	22	413523E, 38974390N	- MGS (heard 2) SWly Sec. 19 MCBS w/ LATR, LYCO, ACASPH loamy sand, AMDU		
wypt	23	413588E, 3897266N	- 1 HIIN		
1415		I complete sound trap along W portion of Sec. 19 + continue north into Sec 18.			
wypt	24	413576E, 3899224N	- patch of SIAL w/ 70 plants, 35 m ² area		
wypt	25	413608E, 3899208N	- 5 SIAL, 0.5 m ²		
wypt	26	413614E, 3897324N	- 1 SIAL		
		Area SIAL 1 0.626 ha, 900-1000 plants			
wypt	27	413612E, 3897684N	- 7 SIAL 10 m ²		
		Area SIAL 2 1500-2000 plants			
wypt	28	413698E, 3899913N	SIAL 15 plants, 4 m ²		
		Other clumps of SIAL throughout this area, extending eastward from fence at least 220m			
		Photo 143-145 SIAL along Sec 18 fence			
		from 413514E, 3899492N towards 144 N, N, NE			
		Photo 146-147 SIAL along Sec 18 fence			
		from 413517E, 3899840N N, NE			
1630		I finish up from the day, ending just south of Cache Creek in NW corner Sec. 18			

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START & FINISH TIMES

12 May

ACTIVITY	Weed Assess.			
FIELD TIME	0730 - 1230			
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START	24°C	1.2	SW	35% high clouds
END	35°C	1.0	SW	50% high

Pg 1 of 3

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

0730

NOTES:

Today I continue my weed assessment along the western and northwestern boundaries of the DTNA. I begin in the NW corner of Sec 18, T31S, R38E, where Cache Creek cuts thru the corner of the section. The *Hirschfeldia incana* extends ^{west} to Wpt 029, 41389E, 3900397N, on east side of the Creek, at the N boundary of Sec 18. Cache Creek is broad in this area & subsequently the HIIN occupies a broader area, i.e. it is growing throughout the wash & along the banks, out to 10-20 m from the edges of the wash. There are 100's of plants. Along the western boundary fence Sec 18, the HIIN extends out to Wpt 030, 41389E, 3900132N. Another big problem is the extent of *Desymbium altissimum* in this area. It extends ~~west~~ ^{west} to about 200 m or more from west & N fence line of Sec 18, into the DTNA. There are 100's of SIAL in this corner (also in this area is *Descurainia sophia* (scattered, not abundant)). SIAL is a more wide-spread problem because it's seeds are dispersed when the dried plants tumble in the wind. It ~~will~~ may disperse farther ~~west~~ east & north into the DTNA since these areas are downwind of prevailing wind direction. As I start to climb the hill in Sec 18 going east, the SIAL is less abundant at 100m S. of N boundary. It is still common along the N boundary. The SIAL continues scattered along N boundary, then drops out near a SSE to NNW trending wash at Wpt 031, 414389E, 3900409N. It extends about 10 m S into the DTNA.

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START & FINISH TIMES

12 May

Pg 2 of 3

ACTIVITY				
FIELD TIME				
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START				
END				
RAINFALL				
WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)				
No. of Bags:	Est. No. of Plants:		Est. Total Weight:	
TIME	NOTES:			
0900	at this point I drive along DTNA boundary looking for sensitive species.			
	at W ypt 032 415097E, 3901360N, along the western boundary of Sec. 8, there are 3 SIAL just within the fence			
0925	I arrive at the SW corner of Sec. 5, T315, R38E. I proceed to walk inside the boundary fence between American Honda + DTNA. at this point northward, there is Salsola <i>tragus</i> + some SIAL. The SATR is mainly confined along drainage + banks just outside the Honda security fence, about 10 m wide. This area was an dirt road, but it is now eroding away.			
0950	I arrive at the quarter section, the N boundary of DTNA in Sec. 5. The SATR is along the N-boundary, east to W ypt 34, 415175E, 3902828N, N 100 m east of Honda security fence, + 10 m south of N-boundary. Some SATR have tumbled further eastward but I don't see any new ones coming up.			
1015	I walk out to the wash just east of the center of Sec. 5. I haven't noted any SATR or any mustards in awhile + the topography leads up hill at this point. I assume there are few problems with encroaches along the remainder of NW + W boundaries. I lead back to my truck at SW corner of Sec. 5.			
1100	I'm back at my truck. I lead out, but stop to photograph mustards in NW corner of Sec. 18, from 413804E, 3900417N, toward WSW Photos 65+66 Photo 67 from 413667E, 3900439N → SSE			

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START & FINISH TIMES

ACTIVITY				
FIELD TIME				
WEATHER	AIR TEMP	WIND SPEED	DIRECTION	CLOUD COVER
START				
END				

Pg 3 of 3

RAINFALL

WORK AREA (township, range, section; GPS coordinates in NAD 83 of start and end points)

No. of Bags: Est. No. of Plants: Est. Total Weight:

TIME

NOTES:

I drive down to Sec. 6, T32S, R38E to check on Ashley's progress & to photograph him in action
1145 I arrive at Ashley's location
Photos 68-69 from 413548E, 3873195N → SE
Photos 70 from 413583E, 3873158N → E
Photo from 413493E, 3873275N → NW of bagged #41IN
1230 I leave the site

APPENDIX D

PHOTOGRAPHS OF OTHER INFESTATIONS



Tumble mustard (*Sisymbrium altissimum*) along western boundary in Section 18, T31S, R38E.
Top: UTM, NAD83, Zone 11 0413517E, 3899840N. View towards north. Bottom: UTM
0413517E, 3899840N. View northeast. DTRNA, Kern Co., CA. May 4, 2006. Photographs by
Denise LaBerteaux.



Mustards along Cache Creek in Section 18, T31S, R38E. Top: UTM, NAD83, Zone 11 0413804E, 3900417N. View towards WSW. Bottom: UTM 0413667E, 3900439N. View SSE. DTRNA, Kern Co., CA. May 4, 2006. Photographs by Denise LaBerteaux.

APPENDIX E

CALIFORNIA NATIVE SPECIES FIELD FORMS

Mail to:
 California Natural Diversity Database
 Department of Fish and Game
 1807 13th Street, Suite 202
 Sacramento, CA 95814
 Fax: (916) 324-0475 email: WYDAB@dfg.ca.gov

For Office Use Only

Source Code _____ Quad Code _____
 Elm Code _____ Occ. No. _____
 EO Index No. _____ Map Index No. _____

Date of Field Work *mm/dd/yyyy*: 05/04/2006

RESET

California Native Species Field Survey Form

VERSION 1.0/1.1

Scientific Name: *Spermophilus mohavensis*

Common Name: Mohave ground squirrel

Species Found? Yes No _____ if not, why?

Total No. Individuals 2 Subsequent Visit? yes no
 Is this an existing NODDB occurrence? yes, Occ. # _____ no unk.

Collection? If yes: _____
 Number _____ Museum / Herbarium _____

Reporter: Denise LaBerteaux

Address: 211 Snow Street
Weldon, CA 93283

E-mail Address: denico@aol.com

Phone: (760) 378-3021

Plant Information

Phenology: _____% vegetative _____% flowering _____% fruiting

Animal Information

adults _____ # juveniles _____ # larvae _____ # egg masses _____ # unknown 2
 breeding wintering burrow site rookery nesting other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: Kern Landowner / Mgr.: BLM

Quad Name: California City North Elevation: 660 m

T 31S R 38E Sec 19 , SW $\frac{1}{4}$ of SW $\frac{1}{4}$, Meridian: H M S Source of Coordinates (GPS, topo. map & type): GPS

T _____ R _____ Sec _____ , _____ $\frac{1}{4}$ of _____ $\frac{1}{4}$, Meridian: H M S GPS Make & Model GARMIN 76CS

Datum: NAD27 NAD83 WGS84 Horizontal Accuracy 2 meters/feet

Coordinate System: UTM Zone 10 UTM Zone 11 OR Geographic (Latitude & Longitude)

Coordinates: Easting/Longitude 413523 Northing/Latitude 3897390

Habitat Description (plant communities, dominants, associates, substrates/soils, aspects/slope):

Mojave creosote bush scrub with *Larrea tridentata* dominating. Associates include *Acanthopappus sphaerocephalus*, *Lycium cooperi*, *Ambrosia dumosa*. On an alluvial fan, on the east side of Cache Creek. Soil: loamy sand. Aspect: west. Slope: 2%.

Other rare taxa seen at THIS site on THIS date:

Site Information Overall site quality: Excellent Good Fair Poor

Current / surrounding land use: open, undisturbed desert, within the Desert Tortoise Natural Area

Visible disturbances: none, although exotic weevil invasions nearby

Threats: trespass sheep grazing; trespass OHV use; exotic weed invasions

Comments: 2 individuals heard

Determination: (check one or more, and fill in blanks)

- Keyed (cite reference): _____
- Compared with specimen housed at: _____
- Compared with photo / drawing in: _____
- By another person (name): _____
- Other: _____

Photographs: (check one or more)

Plant / animal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diagnostic feature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

May we obtain duplicates at our expense? yes no